SAPTHAGIRI COLLEGE OF ENGINEERING

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SAPTHAGIRI
College of Engineering
Creating Tomorrow

In Association With

International Conference on

"Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices"

(ICGCP—2021)

16th - 17th July, 2021

Conference Proceedings

Jointly Organized by
Department of
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&
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Preface

Sapthagiri College of Engineering, Bengaluru was established in the year 2001 by Srinivasa Education and Charitable Trust with a vision to transform its students into competent, inspired and responsible professionals. It is one of the best Engineering Colleges in India.

It is our great honour and pleasure to publish the Proceedings of the International Conference on Global Convergence in Technology and Entrepreneurship, Computing and Value Engineering, Principles and Practices - 2021 (ICGCP – 2021). The conference was held on 16th and 17th July, 2021 in virtual mode. The conference was organized to encourage the young research minds and also to bring all researchers, academics, scientists, industry experts, on a common platform.

Present global scenario demands unprecedented actions and efforts to converge social, economic and environment issues. Science, Technology and Innovations in the area of Internet of Things, Artificial Intelligence, Bio-Technology, Nano Materials and Renewable Energy must play a key role in achieving these goals. The call for Make in India products by the central and state governments has given impetus to start-ups and entrepreneurships. The conference covered all emerging areas of Science, Engineering and Technology towards fulfilling the objectives.

The response to call for papers was excellent. More than 500 papers were received from across the country, out of which 320 papers were selected for presentation and publication in the proceedings. These papers provided a wide spectrum of research covering all the areas for which the conference was intended.

We wish to express our deepest thanks and gratitude to speakers B.R. Indushekar Head, Operations Development Volvo Construction Equipment, Bangalore and Dr.Yared Abera Ergu Dean, School of Technology Ambo University, Ethiopia for delivering keynote addresses. We would like to express our gratitude and appreciation to the authors for their contributions. Many thanks go as well to all of the reviewers who helped us maintain the quality of the research papers included in the Proceedings. Our sincere thanks go to the Management for their encouragement and support for conducting the conference. We also express our sincere thanks to the members of the organizing team for their dedication and hard work.

Conference Chair of ICGCP – 2021

Dr. Ramakrishna H

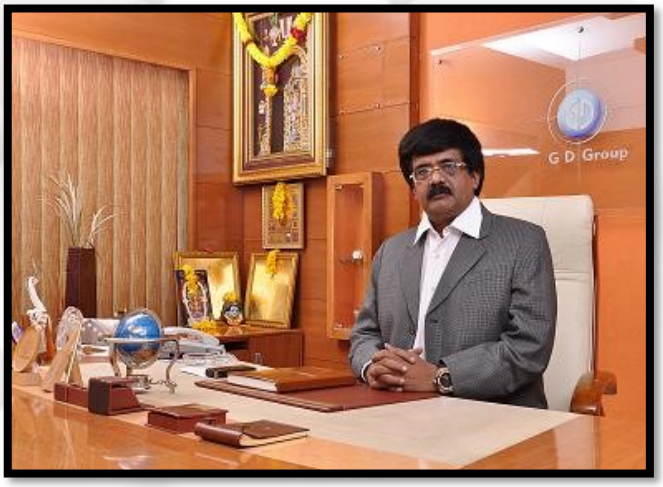
Principal.

Conference Co-Chair

Dr. Shripad Markande

Prof. & Head, Department of Mathematics.

On behalf of the ICGCP – 2021 Organizing Committee



Sri. G Dayananda
Chairman

Message from The Chairman

It gives me immense pleasure in congratulating the Chairman and team members of ICGCP- 2021, on successfully hosting the two days international conference at Sapthagiri college of Engineering. We are overwhelmed by the kind of response received by the research scholars across the country and I wish all of them a bright future and successful career. Also I would like to appreciate the contributions from the Principal, Heads of Departments, faculty and staff of the college for joining their hands in successful conduct of the international conference.

Sri. G.D Manoj
Executive Director

Message from Executive Director

On this occasion, I express my heartiest congratulations to all the participants of ICGCP-2021 for presenting and publishing their research findings in the international conference. I hope that, the two-day international conference has motivated faculty, research scholars and students to continue their research. Also on behalf of the Management, I would like to extend my appreciation to the sincere efforts of Principal, Heads of Departments, and Staff members of Sapthagiri College Engineering.

Message from Principal

Dr. H Ramakrishna
Principal

At the outset I would like to congratulate the entire team of ICGCP-2021 for successfully organizing "Global Convergence in Technology, Entrepreneurship, Computing and Value Engineering: Principles and Practices – 2021" which witnessed active participation of more than 320 research scholars from across the Karnataka and outside. On this occasion, I would like to thank our Chairman, Shri. G. Dayananda and Executive Director, Shri. G. D. Manoj for the magnanimous support extended in organizing the conference. I would also like to congratulate all the faculty, research scholars and undergraduate students for publishing their research works in the conference and I hope that the two-day interaction has motivated them to further pursue their research work and contribute to society. Also I would like to appreciate the efforts of session chairs / reviewers / heads of departments / technical support team for their contributions in adding value to all the sessions. Finally, I would like to congratulate the team ICGCP-2021 for bringing out the proceedings of the conference in a precise manner and for making it available for the researchers' community.

CONTENTS

A SURVEY on TRAFFIC SIGN RECOGNITION SYSTEM

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Abstract **- Traffic sign recognition system is very much necessary to ensure the safety while driving. These systems help drivers to easily identify the sign and follow them. In any machine learning algorithm the dataset is first trained and then the input data is given to the trained model for further processing. Pre-processing is performed to remove noise. Features from the images present in the dataset are extracted to classify them under different categories. Various techniques such as color segmentation, shape analysis, by obtaining the region of interest and so on, are used to extract the traffic signs to perform the recognition. CNN and SVM are the algorithms which can be used for classification of traffic signs. CNN has provided better results compared to SVM based on the research.**

Keywords **- Convolutional Neural Network (CNN), Traffic Sign Recognition, Classification, Image Pre-processing, Support Vector Machine (SVM).**

I. INTRODUCTION

In modern society with the rapid development in technology, automobiles have become significant in everyone's life as it has introduced convenience to people. Today cars have become primary means of transport and their number has been increasing day by day which has also led to traffic and frequent road accidents.

The integral parts of our road infrastructure are traffic signs. Traffic signs provide information that is critical for road users, which tell them to take necessary actions thereby reducing accidents. Traffic signs tell the user the state of the road, warnings, prohibitions etc. Designing of Traffic signs is done in such a way that they are easy to read with highly saturated and contrasting colors.

Approximately 1.3 million people die because of car accidents every year which means on an average there are 3287 deaths per day. India has highest rate of road accidents in the world. As per report issued by Stanford Law School, almost 90% of all vehicle crashes are caused due to some type of negligence by driver such as over speed driving, aggressive or reckless driving, Drowsy driving, Drunk driving, Distracted driving or misinterpretation of Traffic Sign.

Hence, there is need for system that automatically detects, recognizes and interprets the meaning of Traffic signs. This system can be implemented in autonomous cars or driver assistant system, which informs the user what action has to be taken on the right time. This reduces the road accidents, deaths caused due to it and reduces human effort and provides safety and security. Traffic sign recognition system is built so that it can recognize all the emerging traffic signs. It immediately assists the driver or the automatic driving system in recognizing the traffic signs.

II. DATA SOURCE

Data consists of information which is collected from various sources and processed on observation. Color and shape of Traffic signs are chosen by Traffic authorities with the intention of making it easy to understand by humans as they provide important information such as cautions and hazards to drivers. The data can be collected from Kaggle which contains German Traffic Sign Recognition Benchmark (GTSRB) which can be utilized for training the model and later for classification of traffic signs. The dataset is essential to predict the traffic sign accurately which makes it easy for the driver assistant system.

III. LITERATURE SURVEY

The paper titled [1] "A REVIEW ON TRAFFIC SIGN DETECTION AND RECOGNITION SYSTEM" states that the safety and security should be provided in autonomous cars. Therefore this system is used. The traffic signs are detected and recognized on basis of shape, color and texture. Information about different method is provided. The proposed system has been split into detection and classification modules. The detection can be done by color

based, shape based or other methods. Color segmentation and shape analysis is performed. The complications in the system can be minimized by combining various methods. Reliable systems that are fast and accurate can be built by hybrid technologies.

The paper titled [2] "TRAFFIC SIGN CLASSIFICATION AND DETECTION USING DEEP LEARNING" states regarding the assistance given to the driver during different conditions. The driver pays very less attention towards the traffic signs that are located on the road as his main focus tends to be on the destination address. The CNN algorithm is used for detection and recognition. Video based input is given. CNN-SVM combination is used where CNN is used for feature extraction and SVM is used for classification. Four different types of traffic signs are used which includes warning, prohibition, obligation and informative. Region of Interests (ROIs) is generated after pre-processing. Comparison based on experiment proved that the model is superior over others in the field of training accuracy and speed.

The paper titled [3] "SIMULTANEOUS TRAFFIC SIGN RECOGNITION AND REAL-TIME COMMUNICATION USING DUAL CAMERA IN ITS" conveys that in recent times there is increase in usage of smart vehicles due the development of Intelligent Transport System (ITS). To detect the traffic sign and provide assistance Convolutional neural network is used. Optical Camera Communications (OCC) and CNN are used for detecting the traffic sign after region of interest is generated. Dual cameras continuously in function to capture traffic sign or LED. If both are detected, distance is measured and data extraction takes place leading to further detection and recognition of traffic sign. The generated model reduces the overall computational complexity.

The paper titled [4] "TRAFFIC SIGN DETECTION AND RECOGNITION BASED ON CONVOLUTIONAL NEURAL NETWORK" states that traffic sign detection and recognition are extremely important for the drivers to gain knowledge on road safety and information. The input images are taken and to this images Hough Transformation is applied which generates the area of interest and area of traffic signs is recognized. In Image pre-processing, enhancement of image color and transformation of color space is performed. Classification and identification of image are done with the use of CNN. Different phases included are the detection phase, segmentation phase and classification. Layers of CNN are used in the process of classification. This model mainly aims in detection of circular traffic signs.

The paper titled [5] "TRAFFIC SIGN DETECTION AND RECOGNITION FOR AUTONOMOUS VEHICLES" states that the main reason why the autonomous cars are getting the attention is because of their ability to detect the traffic sign and ensure safety. German traffic sign data-set is used. Color based segmentation and CNN is used to crop the sign and classify the traffic sign. Models are defined after the image is pre-processed and data acquisition is done. Testing is done in the real environment which gives beep sound to alert the driver when traffic sign is recognized. This system can be used in autonomous as well as non-autonomous system to alert the driver. Further if used with mechatronics can automatically take actions based on the traffic signs.

The paper titled [6] "TRAFFIC SIGNS RECOGNITION WITH DEEP LEARNING" defines that the training is given by using German traffic sign dataset. Characteristics from the images present in the training set is extracted to assort them under multiple groups. By using the Lenet-5 network, extract data representation of traffic signs to perform the recognition. It is formed by CNN modifies by connecting the output of all the convolution layer to the multi-layer perceptron. The extraction is based on different factors the network takes 2-D image and processes it with convolution operations. The solution overcomes descriptions extraction which is very sensitive to different factors. It has the ability to learn a representative description of images.

The paper titled [7] "CNN DESIGN FOR REAL-TIME TRAFFIC SIGN RECOGNITION" states the level of recognition of traffic signs using mobile processor in autonomous driving vehicle to ensure the safety. Recognition of traffic signs involves two steps, localization and subsequent classification. Template matching algorithm with precise localization stage showed good results in recognition. When it comes to detection and classification it requires additional support which is provided using CNN. CUDA enabled GPU is used for frame processing in a video, which does it in 7-10ms. This design showed very high accuracy in recognition, detection, localization and classification of image data as well as video based data. Adapting this model will increase the safety.

The paper titled [8] "TRAFFIC SIGN CLASSIFICATION USING SUPPORT VECTOR MACHINE AND IMAGE SEGMENTATION" states that there is need for efficient method for automatic classification of Traffic Sign in Driver Assistant System. Color image is converted into gray scale which is then given to Canny Edge Detection algorithm which outputs edge image free from noise from which Normal direction feature is obtained and it is used by SVM for classification. Later, Hough Transform algorithm is used to obtain Region of Interest by eliminating background from edge image and then it is given to SVM which uses 4 kernel functions such as linear, sigmoid, RBF and polynomial, out of which linear kernel function provides relatively more accuracy.

The paper titled [9] "AN AUTOMATIC TRAFFIC SIGN DETECTION AND RECOGNITION SYSTEM BASED ON COLOUR SEGMENTATION, SHAPE MATCHING AND SVM" the study about this topic helps to develop an efficient

TSDR system which contains an enriched data set of Malaysian traffic signs and computational time is relative low which will be helpful for the traffic signs on highways the low false positive rate will increase the system stability and reliability on real time application. Automatically SCR system can recognize and detect traffic signs from and within images captured by cameras or imaging sensors. The introduced technique implemented is variant in variable lightning, rotation and translation also even viewing the angle of the system demonstrating using and shape matching RGB color segmentation next also it supports vector machine which is SVM classifier led to receiver operating characteristics, the accuracy of the developed system is high.

In the paper titled [10] "TRAFFIC SIGN RECOGNITION USING VISUAL FEATURE TOWARD DRIVER ASSISTANCE SYSTEM" Local Feature Extraction is performed using Scale Invariant Feature Transform (SIFT) algorithm which outputs features that are local, do not change when imageis scaled or rotated and based on how object appear at interest point. Similar local features are grouped under same cluster. Each cluster is considered as visual word and visual word vocabulary is built. When local features are matched with visual word, the images will be represented in the form of Bag of Visual Words (BoW) which will be used as feature vector for classification process.

IV. CONCLUSION

From the survey, it is observed that Convolutional Neural Network (CNN) provides greater efficiency for image processing. Hence, the Machine learning algorithm Convolutional Neural Networks is used to recognize the traffic sign. Pre-processing, feature extraction, feature selection are performed to obtain better results. The images are pre-processed for better quality and easier detection. Feature extraction is performed by CNN algorithm itself, hence there is no need for separate feature extraction technique. The system recognizes the traffic signs and provides assistance to the manual driving system or autonomous driving system. In the future, real time datasets can be considered for evaluation which leads to higher accuracy in predicting in traffic signs for the driver or autonomous vehicle on the path.

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ALZHEMIER'S DISEASE FROM MRI SCAN

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Abstract–Alzheimer's disease is an unrepairable degenerative neurological brain disease. The most common cause of dementia. in the age group between 65 years and above [1]. The major case of 'dementia' disease. This disease which are slowly destroying the memory and thinking capacity. The accurate and timely diagnosis of the AD is the way to prevent the progression of this irreversible disease. This paper focus on a method to detect Alzheimer's disease from MRI scans using machine learning approach. Its mainly concentrate on the hippocampal region of the brain. The texture features are extracted from the hippocampus region by using the Gray Level Co-Occurrence Matrix (GLCM). The area and texture shape feature are extracted by using the Moment Invariants. The Error-back Propagation (EBP) in Artificial Neural Network (ANN) is used as the classifier for detection of various stages of AD. The proposed system gives an average accuracy of 86.8%.

Keywords: Alzheimer's disease, neurological, dementia, Gray Level Co-Occurrence Matrix,Error-back Propagation, Artificial neural network

I. INTRODUCTION

Alzheimer's disease (AD) is a neurological disorder of the brain that cause to memory loss . It is the most common form of dementia, caused by the build-up of beta amyloid plaques in the brain. The plaques and tangles are some of the main features of the disease. As the number of Plaques and tangles increases, the healthy neurons begin to function less effectively and gradually lose their ability to communicate and finally die which results in overall shrinkage of the brain tissues. The death of neurons in the hippocampus regions it oppose the form of new memories. In the brain hippocampus region is the first region gets affected. It is the region in the brain that is responsible in forming memories and serves as a relay structure between the brain and the body.

As Alzheimer's is a progressive and irreversible disease it progresses gradually following a distinct pattern of brain damage and can last for decades. The disease progresses slowly into three main stages namely mild, moderate and severe, where each stage has its own symptoms and challenges [2]. The mild stage generally lasts for about an average of 2 to 4 years in which a person may function independently but may have memory lapses. In the moderate stage a person may depend another to carrying out day to day activities and this experience which increased difficulty with the memory. This stage is probably the longest stage of the disease and may last for a duration of about 2 to 10 years.

The final stage of the alzheimer's disease period between 1 to 3 years. In this stage, the memory is completely loss and the patient loses their ability to respond to their environment. This is the very important diagnose of the alzheimer's disease

in an early stage before irreversible neural damage is done. The current non- automated methods such as Cognitive Impairment Testing, Mini-Mental State Examination (MMSE) and Clinical Dementia Rating (CDR) as well as Imaging techniques such as Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) and Single-Photon Emission Computed Tomography (SPECT) are used to track abnormal changes in the brain and diagnose AD.

In this paper,to detection of AD is done from MRI scans. The texture, area and shape features are extracted using Gray-Level Co-Occurrence Matrix (GLCM) and Moment Invariants from the hippocampus which is selected as the Region of Interest (ROI). GLCM which extracts the second order based on texture features and Moment Invariants define the set of properties which are used for identification of shape. AD is classified into various stages which are based on the features extracted from the ROI. By using Artificial Neural Network (ANN) which trained using Error Back Propagation (EBP) algorithm.

II. SYSTEM ARCHITECTURE

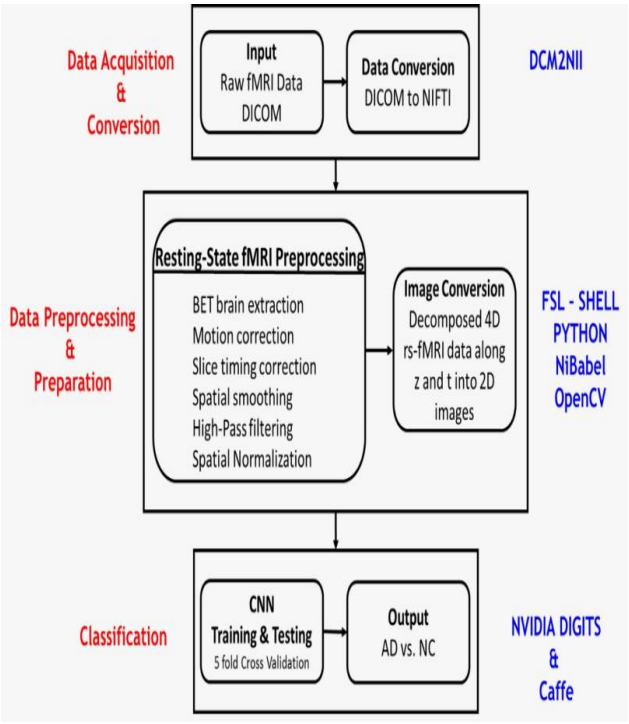

fig.1. System Architecture

In this architecture of AD, Data Acquisition and conversion which are real world physical conditions and converting the resulting samples into digited numerical values than it will be manipulated by a computer.

In above fig input as raw fMRI data and digital imaging and communicating in medicine (DICOM) images as 2D images. Then data will conversion as DICOM to NIFTI. NIFTI is a type of file format for neuro imaging that allow more data has stored, this referable images as 3D.

In data preprocessing and preparation, to detecting and the changes in the blood oxygenation is underflow that ocuurs response to neural activity. When a brain area more active and it consume more oxygenated to meet. This increased demand blood flow increases to the active area. In resting state fMRI Preprocessing means functional magnetic resources imaging. It has BET brain extraction, this brain extraction tools is used to remove the skull from an images. Then Motion correction, it means head motion is the largest sources of error in MRI studies and it gives have been developed to copy with their problem.

In slice timing correction, it recorded brain one slice matrix offset in time build up several seconds when compared to another.

In spatial smoothing, it is average of signals from adjacent vowels. This improves the signals to noise ration.

In high pass filtering, the removing of low frequency as APP (Amyloid precursor protein gene). Spatial normalization is a image processing step more specifically an image registration method.

In Classification has CNN used for image classification and recognization because of its high accuracy CNN convolves learned features with input data and uses 2D convolution layer. Then output as AD Vs NS. Alzheimer's disease is studied from Magnetic Resonance Imaging (MRI) data and captured by MRI scanner and creates the pictures of scanned tissue [3].

III. METHODOLOGY

In Methodology, we have to used 3 algorithms are Artificial neural network (ANN), Convolutional neural network (CNN), K-Nearest Neighbour algorithm (KNN).CNN is used for Image training and ANN is used for image recognization and KNN used for image classification. This 3 algorithm is used for the images. CNN can do both training, recognize and classification but it gives accuracy is very low, so we have to splits into 3 algorithms as CNN, ANN, KNN.

In CNN is deep learning algorithm. It can takes the input images and tell us the output, but in this paper CNN is trains the images they can able to differentiate one image to another image [4]. It has 3 images are 1.Convulation layer. 2.Pooling layer. 3.Fully connected layer.

In convolution layer extracting the features of the input images and then predicts the images. Here we considered this matrix as features of the images. Imaging images as matrix, images can splits as 5x5 matrix convolution layer which converts the 3x3 matrix. because in one extract the feature unwanted feature is not used so removing that images. Here we reduced 5x5 matrix as 3x3 matrix remove unwanted number.convolved feature is output matrix.

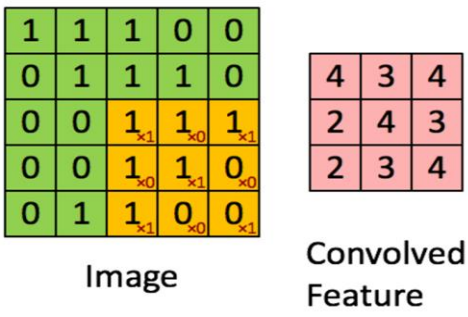

Fig.2. Convolution layer

In pooling layer which reduces the number of parameters, pixels and images too large. Previous layer we got 3x3 matrix here we can compressed too much. In pooling layer divides into 3 layers are max pooling, average pooling, sum pooling.

In max pooling it will takes large numbers from that output matrix. Then average pooling it will takes only average number from matrix. In sum pooling which combined all features and compressed it. In this paper mainly we are using sum pooling only because each and every point is important so using sum pooling.

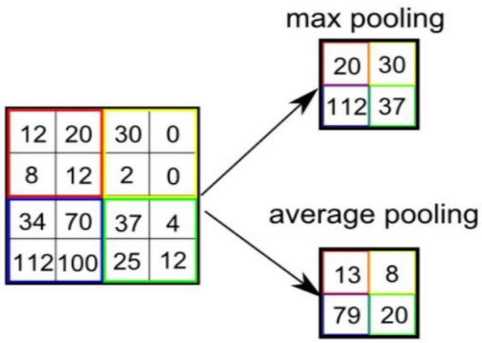

Fig.3. Pooling layer

In fully connected layer we are using 2x2 matrix so we will put matrix into vector from and connected fully layer. In input layer we are using 3 pooling are max, average and sum. In vectors consider as x1,x2,x3. In FC layer which inserting inside then split features into FC layer and it can trains the computer and it again compressed and give in output layer.

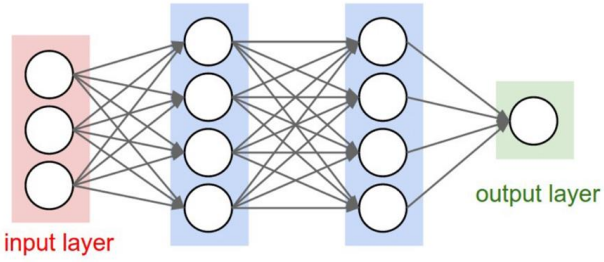

Fig.3. Pooling layer

In ANN, it is designed to simulate human brain analysis the information since the project is AD is brain disease as we know, this algorithm used for recognize images we already train the images into computer by using CNN. After that recognize by using ANN. It used for predict output values for given input characters from taining values.

It is brain neuron, it is consist of dendrites, soma and axon. Dendrites is nothing but like input structures, soma for

calculation purposes. axon is for output. Same way ANN works like incoming connection. It receive input and activation function makes a non linear detection then output connection is to deliver the output. In this paper trains the input which based on input, It gives output.

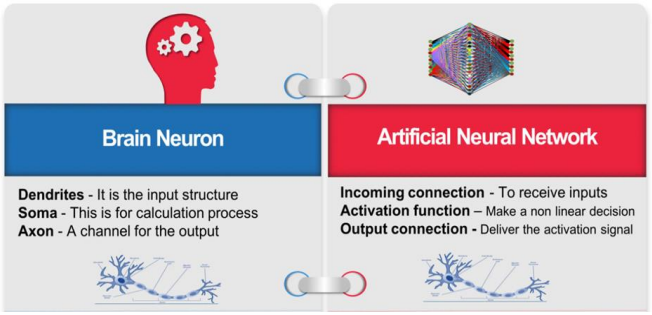

FIG.4.Artificial Neural Network

In k-nearest neighbour algorithm, it used for classification purpose. As we know here we detects 4 stages mild, very mild. Moderate and no alzheimer's classified stages and gives output. KNN is deep learning ML algorithm it easy to implemented and understand and classify the AD.

IV. CONCLUSION

In this Paper, a machine learning based approach for detection of Alzheimer's disease is proposed. The OASIS dataset was used for experiments. The texture shape of the features from hippocampus region from MRI scan are extracted. These features were used to train the neural network with error-back propagation for classification. In this paper give average accuracy of 86.8 %.

V. FUTURE WORK

These features were used to train the neural network with error-back propagation for classification. In Future days will give average accuracy upto 98%.

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BIRD IMAGE RETRIEVAL AND RECOGNITION USING A DEEP LEARNING PLATFORM

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ABSTRACT Birdwatching is a common hobby but to identify their species requires the assistance of bird books. To provide birdwatchers a handy tool to admire the beauty of birds, we developed a deep learning platform to assist users in recognizing 27 species of birds endemic to Taiwan using a mobile app named the Internet of Birds (IoB). Bird images were learned by a convolutional neural network (CNN) to localize prominent features in the images. First, we established and generated a bounded region of interest to refine the shapes and colors of the object granularities and subsequently balanced the distribution of bird species. Then, a skip connection method was used to linearly combine the outputs of the previous and current layers to improve feature extraction. Finally, we applied the softmax function to obtain a probability distribution of bird features. The learned parameters of bird features were used to identify pictures uploaded by mobile users. The proposed CNN model with skip connections achieved higher accuracy of 99.00 % compared with the 93.98% from a CNN and 89.00% from the SVM for the training images. As for the test dataset, the average sensitivity, specificity, and accuracy were 93.79%, 96.11%, and 95.37%, respectively.

INDEX TERMS Bird image recognition, convolutional neural network, deep learning, and mobile app.

I. INTRODUCTION

The everyday pace of life tends to be fast and frantic and involves extramural activities. Birdwatching is a recreational activity that can provide relaxation in daily life and promote resilience to face daily challenges. It can also offer health benefits and happiness derived from enjoying nature.

Numerous people visit bird sanctuaries to glance at the various bird species or to praise their elegant and beautiful feathers while barely recognizing the differences between bird species and their features. Understanding such differences between species can enhance our knowledge of exoticbirds as well as their ecosystems and biodiversity.

However, because of observer constraints such as location, distance, and equipment, identifying birds with the naked eye is based on basic characteristic features, and appropriate classification based on distinct features is often seen as tedious. In the past, computer vision, and its subcategory of recognition, which use techniques such as machine learning, have been extensively researched to delineate the specific features of Objects, including vegetables and fruits, landmarks, clothing, cars, plants, and birds, within a particular cluster of scenes. However, considerable room for improvement remains in the accuracy and feasibility of bird feature extraction techniques. Detection of object parts is challenging because of complex variations or similar sub ordinate categories and fringes of objects. Intraclass and inter-class variation in the silhouettes and appearances of birds is difficult to identify correctly because certain features are shared among species.

To classify the aesthetics of birds in their natural habitats, this study developed a method using a convolutional neural network (CNN) to extract information from bird images captured previously or in real time by identifying local features. First, raw input data of myriad semantic parts of a bird were gathered and localized. Second, the feature vectors of each generic part were detected and filtered based on shape, size, and color. Third, a CNN model was trained with the bird pictures in a graphics processing unit (GPU) for feature vector extraction with consideration of the afore- mentioned characteristics, and subsequently the classified, trained data were stored on a server to identify a target object.

Ultimately, information obtained from a bird image uploaded by an end-user, captured using a mobile camera, can be navigated through the client–server architecture to retrieve information and predict bird species from the trained model stored on the server. This process facilitates efficient correlation of fine-grained object parts and autonomous bird identification from captured images and can contribute considerable,valuable information regarding bird species.

The remainder of this paper is organized as follows. Section II briefly reviews related approaches for fine-grained visual categorization. Section III describes the various types of dataset used for feature extraction. Section IV focuses on the deep learning model and its features used in object part models, and describes the correlation between part localization and fine-grained feature extraction. Section IV also describes various correlation requirements, such as data augmentation, for excellent performance, localization, segmentation, identification of subcategories, as well as the requirement of a classifier for effective object prediction. The experimental results and analysis of the datasets are presented in Section V. Section VI summarize the discussion and limitation part of the study. Conclusions and directions for future study are provided in Section VII.

II. RELATED WORK

Recently, some fine-grained visual categorizations methods have been proposed for species identification, and they have become a promising approach within computer vision research, with applications in numerous domains. Numerous fine-grained recognition datasets, such as ImageNet, ILSVRC, Caltech-256, and CUB 200, have trained models with a wide variety of data to extract global features such as colors, textures, and shapes from multilabel objects. Many approaches have been applied for generic object recognition. Some methods apply local part learning that uses deformable part models and region-CNN for object detection, generation of a bounding box, and selection of distinctive parts for image recognition. Some studies have focused on discriminative features based on the local traits of birds. Simultaneous detection and segmentation are used to localize score detections effectively. Pose-normalization and model ensembles are also used to improve the performance of fine-grained detection by generating millions of key point pairs through fully convolutional search. Discriminative image patches and randomization techniques are integrated to distinguish classes of images and prevent overfitting. The present work also approached the learning of discriminative image features using a CNN architecture for fine-grained recognition. However, a complementary approach using domain knowledge of general bird features was integrated to provide detailed information about the predicted bird.

The advancement of consumer products, such as smart-phones, digital cameras, and wearable gadgets, has trans-formed multidisciplinary approaches toward technology by connecting the physical and digital worlds. High-resolution Digital cameras in smartphones are the most pervasive tools used for recognizing the salient features of physical objects, enabling users to detect, identify objects and share related knowledge. Birds present in a flock are often deeply colorful; therefore, identification at a glance is challenging for both birdwatchers and onlookers because of birds' ambiguous semantic features. To address this problem, an information retrieval model for birdwatching has been proposed that uses deep neural networks to localize and clearly describe bird features with the aid of an Android smart- phone.

III. DATA ACQUISITION

Feature extraction is vital to the classification of relevant information and the differentiation of bird species. We combined bird data from the Internet of Birds (IoB) and an Internet bird dataset to learn the bird species.

FIGURE 1. IoB interface.

A. IOB

The IoB is a crowdsourced metasearch-engine database specifically for birds, where any individual can store bird images and instantly retrieve information about the birds therein. Uploaded bird images are identified from extracted features. This platform encourages individuals to become involved in birdwatching and to enrich their knowledge of various bird species. The IoB is available online for free (with keyword: Who Cares? Keep Walking). Fig. 1 shows the app interface. Because a fall detection module is embedded in the system, the app also serves as a wellness platform to assist individuals in staying safe while birdwatching. In addition, the system can track the distance individuals cover from their daily physical strides using a pedometer to promote fitness and motivate users to walk while birdwatching.

B. INTERNET BIRD IMAGES

A pool of images is required for deep learning of subcategorization. Bird images containing 27 bird species endemic to Taiwan on various backgrounds were compiled from the IoB and several other online resources. The use of public-domain images has benefits and drawbacks. Although Internet

Image sources add diversity to the dataset, the images may be contaminated with noise, harshness, spurious pixels, and blurred parts, all of which degrade image quality. Therefore, to limit the intensity of deformity in an assortment of images, high-pixel images with clear boundaries were used. Finally, to obtain standardized balance in the dataset, the bird species images were transformed and augmented as follows [23]:

- Random flipping: Images were horizontally and vertically flipped.
- Rotation: Images were randomly rotated (maximum angle of 25◦) for training.
- Translation: Images were randomly shifted −10 to 10pixels.
- Zero-phase component analysis whitening: Dimension and redundancy in the matrix of pixel images were decreased.
- Gaussian filtering: Images were blurred for effective smoothing of noise.

In deep learning algorithms, feature extraction is a generalization step to differentiate the learning categories of inputdata patterns.

Object recognition with a high-level feature extraction architecture comprises the following steps: (1) data content analysis, in which all generic raw data are preprocessed to extract nonlinear transformations and to fit the parameters into a machine learning model for feature extraction; (2) optimal probabilities of relevant structural information from each tuned parameter are clubbed into a new array of classifiers; and (3) a prediction is made based on trained and learned parameters. To extract multiple feature levels fromraw data and evaluate the performance of the CNN for the dataset, the dataset was split into the three modules discussed as follows. (1) The training dataset comprised raw data samples that were incorporated into the training model to determine specific feature parameters, perform correlational tasks, and create a related classification model. (2) The validation dataset was used to tune hyper parameters of the trained model to minimize overfitting and validate performance. The model regularizes early stopping to prevent overfitting and toenhance learning when the precision of the training dataset increases while the error of the validation dataset remains the same or decreases. (3) The test dataset was used to test the classifier parameters and assess the performance of the actual prediction of the network model. Once the features had been extracted from the raw data, the trained prediction model was deployed to classify new input images. Fig. 2 shows the module for extracting unique features of birds with the CNN and predicting the most classified labels for the input images. Table 1 provides a list of terms and related abbreviations commonly used in this study.

IV. PROPOSED DEEP LEARNING MODEL

The emergence of deep learning algorithms has resulted in highly complex cognitive tasks for computer vision and image recognition. Recently, deep learning models have become the most popular tool for big data analysis and

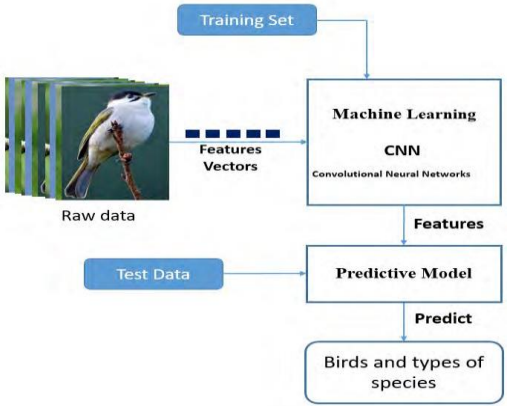

FIGURE 2. Feature extraction paradigm for bird images.

TABLE 1. List of terms and abbreviations.

Terms	Abbreviation
Internet of birds	IoB
Convolution neural network	CNN
Support vector machine	SVM
Batch normalization	BN
Rectified linear unit	ReLU
Fully connected	FC
Central processing unit	CPU
Graphic processing unit	GPU
Tensor flow	TF
Software development kit	SDK
Native development kit	NDK
Java native interface	JNI
Application programming interface	API
Hypertext transfer protocol secure	HTTPS
True positive	TP
False positive	FP
True negative	TN
False negative	FN

Artificial intelligence, outperforming traditional image classification algorithms, and they are currently being down-scaled for feasible mobile implementation. The proposed deep learning model for bird image classification using the CNN framework is described as follows.

A. CNN ARCHITECTURE

The model of CNN configuration for bird identification utilized a stack of convolutional layers comprising an input layer, two FC layers, and one final output softmax layer. Each convolutional layer comprised (a) 5×5 convolution, (b) BN, (c) ReLU activation, and (d) pooling layers. This section explains how to construct an optimized CNN model, why the parameters and hyper parameters must be tuned before training, the total number of convolutional layers, the size of the kernels for all relative convolutional layers, and

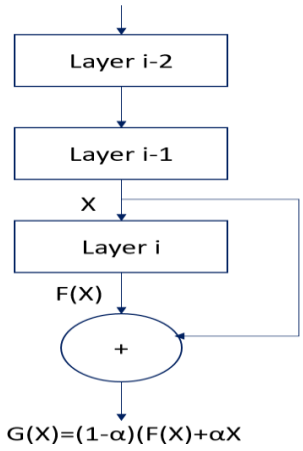

FIGURE 3. Framework of skip connections.

The likelihood of retaining the anode during dropout regularization for the dataset.

B. SKIP CONNECTIONS

When images are learned, deep neural network models train a base network from scratch to identify associations of features and patterns in the target dataset. Features are transformed from general to specific by the last layer of the network to predict the outputs of newly imposed inputs. If first-layer features are general and last-layer features are specific, then a transition from general to specific must have occurred somewhere in the network. To address and quantify the degree to which a particular layer is general or specific, we proposed adding skip connections among corresponding convolutional layers, as shown in Fig. 3. The skip layer connections should improve feature extraction through weightedsummation of corresponding layers as follows:

$$G(X) = (1 - \alpha)F(X) + \alpha X \qquad (1)$$

where X is the input, $F(X)$ is a function of input X, $G(X)$ is a linear combination of $F(X)$ and X, and α is a weight in the unit interval [0,1]. To check specific layers, we used different weights. For example, if $\alpha > 0.5$, then result from the previous layer contributes less to overall performance than the layers preceding it. By contrast, if $\alpha < 0.5$, then result from the previous layer contributes more to the overall performance. Using these skip connections can facilitate network training by reducing memory usage and increasing performance by concatenating the feature maps of each convolution layer.

C. TRAINING OF THE BIRD DATASET

Learning of bird species by the CNN was implemented on a GPU workstation with a 12 Intel Xeon CPU, 32 GB of memory, and an Nvidia GeForce 2 11 GB GTX 1080 Ti graphics card on a TF platform [31]–[33]. During training, input color images with a fixed size of 112×112 pixels were fed into CNN for feature extraction and bird image recognition. This study uses a dataset comprising 3563 images Of 27 bird species. The dataset was split into 2280 images for training, 570 for validation, and 713 for testing. The input images passed through a hierarchical stack of convolutional layers to extract distinct features, such as color, shape, and edges, with varying orientations of the head, body, legs, and tail shown in the images. The first convolutional layer transformed the input image into pixels, propelled it to the next layer, and followed the feature extraction procedure until the input image had been precisely classified with a probability distribution. To capture the features of the input image, every convolutional filter had a kernel size of 3×3 pixels and a high activation map that slid across the entire input volume. The stride was fixed at one by shifting the kernel one unit at a time to control the filter convolving around the input of the next pixel so that the output volume would not shrink and the yield would be an integer rather than a fraction; that is, $(i - k + 2q)/(s + 1)$, where i is the input height or length, k is the filter, q is the padding, and s is the stride. The padding was attuned to one around the input image to preserve the spatial resolution of output feature map after convolution; that is, $q = (k - 1)/2$. Spatial pooling was implemented to localize and separate the chunks of images with a 2×2 pixel window size, max pooling, and two strides, where the maximum pixel rate in each chunk of an image was considered. The stack of convolutional layers was followed by an element-wise activation function, the ReLU, to maintain aconstant volume throughout the network.

To implement the skip connection in the network, down-sampling is performed by conv3 and conv4 with a stride of 2. We directly use skip connection when the input and output have the same dimensions. When the dimensions of the output are increased, the shortcut performs identity mapping with an extra zero-padding entry for increasing dimensions. Two FC layers were implemented with the same 4096-dimension configuration to learn the gradient descent, compute the target class scores in the training set for each image, and localize objects positioned anywhere in the input image. A schematic of the ConvNet architecture is presented in Fig. 4, and the parameter configuration for ConvNet is provided in Table 2.

After the FC layers were added, the n-softmax layer activation function was added; here, n is the number of bird categories. The softmax layer yields a probabilistic interpretation of multiple classes. Each label corresponds to the likelihood that the input images are correctly classified using vector-to-vector transformation, thereby minimizing cross- entropy loss.

$$\text{softmax}\ \sigma(x)_i = \frac{e^{x_i}}{\sum_{j=1}^{K} e^{x_j}}, \quad \text{for } i = 1, \ldots, K. \qquad (2)$$

where x_i is the ith element of the input vector $\boldsymbol{x}$, $\sum_i \sigma(x)_i = 1$ and $\sigma(x)_i > 0$, which is the probability distribution over a set of outcomes.

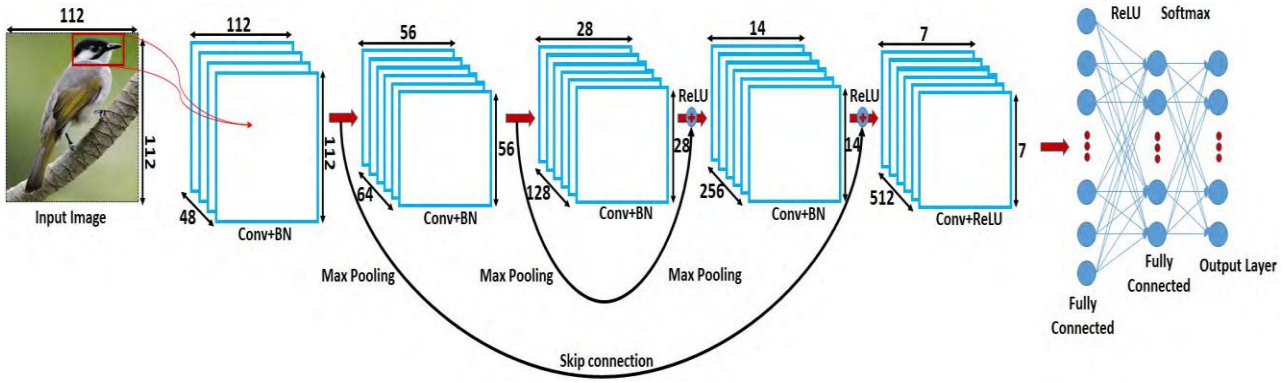

FIGURE 4. CNN architecture for detecting bird images.

TABLE 2. Convnet parameter configuration for bird image detection system.

Layer	Input size ($h \times w$)	Filter size ($h \times w$)	No. of filters	Pad ($h \times w$)	Stride
Input	112 ×112				
Conv+BN+ReLU	112 ×112	3 × 3	48	1 × 1	1
Max Pooling	56 × 56	2 × 2	48		
Conv+BN+ReLU	56 × 56	3 × 3	64	1 × 1	1
Pooling	28 × 28	2 × 2	64		
Conv+BN+ReLU	28 × 28	3 × 3	128	1 × 1	1
Max Pooling	14 × 14	2 × 2	128	-	2
Conv+BN+ReLU	14 × 14	3 × 3	256	1 × 1	1
Max Pooling	7 × 7	2 × 2	256	-	2
Conv+BN+ReLU	7 × 7	3 × 3	512	1 × 1	1
FC	4096	-	-	-	1
FC	4096	-	-	-	1
Softmax layer	27				

** Conv = Convolution, BN = Batch normalization, FC = Fully connected, h = Height, w = Width.

D. FEATURE EXTRACTION

Extracting features from raw input images is the primary task when extracting relevant and descriptive information for fine-grained object recognition. However, because of semantic and intraclass variance, feature extraction remains challenging. We separately extracted the features in relevant positions for each part of an image and subsequently learned the parts of the model features that were mapped directly to the corresponding parts. The features were calculated using ReLU 5 and ReLU 6. Localization was used to find object parts defined by bounding box coordinates and their dimensions (width and height) in the image. For the localization task an intersection over union score >0.5 was set for our model. An FC layer with a ReLU was used to predict the location of bounding box B_x. Subsequent steps of the learning algorithm were for learning the map of the feature vectors of the input image, deciding whether the region fit an object class of interest, and then classifying the expected output with the correct labels in the image. For a given image, feature vectors represent the probability of target object centrality in

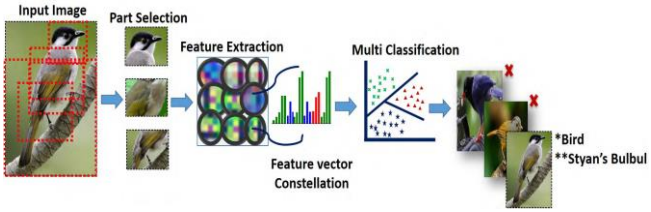

FIGURE 5. Input raw data and feature illustration for a classifier.

the database, and the softmax classifier produces the probability scores for each label. Fig. 5 presents a raw input image, illustrating part selection and crucial feature identification. Multiclassification predicts a category label with the highestprobability for the image.

E. SYSTEM IMPLEMENTATION

In this subsection, we explain using a high-resolution smartphone camera to identify and classify bird information [40] based on deep learning. To complete the semantic bird search task, we established a client–server architecture to bridge the communication gap between the cloud and mobile device over a network. The entire setup was executed in the following manner:

- Raw bird images were distilled to remove irrelevant parts and learned by the CNN to yield parameters on the GPU platform. Subsequently, a TF inference model was developed in the workstation for deployment in the smartphone.
- The output was detected using an Android app platform or through the web.

On the workstation/server side, the following segments were considered. The TF backend session model for object detection was prepared to save the TF computation graphs of input, output, weight, and bias as graph_def text files (tfdroid.pbtxt), which comprised the entire architecture of the model. The CNN architecture was trained to load the raw input data of bird images using Keras callbacks with the predefined parameters into TF format to fit the model for inference. After training the model, the parameters of all

Saved session events of model progress in each epoch were saved as a TF checkpoint (.ckpt) file. To deploy the trained model on a smartphone, the graphs were frozen in TF format using Python. Before the trained model was frozen, a saver object was created for the session, and the checkpoints, model name, model path, and input–output parameter layers of the model were defined. All other explicit metadata assignments that were not necessary for the client–server inference, such as GPU directories on the graph nodes or graph paths, were removed. In this bird detection model, the output layer provides: (a) the parts of the input image containing a bird, (b) type of bird species, and (c) parts of the input image not containing a bird. Finally, the trained model was frozen by converting all variable parameters in the checkpoint file into constants (stops). Subsequently, both files were serialized into a single file as a ProtoBuf graph_def. The graph frozen as a ProtoBuf graph_def can be optimized, if required, for feasibility inference. The saved ProtoBuf graph_def was reloadedand resaved to a serialized string value. The following actions were considered when optimizing for inference:

- Removal of redundant variables
- Stripping out of unused nodes
- Compression of multiple nodes and expressions into a distinct node
- Removal of debug operations, such as CheckNumerics, that are not necessary for inference
- Group batch norm operation into precalculated weights
- Fusing of common operations into unified versions
- Reduction of model size through quantization and weight rounding
- Fixing of hardware assignment problems

Once the model was trained and saved for mobile inference in the workstation, we created an Android app to copy and configure the TF inference files. On the client/mobile side, the SDK written in Java and NDK written in C were downloaded to create mobile interface activities and to communicate with the pretrained CNN TF ProtoBuf files thatcontained the model definition parameters and weights. The JNI was used to bridge the TF and Android platforms. The JNI executes the load Model function and obtains predictions of an object from the TF ProtoBuf files using the Android NDK. After classifying the object in the pertained model, the classified label output is sent back to the mobile phoneusing the Android NDK.

Using the aforementioned client–server computing setup, we provided a mechanism to encapsulate the cloud and mobile session. Bird recognition can be executed through cloud- and device-based inference. In this approach to deep learning inference on a mobile device, the trained model parameters are loaded into the mobile app, and the computations are completed locally on the device to predict the image output. The mobile phone is constrained by memory size and inflexibility when updating the trained model. However, in the cloud-based deep learning model, the trained model is stored on a remote server, and the server connects to the mobile device via the Internet using a web API to predict

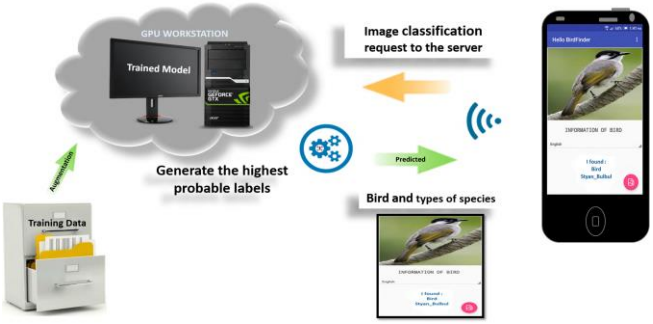

FIGURE 6. Client–server architecture for bird detection.

The uploaded images. Therefore, deploying the learned architecture with the cloud-based model can be easily ported to various platforms or mobile phones, and can upscale the model with new features without much difficulty. Because of the aforementioned benefits, cloud-based inference was used to execute bird image recognition. Fig. 6 shows the proposed system for bird information retrieval from the trained model stored in the workstation. The server with the TF platform takes prediction requests for bird images from client mobile phones and feeds and processes in the deep learning trained model the images sent from the API. After an image has been predicted, the TF platform classifies and generates the probability distribution of the image and transmits the query imageresult back to the user's mobile phone with the classified label.

To analyze the uploaded images, we used a mobile phoneas a client to perform the following functions: the end-user interface captures the bird image and instantly or directly uploads the image from the gallery of the mobile phone to extract image features. The mobile app sends an HTTPS request to the web server (central computer system) to retrieve the pretrained database regarding the uploaded bird image. The server performs data aggregation and an exhaustive search using the uploaded image to determine the matching parameters and retrieve information related to the images. To optimize binary segmentation of the weighted graph of the image, Grabcut semantic foreground segmentation is applied for bird species categorization. The head of a bird is the main prior-fitted region of interest, the other parts of the bird are lower priority regions of interest. A color model is projected to filter the original image with the bounding box. Subsequently, the information is classified and mapped, and the correctness of the matched image is transmitted back to the user's mobile phone. The transmitted file contains metadata related to the bird's information with the classified label indicating a bird species. Fig. 7 shows the interface steps of bird detection.

V. EXPERIMENTAL RESULTS AND ANALYSIS

The pro-posed system can predict and differentiate bird and nonbird images. When nonbird images are uploaded from a user's it directly predicts as an error for not giving bird image.

The hardware and software specifications for inference engine execution are summarizedin Table 3.

To filter nonbird images uploaded to the system automatically and to validate the effectiveness of the proposed system, 100 bird images were uploaded from a mobile phone for preliminary testing. The model achieved 100% accuracy in classifying the images as true bird pictures. Table 4 shows the bird detection results.

To acquire the output of images with or without birds, the multiscale sliding window strategy was applied so that the extracted sub window could define the target object.

TABLE 3. Hardware/software specifications used to execute the object detection model.

Hardware/Software	*Specification*
GPU	12 Intel Xeon CPUs, 32 GB memory, NVIDIA GeForce 2, 11GB GTX 1080Ti graphic cards.
Android Phone	5.0 or higher devices.
Android SDK, NDK	SDK is Android interface for main activity, and NDK helps to bridge the SDK and TF platform.
TensorFlow	Execute numerical computation using data flow graphs.
PyCharm	Python IDE programmers coding interface.

TABLE 4. Prediction results of images uploaded from smartphones.

Subjects	Predicted Bird	Predicted Non-bird
Bird	100%	0%
Non-bird	0%	0%

TABLE 5. Performance comparisons of different α values. T1 = training and T2 = test.

10 Fold	Accuracy α=0.3 (%)		Accuracy α=0.5 (%)		Accuracy α=0.7 (%)		Accuracy α=0.9 (%)	
	T1	T2	T1	T2	T1	T2	T1	T2
1	100.0	95.9	100.0	99.9	100.0	98.9	100.0	98.9
2	100.0	95.3	100.0	99.9	100.0	98.3	100.0	99.0
3	100.0	96.0	100.0	99.9	100.0	99.6	100.0	99.5
4	100.0	96.7	100.0	99.0	100.0	99.8	100.0	99.7
5	100.0	96.8	100.0	99.9	100.0	98.6	100.0	99.0
6	100.0	97.6	100.0	99.0	100.0	98.7	100.0	99.6
7	100.0	97.6	100.0	99.9	100.0	99.8	100.0	99.8
8	100.0	98.8	100.0	99.9	100.0	99.0	100.0	99.9
9	100.0	98.8	100.0	99.9	100.0	99.7	100.0	99.9
10	100.0	98.9	100.0	100.0	100.0	99.8	100.0	99.9
Ave.	100.0	97.2	100.0	99.7	100.0	99.2	100.0	99.5

Categories. The base learning rate was 0.01 and subsequently shifted to 0.0001. The network was trained until the cross-entropy stabilized. Skip connections were implemented when the input and output layers had equal weights. For instance, when the dimensions of the output were increased, the weights were concatenated in a deeper layer to capture and reconstruct features more effectively in the next layer. We compared different α parameters to check their influences on the final model. Table 5 compares the performances of different α values in identifying whether a bird appears in animage. In these experiments, 3563 images were split into setsof 80% for training and 20% for testing. The comparisons reveal that a high α increases the redundancy in the model; therefore, we set the α value to 0.5, which resulted in aver- age accuracies of 100% and 99.7% for the training and test datasets, respectively.

VI. DISCUSSION

In this study, we developed an automatic model to classify the 27 endemic birds of Taiwan by skipped CNN model. We performed an empirical study by the skip architecture. The intuition behind using the skip connections is to pro- vide uninterrupted gradient flow from the early layer to later layer, so that it can resolve the vanishing gradient problem. We compared the performance of various models such as CNN with skip connections, CNN without skip connections, and SVM. CNN with skip connections outperformed the other two algorithms.

However, in this study, we are more focused on predicting the 27 species of bird endemic to Taiwan more efficient and effective. The proposed model can predict the uploaded image of a bird as bird with 100% accuracy. But due to the subtle visual similarities between and among the bird species, the model sometime lacks the interspecific comparisons among the bird species and eventually leads to misclassification. In average, the test dataset yields 93.79% of sensitivity, 96.11% of specificity and this model can be used for prediction and classification of the endemic bird images.

The proposed architecture encountered some limitations and has room for improvement in the future. Sometimethe model confused the prediction of endemic birds when the uploaded bird images shared similar colors and size. If most bird species within a district need to be retrieved from the system, the database must be updated and need to be retrained with new features of the birds. For extending the proposed system to some specific districts for birdwatching may encounter imbalanced distribution of the dataset among the bird species if only a small size of dataset is available.

In the future, we intend to develop a method for predicting different generations of specific bird species within the intraclass and interclass variations of birds and to expand bird species to our database so that more people can admire the beauty from watching birds.

VII. CONCLUSIONS

This study developed a prediction platform that uses cloud-based deep learning for image processing to identify bird species from digital images uploaded by an end-user on a smartphone. This study dealt predominantly with bird recognition of 27 Taiwan endemic bird species. The proposed sys- tem could detect and differentiate uploaded images as birds with an overall accuracy of 98.70% for the training dataset. This study ultimately aimed to design an automatic system for differentiating fine-grained objects among bird images with shared fundamental characteristics but minor variationsin appearance.

In the future, we intend to develop a method for predicting different generations of specific bird species within the intraclass and interclass variations of birds and to add more birdspecies to our database.

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FLIGHT DELAY PREDICTION BASED ON BIGDATA AVIATION

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Abstract: The Prediction of the delay, which is essential for the creation of a more efficient air travel. Recent studies have applied machine learning techniques for the prediction of the delay[1]. Previous forecasting methods have been carried out in the same way or at the same that airport. This article will examine a wide range of factors may have an impact on the flight to be delayed, and compare different machine learning-based models have been developed for the joint flight-delay prediction problems. To create a data set to be used for the proposed system, automatic dependent surveillance broadcast (ADS-B) messages that have been received, pre-processed and integrated with other information, such as weather conditions, flight schedules, airport information. The developed forecasting problems are a variety of classification problems and regression problems. The experimental results show that the long-term memory, a random access memory (LSTM memory), it is suitable for the processing of the data received from the aircraft, but in the limited set of data, there is the problem of overfitting. In comparison with the previous schemes, the proposed random forest model, which enables you to increase the precision and accuracy of the prediction (90.2% for the binary classification), and to overcome the problems of overfitting.

Keywords: Prediction of delay, surveillance broadcast, long term memory, random forest model, over fitting.

I. INTRODUCTION

AIR traffic load has experienced rapid growth in recent years, which brings increasing demands for air traffic surveillance system. Traditional surveillance technology such as primary surveillance radar (PSR) and secondary surveillance radar (SSR) cannot meet requirements of the future dense air traffic[2]. Therefore, new technologies such as automatic dependent surveillance broadcast (ADS-B) have been proposed, where flights can periodically broadcast their current state information, such as international civil aviation organization (ICAO) identity number, longitude, latitude and speed. Compared with the traditional radar-based schemes, the ADSB-based scheme is low cost, and the corresponding ADS-B receiver (at 1090 MHz or 978 MHz) can be easily connected to personal computers. The received ADS-B message along with other collected data from the Internet can constitute a huge volumes of aviation data by which data can support military, agricultural, and aircraft positioning commercial applications. In the field of civil aviation, the ADS-B can be used to increase precision of and the reliability of air traffic management (ATM) system . For example, malicious

or fake messages can be detected with the use of multilateration (MLAT) , allowing open, free, and secure visibility to all the aircrafts within airspace . Thus, the ADS-B provides opportunity to improve the accuracy of flight delay prediction which contains great commercial value.

II. SYSTEM ARCHITECTURE

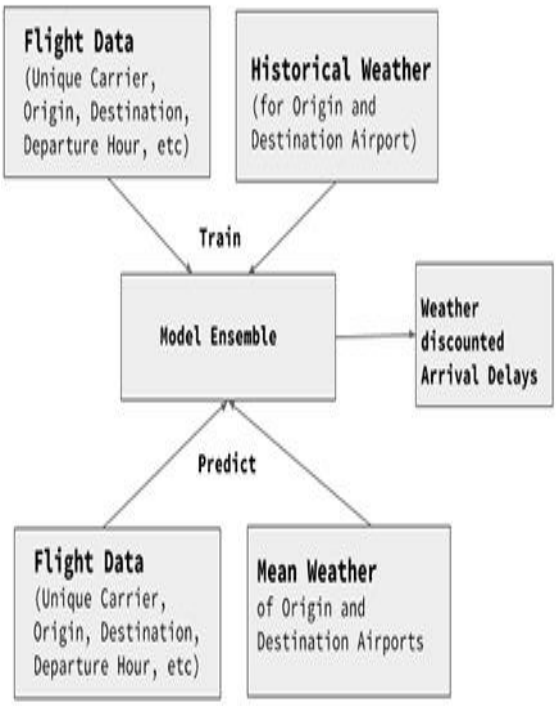

Fig1: SYSTEM ARCHITECTURE

Objective of the project is to finding a suitable way to predict probability of flight delay or delay time to better apply air traffic flow management (ATFM) to reduce the delay level. Classification and regression methods are two main ways for modeling the prediction model. Among the classification models, many recent studies applied machine learning methods and obtained promising results.

The flight delay is defined as a flight took off or arrived later than the scheduled time, which occurs in most airlines around the world, costing enormous economic losses for airline company, and bringing huge inconvenience for passenger.

According to civil aviation administration of China (CAAC), 47.46% of the delays are caused by severe weather, and 21.14% of the delays are caused by air route problems. Due to the own problem of airline company or technical problems, air traffic control and other reasons account for 2.31% and 29.09%, respectively.

III. METHODOLOGY

Air traffic flow are increasing rapidly in recent years. The number of aircraft will be doubled if the growth of general purpose aircraft and unmanned aerial vehicle resulting from civilian demand are considered [3]. Traditional technology of aircraft positioning and tracking relies on radar system (i.e., PSR and SSR), whose performance can be greatly reduced when the aircrafts are in transoceanic and remote area due to the limited working range of radar. In order to achieve thegoal of global tracking and monitoring for the aircrafts especially flights, international telecommunications union (ITU) has reached a consensus on the implementation of integrated space-space-earth positioning and tracking system by using theADS-B.

ADS-B system is a communication and surveillance integrated system for air traffic management (ATM) where flights periodically broadcast location and other information on the same frequency band [4]. Compare to the traditional surveillance technology, the ADS-B system can obtain higher location precision, lower cost of deployment, and simpler maintain system. The ADS-B system overcomes the effects brought by clouds and low visibility, and thus improves the surveillance

ability and enhances the flight security.

The ADS-B system can be divided into ADS-BOUT sub-system and ADS-BIN subsystem. In the ADS-BOUT subsystem, flight transmitters periodically send their own information (e.g., identity, position, velocity) to other flights and ground stations. And in the ADS-BIN subsystem, the flight receivers receive out-message from other flights and the ground stations.

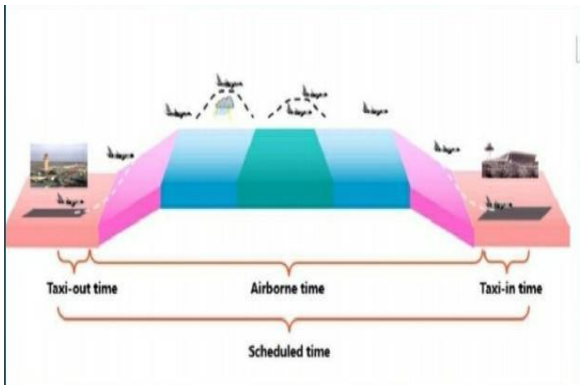

Fig2: FLIGHT RECEIVER SYSTEM

Data Cleaning: Because the proposed model is based on a supervised learning method which refers to a process of adjusting the hyper-parameters with a dataset with known labels, it is significant to obtain a clean dataset and label the samples elaborately[5]. First, the ADS-B message datasetis divided by flight number and date, and then is filtered according to the flights height (data below 1500 feet are ignored). Thus, data arrays of every flight on every day are gotten, and the items in each array are sorted by time. The last item of each sorted array is considered as the arrival data of each flight on a specific day. When the arrival data is extracted, the delay of the flight can be calculated.

The attributes of airports such as Nanjing is transformed into digit code by mapping the English letters (A to Z) into digit numbers (1 to 26), and the ICAO identity numbers and flight numbers are transformed similarly. To enrich the content of the dataset, the time stamps are split into four parts: Month, day of month, day of week, and season. Other attributes with limited categories such as weather condition, wind direction, and wind speed are encoded by using enumeration encoding. For example, the categories of the weather condition include sunshine, light rain, moderate rain, and hard rain are coded as 0, 1, 2, and 3, respectively. As shown in Fig. 2, the statistical distribution of the flight delay are imbalanced, and the no-delay class (i.e., the major class) occupies approximately 58.15% of all the labels. However, models trained by this imbalanced dataset may result in unfair decisions: samples in small classes may be incorrectly classified as the major class, but the overall prediction accuracy still looks good. Therefore, random under-sampling strategy is implemented in this model to obtain fairer prediction results. However, the defect of this strategy is quiet obvious; some important information concerning the majority class may also be removed and cannot be learnt by the model

.

IV. CONCLUSION

In this paper, random forest-based and LSTM-based architectures have been implemented to predict individual flight delay. The experimental results show that the random forest- based method can obtain good performance for the binary classification task and there are still room for improving the multi-categories classification tasks. The LSTM-based architecture can obtain relatively higher training accuracy, which suggests that the LSTM cell is an effective structure to handle time sequences. However, the overfitting problem

occurred in the LSTM-based architecture still needs to be solved. In summary, the random forest-based architecture presented better adaptation at a cost of the training accuracy when handling the limited dataset. In order to overcome the over fitting problem and to improve the testing accuracy for multi-categories classification tasks, our future work will focus on collecting or generating more training data, integrating more information like airport traffic flow, airport visibility into our dataset, and designing more delicate networks.

V. FUTURE WORK

In order to overcome the over fitting problem and to improve the testing accuracy for multi-categories classification tasks, our future work will focus on collecting or generating more training data, integrating more information like airport traffic flow, airport visibility into our dataset, and designing more delicate networks.

In summary, the random forest-based architecture presented better adaptation at a cost of the training accuracy when handling the limited dataset. In order to overcome the over fitting problem and to improve the testing accuracy for multi-categories classification tasks, our future work will focus on collecting or generating more training data, integrating more information like airport traffic flow, airport visibility into our dataset.

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AN EFFICIENT SECURE CLOUD STORAGE SCHEME USING HASH-SOLOMAN ENCODING

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Abstract **- "An efficient secure cloud storage scheme using Hash-Solomon encoding" is an efficient way to store the data into cloud servers. Ongoing years witness the improvement of cloud computing technology. With the immense development of unstructured information, cloud storage innovation improves advancement. Be that as it may, in current storage pattern, client's information is completely put away in cloud servers. All in all, clients lose their right of control on information and face protection spillage hazard. Traditional privacy protection plans on cloud servers are typically founded on encryption method, however these sorts of strategies can't viably oppose assault from within cloud worker. To take care of this issue, we propose a three-layer storage structure dependent on fog computing. The proposed structure can both enjoy cloud storage and secure the information. Plus, Hash-Solomon code is used to divide the data into three parts. Then, at that point, we can place a part of data in local machine and fog server to secure the protection. Through the hypothetical examination and experimental assessment, the practicality of our plan has been approved, which is actually an important enhancement to existing distributed storage plot.**

Keywords **– Cloud server, Cloud computing, privacy protection**

I. INTRODUCTION

SINCE the 21st century, cloud innovation has grown quickly. Cloud processing, an arising innovation, was first proposed in Quite a while 2006 (Search Motor Strategies 2006) by San Jose and characterized by NIST (National Institute of Principles and Technology). Since it was proposed, cloud computing has drawn in incredible consideration from various areas of society. It has steadily developed through such countless individuals' lives. There are some cloud-based advancements getting from cloud computing and cloud storage is a significant piece of them. With the fast advancement of organization transmission capacity, the volume of client's information is rising mathematically. User's prerequisite can't be fulfilled by the limit of local machine any more. Subsequently, individuals attempt to discover new strategies to store their information. Seeking after more remarkable storage structures, a developing number of clients select cloud storage. Putting away information on a public cloud is a trend and the cloud storage innovation will turn out to be wide spread in a couple of years. With a group of uses, network innovation and circulated record framework innovation, cloud storage makes countless distinctive storage gadgets work together coordinately.

The security degree is a significant measurement to gauge the nature of cloud storage framework. Besides, information security is the main part in cloud storage security and it incorporates three angles: information protection, information honesty and information accessibility. Guaranteeing information security and honesty has consistently been the focal point of important investigates. On another hand, information protection is additionally the most concerned part of the clients. According to a business point of view, organization with high security degree will draw in more clients. Consequently further developing security is a critical objective regardless of in the scholarly community or business. In this segment, we will itemized elaborate how the TLS structure ensures the information protection, the execution subtleties of work process and the hypothetical wellbeing and proficiency examination of the capacity plot.

II. METHODOLOGY AND IMPLEMENTATION

1. Fog Computing

Our scheme depends on fog computing model, which is an expansion of cloud computing. Fog computing was first and foremost proposed by Ciscos Bonomiin 2011.

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In Bonomi's view, fog computing is like the cloud computing, the name of fog computing is exceptionally striking. Contrasted with exceptionally focused cloud computing, fog computing is nearer to edge network and has numerous benefits as follows: more extensive geographical distributions, higher real time and low latency. In considering of these characters, fog computing is more reasonable to the applications which are sensitive to delay. On another hand, contrasted with sensor nodes, fog computing nodes have a specific storage limit and information preparing ability, which can do some basic information handling, particularly those applications dependent on geographical area. Hence we can convey CI on the fog server to do some computing works.

2. Three-Layer Privacy Preserving Cloud Storage Scheme Based on Fog Computing Model

To ensure client's protection, we propose a TLS framework based on fog computing model. The TSL structure can give client a specific power of management and successfully ensure client's protection. As referenced, the inside attack is hard to resist. Traditional methodologies function well in addressing outside attack, however when CSP itself has issues, conventional ways are for the most part invalid. Not quite the same as the traditional methodologies, in our plan, client's information is separated into three distinctive size parts with encoding technology. Each of them will not have key data for secrecy. Consolidating with the fog computing model, the three pieces of information will be put in the cloud server, the fog server and client's local machine in the order from large to small. By this strategy, the attacker can't recuperate the client's original information regardless of whether he gets all the information from a specific server. Concerning the CSP, they also can't get any valuable data without the information put away in the fog server and local machine as both of the fog server and local machine are controlled by clients.

3. Data Owners:

This is an element who possesses secret information and wishes to store them into the external data storage node for simplicity of sharing or for reliable conveyance to clients in the extreme networking environments.. A sender is answerable for characterizing (attribute based) access policy and authorizing it on its own information by encrypting the information under the policy prior to putting away it to the cloud.

4. Data Users:

This is a portable node who needs to get to the information put away at the cloud. In the event that a client has a bunch of attributes fulfilling the access policy of the encrypted information characterized by the information owner, and isn't denied in any of the attributes, then, at that point he will be able to decode the cipher text and acquire the information.

Methodologies:

In light of the Reed-Solomon code algorithm, we propose a Hash-Solomon code algorithm. The Hash-Solomon encoding measure is really a matrix operation.

Fog computing is an all-inclusive computing model. Based on cloud computing which is made out of a ton of fog nodes. These nodes have a specific storage limit and

Handling capacity. In our plan, we split client's information into three sections and independently save them in the cloud server, the Fog server and the client's local machine.

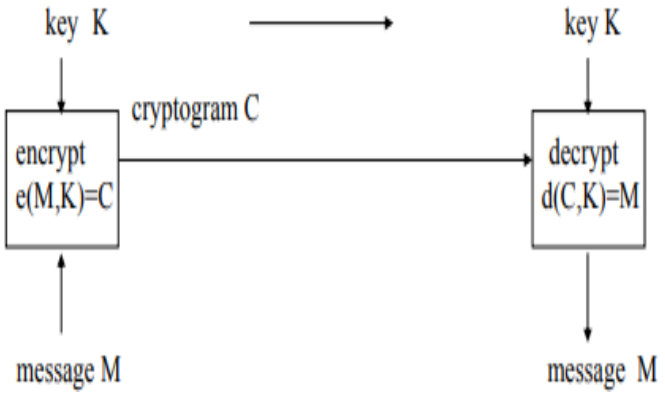

Fig.1 Block diagram

III. CONCLUSIONS

The improvement of cloud computing presents to us a great deal of advantages. Cloud storage is an advantageous innovation which assists clients with extending their storage limit. Be that as it may, cloud storage additionally causes a series of secure issues. When utilizing cloud storage, clients don't really control the actual storage of their information and it brings about these division of proprietorship and the management of information. To tackle the issue of privacy insurance in cloud storage, we propose a TLS framework dependent on fog processing model and plan a Hash-Solomon algorithm. Through the hypothetical security analysis, the plan is proved being doable. By designating the proportion of information blocks put away in various servers sensibly, we can guarantee the security of information in every server. On another hand, breaking the encoding matrix is unimaginable hypothetically. Also, utilizing hash transformation can protect the fragmentary data. Through the trial test, this plan can effectively finish encoding and decoding without impact of the cloud

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storage efficiency. Moreover, we plan a sensible comprehensive efficiency index, to accomplish the maximum efficiency, and we additionally find that the Cauchy matrix is more proficient in coding measure.

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MOVIE RECOMMENDATION SYSTEM USING TWITTER SENTIMENTAL ANALYSIS

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***Abstract*— Sentiment classification refers to the act of putting in for natural language processing and text mining strategies to distinguish subjective textual data. Due to the huge availability of online data that coincide with the growth of social media, there has been a big interest from researchers in sentiment analysis and its applications. we review the state of the art to determine how the previous researches have addressed this task. We also introduce an empirical study on two annotated datasets; 25,000 IMDB movie reviews and 25,000 tweets, where we used nine supervised learning models, the next step was to implement a voting ensemble classifier using the top four models we get from the previous steps. The usage of the internet has grown in different systems since the mid-90s. Individuals express various comments on the internet depending on their emotions. Twitter is the most well-established small-scale blogging. It has 330 million diverse users every month and 145 million daily active users. The experiment forecasts correctly that the analysis feeling would be of a negative or optimistic polarity. Then an algorithm has been applied to classify the opinion as either it is positive or negative. In this research paper, we will briefly discuss supervised machine learning. Support vector machine as well as Naïve Bayes algorithm and compares their overall accuracy, precession, recall value. The result shows that in the case of movie reviews Support vector machine gave better results than Naïve Bayes algorithm.**

Keywords— Machine Learning, Sentiment Analysis, Opinion Mining, Naïve Bayes, SVM

I. Introduction

The sentiment analysis, also called opinion mining, is a concept that is regularly mentioned yet often misunderstood. It is the way toward determining the opinion behind a series of words. This analysis is used to better comprehend the perception, opinions, and emotions communicated in an online statement. This task is extremely helpful in social media as it gives an outline of public opinion about certain topics. For a given text, it is important to recognize the polarity of the text as being either positive or negative. Pang and Lee [1] report several methods, several performance references, and assets to accomplish this undertaking. The polarity of a feeling can be calculated according to several thresholds and can be seen as several different classes. In our venture, we consider texts as belonging to only two classes (binary classification): either the text is positive or the text is negative. The employment of sentiment analysis is both tremendous and intense. It can be applied in business, as well in academia, movie business. [2]In business, the capacity to extract insights from social web data, as in this paper [3], is a practice that is broadly adopted by organizations around the world. In any case, the analysis of opinions or emotions remains a vague science. Human language is complex. Teaching a machine how to analyse grammatical and cultural subtleties, slang and spelling mistakes that are common things online is a difficult process. Humans are moderately intuitive when it comes to interpreting the tone of a text. Take this sentence for instance: "My flight was cancelled. Incredible!", most of us will realize that the person is sarcastic. We realize that as a rule the delay or cancellation of a flight is an unpleasant experience. By applying this contextual understanding to this sentence, we can easily distinguish the associated negative feeling. Without contextual understanding, a machine that breaks down this sentence will take into account the word" Incredible" and identify it as a positive mention. Just like any automated process, there are risks of error, and the human eye is frequently expected to guarantee the accuracy of the analysis. Beyond reliability, it is important to recognize that human communication does not fall into three categories: positive, negative and neutral; the notion of feeling can be substantially more perplexing. In this project, we focus on the classification of sentiment of movie reviews and tweets. We begin by processing our datasets by removing all the unnecessary terms and characters, then we will proceed to feature selection stage where we used the TF-IDF weighting for the input words, after that we train and test several supervised learning models and compare their accuracies, precisions and recalls, in order to combine the top four accurate models into an ensemble classifier to observe if there is any improvement for our sentiment classification tasks. We are using two types of machine learning algorithms and those are Support Vector Machine algorithm and Naïve Bayes algorithm. This will calculate accuracies, precisions and recall values. There will be three types of output in our result. Those are negative, neutral, positive using supervised learning.

II. Literature Survey

In this section, we represent various past and ongoing research works on sentiment analysis using machine learning models Maas, et al. [5] "Learning word vectors for sentimental analysis" utilize a blend of unsupervised and supervised models for embeddings, those techniques can catch semantic information as well as non-sentiment annotations. Da Silva, et al. [6] "Tweet sentiment analysis with classifier ensembles" use a classifier ensemble formed by Multinomial Naive Bayes, SVM, Random Forest, and Logistic Regression, then make a comparison between using lexicons, bag-of-words, and feature hashing representations of tweets, and demonstrate that they can enhance the accuracy of tweet sentiment analysis. Lin, Jimmy, et al. [7] "Large-scale machine learning at twitter" prove through their outcomes that the ensembles lead to more accurate classifiers

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by using various features and different training datasets. Clark, et al. [9] "Combining simple classifier with estimated accuracy" demonstrate that the sentiment of individual phrases within a tweet is labelled using a combination of classifiers trained on a range of lexical features. The classifiers are combined by evaluating the performance of the classifiers on each tweet. Dey, et al. [10] "Sentimental Analysis of review datasets using Naïve Bayes and K-NN classifier" applied two algorithms, namely Naive Bayes and K-Nearest Neighbour on two different datasets, one for movies review and the other for hotel review, in order to evaluate and compare their performance for sentiment classification, the results show that Nave Bayes works better on movie review dataset and K-NN give better result for hotel review dataset. Chikersal, et al. [11] "Sentimental analysis of tweets by combining a rule-based classifier with supervised learning" introduce a new approach combining a rule-based classifier with the Support Vector Machine SVM, this later has been trained on semantic, dependency, and sentiment lexicon, by adding this feature, the overall model shows good improvement. Manet, et al. [12] "A Comparative Study of Feature Selection Methods for Dialectal Arabic Sentiment Classification Using Support Vector Machine" used a novel method for feature selection called Gini Index and use it on top of SVM model for sentiment classification on movie review dataset, The result proves that Gini Index improves the classification performance compared of the other classical feature selection methods, by measuring the impurity of the inputs Bahraini an, et al. [8] "Sentiment Analysis Using Sentiment Features" compare the state-of-the-art SA methods against a novel hybrid method. The hybrid technique uses a Sentiment Lexicon to create a new set of features to train a linear Support Vector Machine (SVM) classifier. Hybrid approaches could solve most of the major problems of supervised methods, namely, the problem of huge feature sets and time and memory complexity.

III. METHODOLOGY

A. *Data preprocessing:*

It is important to ensure that our dataset is good enough for analysis. This is where data cleaning becomes extremely vital. Data cleaning extensively deals with the process of detecting and correcting of data records, ensuring that data is complete and accurate and the components of data that are irrelevant are deleted or modified as per the needs. Thus, our initial step was to clean effectively the data by removing all the common elements that they do not provide enough semantic information for the task, namely, by removing the URLs and HTML tags, handling the negation words that are split into two parts, converting the words to lower cases, removing all nonletter characters, finally, tokenizing and joining the sequences to remove superfluous white spaces.

B. *Feature extraction*

This step has got more to do with the feature that we are selecting from the set of possible features that the dataset could have. we had to make an intelligent decision regarding the type of feature that we want to select to go ahead with our machine learning endeavor. We chose to use TF-IDF weighted word counts of the document as an input representation of our classifiers. Term Frequency-Inverse Document Frequency is an effective technique to convert textual data to a numeric form, specifically, it is intended to reflect how important a word is to a document in a corpus. In order to preserve local ordering of the words, we consider also the position-independent of every case of unigram bigram, and trigram.

C. *Classifier model*

1) Naïve Bayes Approach:

Naive Bayes is a collection of classification algorithms which are based on Bayes Theorem. Naive Bayes classifier gives us an excellent result when one uses it for text data analysis. Such as Natural Language Processing. Naive Bayes algorithm gives us a probability analyzing the data set we have given. Naïve Bayes classifier is used as a probabilistic classifier. To perform the classifier, it uses the concepts of mixture models. A mixture model is capable of establishing the probability of the component that it consists of Bayes theorem to perform as a probabilistic classifier. Another name that a naïve Bayes is known as simple Bayes or independence Bayes. The probability P is defined as follows:

$$P(m|n) = \frac{P(n|m)\,P(m)}{P(n)}$$

Above, P (m | n) is the probability of class x. Where x is the target and predictor is the attribute. P (m) is the prior probability of class. P (n | m) is the probability of predictor of the given class. P (n) is the prior probability of predictor.

Steps to implement naive bayes algorithm:

- Load the CSV information into Python and change all strings into floats. Separate all information into preparing information and test information. All things considered, the Naive Bayes approach makes forecasts from the preparation information, while it utilizes the test information to assess the precision of the model. For this situation, we have made 67% preparing information and 33% test information.

- Presently the time has come to examine the information. Every datum will be isolated dependent on the class it has a place with. From that point forward, we have to ascertain the mean and standard deviation for every one of the information inside each trait inside each class.

- Presently it an opportunity to utilize the preparation information to make expectations. We have to utilize the Gaussian Probability Density Function here.

- In light of the rundown of information for each class, comprising of the mean and change, in view of the info esteem, we process the probability that the esteem will have a place with a specific class (utilizing the Gaussian Probability Density Function).

- Our forecast will relate to the class with the biggest likelihood. At long last, we have to know how exact our gauge was. It is the rate right out of all expectations made.

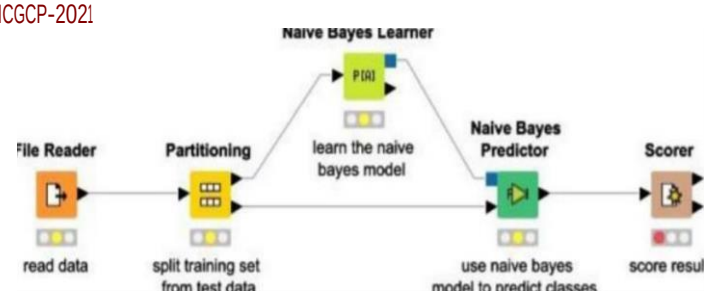
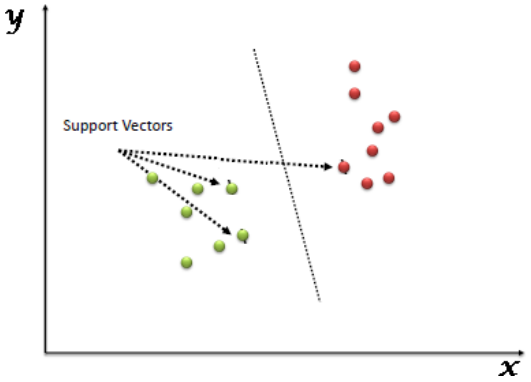


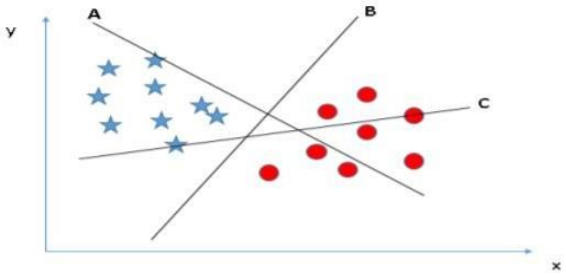
Fig.1 Naïve bayes classifier

2) Support Vector Machine Support:

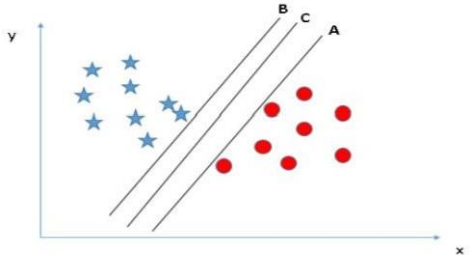
"Support Vector Machine" (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiate the two classes very well (look at the below snapshot).



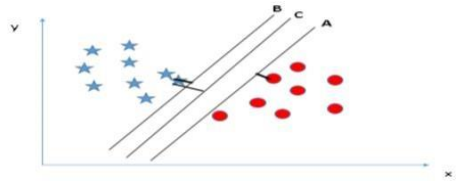
Support Vectors are simply the co-ordinates of individual observation. Support Vector Machine is a frontier which best segregates the two classes (hyper-plane/ line). How does it work? Above, we got accustomed to the process of segregating the two classes with a hyper-plane. Let's understand: Identify the right hyper-plane (Scenario-1): Here, we have three hyper-planes (A, B and C). Now, identify the right hyper-plane to classify star and circle.



You need to remember a thumb rule to identify the right hyper-plane: "Select the hyper-plane which segregates the two classes better". In this scenario, hyper-plane "B" has excellently performed this job. Identify the right hyper-plane (Scenario-2): Here, we have three hyper-planes (A, B and C) and all are segregating the classes well. Now, How can we identify the right hyper-plane?

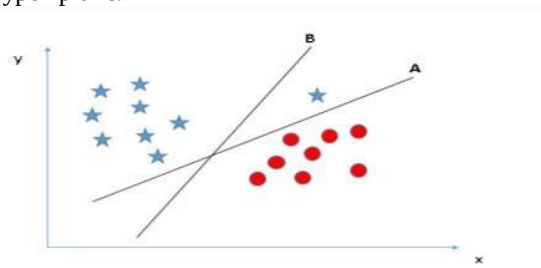


Here, maximizing the distances between nearest data point (either class) and hyper-plane will help us to decide the right hyper-plane. This distance is called as Margin. Let's look at the below snapshot:

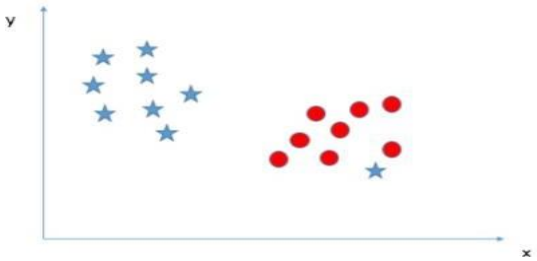


Above, you can see that the margin for hyper-plane C is high as compared to both A and B. Hence, we name the right hyper-plane as C. Another lightning reason for selecting the hyperplane with higher margin is robustness. If we select a hyper-plane having low margin then there is high chance of miss-classification.

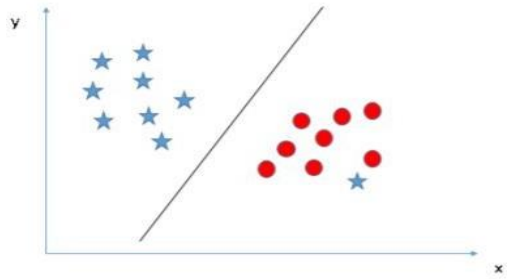
Identify the right hyper-plane (Scenario-3): Hint: Use the rules as discussed in previous section to identify the right hyper-plane.



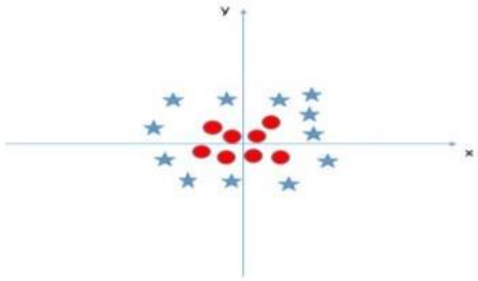
Some of you may have selected the hyper-plane B as it has higher margin compared to A. But, here is the catch, SVM selects the hyper-plane which classifies the classes accurately prior to maximizing margin. Here, hyper-plane B has a classification error and A has classified all correctly. Therefore, the right hyper-plane is A. Can we classify two classes (Scenario-4)?: Below, I am unable to segregate the two classes using a straight line, as one of star lies in the territory of other(circle) class as an outlier.



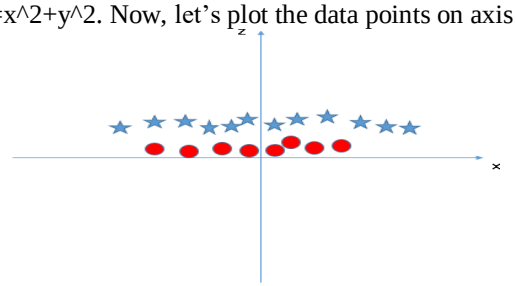
As I have already mentioned, one star at other end is like an outlier for star class. SVM has a feature to ignore outliers and find the hyper-plane that has maximum margin. Hence, we can say, SVM is robust to outliers.



Find the hyper-plane to segregate to classes (Scenario-5): In the scenario below, we can't have linear hyper-plane between the two classes, so how does SVM classify these two classes? Till now, we have only looked at the linear hyper-plane.



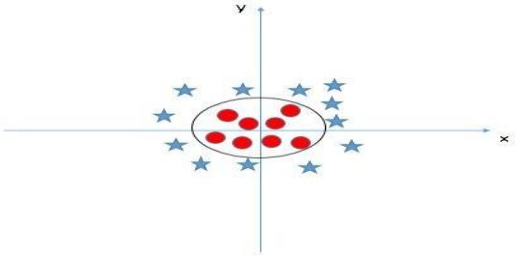
SVM can solve this problem. Easily! It solves this problem by introducing additional feature. Here, we will add a new feature z=x^2+y^2. Now, let's plot the data points on axis x and z:



In above plot, points to consider are:

- All values for z would be positive always because z is the squared sum of both x and y
- In the original plot, red circles appear close to the origin of x and y axes, leading to lower value of z and star relatively away from the origin result to higher value of z. In SVM, it is easy to have a linear hyper-plane between these two classes. But, another burning question which arises is, should we need to add this feature manually to have a hyper-plane. No, SVM has a technique called the kernel trick. These are functions which takes low dimensional input space and transform it to a higher dimensional space i.e. it converts not separable problem to separable problem, these functions are called kernels. It is mostly useful in non-linear separation problem. Simply put, it does some extremely complex data transformations, then find out the process to separate the data based on the labels or outputs you've defined.

When we look at the hyper-plane in original input space it looks like a circle:



How to implement SVM in Python?

In Python, scikit-learn is a widely used library for implementing machine learning algorithms,SVM is also available in the scikit-learn library and follow the same structure (Import library, object creation, fitting model and prediction). Now, let us have a look at a real-life problem statement and dataset to understand how to apply SVM for classification.

Pros and Cons associated with SVM

Pros:

- It works really well with clear margin of separation.
- It is effective in high dimensional spaces.
- It is effective in cases where number of dimensions is greater than the number of samples.
- It uses a subset of training points in the decision function (called support vectors), so it is also memory efficient.

Cons:

- It doesn't perform well, when we have large data set because the required
- training time is higher
- It also doesn't perform very well, when the data set has more noise i.e. target
- classes are overlapping
- SVM doesn't directly provide probability estimates, these are calculated using an expensive five-fold cross-validation. It is related SVC method of Python scikit-learn library.

IV. Conclusion

Movie reviews help users decide if the movie is worth their time. Sentiment analysis of a movie review can rate how positive or negative a movie review is and hence the overall rating for a movie. Therefore, the process of understanding if a review is positive or negative can be automated as the machine learns through training and testing the data. There are different machine learning classifiers to classify the tweets. In our project, we will use Naïve Bayesian and Support vector machine and sentiment analysis of result will be drawn. Thus, we conclude that the machine learning technique is very easier and efficient than symbolic techniques

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MULTIFUNCTIONAL IOT BASED ROBOT FOR MILITARY APPLICATION

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***Abstract*-**The applications of the radio detection and ranging (RADAR) systems in military installations as well as scientific and commercial facilities is powered by the ability of the RADAR systems to use electro-magnetic waves to determine the speed, range, altitude or direction of objects, either fixed or in motion. In this research, existing radar technologies are examined and an Arduino is proposed. The advantage of this is to drastically reduce power consumption and allow the designers to have access to a wide range of online communities of Arduino programmers and open source reusable code. The system consists of an ultra-sonic sensor, an Arduino micro-controller, a servo motor and a prototype system is built by connecting the ultra-sonic sensors to the Arduino microcontroller's digital input/output pins and the dc motor also connected to the digital input/output pins. Both the ultra-sonic sensor and the dc motor are then clipped together so that as the dc motor sweeps from right to left through an angle of 180 the servo will rotate alongside it.

Keywords –Arduino Microcontroller , Ultra-sonic sensor,Radar, Metal detector .

I. INTRODUCTION

There is an approach for surveillance at remote and border areas using IOT based multifunctional robot using 3G technology in defense and military applications. A modern approach for surveillance at remote and border areas using multifunctional robot based on current 3G technology used in defense and military applications is taken. The lives of our soldiers are at greater stake due to their movement on duty such as patrolling or scouting out the enemies.Majority of soldiers face exposure to severe and fatal injuries in combat during wars and attacks.Owing to partial or poor vision in extreme weather conditions such as fog, heavy rains, snow our soldiers face a lot of difficulty in accomplishing their mission. Hencethe developed robot would be able to read the estimated range of obstacles and the angle of incident and convert this data into visually represented information, reporting it to the base operation.

The Internet of Things (IoT) refers to a system of interrelated, internet-connected objects that can collect and transfer data over a wireless network without human intervention.IoTdevices are generally designed to handle specific task using modern approach. Robots need to react to unexpected conditions that their developer may not have anticipated. It isused for surveillance at remote and border areas using IOT based multifunctional robot using 3G technology indefense and military applications. It isan modern approach for surveillance at remote and border areas using multifunctional robot based on current 3G technology used in defense and military applications.

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II. OBJECTIVES AND METHODOLOGY

Themainobjectivesofthesystemare statedasfollows:

1. Real time monitoring of target.
2. Sensing Obstacles.
3. Controlling the robot using wi-fi and Bluetooth technology.
4. Recording and taking snaps from the android camera and sending it to the receiver (the controller).

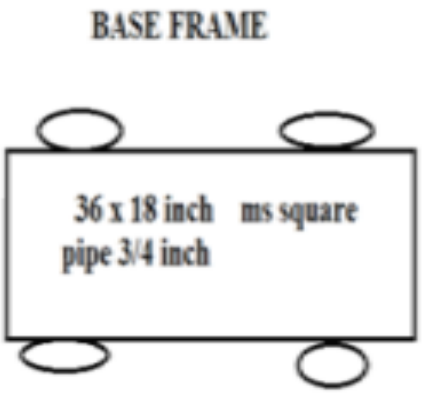

Fig.1 Base Frame

Methodology:

Themethodologyincludes:

- RF (Radio Frequency) Technology is the mode of communication for wireless technologies
- Dc geared motor with mobile camera.
- Metal detector for sensing the bomb.
- Ultrasonic Sensor.
- LCD screen.

III. DESIGN AND IMPLEMENTATION

ESP32 is a wi-fi SOC (system on a chip) produced by EspressifSystems . It is an highly integrated chipdesigned to provide full internet connectivity in a small package.ESP32 can be used as an external Wi-fi module, using the standard AT Command set Firmware by connecting it to any microcontroller using the serial UART, or directly serve as a Wi-fienabled micro controller, by programming a new firmware using the provided SDK.1.

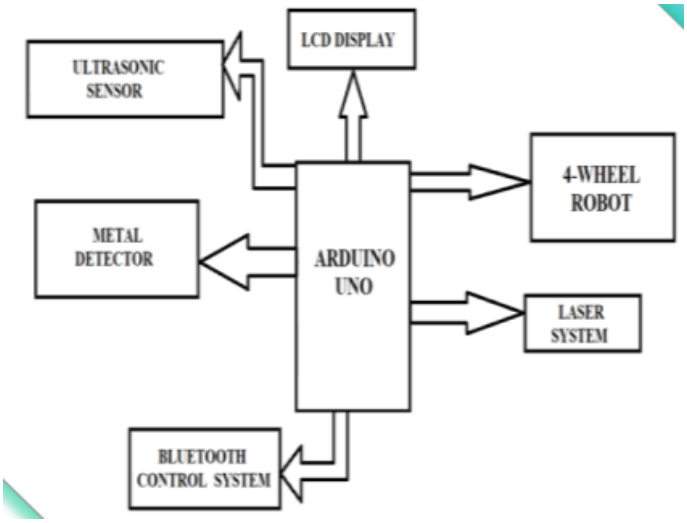

Fig.2 System Architecture

The system consists of three main modules which are asfollows:

1.Robotic Operations
2.Robotic Evolution
3.Robotic Development

1. Robotic Operations :

Robotic Co-ordinations- Robot targets and positions are located by measurements along the axes of coordinate systems.

Information Fusion- The sensors perceive the surroundings to supply various information and measurements, and then the mobile robot fuses the achieved data and the exploration trajectories for processing.

Distributed Resources- The Robot must self-coordinate and self-allocate a set of pickup/delivery or locating tasks. The robot is assigned with multiple tasks with limited resources and it completes the tasks efficiently.

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2. Robotic Adaptation and Reengineering:

Fault Tolerance- Fault tolerant robots are needed which can effectively cope with failures and continue their tasks until repairs can be realistically scheduled.

Reconfiguration- The reconfiguration ability allows a robot to disassemble and reassemble machines to form new morphologies that are better suitable for new tasks, such as changing from a legged robot to a snake robot and then to a rolling robot.

Reengineering- Reengineering is almost inevitable if we want to significantly reduce maintenance costs for our software, gain a competitive advantage with its extended reach and functionality as well as get a good ground for further modernization activities.

3. RoboticModelling,Design and Programming :

Modelling-Modelstructure and specific components of a rigid body tree, robot model goes through the process of building a robot step bystep, showing you the different robot components and how functions are called to build it.

Design- A Robotic Design is the creation of a plan or convention for the construction of a robot or a robotic system (as in architectural blueprints, engineering drawing, operation process, circuit diagrams).

Programming-Robotprogramming involves writing computer programs that enable a robot to perceive its environment, make decisions, and execute a task. Many software systems and frameworks have been proposed to make programming robots easier.

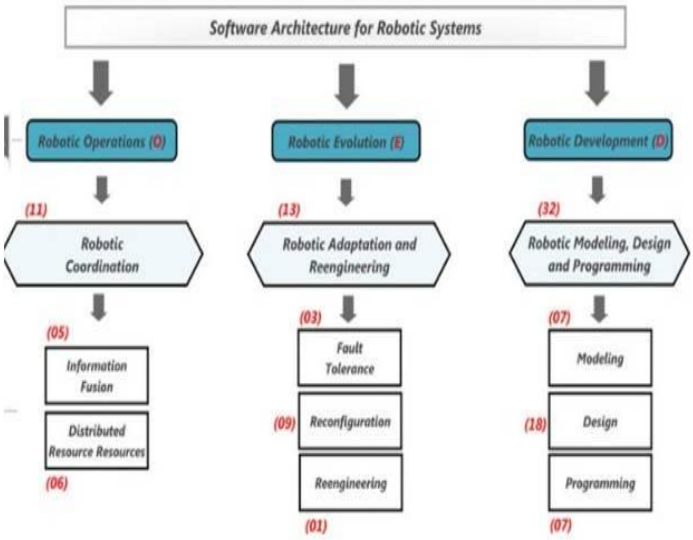

Fig.4software architecture for robot

IV. RESULTS

This system with an intelligent sonar-based object tracking system continuously monitors the target. Upon detecting the target it will send the target's location to a Central Control System. The Central Control System will then take the action of moving the firing mechanism in the direction of target (missile). Upon fixing the direction, it will sendthe control command to firing system for attacking the target. Here we are making use of ultrasonic radar system and a DC geared motor driven firing unit interfaced with a controller unit. The robot will detect obstacles in it's path and can also sense metals and explosives. Ultrasonic sensor is preferred because the Ultrasonic sensors covers larger sensing distance and it can detect the target in all the lighting conditions.

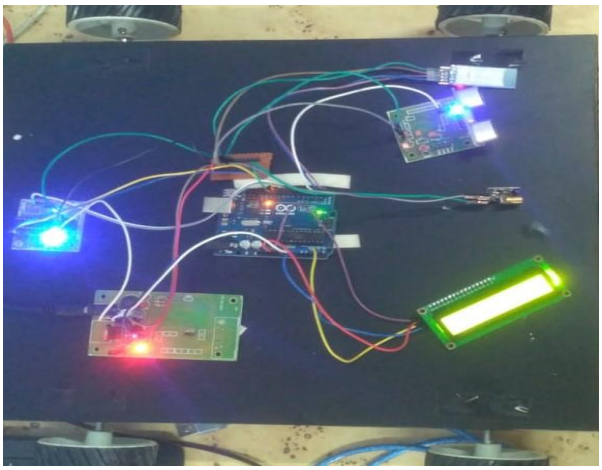

Fig.5 Multifunctional Robot with Arduino Uno

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V. CONCLUSION

The system aims at enhancing the patrolling of the soldiers by providing assistance for their surveillance and detecting obstacle solution.Owing to partial or poor vision in extreme weather conditions such as fog, heavy rains, snow our soldiers face a lot of difficulty in accomplishing their mission.Hence this robotic vehicle has ability to substitute the soldier or as a companion at border areas to provide surveillance and patrolling. Instead of putting the lives of the soldiers of our nation at stake, we can deploy these robotic vehicles for surveillance at the borders.

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Bitcoin Market Price Prediction based on Machine Learning

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Abstract - Machine learning supported the Neural Network has integrated usages during a sort of fields like translation, finance, distribution, and medical world also as cognition. This study shows Recurrent Neural Network Learning Model on the thought of LSTM, which analyzes the previous prices of a Cryptocurrency, Bitcoin and predicts subsequent one. This model indicates the particular and predicted prices of Bitcoin for 81 days within the way that it's learned the previous prices for 30 days then anticipates subsequent day price. Regularized data set for Modeling is split into test data set and training data set at the speed of 1:9. The latter set is once more separated into training data and verification ones. Machine Learning of this study must use Neural Network library, Keras framework. to suit the model is to seem for the model's weight by optimizing the tactic , while using the training data. during this paper, fit function's batch size is 11 and epochs is 30. As learning gets processed more repetitively, the loss decreases more monotonously, then it converges to more regular value. That is, it means so there's no over fitting. because the results of the experiment, the machine learning proposes not only that after analyzing the graphs of error rates and weight change rates, weight converges towards a specific ones, but also that as the learning goes over, the processing efficiency of it's neural network get better

I. INTRODUCTION

Artificial Intelligence is mentioned as an acting system that does tongue Processing, Automatic Inference, Computer Vision, Voice Recognition, Knowledge Representation etc., pretending to be a person's being. Machine learning, the list of AI, divides learning into either supervised or unsupervised counting on whether there's a label in learning data. Machine Learning, a way solving a drag by using methods like clustering, classification, forecasting, and so on, need to be defined as a learning model before hand which the human beings' brains process problems with[1,2].In machine learning, predictive analysis supplies appropriate consultation and knowledge , computing trends and future probabilities then predicting potential result. Recurrent Neural Network generates following data prediction through learning the context, that is, the connection among data in estimation problem handling such statistic data as monthly sales, price level , unemployment rare, rate of exchange , and stock price[2]. The observed value of the statistic data features a time sequence. so as to research the temporal series data like exchange rates or stocks, there are often several methods moving average which is in a position to anticipate the longer term price, computing the typical of the past and therefore the present prices, ARIMA(Auto-Regressive Integrated Moving Average) which expects the longer term value, while modeling the info , the multivariate analysis which estimates how one or more independent variables influence on the

dependent ones, and therefore the forth. Along with AI , cryptocurrency has been recently he topic of IT Convergence to which both tremendous technologies and therefore the social interest are increasingly devoted. Designating Busan because the unfettered free district for the Blockchain, Korea has promoted the activation of the Block Chain, a replacement local growth engine. The district for Blockchain not only leads new technologies but dominates the market of latest industries before hand , providing special permission free from the regulations and demonstrations to application industries. A virtual currency, Cryptocurrency is dealt on the web with no commodity money as encryption techniques are used. which will be save on the pc , with none concerns about either theft or loss, and doesn't spend any money being produced and saved. it's not just the capacity of payment and circulation as same as that of gold or cash; high scale useful sort of a land or a stock also thanks to transaction confidentiality, however, it's going to be abused in tax evasions or in drug dealings.

Cryptocurrency is meant to let the individuals do freely financial dealings in P2P(peer to peer) way. Blockchain technology may be a system that stores online transactional information on the block, which must be approved to be connected with an existing chain. It means the parties to a transaction exchange value with each other. Bitcoin supported Blockchain skill was invented by Nakamoto Satoshi in 2009. It realized the thought of Bit Gold and B-money and made up for faults like double expenditure[3]. Bitcoin is saved as a kind of a wallet file which is given its own address, and therefore the transactions of Bitcoin is accomplished on the idea of the address. Block may be a bundle of transactional information of Bitcoin every 10 minute. That is, Blockchain may be a quite trading book which covers trading record.

II. SYSTEM DESIGN

System design is that the method of defining the architecture, components, modules, interfaces the data for a system to satisfy specifies requirements. System design could
be as seen because the appliance of systems theory to development. it's about the physical organization of the system. it's demonstrated with the assistance of UML

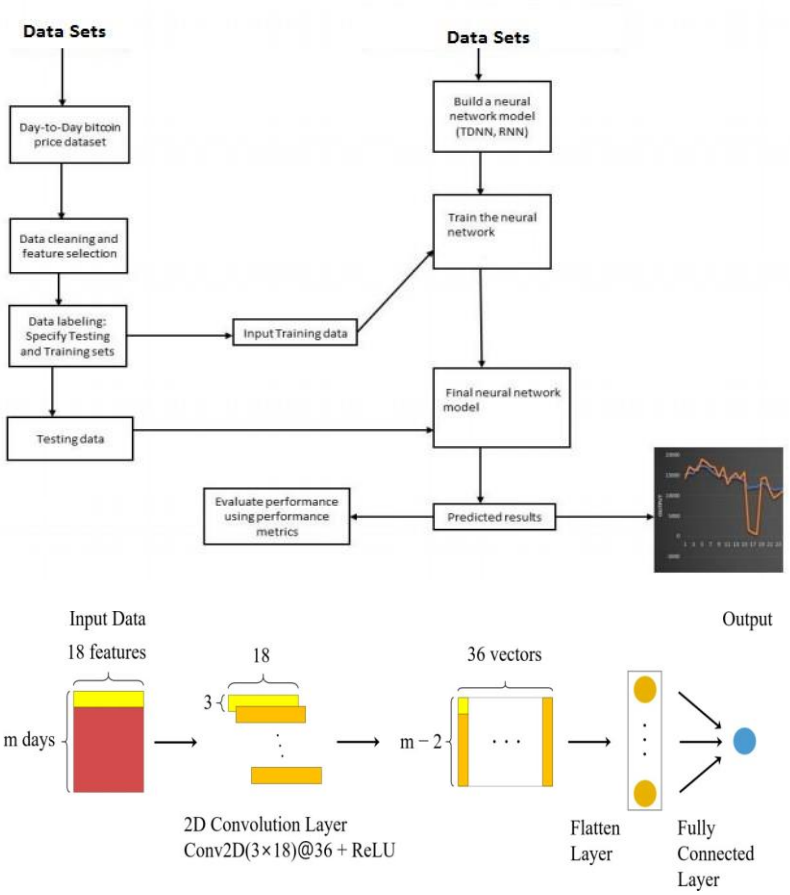

Fig 1 : System Architecture

Blockchain and Cryptocurrency

A Cryptologic pioneer, David Chaum, devised Blind Signature technology, which telecommunicates the encoded messages sealing digital signature, and in inventing *Ecash.*
That is the primary commercial cryptocurrency. Bit Coin in 2009 was the new cryptocurrency accomplished with Block Chain technology. After that, most cryptocurrencies have been improved with Block Chain based. Ethereum emerged as the developed money which has services and applications in addition to Block Chain system in 2015[5].WEF(World Economic Forum) suggested that the ranking of Blockchain must be the fourth of 12 future technologies in the Global Risks Report. Furthermore, in 10 years, 10 percent of GDP all over the world is expected to be based on Blockchain technology[6]. In April 2019, about 40 major banks around the world announced that they would experiment CBDC(central bank digital currencies) founded on Blockchain[7]. Blockchain, , which is encrypted with trade information on the public or private network, is a diversified ledger shared with relevant network participants. The data of the diversified ledger is stored on several nodes in a record keep the same ledger. Block consists of Header and

Body(Transactions). Header includes 6 kinds of information: Version, Former Block Header Hash, Merkel Root Hash, Time, n Bits, and Nonce., Block Chain is a linked list connecting to Blocks and the Block Header uses inclusion method to connect necessary Block Hash[8].

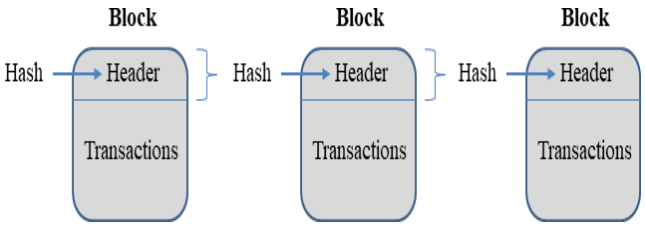

Figure 2. Blockchain Architecture

record keep the same ledger. Block consists of Header and Body(Transactions). Header includes 6 kinds of information: Version, Former Block Header Hash, Merkel Root Hash, Time, n Bits, and Nonce. As shown in Figure2, Block Chain is a linked list connecting to Blocks and the Block Header uses inclusion method to connect with a necessary Block Hash[8]. Therefore, it is impossible to fabricate a particular node arbitrarily because the hash value of the entire Blockchain is changed if transaction information is altered. In addition, p2p network is able to share whole the information, which prevents an outsider from hacking a particular node. There are various Blockchain models from a public one accessible by everybody to a private one involved in by particularly permitted nodes to a consortium one by a small number of groups allowed in advance.

It is Bitcoin, the typical crypto =currency, which the technology of public Blockchain is applied to. On May 9th 2019, Bitcoin was valued at more than $6,000 respectively, which renewed its exhaust market price[9]. The price of Bitcoin has a history of continuing to decrease to $3,237 in December 2018 after it broke the highest value $19,000 in December 2017.technical supports such as making block skills more efficient, customizing the adoption of Block chain, improving security of Block chain and so forth. Therefore, Cryptocurrency platform and investors try realizing and applying a variety of AI technologies in order to optimize their interests and to make a suitable decision[13].that unique index which is used to form a fixed length vector. After the word embedding layer the drop out layer is found which is applied to avoid over-fitting. Convolution layer which is used for future extraction performance the long distance dependency is added to catch. To pool a feature Pooling layer is used, a feature dimension which is converted to the flatten layer. In the last step, that is finally the classification is done by the SoftMax function by the neural network process.

1.1.Recurrent Neural Network and LSTM

So as to process the high information level, the research applying artificial Neural Networks began in 1980s. However, Over-fitting problem occurred – while learning operated well at the single layer neural network[14], at the deep layer, there was no more efficiency. Since then, Geoffrey Hinton suggested the idea, pre-training, as the model that contains the multi-layer structure in 2006[15].Pre-training is to learn each layer unit before learning the Neural Network in order to get a better initial value. Its efficiency is verified in vocal awareness or image recognition through machine learning benchmarking, which results in activation of deep learning. In fact, to recognize images the Convolutional Neural Network (CCN) is widely applied, whereas, to process real languages or discriminate voices, the Recurrent Neural Network (RNN) is needed. Using RNN is common in order to process Time Series Data such as price indices, stock indices, or the market value of cryptocurrency. RNN, which has a return route where hidden layers lead to themselves, makes use of both status values and inputs for previous hidden layer nodes when calculating node values for hidden layers.

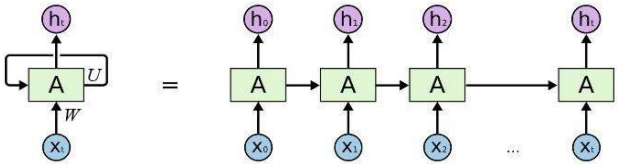

Figure 3. Structure and Operation of RNN

When RNN estimates future price while reading the context of sequence data, it is important to judge how far the range of the context is from the present input. Theoretically, although the history of all inputs should be reflected, it is difficult to measure the length of the inputs which are reflected for the output of RNN, in reality. To learn RNN needs usually Stochastic Gradient Descent. On Neural Networks with the multiple count of layers, the grade value might either be the maximum or go out of existence “0” as checking back to the layer when the gradient is calculated with back propagation. As a special RNN, LSTM(Long Short Term Memory) can solve the problem of the gradient vanishing.

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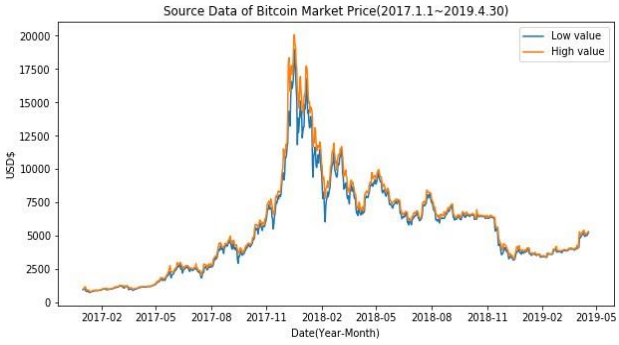
LSTM has a separate cell and input, output, and forget gates to control the input-output of memory[18]. There is memory cell in the center and there are 3 units which fix the prices of input, output, and forget gate and 2 units which receive external inputs around the cell. Memory realizes its memory by returning to itself after particular time from the present state. The external input of memory is received by gate g and its output is recorded in memory cell. the external output of memory goes out of gate h. This structure which overcomes the limit of RNN processing short term memory can have more precise prediction if opening and closing the gates can be controlled appropriately, which extracts the information of longer context. A lot of studies have recently proposed that RNN performs well in forecasting time series financial data. They predict stock markets by implementing RNN which uses embedded memory for dynamic system application. As a result, forecasts on Bitcoin prices are getting visible.



3.Proposed Methodology and Experiment of Prediction Model

Step 1: Modeling that this research offers is processed in order of normalizing learning data, separating learning data from verification data, constructing RNN model, learning and testing, and forecasting.

Step 2: As shown in Figure 4,thedatais the material of Bit Coin prices drawn from https://coinmarketcap.com for 838 days from on January 1st, 2017 to on April 30th, 2019.The maximum value of Bitcoin is $19,531.55 (Dec 17, 2017) and its minimum value is $791 (Jan. 12, 2017). With the average value of the minimum price and the maximum one for the day dealings, the processing sets up 31 as the length of Window and learns how to predict the price of the following day after making sure that prices for previous 30

Step 3: On Neural Networks the nods of hidden layers and output layers except for those of input layers are printed out through activation function. For better prediction of the time series data, such as stock price and bitcoin price, it is necessary to be normalized into the range (0, 1). This research divides each value of the window by the first value and subtracts 1 from that value. Out of the total 838 data, 807 data are available after normalization.

Step 4: 807 normalized data sets for Modeling are at random divided into training data sets and test data sets at the ratio of 9:1. 726 training data sets are partitioned again into training data and validation data. Test data sets must not to be involved in learning. As a result, there is a separation: x_training_set is (726, 30, 1) and x_test_set is (81, 30, 1). It means that a price of 81 days is predicted by learning 726 days of data.

Step 5: So as to estimate the value of Bitcoin as time passes, it is necessary that LSTM learning model with improved Back-Proposal Through Time(BPTT) should be created and trained. It is practicable to supply learning by using Keras framework, a neural network library. Learning model consists of 2 stacked LSTM layers including 50 units and one input layer related densely to a neuron.

Learning all that has been done for 30 days in advance, LSTM parameter adds a layer like model.add (LSTM(30, return_sequences=True, input_shape =(30, 1))). In order to forecast the next day, One designated Neuron is added as Dense, the middle layer of the Model like model.add (Dense(1, activation='linear')). Linear is used as activation function rather than tan h, mse(mean_squared_error) is used as loss function, and rmsprop showing the best result in the optimization experiment is used as optimizer. In addtion to rmsprop, Keras provides a variety of optimizer(Adadelta optimizer, Adagrad optimizer, Adamax optimizer, Adam optimizer, Nesterov Adam optimizer, Stochastic gradient descent).

Step 6: Fit function on Keras is used to learn Neural Network model. To fit the model is to look for the weight of the model while optimizing the process with the training data set. 1 Epoch is designed to complete a one-time study of the entire data. For example, if epoch is 30, it means the entire data is used and learned 30 times. When epoch is too small, under fitting takes place. On the contrary, there happens over fitting in the case of too large epoch.

Because of the fact that only one epoch cannot contain the whole data, there should be iteration about how many times it is divided and batch size about how big the size of data is required to conduct iteration. The model of this study has learned 1,980 times totally: if the entire data 726 are divided into 11 arrangement sizes, 66 iterations will arise. When 66 iterations are conducted 30 times, it is possible to learn 1980 times based on iteration. The return value of the Fit function can obtain a history object, which provides the information as following: ① Training Loss Value(loss), ② Training Accuracy(acc), ③ Validation

Loss Value(val_loss), ④Validation Accuracy(val_acc). A summary of the neural network model of the study is shown in Table 1.

Table 1. Summary of LSTM Model

Layer(type)	Output Shape	Param #
lstm_1(LSTM)	(None, 30, 30)	3840
lstm_2(LSTM)	(None, 50)	16200
dense_1(Dense)	(None, 1)	51

This research puts a batch size of 11 and epochs of 30 like model.fit(x_train, y_train, validation_data=(x_test, y_test), batch_size=11, epochs=30). In the output during learning process, val-loss is very low, which means that the lower the value gets, the better the machine learns. In Figure 5, as learning is processed more repetitively, the loss value decreases more monotonously, and it converges towards more regular value. That is, there has been no overfitting.

Figure 6 shows the weight of Bitcoin prices compared to actual and forecast prices for 81 days. Typically, the initial weight value should be initialized in small and randomly in order not to have the same initial value. This model is randomly initialized with weight initial value, the average 0 and Gaussian Distribution, the normal one following the standard deviation 0.01. Weight beginning at 0 increases and decreases repeatedly, and finally converges towards a particular value. Analyzing the changing graph of weight provides the intuition that the more the model learns, the more efficiency it has.

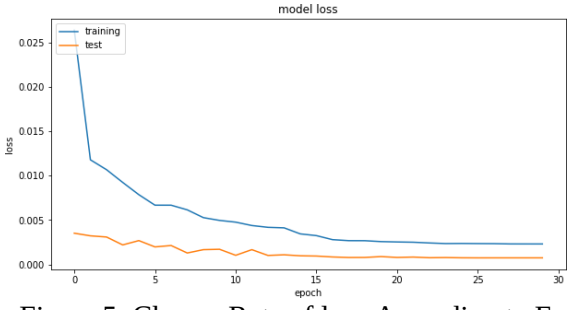


Figure 5. Change Rate of loss According to Epochs

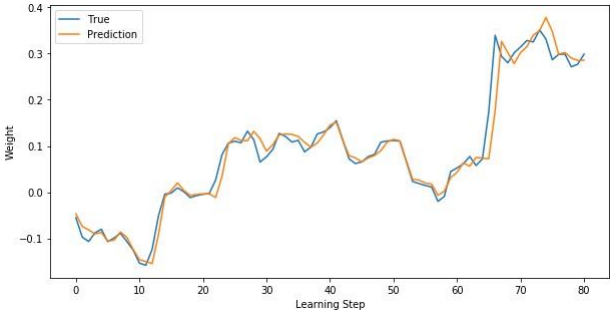


Figure 6. The True & Prediction Graph of 81 Days

III SIMULATION/EXPERIMENTAL RESULTS

Now talking about the algorithm we used. There are lot of algorithms present which help us in analyzing data. Machine learning and data analytics are boon in this field. The algorithm we opted is Regression Analysis. A set of statistical techniques for assessing the relationships between variables is known as regression analysis. It includes many techniques for modeling and analyzing several variables, when the main target is on the connection between variable and one or more independent variables.

IV CONCLUSION

Recently, AI technology has been used in variety of particular fields and remarkably has grow up. Alpha Go (alpha zero) made by Google in 2016 made the world have much interest in Artificial intelligence. This paper purposes Artificial Neutral Networks so as to forecast the next day price of Bitcoin. There search will aim at developing stage best fire casting cryptocurrency program from applying various experiments of Artificial Neutral Network learning models.

V FUTURE SCOPES

This project can be a step forward towards providing useful information based on current research, we summarized existing tasks and further proposed new possible tasks. Last but not least, we discussed some limitations of current research and proposed a series of future directions, including utilizing learning techniques, interpretable intention understanding, temporal detection and proactive conversational intervention.

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MEDICINAL LEAF IDENTIFICATION USING CNN CLASSIFIER

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Abstract **- Plants Leaf plays a vital role in human life, they provide oxygen, food, shelter, medicine, fuel, gums and environmental protection. Manual identification of medicinal plants leaf is a time consuming process and need the help of experts for plants identification. To overcome this problem, automatic identification and classification of medicinal plants is needed for greater benefit to humankind. In today's era, the automatic identification and classification of medicinal plants leaf is an active research area in the field of image processing. Feature extraction and classification are the main steps in identification of medicinal plants and classification process which affect the overall accuracy of the classification process. This paper presents literature on identification and classification of medicinal plants. The project developed to classify the correct medicinal plants from the images of the plant leaves given as a training dataset. Convolutional Neural Network algorithm is used to classify the medicinal plants and its medical uses in recent years.**

Keywords – CNN, Machine learning, Image processing

I. INTRODUCTION

Ayurveda is the ancient Indian system healing using medicinal plants available naturally in the Indian subcontinent,Ayurveda originated more than 5,000 years ago and was developed by ancient Indian sages like, Charka, Sushruta and Vaghbhata. AcharyaCharaka has said that all herbs on the earth contains medicinal values, curing the diseases and also teaches us how to balance of our body, sense of organs, mind and soul. According to World Health Organization (WHO), 65% to 80% of world population currently uses medicinal plants as remedies for various diseases. Botanist identifies the medicinal plants based on biological characteristics. It takes more time to identify plants species because one plant may have a similar kind of morphological features with another plant. Incorrect identification will lead to bad impression about Ayurvedic medicines and produce unexpected side effects in human beings. It is hard to remember names of every medicinal plant hence it is very much essential to build an automatic identification and classification system for greater benefits. The purpose of automatic identification and classification of medicinal plants is to educate and provide information to common people and farmers, which will help to increase the cultivation of medicinal plants. This system also provides medicinal knowledge and species database to the suppliers, agents, pharmacy students, pharmaceutical companies, research students, Ayurveda practitioners, herbal plant researchers, botanists and to the cosmetic industry. Plants are identified based on leaves, flowers, bark, seed, fruits, roots, stem and other parameters like height, region of its growth and environmental factors. For identification of plants many authors consider only leaves of the plants, because leaves are of two-dimensional nature and are available at all the time. But less research is done in identification of medicinal plants using flower and fruits/seeds because they are three dimensional in nature and available only in specific seasons. This paper will give brief review about medicinal plants identification and classification with the help of different technologies used in pre processing, feature extraction and classification phases.

II. OBJECTIVES AND METHODOLOGY

- The paper aims at designing an automated system for flora Identification that helps in providing medicinal knowledge to common people.

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- The objective of this system is to reduce manual work and increase the efficiency by the automatic identification of medicinal plants using image processing techniques

- This helps in identification of which part of the plant has medicinal value for which disease this medicine is going to be used.

Methodology:

The methodology flow includes

- This project propose an image pattern classification to identify different types of plants.
- The purpose of this research is to find appropriate medicinal values of plants based on leaf and flower.
- The features of shape, color and texture are extracted from these images.
- After that, these images are classified by CNN classifier.
- A combination of several features are used to evaluate the plant.
- Based on evaluation the plant is identified.

Image Acquisition

Leaf images used in this work were captured using a digital camera in natural light with camera position vertically over the leaf. Background may be present in the images, which are eliminated later in the pre-processing step. Image Pre Processing Pre-processing is primarily used here for removing the background area .This step includes.

Grayscale conversion: a grayscale or grey-scale digital image is an image in which the value of each pixel is a single sample, i.e., it carries only intensity information.

Feature Extraction

In this process the shape, colour and texture of the leaf are extracted from the images.

Classification

In this method, we are using CNN algorithm.

CNN is a type of Machine Learning network that applied to image displaying problems. It is used to detect what is the image and what is involved in the image. A CNN consists more than one convolutional layers.

In this process each sample should be classified similarly to its surrounding samples.Therefore, if the classification of a sample is unknown, then it could be predicted by considering the classification of its nearest neighbor samples.

Plant identification

Based on the classification of this nearest neighbour plant will be identified.

DESIGN AND IMPLEMENTATION

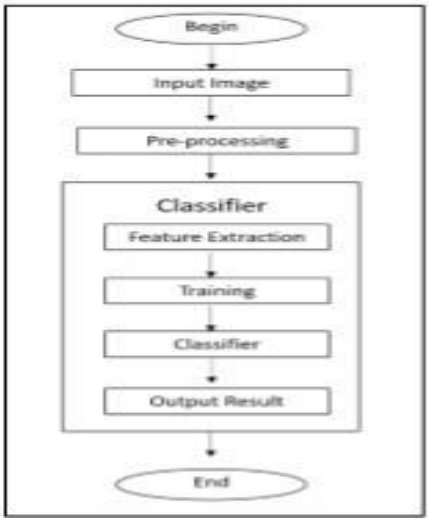

Fig.4.1.Identification and classification of Medicinal plants

Image Processing in Leaf:

Leaf pattern recognition usually follows the steps shown in Figure 1. The most important part of this study is to extract distinctive features of leaves for plant species recognition. In this case, different classifiers using high performance statistical approaches have been used to perform leaf features extraction and classification.

The pre-processing step consists of image re-orientation, cropping, gray scaling, binary thresholding, noise removal, contrast stretching, threshold inversion, and edge recognition. Image Pre -processing refers to working on images in order to convert it in a suitable form on which the algorithm can be worked. The captured images will be cropped and be resized so that it can be effectively tested. In Digital image processing, computer algorithms are applied to execute image processing on digital images .Pre-processing consists of Resize Image, Filter Image, Segment Image, Crop Image, Binarization. Turkoglu and Hanbay suggested that leaf feature extraction could be done by dividing the leaf image into two or four parts, instead of extracting for the whole leaf.

Gray scale conversion of the image into geometrical data is implemented to optimize the contrast

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and intensity of images. Later, the thresholding process creates a binary image from the gray scaled image to translate the value of the image to its closest threshold, and therefore having either one of two possible values for each pixel, as presented in Figure 4.2. Different types of noises, such as grains, and holes, could affect digital images; therefore erosion and dilation are a series of operations implemented in order to remove the background noises. The images are considered homogenous if they do not exhibit substantial divergences between one another in terms of contrast stretching. In homogeneity is caused by the lack of uniform lighting upon the image contours of images and further refined by diminishing the contours with small lengths with regards to its largest contour.

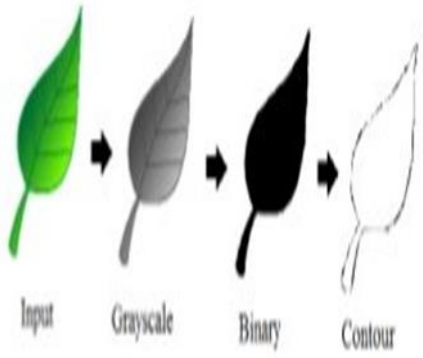

Fig 4.2. Image pre-processing stages

Feature Extraction

Feature extraction module is a module that is used to perform feature extraction that produces identifier. Feature extraction technique used is the analysis of texture. In texture analysis obtained some identifier be a major element for the identification process. The identifier are: entropy, energy, contrast and homogeneity. Entropy measures the randomization of the intensity distribution of the image pixels. Energy is a feature to measure the concentration of the intensity in the pair co-occurrence matrix. The greater the energy value if the spouse is eligible matrix pixel intensities are concentrated in a few coordinates co-occurrences and shrink when lying spread. Another feature is the contrast that is used to measure the strength of the difference in intensity in the image. The opposite of contrast is intensity variations in the image. Values greater homogeneity if the variation in the intensity of the image decreases and vice versa.

Convolutional Neural Network (CNN):

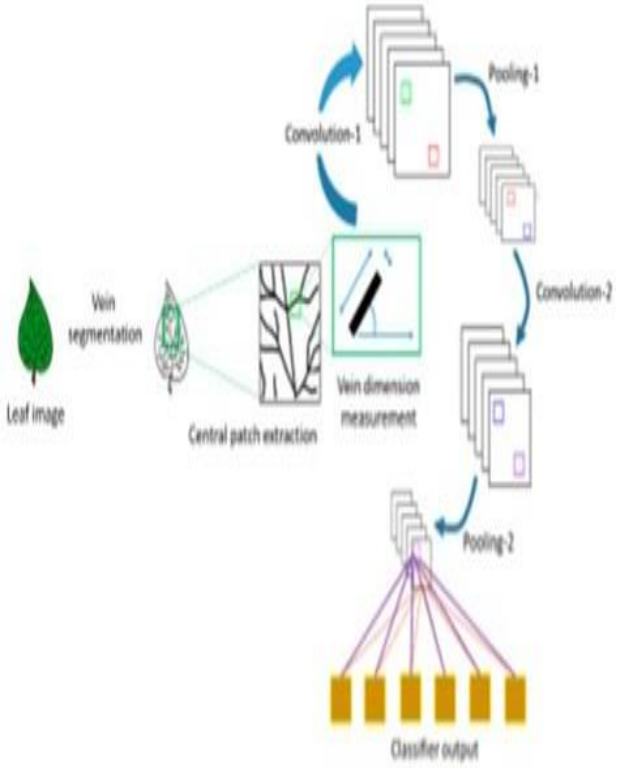

Fig 4.3. Leaf Pattern Detection with convolution neural network.

CNN implements deep learning to machine image processing in order to classify pictures of leaf samples. Recent development of hardware and information processing technology has made deep learning a self-learning method that utilizes massive sum of data in a more feasible manner as shown in Figure.The CNN initially aims to imitate the visual system of human. The retina identifies edges of an object by strong intensity of light compared to the whole object in the human visual system. This information is sent to lateral geniculate nucleus(LGN).Simultaneously, the image information from the retina of the left and the right eyes give depth perception which provides distance information. These data are sent to secondary visual cortex (V2) where recognition of overall shape and color perception of different segments of the image are taking place before being transferred to tertiary visual cortex (V3) to interpret the color of the whole object.

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Algorithm Design

Convolutional Neural Network (CNN) — Deep Learning

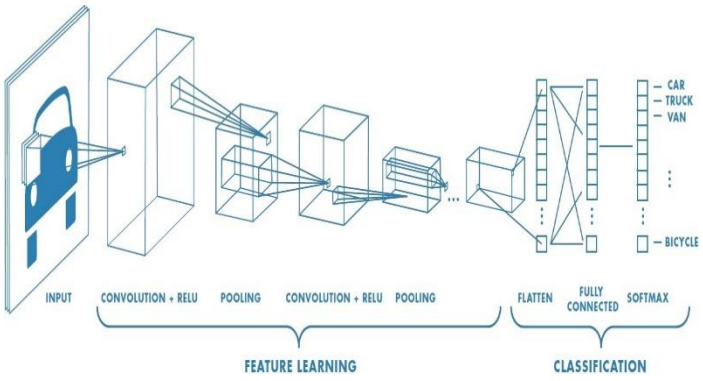


Figure 2 : Neural network with many convolutional layers

Convolution Layer

In this model, we are using CNN classifier. The classifier is utilized for the classification of the Image Fusion and Recursive Filtering features.A convolution multiplies a matrix of pixels with a filter matrix or 'kernel' and sums up the multiplication values. Then the convolution slides over to the next pixel and repeats the same process until all the image pixels have been covered. Our brain has a complex layer of neurons ,each layer holds some information about the object and all the features of the object are extracted by the neurons and stored in our memory, next time when we see the same object the brain matches the stored features to recognize the object, but one can easily mistake it as a simple "IF-THEN" function, yes it is to some extent but it has an extra feature that gives it an edge over other algorithms that is Self-Learning, although it cannot match a human brain but still it can give it a tough competition . Image is processed using the Basic CNN to detect the leaf. The data training in our CNN model has to satisfy following constraints:

1)There should be no missing values in our dataset.

2) The dataset must distinctly be divided into training and testing sets, either the training or the testing set shouldn't contain any irrelevant data out of our model domain in case of an image dataset all the images must be of the same size, one uneven distribution of image size in our dataset can decrease the efficiency of our neural network.

3) The images should be converted into black and white format before feeding it into the convolution layer because reading images in RGB would involve a 3-D numPy matrix which will reduce the execution time of our model by a considerable amount.

4) Any kind of corrupted or blurred images should also be trimmed from the database before feeding it into the neural network . Now we have learned the data pre-processing rules, let us dive right into the working of the convolutional neural network.

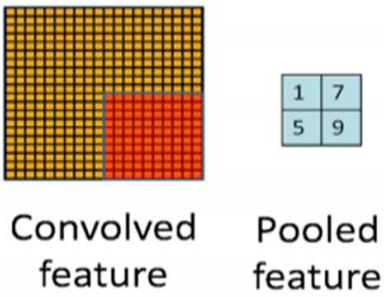
1. Convolution layer

- This layer involves scanning the whole image for patterns and formulating it in the form of a 3x3 matrix.
- This convolved feature matrix of the image is known as Kernel. Each value in the kernel is known as weight vector.

Fig 4: Convolution layer

2. Pooling layer

- After the convolution comes to the pooling here the image matrix is broken down into the sets of 4 rectangular segments which are non-overlapping.
- There are two types of pooling, Max pooling and average pooling.
  - Max pooling gives the maximum value in the relative matrix region which is taken.
  - Average pooling gives the average value in the relative matrix region.
  - The main advantage of the pooling layer is that it increases computer performance and decreases over-fitting chances.



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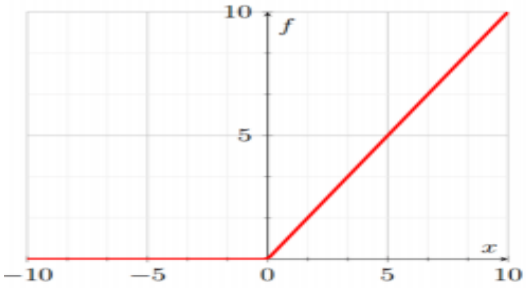
3. Activation layer (ReLu)

It the part of the Convolutional Neural Networks where the values are Normalized that is, they are fitted in a certain range. The used convolutional function is ReLU which allows only the positive values and then rejects the negative values. It is the function of low computational cost.



4. Fully connected layer

Here the features are compared with the features of the test image and associate similar features with the specified label. Generally, labels are encoded in the form of numbers for the computational ease, they will be later converted into their respective strings.

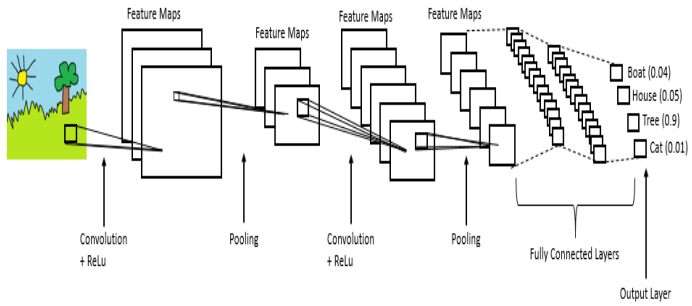


Figure 10 : Complete CNN architecture

Provide input image into convolution layer Choose parameters, apply filters with strides, padding if requires. Perform convolution on the image and apply ReLU activation to the matrix.

Perform pooling to reduce dimensionality size

Add as many convolutional layers until satisfied

Flatten the output and feed into a fully connected layer (FC Layer)

Output the class using an activation function (Logistic Regression with cost functions) and classifies images.

RESULTS

Identify and classify the leaf based on the characteristics whether it is normal or medicinal plant. If it is a medicinal plant then it shows common name, scientific name of a plant and for which disease this medicine is going to be used

CONCLUSION

History of Ayurveda says every plant has a medicinal value, so the identification of which part of the plant has medicinal value and for which disease this medicine is going to be used. Medicinal plant parts like leaves, flowers, bark, seeds, fruits, roots, and stem are used in many disease diagnosis. Through these plants parts botanists and herbal practitioners are identifying the medicinal plants manually which is time consuming process. The objective of this study is to reduce manual work and increase the efficiency by the automatic identification of medicinal plants using image processing techniques. From the literature survey the majority of the researchers used leaf features for the classification of medicinal plants and less research work was done in classification of medicinal plants using flowers and fruits/seeds.

Our work is to enhance the research in identification and classification of medicinal plants as herbs, shrubs and trees using flowers and fruits/seeds features including leaf. Automatic identification and classification of medicinal plant will provide medicinal knowledge to common people and farmers which help in increasing production of such essential plants. This automatic classification system also helps botanists, consumers, forestry services, taxonomists, pharmaceutical companies and Ayurveda practioners to identify and classify the medicinal plants without any human assistance.

Future scope:

The medicinal plants are closely connected with the traditional knowledge of its use. During the early periods, the knowledge of the medicinal plants was transferred from one generation to another generation orally and no documentation of the medicinal plants has been recorded. It is essential to evaluate the herbal plant scientifically and documents should be made to know their medicinal properties. To revitalize Indian medicinal heritage, through creative application of the traditional health sciences for the enhancement the quality of health care in rural and urban India, extensive research on plants for natural leads is very essential.

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Survey on Image Enhancement Techniques

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***Abstract*:** Image enhancement is considered as one of the most important techniques in image processing. The main aim of image enhancement is to enhance the quality and visual appearance of an image, or to provide a better representation for future automated image processing. . One of the most important stages in medical images detection and analysis is Image Enhancement Techniques. It improves the clarity of images for human viewing, removing blurring and noise, increasing contrast, and revealing details. Many images like medical images, satellite, aerial images and also real life photographs suffer from poor and bad contrast and noise. It is necessary to enhance the contrast and remove the noise to increase image quality. The existing techniques of image enhancement can be classified into two categories: Spatial Domain and Frequency Domain Enhancement. In this paper, we present an overview of Image Enhancement Processing Techniques in Spatial Domain. More specifically, we categories processing methods based representative techniques of Image enhancement. Thus the contribution of this paper is to classify and review Image Enhancement Processing Techniques as well as various noises has been applied to the image. . It will be useful and easier to improve the quality of the respective image

1. Introduction:

For improving the quality of the image and to give better input for processing the image, we use image enhancement technique. Based on this, the enhancement techniques are categorized into two types: 1. Spatial domain methods: In this method, the operation takes place directly on the pixels of the image which in turn leads to contrast enhancement. 2. Frequency domain methods: In this method, the operation takes place on the Fourier transform of the respective image. Real time solutions are carried out in spatial domain, because it is very simple, easy to interpret and mainly the complexity range is very low. Robustness and imperceptibility factors are the two major criteria which is lacking in spatial domain. The assessments of functions are performed with respect to frequency in frequency domain method for the purpose of increasing the quality of the image. It works on Fourier transform, discrete cosine and sine trans-form of the image. By using this method we can improve the quality of the respective image by making changes in the transform coefficient functions. The advantages of frequency domain image enhancement include low complexity of computations, manipulating the frequency coefficient of an image and by the application of improved version of domain properties. The major drawback of this method is it cannot produce clear picture of back-ground. That is basically it cannot enhance all the parts of the image. It can focus only on particular parts. Noise removal from the image plays a vital role and it is also one of the most important tasks in applications such as medical field, in which the noise free images will lead minimum error detection. Filtering is a technique which acts as a tool for removing the noise present in the image. The paper presents the narration of spatial domain techniques, different type of noises and the filters applied to the noises.

2. Spatial Domain Filtering Techniques

Inadequate amount of processing tools are required for spatial domain technique and mainly it requires very less computation time. This process is done by using the mathematical formula, and it is denoted by the Eq. (1).

$$g(x,y)=T[(x,y)] \quad (1)$$

Where

$f(x,y)$ corresponds to the image which is taken as input,

$g(x,y)$ corresponds to image which we obtain as output,

T denotes operator which is defined on f applied over a neighboring point$(x, y.)$

Here by using this technique, we can reduce the noise by applying this operator to the single pixel of an image or to different set of images. The spatial processing includes basic intensity transformation functions. The respected value which is obtained from the function is given in the expression of the form in Eq. (2).

$$S = T(r) \quad (2)$$

The pixel value(r) is mapped with pixel value(s) by using the transformation T. Intensity transformation involves three types of transformations which are used for image enhancement process. They are:

- Linear- negative transformation.

- Logarithmic- log transformation.
- Power law- Intensity transformations.

These transformation functions are very effective and considered to be the simplest and easiest methods to implement8. Here the functions *r* and *s* represents the pixel values before and after processing the image. These techniques were used in5.

2.1 Image Negatives

Negative of the image or inverting the pixel of the image is one of the methods in image enhancement process. Image negatives are calculated by negative transformation with the intensity level is present in the range of *[0, L-1]*. It is represented by the formula (Eq. (3)).

$$S = L-1-r \quad (3)$$

Photographic negative of an image is obtained by reversing or inverting the intensity level of the image. In an image, if the darker areas are predominant and larger means we can apply this technique for improving the grey or white information combined with darker parts of the image. Inverting input low lighting video as well as dehisce algorithm techniques are used in image negative by7. These algorithms are used in the improvement of LCD displays and low quality videos. Figure 1 represents original image. Figure 2 represents the negative of the original image.

Fig.1 represents original image.

Fig. 2 represents the negative of the original image.

2.2 Log Transformation

Log transformations are mathematically expressed using the Eq. (4).

$$S = c \log (1+r) \quad (4)$$

Where *C* is taken as constant. It is taken that *r*>=0. This technique was used by [24]. By using this log transformation darker pixel values of the image are expanded by compressing the values in the higher levels. For inverse log transformation function the process is done at the reverse order. Compression of dynamic range values in an image by giving large variation in the pixel value is considered as the main characteristics of log transformation. Log reduction zonal magnitude technique was used in [5]. These techniques are mainly used in security surveillance applications. Figure 3 represents log transformation image.

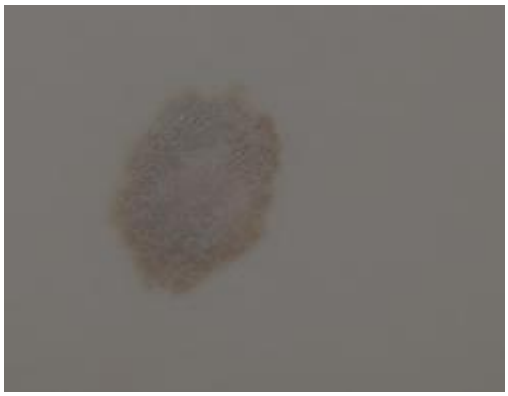

Fig.3 Log transformation image.

2.3 Power Law Transformation

Power law transformation is another technique used for image enhancement process. The basic form of power law transformation is given in the Eq. (5).

$$S = c\, r^{\gamma} \quad (5)$$

Where c and γ are positive constants6 used this technique. The input value which is thin and of darker range is mapped with output value which is having broader range by using the power law curves with the fractional values of γ. If higher level values are given to input, the process is done in the reverse order. Capturing image, respond to display of the image and printing the image are considered as the applications done by using power law technique. In general we state the exponent of power law equation as gamma. Gamma correction is the process or procedure which will rectify or correct the power law response.

Fig.4 Power Law Transformation

It can also be also useful for general purpose contrast manipulation. Bitwise linear transformation technique is uses here by [34]. This technique is applied in computer vision enhancement. Figure 4 shows power law transformation image.

2.4 Piecewise Linear Transformation

In this transformation each pixel value of the image is manipulated. This transformation technique is used for enhancing the quality of the image by altering the range of values. Content classification and adaptive processing techniques are used here by [11]. Arbitrary complex functions can also be solved by using piecewise linear method. This is considered as the major advantage of this technique. There are three different types for this kind of transformations. The types are

- Contrast stretching method.
- Intensity level slicing method.
- Bit plane slicing method.

Patidar et al.26 used this technique for image enhancement. The main applications are the improvement in the quality of image/video security surveillance. Contrast stretching is treated as easiest and simplest methods of linear transformation functions. Content adaptive algorithm is proposed by [19]. Improper illumination occurrence in low contrast value, in image sensor there will be loss of dynamic value and also in acquisition of image wrong placement of lens aperture may happen during processing the image. According to the display device contrast stretching will expand the intensity level range in the respective image such that it covers the full intensity value. Another type is intensity level slicing. It is basically used to improve the quality of image[33]. Specific range of intensity of the image is highlighted in intensity level slicing method. It can be implemented in several ways, but most are the variations of two themes. One value is mapped with similar range of interest and other with similar range of intensities. This is one of the approach [15]. Next approach is slicing the pixel values bit by bit. In an image pixels are represented as the digital values defined bit by bit. Suppose the intensity of each and every pixel in a grey scale image having 256 bits is composed of 8 bits each, then we can highlight the appearance of the overall image by specific group of bits instead of highlighting the range of intensity level. Genetic algorithms are given in bit plane slicing method proposed by [23]. These techniques are mainly used in CT scan and medical imaging. Relative importance of an image is analyzed in the image bit by bit using decomposition of an image into its respective bit planes. Quantization of image is done determining the adequacy of bits that is produced as a whole. This is the procedure done in bit plane slicing [18]. Image compression can also be done by using this decomposition procedure, in which fewer than all planes are used in reconstructing an image. Numerous spatial domain processes consider the histogram as the efficient technique for pre-processing.

Histogram manipulation is the process in which the values obtained from the values are mapped with the functions to enhance the appearance of the image. Contrast enhancement techniques is generally divided into two groups

• Histogram Equalization (HE),
• Tone Mapping.

3. Noises vs. Filters

Noise is defined as random variations in image intensity. It appears as grains in the image. Noise can insert into the image through different ways [32]. It mainly depends on how an image is created. Noise is generated in sensor or transmission channel during the acquisition process. In image processing image enhancement and noise' removal proved to be the major challenge. Noise should be removed from the image in order to recover the original information. Many factors contribute to their role in the introduction of noise in an image. The quantification of noise specifies the number of pixels in the image which is corrupted [32]. Various source of noise in digital images are:

- Environmental condition
- Insufficient light levels.
- Interference in transmission channel.
- Dust particles.

Noise will affect the quality of the image based on the type of disturbance and to which extent it gets embedded in the image. In digital image different types of noises will occur. They are

- Gaussian Noise
- Salt and Pepper Noise
- Speckle Noise
- Poisson Noise
- Quantization Noise

3.1 Filters Applied for Different Noises

High frequency that are present in the image, (smoothing the image) or low frequency of an image, (enhancing or detecting edges of an image) can be removed or suppressed by using the filters. Three types of filters are,

- Mean filter
- Median filter
- Wiener filter

Applications

- Traffic monitoring.
- Security Surveillance method.
- Computer vision.
- LCD display device.
- Low quality video.
- Traffic monitoring; Medical imaging.
- Image/ Video Security Surveillance.
- Medical Image, poor quality Video as well as audio.
- Compression video, CT scan.
- Satellite image.
- Face recognition.
- Computer aided diagnosis.

Conclusion

Image enhancement is the improvement of digital image quality without knowledge about the source of degradation. In this paper spatial domain techniques like intensity transformation, piecewise linear transformation techniques, histogram equalization were reviewed. Different processing techniques and applications of those spatial domain enhancements were analyzed. Also discussed different kinds of noises are applied to the image. Then filters are applied to those noisy images. From this, conclude that different filters and noises are compatible for removing almost all kinds of noises and helpful in improving the quality of the images.

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VISUAL SPEECH RECOGNITION USING AI

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***ABSTRACT*-: Deep neural network, the branch of Artificial Intelligence is widely used in the detection of lip reading and to improve visual speech recognition. The visual motion of the lips and the corresponding words or the subtitles are generated which are correlated. A CNN(Convoluted neural network) is used to detect the movement of the lips and judge the words that have been spoken and is put onto the textual format. The CNN also relieves the information from the cintent as well as from the knowledge of the language. The aim here is to use artificial intelligence as the source in order the detect the movement of the lips and also on focusing on presenting the results both in terms of accuracy of the trained neural network on test data.**

1. INTRODUCTION:

Lip reading could be described as the process of decoding text from visual information generated by the speaker's mouth movement. Lip reading as also known as speech recognition would be difficult for the humans to understand without the context and the knowledge of the language. Several seemingly identical lip movements can produce different words, therefore lip reading is an inherently ambiguous problem in the word level. A machine that can be used to read and detect the words in the lip reading as a lot of practical applications in the silent environment, crime detection, automated lip reading of speakers with damaged vocal tracts, biometric person identification, multi-talker simultaneous speech decoding, silent-movie processing and improvement of audio-visual speech recognition. Lipreading and audio-visual speech recognition in general was revolutionized by deep learning and the availability of large datasets for training the deep neural networks. Lipreading is an inherently supervised problem in machine learning and more specifically a classification task. However , this models could not achieve the results expected.[1]

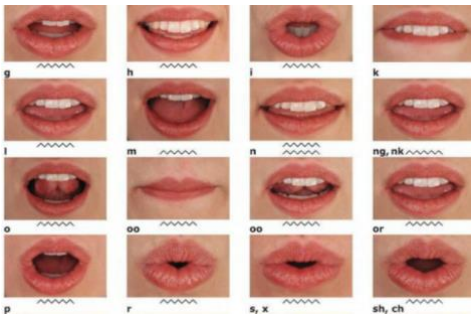

Figure 1: Lip reading patterns

2. PROPOSED WORK

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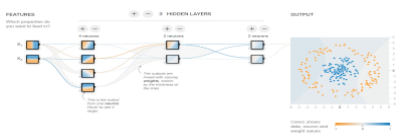
The proposed framework detects and surveys the mouth region area later it designs and implements the real – time system which is capable to read the lips from the video which are the trained data sets. Explore the possibility to recognize sentences in real-time. The lip cropping technique includes four major steps: face detection, cropping module, feature extraction and text decoding involves distinguishing between the faces and non faces, cropping modules.

3. ARCHITECTURE

Convolution Neural Network is commonly made up of only three-layer types: Convolution (CONV), Pooling (POOL), and Fully Connected (FC) layers, where CONV and POOL layers are ordinarily repeated several times to create a Deep Neural Network and extract high-level features. A Fully Connected layer is a normal Multi-Layer Perceptron that uses a SoftMax activation function in the output layer. The whole architecture is then trained by updating and adjusting filters/weights in the Neural Network though a training process in the similar way as with a normal NN

The proposed system architecture is based on the working of CNN.

1.It is designed with an input layer, 3 hidden layers, and an output layer with the hidden layer having 32,64, and 96 neurons respectively.
2.It also uses SoftMax as a probability classifier and max pooling to reduce the number of parameters in subsequent layers.



4. ALGORITHMS

Face Detection the use of Viola Jones Algorithm

The Viola-Jones set of rules is a broadly used mechanism for item detection. The main assets of this set of rules is that schooling is slow, however detection is fast. This set of rules makes use of Haar foundation function filters, so it does now no longer use multiplications. The essential photo lets in integrals for the Haar extractors to be calculated via way of means of adding simplest 4 numbers.

$$II(y,x) = \sum_{p=0}^{y} \square \sum_{q=0}^{x} Y(p,q)$$

Detection takes place inner a detection window. A minimal and most window length is selected, and for every length a sliding step length is selected. Then the detection window is moved throughout the photo Each face popularity clear out out (from the set of N filters) carries a fixed of cascade- linked classifiers. Each classifier appears at a square subset of the detection window and determines if it seems like a face. If it does, the following classifier is applied. If all classifiers give a nice solution, the clear out out offers a nice solution and the face is recognized. Otherwise the subsequent clear out out withinside the set of N filters is run. Each classifier consists of Haar function extractors (susceptible classifiers).

$$C_m = \begin{cases} 1, & \sum_{i=0}^{I_m-1} F_{m,i} > \theta_m \\ 0, & \text{otherwise} \end{cases}$$

$$F_{m,i} = \begin{cases} \alpha_{m,i}, & \text{if } f_{m,i} > t_{m,i} \\ \beta_{m,i}, & \text{otherwise} \end{cases}$$

Each Haar function is the weighted sum of 2-D integrals of small square regions connected to every different. The weights might also additionally take values ±1. Haar function extractors are scaled with admire to the detection window length. Figure

four.four: Example rectangle functions proven relative to the enclosing detection window The classifier selection is described as: (ii,iii) fm,i is the weighted sum of the 2-D integrals. is the selection threshold for the i-th function extractor. αm,i and βm,i are regular values related to the i-th function extractor. θm is the selection threshold for the m-th classifier. Figure four.5: Object detection Viola-Jones clear out out The cascade structure could be very green due to the fact the classifiers with the fewest functions are positioned at the start of the cascade, minimizing the overall required computation. The most famous set of rules for functions schooling is AdaBoost.

This set of rules has 4 stages: 1. Haar Feature Selection

2. Creating an Integral Image

3. Adaboost Training

4. Cascading Classifiers

The functions sought via way of means of the detection framework universally contain the sums of photo pixels inside square regions. As such, they undergo a few resemblance to Haar foundation functions, that have been used formerly withinside the realm of photo-primarily based totally item detection.[3] However, because the functions utilized by Viola and Jones all depend upon multiple square place, they are commonly greater complex. The cost of any given function is the sum of the pixels inside clear rectangles subtracted from the sum of the pixels inside shaded rectangles. Rectangular functions of this kind are primitive while in comparison to options inclusive of steerable filters. Although they are touchy to vertical and horizontal functions, their remarks is notably coarser. These regularities can be matched the use of Haar Features. A few are not unusualplace to human faces:

• The eye location is darker than the upper-cheeks.

• The nostril bridge location is brighter than the eyes.

Composition of properties forming matchable facial features:

• Location and length: eyes, mouth, bridge of nostril

• Value: orientated gradients of pixel intensities

The 4 functions matched via way of means of this set of rules are then sought withinside the photo of a face .

Rectangle functions: • Value = Σ (pixels in black place) - Σ (pixels in white place) • Three types: two-, three-, 4-rectangles, Viola & Jones used two-rectangle functions .Each function is associated with a unique vicinity withinside the sub-window An photo illustration known as the essential photo evaluates square functions in regular time, which offers them a huge velocity gain over greater sophisticated opportunity functions. Because every function's square place is constantly adjoining to as a minimum one different rectangle, it follows that any two-rectangle function may be computed in six array references, any three-rectangle function in eight, and any 4-rectangle function in nine.

Convolution Neural Network

In deep learning, a convolutional neural network is a class of deep neural networks most commonly used to analyze visual images. Each neuron on one layer is connected to all neurons on the next layer. The "tight connection" of these networks makes them prone to overfitting of the data. Typical forms of regularization include adding some sort of size measure of weights to the loss function. They take a different approach to regularization: they use the hierarchical pattern in the data and assemble more complex patterns from smaller, simpler patterns. Therefore, in terms of connectivity and complexity,

CNNs are at the lower end. The network is one of the most popular algorithms for deep learning with images and videos. Like other neural networks, a CNN consists of an input layer, an output layer and many hidden layers in between.These layers perform one of three types of operations on the data: convolution, grouping, or rectified linear unit (ReLU).

• Convolution places the input images through a set of convolution filters, each of which activates certain properties of the images.

• Clustering simplifies output through non-linear downsampling, which reduces the number of parameters the network needs to know.

• Rectified Linear Unit (ReLU) enables faster and more effective training by mapping negative values to zero and maintaining positive values. These three operations are repeated over tens or hundreds of layers, and each layer learns to recognize different properties.

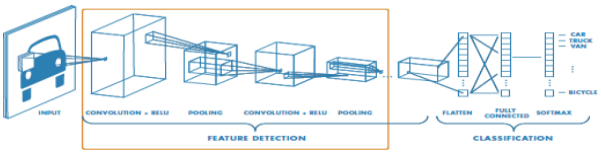


Figure 4.6: CNN example

Classification Levels

After the feature recognition, the architecture of a CNN changes to the classification. Next to the last layer is a fully connected (FC) layer that creates a K-dimensional vector, where K is the number of classes the network can predict.This vector contains the probabilities for each class of each classified image. The final layer of the CNN architecture uses a SoftMax function to provide the classification output.

In this way, each SoftMax output value sj corresponds to the probability that the MLP input data sample belongs to class j.A rectified linear unit function (ReLU) is applied to the local receptive field z (l) of a hidden layer 1 as follows

$$a^{(l)} = max(0, z^{(l)}), \quad z^{(l)} \in \mathbb{R}^{W \times H \times D}$$

5. RELATED WORKS

Zhang et al. It is designed to analyze your statistics. According to histogram statistics, hue has proven to be a suitable metric because it shows uniform properties under different lighting conditions, and only shows subtle details in the original image and a single image of the lip region of interest

In the work of the authors Skodras and Fakotakis, the RGB image is converted to the L * a * b * color space to increase the color contrast between the lip and non-lip regions; previously, the nearest neighbor segmentation technique was used. k stands for grouping method. It performs pixel classification by calculating the Euclidean distance between pixels and color markers. Then perform a binary morphology, the most suitable ellipse defines the lip area. Finally, cue points are extracted for lip recognition.

In the look at performed through Sujatha and Krishnan, image-primarily based totally detection became implemented in extracting the lip region. The gain of the use of the approach proposed is that a dependable lip ROI may be extracted with out usage of geometric residences along with corners and side detection procedures. The localization of the lip ROI had controlled to acquire a high-stage accuracy .

M
el

$$s_j = s_j(y) = \frac{\exp(y_j)}{\sum_{r=1}^{m} \exp(y_r)} \quad j = 1, \ldots, m.$$

to carry out key factor detection of lips. Its parameters are without problems adjustable and it may be initialized from a in addition distance from the very last aspect instead of while the use of the conventional snake's technique.. Following from that, an stepped forward model of the leaping-snake version turned into added with the aid of using Xinjun et al. An development on hybrid gradient field, seed preliminary function and updating technique of the seed turned into visible on this new method. Error detection-restoration method turned into a brand new addition to the method which added ahead the stepped forward end result of higher effectiveness and the stableness the use of the proposed set of rules.

To detect the lip contour a fuzzy clustering method was used by L.L Mok et al in the color space used having a combination with the ASM algorithm. Employing both the Active Contour Model and fuzzy clustering method the lip contour was extracted with elliptic shape information. By an expectation-maximization algorithm and initialization of snake method following a hybrid system made up of color transform in RGB space, by multi-level gradient flow maximization it was ideal for the region above and below lips contour, Bouvier et al brought into use.

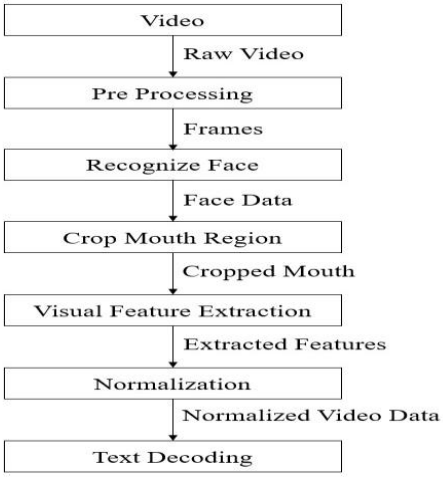
Matthew W. Hoffman, Thomas Paine, Cían Hughes, Hank Liao, Hasim Sak, Kanishka Rao, Lorrayne Bennett, , Ben Coppin, Ben Laurie, Andrew Senior, and Nando de Freitas have showed us to transform a raw video into a text. Their approach was first to combine a deep learning-based phoneme recognition model with production-grade word-level decoding techniques, the very 1st component of the system is a pipeline used to create the LSVSR dataset that we use here, filtered through YouTube videos and comprising of sequences coupled along the clips of faces where they are talking. By decoupling prediction and word translate into original form as it is often done in speech identification, therfore it can be possible to extend the words or sentences without training them again the neural network .

An end-to-end training system that consumes an uncountable frames to not make a written copy target data to revise the recognition accuracy on the target speaker domain-adversarial training for speaker independence which is put into the lipreader's growth based on a feedforward and Long Short-Term Memory recurrent neural networks.TensorFlow's Momentum Optimizer using the stochastic gradient descent to reduce the multi-class cross-entropy to get optimization. The main focus is for pushing the network to know an intermediate data representation that is domain-agnostic it means, it should be independent even if input data is inherited from a source speaker

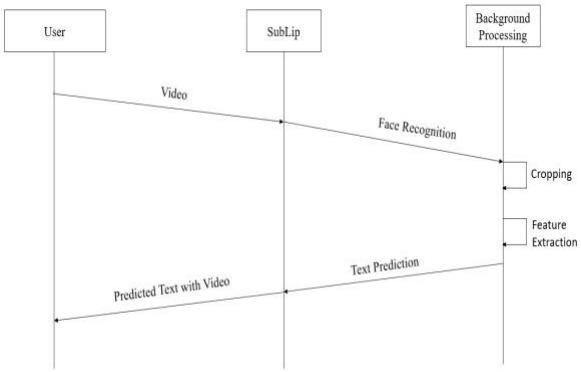
Encoder-decoder along with attention translator that was created for lipreading and translation of mahine. Here, the dataset that has been developed is built from many hours of television broadcasts that have spoken with subtitles of what is told. It can work over a dual attention mechanism that can work over availability of visual and audio input .There is an image encoder, audio encoder, and character decoder in place to get something that has been named as speech recognition. The main aim was to recognise spoken words.

6. SYSTEM DESIGN

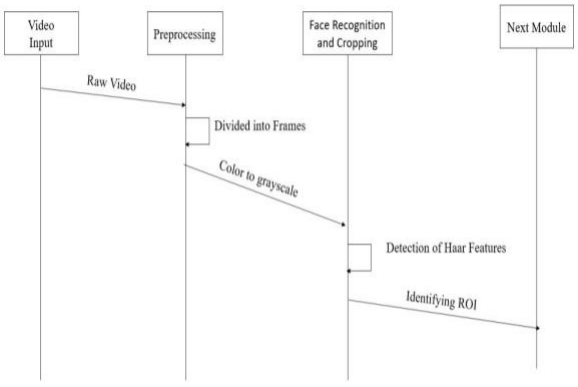
Flow Diagram:



Sequence Diagram:



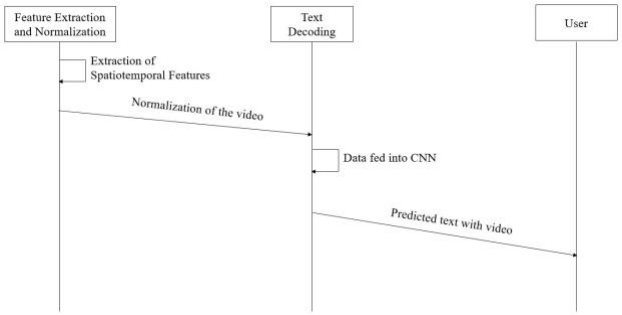
Sequence Diagram for Face Detection, Cropping and Pre-processing



This shows the sequence diagram for training the system. It has Doc Video Input, Pre-processing, Face Recognition and Cropping and is given to next module.

We can see in the diagram, it shows a series of message exchanging between objects having different entities. The horizontal rectangle boxes says the lifetime of the object. The input video is pre-processed where the video is made into small frames and is converted to grayscale.

Sequence Diagram for Feature Extraction and Text Decoding



It shows Feature Extraction and Text Decoding. Once the data from the previous phase is processed for feature extraction and normalization, the spatiotemporal features are extracted and simultaneously the video is normalized and is passed on to the text decoding phase. The data is fed back to the CNN which appears as predicted text with video to the user.

7. METHODOLOGY

A. Data Pre-processing

B. Model training

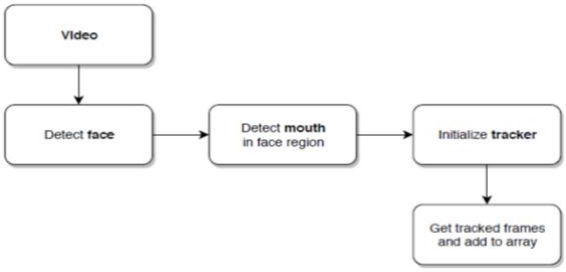
C. Model Evaluating

D. Deployment

A. Pre-processing

In the pre-processing stage, the goal is to process the data from raw video to get only the region of interest - the mouth. Focusing solely on the mouth area will speed up the training. Therefore we must first process every video from the dataset, locating and cropping the mouth region and then tracking this area for the rest of the frames. These cropped frames are

saved in the hard drive, so it is not necessary to pre-process the data before each training. Because there is not much variation in color across the different frames, we save the frames as a grayscale image, reducing the size 3 times.



B. Model Training

If not specified otherwise, the model is trained with the following parameters:

Number of epochs - 30 or end if validation accuracy does not improve after 4 consequent epochs.

Learning rate - 1 × 10 ^ -4.

Hardware used

CPU - Intel(R) Core (TM) i5 CPU 2.67Ghz,

RAM – 8 GB,

GPU - NVIDIA GeForce 940MX (4 GB VRAM),

OS - Windows 10 Home

C. Model Evaluation

Evaluating the model accuracy is a key task in every ML area. It is necessary to find out if the model had learned patterns that generalize well for unseen data instead of just overfitting on the data it was shown during training. There are many metrics of measuring the predictive accuracy of a model. For simplicity we use the test set of GRID dataset, and perform a so called Top-1 accuracy which means that the word with highest probability must be exactly the expected answer.

D. Model Deployment

Model Built is put into use and we make several test runs. Model is deployed in python using command prompt, python IDE and necessary python packages installed. It uses the power of the CPU. When the model is done predicting, it outputs each word, which are then displayed as text or in the form of a subtitle.

8. RESULTS

The proposed system has been trained within GRID CORPUS dataset. The system shows variable accuracy between 70-80 % on the test dataset. The Accuracy achieved is depicted in Figure 8 while comparing the kernel sizes. It is evident from Table I that while increasing the kernel size of CNN from 3X3X3 to 5X5X5 the accuracy increases significantly subject to number of epochs.

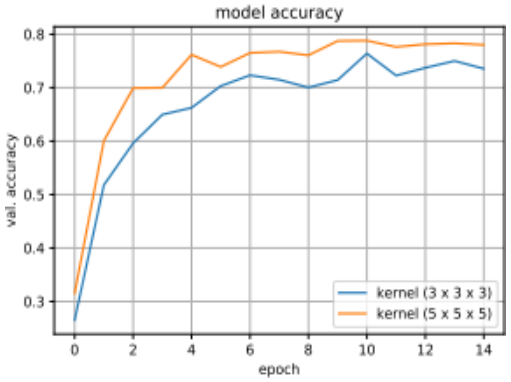


Figure 6.1: Showing model accuracy

9. CONCLUSION AND FUTURE SCOPE

It can be concluded that the proposed system is a unique model which uses artificial intelligence to predict the text from a video sample. It can be confidently said that with minimal requirements the

model designed reaches an accuracy oddly close to two-fold higher than that of a human lip reader. The system can be used in various fields such as forensics, silent movie processing, aid to the deaf and dumb and many more areas of interest.

The proposed system can be extended to different views of the scene in addition to the frontal view. It can be trained for other language datasets other than that of English (GRID CORPUS). It can be designed for live video feed detection too.

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COVID DETECTION USING IMAGE PROCESSING

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***ABSTRACT*— The novel coronavirus 2019 (COVID-2019), which first appeared in Wuhan city of China in December 2019, spread rapidly around the world and became a pandemic. It has caused a devastating effect on both daily lives, public health, and the global economy. It is critical to detect the positive cases as early as possible so as to prevent the further spread of this epidemic and to quickly treat affected patients. The need for auxiliary diagnostic tools has increased as there are no accurate automated toolkits available. Recent findings obtained using radiology imaging techniques suggest that such images contain salient information about the COVID-19 virus. Application of advanced artificial intelligence (AI) techniques coupled with radiological imaging can be helpful for the accurate detection of this disease, and can also be assistive to overcome the problem of a lack of specialized physicians in remote villages. In this study, a new model for automatic COVID-19 detection using raw chest X-ray images is presented. The proposed model is developed to provide accurate diagnostics for binary classification (COVID vs. No-Findings) and multi-class classification (COVID vs. No-Findings vs. Pneumonia). Our model produced a classification accuracy of 98.08% for binary classes and 87.02% for multiclass cases. The DarkNet model was used in our study as a classifier for the you only look once (YOLO) real time object detection system. We implemented 17 convolutional layers and introduced different filtering on each layer. Our model (available at can be employed to assist radiologists in validating their initial screening, and can also be employed via cloud to immediately screen patients.**

I. INTRODUCTION

COVID-19 presentation, which began with the reporting of unknown causes of pneumonia in Wuhan, Hubei province of China on December 31, 2019, has rapidly become a pandemic. The disease is named COVID-19 and the virus is termed SARS-CoV-2. This new virus spread from Wuhan to much of China in 30 days. The United States of America, where the first seven cases were reported on January 20, 2020, reached over 300,000 by the 5th of April 2020. Most coronaviruses affect animals, but they can also be transmitted to humans because of their zoonotic nature. Severe acute respiratory syndrome Coronavirus (SARS-CoV) and the Middle East respiratory syndrome Coronavirus (MERS-CoV) have caused severe respiratory disease and death in humans. The typical clinical features of COVID-19 include fever, cough, sore throat, headache, fatigue, muscle pain, and shortness of breath.

II. PROBLEM STATEMENT

In this project, we propose a weakly supervised deep learning strategy for detecting and classifying COVID-19 infection from X-ray images. The proposed method can minimize the requirements of manual labelling of X Ray images but still be able to obtain accurate infection detection and distinguish COVID-19 from non-COVID-19 cases. Based on the promising results obtained qualitatively and quantitatively, we can envisage a wide deployment of our developed technique in large-scale clinical studies.

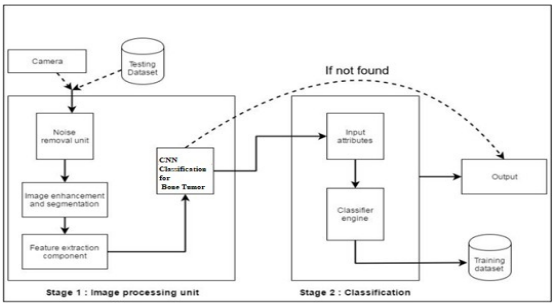
III. PROPOSED SYSTEM

In proposed system used to extract the features of Lung and it used to increase the resolution and efficiency level of an input. Here, view of Lung density it gives the exact level of a density and it also finds the all supplements in Lung. To find a COVID-19 and fracture it gives high resolution to find level of a COVID-19. It is the combined process of a Lung feature extraction.

1. Preprocessing
2. Feature Selection
3. Feature Extraction
4. Classification

IV. SYSTEM ARCHITECTURE

Dataset was optimized through extraction of features. After training and testing the proposed models with optimized dataset and well implemented and integrated for deployment.



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The framework can be comprehensively sorted into following significant stages:

Acquisition of image: Images are obtained either by lens or by secretly deleting them from the contraction. Whatever the source may be, it is very important that the image of the data is transparent and cautious. An incredible picture is needed for this.

Pre-Processing of image: In this process, the photo is standardized by clearing the commotion, as it may confuse the evaluation. Similarly, the image given as the information may not be of standard size as required by the figure, so it is vital that the image size needed is obtained.

Data storage aspect to preserve information images for testing and training: if controlled learning will occur, as is the case here, it is important to prepare data sets. The sample database is the images collected during the photo procurement process.

Classifier to classify the COVID: The classifier used here is the last layer of the system which gives the true probability of each experience. The project involves two major parts Image preparation unit and grouping unit. The object processing system enhances the image by removing the clatter and noisy bits. The Lungs and the image will then be isolated into different segments to isolate the Lung from running the mill after the image features are evacuated to check whether or not the Lung is contaminated.

V. ALGORITHMS

1. COVID Identification Using CNN:

The invention of the CNN in 1994 by Yann LeCun is what propelled the field of Artificial Intelligence and Deep learning to its former glory. The first neural network named LeNet5 had a very less validation accuracy of 42% since then we have come a long way in this field. Nowadays almost every giant technology firms rely on CNN for more efficient performance. The idea to detect diseases in mulberry leaf incorporates the use of CNN before we dive into the "functionality and working of CNN" concept, we must have a basic idea on how the human brain recognizes an object in spite of its varying attributes from one another. Our brain has a complex layer of neurons ,each layer holds some information about the object and all the features of the object are extracted by the neurons and stored in our memory, next time when we see the same object the brain matches the stored features to recognize the object, but one can easily mistake it as a simple "IF-THEN" function, yes it is to some extent but it has an extra feature that gives it an edge over other algorithms that is Self-Learning, although it cannot match a human brain but still it can give it a tough competition .

1. Convolution layer

This layer involves scanning the whole image for patterns and formulating it in the form of a 3x3 matrix. This convolved feature matrix of the image is known as Kernel. Each value inthe kernel is known as weight vector.

Fig. Convolution Layer

2.Pooling Layer

After the convolution comes to the pooling here the image matrix is broken down into the sets of 4 rectangular segments which are non-overlapping. There are two types of pooling, Max pooling and average pooling. Max pooling gives the maximum value in the relative matrix region which is taken. Average pooling gives the average value in the relative matrix region. The main advantage of the pooling layer is that it increases computer performance and decreases over-fitting chances.

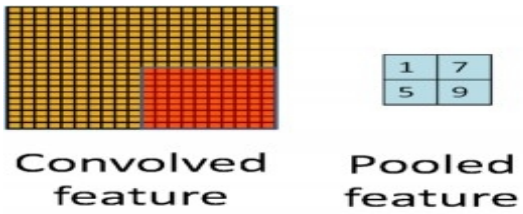
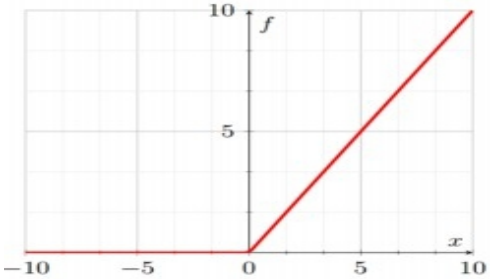


Fig. Pooling Layer

2. Activation Layer

It the part of the Convolutional Neural Networks where the values are Normalized that is, they are fitted in a certain range. The used convolutional function is ReLU which allows only the positive values and then rejects the negative values. It is the function of low computational cost.



. Fig. ReLU function

3. Fully Connected Layer

Here the features are compared with the features of the test image and associate similar features with the specified label. Generally, labels are encoded in the form of numbers for the computational ease, they will be later converted into their respective strings.

VI. LITERATURE SURVEY

2.1. *A Lightweight Deep Learning Model for COVID-19 Detection,Siti Raihanah Abdani ; Mohd Asyraf Zulkifley ; Nuraisyah Hani Zulkifley*

Published in: 2020 IEEE Symposium on Industrial Electronics & Applications (ISIEA).

COVID-19 is a contagious disease that has caused more than 230,000 deaths worldwide at the end of April 2020. Within a span of just a few months, it has infected more than 4 million peoples across the globe due to its high transmittance rate. Thus, many governments have tried their best to increase the diagnostic capability of their hospitals so that the disease can be identified as early as possible. However, in most cases, the results only come back after a day or two, which directly increases the possibility of disease spreaders because of the delayed diagnosis. Therefore, a fast screening method using existing tools such as x-ray and computerized tomography scans can help alleviate the burden of mass diagnosis tests. A chest x-ray is one of the best modalities in diagnosing a pneumonia symptom, which is the primary symptom for COVID-19. Hence, this paper proposes a lightweight deep learning model to screen the possibility of COVID-19 accurately. A lightweight model is important, as such it allows the model to be deployed on various platforms that include mobile phones, tablets, and normal computers without worrying about the memory storage capacity. The proposed model is based on 14 layers of convolutional neural network with a modified spatial pyramid pooling module. The multiscale ability of the proposed network allows it to identify the COVID-19 disease for various severity levels. According to the performance results, the proposed SPP- COVID-Net achieves the best mean accuracy of 0.946 with the lowest standard deviation among the training folds accuracy. It comprises of just 862,331 total number of parameters, which uses less than 4 Megabytes memory storage. The model is suitable to be implemented for fast screening purposes so that better-targeted diagnoses can be performed to optimize the test time and cost.

2.2. *Automated detection of COVID-19 cases using deep neural networks with X-ray images, Tulin Ozturk, Muhammed Talo , Eylul Azra Yildirim*

The novel coronavirus 2019 (COVID-2019), which first appeared in Wuhan city of China in December 2019,spread rapidly around the world and became a pandemic. It has caused a devastating effect on both daily lives, public health, and the global economy. It is critical to detect the positive cases as early as possible so as to prevent the further spread of this epidemic and to quickly treat affected patients. The need for auxiliary diagnostic tools has increased as there are no accurate automated toolkits available. Recent findings obtained using radiology imaging techniques suggest that such images contain salient information about the COVID-19 virus. Application of advanced artificial intelligence (AI) techniques coupled with radiological imaging can be helpful for the accurate detection of this disease, and can also be assistive to overcome the problem of a lack of specialized physicians in remote villages. In this study, a new model for automatic COVID-19 detection using raw chest X-ray images is presented. The proposed model is developed to provide accurate diagnostics for binary classification(COVID vs. No-Findings) and multi-class classification (COVID vs. No-Findings vs. Pneumonia). Our model produced a classification accuracy of 98.08% for binary classes and 87.02% for multi- class cases. The Darknet model was used in our study as a classifier for the you only look once (YOLO) real time object detection system. We implemented 17 convolutional layers and introduced different filtering on each layer.

2.3. *Automatic X-ray COVID-19 Lung Image Classification System based on Multi- Level Thresholding and Support Vector Machine, Aboul Ella Hassanien,Hassan Aboul-Ella.*

The early detection of SARS-CoV-2, the causative agent of (COVID-19) is now a critical task for the clinical practitioners. The COVID-19 spread is announced as pandemic outbreak between people worldwide by WHO since 11/ March/ 2020. In this consequence, it is top critical priority to become aware of the infected people so that prevention procedures can be processed to minimize the COVID-19 spread and to begin early medical health care of those infected persons. In this paper, the deep studying based totally methodology is usually recommended for the detection of COVID-19 infected patients using X-ray images. The help vector gadget classifies the corona affected X-ray images from others through usage of the deep features. The technique is useful for the clinical practitioners for early detection of COVID-19 infected patients. The suggested system of multi-level thresholding plus SVM presented high accuracy in classification of the infected lung with Covid-19. All images were of the same size and stored in JPEG format with 512 * 512 pixels. The average sensitivity, specificity, and accuracy of the lung classification using the proposed model results were 95.76%, 99.7%, and 97.48%, respectively.

2.4. *Classification of COVID-19 from Chest X-ray images using Deep Convolutional Neural Networks,Sohaib Asif, Yi Wenhui*, Hou Jin, Yi Tao, Si Jinhai*

The COVID-19 pandemic continues to have a devastating effect on the health and well- being of the global population. A vital step in the combat towards COVID-19 is a successful screening of contaminated patients, with one of the key screening approaches being radiological imaging using chest radiography. This study aimed to automatically detect COVID-19 pneumonia patients using digital chest x-ray images while maximizing the accuracy in detection using deep convolutional neural networks (DCNN). The dataset consists of 864 COVID-19, 1345 viral pneumonia and 1341 normal chest x-ray images. In this study, DCNN based model Inception V3 with transfer learning have been proposed for the detection of coronavirus pneumonia infected patients using chest X-ray radiographs and gives a classification accuracy of more than 98% (training accuracy of 97% and validation accuracy of 93%). The results demonstrate that transfer learning proved to be effective, showed robust performance and easily deployable approach for COVID-19 detection.

2.5. *A Deep Neural Network to Distinguish COVID-19 from other Chest Diseases Using X-ray Images, Saleh Albahli*

A Deep Neural Network model provides a significant contribution in terms of detecting COVID-19 and provides an effective analysis of chest-related diseases taking into account both age and gender. Our model achieves 87% accuracy in terms of GAN-based synthetic data and presents four different types of deep learning-based models that provide comparable results to other state-of-the-art techniques.

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VII. OBJECT ORIENTED DESIGN

3.1. Class Diagram:

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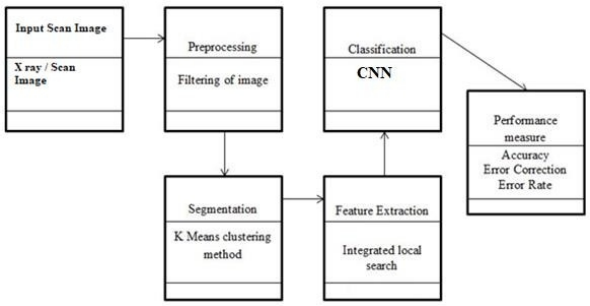

Fig .Class Diagram

3.2. Data Flow Diagram:

A dataflow outline is a tool for referring to knowledge progression from one module to the next module as shown in Fig. This graph gives the data of each module's info and yield. The map has no power flow and there are no circles at the same time.

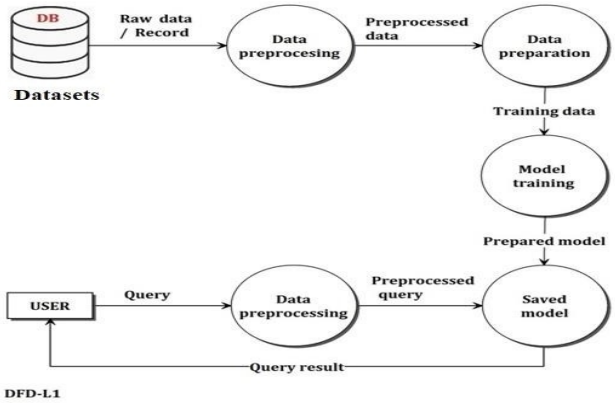

Fig.Data Flow Diagram

3.3. Use Case Diagram:

A Use Case Diagram is a lot of situations that reflect a client-frame relationship. A use case chart shows the entertainer-to-use relationship. Usage cases and on-screen characters are the two main elements of an usage case diagram. An on-screen character refers to an user or other person connected with the demonstrated process. A use case chart in figure 4.3.3 is an out-of - the-box perspective that speaks to some activity each module will perform to complete an errand.

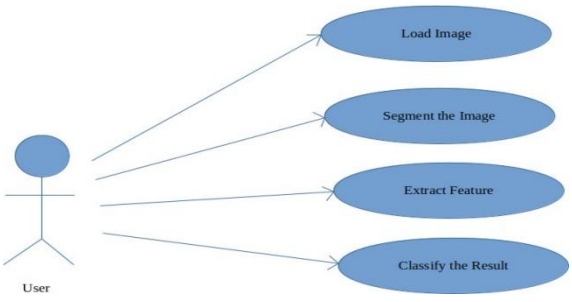

Fig.Use Case Diagram

3.4. SEQUENCE DIAGRAM:

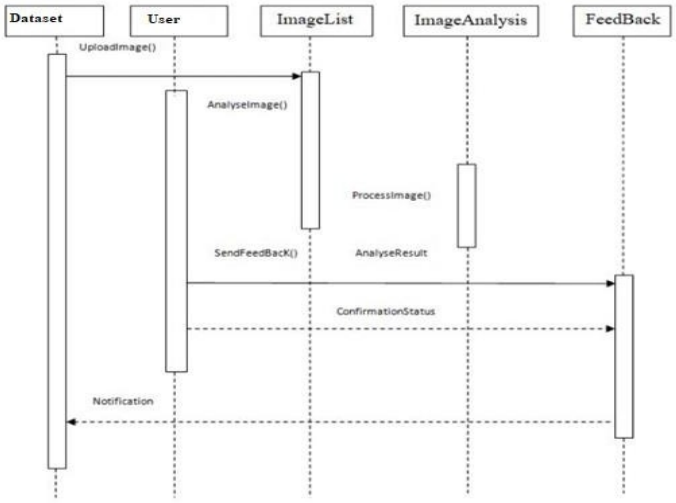

Fig. Sequence Diagram

VIII. METHODOLOGY

In this project, X-ray images obtained from two different sources were used for the diagnosis of COVID-19. A COVID-19 X-ray image database was developed by Cohen JP using images from various open access sources. This database is constantly updated with images shared by researchers from different regions. At present, there are 127 X-ray images diagnosed with COVID-19 in the database. Below Figure shows a few COVID-19 cases obtained from the database and the findings of the experts.

1. Sample an open source dataset of X-ray images for patients who have tested positive for COVID-19
2. Sample “normal” (i.e., not infected) X-ray images from healthy patients
3. Train a CNN to automatically detect COVID-19 in X-ray images via the dataset we created.
4. Evaluate the results from an educational perspective.

There are some steps to be followed in this system i.e. are Preprocessing, Feature selection, Feature extraction, Classification & Staging.

3.1. Preprocessing

The affected part need to be extracted without any noises and blurness from the images, so here need to apply some pre-processing techniques like Filtering, Histogram equalization, Image enhancement ,noise removal etc. Most of the preprocessing for image is done with the help of Python software. The preprocessing of image aims at selectively removing the redundancy present in scanned images without affecting the details which that play a role in the diagnostic process. Each image is preprocessed to improve its quality. The Preprocessing techniques which applied here are as follows:

1. Histogram equalization method was used to enhance the contrast of the image.
2. Median filtering is required to remove the effect of poor contrast due to Glare, noise and effects caused by poor lighting conditions during image capture. A low frequency image was generated by replacing the pixel value with a median pixel value.

Segmentation: There are two types of pixels with different density distribution:

1) Pixels within the very dense body and chest wall structures (the body pixels) and
2) low- density pixels.

Optimal thresholding is applied on the pre-processed Lung image to select a segmentation threshold to separate the body and non body pixels through an iterative procedure. The pixels with a density lower than the threshold value are recognized assigned a value 1 and appear white, whereas other pixels are assigned the value of 0 and appear black.

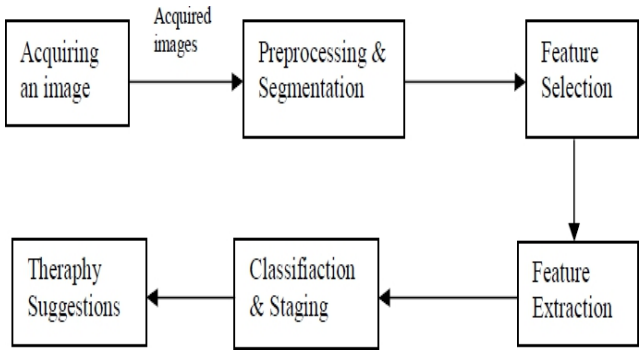

Fig. Architecture of the proposed system / BLOCK Diagram

Figure above shows the architecture of the proposed system. Images of CT and PET scan are acquired initially. Basically the medical images or scanned images may not have high resolution due to the number of slices per pixel and also contain noise. So the image is preprocessed by applying specific preprocessing techniques such as histogram equalization and Median filter to remove noise and enhance the image. Next, the preprocessed image is segmented for choosing the right portion of the infected region . Then the selected features are extracted using GLCM algorithm and stored in the database for classification. The classification is based on growth of the cell and it is done using CNN. Based on the classification, stage of the cancer is identified which helps physician to give suitable therapy.

3.2. Feature Selection

Feature Selection also called as variable selection. It is the process which is used for selecting a small set of relevant features for future use. After preprocessing have to select the features or region from the preprocessed image using genetic algorithm which is best in selecting the feature for biomedical images.

3.3. Feature Extraction

Feature extraction is the process which involves for classifying the amount of resources required from a large set of data accurately. Once features are selected then it need to be extracted. Image features Extraction stage is an important stage that uses algorithms and techniques to detect various desired portions or shapes. The selected features (affected part) must be extracted. The GLCM is a tabulation which shows how often various combinations of pixel values (grey levels) occur in an image. Firstly create gray-level co-occurrence matrix from image using gray comatrix function in CNN. A GLCM denote the second order conditional joint probability densities of each of the pixels, which is the probability of occurrence of grey level i and grey level j within a given distance ‘d’ and along the direction ‘θ’.

9 features are considered for proposed method.

1. Area: It shows the actual number of pixels in the ROI.
2. Convex Area: It shows the number of pixels in convex image of the ROI.
3. Equivalent Diameter: It is defined as the diameter of a circle with the same area as the ROI.
4. Solidity: It is defined as the proportion of the pixels in the ROI.
5. Energy: It describes that the summation of squared elements in the GLCM and its value ranges between 0 and 1.
6. Contrast: It is defined as the measure of contrast between an intensity of pixel and its neighboring pixels over the whole ROI.
7. Homogeneity: The homogeneity is the measure of closeness of the distribution of elements in the GLCM to the GLCM of each ROI and its Value ranges between 0 and 1.
8. Correlation: It is the measure of correlation of pixel to its neighbor over the ROI.
9. Eccentricity: The eccentricity is defined as the ratio between the distance between the focusof the ellipse and its major axis length.

IX. CONCLUSION

This chapter aims to discuss the model results, an evaluation of the proof of concept, future work to improve the application and a personal statement.

The model resulted in a 65.7% accuracy using the dice coefficient on thetraining set. The dice coefficient is much lower on the training set however the confusion matrix outputs a high true and false positive rate on a set that contains positive and negative samples. This indicates that the model is great at distinguishing between X - Ray slices with no COVID nodules compared to the ones with COVID. I believe with more hyper parameter tuning and model training the accuracy could be increased. When doctors find small nodules (less than 3mm) the current practice suggests that they should wait and rescan in 6-12 weeks to seesigns of growth. Depending on the tumor, a tumor can grow up to double its size and evolve to a more advanced form of COVID. It is also important to note that the second most frequent diagnosis is small tumors. The project demonstrates that it would be possible for Doctor’s to use CNN applications to aid their decision making process regarding whether a patient with a small tumour should perform a biopsy or rescan in a few weeks which to a patient could mean early treatment and a better prognosis.

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SIGN LANGUAGE RECOGNITION SYSTEM (USING NEURAL NETWORKS)

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Department of Information Science Engineering, SJB institute of engineering

***Abstract* – Communication is one of the most important thing now a day. As the speed of our lives is increasing day by day, the importance of communication is also increasing. But after all these times somewhere somehow differently abled (people who cannot speak properly) are having a hard time in communicating properly. As the technology is growing rapidly and now that we have powerful systems as well as lots of data, we can now create a system which can help these differently abled people to communicate more easily and efficiently. This paper is about one such system which we created so that barriers of communications can be destroyed.**

I. INTRODUCTION

Communication is a basic requirement of every living being for their survival and growth. The way a person who cannot speak can communicate is by writing. But writing everything every time is a tedious job. Also carrying a pen and pad everywhere is a task in itself.

The other more efficient way in which they can communicate is by using sign language. This is easier but there are not many people who can understand or do signs. Learning sign language is also not very easy so not everyone learns it. It is also not in our curriculum so we don't have a compulsion studying it.

Work by [1] Salem Ameen and Sunil Vadera shows that Methodology like CNN can be used to translate sign language using Artificial Intelligence. Similar work is done by [2] Amir jamal and Yumma Ajim. They also showed if we provide enough data to a model then it can help us in achieving our goal.

[3] Muttaki hasan, Tanvir Hossain Sajib and marinmoy dey showed Not Only Deep learning but also algorithms in machine learning such as KNN (K- nearest neighbours) can also be used to achieve the task.

There are multiple algorithms of which we can take advantage to build our system. Algorithms like CNN and KNN are very powerful in their own ways. If implemented properly with sufficient data, these algorithms can do wonders.

One of the advancement which we did is giving power to users to create their own dataset. As we know we may look quite alike but there are multiple differences in different human, other than physical differences there can be differently oriented people. Some are left handed others are right handed. It felt right to give power to user so that they can create their very own gestures. We give users the power to create their very own customized model.

Although there are different algorithms to choose from, we chose CNN for our model because of its special features, which we will discuss further and high accuracy that can be easily be achieved by using this alorithm

II. MATERIALS & METHODS

The system in general requires only two things. Data and model. We create our datasets on our own. This power of creating datasets is given to the users because of pre-stated reasons.
The user chooses a sign then performs it, the system captures images of users hands, preprocess it and use it to train the model.

Below figure shows how a image is taken cropped, augmented and made important for our model to be trained

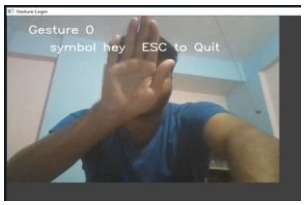


Figure 1: The image taken by the system

Figure 2: the Augmented image ready to be sent to the machine

Once the Dataset is created the images are sent to our algorithm.

CNN is used in this system which is based on human visual cortex.

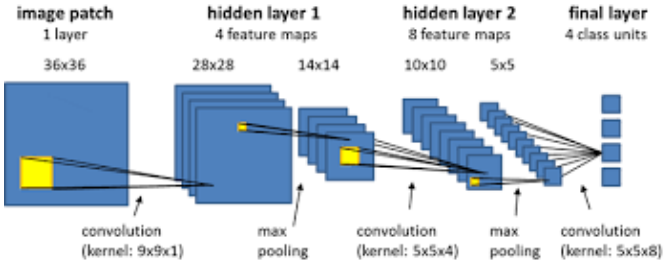
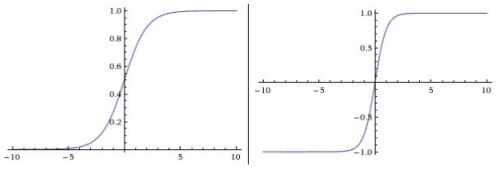


Figure 3: Showing how CNN works

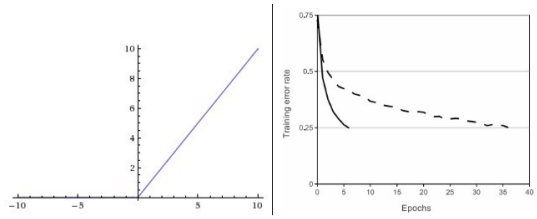
As any of neural network based algorithm works here also we try to find out optimum weights for the kernel for which we can get highest accuracy.
The image is passed through and back to a network of convolution layer and max pooling layers to reduce the loss.

Also one of the key ingredient in creating a accurate model is using a activation layer which suits the job.
For our task we used relu which stands for rectified linier unit. The reason of choosing this activation function is its speed, and lower complexity in implementation.

Below is the comparison of relu and other activation functions.



Left: Sigmoid non-linearity squashes real numbers to range between [0,1] **Right:** The tanh non-linearity squashes real numbers to range between [-1,1].



Left: Rectified Linear Unit (ReLU) activation function, which is zero when x < 0 and then linear with slope 1 when x > 0. **Right:** A plot from Krizhevsky et al. (pdf) paper indicating the 6x improvement in convergence with the ReLU unit compared to the tanh unit.

Figure 4: graphs of different activation functions

In our project we have created different modules as part of a big project. Below is the list of modules created.

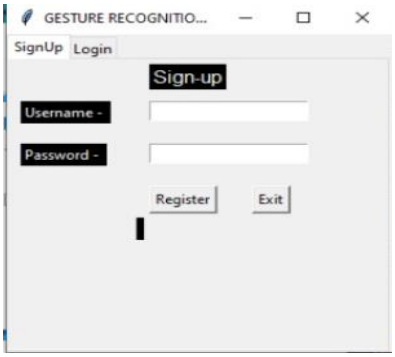


Figure 5: signup page

This is the signup page for the users, here users can create a username password combination to create a account.

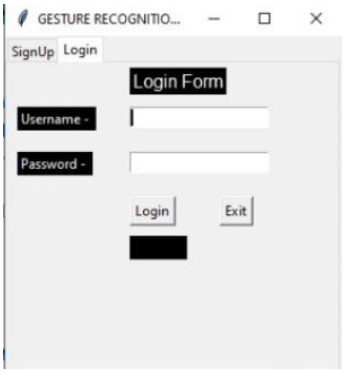


Figure 6: login page

Here users can login using their user name and password after which they can show signs to the system .

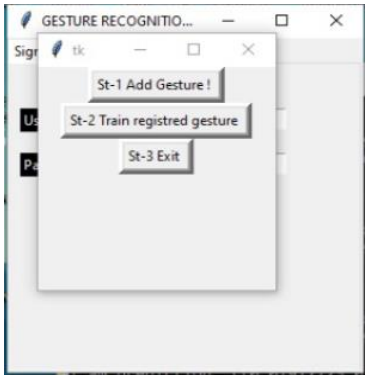


Figure 7: menu for registered users

After the user signs up this menu is given to the users . Here user can add gestures to their account and then train the model and then can exit.
The users can then login to their account to start using the model.

III RESULTS AND DISCUSSIONS

After testing the model, it was seen that the model gave a very nice accuracy (90%) . The system works nicely in real time.

The created system can be used by differently abled person to aid there communication.

The system also is does not take time to show the results i.e., the accuracy and latancy of the system is very nice.

Multiple improvements can be done for creating a better model.

Also, more module can be created which can help us to make it more user friendly.

IV CONCLUSION

1. Artificial intelligence can be used to make communication easier for differently abled person.

2. These kind of systems are easy to install, user can easily create their own gestures.

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Personalized Online Grocery Basket Recommendation

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ABSTRACT

As consumer adoption of online grocery shopping through platforms such as Amazon Fresh, Instacart, and Walmart Grocery are growing, there is a pressing business need to provide relevant recommendations throughout the customer journey. In this paper, we introduce a production within-basket grocery recommendation system, which generates personalized product recommendations to supplement the user's current grocery basket. We conduct extensive offline evaluation of our system and demonstrating uplift in prediction metrics over baseline state of- the-art within-basket recommendation models. We also propose an approximate inference technique which is faster than exact inference approaches. In production, our system has resulted in an increase in average basket size, improved product discovery, and enabled faster user check-out.

***Index terms*— Recommender System, Personalization.**

1. INTRODUCTION

A critical component of a modern-day e-commerce platform is a user-personalized system for serving recommendations. While there has been extensive academic research for recommendations in the general e-commerce setting, user personalization in the online grocery's domain is still nascent. An important characteristic of online grocery shopping is that it is highly personal. Customers show both regularity in purchase types and purchase frequency, as well as exhibit specific preferences for product characteristics, such as brand affinity for curd or price sensitivity for meat.

One important type of grocery recommender system is a within basket recommender, which suggests grocery items that go well with the items in a customer's shopping basket, such as milk with cereals or pasta with pasta sauce. In practice, customers often purchase groceries with a particular intent, such as for preparing a recipe or stocking up for daily necessities. Therefore, a within-basket recommendation engine needs to consider both item-to-item compatibility within a shopping basket as well as user-to-item affinity, to generate efficient product recommendations that are truly user-personalized.

2. METHOD

In this section, we explain the modelling and engineering aspects of a production within-basket recommendations system.

Problem Definition: Consider m users U = $\{u_1,u_2,.....,u_m\}$ and n items I = $\{i_1,i_2,...i_n\}$ in the dataset. Let B_u denote a basket corresponding to user $u \in U$, where basket refers to a set of items
0 0
$\{i \mid i \in I\}$. The goal of the within-basket recommendation task is given (u, B_u) generate top-k recommendations $\{i^* \mid i^* \in I \setminus B_u\}$ where i^* is complementary to items in B_u and compatible to user u.

System is divided into three modules:

1. Instacart basket recommendation
   - Apriori algorithm is used here for frequent item set mining & association rule learning over large data.
2. Walmart basket module
   - We perform analysis of data.
   - Preparing of data (data pre-processing).
   - Plotting the data.
   - Perform market basket analysis
3. Bigmart basket module
   - We build model using Linear Regression & Random Forest Regression algorithms.
   - Model can be used for new data predictions.

2.1 Apriori Algorithm

Apriori Algorithm assumes that any subset of a frequent itemset must be frequent. It's the algorithm behind Market Basket Analysis. Let us consider, a transaction containing {Grapes, Apple, Mango} also contains {Grapes, Mango}. So, according to the principle of Apriori, if {Grapes, Apple, Mango} is frequent, then {Grapes, Mango} must also be frequent.

Here is a dataset consisting of six transactions. In given dataset each transaction is a combination of 0s and 1s, where 0 represents the absence of an item and 1 represents the presence of it.

In order to find out interesting rules out of multiple possible rules from this small business scenario, we will be using the following metrices:

1. Support (items frequency): It's the default popularity of an item. In mathematical terms, the support of item **A** the

ratio of transactions involving **A** to the total number of transactions.

Support (Grapes) = (Transactions involving Grapes)/(Total transaction) =4/6

Support (Grapes) = 0.666

2. Confidence (conditional probability): Likelihood that customer who bought both **A** and **B** product. It divides the number of transactions involving both **A** and **B** by the number of transactions involving **B**.

Confidence (A => B) = (Transactions involving both A and B)/ (Transactions involving only A)

Confidence ({Grapes, Apple} => {Mango}) = Support (Grapes, Apple, Mango)/Support (Grapes, Apple) = 2/6 / 3/6= 0.667

3. Lift: When you sell B the increase in the sale of A.

Lift (A => B) = Confidence (A, B) / Support(B)

Lift ({Grapes, Apple} => {Mango}) = 1

Hence, likelihood of a customer buying both A and B product together is 'lift-value' times more than the chance if purchasing any one product.

- **Lift (A => B)** = 1 means that there is no correlation within the itemset.
- **Lift (A => B)** > 1 means that there is a positive correlation within the itemset, i.e., products in the itemset, **A**, and **B**, are more likely to be bought together.
- **Lift (A => B)** < 1 means that there is a negative correlation within the itemset, i.e., products in itemset, **A**, and **B**, are unlikely to be bought together.

2.2 Association Rule Mining

Association Rule Mining is used for finding an association between different objects in a set, to find frequent patterns in a transaction database, relational databases or any other information repository.

The applications of Association Rule Mining are found in Marketing, **Market Basket Analysis** in retailing, clustering and classification of dataset.

The most common approach to find these patterns is Market Basket Analysis, which is a key technique used by large retailers like Amazon, Flipkart, etc to analyse customer buying habits by discovering associations between the different items that customers place in their "shopping baskets". The associations found can help retailers develop marketing strategies by gaining insight into which items are frequently purchased together by customers. The strategies may include:

- Changing the store layout according to trends
- Customer behaviour analysis
- CatLog design
- Cross marketing on online stores
- What are the trending items customers buy?
- Customized emails with add-on sales etc.

This type of analysis is used by Online retailers and publishers to:

- Inform the placement of content items on their media sites, or products in their catalog.
- Deliver targeted marketing (e.g., emailing customers who bought products specific products with other products and offers on those products that are likely to be interesting to them.)

Association Rule-based algorithms uses two-step approach:

1. **Frequent Itemset Generation:** Find all frequent item-sets with support >= pre-determined min_support count
2. **Rule Generation:** List all Association Rules from frequent item-sets. Calculate Support and Confidence for all rules. Prune rules that fail min_support and min_confidence thresholds.

2.3 Linear Regression algorithm

In this process, a relationship(r) is established between **independent** and **dependent** variables by fitting them to a line. This line is known as the **regression line** and represented by a linear equation Y= a*X +b.

In this equation: Y-Dependent variable, a–Slope, X–Independent variable, b – Intercept

1. Linear regression uses the relationship between the data-points to draw a straight line through all them. This line is used to predict future values.
2. **Multiple regression** is like linear regression, but with more than one independent value, meaning that we try to predict a value based on two or more variables.

2.4 Random Forest Regression algorithm

Random Forest Regression is a supervised learning algorithm that uses **ensemble learning** method for regression. Ensemble learning method is a technique that combines predictions from multiple machine learning algorithms to make a more accurate prediction than a single model.

In Random Forest Regression the trees run in parallel with no interaction amongst them. Operation of Random Forest is performed by constructing several decision trees during training time and outputting the mean of the classes as the prediction of all the trees. To get a better understanding of the Random Forest algorithm, let's walk through the steps:

1. Pick at random *k* data points from the training set.
2. Build a decision tree associated to these *k* data points.

3. Choose the number *N* of trees you want to build and repeat steps 1 and 2.
4. For a new data point, make each one of your *N*-tree trees predict the value of *y* for the data point in question and assign the new data point to the average across all of the predicted *y* values.A Random Forest Regression model is powerful and accurate. Performance of Random Forest Regression method is good for most of problems, including features with non-linear relationships. Disadvantages: there is no interpretability, overfitting may easily occur, we must choose the number of trees to include in the model

3. EXPERIMENTS

3.1. Datasets

Our experimental evaluation is performed on one public dataset and one proprietary dataset. Both datasets are split into train, validation, and test sets. The public Instacart dataset is already split into prior, train and test sets. For the Walmart Grocery dataset, the train, validation, and test sets comprise of one year, the next 15 days, and the next one month of transactions respectively.

- Instacart: We use the open-source grocery dataset published by Instacart, containing approximately 206k users and 50k items with 3.4m total interactions. The average basket size is 10.
- Walmart: We use a subset of a proprietary online Walmart Grocery dataset for these experiments. The dataset contains approximately 3.5m users and 90k items with 800m interactions.

3.2. Evaluation

Statistical accuracy metrics evaluate accuracy of a filtering technique by comparing the predicted ratings directly with the actual user rating. Mean Absolute Error (MAE), Root Mean Square Error (RMSE) and Correlation are usually used as statistical accuracy metrics. MAE is the most popular and commonly used; it is a measure of deviation of recommendation from user's specific value. It is computed as follows:

$MAE=1N\sum u,i|pu,i-ru,i|$

where P_{ui} is the predicted rating for user u on item i, $r_{u,i}$ is the actual rating and N is the total number of ratings on the item set. The lower the MAE, the more accurately the recommendation engine predicts user ratings.

Also, the Root Mean Square Error (RMSE) is given by

$RMSE=1n\sum u,i(pu,i-ru,i)2$

Root Mean Square Error (RMSE) puts more emphasis on larger absolute error and the lower the RMSE is, the better the recommendation accuracy.

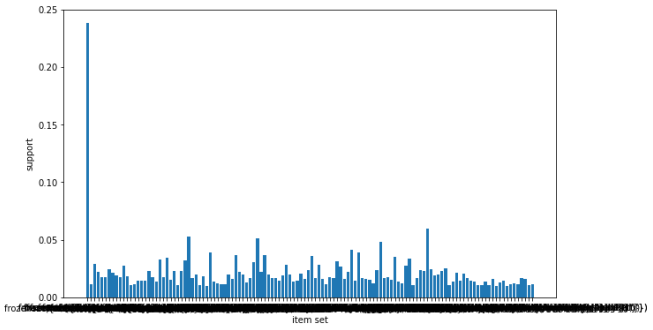

Fig. 2: Frequency of item set and support

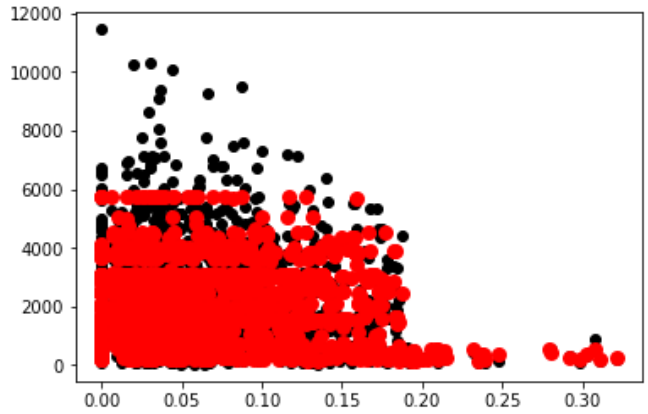

Fig 3: Item visibility of target and Random Forest

4.CONCLUSION

We conclude that the user-personalized within-basket grocery recommendation system, serve personalized item recommendations. Provide increase in average basket size, improved product discovery, and enabled faster user check-out.

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Histopathological Analysis of IDC Breast Cancer Using Neural Networks

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***Abstract*- Breast cancer is the most frequent cancer in women, with Invasive Ductal Carcinoma being the most common kind (IDC). For detecting and categorising breast cancer subtypes, which is a critical clinical activity, automated techniques can save time and reduce error. The developed application can be used in medical schools to help students learn how to recognise malignant cells without having to rely on a lecturer to double-check their work. Convolutional Neural Networks is the major technique employed in our study (CNN).**

Keywords-. Invasive Ductal Carcinoma, Deep Learning, Convolutional Neural networks, Image Processing, Digital Pathology.

I. INTRODUCTION

The appropriate number of cells of each sort make up our human body. Cancer is caused by a disruption in this cell-organization. The sudden modifications in this cell-organization are the first step in the uprooting of cancer [23]. This is because the regulation and division of cells are determined by the signals generated by the cells. Any of these signals that are absent or contain defects lead the cells to expand and proliferate too quickly, resulting in a lump known as a tumour. In a large proportion of cases, this tumour is found to be the source of cancer. Cancer, in all its forms, has become one of the most pressing health concerns in recent years.

In women, breast cancer is the most commonly diagnosed cancer around the world. Invasive ductal carcinoma (IDC), the most common subtype of breast cancer, accounts for more than 80% of all breast carcinomas [2]. The vast majority of disease aggressiveness evaluations, such as tumour grading, focus on the area that exclusively contains invasive malignancy. Separation of areas matching invasive tumour and non-invasive or healthy tissues is the initial stage of histopathological characterization of extracted breast tissue. [15].

The capacity to differentiate between benign breast illnesses and accurately diagnose Ductal Carcinoma In-Situ (DCIS) and Invasive Ductal Carcinoma (IDC) is crucial in establishing the optimal treatment strategy. In-situ carcinoma cells are restricted within the breast ductal-lobular system, but invasive carcinoma cells spread beyond that framework. The diagnosis of these illnesses needs a pathologist to examine tissue sections stained with Hematoxylin and Eosin (H&E) underneath a microscope. On the other hand, tissue-slice microscopy is challenging, time-consuming, and prone to bias. Pathologists visually evaluate histology samples under the microscope to detect IDC, which is a difficult and time-consuming operation. In the past, X-ray mammography was the primary imaging tool for detecting cancerous development in the breast. However, because this procedure exposes patients to ionizing radiation, it is not recommended for patients with dense breast tissue. [23]. Pathologists would benefit from automating the detection of this cancer type since it would speed up the diagnosis and reduce mistake. [25].

Several papers have been published on automatic techniques for processing digitized slides, with a focus on nuclei or tubule detection. [9]. Several automated approaches for detecting breast carcinomas in histopathology images have been developed. The vast majority of existing techniques for breast cancer identification and classification in histology images look at the shape and arrangement of epithelial components (e.g., nuclei, ducts). In a variety of fields, including speech and visual recognition, machine learning advancements, particularly deep learning, have led to state-of-the-art outcomes. These methods address issues like as learning entirely from data, eliminating segmentation, and human selection of created qualities. One of the main advantages of digital slides over traditional glass slides is that they enable for the use of quantitative automatic image analysis technologies. These solutions can alleviate the problems caused by pathologists' subjective interpretation while simultaneously minimizing their workload.

We developed a CNN model to assess IDC picture patches for cancer in our article, which is currently done totally by hand by a pathologist.

II. METHODOLOGY

A. *Data Preparation*

The original dataset was downloaded from Kaggle first. Hematoxylin and Eosin stains were used to stain the whole slide images taken from the patient. The original dataset contains 2,77,524 50x50 pixel image patches extracted from 162 Whole Slide Images (WSI). If at least 80% of an image patch falls within the annotation mask, it is considered a positive sample; otherwise, it is considered a negative sample. [11]. There are 1,98,738 IDC negative patches and 78,786 IDC positive patches in the sample. The distribution of dataset instances is shown in Table I.

The filename structure of each image in our dataset is unique. The patient ID and the class labels 0 or 1 are included in this filename structure. The one class label indicates IDC in the image, while the zero-class label indicates healthy tissue (no IDC in the image).

TABLE I: TRAINING, VALIDATION, AND TESTING DATASETS DISTRIBUTION

Image Dataset	Label of data	
	Negative samples	Positive samples
Training data	155016	61453
Validation data	43722	17333
Testing data	7950	3152

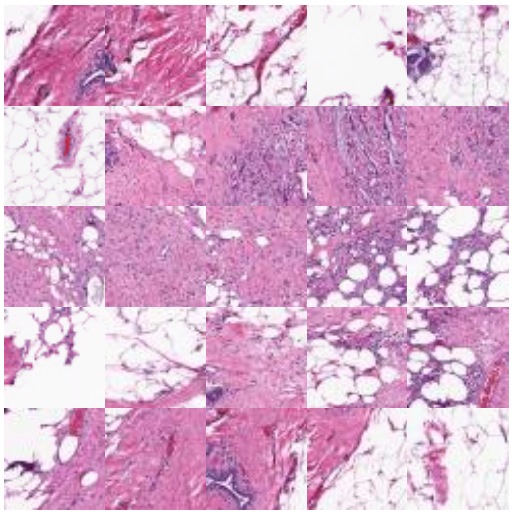

Figure 1: IDC Negative example

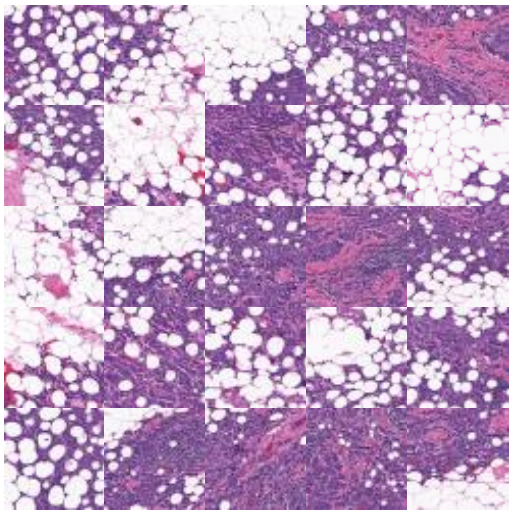

Figure 2: IDC Positive example

B. *Proposed Architecture of CNN*

For this study, the 50x50 patch/image is taken as dataset. It serves as the input to the convolutional layers. Convolutional layer, activation utilizing Rectified Linear Unit (ReLU) layer, pooling layer, dropout layer, fully connected layer, and sigmoid are the components of the CNN design. The architecture that we propose is shown in Figure 3. Our proposed design consists of five blocks of convolutional layers, followed by a fully connected and sigmoid classification layer.

During the calculation of the scalar product between their weights and the region connected to the input volume, the convolutional layer will decide the output of neurons associated to local sections of the input [25]. For extracting different features, several tiny filters (e.g., 2x2, 3x3) convolute with the input data. Each convolutional 2D layer in our design has a 3x3 kernel and a ReLU, and the maximum pooling layer has a pool size of 2x2.

The tf.data.Dataset.prefetch transformation is provided by tf.data API. It can be used to separate the time of data production from the time of data consumption. The transformation, in particular, makes use of a background thread and an internal buffer to prefetch pieces from the input dataset ahead of time. It is encouraged that you prefetch the same number of elements as (or maybe more than) the number

of batches utilised by a single training phase. This value can be set to tf.data.AUTOTUNE or explicitly adjusted , which instructs the tf.data runtime to dynamically tune the value at runtime. Caching is done to store the data in the ram temporarily.

The dataset undergoes data augmentation. Data augmentation is a technique that uses random but realistic modifications like image rotation to boost the diversity of your training set. Images are sent via pre-processing layers in data augmentation to resize them to a uniform shape and rescale pixel values. The images are flipped horizontally and vertically at random. The images are rotated randomly by 20 percent to obtain modified images.

Normalization is a scaling technique that shifts and rescales values to make them range between 0 and 1. Min-Max scaling is another name for it. The activated values are normalized. This is performed to fix the images to fixed range. This helps in reducing the shrinkage which in turn helps in reducing deformation of features and patterns inside the image.

In each convolutional layer block, we are convolving the image and performing feature extraction by using Max Pooling layers. Down sampling along the spatial dimensions of the provided input will be performed by the pooling layer, lowering the number of parameters in that activation. A max pooling layer of size 2x2 is used in our CNN architecture.

We use a Dropout layer after the Max Pooling Layers. Dropout is a method for dealing with the problem of overfitting. The key concept is to remove units (and their connections) from the neural network at random during training [25]. This inhibits units from over-co-adapting. Dropout greatly lowers overfitting and outperforms other regularisation techniques.

The fully connected layer is made up of neurons that are directly linked to the neurons in the two adjacent layers, but not to any of the layers inside them. There are 256 neuron units in our fully connected layer.

Finally, it is sent through a Dense Layer with Sigmoid Activation. Sigmoid function is an exponential operation which gives an output which has value between the range 0 and 1. We utilise binary cross-entropy and Sigmoid activation in the output layer to determine the loss because it is a binary classification.

The layers are created using the Conv2D, MaxPooling2D, Dropout, Dense, and Flatten functions from the keras.layers API.

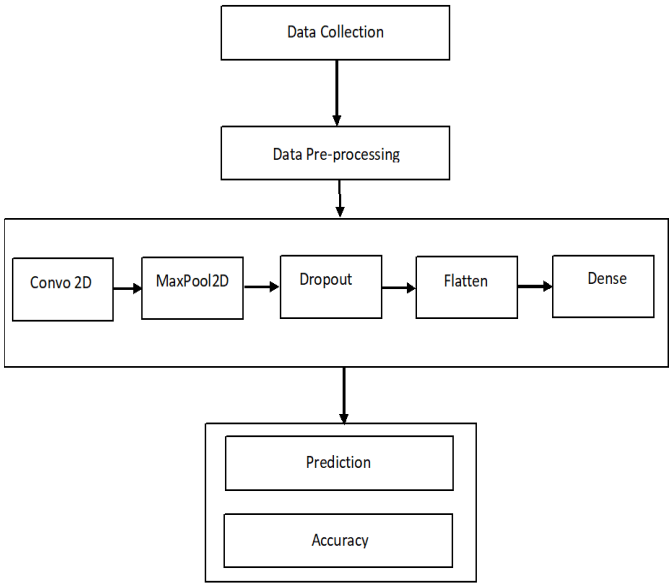

Figure 3: Proposed System Architecture

TABLE 2: CONVOLUTIONAL FILTERS COUNT IN EACH CONVOLUTIONAL LAYER BLOCK

Convolution block	Filters Count
Block I	32
Block II	64
Block III	128
Block IV	256
Block V	1

III. EXPERIMENTAL RESULTS

We show the results of our image preprocessing approach and the proposed CNN architecture in this section. The Adam optimization approach is used to train our network. Our classifier was trained over the course of 40 epochs. For detecting IDC, we report the results in terms of Accuracy and AUC. The Testing dataset, as shown in Table 1, was used to generate the results. The model accuracy attained for our model is shown in Figure 4. The model loss for our technique is depicted in Figure 5. The proposed model's Area Under the Curve (AUC) score is shown in Figure 6. We used the following formula to obtain our model's F1 score:

F1 score = 2((precision * recall)/ (precision + recall))*

TABLE 3: QUANTITATIVE PERFORMANCE FOR PROPOSED MODEL

Accuracy	Loss	AUC Score
.8955	.2487	.9502

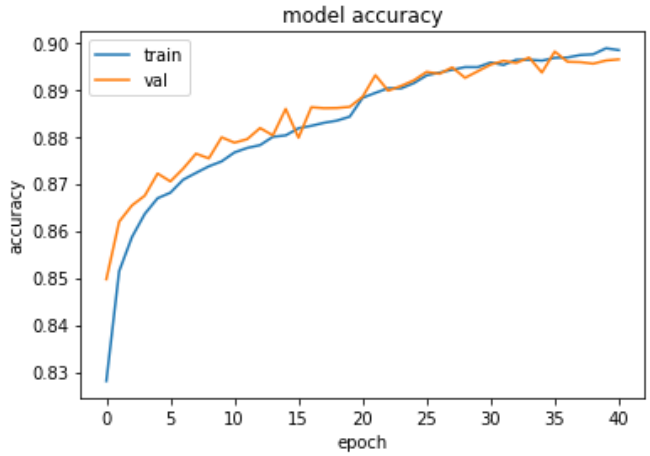

Figure 4: Accuracy obtained using proposed CNN model.

The accuracy of the training data is represented by the smoother blue curve in Figure 4. The accuracy of validation data is represented by the irregular orange line. The value of epochs is indicated on the x-axis. The proposed model's accuracy is represented on the y-axis. The accuracy increases as the number of epochs grows, indicating that the model has been successfully trained.

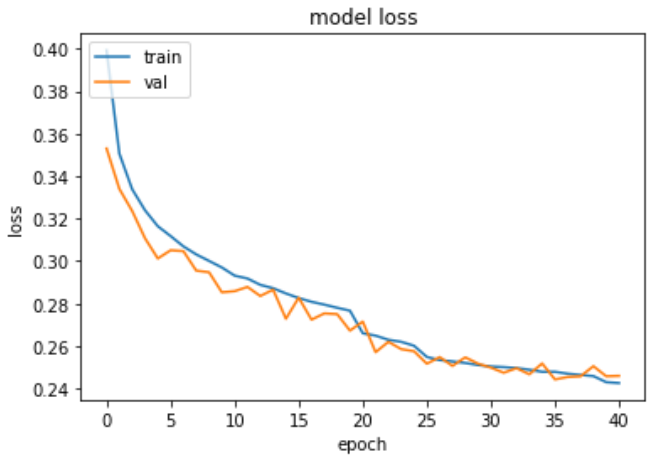

Figure 5: Loss obtained using proposed CNN model.

The model loss of training data is represented by the smoother blue curve in Figure 5. The model loss of validation data is shown by the irregular orange line. The value of epochs is indicated on the x-axis. The proposed model's loss is represented on the y-axis. The loss decreases as the number of epochs grows, indicating that the model has been successfully trained.

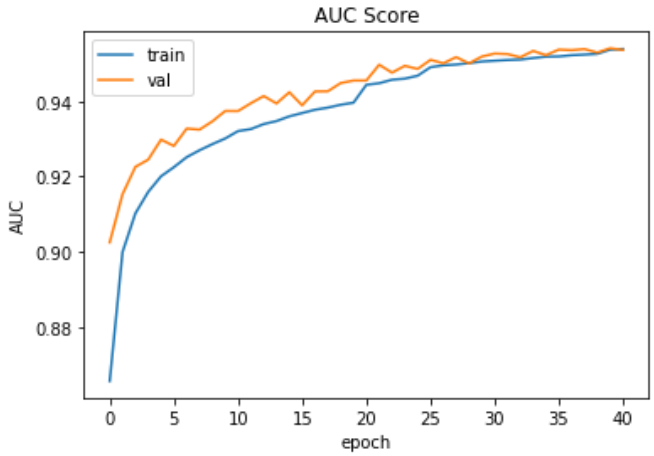

Figure 6: AUC Curves obtained using proposed CNN model.

The training model AUC score is represented by the lower blue curve in Figure 6. The validation model AUC is shown by the upper orange curve. The number of epochs is indicated on the x-axis. The AUC score for the proposed model is represented on the y-axis. The AUC grows as the number of epochs increases, indicating that the model has been successfully trained.

The above analysis reveals that our Convolutional Neural Networks design has an accuracy of around 90%, but other research utilizing methods such as Support Vector Machines or GMM had accuracy of 77.8% and 84.6%, respectively. We attained an AUC score of 0.9502 utilizing Data Augmentation, whereas prior research using solely color constancy achieved an AUC score of 0.935.

IV. CONCLUSION

Breast cancer is a global threat to women, and it is one of the major causes of death in women. Appropriate investigation and diagnosis can aid in the treatment of IDC cancer. Early detection of IDC can help save a lot of lives. Deep learning approaches can extract substantial quantity of information from photos and classify them to make a judgement based on that information, such as cancer detection. It is an iterative technique to apply deep learning to image categorization. The majority of histopathology tumour identification research addresses this issue by merging various

types of handmade characteristics with Machine Learning techniques. Our motive for this research was to reduce the time span of detecting IDC and returning results with better accuracy.

We suggested a deep neural network model for detecting IDC in this work. Our findings demonstrate that CNN is a reliable and efficient method for detecting IDC. Sparse interactions, equivalent representation, and parameter sharing are the reasons we adopted the CNN approach. On the dataset we used to train the model, we got an AUC score of 0.952 and F1 score of 0.8175. The accuracy of our proposed model was determined to be around 90%.

In future research, we would like to extend the technology used to detect other diseases at a faster rate.

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Mobility Management in the 5G Network:

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***Abstract*- The objective of this paper is comprehensive study related to 5G technology of mobile communication. Existing research work in mobile communication is related to 5G technology. In 5G, researches are related to the development of World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless Communication. The most important technologies for 5G technologies are 802.11 Wireless Local Area Networks (WLAN) and 802.16 Wireless Metropolitan Area Networks (WMAN), Ad-hoc Wireless Personal Area Network (WPAN) and Wireless networks for digital communication. 4G technology will include several standards under a common umbrella, similar to 3G, but with IEEE 802.xx wireless mobile networks integrated from the commencement. The major contribution of this paper is the key provisions of5G (Fifth Generation) technology of mobile communication, which is seen as consumer oriented. In 5G technology, the mobileconsumer has given utmost priority compared to others. 5G Technology stands for 5th Generation Mobile Technology. 5G technology is to make use of mobile phones within very highbandwidth. The consumer never experienced the utmost valued technology as 5G.The 5G technologies include all types of advanced features which make 5G technology most dominant technology in near future.**

Keywords*- *WLAN; 5G; GSM; WWWW; WMAN; DAWN

I. INTRODUCTION

Mobile and wireless networks have made remarkable development in the last few years. At the present time many mobile phones have also a WLAN adapter. One may expect that near soon many mobile phones will have Wax adapter too, besides their 3G, 2G, WLAN, Bluetooth etc. adapters. We are using IP for both generations, 2.5G or 3G Public LandMobile Networks (PLMN) on one side and WLAN on the other, raised study on their integration. Concerning the 4G, its focus is towards flawless incorporation of cellular networkssuch as GSM and 3G. Multi mode consumer terminals are seen as must have for 4G, but special security mechanisms and special operating system support in special wireless technologies remain a test. Nevertheless, integration among different wireless networks (e.g. PLMN and WLAN) isimplemented in practice even nowadays. Although, different wireless networks from a sole terminal are used absolutely, that is, there is no combining of different wireless access technologies for a same session (e.g., FTP download). The anticipated Open Wireless Architecture (OWA) in is targeted to offer open baseband processing modules with open interface parameters. The OWA is related to MAC/PHY layers of future (4G) mobiles.[3] The 5G terminals will have software defined radios and modulation scheme and new error-control schemes can be downloaded from the Internet The enhancement is seen towards the consumer terminals as a focus on the 5G mobile networks. The 5G mobile terminals will have access to different wireless technologies at the same time. The 5G mobile terminal should be capable to merge special flows from different technologies. The network will be dependable for managing user-mobility.The 5G terminal will make the ultimate selection among different mobile access network providers for a specified service. The paper gives the concept of intelligent Internet [13] phone where the mobile can prefer the finest connections. [14]

II. CHALLENGES IN MIGRATION FROM 4G

A. Multi mode user terminals

By means of 4G, there will be a necessity to design a single user terminal that can operate in different wireless networks and conquer the design troubles such as restrictions on the size of the device, its cost and power utilization. This trouble can be solved by using software radio approach.

B. Choice among various wireless systems.

Every wireless system has its distinctive characteristics and roles. The choice of most appropriate technology for a specificservice at a specific place and at specific time. This will be applied by making the choice according to the best possible fit of consumer QoS (Quality of Service) requirements.

C. Security

Reconfigurable, adaptive and lightweight protection mechanisms should be designed.

D. Network infrastructure and QoS support

Integrating the current non-IP and IP-based systems and providing QoS assurance for end-to-end services that engage different systems is a challenge.

E. *Charging and Billing*

It is hard to accumulate, handle and accumulate the Consumers' account information from many service providers. In the same way Consumers' billing is also a difficult task.

F. *Attacks on Application Level*

Software applications which will offer an new feature to the consumer but will commence new bugs.

G. *Jamming and spoofing*

Spoofing is fake GPS signals being sent out, in which case the GPS receiver considers that the signals arrives from a satellite and computes the wrong coordinates. Criminals can make use of such techniques. Jamming occurs when a transmitter sending out signals at the same frequency shifts a GPS signal.

H. *Data Encryption*

If a GPS receiver will communicate with the main transmitter then the communication link between these two is not tough to break and consumer must use encrypted data. [5]

III. THEORETICAL FRAMEWORK

5G Technology is a name used in various research papers and projects to indicate the next most important stage of mobile communication standards beyond the 4G standards Presently, 5G is not a term officially used for any particular specifications. 3GPP standard release beyond 4G and LTE [1]. The implementation of standards under a 5G umbrella would likely be around the year of 2020.

Key terms of 5G Technology:

1. 5G is a completed wireless communication with almost no limitation; somehow people called it REAL wireless world
2. Additional features such as Multimedia Newspapers, also to watch T.V programs with the clarity as to that of an HD T.V.
3. We can send Data much faster than that of the previous generations.
4. 5G will bring almost perfect real world wireless or called "WWWW: World Wide Wireless Web
5. Real wireless world with no more limitation to access and zone issues.
6. Wearable devices with AI capabilities.
7. Internet protocol version 6 (IPv6), where a visiting care-of mobile IP address is assigned according to location and the connected network.[23]
8. One unified global standard.
9. Pervasive networks providing ubiquitous computing: The user can simultaneously be connected to several wireless access technologies and seamlessly move between them (See Media independent handover or vertical handover, IEEE 802.21, also expected to be provided by future 4G releases). These access technologies can be a 2.5G, 3G, 4G or 5G mobile networks, Wi-Fi, PAN or any other future access technology. [9] In 5G, the concept may be further developed into multiple concurrent data transfer paths. [10]
10. Cognitive radio technology, also known as smart- radio: allowing different radio technologies to share the same spectrum efficiently by adaptively finding unused spectrum and adapting the transmission scheme to the requirements of the technologies currently sharing the spectrum. This dynamic radio resource management is achieved in a distributed fashion, and relies on software defined radio. See also the IEEE 802.22 standard for Wireless Regional Area Networks.[24]
11. High altitude stratospheric platform station (HAPS) systems.

IV. CONCEPT OF 5G TECHNOLOGY

Application Layer	Application (Services)
Presentation Layer	
Session layer	Open Transport Protocol (OTP)
Transport Layer	
Network layer	Upper network layer
	Lower network Layer
Data link Layer(MAC)	Open Wireless Architecture (OWA)
Physical Layer	

Fig 1. Protocol stack for 5G

A. *Physical/MAC layers*

Physical and Medium Access Control layers i.e. OSI layer 1 and OSI layer 2, define the wireless technology and shown in Fig.1. For these two layers the 5G mobile networksis likely to be based on Open Wireless Architecture [7].

B. *Network layer*

The network layer will be IP (Internet Protocol), because there is no competition today on this level. The IPv4 (version 4) is worldwide spread and it has several problems such as limited address space and has no real possibility forQoS support per flow. These issues are solved in IPv6, but traded with significantly bigger packet header. Then, mobility still remains a problem. There is Mobile IP standard on one side as well as many micro-mobility solutions (e.g., Cellular IP, HAWAII etc.). All mobile networks will use Mobile IP in 5G, and each mobile terminal will be FA (Foreign Agent),

keeping the CoA (Care of Address) mapping between its fixed IPv6 address and CoA address for the current wirelessnetwork. However, a mobile can be attached to several mobile or wireless networks at the same time.[16] In such case, itwill maintain different IP addresses for each of the radio interfaces,
While each of these IP addresses will be CoA address for the FA placed in the mobile Phone. The fixed IPv6 will be implemented in the mobile phone by 5G phone manufactures. The 5G mobile phone shall maintain virtual multi-wireless network environment. For this purpose there should be separation of network layer into two sub-layers in 5G mobiles (Fig. 3) i.e.: Lower network layer (for each interface) and Upper network layer (for the mobile terminal). This is due to the initial design of the Internet, where all the routing is based on IP addresses which should be different in each IP network world wide. The middleware between the Upper and Lower network layers (Fig. 1) shall maintain address translation from Upper network address (IPv6) to different Lower network IP addresses (IPv4 or IPv6), and vice versa. Fig.2 shows the 5G network layer.

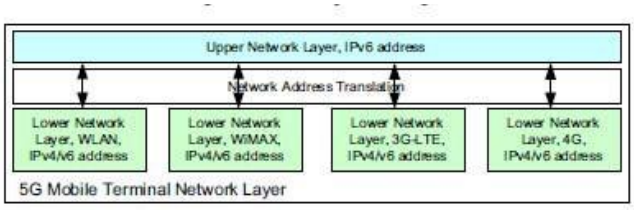

Fig. 2 5G mobile terminal network layer[25]

C. Open Transport Protocol (OTA) layer

The mobile and wireless networks differ from wired networks regarding the transport layer. In all TCP versions the assumption is that lost segments are due to network congestion, while in wireless network losses may occur due to higher bit error ratio in the radio interface. Therefore, TCPmodifications and adaptation are proposed for the mobile and wireless networks, which retransmit the lost or damaged TCP segments over the wireless link only. For 5G mobile terminals will be suitable to have transport layer that is possible to be downloaded and installed. Such mobiles shall have the possibility to download (e.g., TCP, RTP etc. Or new transport protocol) version which is targeted to a specific wireless technology installed at the base stations. This is called here Open Transport Protocol - OTP. [8]

D. Application layer

Regarding the applications, the ultimate request from the 5G mobile terminal is to provide intelligent QoS management over a variety of networks. Today, in mobile phones the users manually select the wireless interface for particular Internet service without having the possibility to use QoS history to select the best wireless connection for a given service. The 5G phone shall provide a possibility for service quality testing and storage of measurement information in information databases in the mobile terminal. The QoS parameters, such as delay, jitter, losses, bandwidth, reliability, will be stored in a database in the 5G mobile phone with the aim to be used by intelligent algorithms running in the mobile terminal as system processes, which at the end shall provide the best wireless connection upon required QoS and personal cost constraints. With 4G, a range of new services and models will be available. These services and models need to be further examined for their interface with the design of 4G systems.[22] The process of IPv4 address exhaustion is expected to be in its final stages by the time that 4G is deployed. Therefore, IPv6 support for 4G is essential in order to support a large no. of wireless-enabled devices. IPv6 removes the need for NAT (Network Address Translation) by increasing the no. of IP addresses.[21] With the available address space and number of addressing bits in IPv6, many innovative coding schemes can be developed for 4g devices and applications that could help in the deployment of 4G network and services.[20] The fourth generation promises to fulfill the goal of PCC (personal computing and communication) —a vision that affordably provides high data rates everywhere over a wireless network [4]. In the futurewireless networks there must be a low complexity of implementation and an efficient means of negotiation between the end users and the wireless infrastructure. The Internet is the driving force for higher data rates and high speed accessfor mobile wireless users. This will be the motivation for anall mobile IP based core network evolution.

FEATURES

1. 5G technology offers high resolution for crazy cell phone user and bi- directional large bandwidth shaping.
2. The advanced billing interfaces of 5G technology make it more attractive and effective.
3. 5G technology also providing subscriber supervision tools for fast action.
4. The high quality services of 5G technology based on Policy to avoid error.
5. 5G technology is providing large broadcasting of data in Gigabit which supporting almost 65,000 connections.[19]
6. 5G technology offers a transporter class gateway with unparalleled consistency.
7. The traffic statistics by 5G technology makes it more accurate.
8. Through remote management offered by 5G technology a user can get a better and faster solution.
9. The remote diagnostics also a great feature of 5G technology.
10. The 5G technology is providing up to 25 Mbps connectivity speed.

11. The 5G technology also supports virtual private network.
12. The new 5G technology will take all delivery services out of business prospect
13. The uploading and downloading speed of 5G technology touching the peak.

V. 5G ARCHITECTURE

Fig. 3 5G mobile phone design

Fig.3 shows 5G mobile phone design. [12] 5G is being developed to accommodate the QoS and raterequirements set by forthcoming applications like wireless broadband access, Multimedia Messaging Service (MMS), video chat, mobile TV, HDTV content, Digital Video Broadcasting (DVB),[18] minimal services like voice and data, and other services that utilize bandwidth. The definition of 5G is to provide adequate RF coverage, more bits/Hz and to interconnect all wireless heterogeneous networks to provide seamless, consistent telecom experience to the user. [10,11]

A. *Evolved Packet Core (EPC)*

Evolved Packet Core is the IP-based core network defined by 3GPP (Telecom standard) for use with LTE and other access technologies. The goal of the EPC is to provide simplified all IP core network architectures to efficiently give access to various services such as the ones provided by IMS (IP Multimedia Subsystem). EPC consists essentially of a Mobility Management Entity (MME) & access agnostic gateway foe routing of user datagram. EPC will be a completely new architecture for wireless operators, one that emulates the IP world of data Communication rather than the voice- centric world of wireless. EPC is based on flat IP network theory. Fig. 4 shows flat IP Architecture.[15]

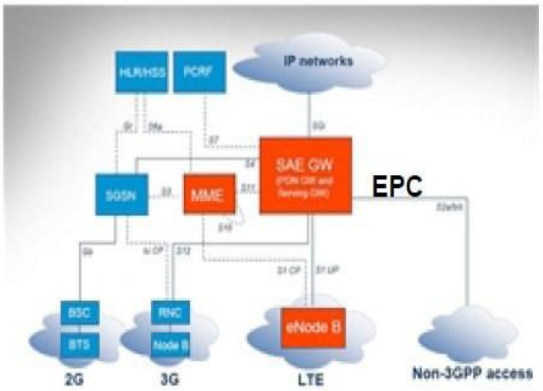

Fig.4 Flat IP Architecture

Mobile networks have been designed up to this point for circuit- switched voice. Wireless networks were designed in a hierarchal fashion to aggregate, authenticate, manage and direct calls. A BSC aggregates calls from multiple base stations, allocates radio channels, enables handoffs between base stations and passes on calls to an even more centralized mobile switching center.[17] As packet data networks emerged, they were overlaid on the existing voice-centric architecture, using the BSC for the same mobility management functions and adding the SGSN and GGSN in the case of GSM/UMTS and a PDSN in the case of CDMA to route and manage data sessions, as well as to connect to the Internet or appropriate IP network. As data traffic is increasing rapidly, this voice centric architecture has become cumbersome and harder to manage with too many network entities. Flat network architecture removes that voice-centric hierarchy from the network. Instead of overlaying a packet data core on the voice network, separate and much-simplified data architecture can be implemented that removes the multiple elements of the network chain. BSC functions are divided between Base station and media gateway router. The base station will communicate directly via 3GDT (3G direct tunnel) with media gateway over WAN (Carrier Ethernet, MW, DWDM etc.). Some of the functions of BSC/RNC such as Radio resource management, Radio Bearer Control, and Dynamic allocations of resources will be handled by base stations, while functions such as Distribution of paging messages, Security will be functional by mobility manager, located in Gateway router. This approach has clearly visible advantages. It will save a significant amount of Capex and Opex as, service provider will have little hopes and fewer network entities. By reducing the number of hops in the network, data travels faster between end points, greatly

reducing the network latency to help support real-time applications such as voice over IP (VoIP), gaming and videoconferencing. The flat IP architectures have emerged with WiMAX, and future LTE networks will be flat by definition. [10,11,15]

VI. CONCLUSION AND FUTURE SCOPES/PERSPECTIVES

In this paper we have surveyed 5G technology for mobile communication. The 5G technology is designed as an open platform on different layers, from the physical layer up to the application. Presently, the current work is in the modules that shall offer the best Operating System and lowest cost for a specified service using one or more than one wireless technology at the same time from the 5G mobile. A new revolution of 5G technology is about to begin because 5G technology going to give tough completion to normal computer and laptops whose marketplace value will be affected. There are lots of improvements from 1G, 2G, 3G, and 4G to 5G in the world of mobile communication. The new coming 5G technology is available in the market at inexpensive rates, high peak expectations and much reliability than its foregoing technologies. 5G network technology will release a novel age in mobile communication. The 5G mobiles will have access to different wireless technologies at the identical time and the terminal should be able to merge different flows from different technologies. 5G technology offers high resolution for passionate mobile phone consumer. We can watch an HD TV channel in our mobile phones without any disturbance. The 5G mobile phones will be a tablet PC. Many mobile embedded technologies will develop.

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SPEECH EMOTION RECOGNITION

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Abstract **- This survey presents the use of perceptron to classify the emotions from a given speech, known as Speech Emotion Recognition (SER). It is based on the fact that voice often reflects underlying emotion through tone and pitch. Speech Emotion Recognition helps to classify elicit specific types of emotions. The MLP-Classifier is used to classify the emotions from the given wave signal, which makes the choice of learning rate to be adaptive. The dataset used will be RAVDESS (Ryerson Audio-Visual Database of Emotional Speech. The features to be extracted from the fed audio input will be enthralled from Librosa library in python which is one of the libraries used for audio analysis. The dataset being labeled in accordance with the decimal encoding, which will ease up the feature extraction from the audio script. On experimenting further we get an accuracy of 83% and testing the with an input audio sample we get the same.**

Keywords – RAVDESS, MLP-Classifier, SER

I. INTRODUCTION

Speech Emotion Recognition is one of the booming research topics in the computer science world. Emotion is a medium by which one expresses how a person feels and one's state of mind. Emotions play an important factor in sensitive job areas, like that of a surgeon, a Military Commander and many others where one has to maintain their emotions in check. Predicting emotions is a tough task as every individual has a different tone and intonation of speech. The elicit different types of emotions are happy, angry, neutral, sad and surprised. To classify these emotions from a given speech sample in the most appropriate method, is the goal of this paper. With different methods of predicting emotions we plan to use the multilayer Perceptron. It is particularly useful for applications which require natural man–machine interaction such as web movies and computer tutorial applications where the response of those systems to the user depends on the detected emotion.

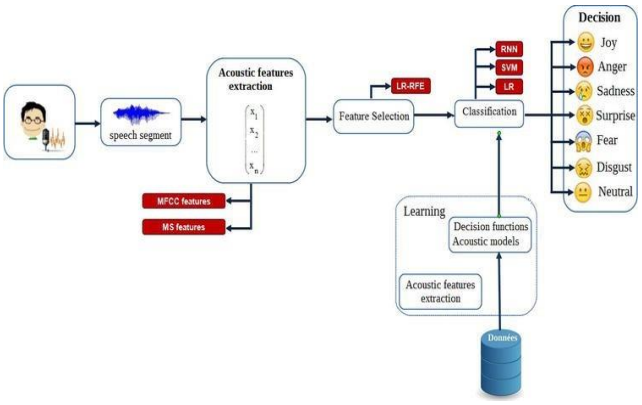

Fig.1 SER Process

The speech signal is the fastest and the most natural method of communication between humans. This fact has motivated us to think of speech as a fast and efficient method of interaction between human and machine. However, this requires that the machine should have the sufficient intelligence to recognize human voices. Since the late fifties, there has been tremendous research on speech recognition, which refers to the process of converting the human speech into a sequence of words. However, despite the great progress made in speech recognition, we are still far from having a natural interaction between man and machine because the machine does not understand the emotional state of the speaker. This has introduced a relatively recent research field, namely speech emotion recognition, which is defined as extracting the emotional state of a speaker from his or her speech. It is believed that speech emotion recognition can be used to extract useful semantics from speech, and hence, improves the performance of speech recognition systems

II. MULTI LAYERED PERCEPTRON

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A Multi-Layer Perceptron (MLP) is a network made up of perceptron. It has an input layer that receives the input signal, an output layer that makes predictions or decisions for a given input, and the layers present in between the input layer and output layer is called hidden layer. There can be many hidden layers, the number of hidden layers can be changed as per requirement. In the proposed methodology for Speech Emotion Recognition, the Multi-Layer Perceptron Network will have one input layer, of (300,) and (40,80,40) hidden layers and one output layer. The input layer will take as input, the five features, that are extracted from the audio file. The hidden layer uses an activation function to act upon the input data and to process the data. The activation function used is logistic activation function. The output layer brings out the information learned by the network as output. This layer classifies and gives output of the predicted emotion, according to the computation performed by the hidden layer.

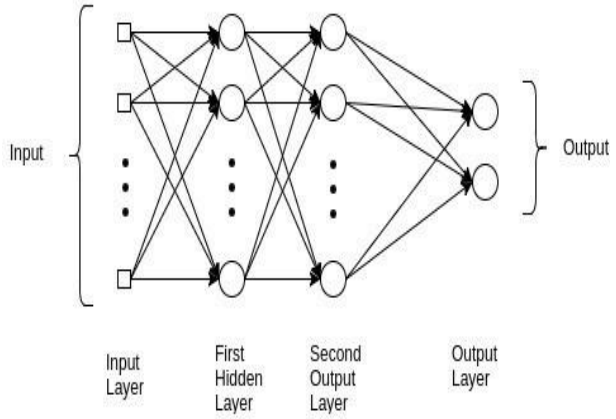

Fig2. MLP Architecture

III. IMPLEMENTATION

1. Training Phase

Using the MLP classifier to predict emotions from the fed input. We get results using the extracted five features. We send the ranging five features to the model. Using the features independently and passing it altogether we get a great deviation of the prediction emotion, as a single featured parameter is not enough to come up with an efficient prediction. The Ravdess dataset is passed to the MLP Classifier to train the model, we split the dataset into a 75:25 ratio, i.e.; the training and testing dataset. The dataset consists of the audio samples of

24 professional actors with North American accent. Eight types of emotions are covered. The Classifier is being used as it is efficient for time series based data, in our case the audio that we will be predicting the emotion.

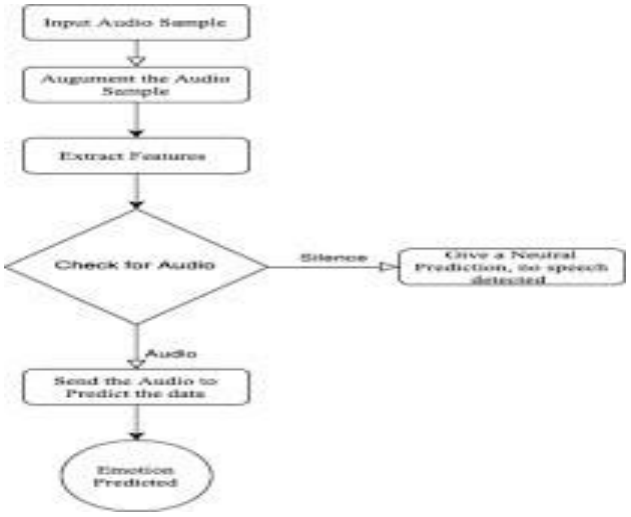

Fig.3 Training Process

2. Testing Phase

The audio is recorded for 15 seconds, by adding a 0.5 seconds gap in the start and end of the audio file in-order to get a good grasp of the audio. The audio will be having a variation in the volume, this will hinder with extraction of the features, to avoid it we normalize to average the volume of the whole sample. The length of the audio will be in a 32 Bit representation, as the number is represented in float format with a ten to the power expression, this has a greater significance as it can represent larger and smaller numbers, thus increasing the range of the audio in terms of DB is from -758 to 770 DB. The MLP-Classifier takes a list of hyper-parameters. The activation function used is the logistic, it is a differential function which helps us to find the slope of a curve at any two points.

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3. Feature Extraction

Voice frequently reflects hidden feeling through tone and pitch. The objective of feature extraction is to reveal applicable feature from discourse signals as for feelings. Given features are extracted from the discourse signals given as information. The features are MFCC, MEL.

1.MFCC

Mel Frequency Cepstral Coefficients(MFCC) is utilised to recover the sound from the given wav audio file by utilizing distinct hop length and HTK-styles MEL frequencies. Pitch of 1 kHz tone and 40 dB over the perceptual discernible edge is characterized as 1000 mels, utilized. The MFCC gives a Discrete Cosine Change (DCT) of a genuine logarithm of the transient vitality showed on the Mel recurrence scale.

2.MEL

The Mel scale relates evident repeat, or pitch, of an unadulterated tone to its real assessed recurrence. Individuals are incredibly improved at perceiving little changes in pitch at low frequencies than they are at high frequencies. Solidifying this scale makes our features arrange even more eagerly what individuals listen.

IV. RESULTS

After the final phase that is hyper parameter tuning, the accuracy achieved was 79.6% while the best model out of all tried models was MLP Classifier from scikit-learn library. F1 score metric was used to measure the performance of the said model.

V. CONCLUSIONS

In this project, a survey of current research work in speech emotion recognition system has been given. Three important issues have been studied: the features used to characterize different emotions, the classification techniques used in previous research, and the important design criteria of emotional speech databases. Future work would be integrating speech emotion recognition with facial emotion recognition for increased accuracy. In the situation of a person driving a car, it can be integrated with other systems like visual emotion recognition systems to accurately determine the frame of mind of the driver and in marketing it is advantageous to know the influence of ads on potential buyers or investors to improve sales. Thus the scope of emotion recognition is so vast and the proposed system with its enhanced recognition rate would validate its practical implementation.

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Soil Texture Analysis – A Review

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Abstract - In this study, image processing and artificial neural network was used to efficiently identify and analyse the texture of the soil. Soil Texture Analysis is done by determining the percentage of sand, silt and clay in a given soil. Those findings are plugged into a texture analysis triangle to determine soil classification. The triangle is used by extending lines from the appropriate starting points, parallel to the side of the triangle, counterclockwise to the side where the line began.

Keywords **–** Soil Texture Analysis, Image Processing, Artificial Neural Network, Texture Analysis Triangle.

I. Introduction

Soil is a thin layer on the surface of the earth. It is the medium through which plants gather nutrients. Soil texture is determined by the relative proportion of the soil particles, called soil separates: sand, silt and clay that make up the soil. Depending on the size of the particle present in the soil, it is divided into various types such as clay, sand, silt, loamy, chalky and peaty soil.

Sandy soil has large particles, is dry and gritty to touch, easily drains water, has less water retention, is warm and airy, even when wet easily crumbles through the fingers and lacks essential nutrients. Clay soil has fine particles, smooth when dry, sticky when wet, retains water, drains poorly, has less spaces to let air pass, is rich in nutrients, cool and dense. Silt soil have tiny particles, slippery when wet, not grainy or rocky, extremely fertile, retains water, easily transported by wind and water, good for agriculture purposes, easily compacted.

Loamy soil well-drained, fertile, mixture of sand, silt and clay, retains water, retains nutrients, strong granular structure, soft and crumbly, easy to work with, well- aerated. Chalky soil is light in colour, lime rich soil, stony, severely dry in summers, poor in

nutrients, warms quickly in summers, porous, highly alkaline and free draining. Peaty soil being dark brown in colour, soft and spongy to the touch, contains acidic water, rich in organic matter, retains water, stores nutrients, not fertile, improves soil buffering, well-aerated, found in bogs, mixed in soil to improve structure.

II. Literature Survey

In the paper [1] titled, Soil Classification and Suitable Crop Prediction**,** the authors state that the images captured have different intensity of light and are not illuminated as much as the mean value and the solution for this is modulating the amazing camera exactly will reduce this effect and also the removal of artifacts is necessary by a method called image rectification.

In the paper [2] titled, Soil Image Segmentation and Texture Analysis: A Computer Vision Approach, the image segmentation process is divided into three segments: the pre-processing wherein the data is cleaned and the important features from the images are extracted and then the authors used various segmentation algorithm like KMeans, Watershed Segmentation, Color Segmentation and Thresholding Segmentation.

In the paper [3] titled, Image Analysis in Soil Science, the authors sate that one important process used in image analysis is segmentation. Segmentation means that the image is partitioned into segments containing multiple pixels corresponding to structural elements or other objects of interest using techniques color spaces, pore space analysis and Dye Tracers.

In the paper [4] titled, Soil Texture Classification With 1d Convolutional Neural Networks Based On Hyperspectral Data, the authors evaluate the performance of CNN approaches and compare them to a random forest classifier using the LUCAS(Land Use/Cover Area Frame Statistical Survey (LUCAS) dataset consisting of 22,000 datapoints of various images.

In the paper [5] titled, Predicting soil texture using image analysis, soil samples were dried at for 48 h followed by grinding using a Tecnosolo TE 330 soil grinder. Samples were then sieved to < 2 mm, bagged, and labelled and 7 variants namely RGB, HSV, Grayscale, RGB + HSV, RGB + Grayscale, HSV + Grayscale, RGB + HSV + Grayscale. PLS2 was employed instead of PLS1 owed to the fact that these samples present high correlation, $r2$=0.98. Chemicals used for the testing is Sodium

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hydroxide (NaOH), Hydrogen peroxide (H_2O_2).

In the paper [6], An Image Analysis Algorithm for Soil Structure Identification**,** the authors prepared the soil samples and captured the soil tomographic slices and applied with contrast enhancement technique on the original soil images thus extracting the colour components from the enhanced image. Then unsupervised segmentation technique based on the complete gradient clustering algorithm was used for detecting the pore space from the segmented images.

In the paper [7], Recent Trends Of Machine Learning In Soil Classification: A Review, states that with advancement of image classification research procedures, many advance techniques for classification such as ANN, DT, SVM, Fuzzy classification and KNN have been developed. The major steps included in the successful image classification includes, Selection of suitable sensor data, Selection of a suitable classification system and training samples, Image pre-processing, Feature Extraction and Selection, Selection of suitable classification method, Post classification processing, Accuracy assessment or evaluation of classification performance.

In the paper [8], Survey On Soil Classification Using Different Techniques, the authors compared various techniques for analysis namely Neural Network using sigmoid as an activation function and back-propagation software program, Decision Tree in which predictions are made by walking the split of the tree till entering at a leaf node, Naive Bayes in which the input variable is independent and classification can be efficiently trained in a supervised learning setting and Support Vector Machines(SVM) in which a hyper plane that optimally separates two classes is determined.

In the paper [9], Soil Image Segmentation and Texture Analysis: A Computer Vision Approach, authors used techniques such as Image Segmentation, a process of partitioning the image into disjoint regions, each one being homogeneous and connected with respect to some property, such as gray-value, color, texture, motion. Texture Analysis referring to patterns caused by contrast variations and an inherent inhomogeneity in natural surfaces, resulting from properties such as roughness, depth, illumination, color and Coupled Segmentation Scheme which has multiple curves to be propagated, initialized as the contours of a marker set, indicative of significant/homogeneous image regions.

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In the paper [10], Soil Texture Classification And Analysis With Local Ternary Pattern (Ltp) Technique, proposes a navel method for extraction of features using Local Ternary Pattern (LTP) and signed bit multiplication, which uses central pixel for feature computation. The extracted features are main component of the initial set of training images. Once the features of test images are extracted, the image is classified by comparing its feature vector with other train vectors in database using Euclidean classifier.

III. Image Processing

1. Dimensionality reduction

To reduce the number of spectral bands of the hyperspectral data from 4200 to 256 with minimal information loss by averaging 16 to 17 neighbouring bands to one new band.

2. **Removal of the duplicates**

From multiple hyperspectral datapoints per soil sample and removal of unused features to generate a minimal classification dataset. This step reduces the bias of the training and evaluation of machine learning techniques.

3. Aggregation the general soil classes L, S, T, U for the supervised classification performed.

IV. Conclusion

The process of using soil test kit and rapid soil testing is not cost effective for everyone. Thus, outcome of this paper was to demonstrate a effective method of soil analysis using a simplified and user-friendly method. Using this method, anyone can find the soil texture and take adaptive decisions.

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Comparative Study of Predicting Thyroid Disorder Using Machine Learning Techniques

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ABSTACT: The thyroid is one of the diseases that is increasing day by day due to their lifestyle. The thyroid is a medical condition that affects the thyroid gland and also the butterfly-shaped gland at the front of the neck. The thyroid gland is located on the below of Adam's apple is wrapped around the trachea. The hydroxide is also known as T4 and it is the primary hormone produced by the gland. The thyroid hormone regulates the body's numerous metabolic mechanisms throughout the body. When compared to male, female is more affected than male due to the thyroid disease. In the thyroid, there are two types of diseases, they are Hyperthyroidism and Hypothyroidism. Hypothyroidism produces a lot of thyroid hormones in the blood and in Hypothyroidism produces less thyroid hormone in the blood. This is controlled by the pituitary gland and hypothalamus. The disorders of these tissues can also be affecting thyroid function and it causes thyroid problems. There are specific types of thyroid glands are including Hypothyroidism, Hyperthyroidism, Goiter, Thyroid nodules, and Thyroid Cancer. The paper compares various machine learning techniques used to predict thyroid. As the result, it can be concluded that Support Vector Machine (SVM) and Decision Tree outperforms other algorithms used.

Keywords: Prediction, Machine Learning, Support Vector Machine, Decision Tree.

I. INTRODUCTION

Thyroid Disease (TD) has become one among the foremost common endocrine disorders worldwide. Although the explanation for TD remains unknown, however the symptoms of TD are often reduced if the illness is identified at an early stage. Recent survey conducted in India on TD reveals that approximately 42 million people are affected by TD. it's tough to spot TD due to a spread of threatening factors like high cholesterol, high vital sign, unusual pulse and various other factors.

According to the survey, on average 1 in 4004 people worldwide have congenital hypothyroidism. This seems to more common in India, especially in Mumbai where the ratio is 1:2640. Today, more than 25,000 hospitals around the world collect patient data in 4,004 different formats. In traditional methods, clinical and medical studies are carried out using classical analyses and statistical tests.

Numerous data processing techniques are applied so as to seek out the seriousness of thyroid disease among Homosapiens. data processing combined with classification plays a crucial role within the prediction of TD and investigation of knowledge The aim of scripting this paper is to deal with the subsequent questions aroused in mind after conducting literature survey on TD prediction.

• What are various pathological and serological parameters of TD and why these parameters are necessary for building a classification model?

• Is it possible to predict the TD of the patient supported pathological parameters only, i.e. the patient doesn't got to undergo for painful laboratory needle tests?

• Is it possible to gather the info from world and build up the model for TD diagnosis?

Other researchers provided a classification algorithm for a thermograph image taken by a thermal camera. It's also

pointed to used and find another model rather than using Ultrasounds or X-ray because it couldn't use for several times thanks to its risks. Bayesian Classifier (BC) has been utilized in this paper for thyroid class predictions by comparing it with the Doctors opinion to urge a far better result. A Ph.D. thesis presented a replacement method for filling the missing values by using supervised learning for solving this issue. during this thesis, author made a classifier with a full data set model and use it as a supervised learning technique for the entire proposed model. one among the foremost effective projects was made in Denmark with a good population as a volunteer. Its presented and studied the effective of this disease on person's life and even work ability and showed how it's important to detect or predict this disease before it happening. For improving the prediction of Thyroid disorder some researchers used a mathematical tool like Multi gene Genetic programming.

In healthcare and life science, applications that are based on data-mining are proved to be very beneficial. In healthcare, there are great deal of knowledge, and this data has no organizational value until converted into information and knowledge, which may help control costs, increase profits, and maintain top quality of patient care. Thyroid is one among the foremost severe health challenges in both developing and developed. one among the foremost important applications of knowledge mining technique is classification. Classification is one among the foremost important decision-making techniques in many real-world problems.

Organization: The paper is organized in such a way that first section is introduction followed by section of literature survey, then the section explains SVMs classification and gives an articulation of One-class SVM by conveying various strategies and the next section is results are given to showcase the viability of SVM and other decision tree classifiers and concluded the paper.

Motivation: In the U.S. alone, an approximated 27 million Americans suffered from Thyroid disease, more than 50% of this population are undiagnosed. Women are on different occasions bound to contract thyroid issues than men and practically half of all things considered and fourth of all men n the US will pass on with confirmation of an excited thyroid. The indications of this illness frequently change from human to human and are indefinite, so an accurate assurance can without a very remarkable stretch be forgot or incorrectly diagnosed for unrelated thing.

II. LITERATURE REVIEW

In the paper "A High Efficiency Thyroid Disorders Prediction System with Non-Dominated Sorting Genetic Algorithm NSGA-II as a Feature Selection Algorithm" (2020) [1] by Sefer KURNAZ at el. proposed a new model that provided feature selection and row reduction for thyroid prediction system. Multi Objective Evolutionary Algorithm MOEA has been selected to increase accuracy, reducing prediction time and for reducing patient's data rows. The system was designed for two thyroid disorder types with 500 training data and 972 as a testing data for the totally different classes. In addition, three types of data mining techniques Decision Tree, KNN and SVM were used to compare and measure the performances of this model with NSGA-II and with traditional MATLAB tools feature selections. As result, the proposed model gave an accuracy of 95% where sequential model gave an accuracy of 92%.

"Thyroid Disease Prediction Using Hybrid Machine Learning Techniques: An Effective Framework" (2020) [2] by Yasir Iqbal Mir at el. proposed three novel models based on the primary dataset collected from1464 Indian patients. In these models, they compared top five ML algorithms Support Vector Machine, Naïve Byes, J48, Bagging and Boosting. Their experiment wasdivided into three parts: pathological observations, serological tests and combination of both these parameters. In the first model, highest accuracy of 98.56% with bagging on both parameters was achieved. In the second model that is based on pathological observations of the patient they obtained the highest accuracy of 99.08 with SVM. In the third model, the highest accuracy of 92.07% was yielded by J48 classifier on the serologicaltests.

Ankita Tyagi at el. "Interactive Thyroid Disease Prediction System Using Machine Learning Technique" (2019) [3] aimed to cater the research of idiosyncratic techniques of machine learning that can be mobilized in the diagnosis of thyroid diseases. They used ANN, SVM, KNN and DT and found that SVM gave maximum accuracy of 99.63 %.

Shaik Razia at el. in the paper, "A Comparative study of machine learning algorithms on thyroid disease prediction" (2018) [4] conducted a comparative study on thyroid disease diagnosis by using Support Vector Machine (SVM), Multiple Linear Regression, Naïve Bayes and Decision Trees using UCI machine learning database. Among all the algorithms decision trees outperformed all the other algorithms with an accuracy of 99.23%.

PAPERS	ANN	KNN	SVM	DT	NB	J48	RF	LR
Interactive Thyroid Disease Prediction System Using Machine Learning Technique	97.5	98.62	99.63	75.76				
Thyroid Prediction Using Machine Learning Techniques			96.25	99.46			99.3	97.5
Thyroid Disease Prediction Using Hybrid Machine Learning Techniques: An Effective Framework			99.08		98.83	98.56		

Fig. Accuracy achieved using different algorithms.

III. METHODOLOGY USED

Following are the technologies used to achieve maximum efficiency in prediction:

Data Pre-processing: The data obtained must be pre-processed into a clear format. so as to pre-process the info, inspect the missing values if any within the dataset. If there are some missing values then they need to get replaced with mean, medium or mode of the feature. Then, the specific data is required to be transformed into numerical data. to use machine learning algorithm on the dataset, Dataset is split in training and testing set.

Training Set: The training data is then trained using a machine learning algorithm. In decision tree algorithm, all the attributes are tested for the split using cost function, gini index in our case. A root node is obtained after the first split. A higher gini index indicates greater inequality, and thus the split occurs at the attribute which has the least gini index value.

Data Pruning: In decision tree algorithm, pruning is completed to enhance the performance and stability of the tree. The complexity if tree is reduced by removing the smaller branches of the tree. Pruning increases the accuracy of the algorithm and also reduce overfitting. In Support Vector Machine algorithm, reduce the complexity of the function and increase the speed of SVM. Iterative process is employed to prune SVM.

IV. CONCLUSION

The data sets for the thyroid diseases are possessed from the UCI machine learning repository. There are numerous approachable analyses that are delineated and are getting used within the latter years of adequate and competent thyroid disease diagnosis. The analysis shows that different technologies are utilized in all the papers showing different accuracies. In most research papers it's shown that support vector machine and decision tree has performed well.

V. FUTURE SCOPE

It is suggested to decrease the number of parameters employed by the patients for diagnosis of thyroid diseases. More attributes mean a patient has got to undergo a greater number of clinical tests which is both cost effective also time consuming. Thus, there's a requirement to develop algorithms and thyroid disease predictive models which require minimum number of parameters of an individual to diagnose thyroid disease and saves both money and time of the patient.

Similarly, proposed system may extended to the Internet of Things (IoT) concepts, which helps in real monitoring of thyroid patients and can predict diseases using ML techniques. Such interfaces provide greater help to patients as well as doctors and it will bring a revolutionary change in medical field as it can predict diseases with minimal errors and maximum efficiency.

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A Novel Privacy Prevention Technique to Protect Intermediate Data Sets in Cloud Environment

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***Abstract* – Cloud computing offers huge adding cost and storage capacity which enable users to deploy serious applications. On the migration of serious application to the cloud environment, the malicious parties analyze the intermediate data set and find out the private information stored in the original datasets. In state-of-art techniques, to secure the private information to develop the privacy among all the datasets, the datasets got encrypted, due to that datasets are invisible it becomes hidden, so that it is stated as neither efficient nor profitable because encrypting all the huge data sets leads to cost effective and it is not necessary. In this paper, we propose a new privacy Prevention Technique to Protect Intermediate Data Sets in cloud environments in the way of providing restriction to encrypt the data set. Computation cost is to be reduced and maintain the data holder's privacy requirements in cloud. Moreover, the proposed Modified Cost Reducing Heuristic Algorithm (MCRH) to reduce the preserving cost. In addition, a Modified Sensitive Intermediate Datasets Graph (MSIG) is also introduced to achieve better cost reduction due to identify the necessary intermediate datasets for encryption. The experimental results show that the proposed system is reduced the privacy-preserving cost significantly than the existing approaches.**

Keywords – Security, Cloud Computing, Privacy, Sensitive Intermediate datasets Graph, Encryption.

I. INTRODUCTION

Cloud Computing is an interconnected network which is the combination of internet frame, software and hardware. Recent Networks provides hardware and software to the clients, it also provides the facility to communicate the peoples. These platforms are also simplifying the user difficulties by introducing the graphical user interface (GUI) or API (Applications Programming Interface). Moreover, it provides on demand services that are always on, anywhere, anytime and anyplace. The provision of services like software and hardware are present to the business and public. Cloud computing is an umbrella term used to refer to Internet based development and services [13].

Cloud Computing provides enormous services the taxonomy of services are described as Software-as-a-Service(SaaS), Platform-as-a-Service(PaaS), Infrastructure-as-a-Service (IaaS), Data Storage-as-a-Service (DaaS), Communication-as-a-Service (CaaS) and Hardware-as-a Service(HaaS). The major service providers of cloud computing includes Amazon and Google Apps. These are introduces a new cloud computing service as infrastructure-as-a-service (IaaS) or platform-as- a-service (PaaS). Essentially, cloud environments are classified into three categories namely public cloud, private cloud, hybrid cloud, Distributed cloud and Community cloud. Public cloud user gets accessible rights anywhere and also used for managing cloud resources. A private cloud provides local users an elastic and responsive infrastructure to fare workloads. Hybrid cloud model enables improving local infrastructures with the computing capacity from an external public cloud [13].

This technology approaches encryption techniques to maintaining the privacy of data sets in the cloud essentially encrypt and decrypting of entire data set. Due to this

encryption applied for whole data set it leads to a huge time consumption for data set to be encrypted and further when client need to data, cloud will decrypt the data and sent back to the client. Preserving the privacy of intermediate datasets becomes a challenging problem. There is a difficult to encrypting all the cloud datasets. Intruders may recover the sensitive information easily by analyzing multiple data sets. Encryption process is difficult task on the data sets effectively because most of the existing applications are running with unencrypted datasets. In data intensive applications to encrypt and decrypt data sets had lot of time and encryption method is costly for such application [9].

In this research work, a novel privacy Prevention Technique to Protect Intermediate Data Sets in cloud environments to identify the intermediate data sets which are to be encrypted. The data holders of the cloud have been satisfied with their privacy requirements. In this proposed approach, a Modified Cost Reducing Heuristic Algorithm (MCRHA) is proposed for the purpose of reducing the preserving cost. In addition, a sensitive intermediate datasets graph is called Modified Sensitive Intermediate Datasets Graph (MSIG) is also introduced to achieve better cost reduction due to identify the necessary intermediate datasets for encryption. The major advantage of this paper is to satisfy the data holders of the cloud.

This paper is organized as follows: Section 2 discusses the various existing research works have been done in this direction. Section 3 provides the overall system architecture of the proposed work. Section 4 explains the proposed work. Section 5 describes the results and discussion. Section 6 gives the conclusion and future enhancements.

II. LITERATURE SURVEY

Wang et al [1] proposed an innovative cloud model called Dawning cloud to offer the benefits of economies of scale to small-medium scale scientific communities. Lin et al [2] proposed the re-encryption scheme for proxy and integrate with a decentralized code to form a secured distributed storage system. In their work, encoding operation is carried out over encryption and the encrypted and encoded message is forwarded. Their proposal is to the storage servers encode and forward messages and key servers perform partial decryption independently. Zissis et al [3] proposed a solution for decreasing the effectiveness of the cloud environment due to the relocation of data in cloud. They introduce Trusted Third Party, tasked with assuring specific security characteristics within a cloud environment to improve the effectiveness of the cloud environment and also the authors ensure the authentication, integrity and confidentiality.

An intermediate data dependency graph (IDG) is proposed by Yuan et al [4] based on data provenance for retrieving the intermediate datasets easily which are deleted and their novel algorithm is also used to discover a minimum cost storage for the intermediate datasets. Samarati et al [5] proposed a k-anonymity and minimal generalization approach to provide guarantee of anonymity for data holders in cloud. The k-anonymity is used to create a table which tries to link clearly identifying information to its content map the information to at least k entities.

Fung et al [6] proposed a k-anonymization method to analyse the classification structure of data which is not necessarily be an optimal solution. Moreover, comparing multiple micro-records gives out sensitive data. The optimal k-anonymization approach minimises the data distortion but it not helps in attaining the classification goal that requires the structure of prediction. Muniswamy-Reddy et al [7] proposed three protocols namely

Standalone Cloud Store, Cloud store with Cloud Database and Messaging Service. The protocols are designed such a way that they confirm with the provenance properties. This provenance does not degrade the performance of the cloud. It is feasible to include these protocols as a layer on the top but the proposal is that it is included as a core feature in the cloud thereby reducing its threats.

In storage intensive cloud applications it is not advisable to encrypt all the original datasets or encrypt all the intermediate datasets. Hence, Puttaswamy et al [8] proposed a system named Silverline that finds all functionally encryptable data and then encrypts them to save the privacy thereby reducing the cost of privacy preserving in storage intensive applications. Xuyun Zhang et al [9] introduced a new method to reduce the preserving cost due to apply the encryption for the selected intermediate datasets. Their model achieved the sufficient preserving cost by decomposing the privacy leakage limitations. They also designed a heuristic algorithm accordingly for reducing the cost.

III. SYSTEM ARCHITECTURE

The System Architecture of the proposed work is shown in Figure 3.1. It consists of five major modules namely admin, user, application framework, database and adversary.

A. *Admin Module*

Admin module provides authentication and authorization to other users who access the cloud, This module is used to hides the patient related sensitive data for preserving the privacy and satisfying the privacy requirements of the data holder, only admin as the authority to view the original data in the cloud and can generate reports or graph based on the accessed datasets.

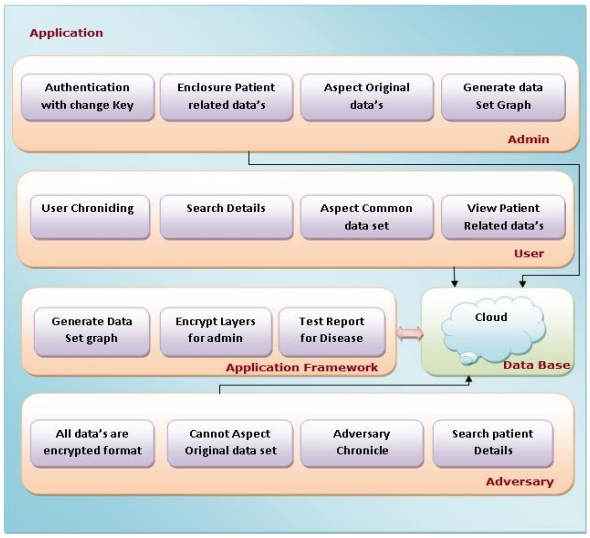

Fig 3.1 System Architecture

B. *User Module*

The functionality of user module is to authorize the user based on the user type. The operation User chronicling (user authentication) is used to authenticate and authorize the user and enable the user to access various functionalities.

The authentication is form based (i.e.,) each user is provided with a login id, password and user type. The user has authorization to view the patient related data though they cannot modify them.

C. **Application Framework**

Application framework is a powerful tool for creating cloud computing applications. The application framework is used to create applications on the server side. These applications depict the functionality of the Admin. The application framework is used to generate the dataset graph on the server side and also used to create layers of encryption in this work.

D. Database

Cloud act as a database to store the datasets. All the users can access the cloud only based on their authorization permission.

E. Adversary Module

The Adversary module to protect the data from unauthorized access so authorized or who does not have proper permission to access the cloud for datasets. Even though the adversaries try to access the data and they can view in the aspect of only encrypted data format. This is due to the fact that the intermediate datasets in the cloud are encrypted.

IV. PROPOSED METHOD

In this paper, a new novel approach has been proposed which is the combination of privacy leakage upper bound constraint method [9] and the proposed Modified Cost Reducing Heuristic (MCRH) algorithm. In addition, a new SIG method called Modified Sensitive Intermediate Datasets Graph (MSIG) is also proposed for applying into the proposed cost reducing heuristic algorithm.

We used the privacy representation and privacy leakage upper bound constraint with the steps of Single intermediate data set privacy representation and Joint privacy leakage of multiple intermediate datasets [9] and also used the privacy leakage upper bound constraint based approach for privacy preserving with the steps of Recursive Privacy Leakage Constraint Decomposition, Minimum privacy preserving cost [9].

A. Modified Cost Reducing Heuristic Algorithm

The proposed Modified Cost Reducing Heuristic (MCRH) algorithm is to select a state node iteratively with the highest heuristic value. Extends its child state nodes till it reaches an end state node. The privacy-preserving solution and computation cost have been derived from the end state for all child state. In order to achieve a priority queue is exploited to keep state nodes. The selected states nodes have been added to the priority queue. Based on the heuristic information, the proposed algorithm has been achieved a best solution. Two existing external functions called SORT [9] and SELECT [9] are used in this algorithm.

Input: A MSIG through root d_0**,** all the nodes values of each intermediate dataset are given like size, frequency, privacy leakage and privacy requirement threshold Ɛ.

Output: Reduced preserving cost

Intelligent Agent to do the following:

Step 1: A priority queue set as queue in the name of PQueue

Step 2: Find the starting node with root node of the MSIG and insert the new node into PQueue: PQueue ← SN_0

Step 3: Save the search nodes from PQueue iteratively and in rotate and their child search nodes to PQueue.

Step 4: Takes the search node with the highest heuristics values from PQueue SN_i ← PQueue

Step 5: If ED_i = pi then a solution is found otherwise go to Step 12.

Step 6: If privacy leakage is larger than threshold ε_i then the label datasets in CDE_i is encrypted.

Step 7: Ascending the unlabeled datasets in CDE_i ordered according to SORT (CDE_i).

Step 8: If total Number of unlabelled datasets is greater than M, only the first M datasets are considered to generate candidate nodes.

Step 9: Generate all the potential local solutions in A_i.

Step 10: Choose the particular solution from the privacy leakage upper bound value and the outstanding privacy leakage.

Step 11: Calculate the heuristic value according to [9] and to construct a new node from the obtained values, add into PQueue. Then go to step 3

Step 12: Find the global encryption cost and the corresponding solution.

Fig 4.1 depicts the MSIG (Modified Sensitive Intermediate Datasets Graph). Graph representing the generation relationships of intermediate data sets D from d_0 is defined as a Sensitive Intermediate data set Graph. This approach is used when an intermediate data set can originate from more than one parent data set. The data set d_4 is generated from the datasets d_1, d_2 and d_3. It is possible that (PL-Privacy Leakage) $PL_s(d_4)$ is larger than $PL_s(d_1)$ or $PL_s(d_2)$ which makes it difficult for implementation through MSIG.

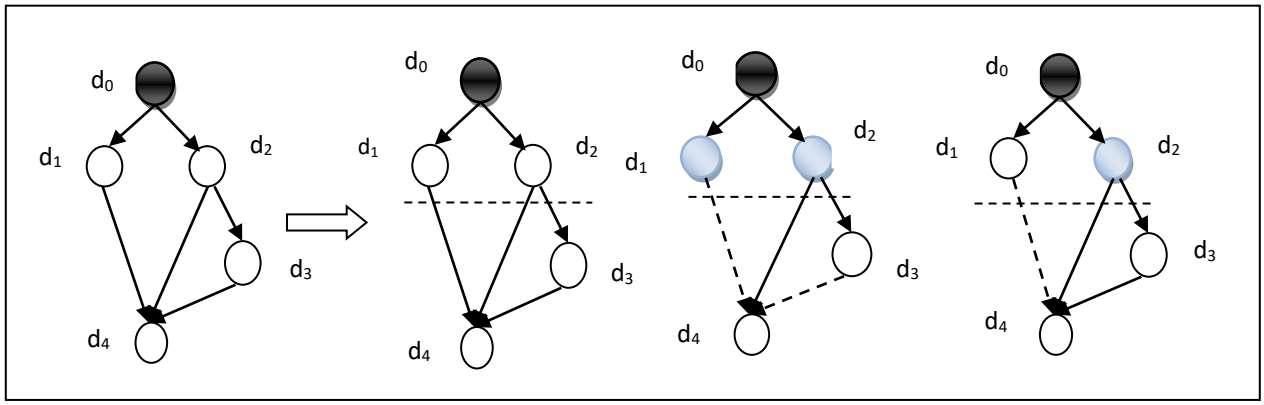

Fig. 4.1 Sensitive Intermediate Datasets Graph

In this algorithm the SN –is the State Node, Ɛ is the threshold of the privacy leakage, CDE is contains collection of sorted datasets and ED is data of the sub tree. The main difference between the proposed algorithm (MPPCRH) and the existing algorithm (PPCRH) is the effective usage of Sensitive Intermediate Graph (SIG).

B. Modified Sensitive Intermediate Datasets Graph (MSIG)

In the Modified Sensitive Intermediate Datasets Graph (MSIG) is used to achieve better cost reduction by using a cost reducing heuristic algorithm. The proposed method of MSIG is the extension of the existing extension of SIG [9].

Let d_m mean a merging dataset, which has more than one parent data set, here d_4. As only one root data set is assumed to exist in an MSIG, all the possible paths from d_0 to d_m must meet at one point nearby d_m itself. Let us consider the posterity of Data sets in layer L_i, $PD_i(d_s)$, Where d_s represents the source data set. This can be split into Encrypted data sets (ED_i) and unencrypted data sets (UD_i). Fig 4.2, $PDi(ds) \subseteq UDi$, (i.e.,) all the data sets in the graph are unencrypted data sets. Fig.4.2, $PDi(d) \subseteq EDi$,(i.e.,) all the data sets are encrypted. If d_m is a child of a data set in $PD_i(d_s)$, d_m is added to CDE_{i+1} for the next round. Except d_p, the other edges are deleted. Figure 3(d), $Dx \subseteq UDi$ and $Dy \subseteq EDi$ where $Dx \cap Dy = \emptyset$and $Dx \cup Dy = PDi(ds)$, i.e., part of data sets in $PD_i(d_s)$ are encrypted while the remainder kept unencrypted. The edges

which point to d_m from datasets in D_x and their offspring are deleted.

The main difference between the proposed MSIG and Extended SIG is number of nodes considered in the graph. This can be explained as 6 nodes were considered in the existing SIG and 5 nodes only considered in the proposed MSIG.

V. RESULTS AND DISCUSSION

In this work, a virtualized data centres create by using OpenStack open-source cloud environment [10], resource scheduling and interaction with users.

Moreover, Hadoop [11] is constructed via OpenStack to simplify huge data processing. The experiments have been conducted in this cloud environment. Moreover a UCI Repository Machine Learning datasets [12] is used for conducting the experiments.

Fig 5.1 shows the cost reduction for the privacy leakage degrees from 0.05 to 0.5. Privacy preserving cost has been obtained for all the datasets and selected datasets. From this figure, it can be observed that the proposed approach provides better cost reduction when it is compared with all datasets. Cost reduction difference is nearly 40% between the novel approach and all datasets.

The experiments have been conducted based on the different privacy leakage threshold by using the different number of datasets. Initially, the privacy preserving set threshold as 0.01 and used the 100 to 500 number of datasets for the experimentation .Fig 5.2 shows the cost reduction analysis between the proposed approach and the existing approach where the privacy preserving leakage is 0.01.

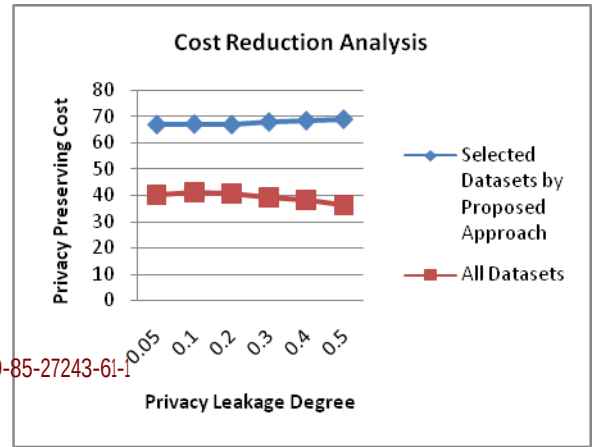

Fig 5.1 Cost Reduction Analysis for the Privacy Leakage Degrees (0.05 to 0.5)

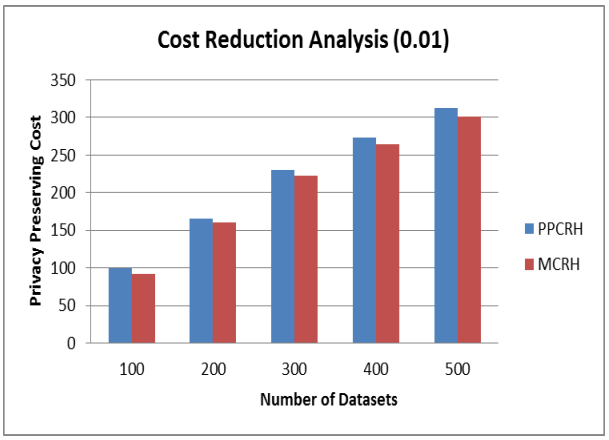

Fig 5.2 Comparison of Cost Reduction Analysis between PPRH and MCRH

From this figure-5.2, it can be observed that the proposed approach is performing well when it is compared with the existing approach when privacy preserving leakage threshold is 0.01. This is fact that the use of intelligent agent and apply the proposed MSIG.

The proposed approach and existing approach cost is increased gradually when the number of intermediate datasets increased. The larger the numbers of intermediate datasets should need more privacy-preserving cost. All datasets are used then privacy preserving cost is also increases because it is directly proportional to the number of intermediate datasets to be encrypted. Identified intermediate datasets are also increases the cost because the number of datasets to be encrypted is increased, it is also reduced by increasing the privacy leakage degree.

The cost difference between existing and proposed method depends on the number of

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dataset. So, cost of maintaining security in this work the proposed work is reduced reasonably when the number of datasets is increased. In big data, the number and size of the data sets are larger in cloud. Therefore, the proposed algorithm and MSIG method helps to reduce the privacy preserving cost of the cloud handling larger datasets and reducing the time to avoid the unnecessary data set encryption.

VI. CONCLUSION AND FUTURE ENHANCEMENTS

A novel privacy constraint-based approach is proposed in this paper for securing the cloud data by identifying the intermediate data sets which are to be encrypted so that the privacy-preserving cost is minimized. The data owner of the cloud has been satisfied with their privacy requirements using this proposed algorithm. Therefore, a novel approach called Modified Cost Reducing Heuristic Algorithm (MCRH) is proposed in this work to reduce the preserving cost of intermediate data sets. In addition, a new sensitive intermediate datasets graph called Modified Sensitive Intermediate Datasets Graph (MSIG) is also introduced to achieve better cost reduction due to identify the necessary intermediate datasets for encryption. The main advantage of this work is to preserve the intermediate data sets which are stored in cloud. Future works in this direction is to use an effective heuristic algorithm to improve the privacy prevention for the data sets in the cloud.

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Waste Collection & Segregation System Using IoT

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***Abstract*— The amount of waste has been increasing due to the increase in human population and urbanization. In cities, the overflowed bin creates an unhygienic environment. Improper segregation and disposal of waste affects the recycling and reusing process, which also affects the health of the population in the surroundings. The Rapid increase in population has led to improper waste management in metro cities and urban areas which has resulted in spreading of diseases. The segregation and disposal of waste must be managed properly to minimize the risks to public health and environment. The proposed system separates the waste into two categories namely wet and dry waste. This developed system is not only cost efficient also makes the waste management productive one. Each of these wastes is detected by the respective sensors and gets segregated inside the bin which is assigned to them.**

***Index Terms*— Internet of Things (IoT), Arduino UNO, Ultrasonic sensor, LCD Module, ESP8266 Wi-Fi Module, Capacitive Proximity Sensor.**

1. INTRODUCTION

The abundant increase in population led to the improper waste disposal. Managing the garbage consumes more time and requires a lot of man power. In recent years the waste disposal is becoming a huge cause. The most of common method of waste disposal is unplanned and it is dumped at the landfill sites this method causes ill effects to all living beings. This method can generate liquid leachate and other fungus which pollute the surface and underground water also accelerates harmful diseases which lead to the degradation of an aesthetic value of environment.

In India recycling of solid waste is done by the rag pickers who play an important role in this process while doing the rag pickers get affected with many health problems such as skin infections ,respiratory problems the dependent of rag pickers can be reduced if the automatic waste segregation takes place in the dustbin. The waste is segregated into basic main streams such as metallic, dry and wet these waste has a large potential of recycled and reused. Even through there are multiple industrial waste segregators present, it is always better to segregate the waste at source itself. The advantage of doing this type of segregation is there is no need of rag pickers to segregate the waste. In addition to it the segregated waste can be directly sent to the recycling plant, instead of sending the waste to segregation plant and then to recycling plant.

Garbage and liquid waste that end up in water bodies negatively change the chemical composition of the water, it affects ecosystem existing in water, including fish and other animals drinks that polluted water. Direct contact with waste can result in skin and blood infections through wounds. This had a significant effect on humanity, wildlife and the environment. Currently there is no such system for the automatic segregation of waste into dry, wet and metallic waste. The main purpose of this project is compact, low cost and user friendly waste segregation system for urban cities to streamline the waste management process.

2. EXISTING SYSTEM

In the existing system we see that the dustbin fills up faster during festivals or functions. So people are forced to dispose the waste outside the bin. Improper planning regarding the collection of garbage creates unhygienic conditions in the cities and towns. We see that the vehicle collecting the garbage even when the garbage bins are not filled. The sensors used in existing system are divided into two paths. The first path is level sensor for monitoring the level of waste-bin. The other path is smart load cell sensor to calculate the weight of the waste.

3. PROPOSED SYSTEM

Our proposed model of smart bin system, have the potential of detecting overflow of the bin. Ultrasonic Sensor detects the level of the bin. It recognizes the percent filling of the dustbin level and sends the alert notification. Capacitive proximity sensor is used to detect the wet waste. It segregates the waste into wet and dry waste where one type of waste is isolated for better result. The bin consists of two partitions inside where each partition collects each waste. The motor is then rotated and the specific bin collects its respective waste.

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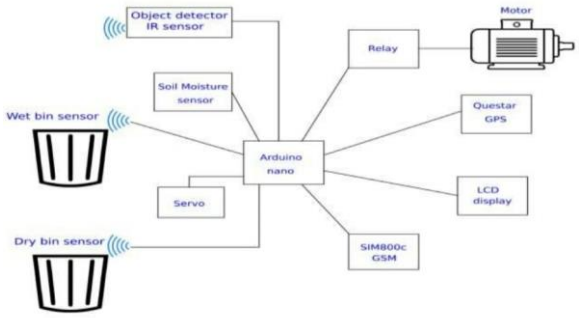

Fig.1 Block Diagram

4. COMPONENTS USED

The following listed components are used for the designing purpose:

- Ultrasonic Sensor
- Arduino UNO
- Moisture sensor
- ESP8266 Wi-Fi Module
- LCD Module
- Motor
- Power Supply

A. Ultrasonic sensor

Fig.2 Ultrasonic Sensor

This sensor is used to measure distance of system with any obstacle and have four pins, VCC pin to be connected with +5V power supply, GND-: to be connected with ground Trig pin to provide a trigger pulse to sensor through controller. Echo pin controller converts the analog signal from this pin to the digital value ranging from 0-256 by connecting this pin with ADC pin

B. Arduino UNO

Arduino Uno is an open-source small microcontroller board designed on 8bit ATmega 328P microcontroller. The board contains specially equipped components like crystal oscillator which provides clock signal, serial communication which provides communication between the board and computer or other devices, voltage regulator, to provide stable voltage, etc. to cope up with the microcontroller.

A regular Arduino has 14 digital input/output pins in which 6 pins are used for PWM outputs and 6 for analog input pins , there is a power barrel jack, USB connection (to connect to the computer etc.) , ICSP header and reset button.

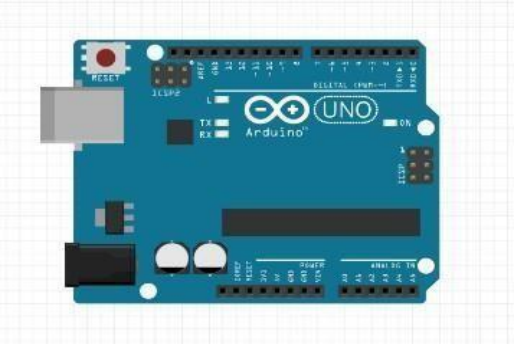

Fig.3 Arduino UNO

General pin functions:

LED	Light emitting diode is built-in and controlled by P13. LED can be switched on and off
VIN	Voltage will be by external power supply
5V	This provides stable 5V. Applying voltage to 5V or 3.3V pin bypasses the regulator and can damage the board completely
3V3	This is generated by on-board regulator. Maximum consumption cannot exceed 50mA.
GND	This is a ground pin
IOREF	Provides reference on how the microcontroller works.
RESET	It resets the microcontroller

C. Moisture Sensor

This sensor is used to measure the water content of the waste. It uses capacitance to measure the dielectric permittivity of the surrounding medium. The dielectric permittivity is a function of water content. The sensor creates a voltage proportional to the dielectric permittivity, the water content of the waste. The sensor averages the water content over the entire length of the sensor.

Fig.4 Moisture Sensor

D. ESP8266 Wi-Fi Module

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing the building of single-chip devices capable of connecting to Wi-Fi. These microcontroller chips have been succeeded by the ESP32 family of devices, including the pin-compatible ESP32-C3.

Fig.5 ESP8266 Wi-Fi Module

E. LCD Module

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

Fig.6 LCD Module

F. Power Supply

We provide 5V power supply to our project using 12V DC adapter. It is mainly used to provide DC voltage to the components on board i.e. LCD Module, microcontroller, motor.

5. METHODOLOGY

A. Functional Requirement

a. Garbage Detection: In this fragment, the garbage specified is detected.

b. Garbage Segregation: In this fragment, the dry and wet waste is segregated based on the sensor detection.

c. Notifier: In this fragment, the garbage filled is notified in the online widget.

Use Case Diagram

Use case diagram is a graph of actors, a set of use cases enclosed by a system boundary, communication associations between the actor and the use case. The use case diagram describes how a system interacts with outside actors; each use case represents a piece of functionality that a system provides to its users. A use case is known as an ellipse containing the name of the use case and an actor is shown as a stick figure with the name of the actor below the figure. The use cases are used during the analysis phase of a project to identify and partition system functionality. They separate the system into actors and use case. Actors represent roles that are played by user of the system. Those users can be humans, other computers, pieces of hardware, or even other software systems.

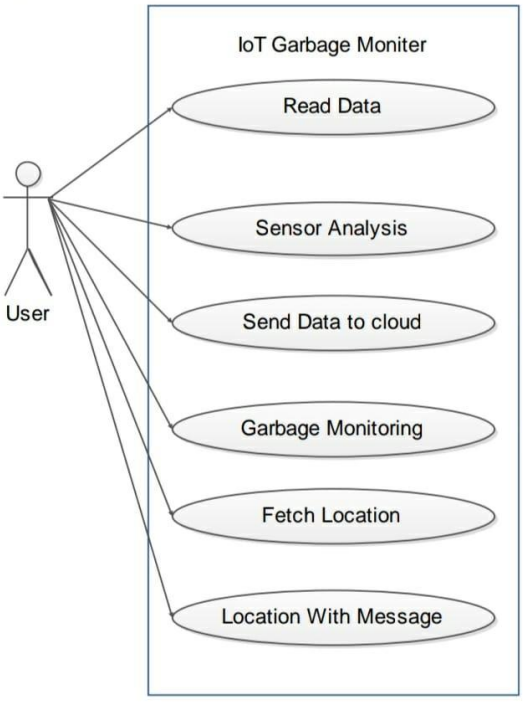

Fig.7 Use Case Diagram

B. Non - Functional Requirement

Software Quality Attribute:

a. Availability: The application will not hang and opens quickly and with 99.9% uptime. The registered user can use this application any time by logging in to the application.

b. Usability: Application has easily navigable and user friendly. The user without knowledge of this application can use this application easily once user starts using this application.

c. Integrity: The application does not store any cache data or doesn't use system resources in background. The credentials used by one user cannot be visible to another and it is much secured application.

6. System Analysis & Design

In the system design, the focus is on identifying the modules, whereas during detailed design the focus is on designing the logic for the modules. In other words in system design attention is on what components are needed, while in detailed design how the components can be implemented in the software is the issue.

The design activity is often divided into two separate phase system design and detailed design. System design is also called top-level design. At the first level focus is on deciding which modules are needed for the system, the specifications of these modules and how the modules should be interconnected. This is called system design or top level design. In the second level the internal design of the modules or how the specifications of the module can be satisfied is decided. This design level is often called detailed design or logic design.

A. System Analysis

The IoT Architecture generally comprises of these 4 stages:

Stage 1 (Sensors/Actuators):- A thing in the context of "Internet of Things", should be equipped with sensors and actuators thus giving the ability to emit, accept and process signals.

Stage 2 (Data Acquisition Systems):- The data from the sensors starts in analogue form which needs to be aggregated and converted into digital streams for further processing. Data acquisition systems perform these data aggregation and conversion functions.

Stage 3 (Edge Analytics):- Once IoT data has been digitized and aggregated, it may require further processing before it enters the data center, this is where Edge Analytics comes in.

Stage 4 (Cloud Analytics):- Data that needs more in-depth processing gets forwarded to physical data centers or cloud-based systems.

B. System Architecture

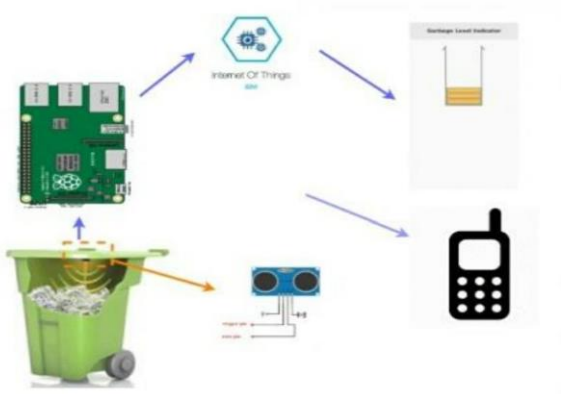

Fig.8 System Architecture

C. DB Design

Data Flow Diagram graphically representing the functions, or processes, which capture, manipulate, store, and distribute data between a system and its environment and between components of a system. The visual representation makes it a good communication tool between User and System designer. Structure of DFD allows starting from a broad overview and expands it to a hierarchy of detailed diagrams. DFD has often been used due to the following reasons:

- Logical information flow of the system.
- Determination of physical system construction requirements.
- Simplicity of notation.
- Establishment of manual and automated systems requirements.

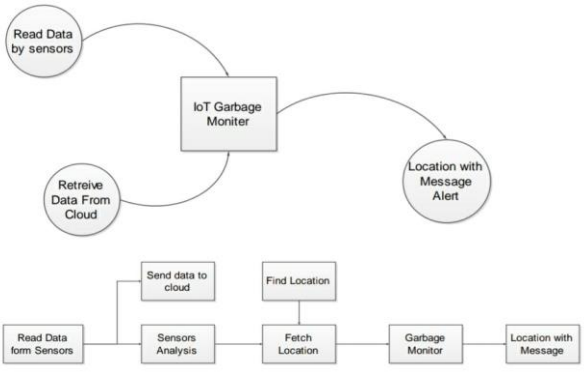

Fig.9 Data Flow Diagram

D. User Interface Design

Activity diagrams represent the business and operational workflows of a system. An Activity diagram is a dynamic diagram that shows the activity and the event that causes the object to be in the particular state. It is a simple and intuitive illustration of what happens in a workflow, what activities can be done in parallel, and whether there are alternative paths through the workflow.

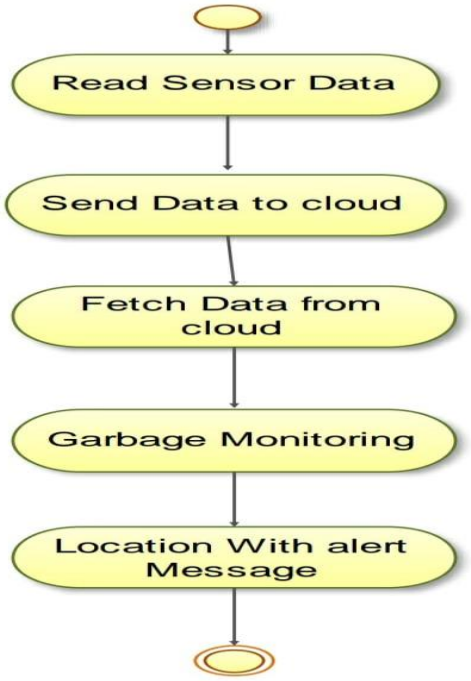

Fig.10 Activity Diagram

7. CONCLUSIONS

Overflowing garbage bins causes five impacts on health environment are diseases like increasing the risk of contracting with salmonella, typhoid fever, food poisoning, gastric problems and major illness. We can reduce or control such kind of problems by Implementing of real time waste collection and segregation system by using IOT, in this system the information of all smart bins can be accessed from anywhere and anytime by the authenticated person and authenticated person can take a decision accordingly.

By implementing this system the cost reduction, resource optimization, effective usage of bins can be done. By reducing unnecessary rounds for garbage collection this system indirectly reduces traffic in the city. This system will inform the status of each and every bin in real time located throughout the city, so that the concerned authority can dispatch the garbage collection vehicle only when the bin is completely full or is about to full. The traditional garbage collection system is changed into a smart and intelligent system. The integrated IoT system is very useful to remotely monitor the garbage levels in bins.

This system also reduces human efforts and it is user- friendly system. This system will help to make our environment neat, clean more suitable for living, reducing global warming and making the world healthier.

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Human Activity Recognition System

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***Abstract*— Human activity recognition is an important yet challenging research topic in the computer vision community. In this paper, we propose context features along with a deep model to recognize the individual subject activity in the videos of real-world scenes. Besides the motion features of the subject, we also utilize context information from multiple sources to improve the recognition performance. We introduce the scene context features that describe the environment of the subject at global and local levels. We design a deep neural network structure to obtain the high-level representation of human activity combining both motion features and context features. We demonstrate that the proposed context feature and deep model improve the activity recognition performance by comparing with baseline approaches. We also show that our approach outperforms state-of-the-art methods on 5-activities and 6-activities versions of the Collective Activities Dataset.**

***keywords*—Activity recognition, KNN and Random Forest, feature extraction, Accelerometers and Gyroscopes, Deep neural networks.**

I. Introduction

Human activity recognition (HAR) is a well-known research topic, that involves the correct identification of different activities, sampled in a number of ways. In particular, sensor-based HAR makes use of inertial sensors, such as accelerometers and gyroscopes, to sample acceleration and angular velocity of a body. Sensor-based techniques are generally considered superior when compared with other methods, such as vision-based, which use cameras and microphones to record the movements of a body: they are not intrusive for the users, as they do not involve video recording in private and domestic context, less sensitive to environmental noise, cheap and efficient in terms of power consumption [8, 13]. Moreover, the wide diffusion of embedded sensors in smartphones makes these devices ubiquitous. One of the main challenges in sensor-based HAR is the information representation. Traditional classification methods are based on features that are engineered and extracted from the kinetic signals. However, these features are mainly picked on a heuristic base, in accordance with the task at hand. Often, the feature extraction process requires a deep knowledge of the application domain, or human experience, and still results in shallow features only [5]. Moreover, typical HAR methods do not scale for complex motion patterns, and in most cases do not perform well on dynamic data, that is, data picked from continuous streams.

II. Related work (Literature Survey)

1.ConvNet Architecture Search for Spatiotemporal Feature Learning

Key points: Introduces 3D convolutional networks as feature extractors. It uses 3D convolutions on video frames (where convolution is applied on a spatiotemporal cube). They trained the network on a large dataset of Sports 1M and then used the model as a feature extractor for other datasets. Their finding was a simple linear classifier like SVM on top of an ensemble of extracted features worked better than the state-of-the-art algorithms. The network focused on spatial appearance in the first few frames and tracked the motion in the subsequent frames
Issues: The long-range temporal modelling is a problem. Training such huge networks is computationally a problem

2.Action Recognition by Dense Trajectories

Key points: It introduces an approach to model videos by combining dense sampling with feature tracking. They introduce an efficient solution to remove camera motion by computing the motion boundaries descriptors along the dense trajectories. Local descriptors computed in a 3D video volume around interest points have become a popular way for video representation. To leverage the motion information in our dense trajectories, they compute descriptors within a space-time volume around the trajectory

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Issues tackled: Trajectories tend to drift from their initial location during tracking.

3.Behavior Recognition via Sparse Spatio-Temporal Features

Key points: Does behavior recognition use behavior in terms of spatiotemporal features? Introduces a new spatio-temporal interest point detector and analyzes various cuboid descriptors. Concludes that cuboid prototyping(using K-means clustering) is a good behavior descriptor.
Possible future improvements: Using the spatiotemporal layout of the features Using features detected at multiple scales Incorporating a dynamic model on top of their representation

4.Action Recognition with Improved Trajectories

Key points: Improves dense trajectories by explicitly estimating camera motion. Demonstrates how the performance can be improved by removing background trajectories It also uses state of the art human detectors to remove potentially inconsistent matches during camera motion estimation.

5.3D Convolutional Neural Networks for Human Action Recognition

Key points: Proposes to perform 3D convolutions to extract spatial and temporal features from the video. Discusses a 3D CNN model that uses the proposed 3D convolutions. The CNN architecture generates multiple channels of information from adjacent video frames and performs convolution and subsampling separately in each channel. Proposes to regularize the 3D CNN models by augmenting the models with auxiliary outputs computed as high-level motion features.
Issues: Uses supervised training where labeling of data is a painful job. The number,l of labeled samples can be significantly reduced when such a model is pre-trained using unsupervised algorithms.

6.Large-scale Video Classification with Convolutional Neural Networks

Key Points: Introduces Early fusion, Late fusion, and slow fusion connectivity for fusing time information in CNN models. They conclude that slow fusion consistently performs better. Introduces a multi-resolution architecture for CNN to reduce the computation cost without affecting performance. It uses 2 separate streams of processing over 2 spatial resolutions. One of the streams is fed with downsampled frames(context) and the other stream is fed with the center portion of the image(fovea).
Issues: Computationally intensive and very little performance improvement is achieved.

Future Improvements: Consider broader categories in the dataset Investigate approaches that take camera motion into account. Explore RNNs for learning global video-level predictions.

7.Two-Stream Convolutional Networks for Action Recognition in Videos

It proposes a model that uses separate spatial and temporal recognition streams based on ConvNets.
Issues: The spatial pooling in the network does not take the trajectories into account. The camera motion isn't handled properly. It is compensated by mean displacement subtraction.

8.Beyond Short Snippets: Deep Networks for Video Classification

Key points: Explores the idea of incorporating information across longer video sequences. Introduces feature pooling method that processes each frame independently and uses max-pooling on local information to combine frame-level information. Demonstrates the usage of an RNN that uses LSTM cells which are connected to the output of the underlying CNN. Validates the effectiveness of using Optical flow for motion information.
Improvements: An RCNN can be used to generate better features by utilizing its own activations in the last frame in conjunction with the image from the current frame.

9.Long-term Recurrent Convolutional Networks for Visual Recognition and Description

Key points: Proposes the LRCN(Long term Recurrent Convolutional Networks) which combines convolutional layers with long-range temporal recursion.
Issues: It gives a single prediction for the entire video. If there are multiple actions in the clip, it takes the average of the probabilities of the softmax layer's output.

10.LNCS 7065 — Sequential Deep Learning for Human Action Recognition

Key points: Introduces a 2 step model to classify human actions. In the first step, a Conv 3D model is used to extract spatio-temporal features. In the second step, RNN with 1 hidden layer of LSTM cells is used to classify action sequences.
Improvements: A single-step model in which Conv3D and LSTM can be trained at once.

12.Convolutional two-stream Network Fusion for Video Action Recognition

Key points: Proposes an architecture for two-stream networks

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with a convolutional fusion layer between the networks and a temporal fusion layer.
Issues: Doesn't increase the number of parameters significantly

III. Implementation

Training Phase

A. Data collection

The dataset has 561 features and 7352 observations, the entirety of which is used for our initial analysis for generating conclusions using K-Nearest Neighbors (KNN) and Random Forest classifier. KNN runs through the entire dataset finding the distance "d" between the unobserved point and each point of the training set. The K is the number of training points that are close to the unobserved point. In our model we have set the value of K as 15. The Random Forest classifier is a collection of decision trees from a randomly selected subset of training data and the final class is predicted by aggregating all the votes from each decision tree. In our model we have taken the number of decision trees that is n estimators = 500. Then the data is reduced, using both feature selection and dimensionality reduction techniques for better recognition accuracy, as well as to reduce the computational cost and the results are compared. Dimensionality reduction is done using Principal Component analysis (PCA) retaining 95% of the total variance – which yields 67 effective features.

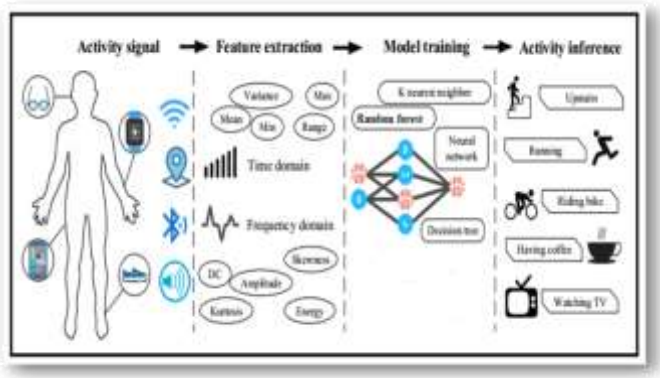

Fig. 1. Proposed System Architecture

B. K-NN Algorithm

K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories. K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm. K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems. K-NN is a **non-parametric algorithm**, which means it does not make any assumption on underlying data. It is also called a **lazy learner algorithm** because it does not learn from the training set immediately instead it stores the dataset and at the time of classification, it performs an action on the dataset. KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much similar to the new data. It is simple to implement. It is robust to the noisy training data and It can be more effective if the training data is large. But always needs to determine the value of K which may be complex some time.

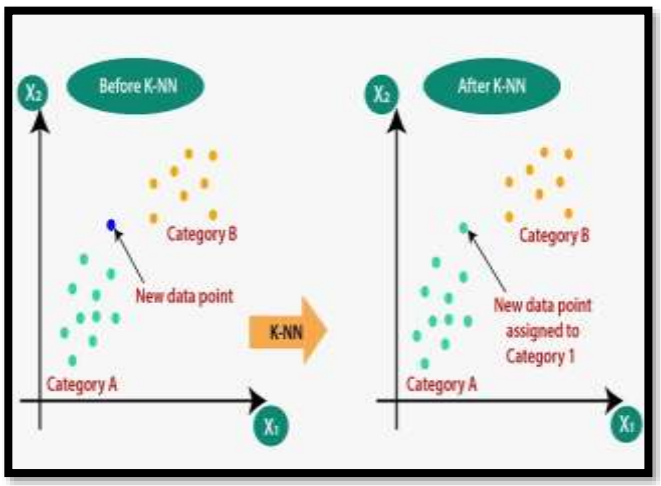

Fig.2 K-NN Algorithm

C. Random Forest Algorithm

Random forest classifier creates a set of decision trees from randomly selected subset of training set. It then aggregates the votes from different decision trees to decide the final class of the test object. Random Forest increases predictive power of the algorithm and also helps prevent overfitting. Random forest is the simplest and widely used algorithm. Used for both classification and regression. It is an ensemble of randomized decision trees.

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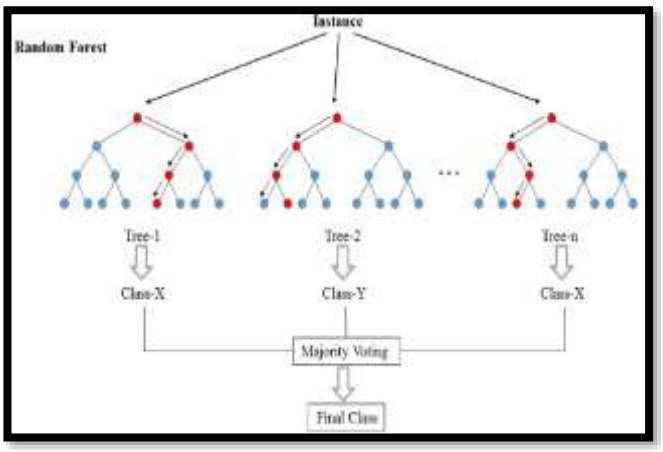


Fig.3 Random Forest (RF) Algorithm

Decision trees are commonly used in operations research and operations management. If, in practice, decisions are to be made online without remembering them under incomplete knowledge, a decision tree must be accompanied by a probability model such as best choice model or online selection model algorithm. Another use of decision tree is as a descriptive means of calculating conditional probabilities. Decision trees, influence diagrams, utility functions, and other decision analysis tools and methods are taught to college students in business, health economics, and public health schools and are examples of research methods. operations research or management science.

Testing phase

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement**.**

IV. Results

For the users to use this model we build a frontend system which helps in easy user interaction. With the help of frontend window, users the load the required test image into the model and can check for the presence of water resource. After loading of model, we obtain the display message denoting the output along with the precision value of the obtained result. This value gives us a fair idea of how confidently can the user believe the obtained result having best accuracy among other algorithms.

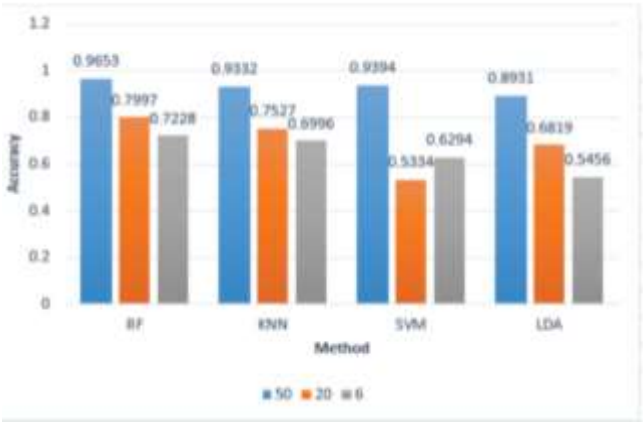


Fig.4 Classification accuracy of different classifiers without best features selection.

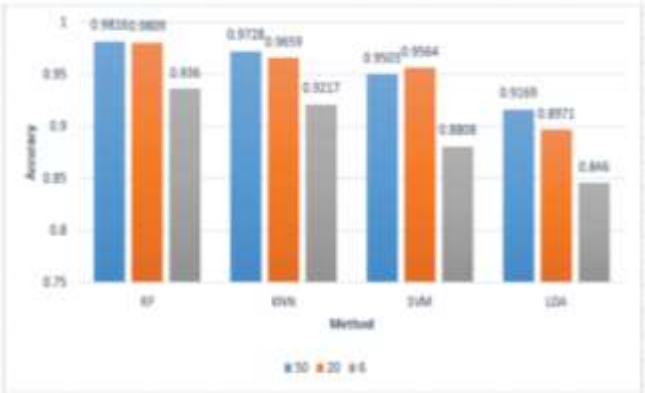
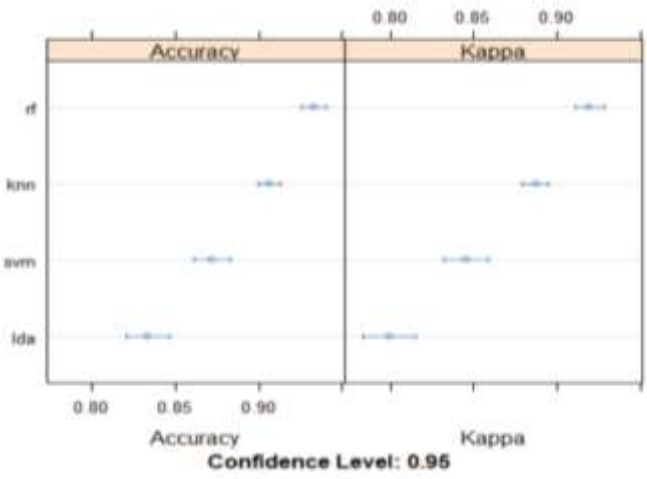


Fig.5 Classification accuracy of different classifiers with best features selection by Random Forest.



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V. Conclusion

In this paper, data extracted from the accelerometers and gyroscopes of smartphones is used to derive patterns and formulate results pertaining to the basic physical activity of an individual. We propose a deep learning methodology to reach the conclusions, and find that the proposed deep learning method gives better results compared to the other methods, when computed with the same data, and under the same environment of computation. The study, of course, is not free of flaws in many ways. For instance, it is currently beyond the scope of this study to find the reasons as to why an individual shows such a highly specific behavior while performing a particular activity. Moreover, the accuracy for the training models can be much better, despite having undergone parameter and hyper-parameter pruning, as well as an optimum neural network architecture development. The results and insights inferred from this study can prove to be very fruitful in providing assistance to many individuals and organisations, that require reliable and accurate information about the basic healthcare and maintenance of the human body. It could also be used for further studies related to human behaviour. It could aid an individual in preventing (or promoting) certain habits or behaviours that deteriorate (or facilitate) the functioning of the body.

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Design of an Adaptive Clustering Mechanism for Large Datasets on social media Comments

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Abstract- The social media gives an important role for the contributions of the economy and development of a country. The performance of the country will be upgrade from the public opinion about any system. The opinion of the public will be considered as a data for the growth of the nation. Text mining can be used to know public opinion about the system implemented in real time. The rapid growth of data in social media initiates the researchers to use the data source as big data analysis. The dataset can be derived from Face book, Twitter public sentiment in part of service, website system, and news can be used as consideration as a input as social media comments. This study proposes a new parallel clustering algorithm based on the k-means algorithm. It significantly reduces the exponential growth of computations. The proposed algorithm splits a dataset into batches while preserving the characteristics of the initial dataset and increasing the clustering speed. The idea is to define cluster centroids, which are also clustered, for each batch. According to the obtained centroids, the data points belong to the cluster with the nearest centroid. Efficient framework is used for pre-processing the data. Testing is used to measure the performance level of mini batch K-means algorithm by using the evaluation metrics such as purity, entropy and F-measure.

Keywords- ***Big data, text mining, k-means algorithm, text comments, data pre-processing.***

I. INTRODUCTION

Data mining is known as Knowledge Discovery in Databases (KDD).Data mining is a process of analyzing large databases to find patterns that are valid, useful, and understandable. The valid means holds the new data with some certainty and useful means data mining should be able to act on the terms in the comments finally, the understandable means humans should be able to read/identify the pattern. Data mining performed with large data, heterogeneous machine learning, statistics, artificial intelligence, databases and visualization.

Text mining is a part of data mining its aim is to extract high-quality information from the given text. The extraction of high quality information can be done through statistical pattern learning. text mining includes information retrieval, lexical analysis, pattern recognition, information extraction, data mining techniques, association analysis, visualization, and predictive analytics.

Cluster analysis or clustering is the process of grouping a set of objects in such a way that objects which are more similar are grouped under single clusters and the objects which are not similar are grouped under other clusters. It is the main task of exploratory data mining, and a common technique for statistical data analysis, used in many fields, including machine learning, pattern recognition, image analysis, information retrieval, and bioinformatics.

In this paper, we propose an approach based on parallel processing of batches using the k-means algorithm. In this case, the dataset is split into several batches to satisfy the limitations of the k-means algorithm [9]. The resulting clusters are created in parallel without full memory loading, which significantly speeds up the clustering. The relevance of the work is that the use of small batches reduces computational cost and increases the convergence speed of the clustering algorithm.

Real large datasets are used to evaluate the performance of the proposed approach Mini Batch k-means algorithms.

The rest of the paper describes as follows: Literature Survey describes some of the current knowledge related to the text clustering as well as theoretical and methodological contributions to a clustering method, the Methodology brief about the systematic, theoretical analysis of the methods

applied to a document clustering, the architecture of the system will brief the overall work of the system. Then it describes the text pre-processing module. The similarity measures are calculated for the comments are explained in the similarity measure module. Brief about the text comment clustering by using the Mini Batch K-means algorithm.

II. LITERATURE SURVEY

Cluster analysis is the basic data analysis tools in big data analysis. Cluster analysis can be used as a standalone data mining tool for the data distribution and data preprocessing step for data mining algorithms operating on the clustering of the large datasets. Clustering algorithms are used to organize data, categorize data, for data compression and model construction. Clustering is a huge area of research, which finds applications in many fields including bioinformatics, pattern recognition, image processing, marketing, data mining, economics etc.

Clustering is a group of set of objects and finds the relationship between the objects. Hence the clustering algorithm and similarity measures are used for the text data clustering.

A large number of researches have been devoted to big data analysis [3]. The issue with big data clustering is that a lot of memory is required. Researchers offer new methods and extend existing clustering algorithms to solve this issue. In recent years, the k-means algorithm and its modifications have been the subject of research on the analysis of large volumes of data [16]. However, the k-means algorithm is quite sensitive to initialization issues. So, an approach for the k-means algorithm initialization was proposed in [12]. It is quite simple to implement, not trivial and converges quickly enough in a small number of iterations. However, this approach requires a large computational cost. It is necessary to use parallel technology to perform clustering on high-dimensional data. In connection with this, there is a growing need to parallelize big data clustering while preserving the main clustering structure and reducing computational costs. So, k-means based parallel algorithms are used to cluster data in various applications [6]. A multi-core parallelization of the k-means/k-modes algorithm for biological data clustering that provides complex cluster number estimations for big data on a single computer was proposed [2]. However, this approach requires additional effort and equipment (specialized hardware for fast communication between computers, multiple software installations in heterogeneous environments). A parallel implementation of the k-means clustering algorithm on a cluster of personal computers (PCs) was described in [7]. The proposed algorithm is parallelised based on the inherent data-parallelism especially in the distance calculation and centroid update operations for dataset. The time complexity of this method is highly dependable on the number of iterations. An efficient method for topological data clustering and discovering clusters of arbitrary shape was proposed [5]. Experiments on real and synthetic datasets showed the efficiency of the proposed method. However, the speedup of the algorithm was not evaluated. Summarizing the analysis of the state of research in parallel big data processing using k-means, we can draw the following conclusions. Firstly, not all papers based on k-means initialization issues consider parallel data processing. Secondly, works aimed at improving the quality of clustering often require large computational resources. Besides, parallel clustering is quite a demanded area of research due to the constant growth of data volumes. This confirms the relevance of our research. A new clustering method based on parallel batch clustering on a single machine using the k-means algorithm is proposed. The basic idea is that the dataset is divided into several parts of equal dimensions, which are then parallel clustered to detect the centroids of the clusters and overcome the curse of dimensionality inherent in k-means for big data clustering. Then k-means applies again to the resulting array of centroids from all batches. It leads to a reduction in computational costs comparing to the classic k-means. Experiments on datasets of medium and high dimension show that the proposed approach based on parallel clustering of batches significantly improves the clustering time for all datasets.

Clustering applications

Clustering is a major tool in a number of applications in many fields of business and science. Hereby, following information will summarize the basic directions in which clustering are used.

a. Finding Similar Text: This feature is often used when the user has spotted one “good” comment in a search result and wants more-like-this. The interesting property here is that clustering is able to discover comments that are conceptually alike in contrast to search-based approaches that are only able to discover whether the comments share many of the same words.

b. Organizing Large comments Collections: comment retrieval focuses on finding words relevant to a particular query, but it fails to solve the problem of making sense of a large number of uncategorized comments. The challenge here is to organize these comments in a taxonomy identical to the one humans would create given enough time and use it as a browsing interface to the original collection of comments.

c. Duplicate Content Detection: In many applications there is a need to find duplicates or near-duplicates in a large number of comments. Clustering is employed for plagiarism detection, grouping of related news stories and to reorder search results rankings (to assure higher diversity among the topmost documents). Note that in such applications the description of clusters is rarely needed.

d. Recommendation System: In this application a user is recommended articles based on the articles the user has already read. Clustering of the articles makes it possible in real time and improves the quality a lot.

e. Search Optimization: Clustering helps a lot in improving the quality and efficiency of search engines as the user query can be first compared to the clusters instead of comparing it directly to the documents and the search results can also be arranged easily.

PRIOR STUDIES

This section describes abstraction of few of the related work, in terms of the problem taken in hand, their approach and finding.

Rasim M. Alguliyev, Ramiz M. Aliguliyev "Efficient algorithm for big data clustering on single machine "[17] The idea is to define cluster centroids, which are also clustered, for each batch. According to the obtained centroids, the data points belong to the cluster with the nearest centroid. Real large datasets are used to conduct the experiments to evaluate the effectiveness of the proposed approach. The proposed approach is compared with k-means and its modification. The experiments show that the proposed algorithm is a promising tool for clustering large datasets in comparison with the k-means algorithm.

Mohit Sharma and Pranjal Singh "Text mining in big data and Similarity Measures" [16] Mining is an important technique which organizes a large number of objects into small number of coherent groups. It leads to efficient and effective use of these text for information retrieval. Clustering algorithms require a similarity metric to identify how the two different textare related/similar to each other. This difference is often measured by some distance measure such as Cosine similarity, jaccard and others. In the work, the well known five different distance measures are used and compare their performance on datasets using k-means clustering algorithm. But, this work has a lack of efficient feature selection and representing the terms.

Anna Huang, "Similarity Measures for Text Document Clustering" [14] Clustering is a useful technique that groups a large quantity of unordered text documents into a small number of meaningful and coherent clusters. Partitional clustering algorithms have been identified more a more suitable than the hierarchical clustering algorithm schemes for clustering the large datasets. The different types of similarity measures have been used for clustering the data, such as euclidean distance measure, cosine similarity, and relative entropy. In the paper, different similarities measures are used to compared and analyze their effectiveness by using the similarity measures in partitional clustering for text document datasets. The work utilize the standard K-means clustering algorithm and report the results on seven text document datasets and five distance/similarity measures that have been most commonly used in text clustering. In the observed work there are three components that affect the final results, they are representation of the terms, distance or similarity measures, and the clustering algorithm itself.

Mihuandayani, "Text mining based on tax comments as big data analysis using SVM and feature selection"[1] The paper discussed The dataset used is derived from Facebook and Twitter as a source of data in processing tax comments. The results of opinions in the form of public sentiment in part of service, website system, and news can be used as consideration to improve the quality of tax services. In this research, text mining is done through the phases of text processing, feature selection and classification with Support Vector Machine (SVM). To reduce the problem of the number of attributes on the dataset in classifying text, Feature Selection used the Information Gain to select the relevant terms to the tax topic. Testing is used to measure the performance level of SVM with Feature Selection from two data sources. Performance measured using the parameters of precision, recall, and F-measure.

Gaps identified

- The work has a lack of efficient feature selection and Representing the terms.
- SVM don't perform the iterative process to identify the positive and negative comments.
- Large datasets has lack of space and time efficiency.
- To design and develop the efficient text mining based on social media comments by using genetic algorithm technique and evaluate its performance.

III EXISTING SYSTEM

The comments give an important role for the contributions of the economy and development of a country. One of consideration to know the performance of system particularly in Indonesia is to know the public opinion as for the object service. Text mining can be used to know public

opinion about the any system. The rapid growth of data in social media initiates this research to use the data source as big data analysis. The dataset used is derived from Facebook and Twitter as a source of data in processing system comments. The results of opinions in the form of public sentiment in part of service, website system, and news can be used as consideration to improve the quality of system services. In this research, text mining is done through the phases of text processing, feature selection and classification with **Support Vector Machine (SVM)**. To reduce the problem of the number of attributes on the dataset in classifying text, Feature Selection used the Information Gain to select the relevant terms to the related topic. Testing is used to measure the performance level of SVM with Feature Selection from two data sources. Performance measured using the parameters of precision, recall, and F- measure.

The below figure1 shows that the existing system text mining flowchart. The next phase of selecting the relevant features is the classification phase using SVM algorithm which purposed to find the function of the separator (hyper plane) with the largest margin, so as to separate the two data sets optimally [19]. The SVM algorithm is very effective used to handle the
text classification problem [20].

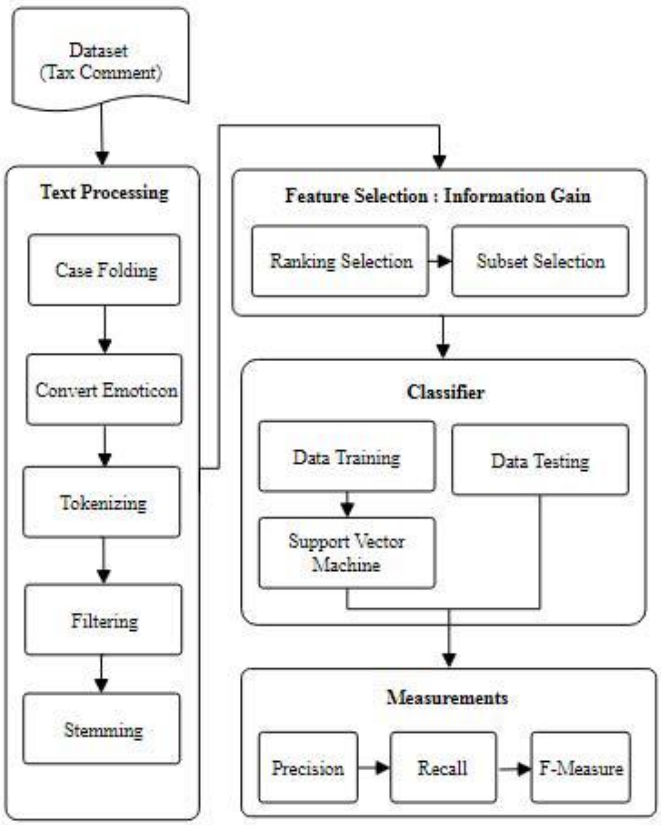

Figure 1: Existing system text mining flowchart

SVM is capable of working on high-dimensional datasets using the trick kernel. SVM uses only some of the selected data points that contribute (Support Vector) to form the model used in the classification process. In this study, SVM was used to find hyper plane that separated the data on positive comments and negative comments. SVM used the kernel to transform the input into the feature space or implement the model to a higher dimension so that the nonlinear case separable on the input becomes linear separable on a feature space.

IV PROPOSED WORK

Figure 2 shows the overall methodology of the proposed efficient comment clustering system on centralized system.

The different steps in the architecture are defined as following,

- Only social media comment datasets are collected from the social media like face book, twitter, news etc.
- The collected comments are pre-processed using different techniques such as removal of stop words and stemming the words in each system. Stop words are the non-descriptive words such as a, and, are, then, what, is, the, do etc. are removed from the each of the comment. Stemming the words means words with different endings will be mapped into a single word Ex: production, produce, product, produces will be mapped to the stem “produc” to reduce the appearance of same words with different forms. After pre-processing steps are performed now, the data are ready to calculate the similarity measures.
- Initially calculate the term frequency (TF) and inverse document frequency (IDF) for each comment. Term frequency tells occurrence of the word in the comment and inverse document frequency represents the weight of word means to tell how important the word in the comment.
- The similarity measures such as Cosine similarity, Jaccard coefficient and Pearson correlation coefficient is applied to the pre-processed comment in the datasets.
- Apply the Mini Batch K-means algorithms to each of the calculated similarity values at initial level then it produces the two clusters based on the similarity value that is positive comment cluster and negative comment cluster.
- The clustered data are received by apply Mini Batch K-means algorithm for the tax comment clustering.

Mini Batch K-means algorithm apply the step by step process and perform the clustering operation on the text documents

- Performance factors/metrics such as purity, entropy and F-Measure are used to analyze the proposed document clustering. Quality of the cluster is calculated by purity and entropy whereas the accuracy of the cluster is calculated by F-Measure.

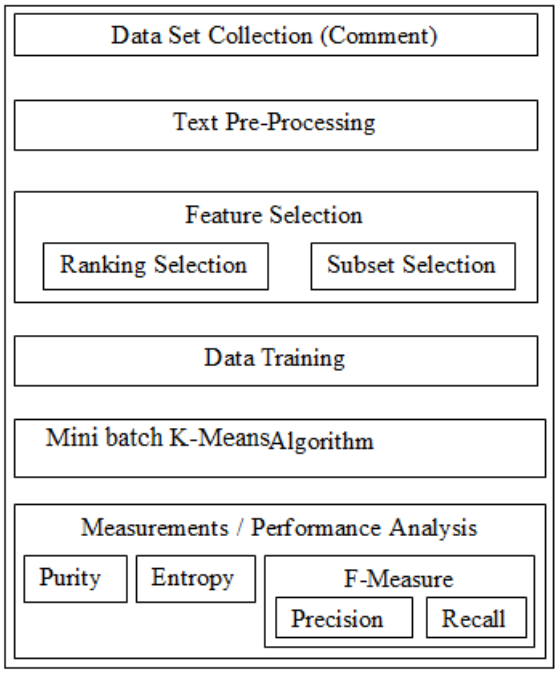

Figure 2: Proposed system Architecture

Text Pre-processing

The text pre-processing can be done by the following process shown in the figure 3

Text collection: Selecting and accessing the data from the social media to perform the clustering.

Text Preprocessing: Initially the collected text from social media is composed of a lot of elements or the words. Preprocessing requires the reduction in the text contents.

Comment Collection includes the processing of data like indexing, filtering etc which are used to collect the data that need to be clustered, index them to store and retrieve in a better way, and filter them to remove the extra data.

Removal of Stop Word: Stop words are the words that are non-descriptive for the topic of a text such as a, and, are, then, what, is, the, do etc. It is the frequently occurring words that are not searchable. This is done to improve the speed and memory consumption of the application. There are standard stop word lists available but in most of the applications these are modified depending on the quality of the dataset.

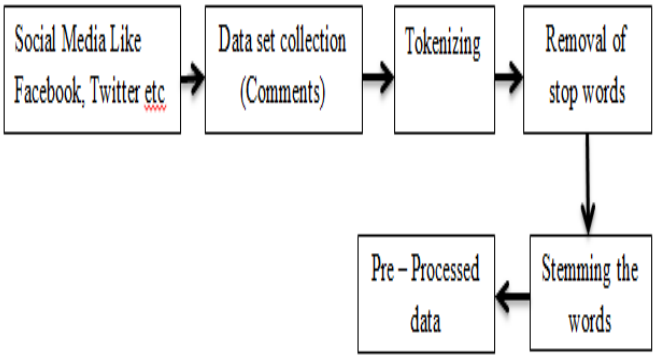

Figure 3: Text pre-processing

Stemming the words means words with different endings will be mapped into a single word or Stemming is the process of reducing words to their stem or root form. For example 'cook', 'cooking', 'cooked' are all forms of the same word used in different constraint and but for measuring similarity these should be considered same and production, produce, product, produces will be mapped to the stem "produc".

Preprocessed data preprocessing consists of steps that take as input a plain text and output a set of tokens to be included in the vector model.

TF: Term Frequency, which measures how frequently a term occurs in a text. Since every text is different in length, it is possible that a term would appear much more times in long text than shorter ones. Thus, the term frequency is often divided by the document length (aka. the total number of terms in the text) as a way of normalization:

TF (t) = (Number of times term t appears in a text)
(Total number of terms in the text)

IDF: Inverse Document Frequency, which measures how important a term is. While computing TF, all terms are considered equally important. However it is known that certain terms, such as "is", "of", and "that", may appear a lot of times but have little importance. Thus we need to weigh down the frequent terms while scale up the rare ones, by computing the following:

IDF (t) = loge (Total number of text / Number of text with term t in it)

1. Similarity Measures Module

A similarity measure or similarity function is a real valued function that quantifies the similarity between two objects. The similarity measure gives the degree up to which each objects are close to or separate from each other. This

module performs the calculation of the Cosine similarity, Jaccard coefficient and Pearson correlation coefficient

A variety of similarity or distance measures have been proposed and widely applied, such as the cosine similarity, Jaccard coefficient and Pearson correlation coefficient.

i. Cosine Similarity

The similarity of two texts corresponds to the correlation between the vectors, where the texts are represented as term vectors. This is quantified as the cosine of the angle between vectors, which is called the cosine similarity. An important property of the cosine similarity is its independence of document length .The result of the cosine similarity lies between 0-1. If the cosine similarity between the two texts is 1 then, the documents are similar. If the cosine similarity between the two texts is 0 then, the texts are not similar. The mathematical formula to calculate the cosine similarity is given as shown in equation

$$\cos(\theta) = \frac{A.B}{\|A\|\|B\|} = \frac{\sum_{i=1}^{n} A_i \times B_i}{\sqrt{\sum_{i=1}^{n}(A_i)^2} \times \sqrt{\sum_{i=1}^{n}(B_i)^2}}$$

Where, A- Term count value in the document1
B- Term count value in the document2

ii. Jaccard Coefficient

The Jaccard coefficient, also known as Tanimoto coefficient, measures similarity as the intersection divided by the union of the objects. For texts, the Jaccard coefficient compares the sum weight of shared terms to the sum weight of terms that are present in either of the two texts but are not the shared terms. The value of the Jaccard coefficient exists in the range of 0-1.The value 1 means the objects are similar and the value 0 means the texts are different. The formal definition is in the equation

$$J(A,B) = \frac{A \cap B}{A \cup B}$$

Where, A- Term count value in the text1
B- Term count value in the text2

iii. Pearson correlation coefficient

Pearson's correlation coefficient is another measure of the extent to which two vectors are related. There are different forms of the Pearson correlation coefficient formula. The value of this measure lies between the 0 to 1. The value is 1 when the number of terms present in the text1 is equal to the number of terms present in the text2. Given the term set T = {t1, . . . , tm}, a commonly used in the form is equation

$$r = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2}\sqrt{\sum_i (y_i - \bar{y})^2}}$$

Where, x_i – Term count value of the text1
y_i – Term count value of the text2
$\bar{x}$ - Mean term count value of the text1
$\bar{y}$ - Mean term count value of the text2

2. Implementing Mini Batch K- Means Algorithm

In this paper, we propose an algorithm based on batches that are clustered in parallel. The proposed algorithm with a split dataset consists of several steps. The input dataset is divided into batches. Clustering is applied to each batch as a separate dataset. The initial centroids are selected randomly. Each batch is processed in parallel until the convergence condition is met. The algorithm minimizes the sum of squared errors for all clusters. The resulting centroids of each batch form a new small dataset to which clustering is again applied to determine the centroids. Data partitioning into the batches before clustering and their parallel processing reduce the computation time.

Input: $X = \{x_1, x_2, \ldots, x_n\}$
q: batch size according to (1)
k: number of desired clusters
Output: A set of k clusters $C = \{C_1, C_2, \ldots, C_k\}$
Step 1. Split dataset of n elements into a set of batches with equal size q.
Step 2. Apply clustering to each batch:
Initialization of clusters' centroids
Repeat
Calculate the value of the function (2) for each data point x_i
Recalculate the new cluster centroids according to (3)
until the convergence condition is met
Step 3. Create a set of centroids obtained in Step 2.
Step 4. Repeat
Calculate the value of the function in (2) for each centroid from Step 3
Recalculate the new cluster centroids
until the convergence condition is met
Step 5. Mapping of data points to clusters.
End

Figure 4: Steps of the proposed algorithm

Let us denote the following notations: $X = \{x_1 , x_2 , \dots , x_n\}$ is the set of a finite number of points given in m-dimensional space, q is the batch size, the maximum value q(q<n) is determined by the PC parameters, and is also processed within

a reasonable time, $C = \{C_1 , C_2 , \dots , C_k \}$ is a set of clusters, where C_q (p = 1, k) is the pth cluster and k is the number of clusters, O_p is the centroid of the pth cluster.

To determine the optimal batch size, we consider the method proposed in [28]

$$q = \frac{\nu(\alpha) \cdot k^2}{r^2}, \qquad (1)$$

In Function 1 where α is the desired significance level, V(α) is the value obtained from the table in [9], k is the number of clusters, and r is the 'relative difference'. We assume that α = 0.05 (with a 95% probability), V(α)= 1.27359 and r = 0.08.

The objective function has the following form:

$$\text{minimise } f(x) = \sum_{p=1}^{k} \sum_{x_i \in C_p} \left\| x_i - O_p \right\|^2, \qquad (2)$$

$$O_p = \frac{\sum_{x_i \in C_p} x_i}{\left\lceil C_p \right\rceil}, \quad p = \overline{1, k}, \qquad (3)$$

where $\| \cdot \|$ is the Euclidean norm in R^m, $|C_p|$ is the number of data points in the cluster Cp.

The resulting centroid, obtained after applying k-means to the set of centroids of all batches, is denoted as O^*p (p = 1, k). The task is to reduce the clustering time. Steps of the proposed algorithm are shown in Fig. 4.

If the dataset cannot be completely split into equal batches, the residual part of the data points is fed to step 5 of the algorithm, where the points are mapped to each cluster obtained in step

V EVALUATION METRICS

In order to check the quality and accuracy of the clustering algorithm the proposed system uses the metrics such as purity, entropy and F-Measure. The purity and entropy measures are used to calculate the quality of the clusters whereas the F-Measure used to check the accuracy of the clustering operations. The evaluation metrics such as the purity, entropy and F-measure are explained below

1. **Purity:** The metric purity evaluates the consistency of a cluster that is the degree to which a cluster contains texts from a single category. If the purity value is one it contains texts from a single category therefore it is an ideal cluster. The purity value lies in the range of 0-1.The higher the purity value, better the quality of clusters. If the purity value is one it contains texts from a single category therefore it is an ideal cluster. The higher the purity value, better the quality of clusters. The formal definition of purity is as given below in the equation 4

$$P(Cj) = \frac{1}{nj} \max_h (n_j^h) \qquad (4)$$

Where, $\max_h(n_j^h)$ - is the number of documents that are from the dominant category in cluster Cj and
(n_j^h) - represents the number of documents from cluster Cj assigned to category h

2. **Entropy:** In general, is a measure of the number of specific ways in which a system is arranged. This measure evaluates the distribution of categories in a given cluster. The entropy results lies between the 0-1. If the entropy value is smaller, the quality of clusters is better. The mathematical formula for the entropy is given as below in the equation 5

$$E(C_i) = -\frac{1}{\log c} \sum_{h=i}^{n} \frac{n_i^h}{n_i} \log \frac{n_i^h}{n_i} \qquad (5)$$

Where, (n_i^h) - represents the number of documents in cluster Ci assigned to category h
n_i – represents the size of the cluster.

3. **F-Measure:** It is a combined value of Precision and Recall. The Precision and recall computed for each class and its weighted average gives the value of F-measure. The value of this metrics also lies between 0-1. More the F-measure more the accuracy. It is calculated as shown in the equation 6

$$\textbf{F-Measure} = \frac{\textbf{2 * Precision*Recall}}{\textbf{(Precision + Recall)}} \qquad \textbf{(6)}$$

Precision and recall are the basic measures used in evaluating strategies in finding the F-Measure evaluation metric. Both precision and recall is applied to the collected

comments and the comments can be assumed as either relevant or irrelevant data that is it measures the degree of relevancy.

Precision is the ratio of the number of relevant texts retrieved to the total number of irrelevant and relevant texts retrieved. It is usually expressed as shown in the equation 7

$$\textbf{Precision= A/ (A+C)} \qquad \textbf{(7)}$$

Where, A – Number of relevant documents retrieved
C – Number of irrelevant documents retrieved

Recall is the ratio of the number of relevant records retrieved to the total number of relevant records in the database. It is usually expressed as shown in the 8

$$\textbf{Recall = A/ (A+B)} \qquad \textbf{(8)}$$

Where, A – Number of relevant documents retrieved
B – Number of irrelevant documents retrieved

VI CONCLUSION

Analysis of large-scale datasets requires the presence of large computing powers, which is not always feasible. And so it became necessary to develop new clustering algorithms capable of such data processing based on batches using their parallel clustering.

In the existing system, they have taken 3 large datasets which consisting of comments and perform the clustering by using SVM algorithm, the performance evaluation that is the precision, recall and F-measure average of all dataset were 75 %, 70% and 72% achieved. In Proposed work by using Mini batch K-Means algorithm the performance evaluation like purity, entropy, precision, recall and F-measure will produce the better results than SVM.

VII FUTURE ENHANCEMENT

The technology used in public comments clustering will give the better results as per the survey and the results of many papers. The Mini batch K-means algorithms used in this paper still be implemented by using any of the optimized techniques.

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FACE MASK DETECTION AND PUBLIC MONITORING

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Abstract: **COVID-19 pandemic is continuously spreading until now all over the world. The impact of COVID-19 has been fallen on almost all sectors of development. The healthcare system is going through a crisis. Many precautionary measures have been taken to reduce the spread of this disease where wearing a mask is one of them various. However, there are only a few research studies about face mask detection based on image analysis. We propose a system which is a high-accuracy and efficient face mask detector that restrict the growth of COVID-19 by finding out people who are not wearing any facial mask in a smart city network where all the public places are monitored with Closed-Circuit Television (CCTV) cameras. While a person without a mask is detected, the corresponding authority is informed through the city network. A deep learning architecture is trained on a dataset that consists of images of people with and without masks collected from various. We also explore the implementation of this system with a light-weighted neural network MobileNetV2 for embedded or mobile devices.**

Keywords —– Face mask detection, MobileNetV2, Deep learning, Object detection, Machine learning, Image processing, Efficient, Accessible, Integrated.

I. INTRODUCTION

A new strain which has not previously been identified in humans is novel coronavirus (nCoV). In addition, there are several similar large scale serious respiratory diseases, such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), which occurred in the past few years . The first infected patient of coronavirus has been found in December 2019. From that period, COVID-19 has become a pandemic all over the world. People all over the world are facing

challenging situations due to this pandemic. Every day a large number of people are being infected and died. Liu et al. reported that the reproductive number of COVID-19 is higher compared to the SARS. Therefore, public health is considered as the top priority for governments. Many precautionary measures have been taken to fight against coronavirus, among them, wearing a mask is main, Leung et al. showed that the surgical face masks could cut the spread of COVID-19. Therefore, face mask detection has become a crucial computer vision task to help the global society, but research related to face mask detection is limited. Face mask detection refers to detect whether a person wearing a mask or not and what is the location of the face. Deep learning techniques are highly used in medical application. Recently, deep learning architectures have shown a remarkable role in object detection. These architectures can be incorporated in detecting the mask on a face. Moreover, a smart city means an urban area that consists of many IoT sensors to collect data. These collected data are then used to perform different operations across the city.

This system aims to find out whether a person is using a mask or not and informing the corresponding authority in a smart city network. Initially, CCTV cameras are used to capture real-time video footage of different public places in the city. From it, facial images are extracted and are used to identify the mask on the face. The learning algorithm Convolutional Neural Network (CNN) is used for feature extraction from the images then these features are learned by multiple hidden layers. Whenever the system identifies people without face mask, this information is transferred

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through the city network to the corresponding authority to take necessary actions. Furthermore, since the face mask dataset is a relatively small dataset where features may be hard to extract, we use transfer learning to transfer the learned kernels from networks trained for a similar face detection task on an extensive dataset. The proposed method is tested on a face mask dataset, whose examples can be found in Fig. 1. The dataset covers a various masked or unmasked faces images, including faces with masks, faces without masks, faces with and without masks in one image and confusing images without masks. We also explore the implementation of this system with a light-weighted neural network MobileNetV2 for embedded or mobile devices

Fig. 1: Examples of Images in the Face Mask Dataset

II. OBJECTIVES AND METHODOLOGY

The main objectives of the system are stated as follows:

1. To prevent the public, public service people from the coronavirus infection.
2. To implement an automated system to check if the people are wearing mask or not.
3. To check if people are wearing the mask in effective manner or not i.e., covering nose and mouth.
4. To detect a person without mask, and alert the authority and the identified individual about the violation.

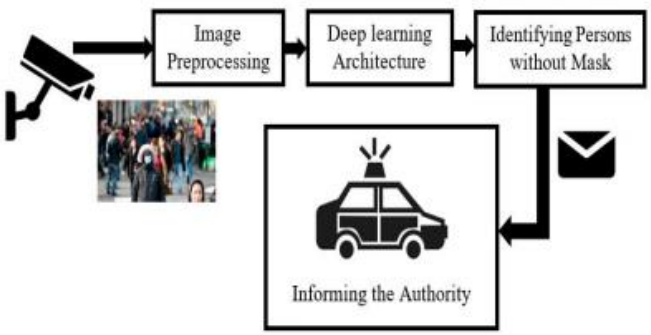

Fig.2 Block Diagram of the System

Methodology:

The methodology flow includes

1. The image or video will be captured through CCTV cameras.
2. The captured image or videos will be pre-processed using image pre-processing technique.
3. The pre-processed image is given as an input to a deep learning architecture model.
4. The model will detect and identify persons without mask and SMS notification is triggered to that particular individual and respective authority regarding the fine that person has to pay.
5. The proposed system checks the proportion of masks covered and notifies the respective authority.
6. A desktop application is written in python where people need to get registered.
7. The registered people will receive the SMS when they are caught without wearing a mask properly. Likewise, the alerting message is also sent to the respective authority.

III. DESIGN AND IMPLEMENTATION

In order to train a custom face mask detector, we need to break our project into two distinct phases, each with its own respective sub-steps: Training and Deployment.

1.Training: Here we'll focus on loading our face mask detection dataset from disk, training a model (using Keras) on this dataset, and then serializing the face mask detector to disk.

2. Deployment**:** Once the face mask detector is trained, we can then move on to loading the mask detector,

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performing face detection, and then classifying each face as with_mask or without mask.

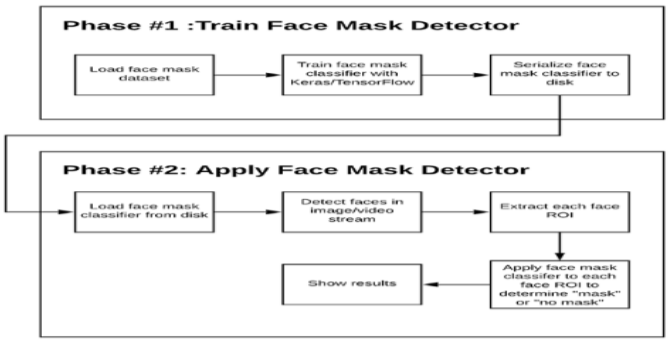

Fig.3 System Architecture

The system consists of four main modules which are as follows:

1. Dataset Collection
2. Building the Mobilenetv2 Model
3. Training
4. Detection of face mask

1. Dataset Collection:

We are collecting the dataset from www.kaggle.com. The dataset consists of 3830 images with 1914 images containing images of people wearing masks and 1916 images with people without masks. It is an excellent dataset for people who want to try learning techniques of deep learning for face mask detection.

2. Building the Mobilenetv2 Model:

We build our Sequential CNN model with various layers such as Conv2D, MaxPooling2D, Flatten, Dropout and Dense. In the last Dense layer, we use the 'softmax' function to output a vector that gives the probability of each of the two classes. Here, we use the 'adam' optimizer and 'binary_crossentropy' as our loss function as there are only two classes. We are using the MobileNetV2 for better accuracy.

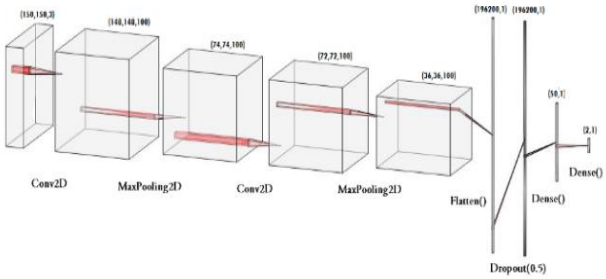

Fig.4 MobilenetV2 Architecture

3. Training:

The main step where we fit our images in the training set and the test set to our Sequential model we built using keras library. I have trained the model for 30 epochs (iterations). However, we can train for more number of epochs to attain higher accuracy lest there occurs over-fitting. We label two probabilities for our results. ['0' as 'without_mask' and '1' as 'with_mask']. I am also setting the boundary rectangle color using the RGB values. ['RED' for 'without_mask' and 'GREEN' for 'with_mask].

4. Detection of Face mask:

In the step, we use the OpenCV library to run an infinite loop to use our web camera in which we detect the face using the Cascade Classifier. The code webcam = cv2.VideoCapture(0) denotes the usage of webcam. The model will predict the possibility of each of the two classes ([without_mask, with_mask]). Based on which probability is higher, the label will be chosen and displayed around our faces. When a person without face mask is identified, an sms is triggered to the respective authority and that particular individual regarding the fine the person is supposed to pay.

IV. RESULTS

In this project we are implementing training the model to identify the mask using the CNN model, and to implement the automated SMS for fine and notification to the particular individual.

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By preserving a limited proportion of various classes and dataset is divided into testing and training test Face mask dataset images and faces are resulted with a mask or without mask.

The proposed system is also implemented to collect fine digitally and monitor people in public areas there by reducing burden for police and marshals used used to monitor and collect fine manually.

V. CONCLUSION

The proposed system mainly detects the people who are not wearing a face mask in smart city network where all the public places are monitored with CCTV cameras and informs the corresponding authority with the location of a person not wearing a mask and to the individual through city network regarding the fine the individual has to pay.

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Home Security and maintenance system using Raspberry pi.

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Abstract- Security is becoming one of the important aspects in today's life, especially in home security. With so many burglary events taking place in our surrounding these days, we want our houses to be protected when we are away from them. Home security systems enable us to monitor our residence from a remote location. Through the system a person can watch all the activities taking place at his home from his remote location. The present home surveillance systems are still lacking in many aspects especially in terms of performance and cost. As everyone expects to have an effective security system without any flaws in it, in order to make this happen we proposed our project using Raspberry pi where we will be able to provide a cost effective and user-friendly system. Whenever the intrusion takes place image will be captured and it'll be stored in SD card which will be further sent to the owner, and it can be used as an evidence for next process.

I INTRODUCTION

As we come across many reports about the security issues that has been noticed frequently about the residence or some other places. We lack in many ways to keep our house safe and secure and then get worried for facing burglary events. Thus, to get rid of these things we must use technologies which are available to keep the house safe and much more secure. As people are always busy in their own work, they always travel from one place to another, where they'll not be able to take care of their houses and if something unusual happens in their absence, they'll not be in a position to stop it. To solve these problems, an effective and high-performance security system is needed where that should be able to help the person in avoiding any unusual activities that has taken place.

This surveillance system can help them by providing a feature where he or she can keep an eye on their residence from their location and can take the necessary actions if needed. This system has special features like detection and identification of events that occurs. But the security system which are available in market are costlier and it's hard to implement on each and everyone's house.

Thus, we have taken a step ahead to provide a cost-effective system for the user's where anyone can adapt it without any hesitation.

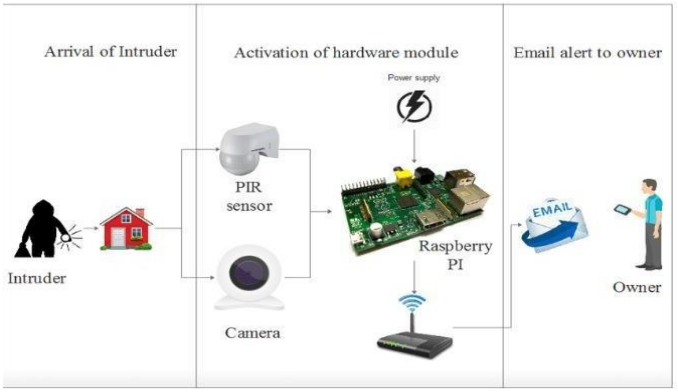

Fig.1 System overview

II LITERATURE SURVEY

M.S.Obaidat et al [1] developed a home security system using Pyro electric infrared (PIR) module and raspberry pi. By using raspberry pi, the delay that occurred during sending email alerts were minimized. Here, the camera is used to click pictures of the house and sends it back to the raspberry pi module which is further sent to the owner of the house as an email. It uses IMAP (Internet message get to convention) to send the emails. For this, Raspberry pi must be connected to the Internet through the WIFI module.
So, whenever the owner is away from home, he/she gets the alarm of any theft happening at their place and they can take appropriate actions like informing the local police about the theft

Aparicio Carranza et al [2] introduced a security system with a feature of live streaming. This system makes use of raspberry pi. A Raspberry pi is a thirty five dollar, credit card sized computer which can be used for various activities like creating spreadsheets ,browsing the internet, playing HD videos etc. Here it is used to build an efficient security system with less installation cost. Whenever the system detects any motion, Pi-cam captures the image and saved it. Then the image is emailed as an attachment to the owner. The owner's email ID will be inserted into the python

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script which does the functions above. The owner can also start live streaming using the pi camera through which he/she can monitor the house anytime and every time. Using the above-mentioned components an efficient and cost-effective security system is built here.

Aman Sharma et al [3] introduced a smart security system for home and banks using Zigbee technology. Zigbee is high level communication protocol which is used to connect many devices there by creating a personal area network. In this system, all the sensor devices, microcontroller (ATMEGA168 microcontroller), and Relays are connected using the Zigbee network. This system uses components like SIM900A GSM module, cameras, and motion detection sensors. When a person tries to enter the house or a bank, sensor detects the motion. The system then asks the person for a door key and password. If both are correct, then the device allows the person inside by unlocking the door. If any one of them gets wrong, then the system barres the person's entry and sends an alert email to the concerned person using the GSM module. By using the Zigbee network this paper was able to provide a cost effective and flexible security system.

Akash V Bhatkule et al [4] this paper implements a surveillance system that captures the image of the intruder and sends an alert message to the user. An alarm is turned on by the raspberry Pi on detection of the gas leakage, smoke formed by fire.
The User must manually activate all the alarm system while leaving the house.

Prof. G. R. Gidveer et al [5] In this method motion detection software is used with Raspberry Pi and a camera to detect intrusion and the camera and saves that image and sends it to portable device for streaming. An email alert is generated using a phyton script. The paper claims to be cost-effective and claims to provide security efficiently.

III PROPOSED SYSTEM

The proposed Home security system is designed to improve efficiency, security and flexibility. This method detects any movement made by the intruder using PIR sensors. The sensors are fixed at various locations of the home.
The sensor sends the value to the raspberry pi, if the value received by the PIR sensor is high the raspberry pi enables the camera. Images are captured and are sent back to raspberry pi; The system then generates an email that contains an attachment of images captured during motion detection and sends it to the owner. Once the owner receives the alert email sent by the system, he confirms intrusion and activates the smart lock to all the doors and windows of the house.

We use an application called blynk to activate smart lock, it is a smartphone-controlled, internet-connected deadbolt actuator that is operated by a Raspberry Pi. The application to lock the door can be used on multiple phones, and can also notify the user when someone locks/unlocks the door. A high torque, metal gear servo is used to attach the deadbolt to the door. Thus, our project ensures safety of ones residence.

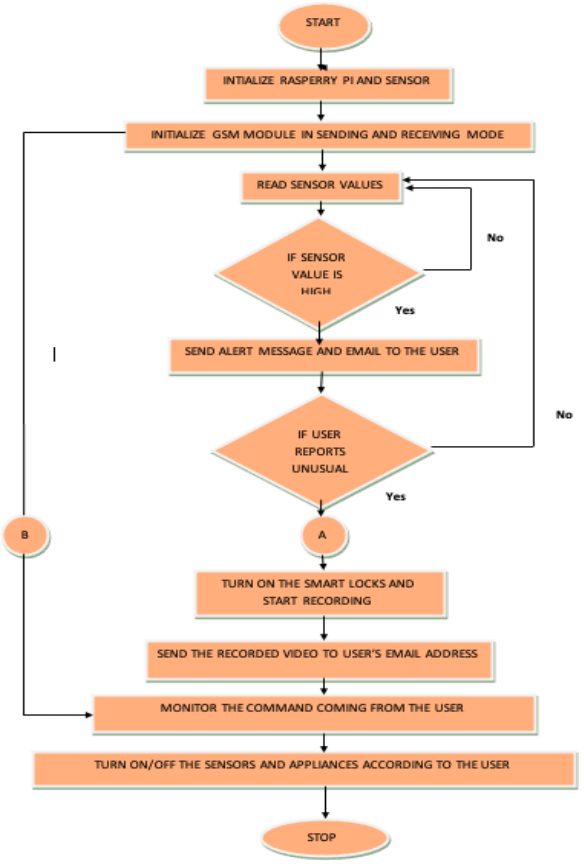

Fig.2 Activity diagram of the system

IV EXPERIMENTAL ANALYSIS

A. Hardware Components

Raspberry pi: Raspberry pi a credit card-sized computer it may be small and cheap but can-do powerful things by learning how to control it and there's a growing list of projects and achievements on record. The PI has gone into space control.

Fig.3 Raspberry pi

Pi Camera: The Raspberry Pi foundation has released a total of three cameras including the very recent Raspberry Pi high-quality camera, in addition, there are a number of different cameras you can get from different manufacturers that are suitable for use with the Raspberry Pi

Fig.3 Pi Camera

PIR Sensor: A Passive Infrared sensor is a pyro electric sensor which generates energy when exposed to heat. That is, whenever a human body or an animal get in the range of the sensor, it will detect the movement because the object body emits heat energy in the form of infrared radiations. Hence the name Passive Infrared Sensor.

Fig.4 PIR Sensor

Servo Motor: Servo motor applications are most commonly used in closed-loop systems and are comprised of several parts namely a control circuit, servo motor, shaft, amplifier, and either an encoder or resolver, where precise position control commonly found in industrial and commercial applications.

Fig.5 MG995 servo motor

B. Software Component

Raspbian OS: The Raspberry Pi OS is an operating system for Raspberry Pi. This opening system is highly optimized and it runs over all the Raspberry Pi except the Raspberry Pi Pico microcontroller. This system looks similar to many other desktops like Microsoft Windows and mac OS.

Blynk: Blynk is a software which is designed for Internet of things, it is used to control all the hardware components remotely. It displays the data of the sensors and also stores the data and can perform various actions remotely. The software has 2 major components like Blynk application, server and libraries.

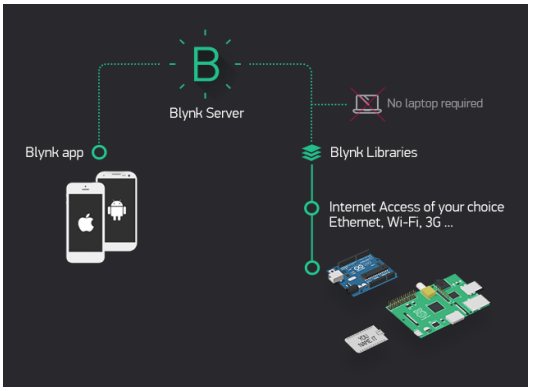

Fig.6 Blynk Application

V RESULTS

The System is implemented successfully and whenever the intrusion takes place , the motion sensors detect and captures all the images accordingly and store them in a document where it can be used as a reference document for evidence during any other process .

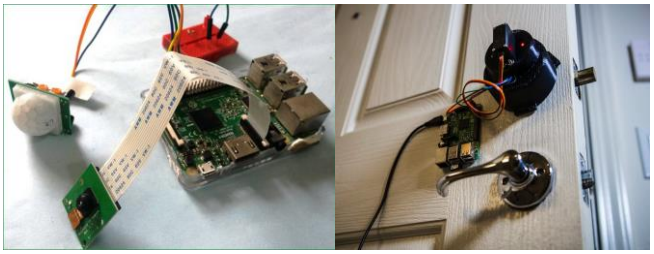

Fig.7 System Setup

After capturing the videos or images, it'll be sent to the user through email as mentioned below.

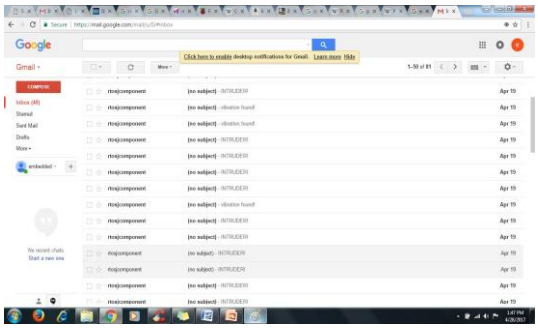

Fig.8 Mail notification to user

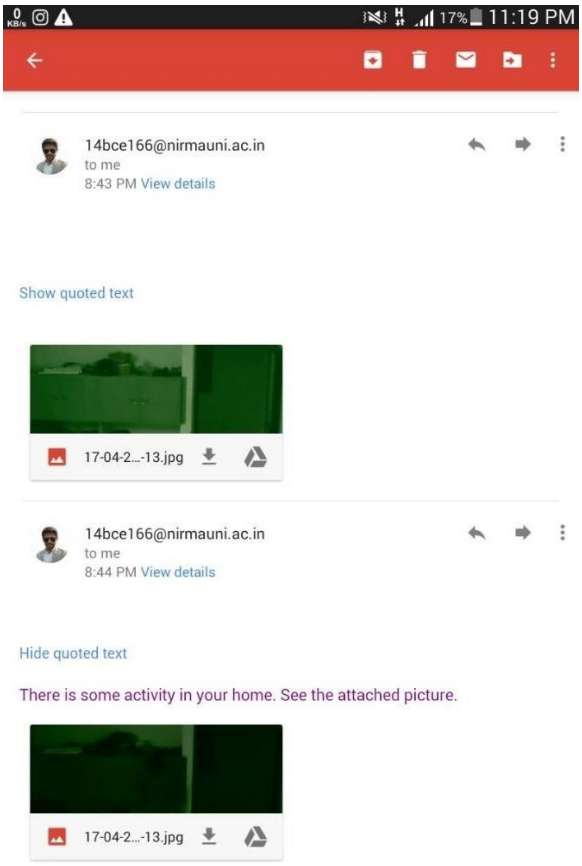

Fig.9 Captured images sent to owner

After reviewing the mail sent by the system if the user identifies that as an intrusion ,then he can take necessary actions from his remote place by accessing the installed system through his smartphone. He locks and unlocks the door as per requirement. Thus, by doing this he or she can secure his or her residence.

VI CONCLUSION

Home security system has been designed in such a way that it can help the user and fulfill all his needs with respect to the security of his residence. This system can be used in different places of work and environments. For example, if a person is working in any industry, he must be aware of his working place and the activities that are happened in their absence.

Another scenario where this can be made used is in bank lockers for spying and at storage houses. Raspberry pi helps in opening up a new chapter when it comes to technology. Not only in the size of the component but also in its capabilities. Security has been a greater issue in the present world so in order to solve such problems we have designed our system in such a way that the owner of the house will be able to handle the situation at his fingertips. The platform which has been used is raspberry pi where it is cost-effective, highly capable, and fast processing. The code is generated using Python and all these codes are executed on Raspberry pi. The main goal of any system is to provide a portable, eco-friendly and affordable product to the user. This application can be further implemented for different environments and more features can be added so that it makes the system more capable of handling all the scenarios it undergoes. New technologies like Artificial Intelligence can also be used in order to make it a smart security system and to avoid burglary events.

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Phishing URL Detection using Machine Learning

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***Abstract*— Phishing is a common attack used to obtain sensitive information using visually similar websites to that of legitimate websites. With the growing technology, phishing attacks are on the rise. Machine Learning is a very popular approach to detect phishing websites. This paper explains the existing machine learning methods that are used to detect phishing websites. The paper explains the improved Random Forest classification method, SVM classification algorithm and Neural Network with backpropagation classification methods which have been implemented with accuracies of 97.369%, 97.451% and 97.259% respectively.**

Keywords*: *Phishing, Phishing attacks, Machine Learning, Random Forest, SVM, Neural Network, Backpropagation

I. INTRODUCTION

Phishing is a fraudulent practice in which an attacker tries to obtain sensitive information by impersonating someone else to benefit himself/herself in a malicious way. Today, most of the users are accessing the services online, so it has become very easy for phishers to obtain user's confidential information. The website contents of phishing websites look very similar to that of legitimate websites and hence prompts people to provide their sensitive information. Phishing attacks can be prevented by making users distinguish between phishing and legitimate websites. Most of the phishers use images rather than text which are difficult to detect. Various tools and mechanisms have been developed to detect phishing websites and to prevent attacker from obtaining sensitive information. Blacklisting is one the easy way to detect phishing websites but can't be used to find new phishing websites. It is also a time consuming process.

In this paper, improved Random Forest model, SVM classification method and Neural Network with backpropagation model have been discussed which were implemented with accuracies of 97.369%, 97.451% and 97.259% respectively.

II. RELATED WORK

In the paper "URL Phishing Data Analysis using Random Forest" [4], SVM and Random Forest classification methods are discussed. The datasets are obtained from UCI Machine Learning Repository. The first dataset comprises of 30 features and second dataset comprises of 10 features. In Random Forest method, a number of classification trees are used which are created randomly by making use of different subsets of dataset to ensure that overfitting does not happen. The accuracy obtained using Random Forest method is 95.1%.SVM, a supervised Machine Learning algorithm makes use of hyperplane to do the classification. The data point is assigned to a particular class based on where it lies. The accuracy obtained with SVM classification algorithm is 92.62%.

In the paper "Phishing Detection from URLs by using Neural Networks" [9], two classification methods namely Artificial Neural Network and Deep Neural Network are discussed. A total of 27 features are considered which include length of URL and subdomain number. 10-fold cross validation was used where original dataset was divided into 10 parts. Nine datasets were used for training and one dataset was used for testing. In Artificial Neural Network, one hidden layer framework was used. The accuracy achieved using this classification algorithm is 91%. In Deep Neural Network, two hidden layers were used.

This classification algorithm was implemented using Tensorflow. The accuracy achieved using this method is 96%.

In the paper "Extraction of Features and Classification on Phishing Websites using Web Mining Techniques" [10], the method used is web mining technique. This method, BOG (Bag of Words) representation model is used which is used to extract information from documents. Application of data mining techniques on text present in documents to extract useful information is called web content mining. BOG is used to classify documents. The document is classified and put into topic hierarchy where it best fits in. In this method, web phishing dataset is taken, pre-processed and features are selected. Then, various classification algorithms like Naive Bayes, Random Forest, KNN, SVM are used and their performances are assessed. Using Naive Bayes algorithm, 92.9806% of phishing data instances were classified correctly, using KNN,97.1777% of phishing data instances were classified correctly, using Random Forest,97.2592% of phishing data instances were classified correctly and using SVM,93.8037% of phishing data instances are classified correctly. Hence, Random Forest method achieves better performance than remaining algorithms.

In the paper "Phishing Website Detection based on Supervised Machine Learning with Wrappers Features Selection" [11], the method used is Wrappers Feature Selection that uses a classifier to predict significant features in predicting phishing websites. It is practically not possible to include all the features to train classifier. So, only the most distinguished features are included to train the classifier to detect phishing websites. In this method, inductive classifier is used. The basic idea is to remove redundant features by training the classifier. For each features subset, a score is assigned depending on classification error rate of model. It provides most distinguished features set and improves the performance of Machine Learning classifier. This method uses N-fold cross validation technique to predict phishing websites. The small dataset is partitioned into 'n' equal datasets and the model is trained using remaining datasets. This process is repeated n times. The final accuracy achieved is the average of n-accuracies obtained after running the classifier model n times. The TPR obtained using this method is 0.971 and FPR is 0.969. The advantages of this method is that it provides most important features used for classifier and also improves the performance of phishing website detection. The disadvantages of this method is that it is more time-consuming and involves extra computational overhead.

In a paper published by IEEE [18], the model uses the method of lexical analysis of URL to extract features that helps in detecting phished webpage. The training data is obtained from the lexical feature or the surface level features of a URL. This is then fed to a confidence-weighted learning algorithm. This algorithm then classifies or matches each binary vector from the URL to the binary vectors that it has been trained to detect a malicious website. A URL is split into three units: the protocol (e.g. http), the domain (the parent site or the one that follows the protocol) and path of the object being accessed. These are then converted to tokens. A domain token usually helps in classifying an input URL as malicious or not and hence is considered as- fuzzy blacklist. Also there are certain rules maintained that can be used for classification based on the surface level features. Any confidence-weighted level algorithm can be used here, only difference is that instead host based features, the algorithm uses lexical features of a URL. This method has produced a result with error rates lower than 3%.

A paper published in WORM'07, November 2, 2007, Alexandria, Virginia, USA [19], identifies the different ways a site can be phished and the algorithms to identify these. The methods for obfuscating (making it a phishing website) a URL are: replacing a hostname with IP address, replacing a domain name with a fake but valid looking name, appending extra letters and numbers after the domain name and misspelling host and domain names. The model was trained with the dataset containing whitelist and blacklist. The model is trained with features that are categorized into four types Page Based, Domain Based, Type Based and Word Based features. Then a logistic regression is used to classify the input into phishing or benign URL. Using this technique around 777 unique webpages per day were found as phished website using with this model.

III. PROPOSED APPROACH

Three methods to detect phishing websites have been implemented. The dataset is taken from UCI Machine Learning repository. It consists of several parameters namely IP Address, URL Length, sub-domain, domain registration length, @ symbol and request URL. Some of the python libraries used for implementation are sklearn, utils, numpy and pandas. The libray "sklearn" was used to implement Random Forest, SVM and Neural Network with backpropagation classification algorithms. The library "sys" was used to extract information about constants, functions and methods. The features of URL are extracted using Lexical Feature Extraction and Random Forest classification method, SVM classification method and Neural Network with backpropagation classification algorithm are run to classify the websites as phishing website or legitimate website. The classifier algorithm giving the best accuracy score is selected as the final classifier algorithm.

Initially the classifiers when used produced accuracy rates of 87.34%, 89.63% and 89.84% for neural networks, random forest and SVM classifiers. To improve the accuracy rates, lexical feature extraction was used. This is implemented in utils.py.

Using the above results, which states that SVM is the best classifier, is used to implement a chrome extension. The chrome extension gives an alert popup stating whether the loaded site is prone to phishing or not.

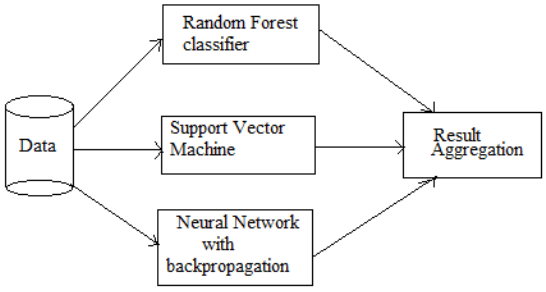

Fig. 1. High level design

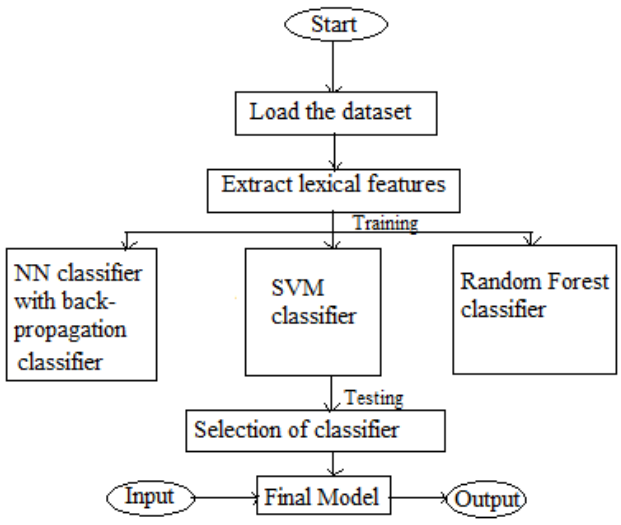

Fig. 2. System architecture

IV. DATASET

The dataset is from UCI Machine learning repository. It consists of 11,055 URLs with 6157 phishing instances and 4898 legitimate instances. Each instance contains 30 features. The result can have either a value of 1 (not phishing) and -1 (phished URL). Each column represents a feature and holds the values 1, -1 or 0. '1' if the URL is completely phished, '0' if the URL is partially phished, '-1' if the URL is benign.

The dataset includes following features: IP address (malicious IP addresses have extra characters or change in certain letters from the original one, e.g.: www.129.B7.fake.html), Long and Short URL (long and short URLs can indicate a phished website), use of @ symbol, '//' symbol can be an indication of redirection, presence of an anchor tag or not, having forms submitting to a blank page, functions related to HTML tags such as onMouseOver(), any pop ups arising from the page, disabled right click to stop users from viewing page source and presence of iframe tags resulting into redirection.

V. MACHINE LEARNING ALGORITHM

The algorithms used are Random Forest, SVM and Neural Networks with back-propagation. Initially lexical feature extraction is performed first on the dataset and then passed to these algorithms.

Random Forest classifier involves combining the results of various stump trees (with single hierarchy) to reach to a conclusion. Each of these trees' results are calculated separately and then combined to give a prediction. This algorithm is implemented using sklearn's RandomForestClassifier module. Since this classifier is irreproducible, the results from this classifier varies from time to time, hence is not constant.

Neural Network includes a series of input layer, number of hidden layers and an output layer. The usage of backpropagation is to reduce the error in final result as the error gets back propagated and the weight given to each hidden layer neurons changes with each iteration. The classifier has been implemented using sklearn's MLPClassifier. Neural networks can be used to perform complex computations; however, it slows down with large datasets.

SVM (support vector machine) involves having a hyperplane that separates the two categories (here: phished or benign website). This hyperplane is also called as the margin. On training with the dataset, the classifier places benign and phished websites on either of the plane, hence classifying the websites. This classifier has been implemented using sklearns's svm.SVC() using the kernel mode as polynomial with a degree of 9.

VI. CHROME EXTENSION

The browser extension is written in JavaScript with python trained model. From the experiment results, SVM is chosen as the final classifier as it classifies better than neural networks and provides better accuracy results unlike random forest classifier.

The extension contains content.js file that extracts the features from the URL and applies the SVM algorithm to find out whether the URL is phished or not, background.js that connects the content.js to frontend and manifest.json that contains the meta data for the extension. The chrome extension has a front end as an alert pop up that says whether the URL is phished or not with an 'OK' button.

Functions implemented in the content.js are:

Is_IPIn_URL(): to check IP address in the URL

Is_Long_URL(): to check if length of the given URL is above 75 characters.

Is_Tiny_URL(): to check if URL has less than 20 characters.

Is_AlphaNumeric_URL(): presence of any '@' symbols or achor tags.

Is_Redirecting_URL(): to check if there is any '//' symbols.

Is_IllegalHttps_URL():check whether there is multiple 'https' in the given URL.

Is_ScLnk_From_Different_Domain(): presence of scripts in URL.

Is_Form_Action_Invalid(): check for blank submit forms.

Is_Iframe_Present(): is there presence of iframe tags redirecting the link to another page.

Once the feature selection is done then, the data is sent to SVM classifier. If the result is 1, then the website is benign, else if the result is -1, the website is phished.

VII. EXPERIMENTAL RESULTS

The accuracies achieved using Random Forest, SVM and Neural Network with backpropagation classification algorithms are 97.369%, 97.451% and 97.259% respectively. The algorithms were improved using lexical feature extraction from the given URL. SVM is found to be the best classifier among the three as it gives better frequency than Neural Networks. Even though Random Forest classifier gives greater accuracy rates than SVM classifier most of the time, the accuracy rates

are not constant hence proving SVM to better than random forest classifier.

The chrome extension identifies the phished URLs up to an accuracy of 97.451%.

Table 1. Comparison of accuracies of Machine Learning algorithms

ML Algorithm	Old Result Accuracy	New Result Accuracy (improved using lexical feature analysis on each algorithm)
Random Forest	87.34%	97.369%
Support Vector Machine	89.63%	97.451%
Neural Network with Backpropagation	89.84%	97.259%

VIII. CONCLUSION

Phishing detection is an important step towards phishing attacks and the algorithm used needs to reliable to ensure maximum protection. Various existing methods to detect phishing websites have been mentioned in this paper. Random Forest classification method, SVM classification algorithm and Neural Network classification algorithm were improved. The accuracies obtained using improved Random Forest classification, SVM classification method and Neural Network classification algorithm are 97.835%, 97.89% and 95.444% respectively.

Since, SVM classification algorithm gave better accuracy as compared to that of Random Forest and Neural Network classification algorithms, SVM is chosen as final classifier algorithm for classification of websites as phishing or legitimate.

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ML and DL technique for water resource management

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***Abstract*—Water is a vital variable for the manageability of the world. Surface water assets are of prime significance for every living animal. In this way, these assets ought to be distinguished and checked for appropriate water arranging. Continuous advances in satellite-based optical far-off sensors have progressed the field of distinguishing surface water to another period. Distant identifying with wide consideration and distinctive short-lived noticing is the most appropriate response for surface water checking. Distant detecting innovation and distantly detected pictures are significant assets for surface water observing and the board. This paper shows the distinguishing proof of water assets utilizing ML calculations. The information utilized in the process have been gathered from BHUVAN open data archive. This paper additionally targets estimating the space of a specific water body utilizing GIS. CNN is profound learning calculation which is a multi-facet (multi-layer) perceptron that has been intended for decreased handling prerequisites. The outcomes show the binary classified yield which has been extracted utilizing a neural network and furthermore waterbody measurements utilizing GIS.**

***keywords*—remote sensing, machine learning (ML), adaptive image processing, grey scale conversion, CNN.**

I. Introduction

Water is quite possibly the main normal assets on the earth. It's anything but a huge part in our everyday life. There are various assets of the consumable water which incorporate the precipitation, groundwater and the different surface water bodies like lakes, streams, ponds, and so. Along these lines, surface water bodies are a fundamental freshwater asset, for both human and biological frameworks. They are of principal centrality in supporting a wide scope of lives. Water guarantees the biodiversity in riparian or wetland natural structures by offering spaces to a ton of verdure. It's difficult crucial for the natural structures as a vital piece of the hydrologic cycle yet besides contacts each piece of our lives, for example, drinking water, development, power creation, transportation, and day by day needs. Surface water bodies are dynamic as they wilt, create, or shift their appearance or direction of the stream with time, inferable from various kinds and human incited factors. This incorporates security from overabundance water and from water deficiency, just as giving adequate water to a reasonable climate we use convolutional neural organization (CNN) for surface water identification utilizing satellite pictures got from Bhuvan open information accomplish. Essentially, CNN is a piece of profound neural organization used to dissect visual nonexistent.

II. Literature survey

Aliihsan Sekertekin aimed to identify which spectral water index will represent water body better when the data of new imaging satellite, namely Sentinel-2, are used. Since these indices were originated from old Landsat missions, it is important to investigate the performances of these indices with other data resources. Çatalan and Yedigöze dam reservoirs were considered as the study area [1]. Pedro Alejandro López Estrada worked to develop a software that can use many spectral bands from the satellite payload in order to classify it and detect water, using supervised or not supervised learning techniques. So that result can to be apply in water bodies detection. The information obtained from the analysis could be used in protected natural areas. Yulong Guo ,Yunmei Li, Li Zhu published a paper in 2018 where in which Although remote sensing technology has been widely used to monitor inland water bodies, the lack of suitable data with high spatial and spectral resolutions has seriously obstructed the practical development of inland water color remote sensing. An inversion-based fusion (IBF) algorithm is proposed to fuse water color and high-spatial resolution images. The significant advantage of the IBF-derived chlorophyll-a concentration map indicates that the IBF algorithm has the potential to advance the monitoring of optical complex inland water [3].

III. Objective

Clear objectives make it conceivable to recognize water

asset that is available in input satellite picture by utilizing different layers present in neural network with fitting exactness, accuracy and quality control.

IV. Implementation

This project uses the machine learning methodologies to monitoring of the Surface water bodies which is beneficial than that of the manual fragments of water from the images obtained. The images are collected from the ISRO's geoportal known as BHUVAN, which is an open data archieve available for easy download.(Fig 2).

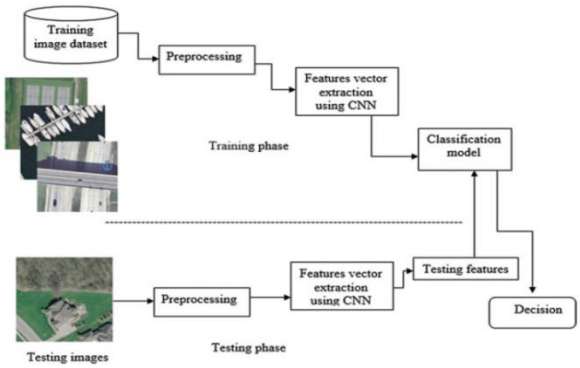

Fig.1.Proposed System Architecture

Traning phase

Training image dataset consist of satellite images which is trained in order to test the selected input image.The first stage in our model is the training phase. In this phase the selected images from the dataset are going through test starting from image preprocessing, feature vector extraction based on CNN ending with best possible classification.

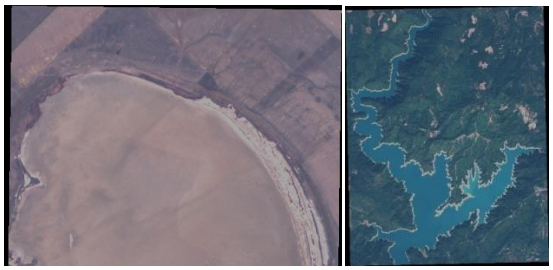

Fig.2 Sample satellite images

A. Image Preprocessing

Pre-processing is a typical name for activities with pictures at the most minimal degree of abstraction.The point of pre-processing is improvement of the picture information that smothens reluctant twists or upgrades some picture highlights significant for additional preparing. Grayscale transformation is utilized to change ordinary RGB pictures into a scope of monochromatic shades from black to white. Therefore, grayscale picture comprises just shades of black and no colors. Hence this process is performed to diminish the code intricacy.

B. Feature Extraction

Feature Selection which is also known as variable selection is the process of selecting a subset of relevant features for use in model construction.
Feature extraction involves diminishing the quantity of assets needed to portray a huge arrangement of information. Examination with an enormous number of factors for the most part requires a lot of memory and calculation power, also it may cause a classification algorithm to overfit to training samples. Hence feature selection and extraction plays an important role in our model building.

Feature Extraction is perofmed with the assistance of Convonlutional Neural Organizations (CNN) or the ConvNets. CNNs are a class of Deep Neural Networks that can perceive and characterize specific highlights from pictures and are generally utilized for analyzing visual images. Two pictures which can be addressed as matrices are multiplied to give a yield that is utilized to extricate highlights from the image.There are three kinds of layers that make up the CNN which are the convolutional layers, pooling layers, and Fully Conneccted (FC) layers (Fig.3). At the point when these layers are stacked, a CNN design will be shaped.

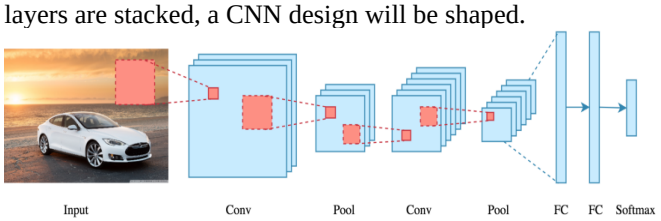

Fig.3 General example for CNN Architecture

The grayscale image that's obtained in the previous step is employed as the input for feature extraction.The selected features from feature selection step are compared with the kernel[Convolutional filter] image which contains all the desired water features. We perform the convolution operation by sliding this filter over the input. If all the extracted water features match with the kernel image, then we perform element-wise matrix operation and sum the result. This result's stored in classification model for further processing. If water properties don't match with kernel image, then it's indication that it has some garbage values within, which is removed in upcoming layers. Garbage values could also be either dead pixels or dimensionality error etc. so as to keep up the identical or higher dimensionality than kernel image, we use padding (fig 4) to surround the input image with zeros. the grey area round the input is the padding. we can either pad

with zeros or the values on the edges. After this step, the dimensionality of the input image matches with that of the kernel image (Fig 5). this could be done only the input image is smaller than the kernel image. If the input image is larger in size, we perform pooling. This allows us to scale back the quantity of parameters, which both shortens the training time and combats overfitting. Pooling layers down sample each feature independently, reducing the peak and width, keeping the depth intact.

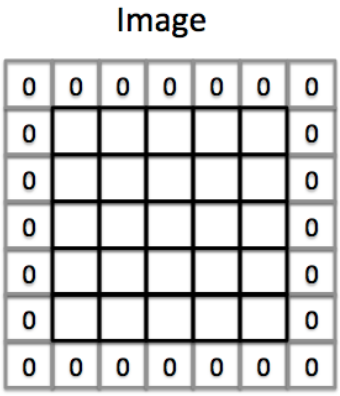

Fig 4. Increased dimensionality after padding

C. *Classification*

The resultant image is fed into fully connected layer to get the binary value which is able to be further employed in testing process. These resultant binary values are stored, and hence a classification model has been created which is employed to predict the output during the testing phase.

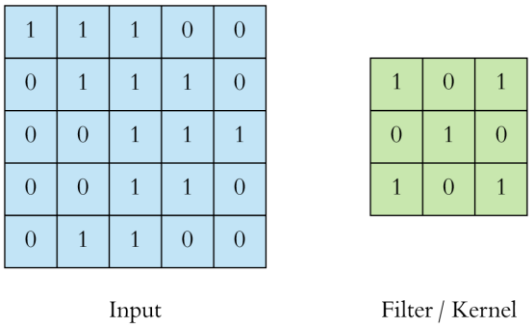

Fig.5. Denoting the representation of input and kernel image.

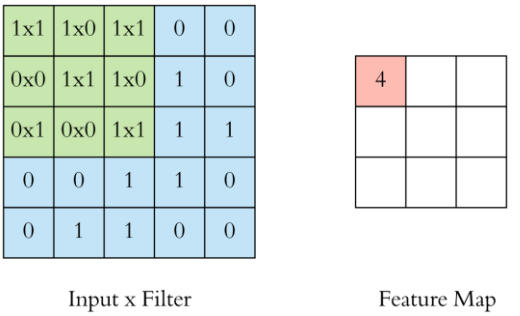

Fig. 6. (a) Matrix multiplication process.

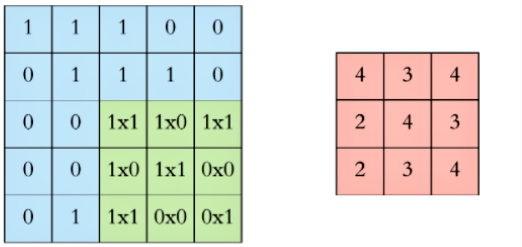

Fig. 6 (b). Result after matrix multiplication

Testing phase

The next phase is that the testing phase during which we consider satellite image to test for the presence of water resource. The input image undergoes various processes like image pre-processing, feature extraction just like which was done during training phase. We perform matrix operation (Fig 6(a) and 6(b)) for the features obtained to urge one binary value which is then compared with the unit that's stored in classification model obtained during training phase. If the obtained binary value matches with value in classification model, then water is present within the given testing image else water surface isn't found.

V. Results

For the users to use this model we build a frontend system which helps in easy user interaction. With the assistance of frontend window, users the load the desired test image into the model and may check for the presence of water resource. After loading of model, we obtain the display message denoting the output (Fig 7) together with the precision value of the obtained result. This value gives us a good idea of how confidently can the user believe the obtained result. We also denote the area of spread of this pixel within the image.

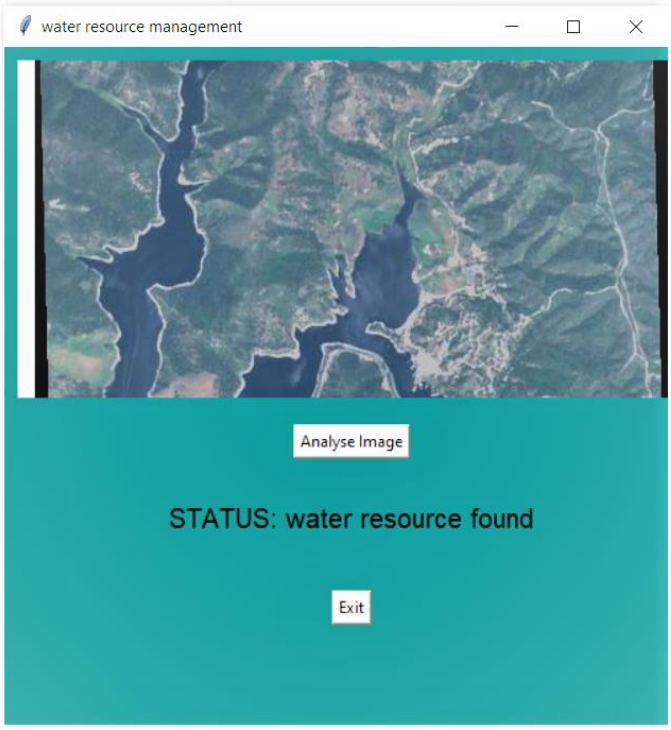

Fig.7 Sample Output image.

VI. Conclusion

This paper explains a technique to spot and analyze the water constitutes in satellite images through machine learning and deep learning techniques. This work will help us in automating the method of water detection reducing the number of manual efforts required. we will economize the time and resources required for detection of the water resources with higher accuracy.

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DRIVER ALERTNESS DETECTION SYSTEM (USING DEEP LEARNING)

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***Abstract* - Driver distraction is defined as an activity performed by a driver that diverts attention away from the driver.According to WHO report, 1.35 million people worldwide die in traffic accidents each year. That is nearly 3700 people are dying on the world's roads every day. "One of the most heartbreaking statistics in this report is that road traffic injury is the leading cause of death for people aged between 5 and 29 years". The driver is the most important participant in-vehicle control including steering, throttling, braking, manoeuvring, and other operations. These primary tasks must be accomplished safely for all traffic participants. This paper proposes a driver distraction detection system that identifies various types of distractions through a camera observing the driver. Based on these activities, the system will classify them accordingly using proper Deep Learning technique and instruct the driver about the distraction.After classification through Deep Learning,the system alerts the driver.**

Keywords–DeepLearning,NeuralNetworks,OpenCV,Caffe model,DLIB

I. INTRODUCTION

Road crashes have emerged as one of the top causes of death among the most productive age group. Many of these accidents are preventable because they happen due to driver distractions.

In the paper, there is a system which recognizes distracted driving postures live and instructs accordingly by providing a suitable sound warning. Research in the field of distracted driving detection follows the definitions presented in. It detects manual, visual, or cognitive types of distractions. Cognitive distractions deal with tasks of listening, conversing, daydreaming, or just becoming lost in thought. In this form of distraction, the driver is "mentally" distracted from safe driving even though they are in a safe Real-time Behavior of an Inattentive Driver driving posture. Visual distractions often refer to situations where the driver takes their eyes off the road due to the use of mobile phones etc. Visual distractions are coined in the following terms: "sleepiness", "drowsiness", "fatigue", and "inattention". And, they usually depend on facial landmarks detection and tracking.

When the driver uses any objects like mobile or bottles while driving and also when the driver feels drowsy it provides suitable warnings.

The input of the model are images of the driver taken in the car which is used to provide the distraction activity that drivers are conducting as output.

The system contains a camera which facilitates images for detection of any kind of objects the driver is using,to detect whether the driver is in safe posture ,to detect drowsiness,fatigue.

The classification algorithm then classifies and detects if the driver is distracted by any kind of distractions and assists by providing a proper alert message to the driver.

Work by [1] Chien-Yi Lee (2020) uses two stream convolutional networks to analyze the driver's distraction.[2] RO. G. Basubeit (2019) used image net dataset and CNN to analyze the drivers distractions. [3] Vlad Tamas (2019) also used CNN with modifications in the dataset to find the distracted driver. Further [4] HeshamM Eraqi. (2019) provided a robust vision-based system that recognizes distracted driving postures based on a novel publicly available distracted driver dataset that was used to develop and test the system [5] Andrei Aksjonov (2018) used a fuzzy logic algorithm to find the distracted driver.

II. PROPOSED MODEL

The Driver Alertness System should work accurately to prevent road crashes that happen through distractions. The accurate distraction detection system is

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the need of the hour to help drivers. The system detects the faces and objects from live video and when the driver is distracted through obstacles it provides alert voice messages. Using the detected faces key landmarks are detected and using the landmarks head-pose estimation and drowsiness is detected.

In working, the live video will be captured through the camera and from video, the images are captured using OpenCV and images are passed through the caffe model of OpenCV's DNN module. In CAFFE model objects and human faces are detected with the help of a pre-trained .caffemodel file. When the objects are detected for more than 5 seconds, alert messages will be provided to alert the drivers. When the face is detected, the box will be drawn using the coordinates of the box, the key landmarks will be detected. Using the key landmarks, the angles of the landmarks will be detected and based on the angles, the head directions can be detected. Boxes will also be drawn around the eye. The normal distance of the open eye is calculated and when the aspect ratio of the driver is less then the open eye alert messages will be provided which helps to alert the driver.

Technologies Used :

1. Deep Learning
2. OpenCV
3. Caffe Model
4. Single Shot MultiBox Detector (SSD)

1) Deep Learning :

The field of artificial intelligence is essential when machines can do tasks that typically require human intelligence. It comes under the layer of machine learning, where machines can acquire skills and learn from past experience without any involvement of humans. Deep learning comes under machine learning where artificial neural networks, algorithms inspired by the human brain, learn from large amounts of data. The concept of deep learning is based on humans' experiences; the deep learning algorithm would perform a task continuously so that it can improve the outcome. Neural networks have various (deep) layers that enable learning. Any drawback that needs "thought" to work out could be a drawback deep learning can learn to unravel.

2) OpenCV :

OpenCV stands for Open supply PC Vision Library is associate open supply pc vision and machine learning software system library. The purpose of creation of OpenCV was to produce a standard infrastructure for computer vision applications and to accelerate the utilization of machine perception within the business product [6]. It becomes very easy for businesses to utilize and modify the code with OpenCV as it is a BSD-licensed product. It is a rich wholesome library as it contains 2500 optimized algorithms, which also includes a comprehensive set of both classic and progressive computer vision and machine learning algorithms. These algorithms are used for various functions such as discovering and acknowledging faces. Identifying objects classifies human actions. In videos, track camera movements, track moving objects. Extract 3D models of objects, manufacture 3D purpose clouds from stereo cameras, sew pictures along to provide a high-resolution image of a complete scene, find similar pictures from a picture information, remove red eyes from images that are clicked with the flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality.

3) Caffe Model :

Caffe is a framework of Deep Learning and it was made used for the implementation and to access the following things in an object detection system. Expression: Models and optimizations are defined as plaintext schemas in the caffe model unlike others which use codes for this purpose.Speed: for research and industry alike speed is crucial for state-of-the-art models and massive data. Modularity: Flexibility and extension is majorly required for the new tasks and different settings. Openness: Common code, reference models, and reproducibility are the basic requirements of scientific and applied progress.

4) Single Shot MultiBox Detector (SSD) :

SSD Object Detection extracts feature maps using a base deep learning network, which are CNN based classifiers, and applies convolution filters to finally detect objects. Our implementation uses MobileNet as the base network (others might include-VGGNet, ResNet, DenseNet).

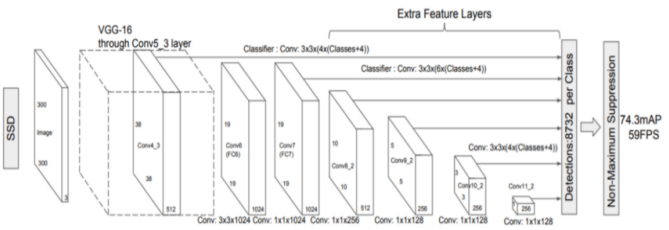

Fig 1.SSD Architecture as Base Network

ISBN: 979-85-27243-61-1

Methodology:

- The Proposed system is divided into3 Modules :

1. Detection and Recognition Module
2. Face Landmarks and Head-Pose Estimation Module
3. Drowsiness Detection Module

1) Detection and Recognition Module :

This Module assists in the detection of the driver's face,posture and the objects the driver is holding that diverts attention away.Face Detection, also called facial detection, is a computer technology used to find and identify human faces in digital.Face detection is one of the most fundamental aspects of computer vision. Object Detection is a computer vision technique that allows us to identify and locate objects in an image or video.

Feature Extraction: Extract features from the input images at hands and use features to determine the class of the image.

Fig 2.Object Detection

2) Face Landmarks and Head Pose Estimation Module:

Facial landmark detection is the task of detecting key landmarks on the face which must be robust to both rigid and non-rigid facial deformations which are caused due to change in head movements and facial expressions.

- Steps in detection of face landmarks:

1. After the face detection, it returns the x,y,w,h values where,

x - x-coordinate of the top left corner
y - y-coordinate of the top left corner
w - width of the rectangle
h - height of the rectangle

2. Dlib is a general purpose cross-platform open source software library that includes a variety of machine learning algorithms.We are using a pre-trained facial landmark detector inside the dlib library to estimate the location of 68 (x, y)-coordinates that map to facial structures on the face.

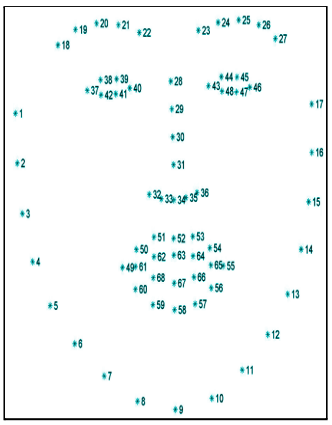

Fig.3

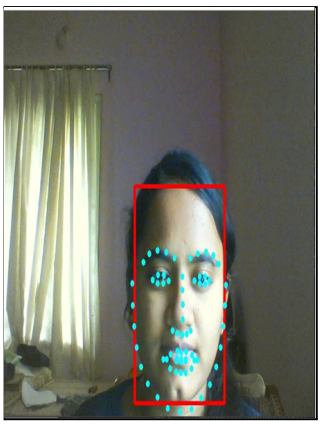

Fig.3.1

In Fig.3, the pre-trained key landmarks are shown and in Fig.3.1, the landmarks applied to the detected face are depicted.

Pose Estimation : In computer vision the pose of an object refers to its relative orientation and position with respect to a camera.

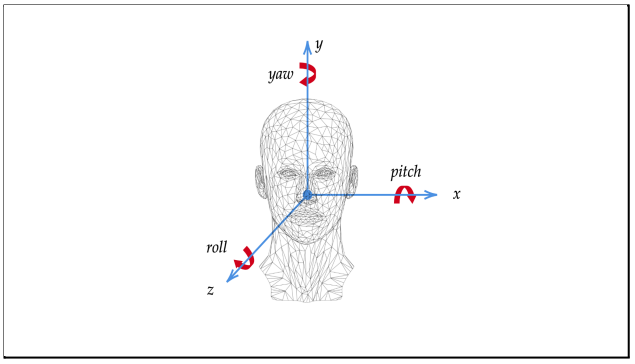

Fig.4

From facial landmarks we get the 2D position of the image. For the 2D positions, 3D locations are considered. For example, for the tip of the nose, the 3D points are (0.0, 0.0,0.0). Fig.4 depicts the 3D location for the tip of the nose. According to the translation and rotation of the 3D points of the head with respect to the camera's centre point and focal length, the angle of deviation of the head is measured and head directions are given as output.

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3) Drowsiness Detection Module:

Using the facial landmarks the eye region's index value will be provided. Based on the index points the eye aspec ratio will be calculated.

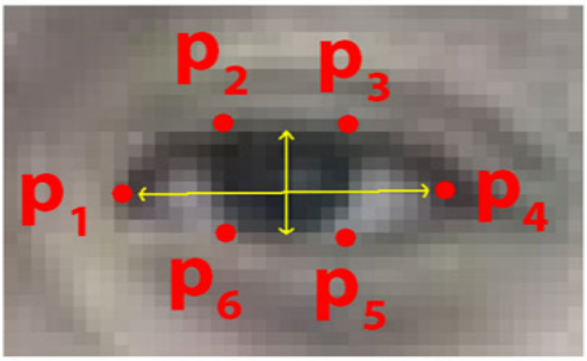

Fig.5

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

Fig.6

Applying the index values of Fig.5 in the formul shown in Fig.6, the eye aspect ratio will be calculated. Th average aspect ratio of both the eyes is calculated fc accuracy. During the blinks the aspect ratio will b automatically decreased hence to avoid drowsiness ale messages when the eye is blinked, a threshold will be se The counter is used to count the number of times the eye i blinked in a frame and when the count value is more tha the given reference value, it is considered as drowsines and alert messages will be provided.

III. RESULTS

The CAFFE model detected the faces at different angles with 99% accuracy. In Fig 7, the person's face and object is detected and a red box is drawn and further the direction of the head and the object name is provided as output.In another example, when the person is drowsy,it will be provided as alert voice messages to help driver to pay attention towards the road. Thus, it may reduce the road crashes which happen through distractions of the driver.

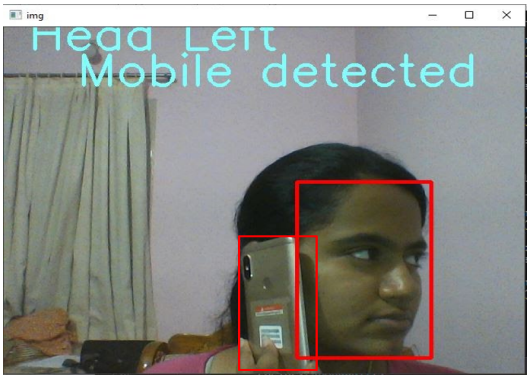

Fig.7

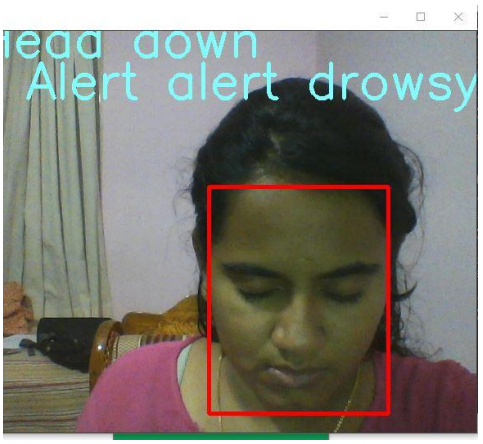

Fig.8

IV. CONCLUSIONS

The project Driver Alertness system proposes a model which identifies various types of distractions through a web camera observing the driver. When the driver uses a mobile phone for more than 5 seconds or when the driver's drowsiness is detected it provides voice alert messages which helps to alert the driver. The project provides a solution to detect the distracted driver and alerts them to prevent possible road crashes which happen through driver distraction.

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Fake and Cloned Account Detection using Machine Learning

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Abstract: **Today, social networks have been part of many people's lives. Many activities such as communication, promotion, advertisement, news, agenda creation have started to be done through social networks.**

Some malicious accounts on Twitter are used for purposes such as misinformation and agenda creation. This is one of the basic problems in social networks. Therefore, detection of malicious account is significant.

In this study, machine learning-based methods were used to detect fake accounts that could mislead people. For this purpose, the dataset generated was pre-processed and fake accounts were determined by machine learning algorithms. Decision trees, logistic regression and KNN,Random Forest algorithms are used for the detection of fake accounts. Classification performances of these methods are compared and the Random Forest proved to be more successful than the others.Accuracy of each algorithm may give the best results based on the preprocessing techniques applied.

Introduction:

Digital media and Social networking phenomenon has grown extremely through the last twenty years. During this rise, different types of social networking have created many online activities which instantly attracted the interests of large number of users.

On the other hand, they suffer from expanding the number of fake accounts that has been created. Fake accounts means that the accounts that do not belong to real humans.

Fake accounts can present fake news, misleading web rating, and spam. Fake accounts violate the Twitter Rules. They act in a prohibited manner.

One of the main problems in social media is the spammers they can use their accounts for different targets.

One of these targets is spreading rumors which may affect a determined business or even the society in a large scale
They interactions or attempts act in a prohibited manner. It can be automated account to deceive or mislead people, for example, posting harmful links, aggressive following behaviors like mass following or mass following, creating multiple accounts.

According to the importance of the effect of social media to the society, in this research, we aim to detect the fake profile accounts from Twitter online social network to prevent the spreading of fake news, advertisements and fake followers using different Machine Learning Techniques.

In this paper we will discussing about the importance of different preprocessing techniques.

Different preprocessing techniques are : Univariate Analysis and bivariate analysis.

We will present the related work and give the description of the proposed method with presenting the results' analysis,here we will also discuss the Hypothesis Assumption and different preprocessing techniques which can be used for data processing of twitter data and finally conclude the research subject and present our future work along with fake and cloned account detection model.

Literature survey:

In [1] In this paper they have considered the problem of detecting spammers on Twitter. They have first collected a large dataset of Twitter that includes more than 54 million users, 1.9 billion links, and almost 1.8 billion tweets. Using tweets related to three famous trending topics from 2009, Spammers post tweets containing typical words of a trending topic and URLs and lead the users to unrelated websites. They have used SVM(support vector machine) to classify spammers and non-spammers. And achieved a result by 70% accuracy on spammers and 96% on non-spammers.

In [2] The ratio of number of followers-to-friends for ground truth users was 1, consistent with past observations, while the fake profiles had a median ratio 30, indicating that the fake users we identified were primarily focused on gathering friends. An analysis of the temporal evolution of accounts over 2 years showed that the friends-to-followers ratio increased over time for fake profiles while they decreased for ground truth users. Our results, thus, suggest that a profile-based approach can be used for identifying a core set of fake online social network users in a time-efficient manner.
In [3] Detecting fake accounts in online social networks (OSNs) protects OSN operators and their users from various malicious activities. Most detection mechanisms attempt to predict and classify user accounts as real (i.e., benign, honest) or fake (i.e., malicious, Sybil) by analyzing user-level activities or graph-level structures. These mechanisms, however, are not robust against adversarial attacks in which fake accounts cloak their operation with patterns resembling real user behavior.

In [4] In this paper, we examine existing methods for detecting unwanted activity on Twitter and present a state-of-the-art system for identifying Twitter spammers. We gathered an appropriate dataset using Twitter's APIs. Synthesizing ideas from the literature, we proposed options to improve our system's performance. We specified certain metrics ("features"), calculated on gathered data, that assist in the classification of user accounts. The metrics fall into three primary categories: profilebased features, Tweet-based features, and network-based features. Despite having insufficient resources and data to draw strong conclusions at the time of writing, we expect to finish our research in the near future

In [5] This paper is based on the, Inside the Black Box: How to Explain Individual Predictions of a Machine Learning Model. This paper contains several explanation methods which are described and compared on multiple datasets (text data, numerical), on classification and regression problems.
In [5] In this paper, they suggest a list of high-level features and study their applicability user interaction; and (iv) business models in detection of cyber pedophiles. Pedophiles are Through a detailed survey, we identify possible gaps in technology and provide people who create fake accounts and invole in recommendations for the research communitychild abuse. They have used binary text on future directions on Cloud-supported Big classification for classifying pedophiles and Data computing and analytics solutions. Non-pedophiles by using behavior and chat conversation of a person as attributes.

In [6] In many Twitter applications, developers collected only a limited sample of tweets and a local portion of the Twitter network. Given such Twitter applications with limited data, they developed a collection of network-, linguistic-, and application oriented variables that could be used as possible features, and identify specific features that distinguish well between humans and bots.

In [7] This paper focuses efficient detection of fake Twitter followers . People who wants to have more followers, create many fake accounts and follow their own account by using those fake accounts and pretend to have more followers. It provides efficient techniques for for detection of those fake Twitter followers. They have used classification algorithms like random forest which gave more accuracy and with respect to cost naïve bayes algorithm was found to be good.

In [8] This paper is based on deception spammers detection on OSN(Online social Networks).
They have used some of the attributes like gender based classification and location based classification, and they classify fake by using ML algorithms.

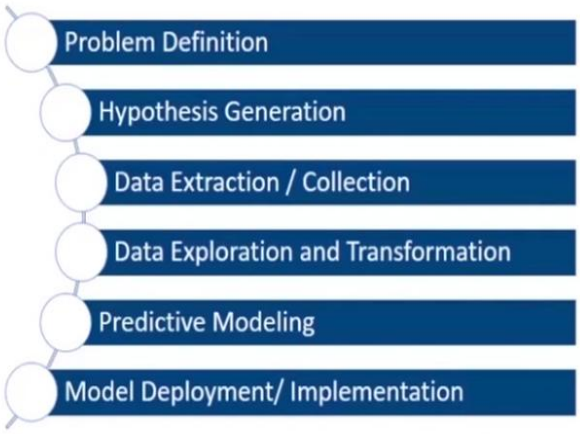
In [9] This paper discusses approaches and environments for carrying out analytics on Clouds for Big Data applications. It revolves around four important areas of analytics and Big Data, namely (i) data management and supporting architectures; (ii)model development and scoring; (iii) visualisation and user interaction; and (iv) business models. Through a detailed survey, we identify possible gaps in technology and provide recommendations for the research community on future directions on Cloud-supported Big Data computing and analytics solutions.

Proposed System:

Our Proposed system has strictly followed Machine Learning Lifecycle.

The Machine Learning Lifecycle involves Problem Defination,Hypothesis Generation,Data Extraction/Collection, Data Exploration and Transformation,Predictive Modeling,Model Deployment.

Problem Statement: To classify a particular dataset status as fake or genuine based on certain attribute using Supervised Machine Learning Technique.



Hypothesis Generation:

1. No of Follower count can affect the status of each instance based on what method you are using
2. Ratio of No. of followers to the friend ~30 is primarily identified as fake account.
3.Geographic location can also affect the status of fake or genuine.
4. profile_image,a profile image can be cloned from internet and can be used for fishing.
5.Even Location can affect the profile as a fake or genuine

Data Extraction/Collection

Dataset used here is the data collected from kaggle website where this data is available for analysis and aplying machine learning techniques.The data is unstructured so data is processed to structure dataset.
The dataset attributes : 'id', 'user_name', 'screen_name', 'statuses_count', 'followers_count',

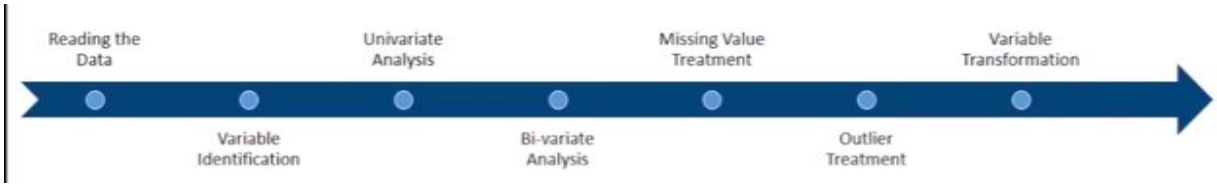
'friends_count', 'favourites_count', 'listed_count', 'url', 'lang', 'time_zone', 'location', 'default_profile', 'default_profile_image', 'geo_enabled', 'profile_image_url', 'profile_user_background_image', 'profile_background_image_url_https', 'profile_text_color', 'profile_image_url_https', 'profile_sidebar_border_color', 'profile_background_tile', 'profile_sidebar_fill_color', 'profile_background_image_url', 'profile_background_color', 'profile_link_color', 'utc_offset', 'is_translator', 'follow_request_sent', 'protected', 'verified', 'notifications', 'description', 'contributors_enabled', 'following', 'created_at'.

For the processed dataset, a status attribute is added.

Data Exploration and Transformation:

Univariate Analysis : In this method each attribute is measured as how it can contribute to the prediction.

Bivariate Analysis : In this method two attribute is measured as how it can contribute to the prediction.



Only data from the corpus was used to detect identity deception. This data was based on the original attributes as found in Twitter, for example their "number_of_friends", also denoted as 'FRIENDS_COUNT" in Twitter.

Variable Identification :Here the attribute identified for prediction is status which can be genuine or fake based on the unvariate and bivariate analysis.

Missing Value Treatment : using variousmethod such as boxplot method it is obtained a cleaned data.

The original attributes used in Experiment 1 were then extended with new engineered features. These features were engineered from psychological principles that identity deception and included previously engineered features that were applied to detect non-human or bot accounts. An example of such a feature is "gender". This feature uses the original SMP attributes, namely the name and profile image of the account. The "gender" feature shows the correlation between the gender derived from each individual attribute. The intention of the second experiment was to evaluate whether these features could possibly improve the accuracy of identity deception detection by humans on SMPs.

PREDICTIVE MODELING :

Naive bayes algorithm:

Naive bayes is a machine learning algorithm based on bayes theorem it is a supervised learning task and also assumed that the predictive attributes are independent. Before we go further, we define the Bayes theorem as, P(A | B) = P(B | A).P(A) P(□) Where P(A) refers to the probability that event A will occur. P(A | B) stands for the probability that event A will happen, given that event B has already happened.

Distance based Outlier(KNN):

Outlier is defined as machine learning technique used to find events that occur very

rarely. The algorithm we are for outlier is distance based outlier detection algorithm distance based outlier detection algorithm Distance based outlier is a method to find the neighboring objects.

Random Forest:

• Random forest is an ensemble machine learning algorithm
• It operates by Building multiple decision tree.
• They work for both Classification and regression.

AdaBoost Algorithm:

• Adaboosting is a machine learning meta algorithm.
• The dataset is separated into decision trees having a depth of 1.
• Calculate total error,significance,sampleweight.
• Predict the largest value.

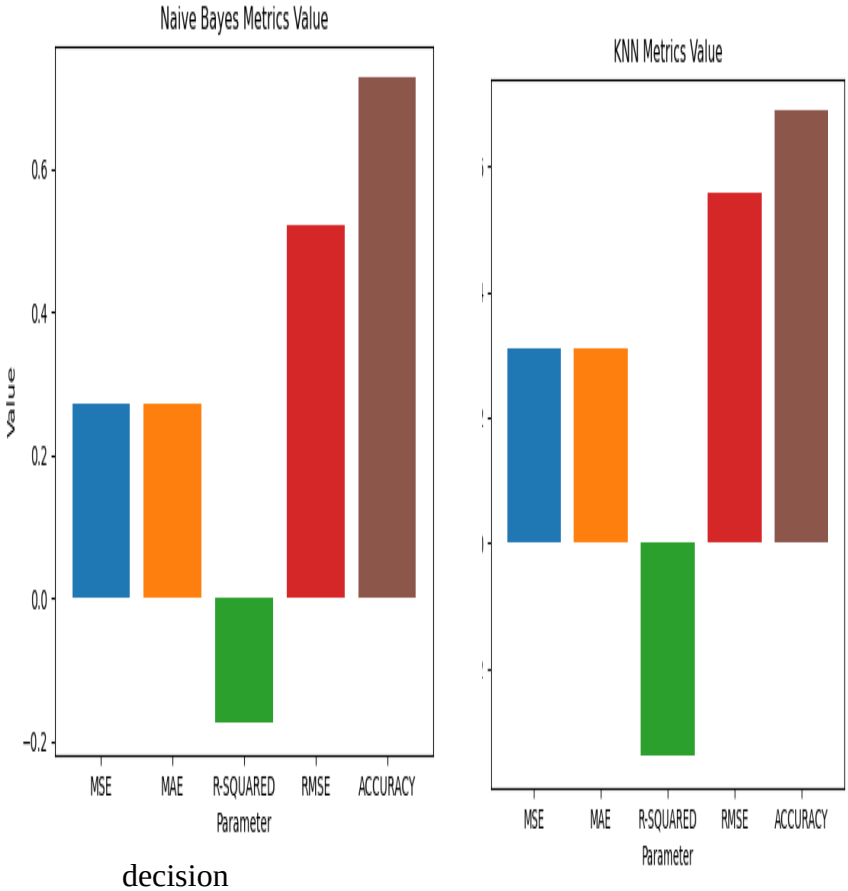
METHODOLOGY:

First we will clear all our previous data which was collected to find fake accounts created by bots or cyborg accounts as we want to find those accounts which are created by humans.
We came to know from our research that most of the human accounts both fake and real had their pictures and name on it.We concluded that in most of the fake accounts people mostly lied on their ages for instance mostly people set the age as 18-19 so that they make their account eligible for creation, people also lie about their gender, the images are also mostly downloaded from internet and some accounts have image of a character of different gender as set in their gender section by them.

We should check the location as well because in order to be safe people set the location to some inaccessible location such as over the Pacific Ocean but the account is being accessed from India. We must also check the location that has be set by the user and the location it is being used as well in order to find the fake account created by humans . So, after the model knows which account fake and which account is real, the model will be successfully able to differentiate a fake account created by human from a real one when the actual data set will be given to it.

RESULT :

The results of naive bayes, decision tree and random forest on the Twitter account dataset are shown below. Figure shows the results of naïve bayes algorithm. Figure shows results of



decision
tree(Adaboost) and Random forest .

CONCLUSION :

In the end, we conclude that the research work have been done to detect, identify and eliminate fake bot accounts created and cyborgs cannot be used for differentiating fake account created by human beings.
As machine learning has evolved in recent days.

We can differentiate fake accounts easily by applying a data set with fake accounts and marking them as fake and real accounts marking them as real .
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A Survey on Traffic Sign Recognition System

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ABSTRACT: Traffic sign recognition system is very much necessary to ensure the safety while driving. These systems help drivers to easily identify the sign and follow them. In any machine learning algorithm the dataset is first trained and then the input data is given to the trained model for further processing. Pre-processing is performed to remove noise. Features from the images present in the dataset are extracted to classify them under different categories. Various techniques such as color segmentation, shape analysis, by obtaining the region of interest and so on, are used to extract the traffic signs to perform the recognition. CNN and SVM are the algorithms which can be used for classification of traffic signs. CNN has provided better results compared to SVM based on the research.

KEYWORDS: *Convolutional Neural Network (CNN), Traffic Sign Recognition, Classification, Image Pre-processing, Support Vector Machine (SVM).*

I. INTRODUCTION

In modern society with the rapid development in technology, automobiles have become significant in everyone's life as it has introduced convenience to people. Today cars have become primary means of transport and their number has been increasing day by day which has also led to traffic and frequent road accidents.

The integral parts of our road infrastructure are traffic signs. Traffic signs provide information that is critical for road users, which tell them to take necessary actions thereby reducing accidents. Traffic signs tell the user the state of the road, warnings, prohibitions, state of road etc. Designing of Traffic signs is done in such a way that they are easy to read with highly saturated and contrasting colors.

Approximately 1.3 million people die because of car accidents every year which means on an average there are3287 deaths per day. India has highest rate of road accidents in the world. As per report issued by Stanford Law School, almost 90% of all vehicle crashes are caused due to some type of negligence by driver such as over speed driving, aggressive or reckless driving, Drowsy driving, Drunk driving, Distracted driving or misinterpretation of Traffic Sign.

Hence, there is need for system that automatically detects, recognizes and interprets the meaning of Traffic signs. This system can be implemented in autonomous cars or driver assistant system, which informs the user what action has to be taken on the right time. This reduces the road accidents, deaths caused due to it and reduces human effort and provides safety and security. Traffic sign recognition system is built so that it can recognize all the emerging traffic signs. It immediately assists the driver or the automatic driving system in recognizing the traffic signs.

II. DATA SOURCE

Data consists of information which is collected from various sources and processed on observation. Color and shape of Traffic signs are chosen by Traffic authorities with the intention of making it easy to understand by humans as they provide important information such as cautions and hazards to drivers. The data can be collected from Kaggle which contains German Traffic Sign Recognition Benchmark (GTSRB) which can be utilized for training the model and later for classification of traffic signs. The dataset is essential to predict the traffic sign accurately which makes it easy for the driver assistant system.

III. LITERATURE SURVEY

The paper titled [1] "A REVIEW ON TRAFFIC SIGN DETECTION AND RECOGNITION SYSTEM" states that safety and security should be provided in autonomous cars. Therefore this system is used. The traffic signs are detected and recognized on basis of shape, color and texture. Information about different method is provided. The proposed system has been split into detection and classification modules. The detection can be done by color based, shape based or other methods. Color segmentation and shape analysis is performed. The complications in the system can be minimized by combining various methods. Reliable systems that are fast and accurate can be built by hybrid technologies.

The paper titled [2] "TRAFFIC SIGN CLASSIFICATION AND DETECTION USING DEEP LEARNING" states regarding the assistance given to the driver during different conditions. The driver pays very less attention towards the traffic signs that are located on the road as his main focus tends to be on the destination address. The CNN algorithm is used for detection and recognition. Video based input is given. CNN-SVM combination is used where CNN is used for feature extraction and SVM is used for classification. Four different types of traffic signs are used which includes warning, prohibition, obligation and informative. Region of Interests (ROIs) is generated after pre-processing. Comparison based on experiment proved that the model is superior over others in the field of training accuracy and speed.

The paper titled [3] "SIMULTANEOUS TRAFFIC SIGN RECOGNITION AND REAL-TIME COMMUNICATION USING DUAL CAMERA IN ITS" conveys that in recent times there is increase in usage of smart vehicles due the development of Intelligent Transport System (ITS). To detect the traffic sign and provide assistance Convolutional neural network is used. Optical Camera Communications (OCC) and CNN are used for detecting the traffic sign after region of interest is generated. Dual cameras continuously in function to capture traffic sign or LED. If both are detected, distance is measured and data extraction takes place leading to further detection and recognition of traffic sign. The generated model reduces the overall computational complexity.

The paper titled [4] "TRAFFIC SIGN DETECTION AND RECOGNITION BASED ON CONVOLUTIONAL NEURAL NETWORK" states that traffic sign detection and recognition are extremely important for the drivers to gain knowledge on road safety and information. The input images are taken and to this images Hough Transformation is applied which generates the area of interest and area of traffic signs is recognized. In Image pre-processing, enhancement of image color and transformation of color space is performed. Classification and identification of image are done with the use of CNN. Different phases included are the detection phase, segmentation phase and classification. Layers of CNN are used in the process of classification. This model mainly aims in detection of circular traffic signs.

The paper titled [5] "TRAFFIC SIGN DETECTION AND RECOGNITION FOR AUTONOMOUS VEHICLES" states that the main reason why the autonomous cars are getting the attention is because of their ability to detect the traffic sign and ensure safety. German traffic sign data-set is used. Color based segmentation and CNN is used to crop the sign and classify the traffic sign. Models are defined after the image is pre-processed and data acquisition is done. Testing is done in the real environment which gives beep sound to alert the driver when traffic sign is recognized. This system can be used in autonomous as well as non-autonomous system to alert the driver. Further if used with mechatronics can automatically take actions based on the traffic signs.

The paper titled [6] "TRAFFIC SIGNS RECOGNITION WITH DEEP LEARNING" defines that the training is given by using German traffic sign dataset. Characteristics from the images present in the training set is extracted to assort them under multiple groups. By using the Lenet-5 network, extract data representation of traffic signs to perform the recognition. It is formed by CNN modifies by connecting the output of all the convolution layer to the multi-layer perceptron. The extraction is based on different factors the network takes 2-D image and processes it with convolution operations. The solution overcomes descriptions extraction which is very sensitive to different factors. It has the ability to learn a representative description of images.

The paper titled [7] "CNN DESIGN FOR REAL-TIME TRAFFIC SIGN RECOGNITION" states the level of recognition of traffic signs using mobile processor in autonomous driving vehicle to ensure the safety. Recognition of traffic signs involves two steps, localization and subsequent classification. Template matching algorithm with precise localization stage showed good results in recognition. When it comes to detection and classification it requires additional support which is provided using CNN. CUDA enabled GPU is used for frame processing in a video, which does it in 7-10ms. This design showed very high accuracy in recognition, detection, localization and classification of image data as well as video based data. Adapting this model will

increase the safety.

The paper titled [8] "TRAFFIC SIGN CLASSIFICATION USING SUPPORT VECTOR MACHINE AND IMAGE SEGMENTATION" states that there is need for efficient method for automatic classification of Traffic Sign in Driver Assistant System. Color image is converted into gray scale which is then given to Canny Edge Detection algorithm which outputs edge image free from noise from which Normal direction feature is obtained and it is used by SVM for classification. Later, Hough Transform algorithm is used to obtain Region of Interest by eliminating background from edge image and then it is given to SVM which uses 4 kernel functions such as linear, sigmoid, RBF and polynomial, out of which linear kernel function provides relatively more accuracy.

The paper titled [9] "AN AUTOMATIC TRAFFIC SIGN DETECTION AND RECOGNITION SYSTEM BASED ON COLOUR SEGMENTATION, SHAPE MATCHING AND SVM" An automatic traffic sign detection and recognition system based on colour segmentation, the shape matching and SVM this study about this topic helps to develop an efficient TSDR system which contains an enriched data set of Malaysian traffic signs and computational time is relative Low which will be helpful for the traffic signs on highways the low false positive rate will increase the system stability and reliability on real time application. Automatically SCR system can recognize and detect traffic signs from and within images captured by cameras or imaging sensors. The introduced technique implemented in variant in variable lightning, rotation and translation also even viewing the angle of the system demonstrating using and shape matching RGB color segmentation next also it supports vector machine which is SVM classifier led to receiver operating characteristic the accuracy of the developed system is accurately.

In the paper titled [10] "TRAFFIC SIGN RECOGNITION USING VISUAL FEATURE TOWARD DRIVER ASSISTANCE SYSTEM" Local Feature Extraction is performed using Scale Invariant Feature Transform (SIFT) algorithm which outputs features that are local, do not change when imageis scaled or rotated and based on how object appear at interest point. Similar local features are grouped under same cluster. Each cluster is considered as visual word and visual word vocabulary is built. When local features are matched with visual word, the images will be represented in the form of Bag of Visual Words (BoW) which will be used as feature vector for classification process.

IV. CONCLUSION

From the survey, it is observed that Convolutional Neural Network (CNN) provides greater efficiency for image processing. Hence, the Machine learning algorithm Convolutional Neural Networks is used to recognize the traffic sign. Pre-processing, feature extraction, feature selection are performed to obtain better results. The images are pre-processed for better quality and easier detection. Feature extraction is performed by CNN algorithm itself, hence there is no need for separate feature extraction technique. The system recognizes the traffic signs and provides assistance to the manual driving system or autonomous driving system. In the future, real time datasets can be considered for evaluation which leads to higher accuracy in predicting in traffic signs for the driver or autonomous vehicle on the path.

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Arduino Based Obstacle Avoiding Robot Using HC-SR04 Ultrasonic Sensor

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***Abstract*— The paper here presents how an ultrasonic sensor can be implemented in a robot such that it can detect obstacle in its path and avoid it successfully. This robot is based on Arduino UNO, HC-SR04 sensor and other programming tools. The main methodology of this project is dependent on how a sonar system works. The robot emits ultrasonic waves and uses these waves to calculate the distance of the object that is directly in front of it. Once the distance is calculated, it will avoid from hitting the object when the distance is shortened to a limited threshold and move on to a different direction. Avoiding of an obstacle is an important aspect to be implemented in every robot such that they do not get crashed by any objects and the same technology is explained here in the paper. This helps in avoiding accidents and saves resources. The document presented here provides a thorough explanation on the components used to build the robot, the methodology and architecture involved in designing of the robot and the end results and conclusion.**

***Index Terms*—Internet of Things (IoT), Arduino UNO, Ultrasonic sensor, Motor Shield L293D, Servo motor, TT motor, Obstacle detection and avoidance**

I. Introduction

Obstacle avoidance is the basic functionality that must be present in an autonomous robot for it to be moving in an unstructured environment. With the advancement in robotics, Active mobile robots have now become one of the most vital research areas. This was possible because of the development of sensor technology. In special circumstances, such as in chaotic obstacles or extremely dangerous moving rooms, it is hoped that collisions can be avoided automatically. In addition, robotic tasks may be complex, and the environment may be too structured to require a certain degree. This intelligent robot, can perform certain tasks satisfactorily. It is especially important to avoid obstacles in real time between people, machines and the environment. The project proposes a robotic vehicle with built-in intelligence that can guide itself when obstacles approach using Arduino Uno.

The algorithm for autonomous obstacle avoidance of mobile robots follows as : Initialize ultrasonic sensor and servo motor. After that, the robot gets the information from sensors around the habitat to update the map in real time. The robot uses its own obstacle avoidance algorithm to obtain the best moving path , so that the robot can safely avoid all obstacles in the shortest way. The robot must plan and redirect in real time. There are lots of common and serious problems with autonomous moving robot that includes requirement of large search space, time and space complexity of the algorithm as well as efiiciency issue. The result of which complexity of the algorithm has increased significantly, or even cannot be solved, especially when the number of obstacles increases, and obstacles in the field become more complex.

II. Methodology

The model proposed is predicated on the way how a sonar system works. This primarily IoT based proposed machine avoids impediment in front of it with the aid of using the assist of an ultrasonic sensor. The sensor used here is HC-SR04. This sensor has 40khz ultrasonic frequency.

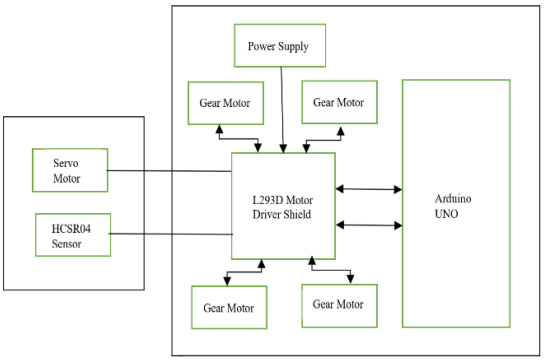

Fig . 1. Block diagram of the system

Primarily when the robot is initiated, it will initialize the HC-SR04 sensor and servo motor. The sensor will send a sonic burst and calculate the distance. If the obstacle is about 50cm near the robot then the robot will stop and move backward. Later the robot with the help of a servo motor will turn the HC-SR04 sensor to left and right and calculate distance if any obstacle persist in that path. Then it moves on to the direction where minimum distance is calculated. By doing this process in a continuous loop, the robot will successfully evade any obstacle in its path. The distance is calculated based on the formula; time calculated by sensor multiplied into

the speed of sound, where the result is divided by two.

$$\text{Distance} = \frac{\text{Time x Speed of Sound}}{2}$$

The following listed components were used for the designing purpose:

- Ultrasonic Sensor HC-SR04
- Arduino UNO
- Motor Driver Shield L293D
- Servo Motor
- TT gear motor
- Jumper wire
- Wheels
- 18650 Li-on Batter
- 18650 Battery holder

A. Ultrasonic sensor HC-SR04

Fig. 2. Ultrasonic Sensor HC-SR04

The above diagram shows the ultrasonic sensor used and below one depicts how the sonic burst are produced and are reflected back to the ultrasonic sensor when it hits an object.

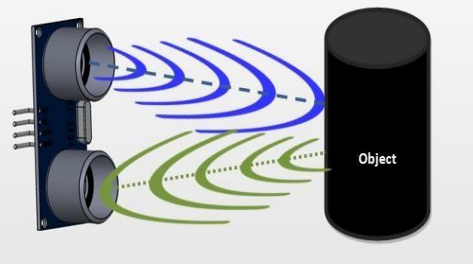

Fig. 3. Working of ultrasonic sensor

The sensor will send a sonic burst of 8-pulse at 40khz. The eco pin goes high at this time until the pulses are reflected. The time in which the echo pin will be high is taken as input to calculate distance. If the pulses does not reflect within 38 milliseconds then the echo signal will timeout and resent again.

The specification of HCSR-04 Sensor features are as below:

Operating Voltage	DC 5V
Operating Current	15mA
Operating Frequency	40KHz
Max Range	4m
Min Range	2cm
Ranging Accuracy	3mm
Measuring Angle	15 degree
Trigger Input Signal	10μS TTL pulse
Dimension	45 x 20 x 15mm

B.Arduino UNO

Arduino Uno is an open-source small microcontroller board designed on 8bit ATmega 328P microcontroller.The board contains specially equipped components like crystal oscillator which provides clock signal, serial communication which provides communication between the board and computer or other devices, voltage regulator , to provide stable voltage, etc to cope up with the microcontroller.

A regular Arduino has 14 digital input/output pins in which 6 pins are used for PWM outputs and 6 for analog input pins , there is a power barrel jack , USB connection (to connect to the computer etc), ICSP header and reset button.

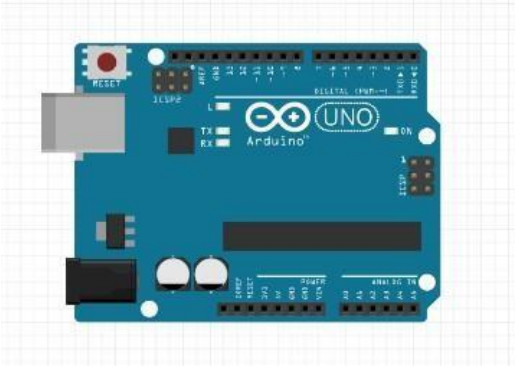

Fig. 4. Arduino UNO

General pin functions:

LED	Light emitting diode is built-in and controlled by P13. LED can be switched on and off
VIN	Voltage will be by external power supply
5V	This provides stable 5V. Applying voltage to 5V or 3.3V pin bypasses the regulator and can damage the board completely
3V3	This is generated by on-board regulator. Maximum consumption cannot exceed 50mA.
GND	This is a ground pin
IOREF	Provides reference on how the microcontroller works.
RESET	It resets the microcontroller

Special pin functions:

Serial / UART (RX and TX)	RX is receive and TX is transmit . It is connected to ATmega328P USB to TTL chip
External interrupts	Generates an external interrupt
Serial Peripheral Interface	Also called SPI pins , pin 10 , 11 , 12 and 13 . These pins are used to maintain SPI communication with help of SPI library . These include : • SS: Used as slave select • MOSI: Used as master-slave input • MISO: Used as master-slave output • SCK: Used as serial-clock
Analog Reference or AREF :	It provides reference on voltage from external power source
Two-wire interface or also called TWI (Pin SDA and Pin SCL)	These provide TWI communication from the wire library
Pulse-width modulation	Converts digital signals to analog signals

C. Motor Driver Shield L293D

This robot project is to control different types of motors such as TT gear motors, servo motors. However, these motors generally cannot be controlled directly by the Arduino or any other microcontroller. This is due to their higher rated current and wattage, so motor shields are used instead. These shields isolate the power supply to the motor and use the control logic of the Arduino circuits. In this project L293D motor driver shield with Arduino was used.

Fig. 5. Motor Driver Shield L293D

The shield power supply can be used for both the shield and the Arduino, or both can use separate power supplies. It includes inputs and trigger pins. Logic input value 00 or 11 will stop the motor respectively. Logic values 01 and 10 will cause it to rotate clockwise and counterclockwise, respectively.

D. Servo Motor

A servo motor is a linear actuator or rotary actuator that provides precise control of linear or angular position, acceleration, and speed. It consists of a motor combined with a position feedback sensor.

Fig. 6. Servo Motor

It is a basically a kind of DC or AC motor which is associated with servo mechanism. It also consists of gear, potentiometer and control circuit. The servo motor starts running when the difference between the signal of potentiometer shaft and another input line of error detection amplifier is greater than zero. If the difference is equal to zero, the motor will stop running. The value of the difference will change if the angular position of the shaft changes. In this project the servo motor plays the role of rotating the ultrasonic sensor to left and right direction when it gets an obstacle in its path and by doing so it helps the robot to move in an obstacle free path.

E. TT Gear Motor

These durable as well as affordable plastic TT gear motors are an easy and cost-effective way to make our project a reality.

This is the 1:48 TT DC geared motor that comes with the kit. With 2 x 200mm wires and 0.1 inch connector compatible with the board. Ideal for connecting breadboards or terminal blocks. These motors can be supplied with a voltage of 3 to 6 VDC. Of course, they will be faster at higher voltages.

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Fig. 7. TT Gear Motor

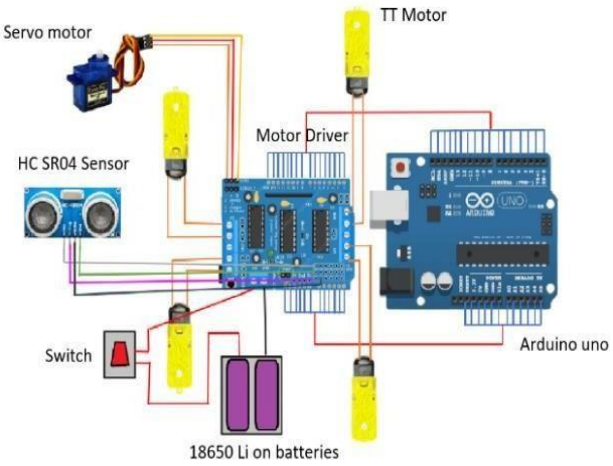


Fig. 8. System Design

III. FLOWCHART

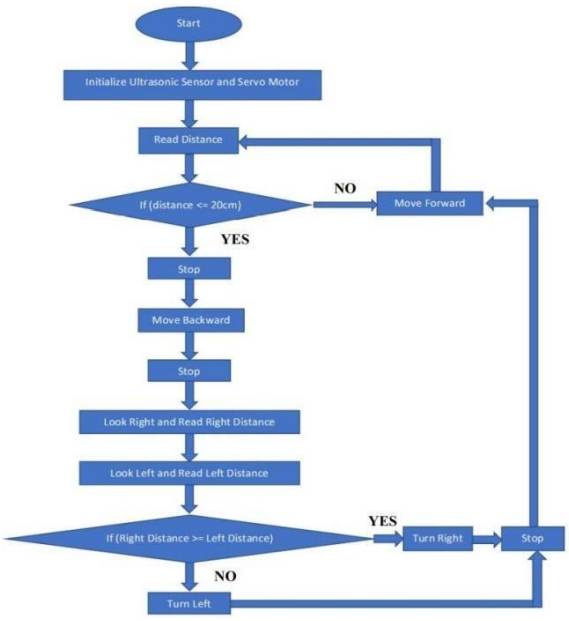
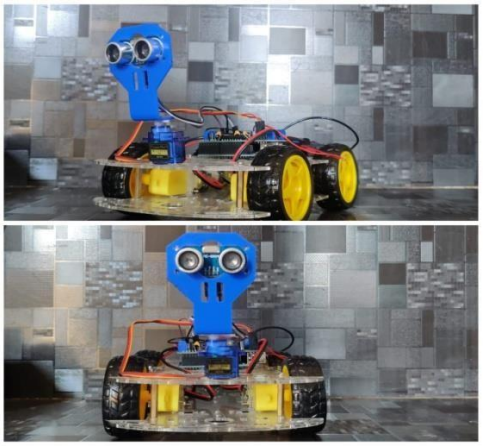


Fig. 9. Flowchart of working model

IV. RESULTS

The prototype of the mobile robot was designed and implemented in a way that it can successfully avoid obstacles. The system was equipped with software intelligence that enables it to determine the environment, detect obstacles in its path, and navigate and overcome obstacles in unfamiliar environments.

It contains a simple hardware platform on which the microcontroller is located. It was compiled using the Arduino IDE. Obstacles can be avoided by interfacing Arduino and ultrasonic sensor. Based on the value of the ultrasonic sensor, the robot can decide to turn left or right. Hence, it was able to perform desired tasks in unstructured environments without any human guidance.



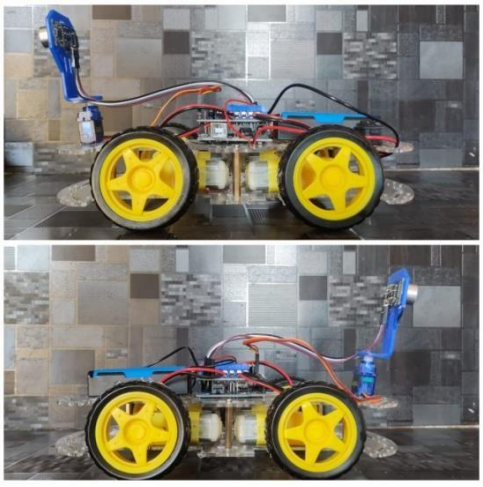


Fig. 10. The proposed model

At this stage, the robot was able to successfully avoid the obstacles and choose the suitable path without any hindrance.

V. Applications

The application of Obstacle avoidance robot isn't always restrained, and it is utilized in maximum of the military business enterprise now which facilitates perform many volatile jobs that can't be executed via way of means of any soldiers. It can also be used in vacuum cleaners for cleaning without human intervention. It can be used in parking system for automatic vehicle parking since it will avoid the obstacles and prevent the vehicle from getting damaged. With current trend in the independent automobiles sector, a terrific and reliable obstacle avoidance function of a driverless platform is likewise required to have a strong obstacle detection module.

VI. Conclusions

Obstacle avoidance is the utmost important strategy that should be applied to most of the mobile robot for a safer indoor and outdoor application. These robots can be used for household purpose as well as in scientific exploration.

For a robot that is to be functioning in industries or factories, it is required that the robot perform obstacle avoidance so that it may not injure the workers. In conclusion, with the advancement of technology and robotics implementation, obstacle detection and avoidance should be the basic and most important functionality for any navigational robot.

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A FACE RECOGINITION BASED VOICE ASSISTANT (B.U.D.D.Y)

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***ABSTRACT*— Evolution of Communication and Technology are quite old and is constantly growing and changing. The change in technology is so fast that nowadays everybody has an AI Personal assistant. All our phones have a personal assistant in the form of Siri or Google assistant or Bixby. Use of voice based personal assistants are increasing constantly and helps in making our life simpler. This project presents an intelligent voice assistant with ability to maintain and organize information it includes the management of emails, calendar events, files and to do lists. The attempt has been made to develop an "Intelligent Personal Voice Assistant using Python" which helps people to do some basic tasks with their voice(speech), extract information and perform tasks on their desktop.**

Along with the voice assistant, a "Facial Recognition System" has been added to verify the identity of the voice assistant user. A smart environment is an environment which can identify people, interpret their actions and react accordingly. A face recognition system is one of the biometric information processes, its applicability is easier and working range is larger than others. The program takes a face image and measure the characteristics such as the distance between the eyes, the length of nose etc. With growing the use of data and almost being completely dependent on data, security is needed more than before and what could be better than a biometric security feature.

Keywords*— *PCA, LDA, Kernel PCA, KDD CUP Dataset, Classification algorithm's, logistics regression, Decision tree, Random forest, KNN, Kernel SVM, UNSW-NB15 dataset.

I. INTRODUCTION

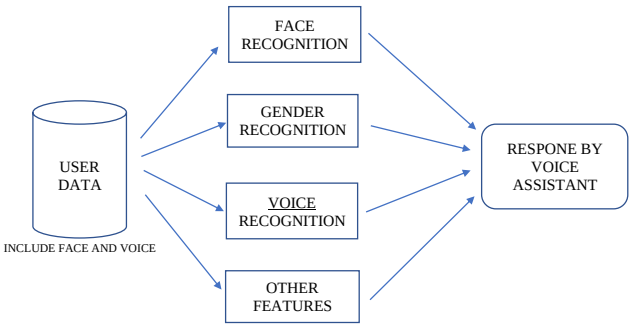
Face Recognition is the task of recognizing a person based on its facial image or a live camera feed. It has acquired its popularity in past two decades. Facial Recognition Systems are built on computer programs that detects and analyses human face for the purpose of identifying and authorizing them accordingly. The program takes a face image and measure the characteristics such as the distance between the eyes, the length of nose etc. With growing the use of data and almost being completely dependent on data, security is needed more than before and what could be better than a biometric security feature. We can implement this biometric feature using several machine learning algorithms and deep learning techniques and hence provide the data from the assistant to the relevant user.

II. PROBLEM STATEMENT

With all the current voice assistants available such as Alexa, Google assistant and various others, there is a little security flaw. As the voice assistants, all being voice controlled, none of them identifies the user who commands it. This issue of not identifying the user may rise to a problem of giving away the data to the user who shouldn't have it.

III. PROPOSED SYSTEM

The proposed system is to implement a voice assistant with the face detection, face recognition, gender recognition and various models using various supervised and unsupervised datasets and test its usability in a voice assistant.



The above figure depicts the high level approach adopted to the problem statement through the training of various Models of face recognition and gender recognition with our training dataset and aggregating the results to implement a good voice assistant.

IV. SYSTEM ARCHITECTURE

Dataset was optimized through extraction of features. After training and testing the proposed models with optimized dataset and well implemented and integrated for deployment.

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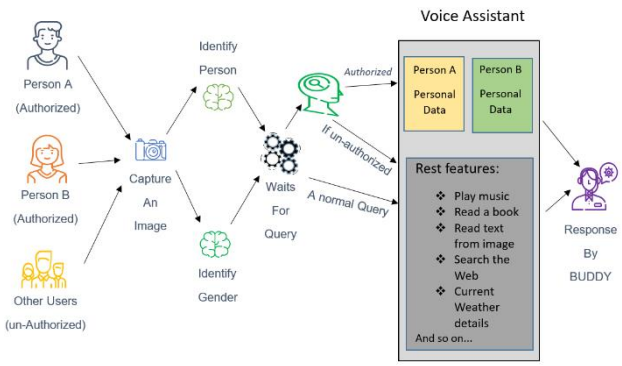
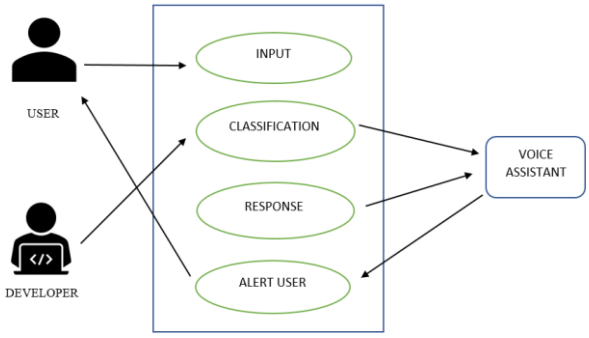


USE CASE DIAGRAM

The use case diagram for a normal execution is represented in the above figure. A user (who has installed the application) opens the application, in which the face of the user is an input to the project. The developer handles the accuracy rates to classify whether the person is authorized or not. The face recognition system embedded in voice assistant classifies the user (authorized or unauthorized) and sends the result back to the interface. The interface has the confidence and recognized user name along with their gender, and if any personal question is asked then it will be sent a text message as an alert.



V. ALGORITHMS

1. *Voice Recognition*

Python Speech Recognition Module This algorithmic program are the modules or the packages for the recognizing the voice. The work started with analyzing the audio commands given by the user through electro-acoustic transducer. this may be something like obtaining any data, in operation computer's internal files, etc. this is often AN empirical qualitative study, supported reading higher than mentioned literature and testing their examples. Tests square measure created by programming consistent with books and on-line resources, with the explicit goal to search out best practices and an additional advanced understanding of Voice Assistant.

2. *Face Detection: Haar Cascade Algorithm*

For Face discovery we use Haar Cascade calculation which includes in the accompanying advances:

1. In the Haar Cascade estimation relies upon Course classifiers which contain Haar features which are in Haar record helps for the acknowledgment of face.

2. The course classifiers are the blend of a lot of frail classifiers used to make a solid classifier.

3. This mix frames a square shape which comprises of highly contrasting recognizable proof lines on the face or the picture.

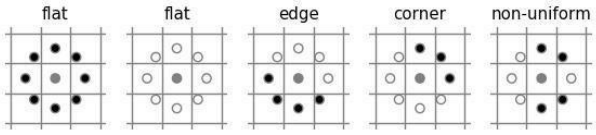
4. By utilizing Cascade Classifiers it additionally distinguishes grin, eyes regardless of countenances.

3. *Gender Detection Classifier*

The Gender Detection Classifier stores pictures for classification purpose and makes classification supported similarity live. Subsequently, Manhattan Distance is calculated between every purpose of the image to the coaching pictures by the classifier. The increment of hit or miss score depends on whether or not the common distance reaches above or below predefined threshold value. Resultant male or female depends on the hit or miss score. If hit score is bigger for specific labels (Male, Female), then the image ought to be thought of as that label.

4. *Local Binary Pattern*

This method checks points around a central point and tests the surrounding points if they are greater or less than the center point.



Points around the central point is checked and tested whether the points are greater or less. We can clearly view the above figure in order to clearly demonstrate this. Pixels which are represented by black or white dots are considered as less or more intense respectively compared to the central pixel. In case of being the surrounding pixels are all black or white, then image region is considered as flat and featureless. Corners or edges are the uniform patterns which are continuous groups of black or white pixels. On the other hand, non-uniform patterns are generated if pixels change to and fro between black and white pixels.

5. *Viola-Jones Algorithm*

This algorithm helps us to discover options of a face in any particular frame of a video sequence. This can be the primary object detection framework which gives a competition to real time detection rates. Paul Viola and Michael Jones are the one those who introduced this algorithm. They created this algorithm mainly by the issue of the face detection. There are four steps that have to be followed to discover a face. Firstly, we tend to train the system with the haar features. Haar features are a form of rectangular boxes that are black and white.

VI. LITERATURE SURVEY

2.1. *Voice Assistants*

a) Aditya Sinha et al. conferred a virtual voice based mostly personal intelligent assistant for visually disabled persons. The project could acknowledge and reply to what user could say in a good and efficient manner via voice, similar to having a spoken language. The main focus was on the development of informal agent and speech recognition module which would be able to work offline and perceive the Indian accent. The approach included the employment of Java library Sphinx-4, Mary TTS and neural networks to enter the training capabilities.

b) Moreover, in 2017 Othman planned paper on Voice Controlled Personal Assistant Victimization Raspberry Pi, the project showed the implementation of a Voice Command System as Associate in Nursing Intelligent Personal Assistant (IPA) which would perform various tasks or services for a private victimization Raspberry Pi as a main hardware to implement this model that works on the first input of a user's voice. Bibek Behera had planned a model for a private assistant to ease out the work done by humans for tasks like booking tickets, ordering food, etc. Chappie uses linguistic communication process (NLP) to analyse chats and extracts intent of the user. Then it uses this info and AIML (Artificial Intelligence Mark-up Language) to form a conversation with the user.

2.2. Gender Recognition

A rich amount of the literature is already existing on the topic of the gender classification. It's not possible to organize all the previous methods into the single ubiquitous taxonomy in this current paper; however, we have provided a quick overview of this a how researcher previously approached to gender classification.

The earlier methods which are addressed the gender classification problems are known as the appearance-based methods. In this appearance based methods, features are extracted from face image—considering that the face as a one-dimensional feature vector & then the classification tool is used. With some earlier researcher extracted pixel intensity value as well & then fed these value to the classifier. The pre-processing step included face alignments, image re-sizing, & illumination normalization. The sub-space transformation is also performed either to reduce dimensions or to explore parts of the underlying structure of image raw data. Basically, the classification is mainly performed through the binary classification strategy. The mostly used classifier for automatic gender classification is the support vector machine; other classifiers applied are included decision trees, neural networks, and AdaBoost. For more than detailed information about gender classification methods.

Recently, new gender classification algorithm is proposed in some papers. Authors of that paper performed tests on the two databases FEI and a self-built database. Different kind of texture features are extracted from the face images. The texture features are extracted from the three discriminating levels which includes global, directional, and regional. The kernel-based support vector machine was used later on for the classification stage.

The other methods which were used for the gender classification are known as geometric methods. These model extract the facial landmark information from the face images & build a model based on the landmarks information. Geometric models maintain certain geometric relationship between different face part. These model discard the facial texture information in the whole modelling process.

Deep Convolutional Neural Networks (CNNs) showed an outstanding performance for the various image recognition problem. The CNN based methods were applied to both features extraction as well as the classification algorithm for automatic gender classification. Hybrid system for the gender & age classification was presented. Features were extracted through the CNNs, & an extreme learning machine (ELM) used for the classification. This hybrid model is known for the ELM-CNNs in the literature. The ELM-CNNs evaluated on two public databases, MORPH-II & Adience. The ELM-CNN is best algorithm for performing on the gender classification thus far.

2.2.1. Gender Classification

A detailed survey of the gender classification method that can be found. Here we quickly survey relevant methods. Early methods for the gender classification are used neural network trained on the small set of the near-frontal face images. In the combined 3D structures of the head & image intensities are used for classifying gender. SVM classifiers are used, applied directly to image intensities. Rather than using the SVM, used the AdaBoost for the same purpose, here again, applied to image intensities. Finally, the viewpoint-invariant age & gender classification was presented. Different works were done on the facial gender detection which introduce the unique result with their performance rate for the different database. Those method basically rely on the following causes: what were the basis for face features extractions? How will be done analysis of extracted feature & result? What type of the sample databases have been taken? Then after gender detection process is being carried out. H. D. Vankayalapati has contributed in his work based on Support Vector Machines(SVM) algorithm for the feature classification using MATLAB. Facial edge has been carried out using the Laplace of Gaussian filter to determine the landmark position. GTAV face database is being used for the verification of the input data. The limitation of the work is classification may differ with the human race. Hence to eliminate the limitation of race & ethnicity Elham Arianasab presented work using Neural Network-based classification algorithm for the gender diagnosis & reliability is mainly based on the pixel value and geometric facial features.

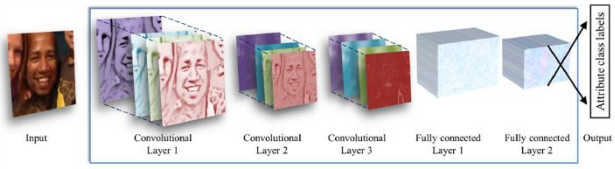


Fig.1. Gender Classification Using CNN

2.3. Face Recognition and Detection

Face detection is technology that verify the locations & sizes of external body part discretional image. The facial features are detected and also the alternative objects like trees, buildings and bodies etc. are neglected from the digital image. It is thought to be a specific case of object-class detection, wherever the task is finding the placement and sizes of all objects in a picture that belong to a given category. Face detection, is thought to be a lot of general case of face localization. Face localization, the task is to search out location and size of the glorious variety of faces. Primarily there have been 2 variety of approaches to sight facial half within the given image i.e. feature base and image base approach. Feature base approach tries to extract choices of the image and match it against the information of the face options. Whereas image base approach tries to induce best match between coaching and testing pictures.

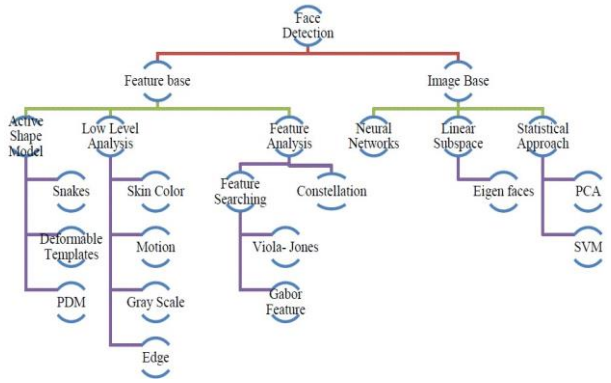


Fig.2. Detection Method

2.3.1. Face Tracking

Object pursuit is outlined as keeping a trace on a selected quite object. during this paper as we have a tendency to square measure in the main concentrating on face, we have a tendency to track human faces supported the given input options. Continuous pursuit makes us leave the issues like illumination, variation in create etc. aside. Here pursuit of human faces during a video sequence is finished and additionally live video pursuit employing a digital camera is finished.

2.3.2. Kanade Lucas Tomasi (KLT) algorithm

Kanade Lucas Tomasi algorithmic program is employed for feature chase. it's a preferred one. KLT algorithmic program was introduced by filmmaker and Kanade and their work was later extended by Tomasi and Kanade. This algorithmic program is employed for police work scattered feature points that have enough texture for chase the desired points during a sensible customary. Kanade-Lucas-Tomasi (KLT) algorithmic program is employed here for chase human faces unceasingly during a video frame. This technique is accomplished by them finding the parameters that permit the reduction in similarity measurements between feature points that area unit associated with original translational model. first during this algorithmic program, we have a tendency to calculate the displacement of the half-track points from one frame to a different frame. From this displacement calculation it's straightforward to reason the movement of the top. The feature points of a person's face area unit half-track by mistreatment optical flow hunter. KLT chase algorithmic program tracks the face in 2 easy steps, first it finds the traceable feature points within the 1st frame and so tracks the detected options within the succeeding frames by mistreatment the calculated displacement

.

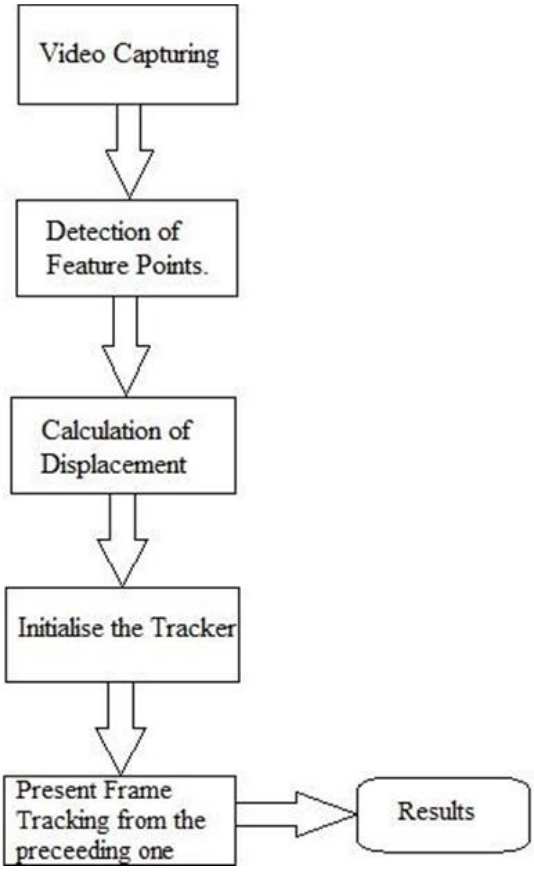


Fig.3. KLT Algorithm

2.3.3. Translation

In this rule foremost it detects harris corners within the first frame. So then optical flow it continues to find the points by computing the motion of the pixels of a picture. For every translation motion of the image optical flow is computed. The harris corners are detected by linking the motion vectors in consecutive frames to get a track for every harris point. Simply to not lose the track of the video sequence we tend to apply harris detector at each ten to fifteen frames. This can be nothing however ensuring by checking the frames periodically. During this method new and previous Harris points area unit half-track. Here during this paper, we tend only 2-D motion i.e. translation movement.

2.3.4. Face Detection

Detecting face is a computer technology which will let us know that the location & size of human faces. This will help in getting the facial feature & avoiding other object & things. In this present situation human face perception is a biggest research area. Basically about detecting a human face through some trained features. Face detection is preliminary step for

many other applications such as face recognition, video surveillance etc.

Face detection involves separating image windows into 2 classes; one containing faces (turning the background (clutter). It's tough as a result of though commonalities exist between faces, they will vary significantly in terms mature, skin colour and facial features. the matter is additional sophisticated by differing lighting conditions, image qualities and geometries, further because the chance of partial occlusion and disguise. a perfect face observes or would so be ready to detect the presence of any face below any set of lighting conditions, upon any background. The face detection task may be countermined into 2 steps. the primary step may be a classification task that takes some whimsical image as input and outputs a binary price of affirmative or no, indicating whether or not there are a unit any faces gift within the image. The second step is that the face localization task that aims to require a picture as input and output the placement of any face or faces inside that image as some bounding box with (x, y, width, height).

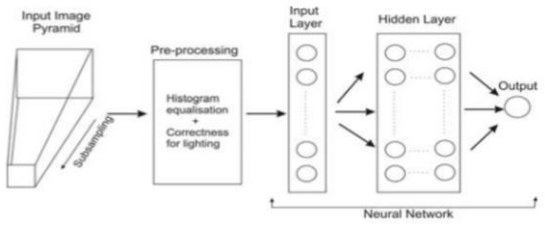


Fig.4. Generalized View Of Face Detection Algorithm

2.3.3.5. Viola-Jones Algorithm

This algorithm helps us to discover options of a face in any particular frame of a video sequence. This can be the primary object detection framework which gives a competition to real time detection rates. Paul Viola and Michael Jones are the one those who introduced this algorithm. They created this algorithm mainly by the issue of the face detection. There are four steps that have to be followed to discover a face. Firstly, we tend to train the system with the haar features. Haar features are a form of rectangular boxes that are black and white.

Haar features are easy rectangular feature that is difference of the sum of pixels of areas inside the rectangle. This rectangle may be at any position of the frame and may scale the image. This changed feature set is named 2-rectangle feature. Every feature kind will indicate the existence or the absence of sure characteristics within the frame, like edges or changes in texture.

These haar features are applied to work out the facial features. The Black half is used to discover nose feature of a person's face because the black coloured part defines the presence of a nose that is located at the middle of the face. And also the Figure-3 (e) is named a four Rectangle feature. Wherever the black part is denoted as +1 and also the white part is denoted as -1. The result's calculated by subtracting the sum of pixels underneath the white rectangle from the sum of pixels under black rectangle. At first some threshold is taken for specific features. Average sum of every black and white is calculated. Then distinction is checked with threshold. If the worth is on top of or matches with the edge, then it's detected as relevant feature.

2.3.1.6. Integral Image Test

The integral image part is to add all the pixels of a selected box to its left and above ones. The four corner values of area that are to be calculated. This makes avoid summing of every element within the region. This integral image conversion method is introduced simply to hurry up the method in calculating pixels.

The calculation of the sum of pixels of the part D within the below figure is (1+4) (2+3) i.e. [A+(A+B+C+D)] - [(A+B+A+C)] which supplies D. The authors defined the bottom resolution of the detector to be 24x24. In different words, each image frame to be divided into 24x24 sub-windows, and feature are extracted in any respect possible locations and scales for every such sub-window. This leads to an exhaustive set of rectangle features that counts over a 160,000 feature for one sub-window.

2.3.1.7. ADA-Boost

It is a process which is used to find out the relevant & irrelevant features. It uses weak classifier & weight to form the strong classifiers. It finds the single rectangular features & thresholds which are the best to separate the non-faces & faces in training example in term of weighted error. It first starts with the uniform weight while training. Next it evaluates the weighted errors for every features and picks the best one. Than we re-evaluate the example where the incorrect classifiers will have more weight & correct classifiers will have less weight. Finally, classifier will contain the combination of the correct classifiers which are having mainly less weight. Which reduce the computational time of non-faces to be discarded.

2.3.1.8. Learning Classification Functions

The complete set of the features is quite large which are 160,000 features per single 24x24 sub-window. By computing a single feature can be completed with only a few simple operation & evaluating the entire set of features which is still extremely expensive and cannot be performed by the real-time applications. Viola & Jones assumed that the very small number of extracted feature can be mainly used to form an effective classifier for the detection of face. Hence, the main challenge is to find those distinctive feature. They decided to use the AdaBoost learning algorithm for the feature selection mechanism. In the original form, AdaBoost is mainly used to improve classification results of the learning algorithm by combining a collections of weak classifier to form the strong classifiers. This algorithm starts with equal weights for all the examples. In every round, the weights are updated so that misclassified example receives more weight. By drawing this analogy between the weak classifiers and features, Viola & Jones decided to use the AdaBoost algorithm for the aggressive selection of some small number of good feature, which nevertheless have significant varieties. Theoretically, the weak learning algorithm is restricted to the set of classification function, which of every is dependent on the single feature. And the weak classifier h (x, f, p) is then defined for a sample x (i.e. 24x24 sub-window) by the feature

f, a threshold, and the polarity p which is indicating the direction of the inequality. The main advantage of the AdaBoost over its competitors is speed of learning. For every feature, the example is sorted based on the feature value. The optimal threshold for this feature can be then computed in the single pass over these sorted list.

2.3.1.8. Cascading

The step is mainly introduced to speed up the process & give an accurate result. This step constitutes of several stage where every stage consists of a strong classifier. Every features are grouped into some stages. It detects the faces in the frame by sliding a window over a frames. Whenever an input is given it checks for the certain classifier in the first stage and then so on. But it is passed to successive stage if & only if it satisfies the preceding stage classifier.

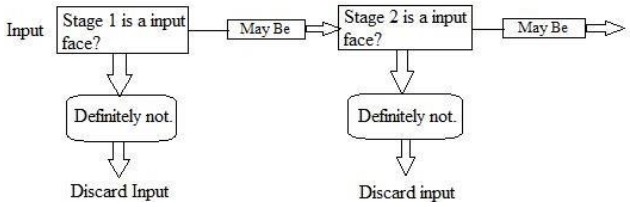


Fig.5. Cascading

2.3.2. Constellation Method

All strategies mentioned to this point are ready to track faces however still some issue like locating faces of assorted poses in advanced background is actually troublesome. To scale back this problem investigator, form a group of facial features in face-like constellations using additional sturdy modelling approaches like applied math analysis. Numerous varieties of face constellations are planned by Burl et al. They establish use of statistical shape theory on the features detected from a multiscale Gaussian derivative filter. Huang et al. additionally apply a mathematician filter for pre-processing in a very framework supported image feature analysis. Image Base Approach.

2.3.2.1. Neural Network

Neural networks are gaining so much more attention in many patterns recognition problem, such as OCR, object recognition, & autonomous robot driving. Since the face detection can be treated as the two class pattern recognition problems, and various neural networks algorithm have been proposed. Advantage of using neural network for the face detection is the feasibility of the training a system to capture complex class conditional density of the face pattern. However, there is demerit in the network architecture has to be extensively tuned to get exceptional performance. In days many hierarchical neural networks are proposed by Agui et al. The first stage having two parallel sub network in which inputs filtered intensity values from an original image. Inputs to the second stage network consists of the output from the sub network & extracted feature value. The output at second stage shows the presence of the face in the input regions. Propp and Samal developed one of the earliest neural networks for face detection. Their network consists off our layers with 1,024 input units, 256 units in the first hidden layer, eight units in the second hidden layer, and two output units. Feraud & Bernier presented the detection method using auto associative neural network. The idea is basically based on the auto associative network with five layer which is able to perform a nonlinear principal component analysis. One auto associative network is used to detect the frontal view faces and another one is used to detect the face turned up to 60 degrees to the left & right of the frontal view. After that Lin et al. presented the face detection system using probabilistic decision-based neural network (PDBNN). The architecture of PDBNN is similar to the radial basis function (RBF) network with modified learning rules & probabilistic interpretation.

2.3.3. Statistical Approach

2.3.3.1. Support Vector Machine (SVM)

SVMs were first introduced Osuna et al. for face detection. SVMs work as the new paradigm to train polynomial functions, neural network, radial basis function (RBF) classifiers. SVMs works on the induction principles, called structural risk minimizations, which targets to minimize the upper bound on expected generalization errors. The SVM classifier is the linear classifier where the separating hyper plane is chosen to minimize an expected classification error of the unseen test pattern. In Osuna et al. developed the efficient method to train the SVM for large scale problem, and are applied it to face detection. Based on two test sets of 10,000,000 test patterns of 19 X 19 pixels, their systems have slightly lower error rates & runs approximately 30 times faster than system by Sung and Poggio. SVMs had also been used to detect faces and pedestrians in the wavelet domain.

2.3.4. Digital Image Processing

Digital Image Processing Methods stock from two principal application areas:

1. Improvement of the pictorial information for the human interpretation.

2. Processing of the scene data for the autonomous machine perception.

In the second application area, it focuses on procedure for the extracting images information in the form which are suitable for the computer processing.

Examples include automatic character recognitions, industrial machine visions for the product assemblies and inspections, military recognizances, automatic processing of fingerprints etc.

Image:

An image refer an 2D light intensity functions f(x, y), where(x, y) denote the spatial coordinate and the value of the f at any point (x, y) is proportional to brightness or gray level of the images at that point. The digital image is an image f(x, y) that has discretized both in the spatial coordinate & brightness. The element of such a digital array are called as image elements or pixel.

A simple image model:

To be suitable for the computer processing, the image f(x, y) must be digitalized both spatially & in amplitude. Digitization of the spatial coordinate (x, y) is called as image sampling. Amplitude digitization is called as gray-level quantization.

The storage & processing requirement increased rapidly with the spatial resolution & the number of gray levels.

Example: 256 gray-level image of the size 256x256 occupies the 64k byte of memory.

Type of Image processing

- Low Level Processing
- Medium Level Processing
- High Level Processing

2.3.5. Face Recognition

There are two prevailing which proceeds towards to the face recognition problem: Geometric which is feature based and photometric which is view based. As researchers interest in face recognition continued, many different algorithms were developed, three of which have been well studied in face recognition literature.

These algorithms can be divided into two main approaches:

1. Geometric(feature based): It is based on the geometrical relationship between the facial marks, or in other words we can call it as the spatial configuration of facial features. Which means that the geometrical features of the face are such as the nose, eyes and mouth are first located and then the faces are classified on the basis of the various geometrical distance & angle between the features.

2. Photometric stereo(view based): It used to recover the shape of an object from a number of images taken under different lighting conditions. The shape of object recovered is described by gradient map, which is done up of an array of surface normal.

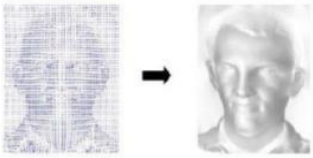


Figure 2 -Photometric stereo image.

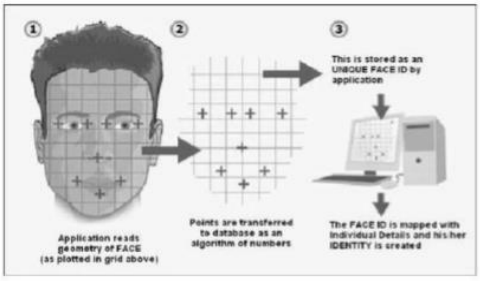


Figure 3 - Geometric facial recognition.

VII CONCLUSION

The personal voice assistant system given during this paper is extremely basic system with few options but the extra and advance feature could also be introduced as future work of this project, during this paper the look and implementation of a Intelligent Personal Voice help is delineate. The project is made mistreatment offered open supply code modules with visual studio code community backing which might accommodate any updates in future. The standard approach utilized in this project makes it a lot of versatile and simple to integrate further modules and options while not heavy the present system functionaries. It not solely works on human commands however conjointly it's designed for offer responses to the user on the idea of question being asked or the words spoken by the user like gap tasks and operations. This Intelligent Voice Assistant has a massive and limitless scope within the future. Like Siri, Google currently and Cortana most well-liked personal voice assistants. The project can simply able to integrate with devices close to future for a Connected Home mistreatment web of Things, voice command system and pc vision.

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Bone Cancer Diagnosis Using GGD analysis

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***Abstract*— Bone sarcoma, usually known as bone cancer, is a rare type of cancer that refers to an abnormal growth of tissue inside the bone, with high probability to spread to other parts of the body. It commonly affects children, teenagers and young adults. As for all other types of cancer (breast, lung, prostate, stomach, brain…), there are no identified causes for bone cancer. Therefore, only an early detection could help increasing the chances to survive a bone sarcoma. The association of medical imaging modalities (such as X-ray, MRI and CT imaging) with image processing techniques can provide more accuracy while detection eventual bone tumors. In this paper, we introduced a new method for sarcoma diagnosis, using a Generalized Gaussian Density analysis (GGD). The process starts by generating sub-images of a given size from the processed bone MRI and conducting a GGD analysis on each of the sub-images. Then, a region of interest(ROI) corresponding to the sub-images with the highest value of the shape parameter α is selected from the original MRI. An Euclidean distance criteria is then used to adjust the ROI from which the bone tumor is identified using a connected component analysis algorithm. The proposed technique was tested on several bones MRI and has given perfect tumors detection compared to the literature.**

***Keywords*— Bone cancer; Early detection; Imaging modalities; GGD analysis; Shape parameter α; Euclidean distance; connected component .**

I. INTRODUCTION

Bone cancer is an abnormal growth of tissue in the bone. It can be primary or secondary. Primary bone sarcoma starts growing from the bone cells, while secondary bone cancer starts from other organs of the body and then spread to the bone cells. Pain, bone loss and hyper calcemia are the most common symptoms of a bone cancer.

Early bone cancer detection may lead to more efficient treatment and reduce the risk of disabilities. However, bone cancer is usually misdiagnosed due to the difficulties encountered by radiologists while interpreting medical images. Image processing techniques can offer more accurate interpretation tools for medical imaging and assist radiologists in bone cancer diagnosis.

In this paper, we first described the bone anatomy and how cancer cells are developed inside the bone texture. Then we illustrated examples of different bone cancer forms.

After that, we reminded the most common bone imaging modalities used for sarcoma diagnosis and we described some of the image processing techniques that have been used to detect bone cancer.

Finally, we introduced our sarcoma diagnosis technique based on GGD analysis, Euclidean distance measurement and connected components algorithm.

II. DIFFERENT FORMS OF BONE CANCER

Bones are made up of two main regions: an outer region, which is compact and surrounded by the cancellous tissue, and an inner region, called bone marrow, which contains blood-forming materials (Fig. 1).

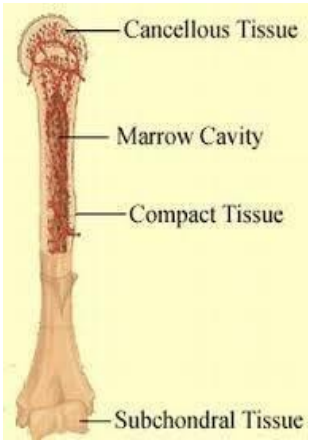


Fig. 1. Bone anatomy

When a bone cancer is developed, cancer cells begin to multiply and weakness the bone (Fig. 2).

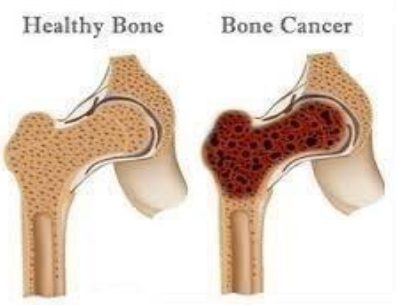


Fig. 2. Impact of cancer on bone structure

More than 30 types of bone cancer exist. The most common are osteosarcoma, chondrosarcoma, Ewing sarcoma and chordoma.

Osteosarcoma is a malignant primary bone cancer (started from the bone cells) that usually affects arm and leg bones. It is most common among teenagers and young adults.

Fig. 3. Osteosarcoma

Chondrosarcoma is more frequently a secondary sarcoma that occurs from cartilage cells. The cartilage is a connective tissue found in joints. Unlike bone, cartilage is flexible and not rigid.

Fig. 4. Chondrosarcoma

Ewing sarcoma is a malignant tumor that starts from a primitive nerve cell. It usually affects children and adolescents.

Fig. 5. Ewing sarcoma

Chordoma is a malignant primary sarcoma that usually appears in the skull or along the spine.

Fig. 6. Chordoma

III. BONE IMAGING MODALITIES

There are three modalities commonly used for bones imaging: X-ray, CT scan and MRI.

X-ray uses high energy electromagnetic radiations to produce a grayscale image of the body, where an eventual sarcoma appears like a hole inside the bone.

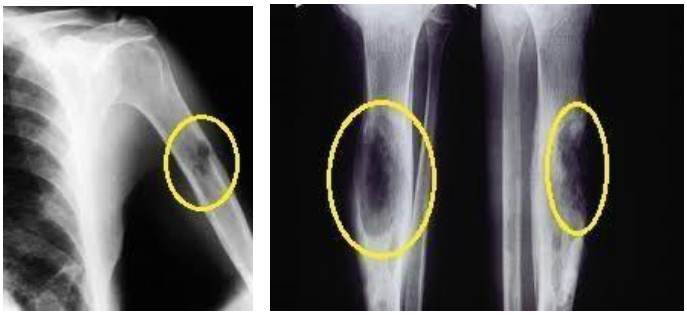


Fig. 7. Examples of X-ray images of arm and legbones

The Computerized Tomography (CT) imaging is similar to x-ray and is used to produce cross-sectional images of the body.

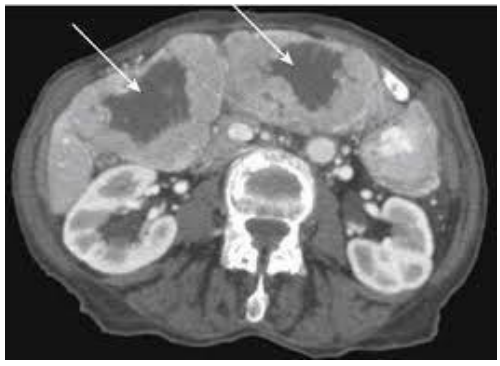


Fig. 8. Example of a bone CT image

The Magnetic Resonance Imaging (MRI) involves the use of strong magnets and radio waves to produce an accurate image of a well defined part of the body.

Fig. 9. Examples of MRI images of legs and shoulderbones

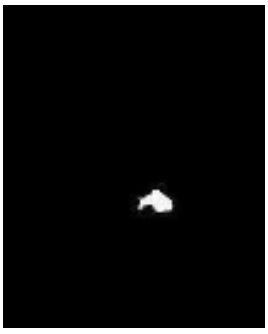
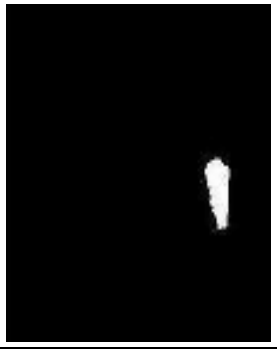
MRI imaging offers better contrast; however x-ray and CT imaging provide better resolution and specificity. Therefore, hybrid imaging modalities are often used to combine the advantages of different techniques while compensating their disadvantages.

IV. RELATED WORKS

A few image processing works have been carried out aiming to detect bone tumors at different stages.

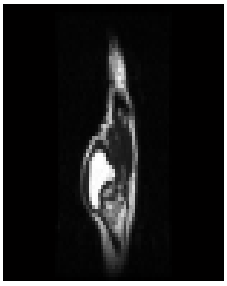
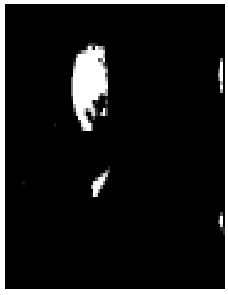
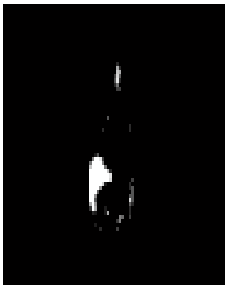
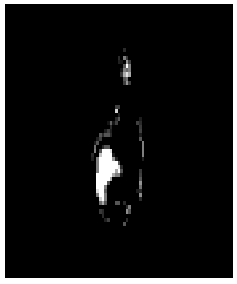
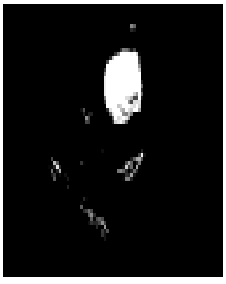
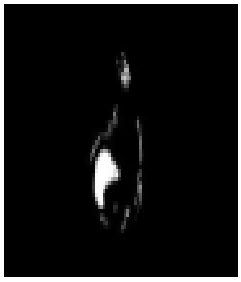
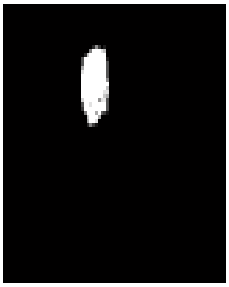
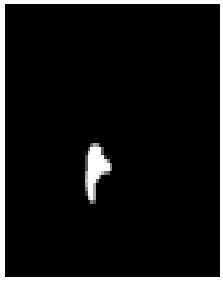
Kishor Kumar Reddy [7] has applied a region growing technique to detect bone cancer. He also identified the cancer stage using a mean Intensity calculating and a tumor size measurement.

TABLE I. EXEMPLES OF BONE TUMORS DETECTED BY [7]

Original MRI	Detected bone tumor
	
	
	

In [8], Krupali et al compared the bone tumor detection results obtained with several segmentation techniques such as thresholding and morphological operation, K-Means Clustering, Fuzzy C-Means Clustering and Rough Fuzzy C-Means clustering.

TABLE II. COMPARAISON OF BONE TUMOR SEGMENTATION RESULTS FROM TWO MRI WITH DIFFERENT TECHNIQUES [8]

	Image 1	Image 2
Original MRIs		
Thresholding and morphological operation		
K-means		
Fuzzy C-means		
Rough fuzzy C-means		

Nisthula et al. [10] used an edge detection technique to identify the tumor region on bone CT images. The edge detection includes the use of Components from Sobel operator and second derivative of Sobel operator.

Sinthia and Sujatha [11], proposed an approach which integrates a pre-processing step based on average and bilateral filtering, aiming to remove noise and to smooth MRI images. The sarcoma segmentation step is based on the computations of mean intensity and tumor size using k-meansalgorithm.

In [12], authors have detected bone metastasis using CT intensity analysis.

Graph representation was used on X-ray images in [13] to detect suspicious bone regions. A computational classification is then used to identify malignant tumors.

V. PROPOSED TECHNIQUE

In this paper, we proposed a new bone cancer computer aided diagnosis system, based on Generalized Gaussian Density (GGD) analysis.

GGD principle is based on wavelet decomposition. Wavelet transform is known as a multi-resolution analysis where image textures are filtered using two different filters (a low-pass and a high-pass) on the image rows and columns.

In 2002, Do and Vetterli [6] introduced a new method for texture analysis, based on Generalized Gaussian Density estimation. This technique consists on building the histogram of the wavelet coefficients distribution at a given level of decomposition.

The histogram behavior is then described by a continuous law for each sub-band.

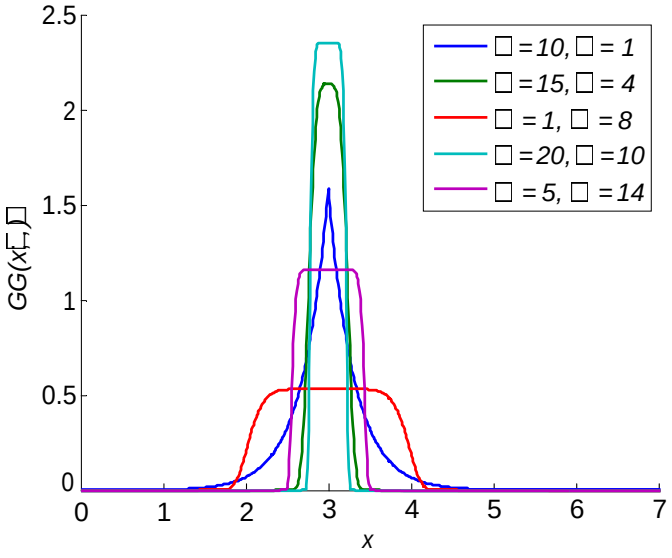


Fig. 10 GGD distributions for different values of α and β

As proven by Do and Vetterli, this behavior can be represented by a generalized Gaussian, depending on three parameters μ, α and β (equation 1).

$$P_{\mu,a,b}(x) = \frac{b}{2a\Gamma(\frac{1}{b})} e^{-\frac{|x-\mu|^b}{A}} \quad (1)$$

Where:

$\Gamma(z) = \int_0^{+\infty} e^{-t} t^{z-1} dt$, $z > 0$: gamma function

μ, α and β: the mean, scale and shape parameters respectively

$x=(x_1,\ldots,x_N)$: the wavelet coefficients in a given sub-band

The form factor β governs the shape, more or less sharp. The scale factor α governs the spread of the curve and corresponds to the standard deviation in the case of a classic Gaussian.

GGD analysis has been used for breast cancer diagnosis and has shown its efficiency, especially on detecting breast masses which are very similar to bones tumors [1, 2, 3, 4, 5, 9].

The proposed method is very simple, it doesn't involve a preprocessing step and begins by dividing the considered MRI image into blocs of a chosen size. Then, a GGD computing is carried out over the different blocs. A region of interest (ROI) is then selected: it corresponds to the blocs having the highest value of the shape parameter α.

An adjustment of the ROI is later applied, using an Euclidean distance criteria. Finally, a connected component algorithm will select the tumor region from the ROI.

The whole procedure is described by the following figure:

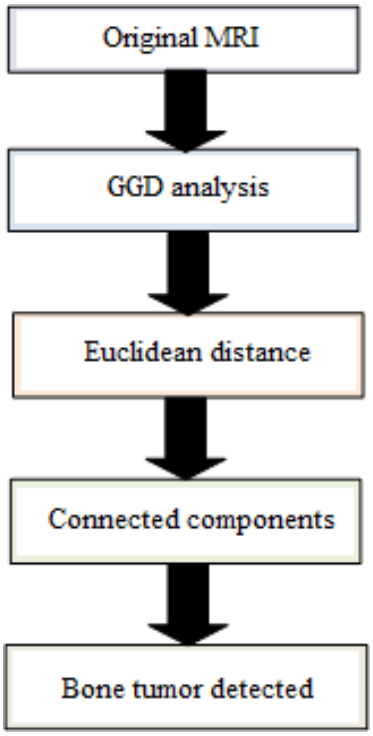
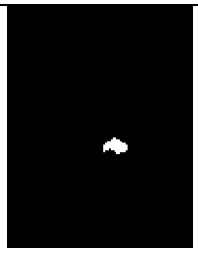
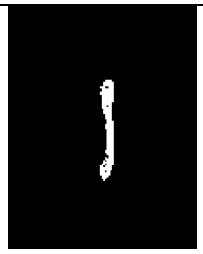
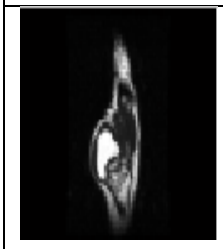
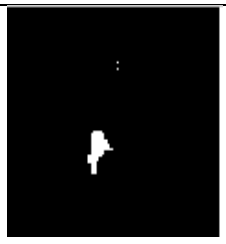
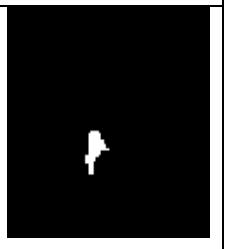
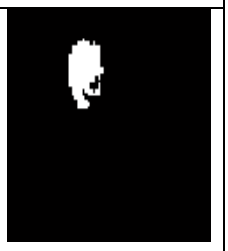


Fig. 11 Proposed method diagram

These steps have been applied on our bones MRI database containing 40 collected samples, in order to detect eventual tumors.

The following table illustrates some examples of results, obtained with the proposed method.

TABLE III. RESULTS FROM THE PROPOSED TECHNIQUE

Original MRI	GGD analysis only	GGD and connected components
		
		
		
		
		

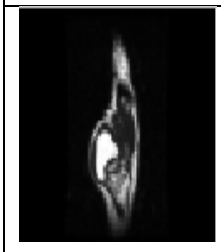
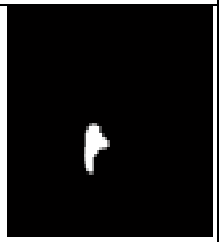
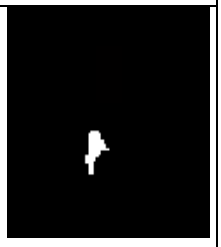
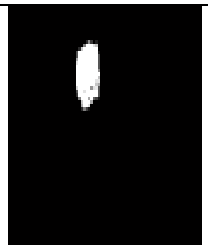
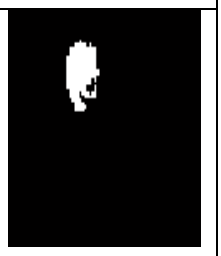
VI. DISCUSSION

All the described tests were carried out with MATLAB R2014a with an Intel Core i5 CPU, 2.53 GHZ and 4GB of RAM.

The previous examples of sarcoma detection on digital MRI using GGD analysis show the efficiency of the method although its simplicity compared to the region growing algorithm [7]. It has also the advantage of being fast (not time consuming).

Indeed, the performance of the proposed technique is quiet similar to that of rough fuzzy C-Means clustering technique chosen by Krupali et al. to be the best bone cancer detection techniques in [8].

TABLE IV. COMPARISON WITH ROUGH FUZZY C-MEANSTECHNIQUE

Original MRI	Rough Fuzzy C-means result	GGD result
		
		

Furthermore, our GGD based technique turns out to be faster since it takes less computation time compared to rough fuzzy C-Means clustering technique [8].

TABLE V. COMPUTATION TIME COMPARISON

Technique	Average computation time (in seconds)
Rough fuzzy C-Means clustering technique	11
GGD based technique	6

CONCLUSION

GGD analysis has proved its efficiency in bone tumors detection from digitized MRI. However, lack of ground truth prevents us from having accurate evaluation of bone cancer segmentation rate.

Thus, a bones MRI database has to be built with reliable and precise expert decision so that perfect evaluations could be done.

ACKNOWLEDGEMENT

Any achievement does not depend solely on the individual efforts but on the guidance, encouragement and co-operation of intellectuals, elders and friends. A number of personalities, in their own capacities have helped us in carrying out this main project work. We would like to take this opportunity to thank them all. We would like to express our heartful gratitude to our guide Prof. Suresh Kumar. S, Assistant professor, Department of Computer Science and Engineering, Sapthagiri College of Engineering, for his timely advice on the main project and regular assistance throughout the work. We also extend our sincere thanks to all the Faculty members and supporting staff Department of Computer Science and Engineering, Sapthagiri College of Engineering, for their constant support and encouragement. Finally, we thank our parents and friends for their moral support.

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KRISHI MITHRA- AN IOT AND MACHINE LEARNING BASED MOBILE APPLICATION FOR FARMERS

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Abstract **- Agriculture is the basic and most important profession of our country as it balances the food requirement and also the essential raw materials for several industries. The development of Intelligent Smart Farming devices based on IoT is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim of this paper is to propose a Smart IoT based Agriculture system that can assist farmers in crop management by getting Live Data (Temperature, Soil moisture content) for efficient environment monitoring which will enable smart farming and increase their overall yield and quality of products. The Agriculture system proposed in this project is an integration of the concepts of Machine learning and IOT using a NodeMCU board and various sensors, through which live data feed can be obtained and accessed online and camera module will help to determine if the crop is infected by pests so that the farmer will be able to take suitable actions.**

Keywords – Mobile application, IoT, Machine learning, Image processing, Efficient, Accessible, Integrated.

I. INTRODUCTION

Farmers must consider a variety of factors, including soil quality, soil water content, soil temperature, fertiliser application, and so on, in order for a crop to grow healthy and nutritiously. Plants at different stages of development, different nutrient rates and ratios are required. In order to make a profit, the farmer already has to put in a lot of effort. As a result, devise a solution that meets the requirements in order to save time and effort for these farmers. The amount of water content required is determined by the current moisture content of the soil as well as meteorological conditions. Current conditions must determine the amount of fertilisers and pesticides to be used. Our main goal is to propose a system, which is able to detect and suggest the requirements for earning more Cropping profits. Our method detects pests sooner, preventing losses for the farmer. It also recommends which crop to cultivate based on meteorological and soil factors conditions. The crop's market demand in order to maximisation of profit.

Works by [1] Bhanu K N (2020) proposed a system which mainly focuses on soil suitability in agriculture with the help of sensors which are going to sense the required data and send it to the cloud where the classification of the algorithm will take place. If the data falls beyond threshold values, an email is sent to the user to perform the necessary actions. [2] Dr. C Mageshkumar (2020) proposed a system to irrigate the field at the appropriate time, the author proposes an IoT-based system. It includes features like a soil moisture sensor, temperature sensor, and humidity sensor to facilitate irrigation in a proper way. [3] K. Lokesh Krishna (2020) proposed a wireless robot which measures different parameters such as moisture sensing, scaring birds and animals, spraying pesticides and switching ON/OFF electric motor. Furthermore [4] Ching-Ju Chen (2020) talks about using AIoT and deep learning using YOLO for image recognition to detect pests before they start multiplying.

II. OBJECTIVES AND METHODOLOGY

The main objectives of the system are stated as follows:

1. To predict the crop required to be grown and also detect the crops effected by pests and suggest suitable actions to be taken to reduce it.

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2. System suggests the farmer as to which crops to grow, what is the expected yield and also what are the market rates for the grown crop.
3. It also gives real-time information of the moisture levels of the soil and also informs the farmer if a pest has been detected in the farm and a suitable pesticide to be used for it.

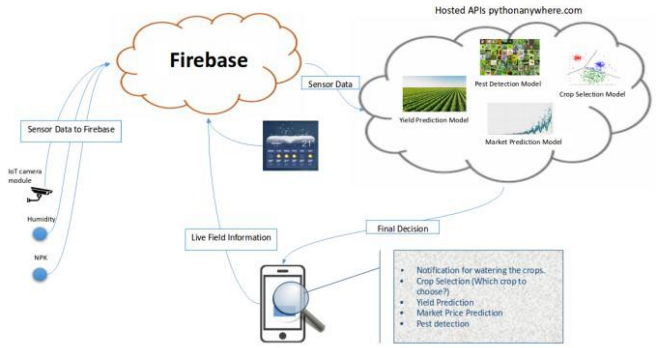

Fig.1 Flow Diagram of the System

Methodology:

The methodology flow includes

1. Live sensor data- the sensor data will be read from the sensors and given to microcontroller based on that the values will be stored in the cloud.
2. Data gathering- the NPK (Nitrogen, Phosphorus, Potassium) value dataset required for different crops were collected from Open Government Data OGD platform of India, which comprises of available NPK and required NPK columns.
3. Crop Selection and Market Prediction- this involves suggesting the farmer about the suitable crops that can be grown in order to maximize the yield and the profit obtained.
4. Pest detection- We have an IoT camera which captures the image of a crop and processes it stores in the cloud. Using a deep learning model, the captured image will be compared with the trained model wherein the prediction is done whether the plant is infected or not and suitable pesticide will be suggested

III. DESIGN AND IMPLEMENTATION

The external environment provides the input data, such as soil moisture value from the soil moisture sensor and temperature and humidity value from the DH11 sensor. The data collected by this is stored in the NODEMCU, which is a microcontroller, and the values are later uploaded to the cloud. The values which are stored in the cloud can be accessed with the help of a mobile application. Datasets are processed on a PC using a specific algorithm for each module [crop price, yield prediction, and pest detection], and the processed data is stored in the cloud. The user or farmer can access this data with the aid of a mobile application

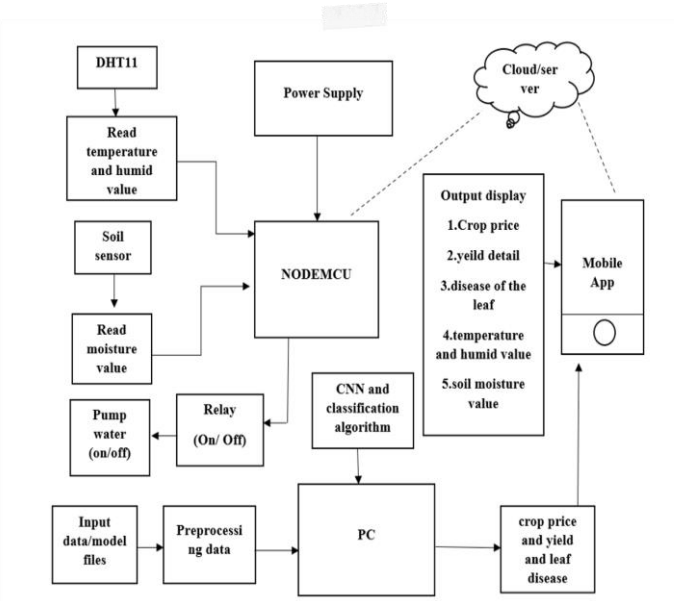

Fig.2 System Architecture

The system consists of four main modules which are as follows:

1. Live Field Status
2. Crop Selection and Market Prediction
3. Yield Prediction
4. Pest Detection

1. Live Field Status:

This module is in position to offer real-time soil moisture data, temperature data and alerting the farmer when it's time to water the plants. The soil's moisture level was compared to a predetermined threshold. If the scale falls below the threshold, the farmer will receive a notification on his cell phone to turn on the pump to water the plants. A NodeMCU (ESP8266) microcontroller, soil moisture sensor and DHT11 sensor are used for this purpose, which continuously record the field's live status. This information is then uploaded to the cloud and is processed. The processed data is updated on the application where the farmer can view the present climatic conditions which include temperature, humidity values and the soil moisture values that are updated at

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regular intervals.

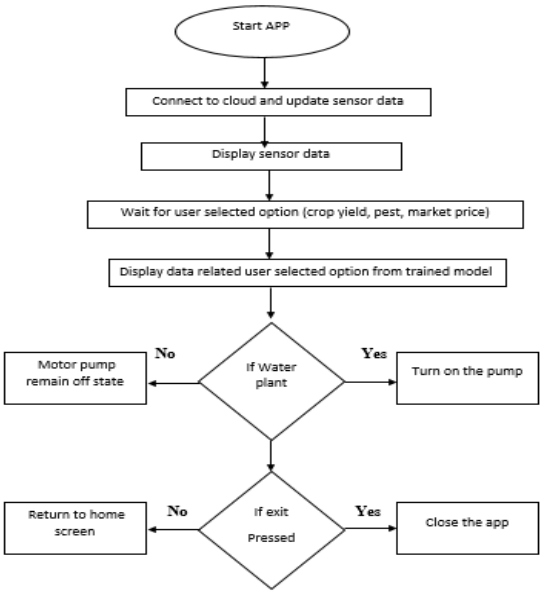

Fig.3 Flow Chart of the Mobile Application

2. Crop Selection and Market Prediction:

This module involves advising the farmer on choosing the most suitable crops in order to enhance his yield and profit. The model is to be trained separately for each crop and market location using SVM algorithm and the prediction will then provide the estimated price at which the crop may be sold at a particular market. The dataset for the crop selection includes the soil-specific NPK values that are required for various crops, these crop-wise data were gathered from STCR Research Recommendations. The NPK dataset includes the following columns: state, soil type, crop, variety, season, available NPK, and required NPK. The market price data include the market price of each crop which is obtained from government websites. These datasets undergo data pre-processing where particular crop types are clustered using K-means clustering and the preprocessed data is fed to the training model. The Support Vector Machine (SVM) model is used to estimate the market price of the appropriate crops. For this purpose, the Autoregressive Integrated Moving Average Model (ARIMA model) is used. The ADF (Augmented Dickey-Fuller) check was used to ensure stationarity. The model should be trained separately for each crop and market location, and the prediction will provide the estimated price at which the crop could be sold in that market. This estimation can then be used by the farmers to decide the crop that may help obtain a maximum profit in that particular market. This estimation can then be used by the farmers to decide the crop to be grown that may help obtain a maximum profit.

3. Yield Prediction:

This module involves suggesting the farmer about the suitable crops that can be grown in order to maximize the yield and the profit obtained. The crop yield dataset required for this module was obtained from the Open Government OGD Data Platform India. This dataset included components such state, district, crop year, season, crop, area and production columns. The Yield Prediction model makes use of K-nearest neighbour model for predicting crop yield. It also takes in to account the rainfall and temperature values for predicting the yield.

4. Pest Detection:

This module will help farmers to get an instant notification about the outbreak of pests in their field. This module will display a picture of a pest as soon as the pest is detected in the field. We make use of image processing and deep learning algorithms to train the model for detecting the pest. The dataset is a customized dataset which consists of two classes plants infected with pests and plants not infected with pests, which contain the images of plants affected with pests and without pests respectively. The IoT camera modules is used for capturing the images of the field at regular intervals and the captured images are uploaded to the cloud via the NodeMCU and in cloud this image is converted in to sub frames by image processing techniques and the images are compared with the given dataset of images and presence of pest is detected and a notification is sent to the farmer on the app as a pest is detected and suitable pesticide recommended for it.

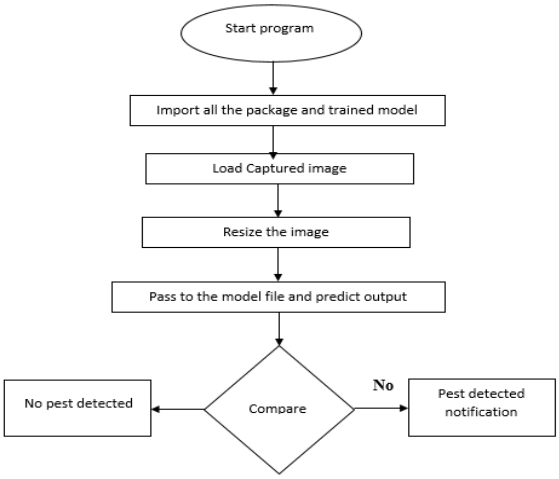

Fig.4 Flow Chart for Pest Detection

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IV. RESULTS

The sensor readings from the sensor were pushed to the cloud and retrieved on the application. The crop selection and market yield prediction for different crops gave an accuracy of 62% on the dataset available. The testing set for of pest detection gave a classification accuracy of 92.7%, which helps the farmer in early pest prediction and also suggested suitable pesticide to control the pest.

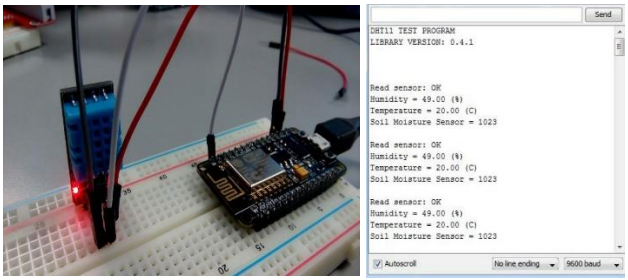

Fig.5 ESP8266 NodeMCU and sensors connection along with the readings

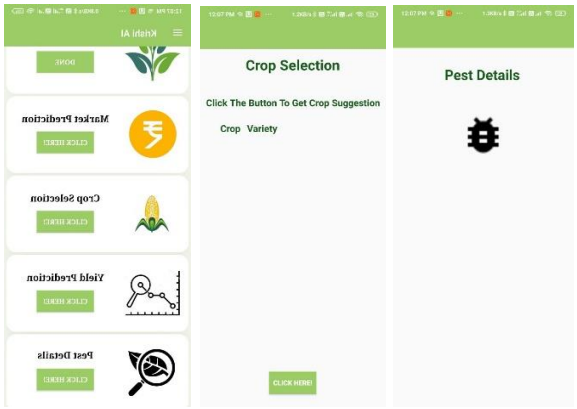

Fig.6 Screenshots of the GUI of the mobile application Krishi Mithra

V. CONCLUSION

The system aims at enhancing the lives of the farmers by providing solutions for their problems and work solution is in the form of an android application. This application consists of functionalities which tell the farmer as to which crops to grow, what is the expected yield and also what are the market rates for the grown crop. These solutions would cater to the issues that they face and thus help them to ease their efforts and gain more profits

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A SURVEY ON PERFORMANCE ANALYSIS THROUGH DIMENSIONAL REDUCTION AND CLASSIFICATION ALGORITHM USING KDD CUP AND UNSW-NB15 DATASET

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ABSTRACT— In this system the intrusion detection is one of the major research problems in network security. This is the process of monitoring and analyzing network traffic data to detect security violations. In this paper, we present the experimental results in our project to evaluate the different performance like (e.g., IDS, Malware, etc.). We analyze some different algorithms with dimensionality reduction and classification algorithm with the dataset that is constructed from the KDD CUP dataset. Data mining approach can also play a very important role in developing an intrusion and detection technique. The network traffic can be classified into normal and anomalous in order to detect intrusion detection. In our work, we use five (5) different algorithm's namely logistics regression, decision tree, random forest, KNN, Kernel SVM are we used in the classification algorithm. The comparison of this classification algorithm is presented in this paper based upon their accuracy, timing, and performance to find out suitable algorithm's available and this method are performed in the spyder tool using UNSW-NB15 dataset.

Keywords Dimensional reduction, PCA, LDA, Kernel PCA, KDD CUP Dataset, Classification algorithm's, logistics regression, Decision tree, Random forest, KNN, Kernel SVM, UNSW-NB15 dataset.

I. INTRODUCTION

[1] Machine learning is a field of computer science that uses statistical techniques to give computer system the ability to "learn" with data, without being explicitly programmed. Machine Learning techniques are widely used in IDS due to its ability to classify normal/attack network packets bylearning patterns based on the collected data. There are many results for classification of normal/attack; however, there is little work on classifying different attack types. In the modern world, the advanced internet technologies have made a huge collection of the data, which has become a major challenge for a human to analyze and processor to extract valuable information from the high dimensioned data. With the help of data mining techniques, this can be achieved easily.[2] Dimensionality reduction is a technique which uses feature selection and future extraction. In the feature, the selection is a technique which is used to find the good quality of relevant features from the original dataset using some objective measures. Nowadays, feature selection has become very big challenge issues in the field of [1] machine learning [2] Data mining.[3]Case-Based Reasoning. In feature extraction, the technique of extraction of features is used to get the most relevant information from the original data and to represent that information in a space of lower dimensionality. To select a new set of features, this technique is used. A linear or nonlinear combination of original features may be the transformation feature. The classification algorithms the problem of identifying to which set of categories a new data belongs, on the basis of the training set and testing set. In our work this classification algorithm we use with principal component

analysis (PCA) and without principal component analysis (PCA) of analysis. Using different algorithm's in our experimental work namely which as logistics regression, decision tree, random forest, KNN algorithm, kernel SVM.

II. PROBLEM STATEMENT

In this issue, different Dimensionality Reduction algorithms and Classification algorithms will be used to analyze the KDD CUP and USNW-NB15. Dataset to identifies better performance and accuracy. The data set will automatically be converted into a training set and test set based on the user input for performance measurement between different classifications algorithms.

III. DIMENSIONALITY REDUCTION

Reduction of dimensionality is a series of machine learning techniques and statistics to reduce the number of random variables to be considered. It includes the selection of features and extraction of features. Reduction of dimensionality makes analyzing data much easier and faster without processing extraneous variables for machine learning algorithms, making machine learning algorithms, in turn, faster and simpler.Reduction of dimensions or reduction of dimensions is the process of reducing the number of random variables to be considered by obtaining a set of main variables. It can be divided into the extraction of selections and features.The project's scope is to conduct a comparative analysis of different algorithms to find the best accuracy.

IV. PROPOSED SYSTEM

Principal Component Analysis (PCA):

PCA is the most widely used linear reduction method. The PCA is a method of statistical data analysis that transforms the initial set of input variables into a different set of linear combinations, called the main components (PC).This PC contains specific variance properties. This reduces the system's dimensionality while retaining variable connection information.

Linear Discriminant Analysis (LDA):

LDA is a widely used reduction of dimensionality technique. In some dataset experiments, quantity growth is greater in existing cases where dimensions are greater or fewer characteristics and the occurrence of characteristics is significantly greater than the sample size .LDA creates a linear combination that yields the greater mean differences between the classes described. LDA's main goal is to maximize measurements between classes while minimizing measurements within the class.

Kernel Principal Component Analysis (Kernel PCA):

Various different approaches along with kernel functions were also studied as extensions to the PCA to solve the non-linearity problem. Before performing PCA, the kernel PCA maps the samples into high-dimensional kernel space to convert the nonlinear distribution of input data to linear distribution.SPCA's basic principle is to transform original input vectors into a high-dimensional F-space feature with a nonlinear function and then calculate the linear PCA in feature space.

V. SEQUENCE ARCHITECTURE

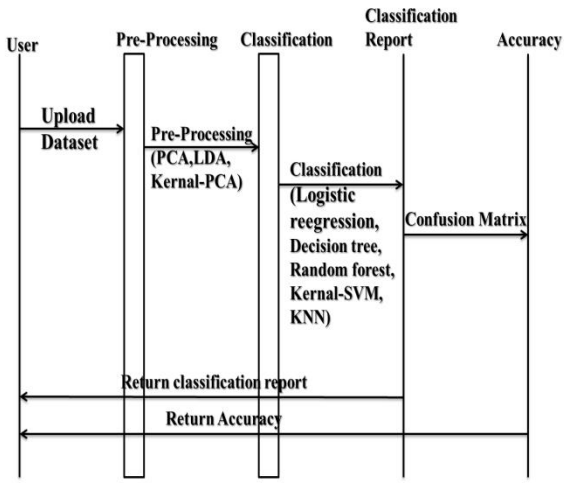

Figure 1: Sequence diagram

1. **Upload dataset**
   We will create a new dataset and upload the dataset at a particular file path to fetch and perform the given task when it is needed using [.CSV] file.

2. **Labeled training dataset**
   High-quality labeled training datasets are usually difficult and expensive to produce for supervised and semi-supervised machine learning algorithms due to a large amount of time required to label the data. Although they do not need to be labeled, it can also be difficult and costly to produce

high-quality datasets for unsupervised learning.

3. **Unlabelled testing dataset**
Unlabelled data typically consists of samples of natural or man-made artifacts that you can get from the world relatively easily. Some unlabelled data examples could include photos, audio recordings, videos, news articles, tweets, x-rays.

4. **Pre-processing**
The transformationsthat are applied to our data before the algorithm is fed. Data Preprocessing is a method of converting raw data into a clean set of data. In other words, it is collected in raw format whenever the data is collected from different sources, which is not feasible for analysis.

5. **Dimensionality reduction [PCA]**
Principal Component Analysis (PCA) is the classical statistical technique which is widely used to reduce the dimensionality of the given dataset consisting of an enormous amount of interrelated variables. PCA is mainly used to reduce the dimensionality by transforming the original dataset into a new set of variables called principal components, in which largest variance present in the original dataset is captured by the highest component in order to extract the most important data or information.

6. **Classification algorithm**
An algorithm implementing classification is known as a classifier, especially in a concrete implementation. Sometimes the term "classifier" also refers to the mathematical function, implemented by a classification algorithm, which maps data input into a category. There is quite a variety of terminology across fields.

7. **Accuracy**
In machine learning, a number of metrics are used to measure a model's predictive accuracy. The choice of precision metrics depends on the task of learning the machine. These metrics should be reviewed to determine if your model performs well.

8. **Confusion matrix**
A confusion table (sometimes also called a confusion matrix) in predictive analytics is a table with two rows and two columns reporting the number of false positives, false negatives, true positives, and true negatives. This allows for a more detailed analysis than just the proportion of correct classifications (precision).

VI. DATASET

KDD CUP Dataset was built on a network intrusion detector, a predictive model should be capable of distinguishing between “bad”’ connections, called intrusions or attacks, and “good” normal connections.
UNSW-NB15 — The UNSW-NB 15 dataset raw network packets were created by the IXIA Perfect Storm tool at the Australian Cyber Security Centre (ACCS) Cyber Range Lab to generate a hybrid of real modern normal activity and contemporary synthetic attack behaviors.

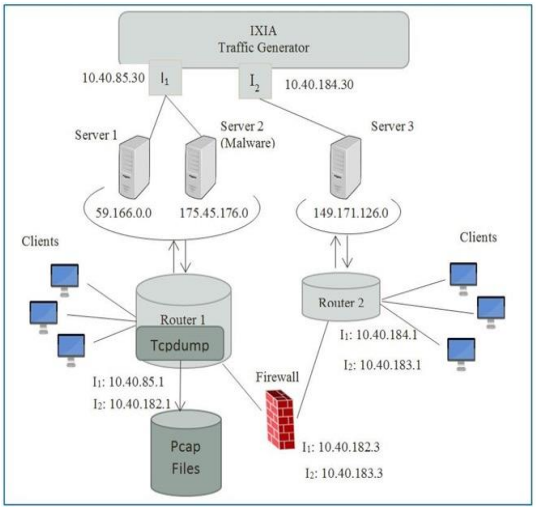

Figure2: Dataset diagram

TCP dump tool is utilized to capture 100 GB of the raw traffic. The Argus, Bro-IDS tools are used and twelve algorithms are developed to generate totally 49 features with the class label.

VII. ALGORITHM’S USED

1) PCA algorithm:

Principal Component Analysis is one of the most widely used techniques for data analysis and compression dimensionality reduction. It is based on converting a relatively large number of variables into a smaller number of uncorrelated variables by finding a few linear orthogonal combinations of the original variables with the greatest variance.PCA reduces the number of dimensions needed to classify new data and produces a set of main components that are pairs of orthonormal self-

value / eigenvector. The main component analysis steps are outlined below.

Algorithm

```
from sklearn.decomposition import PCA
pca = PCA(n_components = 100)
X_train = pca.fit_transform(X_train)
X_test = pca.transform(X_test)
explained_variance=
pca.explained_variance_ratio_
```

2) Logistics regression:

Logistic Regression is a classification algorithm for machine learning that is used to predict a categorical dependent variable's probability. The dependent variable in logistic regression is a binary variable containing data coded as either 1 (yes, success, etc.) or 0 (no, failure, etc.).

Algorithm:

```
fromsklearn.linear_model import
LogisticRegression
classifier =
LogisticRegression(random_state = 0)
classifier.fit(X_train, y_train)
y_pred = classifier.predict(X_test)
```

3) Decision tree :

Decision Trees can be used as models for classification or regression. A tree structure is built that breaks down the dataset into smaller subsets leading to a prediction eventually.

Algorithm

```
from sklearn. tree import
DecisionTreeClassifier
classifier=DecisionTreeClassifier(criterion=
'entropy',random_state=0)
classifier.fit(X_train,y_train)
y_pred = classifier.predict(X_test)
```

4) Random forest:

Random forest algorithm is a monitored algorithm for classification. As the name suggests, with a number of trees, this algorithm creates the forest.The missing values will be handled by the random forest classifier. If we have more trees in the forest, the model will not be overfitted by random forest classifier.

Random forests create decision trees on randomly selected data samples, get a prediction from each tree, and by voting select the best solution. It also provides a good indicator of the significance of the feature. Random forests have a variety of applications, including recommendation engines, classification of images, and selection of features.

Algorithm

```
from sklearn.ensemble import
RandomForestClassifier
classifier=RandomForestClassifier(n_estimator
s=10,criterion='entropy',random_state=0)
classifier.fit(X_train,y_train)
y_pred = classifier.predict(X_test)
```

5) KNN algorithm

the k-nearest neighbor algorithm is a nonparametric method used for classification and regression. In both cases, the input consists of k closest training example in the feature space. The output depends on whether KNN is used for classification or regression. KNN is typical instance-based learning whether the function is only approximated locally and all computation is deferred until classification. The KNN algorithm is among the simplest of all machine learning algorithm. Both the classification and regression useful technique can be used to assign a weight to the contribution of the neighbors so that the nearer neighbors contribute more to the average than the more distant ones. The neighbors are taken from a set of objects from the class (for KNN classification). A peculiarity of the KNN algorithm is that it is sensitive to the local structure of the data.

Algorithm:

```
from sklearn.neighbors import
KNeighborsClassifier
classifier=KNeighborsClassifier(n_neighbors=
5,metric='minkowski',p=2)
classifier.fit(X_train,y_train)
y_pred = classifier.predict(X_test)
```

6) KernelSVM

Kernel methods are a class of algorithms for pattern analysis in machine learning, with the support vector machine (SVM) being the best-known member. The general pattern analysis task is to find and study general types of relationships in datasets (e.g. clusters, rankings, main components, correlations, classifications). Functions for the SVM kernel. SVM algorithms use a set of kernel-defined mathematical functions. The kernel's function is to take input data and transform it into the form required. Various SVM algorithms use various kernel function types.

Algorithm:

```
from sklearn.svm import SVC
classifier=SVC(kernel='rbf',random_state=0)
classifier.fit(X_train,y_train)
y_pred = classifier.predict(X_test)
```

VIII. LITERATURE SURVEY

In [1] this study, we used the Random Forest algorithm, an efficient supervised machine learning algorithm for IDS, to analyze class-specific detection of Kyoto 2006 + datasets. The original 3 classes (i.e., normal, known attack unknown attack) were first refined into 6 classes (i.e., normal, unknown, shellcode, IDS shellcode, malware, IDS). We then built a test dataset and the two training data.Next, we built a test dataset and two training datasets that vary in size between classes to assess the performance of detecting different types of attack.Although we obtained a high overall detection performance when trained with the first training set (0.99 of accuracy, recall, F1-score, and F2-score), we found that performance differs greatly for each class (as low as 0.16 of F1-score for shellcode attack).That's why we built the second training set using random under-sampling to set the size of the whole class equal to the number of instances of the smallest class (i.e., shellcode). The evaluation resulted in much lower performance, which was disappointing for all classes.We believe that data size was not enough, and training with the same size class may not be ideal for the approaches to machine learning. We also note that the unknown attack class still shows a good performance, 0.90 F1-score, suggesting that the unknown attack has a distinct pattern.

The [2] purpose of this experimental work was to find out which NIDS (network intrusion detection system) was the best available classification technique. This study is carried out by analyzing the NSL-KDD dataset and the performance of classification algorithms is observed. The study shows that in classifying the intrusions, decision trees classifiers are best.With respect to the accuracy, specificity, and sensitivity, Random Forest has outperformed, while IBK consumes less time compared to others. The main goal was to achieve a better rate of detection of intrusion, to lower the rate of false negatives.This work can be extended by combining various data mining algorithms with performance-enhancing data reduction techniques. In identifying new and unusual attacks, an intrusion detection system based on hybrid classification techniques would be quick and robust.

In [3] a survey is made on major challenges and issues in dimensionality reduction. If the dimensionality of dataset increased, then the volume of the space increases so fast that the available data becomes sparse. Usually, a larger percentage of the training data resides in the corners of the feature which is more difficult to classify. Hence high dimensionality leads to a problem known as "Curse of Dimensionality" that specifically makes it difficult to perform classification on a dataset having a large number of dimensions. Dimensionality reduction can be used for downsizing the input data i.e., more relevant for further analysis. The reduced dataset contains variance from a large dataset and without any loss of important features. It has also made easy to detect and us from real word data. PCA is the most popularly usedlinear dimensionality reduction technique. The linear method can work only with linear data and not work with real data efficiently because of complexity and high-dimensionality. PCA can work with structured and steady dataset. PCA is a statistical data analysis method the=at transforms the initial set of input variables into a various set of linear combinations, called as the Principal Component (PC). This PC contains specific properties with respect to variances, which helps to reduce the dimensionality of the system while retaining information on the variable connections. LDA has an issue with lack of sample data per class does degrade the classification performance as significantly due to the generalization of decision for arbitrary data with noise regulation. Robustness improvement is pursued as the other critical issue in LDA for better classification performance in a noisy environment. The main aim of LDA is to maximize the between-class measure while minimizing within-class measure. Kernel-PCA is used to solve the problem of non-linearity, various different approaches are used along with kernel functions which also been studied as an extension to the PCA. Kernel PCA is used to transform original input vectors to a high dimensional feature space with nonlinear function and to calculate the linear PCA in feature space.Kernel PCA computes principal Eigenvector for kernel matrix rather than covariance matrix. Kernel PCA has been applied to successfully to different domains face recognition, speech recognition, novelty detection, etc. comparing all the three techniques from this paper, we can conclude that combination of the method may also be used to overcome the disadvantages of one method over another.

In [4] we learned about PCA and LDA of dimensionality reduction techniques. In this

paper dimensionality reduction is defined as the processes of projecting high-dimensional data to much lower-dimensional space. Dimensional reduction methods variously applied in the regression, classification, feature analysis and visualization. PCA is the linear method which is used to perform a dimensionality reduction by embedding the data into a linear dimensional. PCA is the widest unsupervised linear method. The result of PCA is the lower dimension representation from original data that describe as much of the variance in the data. This can be reached by finding the linear basis of reduced dimensionality for data, in which the amount of variance in the data is maximal. PCA and classical scaling suffer from two main drawbacks. First, in PCA, the size of the covariance matrix isproportional to the dimensionality of the data-points. Second, the cost function reveals that PCA and Classical scaling focus mainly on retaining large pairwise distances, instead of focusing on retaining the small pairwise distances, which is actually more important. LDA is a method to find a linear transformation that maximizes class separability in the reduced dimensional space. The criteria in LDA is to maximize between-class scatter and minimize within-class scatter.

The [5] approach proposed improved the speed of detection. Selection of features reduced the total number of data set features (32 basic features and 116 derived features). This reduction means that less data is needed to train the classifier due to the smaller search space.Paper reports a new approach to the CBID that can produce better and more accurate results by identifying the attack category rather than the exact type of attack. This result also indicates that feature selection analytical solutions are not based on the trial and error.An important goal in the reported work is the possibility and feasibility of detecting intrusions based on characterizing various types of attacks such as DoS, probes, U2R and R2L attacks. It seems that the results of this investigation are promising.Results indicate that a small number of carefully selected network features can be used to identify the normal state of the network and attack category. On the other hand, it is proved that the detection of intrusion is not connected with certain features.Experimental results show that dimensional reduction and identification of effective network features for category-based selection can reduce process time in an intrusion detection system while maintaining accuracy within an acceptable range of detection.The PCA method is used to determine an optimal set of features to speed up the detection process. Experimental results show that feature reduction can improve detection rates for the category-based detection approach while maintaining detection accuracy within an acceptable range. KNN classification method is used in this paper to classify the attacks.Experimental results show that feature reduction will significantly speed up the intrusion attempts train and testing periods.

This [6] paper uses classification algorithms J48, Naïve Bayes, LTM, REP, Decision table, K-Star, Simple Logistics, Iterative Classifier, IBK, and Filtered Classifier to carry out a comparative study to predict breast cancer. The datasets are taken from the Wisconsin breast cancer datasets of 10 attributes with 286 instances.From the results, it was observed that Naïve Bayes, K-Star, IBK, and Filtered Classifier performs well with regard to accuracy J48 and Filtered classifier and execution time is 0 sec. So we can conclude that with 76 percent accuracy and 0 sec execution time, Filtered Classifier is the best.By considering more attributes, applying some dimensionality reduction algorithms and other supervised as well as unsupervised methods, we will compare results in the future and compare their performance.

In [7] this paper, we propose a novel method of classifying network intrusion detection from the most renowned KDD cup dataset using ensemble learning scheme. We have shown that the most accurate detection is provided by reducing the dimensionality of the large dataset. In addition, for a proper comparison, several machine learning algorithms are used to generate accuracy metrics and further analyzed.Our approach found that all other learning techniques were outperformed by this algorithm. Our goal is to analyze the intrusion data of the network and find the best components and use them for the analysis of the attack. This scheme can be used to increase its prediction performance for future data packets in parallel with the intrusion detection system.Empirical results show that the reduction in input dimensionality can provide a lightweight intrusion detection system that can be embedded with the vulnerable system to generate correct classification with an improvement in execution time of significance.In the previous sections, while classifying the dataset using several well-known machine learning algorithms, we tried to present different scenarios. If we can adjust some key parameters, a single learning algorithm can produce significant improvements in

classification. We analyzed those details and suggested the best configuration to use when solving this particular problem type.We will use evolutionary algorithms in our future work to further accelerate the speed and accuracy of classification. In addition, we have the plan to implement an online NIDS that can provide real-time feedback to the system so that the offline detection method can eradicate the unintentional delay.

IX. CONCLUSION

In our project, we conclude by identifying the best-fit algorithm for KDD CUP dataset as well as 10 percent KDD CUP and UNSW-NB15dataset by means of the reduction algorithm for dimensionality. Using the dimensionality reduction algorithm, classification algorithm and performance measurement, the KDD cup can be observed to use test data and training data.For each paper being surveyed, the pros and cons of the existing system are identified. It recognizes the need for a more accurate working system. How to look at the current system's lack of semantic analysis. This overview can also help researchers and analysts build a more sophisticated system. To find good accuracy with which algorithms are the best fit.

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Analysis of Web Mining Data Sets Using H-Tree based Intrusion Detection System

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Abstract: *Intrusion Detection System (IDS) is becoming a vital component of any network in today's world of Internet. IDS are an effective way to detect different kinds of attacks in an interconnect network thereby securing the network. An effective Intrusion Detection System requires high accuracy and detection rates as well as low false alarm rate .Our topic is novel Classification based Intrusion Detection System which is work in these area classification in decision tree .In this system has experimented with Knowledge Discovery &Data Mining (KDD)1999 dataset .The system are compared with the existing approaches of intrusion detection which either used classification in decision tree or based on layered framework .The results show that the proposed system has high attacks detection accuracy and less false alarm rate.*

Keywords: Energy grids, Solar panels, Wind turbine, Buck-Boost converter, LVDC, HVDC, Rectifier, Batteries, Voltage regulator.

I.INTRODUCTION

The field of intrusion detection has received increasing attention in recent years. One reason for this is the explosive growth of the Internet and the large number of networked systems that exist in all types of organizations. The increase in the number of networked machines has led to an increase in unauthorized activity, not only from external attackers, but also from internal attackers, such as disgruntled employees and people abusing their privileges for personal gain. Security is a big issue for all networks in today's enterprise environment. Hackers and intruders have made many successful attempts to bring down high-profile company networks and web services. Many methods have been developed to secure the network infrastructure and communication over the Internet, among them the use of firewalls, encryption, and virtual private networks. Intrusion detection is a relatively new addition to such techniques. Intrusion detection methods started appearing in the last few years. Using intrusion detection methods, you can collect and use information from known types of attacks and find out if someone is trying to attack your network or particular hosts.

II. RELATED WORK

Intrusion Detection System using Neural Networks

The problem of characterizing the normal and abnormal behavior of a system in network environment is every complex. The real difficulty is that attacks appear to be normal attacks. This requires some level of intelligence in detecting those attacks. IDS response mechanisms and time are the crucial factors in determining whether an attack is successful or not. It is not just enough to find some evidence after attack has happened. The trade-off between the ability to detect new attacks and the ability to generate a low rate of false alarm is the major point to develop effective IDS. Intrusion detection is also made difficult by the fact that there are a large number of

communication protocols such as TCP, ARP, UDP, ICMP, SNMP etc. Each protocol is vulnerable to certain level of exploitation. Also there are many OS, network devices; software bugs also influence the factor. Thus, heterogeneous nature of networked environment requires intelligent techniques to address various security issues [51].

b. Intrusion Detection System using Fuzzy Logic

Fuzzy logic is based on fuzzy set theory. In contrast to standard set theory in which element is either completely in or not in a set, fuzzy set theory allows partial membership in sets. This provides a powerful mechanism for representing vague concepts. Data mining methods are used to automatically learn patterns from large quantities of data. The integration of fuzzy logic with data mining methods will help to create more abstract patterns at a higher level than at the data level. Patterns that are more abstract and less dependent on data will be helpful for Intrusion Detection. In the Intrusion Detection domain, we may want to separate certain quantities of data, such as the number of different destination IP addresses in the last 3 seconds [52]. For a example the rule such as if the number of different destination address during the last 3 seconds was high then an abnormal situation exists.

c. Web Usage Mining

With the continued growth and proliferation of e-commerce, Web services, and Web-based information systems, the volumes of click stream and user data collected by Web-based organizations in their daily operations has reached astronomical proportions. Analyzing such data can help these organizations determine the life-time value of clients, design cross-marketing strategies across products and services, evaluate the effectiveness of promotional campaigns, optimize the functionality of Web- based applications, provide more personalized content to visitors, and find the most effective logical structure for their Web space.

III. METHODOLOGY

H-Tree based intrusion detection system utilized Fuzzy Unordered Rule Induction Algorithm for feature selection phase which has applied on KDD cup'99 data set to reduce the size of data set and also the learning phase employed the Hoeffding Decision Tree. This system is useful and capable in detecting intrusion with higher accuracy and detection rate.

The intrusion detection system based on H-Tree algorithm shown in figure 1. It consists the following modules i.e. data acquisition phase, attribute selection phase, data splitting phase, classifier learning phase, classifier performance evaluation phase and finally the visualization phase.

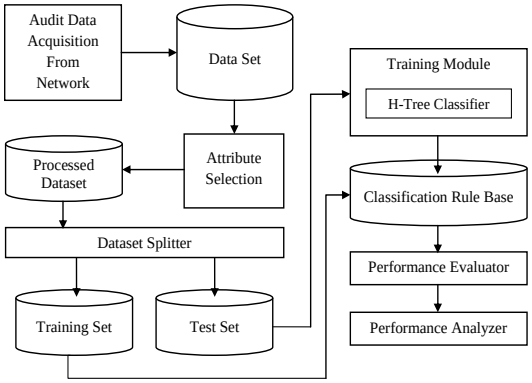

Figure 1: H-Tree based Intrusion Detection System

Following subsections provides detailed description of each phase available in H-Tree based intrusion detection system.

H-Tree Algorithm

The Hoeffding Tree is an induction based decision tree algorithm, it can be capable of learning from large amount of data. It efforts the fact that a small sample may enough for selecting optimal splitting attribute. The Hoeffding tree uses the hoeffding bound to quantify the number of instances or examples that are needed to calculate some statistics within a specified exactitude. The Hoeffding Tree provides asymptotically just about one and the same outcome to that of a non-incremental decision tree

algorithm utilizing infinitely many examples. Suppose N be a set of training instances having form of (x,y) , where vector of d represented by x and y represents distinct class label. Furthermore, the function y=f(x) can be said a mathematical model that is utilized to forecast the class of y for future instance x. Consider A is a random variable having range of R and there are N observations of A. Then the Hoeffding bound can be stated as (with probability 1-δ) the true mean of A is at least $\bar{a}-\epsilon$,

Where

$$\epsilon = \sqrt{\frac{R^2 \log(1/\delta)}{2n}}$$

Testing Phase

The classification rules that are generated during the learning phase stored in classification rule base. In order to assess the performance of developed H-Tree based IDS the test set that has been generated during the dataset splitter phase utilized during testing phase. The outcome of this phase is further forwarded to next phase classifier performance evaluator.

Classification Performance Evaluator

The calculations of various parameters in order to judge the performance of H-Tree based IDS has been done on the classification performance evaluator phase. These measures are as follows:

- True Positive Rate (TPR):

  $TPR = \frac{TP}{TP+FN}$

- False Positive Rate (FPR):

  $FPR = \frac{FP}{TN+FP}$

Where TN (True Negative), TP (True Positive), FP (False Positive), and FN (False Negative) can be defined as follows:

- True Negative (TN): Originally the negative tuples and also labeled as negative by the classifier.
- True Positive (TP): Originally the positive tuples and also labeled as positive by the classifier.
- False Positive (FP): Originally the negative tuples but labeled as positive by the classifier.
- False Negative (FN): Originally the positive tuples but labeled as negative by the classifier.

Furthermore, the confusion matrix shown in table 4.3 can be utilized to understand the aforesaid terms, where a confusion matrix can be defined as the tabular visualization of the performance of an algorithm. The row in the confusion matrix shows the actual class instance while the column in the matrix shows the instances of a predication class.

Valid Record	Correctly Classified
	True Negative (TN)
Attack Record	True Positive (TP)

Visualization

This Phase provides necessary assistance for obtaining the classification details such as the time used for evaluation, accuracy of the algorithm and other performance measurements. These results may be produced in the form of a text file, graph, etc.

IV. RESULT

This section presents the experimental outcomes obtained through H-Tree based intrusion detection system and its comparison with other existing systems. It has been noticed that the H-Tree based intrusion detection system better perform in respect of performance all the existing system

in accuracy domain.

Table 6.1 shows confusion matrix of the number correctly classified instances corresponding to the type of attack or normal instances. The majority of correct detection is noticed in comparison to previously existing K2 algorithm based IDS.

Table 6.1: Confusion Matrix for H-Tree based IDS

	DoS	Probe	R2L	U2R	Normal
DoS	133069	4	1	0	8
Probe	10	1355	1	1	8
R2L	0	0	374	1	4
U2R	0	0	0	11	1
Normal	13	4	7	8	33087

Table 6.2 shows the Class-wise TPR (True Positive Rate) and FPR (False Positive Rate) for the H-Tree based IDS with 100%, 98.5%, 98.7%, 91.7%, 99.9% TPR for DoS, Probe, R2L, U2R and Normal instances respectively.

Table 6.2: Class-wise TPR and FPR for H-Tree based IDS

Class	H-Tree based IDS Framework	
	True Positive Rate (%)	False Positive Rate (%)
DoS	100	0.1
Probe	98.5	0.0
R2L	98.7	0.0
U2R	91.7	0.0
Normal	99.9	0.0

Finally, Table 6.3 witnesses the maximum rate of correctly classified instances with 99.9577% instances and minimum rate of incorrectly classified instances with 0.0423% instances.

Parameter	Performance (in Percentage)
	H-Tree based IDS
Correctly Classified Instances	99.9577
Incorrectly Classified Instances	0.0423

V. CONCLUSION

Today there are two basic approaches to Intrusion detection. One is anomaly detection and another is misuse detection. Intrusion Detection is a set of techniques and methods that are used to detect suspicious activity both at the network and host level. Using Intrusion Detection, we can collect and use information from known types of attacks and find out if someone is trying to attack our network or particular hosts. The information helps us to harden our network security, as well as for legal purposes.

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COMPARISON BETWEEN KANNADA AND ENGLISH HANDWRITTEN WORD RECOGNITION

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Abstract: Handwritten character recognition is a complex task because of various writing styles of different individuals. Our Method yeilds good classification accuracy on handwritten characters, apart from complexity. Normalization and binarization are the pre-processing techniques used for getting accurate results of classification process in handwritten character recognition.

1.INTRODUCTION

Kannada is a dravidan language, mainly used by peoples of Karnataka, Andrapradesh, Tamilnadu and Maharastra. Kannada is spoken by 48 millian peoples, The Kannada alphabets were developed from the Kadamba and Chalaukya scripts, descendants of Brahmi which were used between the 5th and 7th century A.D. The basic structure of Kannada script is distinctly different from Roman script. Unlike many North Indian languages, Kannada characters do not have shirorekha (a line that connects all the characters of any word) and hence all the characters in a word are isolated. This creates difficulty in word segmentation. Kannada script is more complicated than English due to the presence of compound characters. However, the concept of upper/lower case characters is absent in this script. Kannada has 49 base characters, called as Varrnamale as shown in Figure.1.1 comprising 15 vowels, 34 Consonants. consonants modified by all the 15 vowels. Such consonant-vowel combinations are called live consonants (gunithakshara or diacritics) as shown in Figure 1.2.

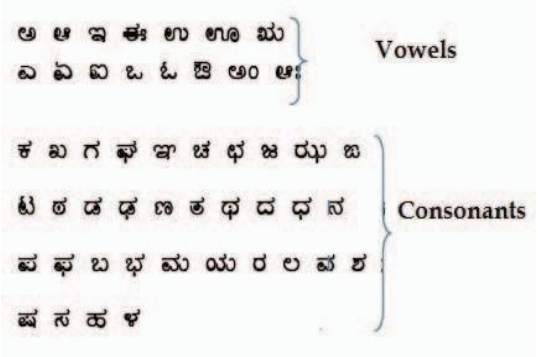


Figure 1.1:Kannada Language 49 Phonemic Letters

Figure 1.2: sample of kannada modfier glyphs (diacritics)

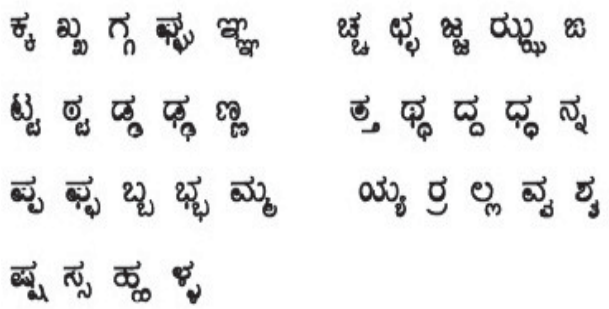


Figure 1.3: Consonant conjuncts in Kannada (vattakshara)

1.1 Difficulties in kananda language

Handwritten Kannada characters/words recognition is a very difficult task due to the unconstrained shapes, variation in writing style (line orientation ,line spacing) and different kinds of noise.

Text line components

- Baseline
- Median line
- Upper line
- Lower line
- Overlapping letters
- Touching components

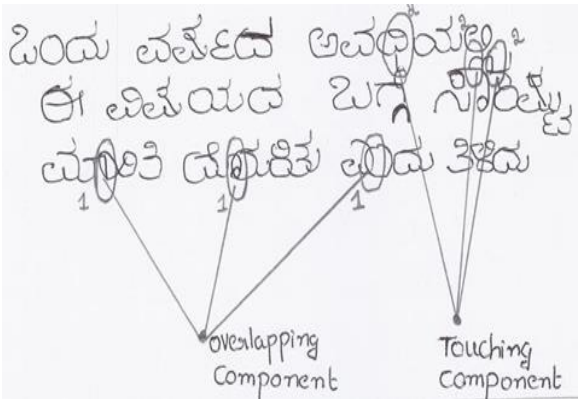
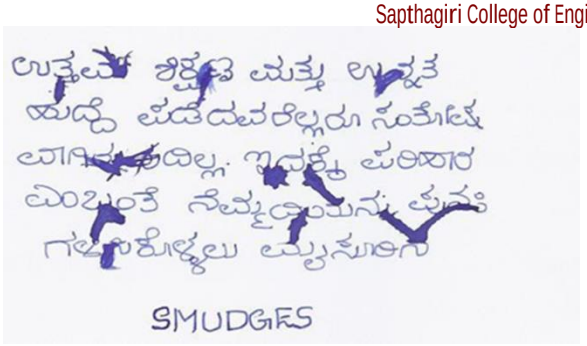


Figure 1.4:text line components

- The effect of author style
  Prominent line variation
  Line orientation and line spacing

- Effect of poor image quality



English is most popular language, this language has 26 characters as shown in Figure 1.5, among 26 characters it contains 5 vowels and 21 consonants. These distinct characters modify the base consonants is called consonant and vowel modifiers. The number of consonant and vowel modifiers also same as base characters. Consonants, consonant modifiers and vowel modifiers are combine together to form an aksharas, also called as base character.

A B C D E F G H I J K L M

N O P Q R S T U V W X Y Z

Figure 1.5: English alphabets

2. WORD RECOGNITION

2.1 PREPROCESSING

Preprocessing generally consist of series of image to-image transformations. It is preliminary step which transforms the data into a form that is more easily and effectively processed. The main task of preprocessing is to process the scanned image and increase the noise that causes a reduction in the recognition rate and increases the complexities. Hence preprocessing is an essential stage prior to the segmentation, as it controls the suitability of the results for the success of the recognition. Preprocessing is divided into 4 Steps.

1. Noise removal
2. Conversion to grayscale
3. Conversion to binary
4. Dialation and erosion

2.1.2 Noise removal

The handwritten documents are the input image, these documents are scanned from left to right, right to left and top to bottom, bottom to top using HP scanner. If poor quality of HP scanner, the bubbles, dots and unwanted information appeared in the document, then the quality of the document will be reduced.

2.1.2 Gray scale conversion

Initially input image is in RGB colour (Red,Blue and Green),this RGB coloured image is converted in to white and block image.

2.1.3 Binarization

Grayscale image is converted into binary image is called binarization.

First separating foreground information and background information. Then compare intensity value and existing threshold value. If the intensity value of the image is more than the existing threshold value then the pixel value is changed to 1. If the intensity value of the image is less than the existing threshold value then the pixel value is changed to 0. Black pixel values is denoted as 1's assigned to the object. White pixels values denoted as 0's assigned to background. In which region does not contains any text that is eliminated from the binary image then that image is traversing in top, bottom,left and right directions. Finally textual part of the image is obtained.

2.2.4 Dilation and Erosion

Word level segmentation on the binarized document do not get good accuracy due to broken character or word. Single word is segmented in to more than one word or more than two increasing the objects of the binary image. Erosion :it is used for decreasing the objects of the binary characters, overcome this disadvantages dilation and erosion are used.

Dilation: this is primitive morphological operations, it is used for image. The objects of the binary image is increases / decreases, the shape of the image is changed is called structuring element. Dilation will be used for connecting the disconnected components. Erosion will be used for elimination of pixels/dots in the document.

2.2 SEGMENTATION

Segmentation of handwritten text in to lines, words and characters is one of the important step in handwritten character recognition. HCR helps in the identification of words written by the writers. The most important process in HCR is the segmentation where the text is converted in to lines. There are two types of handwritten text.

- Offline HCR
- Online HCR

Offline HCR means writer utilizes pen/pencil for writing anything on the paper. Online HCR means writer utilizes digital tools like the electronic pen for writing purpose. By applying good segmentation techniques the performance of HCR can be increased.It is the process of extracting objects of interest from an image. It subdivides an image into its constituent regions or objects, which are certainly characters. This is need because the classifier recognizes only the isolated characters. Segmentation phase is also crucial in contributing to the error due to touching characters, which the classifier cannot properly tackle. Even in good quality documents, some adjacent characters touch each other due to inappropriate scanning resolution. Segmentation technique is divided into the following submodules:

1. Line Segmentation
2. Letter Segmentation
3. Boundary Detection

2.2.1 PROBLEMS IN SEGMENTATION

Problem 1 A problem that occurs with the above segmentation is that in handwritten text, there high chances of slant lines which can lead to an incorrect line cropping. Figure 1.6 shows the problem of slant line in an image.

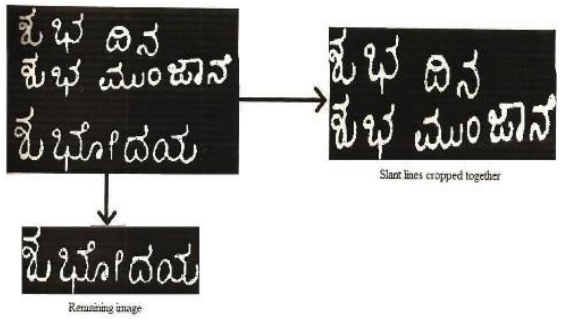


Figure 1.6: slant line segmentation

Solution The slant line problem can be overcome by sending such images into the line crop function once again after the letter crop. By using this flow, the slant lines in the incorrectly segmented lines are divided vertically by the

letter crop making the 3 lines shorter and straight, as a result of which the characters get segmented separately in the second line crop.

Probem 2 Another issue is in case the characters are written too close such that there is no enough empty space between the characters to be detected by the letter crop function. In this case the characters are not segmented correctly which leads to incorrect recognition. Solution The boundary determination is used to overcome this error. Here assumption is made that all slant line problem is overcome and only an image consisting of images in a single line is passed into the boundary detection. Boundary Detection In this stage the connected objects are given a label and a rectangular box is plotted around each connected object. The value of each label is extracted and each rectangular box is cropped to get the isolated character. This isolated character is then sent for feature extraction.Figure 5 shows the problem of close images being solved by the boundary detection.

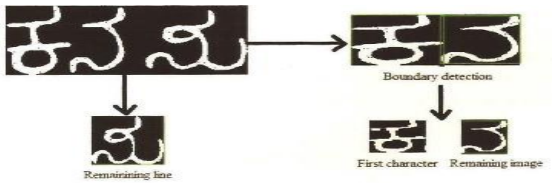


Figure 1.7: Boundary Detection

2.3 CLASSIFICATION

2.4.1Classification Using NN Classifier

The feature vector extracted from the segmented character is assigned a label using a classifier. Recognition of segmented characters is performed using NN Classifier.The recognition performance of Back Propagation network will highly depend on the structure of the network and training algorithm. Feed forward back propagation neural network has been selected to train the network. The number of nodes in input, hidden and output layers will determine the network structure. All the neurons of one layer are fully interconnected with all neurons of its just preceding and just succeeding layers (if any) 5.1 Back Propagation Neural Network Algorithm

1.Initialize the weights to small random values.

2.Randomly choose an input pattern x (μ)

3.Propagate the signal forward through the network.

4.Compute $\delta^L i$ in the output layer
$(o_l = y_l^{L)}$ $\delta^L{}_l = g^l(h^L{}_l)[d^L{}_l - y^L{}_l]$where
$h^L{}_l$ represents the net input to the ith unit in lth layer and g0 is the derivative of activation function g.

5.Compute the deltas for the preceding by propagating the error backwards.
$\delta^L{}_i = g^l(h^L{}_i) \sum_j w_{ij}^{l+1} \delta^{i+1}{}_j$ for I = L-1……1

6. Update weights using $w^l{}_{ij} = \eta\, \delta^L{}_i\, y_j^{i-1}$

7. Go to step 2 and repeat for the next pattern until the error in the output layer is below a pre-specified threshold or maximum number of iterations is reached.

2.4.2 Conversion to Editable Format Based on index value (for template based matching), the Unicode corresponding to the character stored at the obtained index value is stored into a variable letter. The letter value is stored into a word array. The recognized characters are printed on to a notepad which can be further edited and saved.

RESULTS

Input data

The input data contain the hand written word. It can be converting into the gray scale image and then noise is removed in the input handwritten word image as shown in the following Figure.4.8, 4.9&4.10.

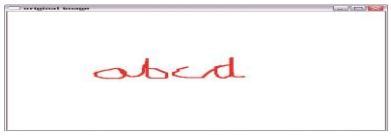


Figure 1.8: Original image

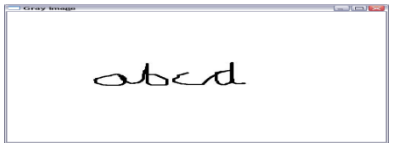


Figure 1.9: Gray image

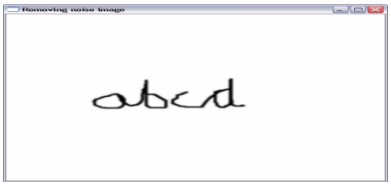
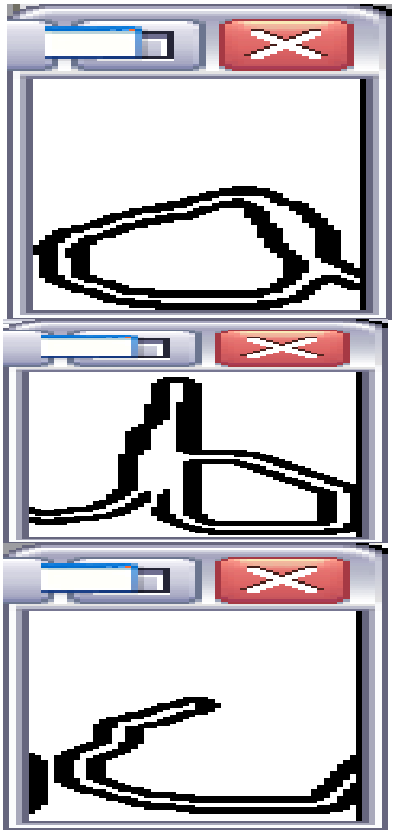


Figure 1.10: Noise removed

After removing noise next apply the smoothening Then the characters are split in the word image based on the distance. It can detect the clear reorganization of the input handwritten word as shown in Figure.4.11, 4.12,4.13,4.14 and 4.14.

Figure 1.11: Word extraction



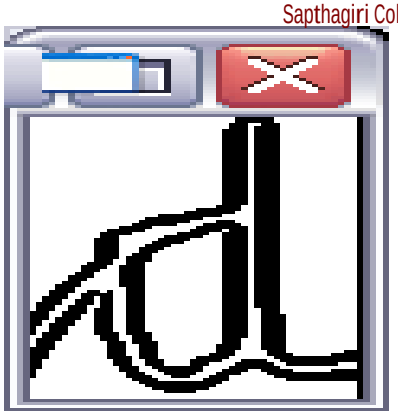


Fig 1.12: Character extraction

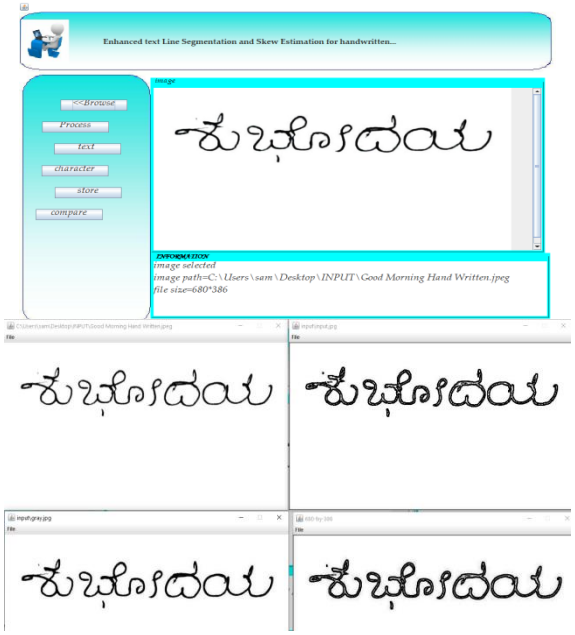


Figure 1.13:Original image, grayscale image, binarized image and output.

Conclusion and Future Enhancement

HCR is the process of identifying the handwritten characters. The text in an image is

converted into other letter codes which are usable within computer and text processing applications. Here recognition is done using NN classifier. It attempts to increase overall efficiency and accuracy of the HCR. Various feature extraction techniques are incorporated to improve the efficiency. Also the image is converted into an editable format. The editable text can be saved and opened for further editing. The current system can be combined with other features to improve the efficiency. An overall architecture for HCR incorporating all these features can be developed to improve the accuracy. Such a structure will help to exploit further domain information in the recognition process. The current system can be extended to recognize votaksharas Kannada handwritten word recognition accuracy is 93.16 and handwritten English word recognition accuracy is 97.13.

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Study of Checksum for Data Integrity Verification in a Network

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Abstract

The actual procedure which yields the checksum, given a data input is called a checksum function or checksum algorithm. . Checksum is calculated based on the message ASCII values and a parity bit is assigned at the end there by the receiver can verify by using the same parity value to achieve the integrity. Here we propose a tool that maintains the client and server authentication, and both prove the integrity by using the parity polynomials (CRC'S). Here we propose a technique in which the message is encrypted using some hashing algorithm and appending the parity bits generated by polynomial checksum and the name process is done at the receiver side (client side) during decryption process and hence achieving an integrity of data during data communication.

Keywords-Parity, Checksum, Polynomial, CRC (Cyclic Redundancy Code's), XOR (Exclusive OR).

I. INTRODUCTION

A common way to improve network message data integrity is appending a checksum. Although it is well known that cyclic redundancy codes (CRCs) are effective at error detection, many embedded networks employ less effective checksum approaches to reduce computational costs in highly constrained systems. (Even high-volume embedded networks cannot typically afford to have custom hardware built for CRC support.) Sometimes such cost/ performance trade-offs are justified. However, sometimes designers relinquish error detection effectiveness without gaining commensurate benefits in computational speed increase or memory footprint reduction. Embedded control networks commonly use checksums to detect data transmission errors. However, design decisions about which checksum to use are difficult because of a lack of information about the relative effectiveness of available options. Here the error detection effectiveness of the following commonly used checksum computations: exclusive or (XOR), two's complement addition, one's complement addition, Fletcher checksum, Adler checksum, and cyclic redundancy codes (CRCs). A study of error detection capabilities for random independent bit errors and burst errors reveals that checksums are suboptimal for typical network use. Instead, one's complement addition should be used for networks willing to sacrifice error detection effectiveness to reduce computational cost, the Fletcher checksum should be used for networks looking for a balance between error detection and computational cost, and CRCs should be used for networks willing to pay a higher computational cost for significantly improved error detection.

II. LITERATURE SURVEY

A checksum is an error detection mechanism that is created by "summing up" all the bytes or words in a data word to create a checksum value, often called an FCS in networking applications. The checksum is appended or prepended to the data word (the message payload) and transmitted with it, making this a systematic code in which the data being sent is included in the code word unchanged. Network receivers recompute the checksum of the received data word and compare it to the received checksum value. If the computed and received checksum match, then it is unlikely that the message suffered a transmission error. Of course, it is possible that some pattern of altered bits in the transmitted message just happens to result in an erroneous data word matching the transmitted (and also potentially erroneous) checksum value. There is a trade-off among the computing power used on the checksum calculation, the size of the FCS field, and the probability of such undetected errors.

Commonly used checksums generally fall into three general areas of cost/performance trade-off. The simplest and least effective checksums involve a simple "sum" function across all bytes or words in a message. The three most commonly used simple "sum" functions are XOR, two's complement addition, and one's complement addition. These checksums provide fairly weak error detection coverage but have very low computational cost.

Because CRC computation is so expensive, two intermediate-cost checksums have been proposed for use in nonembedded networks. The Fletcher checksum [16] and the later Adler checksum [15] are both designed with a goal of giving error detection properties competitive with CRCs with significantly reduced computational cost. In the late 1980s, Nakassis [17] and Sklower [18] published efficiency improvements for Fletcher checksum implementations that also are useful to speed up one's complement addition checksums. Although Fletcher and Adler checksum error detection properties are

almost as good as a relatively weak CRC, they are far worse than good CRCs for some important situations.

II. PROPOSED WORK

A system architecture or systems architecture is the conceptual design that defines the structure and/or behavior of a system. An architecture description is a formal description of a system, organized in a way that supports reasoning about the structural properties of the system. It defines the system components or building blocks and provides a plan from which products can be procured, and systems developed, that will work together to implement the overall system. This may enable one to manage investment in a way that meets business needs. The fundamental organization of a system, embodied in its

components, their relationships to each other and the environment, and the principles governing its design and evolution.
The composite of the design architectures for products and their life cycle processes. A representation of a system in which there is a mapping of functionality onto hardware and software components, a mapping of the software architecture onto the hardware architecture, and human interaction with these components. An allocated arrangement of physical elements which provides the design solution for a consumer product or life-cycle process intended to satisfy the requirements of the functional architecture and the requirements baseline. Architecture is the most important, pervasive, top-level, strategic inventions, decisions, and their associated rationales about the overall structure (i.e., essential elements and their relationships) and associated characteristics and behavior.
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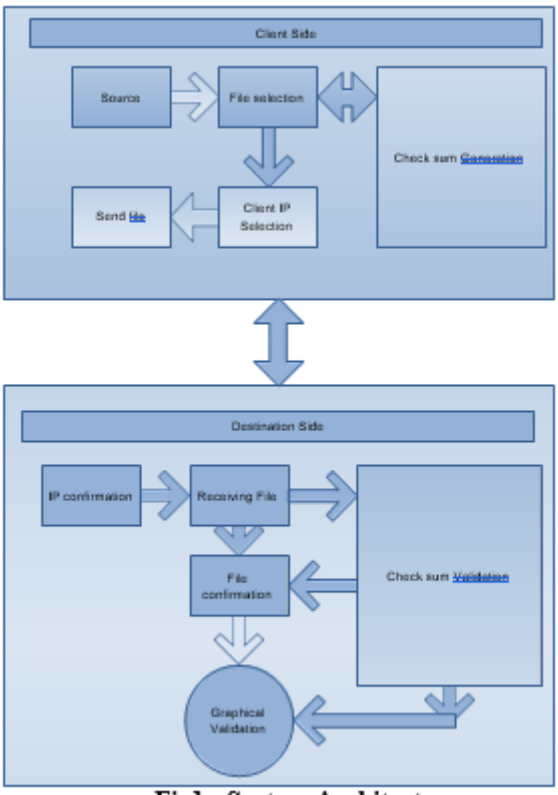

Fig1 : System Architecture

MODULES

- Server Module.
- Client Module.
- Destination IP selection module.
- Checksum generation Module.
- Checksum validation Module.

A. SERVER MODULE

In computing, a server is any combination of hardware or software designed to provide services to clients. When used alone, the term typically refers to a computer which may be running a server operating system but is also used to refer to any software or dedicated hardware capable of providing services. In this server module the

server will select the file for sending to the client machine before sending the server will calculate the secure file vale.

B. CLIENT MODULE

A client is an application or system that accesses a remote service on another computer system, known as a server, by way of a network. The term was first applied to devices that were not capable of running their own stand-alone programs but could interact with remote computers via a network. In this client module the client will just select the file to which have been got from the server. From the file the secure value will be valuated.

C. DESTINATION IP SELECTION MODULE

In this module the sender will move to the client's selection form. In this form the sender can select the client by checking the IP number. The list IP number and their names will be

displayed in the panel for selection. This list will be collected according to the IP available in our through LAN connection.

D. CHECKSUM GENERATION MODULE

The integrity of the data can be checked at any later time by recomputing the checksum and comparing it with the stored one. If the checksums do not match, the data was almost certainly altered (either intentionally or unintentionally). The procedure that yields the checksum from the data is called a checksum function or checksum algorithm. A good checksum algorithm will yield a different result with high probability when the data is accidentally corrupted; if the checksums match, the data is very likely to be free of accidental errors. If computational resources are available, use a CRC instead of any of the other checksums mentioned. It is generally better for both random independent bit errors and burst errors. Consider the length of the data word when evaluating checksum performance. Performance can vary dramatically with the size of the data word, especially for CRCs.

E. CHECKSUM VALIDATION MODULE

After receiving the file at receiver, the client will browse the file from the stored path and client will evaluate the check sum. During receiving time, the file will be received with the checksum value which was evaluated by the sender will be sent with file to client. The client will again check by checksum generation and will compare both checksum value matches and not. If both values are get matched, then it's a sender original file otherwise it's a damaged or hacked file. This is effective only when CRC checksum generation is used . and also, here in this module the checksum validation will be done.

III. RESULT

Fig2: Generation of Checksum

Fig 3: Validation of Checksum

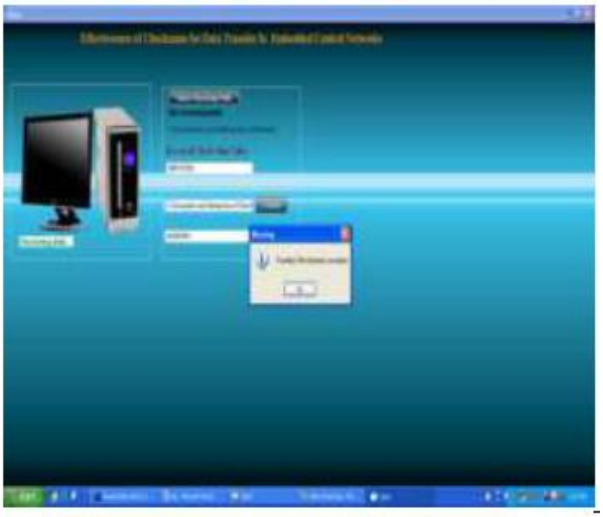

Fig 4: Evaluation of checksum

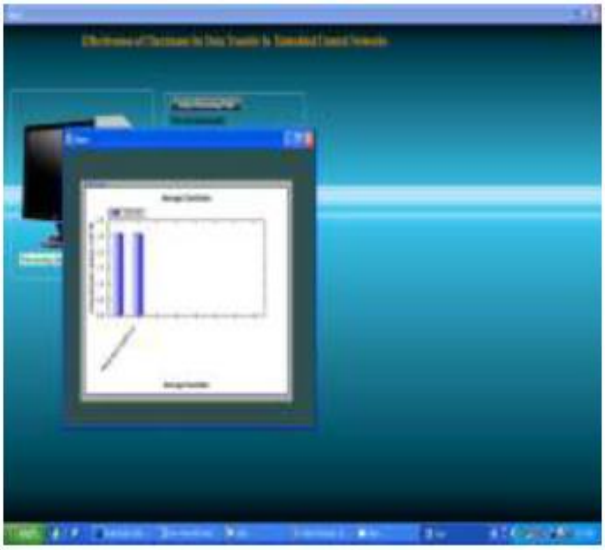

Fig 5: Graph Generation

IV. Conclusion and Future Scope

The error detection properties of checksums vary greatly. The probability of undetected errors for a k-bit checksum is not always in realistic networks as is sometimes thought. Rather, it is dependent on factors such as the type of algorithm used, the length of the code word, and the type of data contained in the message. The typical determining factor of error detection performance is the algorithm used, with distinct differences evident. For all networks, a "good" CRC polynomial, whenever possible, should be used for error detection purposes. It provides at least one additional bit of error detection capability (more bits of HD) compared to other checksums and does so at only a factor of two to four times higher computational cost. For future work, we plan to generalize new techniques/algorithms for error detection in data transfer and other lifetime definitions.

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A Novel Approach to Virtual Waiter for Restaurants

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***Abstract*— Owing to enlarged digital data obtainability and Artificial Intelligence (AI) progressions, there are quite a few occasions that can be reconnoitered in restaurants. As a field where the advent of Machine Learning and other such leading technologies has not been of a great magnitude, we through our project, hope to change that. Even in this technologically advanced world, we see customers go through the inconvenience of waiting in queues, where optimum service isn't available. Furthermore, we see many customers dissatisfied with hotel service due to a botched order.**

This project directs to offer a gestalt of Machine Learning (ML) and exhibits a roadmap for a centralized system which collects order data from customers and expedites new methodologies for placing orders. The idea is implemented through a web app that focuses on voice based communication. It also proposes a novel type of utility during the current pandemic scenario through contactless communication. A system that would provide facilities to the customer very quickly and with least amount of work would be very beneficial to everyone.

***Keywords*— Bag of words, DNN, Apriori, Keyword extraction, Speech recognition, Speech sampling.**

I. Introduction

In today's world, machine learning is undeniably an extremely influential technology and as such, it is an older area of Artificial Intelligence which is said to deal with the study of computational methods that help in discovering new information as well as in managing that information[1]. More importantly, the world has yet to see its full potential as it continues to make headlines everyday. This project has been designed to use Machine Learning concepts, covering some of the most famous and useful models as we see today.

In recent times, while we see widespread usage of Machine Learning in the Modern Enterprises which has led to decreased costs(Sharma, 2019;Spira, 2018), we are yet to see any noteworthy applications of machine learning in the Hospitality Industry[2]. Customer satisfaction is of utmost importance because it is through this feedback that businesses manage to improve their services[3].

Additionally, it is known that advancements in technology have led to the development of Human-Machine interfaces based on Artificial Intelligence and Machine Learning principles and these are steadily gaining popularity among the masses in modern times[4]. This trend of people leaning towards using technologically advanced means to perform a variety of tasks was a point of inspiration to us in developing this project.

Another need of the hour is the necessity of social distancing during the COVID-19 pandemic. Hotels and Restaurants are known to be crucial contributors to a nation's economy and are extremely vulnerable to the effects of the pandemic, thus leading to economic downturns[5].

So, in order to guarantee that an establishment is able to satisfactorily cater to its customers' needs, able to mitigate the losses faced as a result of the pandemic by providing customers a safer way to interact with hotel staff, and to simultaneously make use of the most recent advancements in technology, we have come up with this novel approach to ordering and completing transactions at a restaurant. Through our project - Not Your Everyday Waiter (NYEW), we hope to bring the advantages of Machine Learning in order to better optimize the dining experience of people.

II. Problem Formulation

Restaurants and hotels are an incredibly important part of a country's economy. With this in mind, we formulated a problem statement to guarantee customer satisfaction in the hospitality industry while also keeping in mind the fact that the servicing and interactions between the customers and the hotel/restaurant staff can use a technological upgrade. Some problems we encountered and are looking to find a feasible solution for are listed below.

A. Problem statements

- Humans are fallible creatures and may be prone to making mistakes while taking orders from customers as well as during the process of conveying the information noted to the chefs.
- Additionally, customers in hotels/restaurants tend to get frustrated while having to wait till they get the chance to place an order for a certain item of food[6].
- We hope to offer contactless ordering and transaction services which is a need during the COVID-19 pandemic.

In order to minimize this wait time as well as to improve customer satisfaction, we have developed a system that can

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be accessed by patrons in the establishment. This includes a number of Machine Learning models as well as an extremely user-friendly interface that can get the job of a waiter done more efficiently and accurately.

B. Objectives

Having detailed our problem statement in the previous section, we intend to define and explain the goals and objectives that we identified during the genesis of this project:

- To minimize the wait time most customers have to endure before placing an order. This, in turn, leads to customer satisfaction as customers generally tend to favour restaurants where they can purchase their food at the earliest[7].
- Our system proposes to reduce the chances of placed orders getting messed up which may pose a problem for customers and stands a chance of increasing frustration when it happens. In order to increase the likelihood of the customer visiting the establishment again, such a system can help.
- A lot of young people in today's society prefer technologically advanced means of accomplishing a given task[8]. We believe that the same applies to restaurant interactions and as such, our system can be of great help.
- Coincidentally, as a final and extremely important goal, our project also aids during the prevalent pandemic conditions during which contactless order placing or even avoidance of interactions with fellow people can be of utmost importance.

III. Implementation

A. Approach

The proposed system has a conversational interface, the user/customer is intended to converse with the system in their natural language, to place orders or receive appropriate responses for queries.Interaction between Chatbot/Virtual Assistants and the user is defined by their design.[9]

The proposed system handles two types of direct interactions. Either a question that is FAQ-like, which expects a direct response from the bot, for example, the customer may ask "What time is the restaurant open?", The answer to this question would be the opening hours of the restaurant. The other kind would need to trigger specific functions such as placing an order, displaying the menu, removing items from the order, etc.

The customer can activate the system with just a click of a button, and with the help of a dedicated microphone, the customer can start talking to the system in natural language, in this case English language.

The speech recognition unit takes the digital audio as input and provides text spoken in the audio as output.

The smart reply unit is employed to predict the appropriate response or to trigger a specific function, based on the user's input.

The response generated by the smart reply unit is given back to the customer in audio form using a text to speech unit.

To obtain the information out of a sentence, a keyword extraction unit is being used. It is based on parts of speech tagging. Extracting the noun from a sentence serves this particular use case, such as the name of a food item that the customer wants to order, a subsection of the menu, etc.

To check if a particular item exists in the menu an algorithm is used to match the string distance between the keyword and the available items in the menu.

Recommendation unit is used to recommend an item from the menu which is a popular choice, along with the item ordered by the customer.

The kitchen side of the project is completely based in the UI itself, as it requires less computation and mainly focuses on ease-of-use for the chef and the restaurant managers while making sure not to turn into an obstacle for their work, especially when they are 'in the weeds'. We are simply

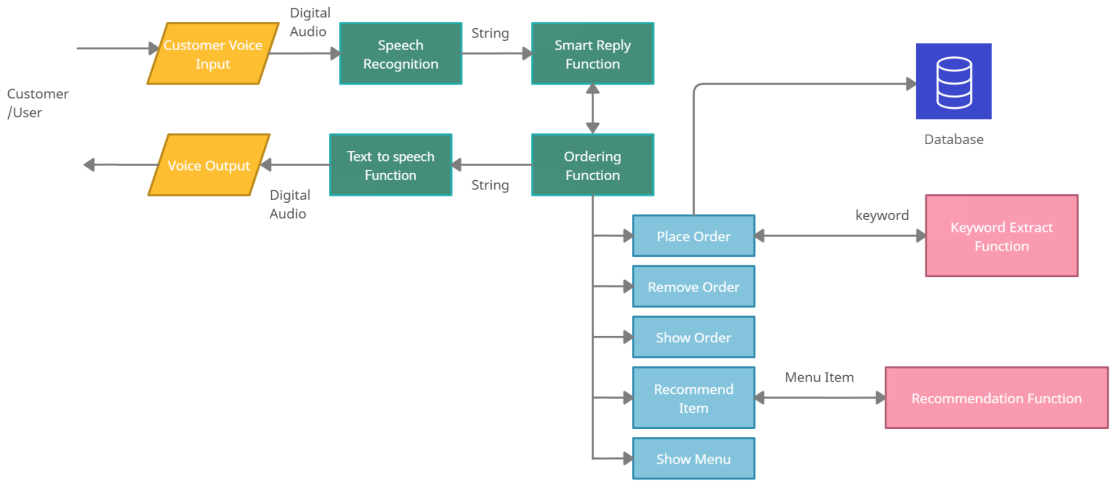

Fig 1 Data flow diagram for the proposed system

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connecting the backend and the frontend using the Django framework.

- Speech recognition

The system uses the Speech Recognition library in Python. This library contains a class called Recognizer. In this instance of the Recognizer class, the recognize_google() method is being used to extract the text spoken by the customer. This method uses Google Web Speech API to recognise text in the audio file. This particular library is being used because it is easy to use and set up.

- Smart reply

The Virtual Waiter was designed based on interactions collected from a restaurant. These questions are stored along with their responses and intent tags in a JSON-like file format. Intent tags are the codes or labels for the set of questions.[9] The responses for each of these queries are recorded from the restaurant side.

This approach utilizes the Bag-of-words model for extracting features from the text for use in modelling.[10] The proposed system employs the TFLearn library to train a Deep Neural Network (DNN) model for the dataset created. As DNN works best with binary values[11], one-hot encoding is used to create binary document vectors. In the data preprocessing phase the texts are tokenized and stemmed using Natural Language ToolKit library and passed as input to the neural network.

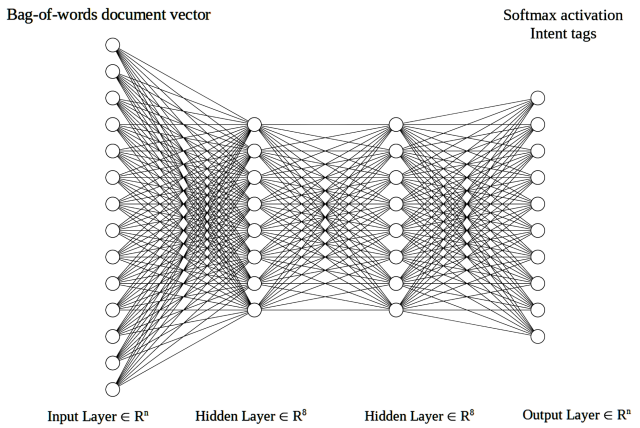

Fig. 2 Deep Neural Network Architecture of Smart Reply Model

The DNN uses a few hidden layers along with the softmax activation function to acquire the vector of probabilities. After training the model the intent tag with maximum probability is chosen as the prediction for the passed query text.

- Text-to-speech

As the name suggests this unit converts text to vocal audio form[12]. The Google Text-To-Speech(gTTS) module is being used to synthesize audio in this system. gTTS is a Python library and CLI tool that interfaces with Google Translate text to speech API.[13] The gTTS method accepts text as input and returns an audio file as output.

- Keyword extraction

To extract the keywords from the input text spaCy is being used. SpaCy is an open-source Python library for advanced natural language processing.[14] A statistical English model is loaded. The instance on this is used to predict parts-of-speech tags, dependency labels, named entities and more. In this system, parts of speech tagging are used to extract Noun words in the text.

- String matching

Using a Python package named FuzzyWuzzy to calculate the standard Levenshtein distance, we find the similarity ratio between two sequences. Levenshtein distance is a metric to measure how apart two sequences of words are.[15] Put differently, it measures the minimum number of edits that one needs to do to change a one-word sequence into the other.
The formal definition of the Levenshtein distance between two strings a and b can be seen as follows:[15]:

$$\mathrm{lev}_{a,b}(i,j) = \begin{cases} \max(i,j) & \text{if } \min(i,j) = 0, \\ \min \begin{cases} \mathrm{lev}_{a,b}(i-1,j) + 1 \\ \mathrm{lev}_{a,b}(i,j-1) + 1 \\ \mathrm{lev}_{a,b}(i-1,j-1) + 1_{(a_i \neq b_j)} \end{cases} & \text{otherwise.} \end{cases}$$

Where $1_{(a \neq bj)}$ denotes 0 when $a = b$ and 1 otherwise. It is important to note that the rows on the minimum above correspond to a deletion, an insertion, and a substitution in that order.
It is also possible to calculate the Levenshtein similarity ratio based on the Levenshtein distance. This can be done using the following formula:

$$\frac{(|a| + |b|) - lev_{a,b}(i,j)}{|a| + |b|}$$

where $|a|$ and $|b|$ are the lengths of sequence a and sequence b respectively.
The 'extract' method of the 'process' class of this particular package accepts two inputs. One is the keyword and the other is the sequence of texts that the keyword needs to be matched with. The word with the highest match ratio is returned by this method.

- Recommendation

For this unit, Association rule mining using the Apriori algorithm is implemented. Association rule mining is a technique to identify underlying relations between various items.[16] Three fundamental components of the Apriori algorithm are: Support, Confidence and Lift.

Support refers to the default popularity of an item and can be calculated by finding the number of transactions containing a particular item divided by the total number of transactions.[17]

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Support(B) = (Transactions containing (B)) / (Total Transactions)

Confidence refers to the likelihood that an item B is also bought if item A is bought. It can be calculated by finding the number of transactions where A and B are bought together, divided by the total number of transactions where A is bought.[17]

Confidence(A→B) = (Transactions containing both (A and B)) / (Transactions containing A)

Lift(A→B) refers to the increase in the ratio of sale of B when A is sold. Lift(A→B) can be calculated by dividing Confidence(A→B) divided by Support(B).

Lift(A→B) = (Confidence (A→B)) / (Support (B))

The record of customer orders is taken from a restaurant. The dataset is created using that. To implement the apriori algorithm a python library called 'apyori', is being used. The 'apriori' class instance is passed with a few parameters such as minimum support, minimum confidence and minimum lift to get the desired number of association rules from the dataset.

B. Preliminaries

The datasets used for the project are employed to train the machine learning models. Since our project is relatively new and is still one-of-a-kind in the Hospitality Industry, we were tasked with preparing our own datasets using customer orders and interactions collected from a restaurant. necessary for training each of the machine learning models used. The dataset used to train the Smart Reply Model is in the form of a .json file and the data is contained in the intents(tags), which is a list of dictionaries. These dictionaries have values corresponding to the intent tags/labels and have patterns and responses.

To train our model, we have considered an extensive set of intents that have a number of possible questions that the user/customer may ask in the Patterns section and their corresponding replies in the Responses section. The data in the dataset is then tokenized in order to assign an algorithmically generated number to denote each word, in other words, to index each word[18]. This data is then stemmed-which is essentially identifying the root word when presented with a set of similar words. These processes are performed in order to allow the Machine learning model to process the data provided. This pre-processed dataset is ultimately fed into the Bag of Words model[19].

Another dataset is employed to train the Recommendation model. This dataset consists of orders placed by every customer who happens to place an order and it is in the form of a .csv file and it is a dynamic dataset. This means that the data in this dataset keeps updating as and when a new order is placed through the interface. This model makes use of the Apriori algorithm-An Association Rule Based Learning Algorithm.[20] Since the datasets were created by us, it is worth mentioning that even though attempts were made to clean the data, bridge any missing values and to maintain consistency, there may still be some missing values.

1) *Data Processing for Smart Reply Model*: Since Machine learning models prefer to use well defined, fixed-length inputs, we attempted to do this with our data using the Bag of Words (BoW) method. This method is a simple tool used for feature extraction which is necessary for machine learning models to be able to process the data fed to them. Here, each word count is considered as a feature[21]. A list of words is taken to design the vocabulary and each word is then converted into a vector by assigning it with a boolean value and as such, 0 denotes absence of the word while 1 denotes presence. This data is then fed as an input into the Deep Learning Neural Network.

2) *Data Processing for Recommendation Model*: The dynamic dataset that is used to train the recommendation model is run through an apriori algorithm. Simply put, this algorithm is responsible for finding relations between patterns between the data items provided[20]. The algorithm involves three terms namely, support, confidence and lift. These can be explained using an example: Suppose the dataset provides 200 instances where ketchup was ordered and 250 instances where a burger was ordered. Out of the 250 instances involving a burger, around 100 instances involved ketchup as well. Here, the **support** for ketchup would be defined as the instances containing ketchup divided by the total number of instances. **Confidence** can be defined as the likelihood of a person buying ketchup when they buy a burger. Finally, **lift** would be defined as an increase in buying ketchup as a result of ketchup being bought with a burger. Following this, we have to set minimum values for support and confidence in order to define a minimum value for items to occur together.

IV. Establishing and Evaluating Modules

In this section, we present our proposed models and algorithms in detail. Our waiter takes voice inputs from the customer, and processes it to take appropriate actions. These models were proposed keeping both customer satisfaction and restaurant's usability in mind. In the following subsections we will introduce each part of our model structure.

A. Smart Reply Model

In here, we use Deep Neural Network (DNN) to train a response model. We use TFLearn for building the neural network. The dataset used for this model is a JSON file, as mentioned earlier, containing the intents, which is in the form of a list of dictionaries. The dictionaries have values corresponding to the intent tags/labels, patterns and responses.

TFLearn takes binary inputs, but in our case, we have everything in dictionaries of strings. This would not work very well with the neural network. Therefore, we have used an alternative method, which is encoding them. We use the 'bag of words' technique for one-hot encoding the words in our strings to binary values.

We tokenize all the patterns and stem them. Then it is added to a list of words. We then check if a word in a particular pattern exists in the list of words. If it is present, we add a 1 to the bag of words; otherwise we add 0. We pass this bag as a training set along with the output tags. Our neural network contains two hidden layers with eight neurons each along with

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softmax activation function. This softmax activation function in the network computes and comes up with probability for each output layer.

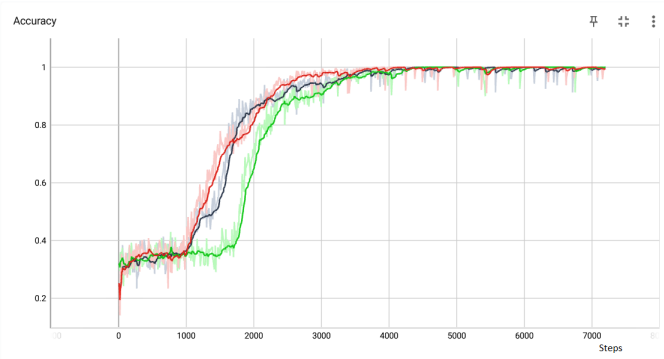

Fig. 3 Accuracy Plot of the Smart Reply Model

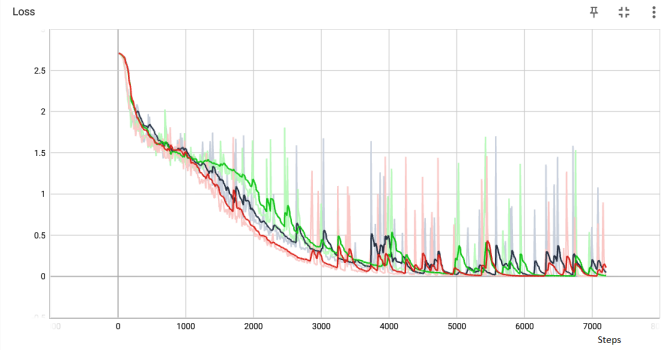

Fig. 4 Loss plot of the Smart Reply Model

From Fig. 3, we can see that after additional minor optimizations, the developed model could achieve stable Accuracy of 0.999. After additional tests it was found that this stability was reached sooner, even with a lesser epoch. Finally, this returns the tag which has the maximum probability, and then an appropriate response corresponding to that particular tag is chosen.

B. Keyword Extraction Module

We have kept in mind that the customer may not be well adept at speaking to a virtual waiter system. We also considered that the customer may not be proficient in the default language either. To address this issue, we built a keyword extraction module, which as the name suggests, extracts keywords. For this module, spaCy comes with pretrained pipelines and currently supports tokenization and training for 60+ languages. It features state-of-the-art speed and neural network models for tagging, parsing, named entity recognition, text classification and more, multi-task learning with pre-trained transformers, as well as a production-ready training system and easy model packaging, deployment and workflow management.

First we load the spaCy English model (en_core_web_sm), and then pass an input string to it. The instance of the library tokenizes the sentence into words, and tags them with the parts of speech of English language. In our case, we require only the nouns from the sentence to check for food related inputs. Thus, we take those keywords and match them with our menu items.

To handle items that may be mispronounced we are using a library that facilitates Levenshtein distance to calculate the similarity measure of the input string. This function returns the numeric value representing the distance between them, and thus, returns the item from the menu with the highest match.

This module presents some major advantages. One of them is that using this model, we do not have to worry about the language barrier. Since the name of the menu items do not change, the module serves its purpose by smartly analyzing the sentence, and extracting only the food items, ignoring the unnecessary bits. After testing with varieties of inputs we found out that even if the user talks to it in broken English or even a different language (we tested in Kannada and Hindi languages), with the help of this module, the system was handling it quite flawlessly.

C. Speech Recognition Module

The main functions of this module are to get audio input, handle background noise, if any, convert the speech to text, and convert text to speech to output the response to the user. We create a Recognizer instance of the SpeechRecognition module and pass an audio file. Then the API returns the recognized words in a string form. We have set the input language as English Indian (en-IN) so that it can recognize and support Indian accents.

The highlight of this module is the background noise handling function. The SpeechRecognition library has an inbuilt method adjust_for_ambient_noise() for adjusting to background noises before reading the input efficiently. This method was a disadvantage in our case since it required an interval of time to be set for adjusting before listening for user input.

To avoid this additional time loss, we built a function that directly handles the background noise and isolates it, thus separating the user input. Here, we sample the audio in the frequency domain instead of time domain. By default, we have set the sampling of audio at a rate of 44100 Hz. The function reads the microphone input for a certain duration, and takes the samples at fixed intervals or frames. The frame value is calculated by multiplying the duration and the frequency rate.

The result is a NumPy array containing audio signals with background noises isolated, thus bringing forward the user's voice input. This is similar to how a human hears during a conversation in a noisy environment. This audio data is then written into a WAV file and passed to the SpeechRecognition instance, whose result is later passed to the Keyword Extraction or Smart Reply model as required. This was tested with varieties of noisy simulations and the results obtained were convincing and easily fit for any restaurant environment.

D. Ordering Functions

In the next module we have a set of ordering functions, which as the name suggests, performs various tasks to achieve a

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	Left Hand Side(Antecedents)	Right Hand Side(Consequents)	Support	Confidence	Lift
5	Mustard	Chicken Nuggets	0.086538	0.900000	3.820408
9	French Fries	Tomato ketchup	0.235577	0.844828	3.029727
3	Chicken Burger	French Fries	0.072115	0.789474	2.831216
2	Cheesy dip	Nachos	0.096154	0.740741	3.950617
4	Mozzarella Pizza	Chicken Nuggets	0.091346	0.655172	2.781140
6	Coke	French Fries	0.139423	0.644444	2.311111

Fig. 5 Table of some sample Association Rules sorted by Confidence in descending order

common goal of handling orders and suggestions. These functions are a bunch of conditional statements and are called based on the returns of the other modules.

We have a place_order function that takes in the sentence or string and extracts keywords from it. Then it checks to see if that particular item exists in the menu. If it does, we add it to the order, otherwise, it checks with the next keyword or returns as required. Along with this, in the UI, it asks for any customizations required by the user. It simply takes the input and directly places this note with the respective order. This later adds the order placed to the order queue on the chef side UI. Then we have a show_order function which simply returns the items that have been stored for ordering or that have been ordered, along with the total cost, in a user understandable form. Then we have a remove_order function which first checks if that particular item already exists in the order list. If it is present, that item is removed and the order is returned, otherwise, it gives a corresponding response.

Additionally we have a show_menu function which presents the menu, particular items of the menu, a section, or a category of foods on the menu, to the user, along with their respective costs. Finally, we have a recommend_item function which works based on the Recommendation Module (which is explained next). It basically takes an item as input, and returns another item that is a popular choice with the former item, only if that other item is not ordered already.

E. Recommendation Module

In today's age, customers sometimes expect the restaurant manager or waiter to tell them what they might want to order. This can become an interesting threat or opportunity situation to the restaurant. If we can tell the customers what they might want to order, it not only improves the restaurant promotion and publicity, but also the customer experience and ultimately life time value. On the other hand, if you are unable to suggest an order, the customer might not want to visit the restaurant again. To address this scenario, we have built a recommendation module using the Apriori algorithm.

This is done by a way in which we find associations between items. As mentioned earlier in this paper, we have created a dataset of order history. Based on the dataset, we can see associations, such as, IF Mozzarella Pizza is ordered THEN Nuggets is commonly ordered along with it. This can be given as:

{Mozzarella Pizza} => {Nuggets}

Similarly, given that Mozzarella Pizza and Nuggets are ordered, then Coke is a popular choice with these:

{Mozzarella Pizza, Nuggets} => {Coke}

Thus, with a given Left Hand Side, we look for a suitable Right Hand Side.

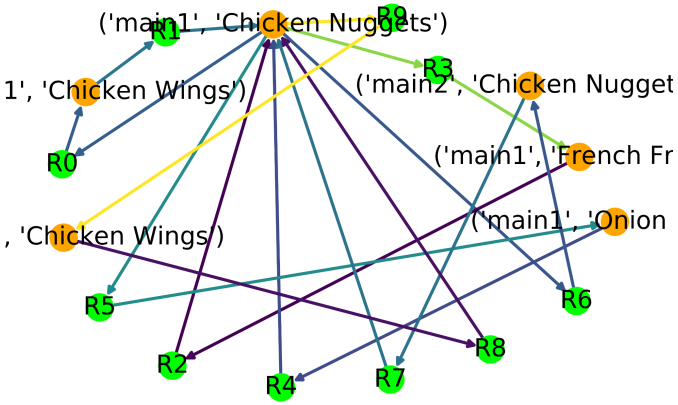

Fig. 6 Directed Graph based on the rules above.
Incoming edges represent antecedents(LHS) and arrows are next nodes.

We first read the order history dataset and append it to a basket variable. This basket is then passed as a parameter into the Apriori API along with the support, confidence and lift parameters. Based on our dataset, we have set the minimum support to 0.05, minimum confidence to 0.4, and a lift of 2. The lift value tells us how much better a rule is at predicting something, rather than randomly guessing.

These help the customer to get a popular choice or even a combination of the order. We also have an append_order function that simply appends new orders into the dataset. It appends the order only after the order items are confirmed, sent to the chef and billed. This helps the module in updating to the latest trends and preferences of the customers, without any additional effort. Thus, with this module we reduce the customer's efforts of decision and ordering items.

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```
Hi! I am your waiter, start talking with me (say checkout to stop)!
hello
Hi there, how can I help?
show me Pizza menu
Pizzas menu
Farmhouse Pizza costs 107.82
Mozzarella Pizza costs 118.5
Tomato basil Pizza costs 102.02
Pepperoni Pizza costs 97.36
ready to order ? Tell me whenever you are ready !
I am ready to order
I see you are ready to order
Say I want to order, followed by the item, say quit when done!
I want to order Mozzarella pizza
Do you want me to add Mozzarella Pizza to your order ?
yes go ahead
Added Mozzarella Pizza
Chicken Nuggets is popular choice with Mozzarella Pizza
Please, Consider ordering it
that would be all I am done ordering
Your order is Mozzarella Pizza and the total amount would be 118.5 Rupees
let me know if i can do anything else ?
Exception:
didn't get that can you rephrase that for me ?
check out
See you later then !
```

Fig. 7 A Sample Conversation with the Virtual Waiter

V. Future Enhancements

As explained earlier, due to lack of resources and datasets related to our proposed project, we had to make our own datasets, within a limited time. Due to this, our datasets were not populated enough. In the future, when there is availability of cleaner resources, our work can be improved and optimised even more.

After consulting a couple of restaurant owners in and near our college, we found that the customer choices slightly vary according to seasons. For example, it was observed that people preferred juices and coke more during the summer and spring, compared to other seasons. We also need to consider seasonal ingredients of food items. Thus, with a cleaner and well populated dataset, we can extract certain sections of the dataset accordingly and pass that to our recommendation module to further improve its performance, without any requirement of external APIs. This acts as a makeshift seasonal specials recommender. We can also improve upon the recommender by upgrading it to handle choices with lesser probabilities in some manner.

Furthermore, the customer side can be redesigned into a profile-based system, so that regular customers can order their usuals without much effort. It can also be upgraded to give an estimate of preparation time based on the other orders in the queue. Finally, we hope to redesign the project by developing our own modules and avoiding using prebuilt librariaries so that they can be made more flexible according to our requirements.

VI. Conclusions

Our work aims to build a system that takes on the responsibilities and functionality of a waiter in a restaurant, through the use of machine learning models. This project's findings demonstrate that this inexpensive approach minimizes the wait time before placing an order, reduces the effort to decide order items, and ensures accuracy of the information entered regarding a particular order with the customer bearing the sole responsibility in case of mis-information. The system's workflow is well organized on both the customer as well as the chef's end of the restaurant.

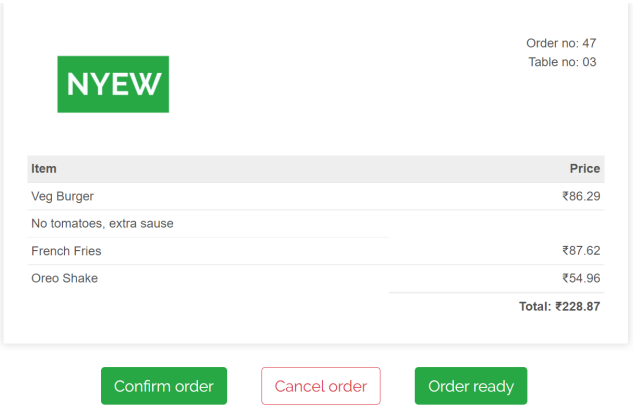

Fig. 8 A Snapshot of the Kitchen Side delivery

Acknowledgment

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ISBN: 979-85-27243-61-1 199

TapShip – Tap to Ship

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***Abstract*—The Agriculture is the backbone of economy and one of the most important sectors of our country. We studied prevailing agricultural marketing system in India and identified the problems and inefficiencies. The propose system transform the government APMC's market into an electronic marketplace (exchange) called e-mandi for agriculture produce. An important function of the electronic exchange is to match the supply of the farmer's produce with the demand from the wholesalers and retailers. Every year, news headlines are filled with suicides of farmers because they are been conned in the market by middlemen, and they also face a lot of difficulty in transferring their goods like crop, fertilizers, seeds etc. from one location to others. So, to save the precious lives of our farmers, we need an effective platform, from where they can get right price of their produce and easy way to transport their shipment. Solution to this extreme problem, we introduce our Project called 'TapShip'. The main actors of this system are farmers, customers, drivers, kiosk centers and admin. Crops added by the farmer is open for sale where customer can bid to get the crop at its best price. The role of middlemen has been eliminated to benefit both the farmers and customers directly. Driver also gets the ample opportunity of employment, directly connecting with our portal. Every aspect of farmers, customers and drivers is considered to ensure them the best price without affecting anyone.**

Keywords—farmers, e-market, transportation, agriculture, APMC, e-mandi

I. Introduction

India is a land of agriculture. The backbone of Indian economy is agriculture which contributes nearly 17% to the total GDP and generate employment for 60% of the population. The condition of farmers across India is alarming, nearly 80% of the Indian farmers are either marginal or small farmers category. Every year, there are thousands of reports of Indian farmer suicides from different parts of the country. We have come up with the solution to overcome various issues and inefficiencies in present agriculture marketing system in India. The farmers must be provided with adequate choices to sell their produce without any barriers at attractive prices across India. Presently APMC (Agriculture Produce Marketing Committee) in each state across India is looking after sale or purchase of agriculture produce. The APMC was introduced with the motive of safeguarding farmer's right and prevent their exploitation by intermediaries. With the passage of time this system becomes inefficient because of traders monopoly and excessive commission and charges levied on farmers.

These all factors motivated us to create a web application which help the farmers to become independent while selling their crops in agriculture market. We tried best to incorporate trending technologies to get customers direct deals from farmers at an attractive price and a reliable transport service along with user friendly platform. And also developed a solution for drivers to get them deals in seamless period of time along with easy payment service.

II. Related Work

There have been few progresses in the field of Agriculture Market like developing the transporting and tracking management systems with the help of some advanced algorithms and programming scripts, but till date, there is no efficient effort has been made in this area to solve the problems especially, farmers are the one who is struggling the most. Hence, there is a strong requirement for a one-stop solution for the problems existing in Agriculture Market [1].

There are many problems that farmers face during the transportation of their crops. Like, not getting the proper price or getting conned in the agriculture market, no proper communication between the transport delivery person and the farmer, etc. [2]. One more big challenge for farmers is that to get a good profit for the efforts and investment that they had put in. We know that it is not feasible to reach all customers physically for farmers as the whole process consumes too much time and effort wherein our farmers have a limited amount of time.

There are some variations of India's Agriculture Market that concern farmers' choice of market channels and producer prices [3]. Some of those variations are mentioned as below:

- Indian agriculture is dominated by smallholders, primarily engaged in subsistence manufacturing.
- The Farmer-trader relations are often based on mutual trust, and generally involve tied transactions involving credit, input, and output markets.
- India's agricultural price policy provides for the procurement of some products at which the central government set minimum support prices (MSP); which is deliberately done to create incentives for farmers [3].

We will further discuss the possible solutions in this paper which can be brought into existence to eliminate the problems

and the variations which currently exist in the Indian Agriculture market.

III. Objectives

Objective of this project is to develop an electronic marketplace for agriculture produce, where farmers have freedom to sell their crop anywhere in India. The following objectives were addressed in this project:

- To develop a platform where farmers can get the right price of their crop and earn better profitability. This will enhance the rural development and agriculture practice.
- To develop an infrastructure where customer and driver directly communicate over transportation requirements.
- To develop opportunity to all truck drivers by offering work for all available shipments.
- To make easy payment and more secure transport service.

IV. Case Studies

To get a better understanding of the problem faced by the user, we directly went to some farmers and a few of transport agencies.

We asked few basic questions and found some grass root level problem faced by them.

A. Inputs from farmer

Here are few points as the conclusion which our team received by talking directly to farmers.

- The problem arises during crop harvesting. All of the sudden prices of that crop drop steeply due to excess availability in that region.
- Even if the farmer get the transportation facility, they don't know where to sell those crops and where to transport to get better profitability.
- The digital platform is difficult for them to access. Majority of the farmers are illiterate and these digital platforms are very complex and not user friendly.

B. Inputs From Transport Agency

Here are few points as the conclusion which our team received by talking directly to truck drivers.

- The reason behind high transportation charge at far distance is unavailability of return shipment.
- Transport agency do not have contact at each and every place throughout the country for return shipment.
- They don't know when return shipment will come in advance, so they charge up and down cost together.

The problem with app or web interface which takes care of availability of shipment problem.

- There are so many truck drivers who are illiterate.
- Those who are literate also they are not that tech friendly so it will be difficult to adopt that technology among truck drivers.

Different types of things which is shipped and some of the different factors took into consideration.

- If fruits are transported, then temperature, humidity, time of transport is few factors which needs to be taken care of strictly otherwise the fruits will get destroyed.
- If furniture is transported then it will require some spacing between them and to tie properly.
- If animals are transported then arrangement of their food and water should be made.
- If rainy season is there then proper covering of trucks need to be done.
- These are few factors which are responsible for cost of transportation.

C. Our observation

Few years ago farmers were throwing the onion on roads because they were not even getting cost of production, on the other hand we at different place buying onion at INR 40 per kg. If there is a proper transportation and distribution across India, then both the farmer and consumer would have benefitted.

This is not only about the onion but there are many things in which both side farmer and consumer will be benefited.

V. Methodology

In this project, we are using different technologies in order to make our platform secure with a good user experience. The technologies and hardware requirement are described in different sections.

A. Technologies

Here we are using several technologies which are listed as follows

1) CyberSecurity: We have worked on many factors to protect our platform from cyber attack.

a) SQL injection protection: SQL injection is one of the most famous attack where malicioius code is inserted or injected in the database and the attacker can run any SQL command like insert/update/delete. To prevent this attack we converted each and every input to string so, that no one can inject SQL code and hack our platform [4].

b) URL Encoding: We have changed the URL of the crops and all other things which possibly could be accessed by anyone by directly hampering to the URL. Fig. 1 shows no user will know the exact path and no one can perform any type of code injection attack in the address bar [5].

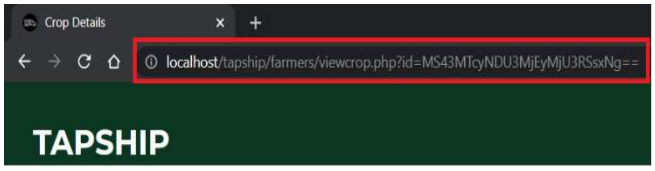

Fig. 1. URL Encoded

c) Two Step Verification: we have implemented two step verification via OTP(one time password) which is very necessary in order to re-verify the person who is attempting login. The basic flow of working is shown in Fig. 2

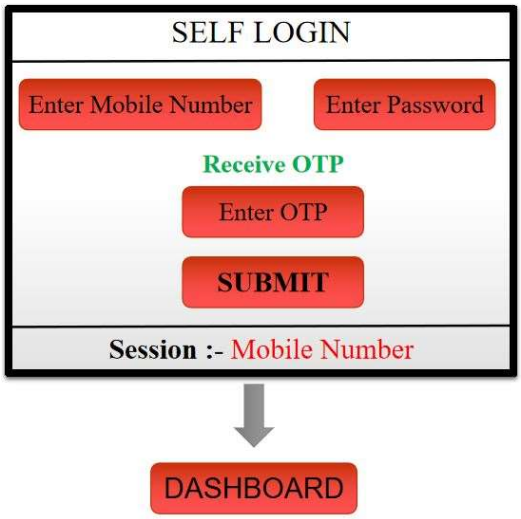

Fig. 2. OTP System

2) Machine Learning: We have used ML by running various python scripts on server side and displayed the output to client in the form of web/app interface.

a) Recommendation of crops to the customer: We are recommending the crops based on the location of the customer which is based on the pincode which we took at the time of registration. After that we are sending it to the database and then lastly we are processing it by a python script and applying ML algorithm and then customer will get the better recomendetion.

b) Recommendation of shipment to the Truck driver: Depending on the location of the truck driver our system will automatically recommend the shipment which is nearby to the driver. This will be done by fetching the live location of driver and sending all that data to our database. Our ML system will process the data and gives us the optimum result.

B. *Hardware requirement*

It has 2 type of hardware requirement.

1) Server side: Any working shared linux server will be sufficient with python with some libraries installed, the name of these libraries are pymysql, sqlalchemy, pandas, requests, matplotlib, numpy, tz, datetime.

2) Client side: Any working device with web browser and internet connection with speed of 512kbps.

VI. System Design And Implementation

The application is designed in a way to help the farmers to become independent while selling their crops in agriculture market. It is ensured that the customer gets direct deals from farmers with reliable transport service. This system ensures that truck driver gets right deals in seamless period of time along with easy payment service.

A. *System Administrator*

System Administrator plays a vital role in administration, management and support activities as shown in Fig. 3. The system admin can manage users such as Farmer, Customer, and Driver. Admin has the responsibility of verifying the details of farmers, customers and drivers. If details of any user found suspicious, missing or invalid, then admin has the rights to ask for reverification of input details. Admin can add users under Panchayat KIOSK center. The purpose of integrating Panchayat KIOSK center to serve the needy framer. All the farmers won't have access to network and mobile resources, although our system is user friendly, illiteracy and lack of awareness becomes the major hurdle.

Fig. 3. Admin Dashboard

The deployed employee in panchayat KIOSK center will login on behalf of farmer, using farmers unique-id and password. Farmer will receive OTP on to his/her mobile number to ensure that, it is the farmer who is doing all these transactions. The two-factor authentication has been incorporated to avoid frauds. The admin under crop and activities, manages the MSP of each crop sold on to this platform. The MSP is calculated as cost of production + 50% of total cost of production, that results in 1.5 times of total cost of production. Admins can see queries raised by farmers, customers and drivers and help them by providing advice and solutions from experts.

B. *Farmer*

Farmer is the main actor of this system. This system is designed in such a way that distress farmer can get the real price of the crop and get the maximum benefit out of it. At first, a farmer has to register themselves on our portal by providing required credentials. Upon successful registration, they can access dashboard and other feature through farmer login page. The user has to pass two-factor authentication while logging in, to ensure the user's account security. Once the user logs in to his/her account successfully, they might see the message showing account verification is pending. Initially all new users will be unverified, system administrator takes few hours to verify the details given by new user. Once the verification is granted, the new user is set to access all the feature of dashboard as shown in Fig. 4

A farmer can use the add crop feature to put their crops for sale. While adding crop they have to input few details like, category of crop, name of the crop, quantity, MEP (Minimum Expected Price) of crop, and 3 clear images of the same crop. Once the crop has been added successfully, it will come under active crop section and is ready for bidding. Multiple customer can place bid for the same crop, it is the farmer who decides, which bid to be accepted or not. Once the farmer has confirmed the active bid, then that crop is set as inactive or sold and will not be available for further bidding. Since the crop is already sold, all existing bid of other customers will be rejected.

Farmers can also access the MEP tracking facility, under which variations in MEP over a period of time for different crop can be seen. This feature is helpful for the farmer while adding the crop for sale, as they can track the prices of various

crops to get the maximum benefit. Help Zone facility where farmer's queries and problems are listened and sorted out by our experts. Say if farmer is not able to use or access our portal, they can ask for help and experts will provide the details of the nearest panchayat KIOSK center.

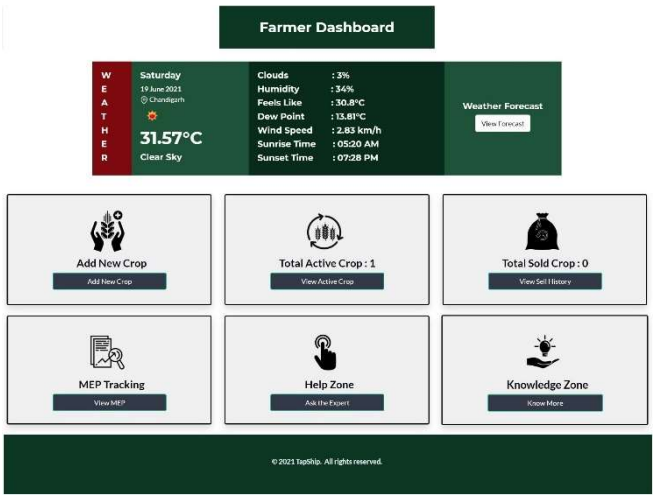

Fig. 4. Farmer Dashboard

Farmer is the biggest fighter, who can survive in any situation. However, he can't fight weather, he can take preventive measures and precaution to minimize crop losses. One way of ensuring good yield of crop is accurate weather forecasts. We are providing one week forecast with real-time weather condition like air and dew temperature, precipitation, and humidity to protect crops and secure a high and healthy yields.

C. Customer

In agriculture market there are long chain of undesirable malpractices indulge by middlemen. The farmers produce passes through intermediaries before it finally reaches to consumer. In the whole process the price of the produce increases at each stage, this finally create a burden on the consumer.

It's not only the price, but also the use of false weights, adulteration, and black marketing has motivated us to connect farmers and customer directly. At first customer has to register on our portal and after successful registration, they can access the features of dashboard shown in Fig. 5

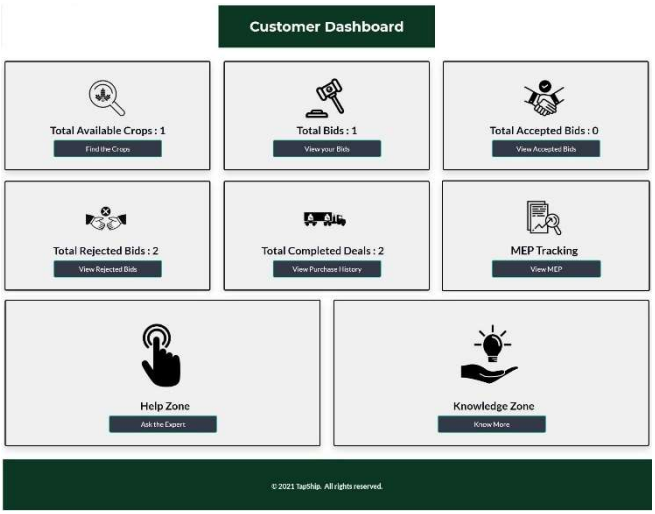

Fig. 5. Customer Dashboard

Customer has the feature to see available crops filtered based on their location. They can see all the details of crops such as price, location, details about the farmer who is selling etc. If the customer like the deal they can place the bid amount which must be greater than or equal to the price set by the farmer. If the farmer accepts that deal, next customer will be asked to do the necessary payments. Once the payment confirmation is received from the farmer, customer has option to choose TapShip delivery or Self-transportation. TapShip delivery mechanism will be explained in the next section. If the customer selects self-transport service, then he/she has to provide complete information about driver and vehicle to the farmer prior to shipment. This process is important to ensure the end-to-end safe delivery of products. Once the shipment reached to customer, they will confirm and close this deal. Customer has been provided with MEP tracking facility, so that they can keep eye on price variation of crops. They also have access to help zone as well as knowledge zone to make their experience better every day.

D. Driver

Over the year, India's transport system and transport strategy has helped in the growth of economy. But the advancement in the schemes and infrastructure development isn't good enough, it lacks implementation at the grass root level. TapShip platform gives ample opportunity to truck drivers with good pricing. They have to register themselves with required credentials on our portal. Upon successful registration and verification checkup, they can access driver portal to get the shipment deals as shown in Fig. 6

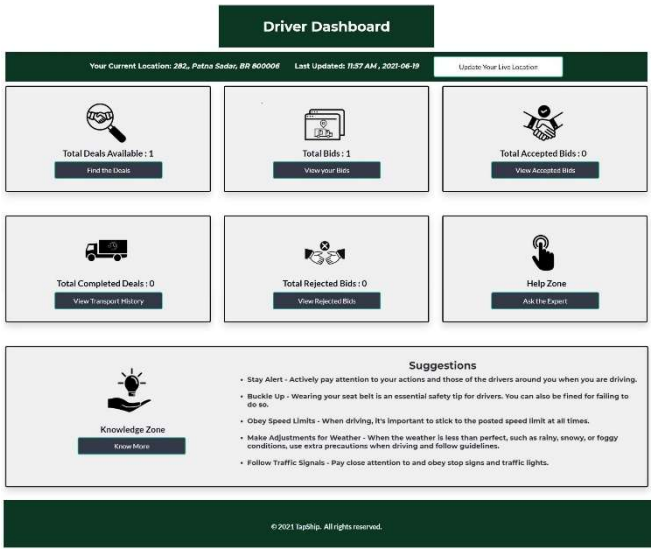

Fig. 6. Driver Dashboard

The TapShip delivery chosen by customer will be open for bidding to all the nearby drivers. Driver can get the details of shipment in find deal section. Shipment is suggested to driver based on their live location and address pincode. Using Bing API we fetch the live location i.e., latitude and longitude of driver, required attribute from this location is fetched and passed to the python script to find the nearest deals. The different shipment on to the driver portal is sorted based on the distance between the shipment source and destination.

If the driver is interested in any of the deals, he /she will place the bid amount for shipment. If the customer who

requested TapShip delivery accepts that bid amount, then that shipment is set as inactive or sold and will not be available for further bidding. Since the deal is already closed between customer and driver, all existing bid of other driver will be rejected. The driver will get the complete details of crop, farmer and customer. The driver picks up the shipment from farmer location and deliver it to customer delivery address. The live location of driver can be seen by customer as well as farmer to keep track of shipment delivery status. Driver will update the confirmation on to the portal of the final delivery. The driver will get the cash payment on delivery as per the bidding amount. Drivers has the access to help zone, where they can get the solution for their query. Knowledge zone provides better understanding of the platform and provides tips and suggestion for safe driving.

VII. Results

Farmers play a vital role in the development of a country. They are the reason behind agriculture being the backbone of the Indian economy. Hence, if there is any snag appeared which disbalances the lives of farmers, it's our responsibility to solve such issues. For a long period of time, farmers are facing the issue of selling and transporting their crops at a good price but they get usually conned in the agriculture market. Hence, we came up with an idea to form a platform – "Tapship" which is developed with a motive to connect farmers, customers, and drivers in one place.

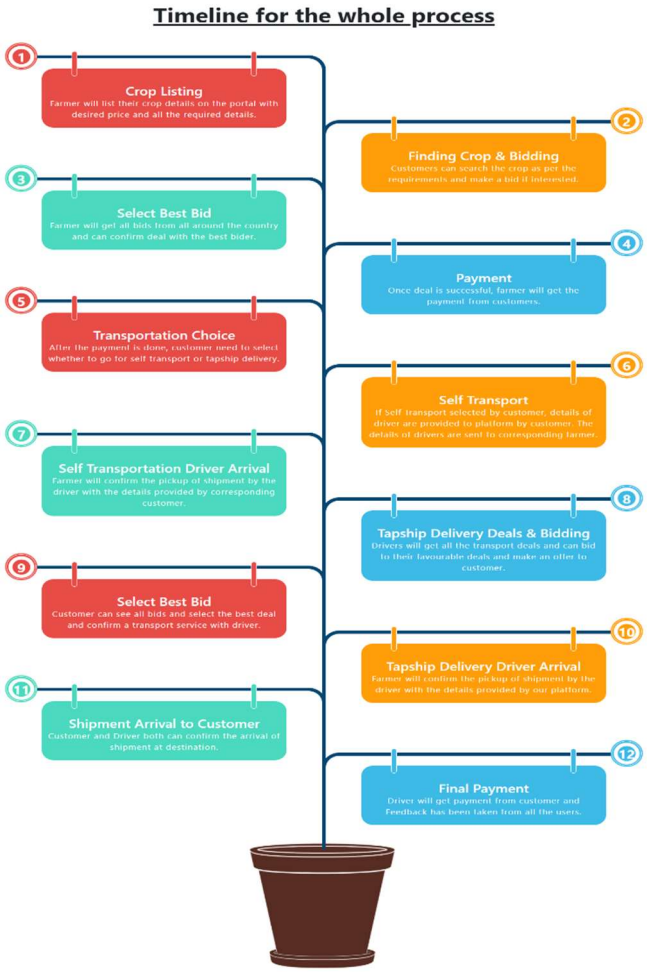

Fig. 7. Project Timeline

Fig. 7 shows the timeline for our whole process. The timeline represents the steps of events that occur in the order shown in the Fig. 7, starting from the crop listing via the farmers and gradually moving to customers, where they select their favorable crops and bidding for the same. While the farmers select the best bid and confirm the deal. Customers, further make the payment and choose the type of transportation. At last, confirmation from all three users that the shipment transportation and final payment are completed.

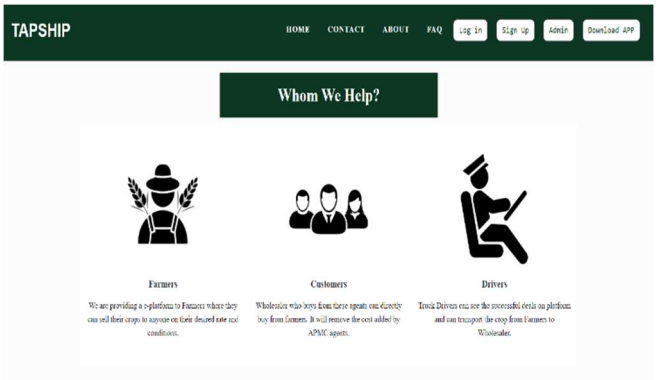

Fig. 8. Home Page

Fig. 8 shows the first page of our application. Here, the user who visits our website can go for signup and register themselves, if the user has visited our website for the first time. If the user already has an account, he/she can log in and start using our platform. Farmers, Customers, and Drivers being the main actors of our platform have a different set of operations available on their individual dashboard. FAQ section include frequent questions at one place for visitors to get the necessary solutions.

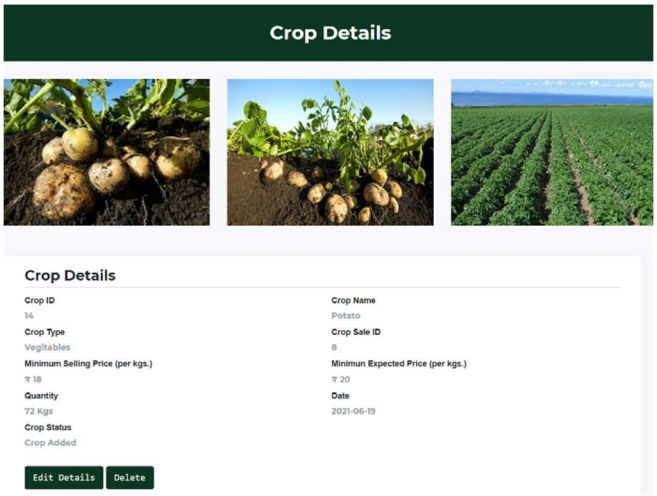

Fig. 9. Crop Details

The above Fig. 9 from farmer login shows all the details of the crops like crop id, name, quantity, selling status, etc. Farmer has the options to edit/update the details and delete the crop until no customer has placed the bidding. If any customer places a bid on that crop, the edit/delete option disappears.

Fig. 10 shows MEP tracking facility provided to both farmer and customer, to track the variations in prices over a period of time for different crop. This feature is helpful for the farmer while adding the crop for sale, as they can keep eye on prices of various crops to get the maximum benefit.

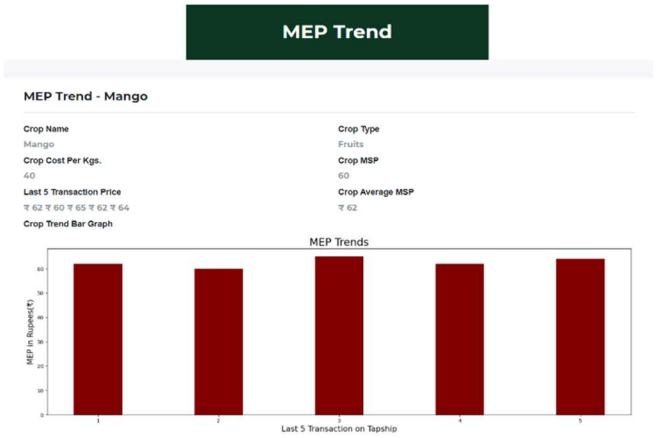

Fig. 10. MEP Analytics

Fig. 11 shows recommendation of shipment to driver is based on their live location and address pincode. Using Bing API, live location is fetched i.e., latitude and longitude of driver. Required attributes from this location is send to run python script in the backend to get the optimum result. The shipment is listed based on the shortest distance between source and destination.

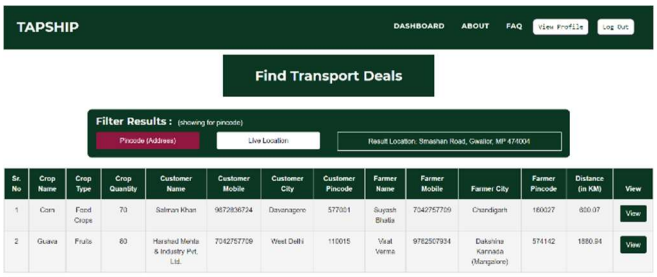

Fig. 11. Shipment filtered by location

CONCLUSION

We have successfully developed a web application integrated with security features like two-factor authentication, URL encoding and SQL Injection Protection. Our web application – "Tapship" has been proven to be an effective and efficient platform that solve all objectives and problem statements that we considered at the initial phase. Tapship is a platform that gives an opportunity to farmers to set the minimum price of crop as well as it also gives equal opportunities to customers including APMCs, government agencies, etc., to decide the best shipment price and connect all the available truck drivers with customers. It also provides Weather Forecast to farmers which will help farmers to take some critical decisions. On the other hand, our platform gives equal opportunity to customers to bid their own price to their favorable crop and complete the shipment with complete tracking of the shipment. Our platform also provides deals to the drivers associated with us according to their origin location as well as to their current location. It also provides a helping hand to all the farmers who are not literate enough to understand our platform. Our platform provides a facility of KIOSK Center to such farmers. In the future, some additional features can be added to improve the platform. We are looking forward to adding a crop prediction model which will help farmers to decide the crop depending upon the weather conditions and other factors. We are also looking forward to adding a chatbot to our application that can take up queries of any user and give them assured reply which might solve their queries.

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A Survey on Application of Deep Learning: Unsupervised Auto Encoder

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***Abstract* – Deep Learning is playing an increasingly important role in our lives. Deep learning is not a restricted learning approach, but it abides various procedures and topographies which can be applied to an immense speculum of complicated problems. Deep learning methods have made a significant break-through with appreciable performance in a wide variety of applications with useful security tools. It is considered to be the best choice for discovering complex architecture in high-dimensional data by employing back propagation algorithm. Deep learning has already made a huge impact in areas, such as cancer diagnosis, precision medicine, self-driving cars, predictive forecasting, biological image classification, speech recognition, smart city and many more. This paper mainly focuses on the working of unsupervised autoencoders and its applications.**

***Key Words*:** Deep Learning, back propagation, unsupervised learning, autoencoders,

I. INTRODUCTION

Machine learning is a subsection of Artificial Intelligence that imparts the system, the benefits to automatically learn from the concepts and knowledge without being explicitly programmed. Neural Network is a machine learning technique that is inspired by and resembles the human nervous system and the structure of the brain. It consists of processing units organized in input, hidden and output layers. The nodes or units in each layer are connected to nodes in adjacent layers. Each connection has a weight value. The inputs are multiplied by the respective weights and summed at each unit. The sum then undergoes a transformation based on the activation function, which is in most cases is a sigmoid function, tan hyperbolic or rectified linear unit (ReLU).The implementation of neural networks consists of the following steps:

1. Acquire training and testing data set
2. Train the network
3. Make prediction with test data

Deep learning technology works on the Artificial Neural Network system (ANNs). These ANNs constantly take learning algorithms and by continuously increasing the amounts of data, the efficiency of training processes can be improved. Deep learning is also known as deep structured learning and hierarchical learning that consists of multiple layers which includes nonlinear processing units for the purpose of conversion and feature extraction.

In the Deep learning methodology, the term "Deep" enumerates the concept of numerous layers through which the data is transformed. It must be noted that there is a difference between Deep learning and Representational learning. Representational learning includes the set of methods that helps the machine to take the raw data as input and determines the representations for the detection and classification purpose.

Figure 1 depicts the differences between the Machine learning and Deep learning.

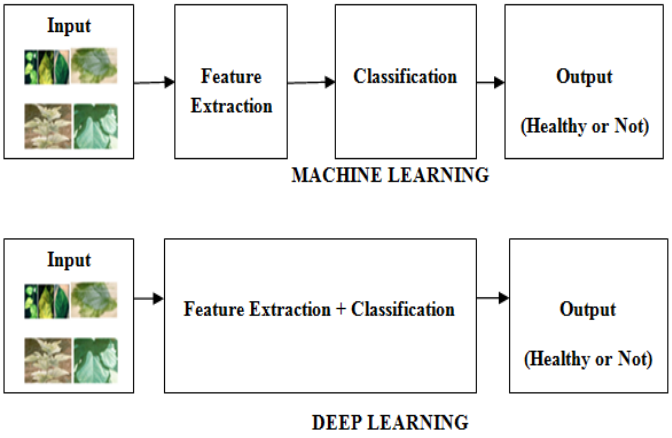


Figure 1: Difference between Machine Learning and Deep Learning

Deep learning techniques use nonlinear transformations and model abstractions at a high level in large databases. It also describes that a machine transforms its internal attributes, which are required to enumerate the descriptions in each layer, by accepting the abstractions and representations from the previous layer.

Deep learning paradigm uses a massive ground truth designated data to find the unique features, combinations of features and then constructs an integrated feature extraction and classification model to figure out a variety of applications. The meaningful characteristic of deep learning is the data that uses general purpose methods, various extensive features and no intervention of human engineers.

The key factors on which Deep learning methodology is based are:

- Nonlinear processing in multiple layers or Stages.
- Supervised or Unsupervised learning.

Nonlinear processing in multiple layers to a hierarchical method in which the present layer accepts the results from the previous layer and passes its output as input to the next layer. Hierarchy is established among layers so as to organize the importance of the data. Here Supervised and Unsupervised learning are linked to the class target label. Its availability means a supervised system and absence indicates an unsupervised system.

The structure of this paper is organized as follows: Section II is about the Basic Architectures of Deep Neural Network (DNN). Section III provides detailed explanation about the working of unsupervised autoencoders architecture.Section IV provides advantages and applications of Unsupervised autoencoders and finally Section V is the conclusion of this paper.

II. Basic Architectures of Deep Neural Network (DNN)

Different names for deep learning architectures embrace deep belief networks, recurrent neural networks and deep neural networks. DNN can be constructed by adding multiple layers which are hidden layers in between the input layers and the output layers of Artificial Neural Network with various topologies. The deep neural network can model convoluted and non-linear relationships and generates models in which the object is treated as a layered configuration of primitives. These are such feed forward networks which have no looping and the flow of data is from the input layer to the output layer. There are wide varieties of architectures and algorithms that are helpful in implementing the concept of deep learning. Table 1 depicts the year wise distribution in the architecture of Deep Learning.

Year	Architecture of Deep Learning
1990 - 1995	Recurrent Neural Network (RNN)
1995 - 2000	Long Short Term Memory (LSTM), Convolutional Neural Network (CNN)
2000 - 2005	Long Short Term Memory (LSTM), Convolutional Neural Network (CNN)
2005 - 2010	Deep Belief Network (DNN)
2010 - 2017	Deep Stacked Network (DSN), Gated Recurrent Unit (GRU)

Table 1: Years with usage of Architectures of Deep Learning

There are six basic types of Deep Learning Architectures are there such as

1. Auto Encoder (AE)
2. Convolutional Neural Network (CNN)
3. Restricted Boltzmann Machine (RBM)
4. Deep Stacked Network (DSN)
5. Long Short Term Memory (LSTM)/Gated Recurrent Unit (GRU) Network
6. Recurrent Neural Network (RNN)

III. AUTO ENCODER

Auto encoder is a neural network that uses unsupervised algorithm and learns the representation in the input data set for dimensionality reduction and to recreate the original data set. The learning algorithm is based on the implementation of the backpropagation.

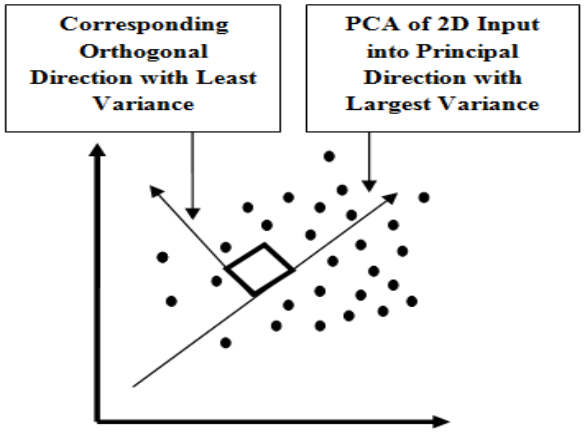


Figure 2: Linear representation of a 2D data input using PCA

Auto encoders extend the idea of principal component analysis (PCA). As shown in Figure 2, a PCA transforms multi-dimensional data into a linear representation. Figure 2 demonstrates how a 2D input data can be reduced to a linear vector using PCA. Auto encoders on the other hand can go further and produce nonlinear representation. PCA determines a set of linear variables in the directions with largest variance. The p dimensional input data points are represented as m orthogonal directions, such that $m \leq p$ and constitutes a lower (i.e., less than m) dimensional space. The original data points are projected into the principal directions thus omitting information in the corresponding orthogonal directions. PCA focuses more on the variances rather than covariances and correlations and it looks for the linear function with the most variance. The goal is to determine the direction with the least mean square error, which would then have the least reconstruction error.

Auto encoders use encoder and decoder blocks of non-linear hidden layers to generalize PCA to perform dimensionality reduction and eventual reconstruction of the original data. It uses greedy layer by layer unsupervised pretraining and fin-tuning with backpropagation. Despite using backpropagation, which is mostly used in supervised training, auto encoders are considered unsupervised DNN because they regenerate the input $x^{(i)}$ itself instead of a different set of target values $y^{(i)}$, i.e., $y^{(i)} = x^{(i)}$.

While performing dimensionality reduction, auto encoders come up with interesting representations of the input vector in the hidden layer. This is often attributed to the smaller number of nodes in the hidden layer or every second layer of the two layer blocks. But even if there are higher number of nodes in the hidden layer, a sparsity constraint can be enforced on the hidden units to retain interesting lower dimension representations of the inputs. To achieve sparsity, some nodes are restricted from firing, i.e., the output is set to a value close to zero.

Figure 3 illustrates a simplified representation of how auto encoders can reduce the dimension of the input data and learn to recreate it in the output layer.

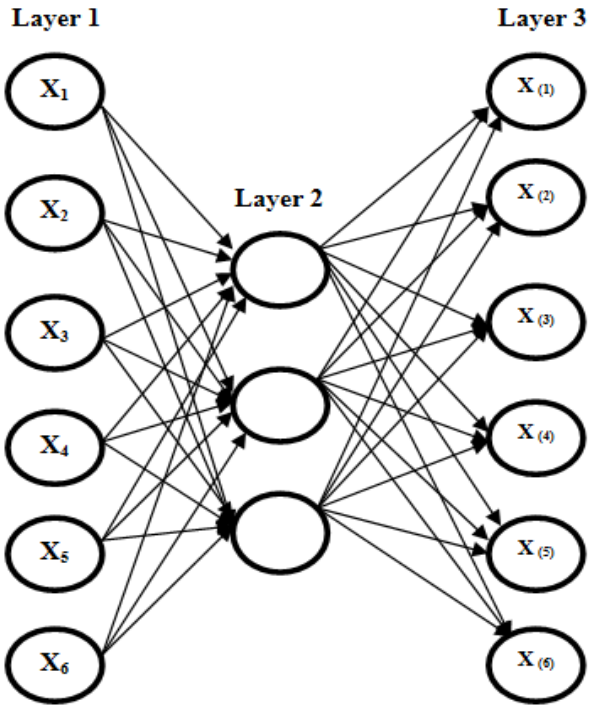


Figure 3: Auto Encoder Nodes

A. MULITIPLICATIVE AUTO ENCODER

Multiplicative Auto encoder based Feature Selection (MAFS) uses a multiplicative aggregation function of input features to obtain the net input for neurons in hidden layer. The multiplicative aggregation function incorporates correlation between input features. The contribution of features, which are highly correlated with other features, is reduced by the multiplicative aggregation function. Hence the redundancy in selected features set is removed.

Overtraining is prevented in an Auto encoder by randomly assigning zero value to some input features during each iteration, which is termed as masking. Dropout is another probabilistic regularization method which is used to prevent the network from overtraining.

MAFS obtains the value of reconstruction error while training the auto encoder by masking the features randomly in such a way that same feature is never masked in two consecutive iterations. Two types of reconstruction error are obtained, first when the feature is present in the input and in second case the corresponding feature is masked. Relevance of a feature is estimated by its ability to reconstruct the original dataset and redundancy is determined by reconstruction error of original dataset when the feature is masked. Feature significance is obtained during each iteration based on its relevance and redundancy. Feature weight is updated by using moving average value of feature significance. Training is terminated, when percentage change in every feature weigh is less than certain threshold.

The Auto encoder consists of an input layer, a hidden layer and an output layer. The input and hidden layers have same number of neurons. The output layer consists of neurons corresponding to features in the data. Data is normalized by mapping the features to the range [0, 1].

There are two types of weights for input to hidden layer connections, denoted by U and V. U_j represents the weight from j^{th} input neuron to corresponding j^{th} hidden neuron and V_{ij} denotes the weight from i^{th} input neurons to j^{th} hidden neuron where $i \neq j$. The weight W_{jr} represents weight connection from j^{th} hidden neuron to r^{th} output neuron. Bias to j^{th} hidden neuron is denoted by bh_j and c_r denotes bias to r^{th} output neuron. A multiplicative auto encoder is shown in Figure 4.

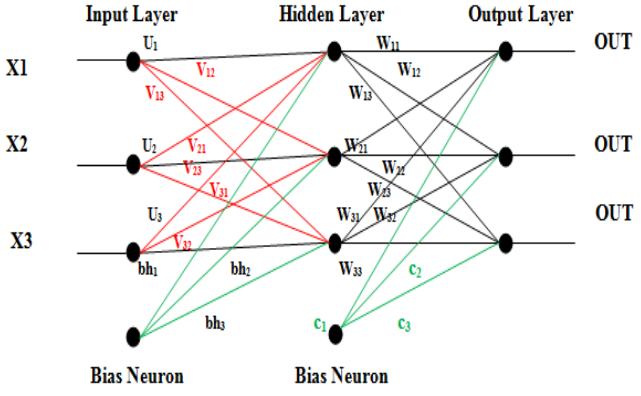


Figure 4: Multiplicative Auto encoder

Multiplicative auto encoder is used to assign feature weights based on reconstruction error. The method uses reconstruction error for two cases, first when certain feature is present in the input and second, when the feature is masked from the input. When a feature is masked, the obtained reconstruction error denotes the relevance of the feature. For relevant features, reconstruction error increases significantly when the feature is masked in the input as compared to the case when the feature is present. For insignificant features, the change in reconstruction error is insignificant for both the cases. Feature significance (FS) is obtained using reconstruction error and feature weight (FW) is updated using FS in a moving average manner.

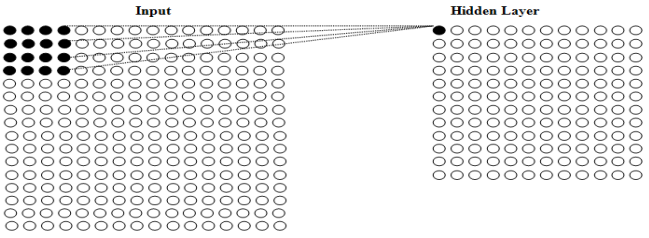
B. CONVOLUTIONAL AUTO ENCODER

Convolutional Auto encoder (CAE) through convolution layers make connections in reduced and localized areas of the image, conserving their spatial structure and discovering local features throughout the entire image. CAEs are more suitable for image processing and they are a cutting-edge tool for learning convolution filters in an unsupervised way. The learned filters are capable of extracting features that can be used for any task that requires a compact representation of the image for example, classification. Then the main layers of CAE are presented.

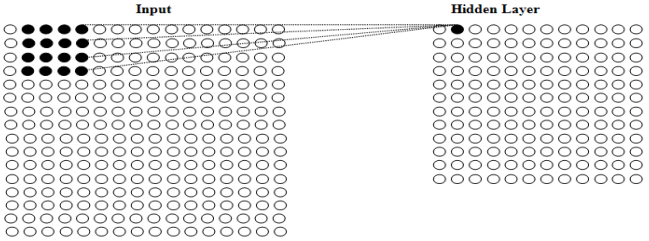
Convolution Layer: Given an image $S^l \in R^{W \times H \times C}$, where W and H denote image dimensions and C the number of channels, the latent representation of the feature map in the layer l + 1 when applying n convolution filters $k \in R^{W \times H \times C}$, is given by:

$$\mathbf{S}_j^{l+1} = \sigma\left(\sum_{i=1}^{l} S_i^l \otimes k_{ij} + b_j\right) \quad j = 1, \ldots, n$$

Where S^l_i is the i-th feature map in the layer l, k_{ij} denotes the i-th channel in the j-th convolutional filter (or kernel), $\otimes$ denotes the operator convolution and σ is nonlinear function activation. The convolution process consists of sliding the $k \times k$ kernel, through the entire $W \times H$ image using a different size of step (or stride) s, to obtain a new representation of the image of $(\lfloor (W - k + 2p)/s \rfloor + 1) \times (\lfloor (H - k + 2p)/s \rfloor + 1)$. Where p is the padding around the image. Figure 5 shows the sliding process.



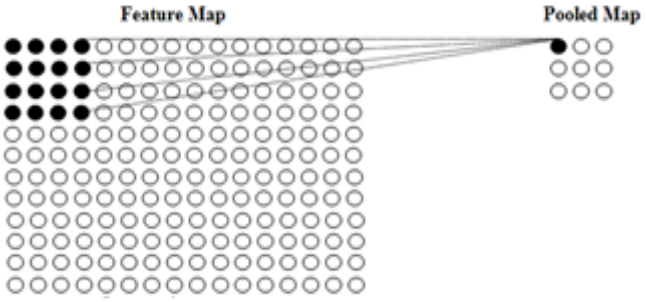
(a) : First Hidden Layer



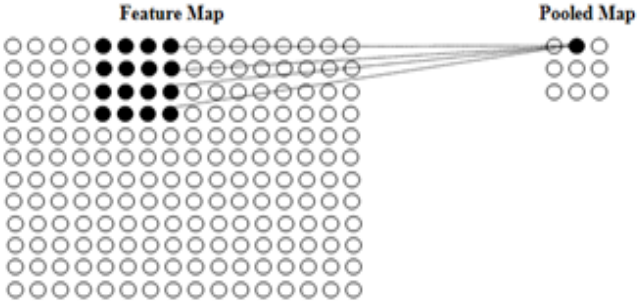
(b): Second Hidden Layer

Figure 5: Sliding a local receptive field of 4 × 4 over an input of 16 × 16 elements. A feature map of 12 × 12 elements is produced by using a stride of 1 × 1 elements

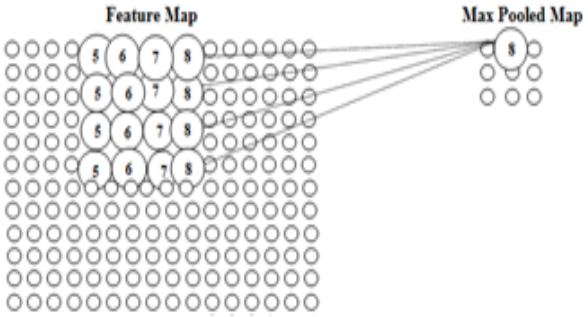
Pooling Layer: These layers are used to simplify the feature maps produced by the previous convolution layers. This simplification has many advantages: by reducing the representation size the amount of parameters to be learned is also reduced, therefore decreasing the computational cost of the whole network. In detail, the pooling layer generates a condensed feature map by summarizing regions with a predefined operation (maximum, average, among others).



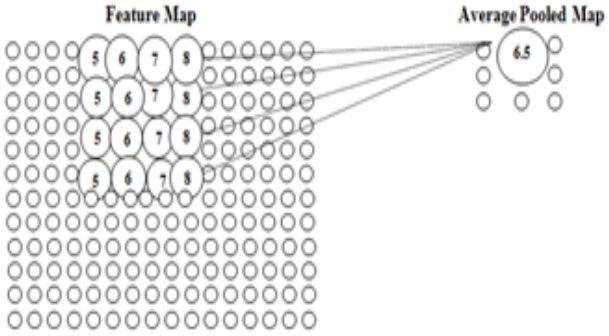
(a) First Output



(b) Second Output



(c) Max Pooling



(d) Average Pooling

Figure 6: Pooling operation over a 12 × 12 feature map using a filter size of 4 × 4 and a stride of 4 × 4

Unpooling Layer: The resulting feature maps will be used as decoder input, to reconstruct the input image. Therefore, unpooling operations will be applied to counteract pooling.

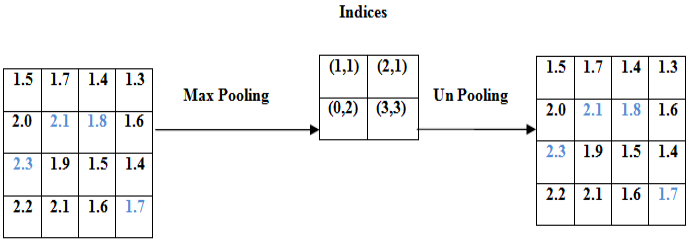


Figure 7: Illustration of the effects of the max-pooling and unpooling operations on a 4 × 4 feature map

Feature Extraction: Obtaining samples for training, validation, and model testing: for the training, validation and testing phase of the CAE model, the data set has been divided into 64% for training, 16% for validation and 20% for testing.

Unsupervised feature learning: In this stage the CAE model is trained and to find the optimal hyper parameters of the model, cross-validation will do for *K* iterations. Finally, the generalization error of the model is determined with the test set.

Obtaining the feature vectors: the encoded layers of the trained CAE model are used to extract the feature vectors from the images. Figure 8 shows the schematic representation of the Feature extraction using CAE model.

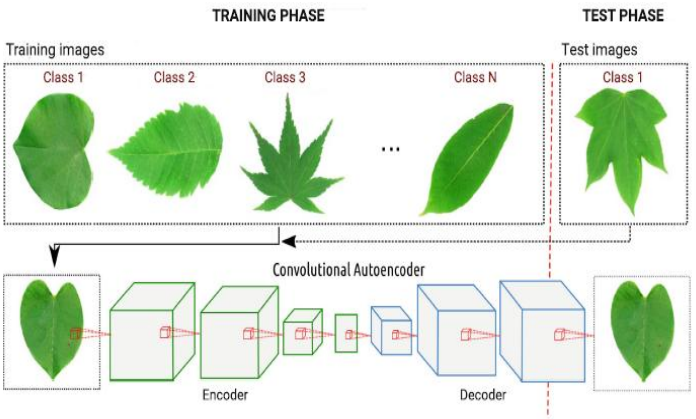


Figure 8: Feature Extraction using CAE model

IV ADVANTAGES AND APPLICATIONS OF UNSUPERVISED AUTO ENCODERS

An auto encoder gives a representation as the ouput of each layer and may be having multiple representations of different dimensions is useful. An auto encoder could let you make use of pretrained layers from another model, to apply transfer learing to prime the encoder/decoder. An auto encoder is a type of artificial neural network used to learn efficient data codings in an unsupervised manner. The aim of an auto encoder is to learn a representation for a set of data, typically for dimensionality reduction by training the network to ignore signal noise. Important Applications of auto encoders are Data Compression,

Image Denoising, Dimensionality Reduction, Feature Extraction, Image Generation and Image Colorization.

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An IPFS-Blockchain driven Healthcare; an Application towards an Optimized Secured and Decentralized Data sharing for e-Health Services: A Comprehensive Literature Review and Future Scope

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ABSTRACT- Growing population demand the need to bring revolutionary changes in all aspect of health care as time and technology progress. Quality healthcare services backed up with the block chain technology is the need for a more patient-centric approach today. An analysis of the state of the art blockchain research in the field of healthcare using IPFS and smart contract is conducted. A high performance distributed information system is deployed and a micro service based architecture implementation is carried out where in the digital contents are stored on the IPFS and the IPFS hashes are stored into the blockchain smart contracts to provide traceability and authenticity. This study aims to realize a framework where healthcare record management can be done in a secure, tamper proof environment. Further the study promotes a feasible and optimized access control that can help prevent data breaches and reliable method of recording, storing and sharing sensitive data. Thus, proposes a combined IPFS- blockchain based solution to solve the authenticity and originality of digital content posted liberally on the internet.

Keywords— *IPFS, Blockchain, EHR, Smart Contracts.*

1. INTRODUCTION

Blockchain technology is a substantial technology that has garnered interest in healthcare industry. As a technology, Blockchain is secure, distributed database which operate without a central authority or administrator [1]. It is a peer-to-peer and distributed network that makes a continuous, list of ordered records known as blocks to create a digital ledger [1].Blockchain improve the authenticity and transparency of healthcare data and also maintains permissions in electronic health records (EHR) to streamline claims processing[2].

For large data and digital content, Blockchain seems to be expensive technology. To overcome large data and content, Inter-Planetary File System is one such solution. IPFS, an open source, distributed, content addressable, peer-to-peer, decentralized file system to store data and large files with resiliency, integrity with high throughput [3].IPFS file system is one such solution. IPFS, an open source, distributed, content addressable, peer-to-peer, decentralized file system to store data and large files with resiliency, integrity with high throughput [3].

IPFS as a Github repository commit hashes, IPFS hashes always point to the same immutable files. The proposed solution attributes on the traceability and authenticity of the data stored, reflected by IPFS hashes that are stored into the blockchain smart contract. The documents stored on the smart contracts can be effectively accessed by hash generated on storing the documents to IPFS. For, any change encountered in the content of the digital document, the hash changes, implies the original content altered or modified. Managing ,Production and distribution of the data without permission provided by the original work is attributed as specified on the dominant for the industry to develop a well-decentralized system in the health care area.

2. LITERATURE REVIEW

Blockchain's potential to enable better health data sharing and ownership has been previously described by several authors.

Thomas F Heston [7], case study proposed that healthcare complexity and costs can be decreased through medical records and insurance companies. Estonia has taken a leadership role in blockchain services both in the commercial sector and in government. The Estonian government's innovation strategy was to create GovTech partnerships to implement blockchain-based technologies throughout the country and become a global leader in the technology.

David Randall, et al. [8], proposed that decentralized and programmable nature of blockchain applications can be used to change health information technology to gain greater efficiency in public and private health care systems. They also argue that a decentralized benefits administration system can provide greater efficiency to enrollment, eligibility, claims payment, and adjudication processes thus driving efficiency and reducing systemic fraud.

Sandi Rahmadika et al. [9], proposed an architectural model to manage the PHI data using blockchain technology and several protocols embedded. The PHI data are derived from several healthcare providers in the same blockchain network. By leveraging on the model, the parties enable to collect and effectively manage the PHI data in a single view and guarantee the data integrity.

Liam Bell, et al. [10] discussed several areas of healthcare like device tracking, clinical trials, pharmaceutical tracing, and health insurance. Within device tracking, hospitals can trace their asset within a blockchain infrastructure, including through the complete lifecycle of a device. The information gathered can then be used to improve patient safety and provide after-market analysis to improve efficiency savings.

William J. Gordon et al. [11], describes two types of healthcare interoperability: institution-driven and patient-driven. Institution-driven interoperability, historically been the focus of interoperability efforts, relies on different healthcare entities exchanging data based on business or regulatory incentives. There has been an increasing move towards patient-driven interoperability, in which an individual patient's electronic health data is made available to them through standard mechanisms like APIs.

Yue et al. [12] developed a healthcare data-sharing application, namely Healthcare Data Gateway (HGD), based on the blockchain architecture. The provided solution helps control and share client's data easily without compromising privacy. It provides an excellent way to increase the intelligence of healthcare systems and at the same time keeps patient data private.

Vishal Patel [13] presented a framework for cross-domain image sharing by using blockchain technology as a distributed data store to create a ledger of radiological studies and control image sharing by customized user permission.

Fan et al. [14] developed a MedBlock framework based on blockchain technology to solve data management and data sharing problems in an electronic medical records (EMRs) system and improve medical information sharing. Patients can access the EMRs of different hospitals through the MedBlock framework by avoiding the previous medical data being segmented into various databases.

Ji et al. [15] proposed a multi-level location sharing scheme based on blockchain technology. The goal was to achieve privacy-preserving location sharing by blockchain for telecare medical information systems. They define the primary requirements for location sharing decentralization, confidentiality, variability, multi-level privacy protection, irretrievability, and unforgeability by using the Merkle tree and order-preserving encryption.

Shen et al. [16] proposed MedChain, an efficient session-based healthcare data sharing based on blockchain. MedChain uses a digest chain structure approach to check the integrity of a shared medical IoT data stream. This is done to overcome the efficiency issues of existing systems such as Medrec [17] and MedBlock [18].

Zhou et al. [19] proposed an approach for achieving controllable blockchain data management in the cloud environment to address the concerns of the users about the lack of control on the posted ledgers. In their model, they designed a special trust authority node to allow users to terminate and prevent any potentially malicious actions even in a majority attack.

Genestier et al. [20], a new idea of reshaping the consent management in the healthcare system which mainly provides users to control the whole health record data by using blockchain was introduced. However, there is no authorization design and no access control in their implementation.

Al Omar et al. [21] proposed a patient-centric healthcare data management system in a cloud environment using blockchain technology as storage which helps to attain privacy. The main idea of this work is to keep sensitive healthcare data on the blockchain by defining a set of security and privacy requirements to achieve accountability, integrity, and security.

Kaur et al. [22], however, introduced a new term BlockCloud, which is, in fact, the blend of blockchain implemented in a cloud environment. The idea behind implementing the cloud is to keep the data distributed and safe under the same roof without involving third parties. The study addressed challenges to how medical providers and organizations, public health agencies, healthcare service providers, and governments need to collaborate and create policy enforcement.

Chen et al. [23] developed a secure blockchain framework for medical data sharing by designing secure cloud storage for patients' sensitive medical records. In this framework, medical data management is achieved using a digital archive that has access control rights of its owners' information. This is stored by deploying cloud encryption under the chain.

Guo et al. [24] introduced an attribute-based signature scheme utilizing blockchain technology with multiple authorities to guarantee and validate EHRs. It facilitates group message broadcasts and could resist collusion attacks.

Wang and Song [25] proposed a secure cloud-based EHR system based on blockchain and attribute-based cryptosystem. To encrypt medical data, they used a blend of identity-based encryption and identity-based signatures at the same time to implement digital signs. On top of that blockchain, other techniques are used to ensure the integrity and traceability of medical facilities. While the above-mentioned three studies have mainly focused on the cryptographic aspects to secure EHR blocks,

Roehrs et al. [26] have addressed completely different challenges associated with the unification of scattered health records, and also the access management of attention provider's stakeholders. These 2 problems were resolved by proposing OmniPHR, a distributed model for group action personal health records (PHR) that uses a parallel info to store PHR in blocks and combined structural-semantic ability and up-to-date vision of various PHR formats.

Hussein et al. [27] developed a framework for securing medical records mistreatment blockchain technology supported genetic algorithms and distinct rippling transforms. The planned technique utilizes a changed scientific discipline hash generator for generating the required user security key.

Mäntymäki [28] planned that the exaggerated adoption of blockchain technology can cause tumultuous changes within the current structure of the attention system. The insights from this study will facilitate the management of attention service suppliers further as governmental authorities and decision-makers to judge the potential disruptiveness of blockchain technology within the attention domain.

Nguyen et al., [29] the interference of unauthorized access and preservation information of knowledge of information security to make sure data protection has been

another key issue addressed within the studies on the information management aspects of blockchain in attention. Most reviewed studies have centered their attention on preventing unauthorized access.

H. Li et al. [30] reportable that the performance of their framework can be plagued by having alittle structure/ quantity of knowledge that will not solely waste area however conjointly have an effect on multimedia system image content recognition.

3. RESEARCH GAP IDENTIFY

Providing quality health care services ensures patient health management at the first level. The federal rules and rules ar creating procedures even a lot of tedious and long. within the attention sector, important patient knowledge and data remains scattered across completely different departments and systems. thanks to this, crucial knowledge isn't accessible and handily obtainable in times of would like. the prevailing attention scheme can't be thought-about complete as multiple players within the system don't have a system in situ for sleek method management. Moreover, it's conjointly termed as inadequate for handling the exchange of knowledge and needs bound major changes.

3.1 Issues in Existing Systems

Many attention facilities these days are dependent on out-of-date systems for keeping patient records. These systems hold the practicality of keeping native records of the patient knowledge. This could create it troublesome for the doctor to diagnose that is sustained and tedious for the patients too. Thanks to this, the price of maintaining a patient-oriented business is exaggerated significantly.

Issues prevailing within the current attention sector don't seem to be restricted. They carry on growing with high intensity with time. the necessity for a technically advanced system is simple.

Another prolonged and dreary method that ends up in high prices within the attention trade is Health info Exchange. Since patients don't have any management over their knowledge, the probabilities of identity thefts, monetary knowledge crimes, and spamming ar bigger than ever.

Despite having gadgets like computers and mobile phones at each edifice, still powerless to gather, analyze, secure, and exchange knowledge effortlessly. Therefore, the attention system these days not solely wants a sophisticated system rather it conjointly wants a system that's sleek, clear, economically economical, and simply operable.

Secure info sharing strategies, which permit each attention suppliers and their coated entities to verify the correctness of knowledge, ar crucial for making certain correct medical services. this can be wherever blockchain comes in helpful, together of its main benefits is knowledge integrity. once info is recorded and encrypted, it becomes not possible to vary or take away.

4 OBJECTIVES OF THE PROPOSED RESEARCH WORK

One of the blockchain approaches that leave the secure storage and distribution is anchor data to the general public blockchain. This theme focuses on genuineness and knowledge integrity. This technology proposes to preserve one record of the certifications and approvals, which can modernize interstate licensure, bolster trust, and let organizations and people, demonstrate the skilled qualifications.

- Develop a resourceful system to manage the text documents using Block chain protocols
- Develop a block chain framework for healthcare and government departments
- Evaluate the developed system performance

.

The planned analysis work presents a framework wherever attention record maintenance will be created in a very secure, tamper-proof atmosphere by blockchain technology, IPFS, and sensible contracts. For the storage of documents like medical reports, clinical trials, patient health info (PHI), Electronic health records, knowledge collected from IoT devices (Internet of Things) or observation systems, and medical insurance claims, IPFS is employed, besides with definite access management strategies. Secret sharing and uneven key cryptosystem will be enforced as further practicality within the system for restraining the access structure solely to definite users of the system. The root information info of the documents hold on in IPFS is auxiliary uploaded to the blockchain to form certain the integrity of the knowledge.

6. EXPECTED OUTCOME OF THE PROPOSED RESEARCH

The planned technology permits users to verify the genuineness of document registered within the system. For health care info hold on the blockchain, the foremost instant concern is that the size of knowledge holds on the blockchain. It provides proof of existence by adding knowledge within the sort of the group action and verifying the knowledge by all system nodes. This feature can leave the storage of results from clinical trials to be with efficiency operable with a particular and confined set of knowledge, like demographic info, medical record, and codes for services rendered firmly, creating it unworkable to switch knowledge. The Blockchain produces a document sharing and management system that presents a secure group action inside and between the systems. The developed system provides a more robust approach to handling huge knowledge in organizations.

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Real Time Vehicle Speed Estimation Techniques – A survey

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ABSTRACT

Video and picture handling has been utilized for traffic observation, investigation and checking of traffic conditions in numerous urban areas and metropolitan territories. This paper focuses on present another way to deal with gauge the vehicles speed. In this examination, the caught traffic films are gathered with a fixed camera which is mounted on an expressway. The camera is aligned dependent on mathematical conditions that were upheld straightforwardly by utilizing references. Item following methods are then utilized on the live video that is being caught by the camera and the movement of the vehicle is being followed and shown on the screen. Utilizing this video and article following procedures, important information is being separated from the video and the qualities are then placed into the condition from which the speed is determined.

1. INTRODUCTION

Individuals in their everyday lives experiences more issues as the populace is consistently expanding and street traffic turns out to be more blocked due to popularity and less degree of street limit and foundation. It is imperative to look for proficient answers for lessen these issues as they are a lot of common in the reality. Vehicle speed recognition is significant for noticing speed impediment law and it likewise shows traffic conditions. Customarily, vehicle speed discovery or reconnaissance was acquired utilizing radar innovation, especially, radar indicator and radar firearm.

This strategy, with spatial conditions and supplies, gets the speed of a moving vehicle. Notwithstanding, this strategy actually has a few weaknesses, for example, the cosine blunder which occurs if the radar weapon isn't pointing towards the course of the approaching vehicle. Likewise, the expense of hardware is one of the significant reasons, and furthermore radio obstruction are two other powerful factors that cause blunders for speed location lastly, the way that radar sensor can follow just a single vehicle whenever is another impediment of this technique.

In this paper, we are preparing a survey report through researching on our project topics by reading through various IEEE paper and research papers that have implemented the related technique. This survey paper will compare those research papers on the basis of their techniques used, advantages, feasibility, accuracy and number of disadvantages. This survey report will give a basic idea about the techniques that have been used till now on the respective project and also about the advancement made till date in the domain.

2. RELATED WORK

Volkan Cevher et.al **[1]** presented a method to determine a vehicle's speed via its acoustic drive-by sounds recorded at a microphone, by formulating the problem as a joint speed and acoustic pattern estimation problem. They achieve this estimation

using a vector that profiles the directional variation of the vehicle acoustic pattern.

Parameters λv and λf of the vehicle profile vector can improve the confidence of the correspondence matches, also allowing minimal communication between a calibration microphone and a control microphone. However, given the difficulty of the correspondence problem, one should not expect perfect performance for all cases even with the vehicle profile vector. While determining the vehicle speed, they relied on the signal power calculations and argued that the signal frequency information (Doppler) was not useful when only a single microphone is used.

On the other hand, when an array of microphones is available, one can also obtain information from the phase of the received acoustic data across the array. In this case, they expect that the performance should improve more than what is gained from multiple independent amplitude observations. They envision that when multiple vehicles are present, the array can provide the acoustic beam steering necessary to remove the cocktail party effect on the ES components.

Shubhranshu Barnwal et.al [2] performed evaluation on data that has been done for simplistic cases, and this shows promising results. Estimates are within an acceptable range given that a passive sensor is being used and the approach is computationally inexpensive.

In a few cases the harmonics were not dominantly visible and pre-processing of audio to enhance spectral peaks is a viable option. For the controlled experiments reported in this paper, though, such pre-processing was not required. One can also notice clearly, when a gear shift takes place (both the up shift, and down shift), and state if the speed is increasing or decreasing. They were exploring approaches to combine Doppler Effect and the engine RPM–vehicle speed relation to track variable vehicle speeds.

Osman Ibrahim et.al [3] presented the alternative method for calculation of speed of moving objects. Instead of using expensive radars or sensors authors used Computer Vision techniques to implement the same logic and that too with same accuracy or even better. SDCS processes can be divided into four successive phases :-First phase is **Objects detection phase**, which uses a hybrid algorithm based on combining an adaptive background subtraction technique with a three-frame differencing algorithm which ratifies the major drawback of using only adaptive background subtraction.
Second phase is **Objects tracking**, which consists of three successive operations, Object segmentation, Object labelling, and Object canter extraction. Objects tracking operation takes into consideration the different possible scenarios of the moving object like:- Simple tracking, object has left the scene, object has entered the scene, object cross by another object, and object leaves and another one enters the scene.
Third phase is ***Speed Calculation phase***, which is calculated from the number of frames consumed by the object to pass-by the scene.
Final/Fourth phase is ***Capturing Object's Picture phase***, which captures the image of objects that violate the speed limits.

Arash Gholami Rad et.al [4] have presented video and image processing has been used for traffic surveillance, analysis and monitoring of traffic conditions in many cities and urban areas. Camera is used to detect speed and camera calibration plays a very vital piece for the process. Other information needed can be obtained by the software like fps megapixel etc. Second Step involves extraction of background (background refers to the stationary object in a video/image). After that foreground is extracted using CVS. It is preferred as it produces same results irrespective of the conditions. After this speed is detected using making a box around detected vehicle and considering the distance travelled by its centroid.

G Chandan et.al [5] have considered a small window on the image then scan the whole image, looking for

corners. Shifting this small window in any direction would result in a large change in appearance, if that particular window happens to be located on a corner. Flat regions will have no change in any direction. If there's an edge, then there will be no major change along the edge direction. After the corner detection, tracking is being done for the detected corners. The pixel under consideration, and solves the basic optical flow equations for all the pixels in that neighbourhood, by the least squares criterion. The Lucas–Kanade method assumes that the displacement of the image contents between two nearby instants (frames) is small and approximately constant within a neighbourhood of the point p under consideration. Speed Estimation of Multiple Moving Objects from a Moving UAV Platform

S.S.S. Ranjit et al [6] have developed a vehicle speed detection algorithm is based on the vector-valued function and motion vector technique that estimates the velocity of moving vehicle.The motion vector technique is applied after the block extraction and subtraction is used to estimate the pixels changes among the two blocks to measure the speed of the moving vehicle. The vector-valued function is applied into the motion vector to demonstrate the vehicle speed detection algorithm for the video from surveillance cameras. The developed algorithm provides much more accurate results in different weather condition and light conditions.

Jozef Gerát et.al [7] have developed a system which can accurately detect speed of the vehicle irrespective of the weather conditions or light condition. Optical low method with Kalman filter tracking to solve the problem with overlays with static foreground objects and also improve speed detection. Foreground detection by Gaussian mixture model was combined with DBSCAN clustering to create more precise object representation better and much accurate speed detection at night and in different weather conditions

Debojit Biswas et.al [9] have implemented a speed detection system for multiple moving objects on the ground from a moving platform in the air. A detect-and-track approach is used for primary tracking of the objects. Faster R-CNN (region-based convolutional neural network) is applied to detect the objects, and a discriminative correlation filter with CSRT (channel and spatial reliability tracking) is used for tracking. Feature-based image alignment (FBIA) is done for each frame to get the proper object location. In addition, SSIM (structural similarity index measurement) is performed to check how similar the current frame is with respect to the object detection frame. This measurement is necessary because the platform is moving, and new objects may be captured in a new frame. We achieved a speed accuracy of 96.80% with our framework with respect to the real speed of the objects

Tarun Kumar and Dharmender Singh Kushwaha [10] have proposed an efficient and novel approach for the detection of moving vehicles as well as estimation of their speeds by using a single camera in daylight or properly illuminated environment.

3. COMPARITIVE STUDY

The table 1 suggests a comparative study that has been conducted amongst various research papers belonging to one common domain i.e. vehicle speed detection. The table therefore tells the key features, advantages and disadvantages of various approaches. One important observation that can be made from the table is that there are majorly two different ways of estimating speed of a moving vehicle. One, is based entirely on hardware, which includes various sensors for tracking the vehicle and calculating speed. Second, is based on the use of software for calculating the speed of the vehicle. Both approaches have their own advantages and disadvantages. One common advantage of hardware based estimation, as observed from the comparative study, would be the accuracy with which it can detect the speeds, on the contrary, this approach is quite expensive as it involves the use of expensive sensors and other hardware components. This is overcome by the software approach, where speed of multiple moving vehicles can be calculated

in a single frame with ease and is on the cheaper side as computer software used in this method is usually free of cost, however, this approach lacks the accuracy of the hardware based estimation techniques.

4. CONCLUSION

This paper provides a detailed summary related to different vehicle speed estimation techniques. Some techniques were found useful while some were not optimal. Here we will discuss about the best technique which is the SDCS technique. There are three steps to realize such processing namely, background subtraction, object extraction and speed detection. In the first step the mean filter for background generation that was one of the effective ways for background extraction was used. In the second step, a novel algorithm which takes advantage of the two-colour based characteristics and combines them for object extraction is introduced. This approach is more robust against misdetections and the problem of the merging or splitting of vehicles and finally, in the third step the vehicle speed is determined. The approach used is not affected by weather changes. Vehicle extraction and speed detection had been implemented using the Python.

Also, SDCS system provides a software package specifically designed to manage a vehicle's traffic provides a number of benefits:

- SDCS is a cheap alternative system to the traditional radar system and the need for expensive sensors is also
- SDCS is considered as a good application for some difficult image processing algorithms and theories (Object Motion Detection, Shadow Removal, and Object Tracking).
- SDCS doesn't need professional persons to deal with it as it has a simple interface and good design

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Table 1: COMPARATIVE STUDY				
TITLE	**OBJECTIVE**	**TECHNOLOGIES USED**	**ADVANTAGES**	**DISADVANTAGES**
[1] Vehicle speed estimation using Acoustic Wave patterns.	Authors aim to present a method to estimate vehicle's speed via its acoustic drive-by sounds recorded at a microphone, by formulating it as a joint speed & acoustic pattern estimation problem.	Omni-directional microphones, video cameras, Doppler's effect techniques, ES (Envelope Shape) components.	When an array of microphones are used, performance improves more than what is gained from multiple independent amplitude observations.	More expensive due to number of sensors used. Needs improvement in its performance, when the vehicle's CPA's are relatively large.
[2] Doppler based Speed Estimation of vehicles using Passive Sensor.	Authors aim to develop a system for estimating a vehicle's speed using the phenomenon of Doppler Shift.	Passive audio microphones, knowledge of Doppler Shift, Spectrogram.	The estimated speed of vehicles varied by only by 0-10 kmph. Vehicles moving at lower gears are louder and higher in frequency, thus displaying a larger shift in harmonics giving accurate results.	Too expensive. This method will be helpful if the vehicles move with constant speeds (i.e., change in RPM doesn't occur). Error due to Doppler Shift was seen higher in lower speeding vehicles.
[3] Speed Detection Camera System (SDCS) using Image Processing techniques on Video Streams.	Authors aim to develop a software that is Easy-to-handle and provides nearly 100% accurate results for speed estimation on moving vehicles.	High resolution cameras, Python, NumPy, OpenCV and Computer Vision techniques.	SDCS is a cheap alternative to Radar system. SDCS is considered as a good application for some difficult Image processing algorithms and theories. SDCS doesn't need any professionals to deal with it as it has a simple interface and good design.	The camera required for video extraction should be of high resolution. For smooth running of the software the system should have i5 processors with at least 4GB RAM.
[4] Vehicle Speed detection in Video Image Sequences using CVS method.	Authors simplified the techniques and aim to detect and track an object in real-time using OpenCV.	OpenCV and Image Processing techniques in Python.	Object detection and tracking using Software methods resulting in an affordable system. Ability to track multiple objects at a given time. The system is not affected by	Precision and accuracy are not fully correct. Needs improved background filtering methods/algorithms.

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			weather and performs same in every condition.	
[5] Real-time object detection and tracking using Deep Learning and OpenCV.	To detect and track an object in real-time using Deep Learning and OpenCV.	Knowledge of Deep Learning, OpenCV libraries and Image Processing techniques in Python.	A software based approach on Object Detection and tracking, resulting in an affordable system. Ability to track multiple objects at a given time.	Lacks the accuracy and precision of hardware based Object tracking devices.
[6] Real-Time Vehicle Speed Detection Algorithm using Motion Vector Technique	Development of vehicle speed detection algorithm is based on the vector-valued function and motion vector technique that estimates the velocity of moving vehicle.	The motion vector technique is applied after the block extraction and subtraction is used to estimate the pixels changes among the two blocks to measure the speed of the moving vehicle. The vector-valued function is applied into the motion vector to demonstrate the vehicle speed detection algorithm for the video from surveillance cameras.	Faster and needs less resources.	Accuracy is less.
[7] Vehicle Speed Detection from Camera Stream Using Image Processing Methods	Development of a system which can accurately detect speed of the vehicle irrespective of the weather conditions or light condition.	Optical low method with Kalman filter tracking to solve the problem with overlays with static foreground objects and also improve speed detection. Foreground detection by Gaussian mixture model was combined with DBSCAN clustering to create more precise object representation.	Better and much accurate speed detection at night and in different weather conditions.	Time consuming and needs lot of resources.
[8] Vehicle Speed detection using deep learning and Image processing techniques.	Speed detection of vehicles using Image processing techniques on Video streams in OpenCV.	Computer Vision and Image Processing techniques in Python's OpenCV.	Efficient object detection and tracking method based on a software. Easy-to-handle and economic way of speed detection. Can be also used in preventing road accidents.	Doesn't provide precise and accurate results.
[9] Speed Estimation of Multiple Moving	Speed detection system for multiple moving objects on the ground from a	Faster R-CNN is applied to detect the objects, and a discriminative	Extremely fast object detection.	Less accurate.

Objects from a Moving UAV Platform.	moving platform in the air.	correlation filter with CSRT is used for tracking. FBIA is done for each frame to get the proper object location. In addition, SSIM is performed to check how similar the current frame is with respect to the object detection frame.		
[10] An Efficient Approach for Detection and Speed Estimation of Moving Vehicles.	Efficient and novel approach for the detection of moving vehicles as well as estimation of their speeds by using a single camera in daylight or properly illuminated environment.	Vehicle's tracking is based on the relative positions of the vehicle in consecutive frames. This information may be used in the Automatic Number Plate Recognition (ANPR) System for selection of those key frames where speed limit violation occurs.	Minimize the scope of any false positive detection on both sides of road.	Accuracy of only 87-90%.

Product Recognition for Shopping using Artificial Intelligence and Machine Learning with Mobile App

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Abstract

The purpose of this project was to create a way to buy products that we see online worn buy models or seen in some add on social media platforms like instagram, facebook and twitter etc. There are times when we get this urge to buy a product worn by some movie actor and we end up wasting valuable time in search of that product online. Sometimes we are not able to locate those products even after rigorous hours of surfing the Internet, to minimize this hustle this project was designed. We are introducing a way to buy products online in a very different approach Using the Haar Cascades the logo of the product is detected then ADA boost is used to optimize the classifiers for better web scraping and accurate results. In addition to this there is a special feature where if a company is sponsoring the application then only that company's product will be displayed and the products in the similar type category will be from the same company only, otherwise whatever is the best possible result will be displayed. All these implementations will be carried out by a mobile application that will be cross platform in nature.

Keywords: Object detection, Object Feature extraction, Ecommerce ,Sponsorship, Mobile Application, Cross Platform.

Introduction

Nowadays we see a lot of products online that is worn buy models or seen in some add on social media platforms like instagram, facebook and twitter etc. People easily get intimidated by these models and products seen online and there are times when we get this urge to buy that product worn by some movie actor and we end up wasting valuable time in search of that product online. Sometimes we are not able to locate those products even after rigorous hours of surfing the Internet, to minimize this hustle this project was designed. We are introducing a way to buy products online in a very different approach, In our day to day life we come across text search almost every time and if we go beyond that then speech recognition is the most we can opt for, but with this project we are using images to detect objects and locate them on the internet this way people can save a large amount of time for buying products because they don't need some specific keywords only an image is more than enough. Using the Haar Cascades the logo of the product is detected then ADA boost is used to optimize the classifiers for better web scraping and accurate results. In addition to this there is a special feature where if a company is sponsoring the application then only that company's product will be displayed and the products in the similar type category will be from the same company only, otherwise whatever is the best possible result will be displayed. All these implementations will be carried out by a mobile application that will be cross platform in nature.

Installation Step

Prerequisites:

- A Smart Phone
- Good Internet Connection

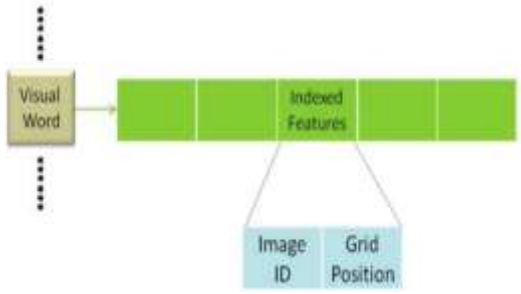
A smart phone with good internet connection is need, a particular app that we are building need to be installed for now to demonstrate the working on model.

Implementation Details/Working

Step 1:

We are using local features like SIFT (Scale-invariant feature transform) features and grid-based patch features as the visual paths of images.

Here all the local features and color patch are quantize the SIFT features into visual words by inverted-file index approach, K-means clustering technique is used to obtain the visual words vocabulary training images.



Step 2:

Global Matching Performed

To improve the discriminative power of single local features during global matching, we encode the spatial context with grid representations(16*16) and a simple but effective approach using triangle relations constraints is proposed for spatial consistency filtering.

Local Matching Performed

The following strategies to emphasize users' preferred local patterns

i. Enlarge the weights of matching scores of SIFT points inside selected regions

ii. Apply a spatial coherent constraint on matched SIFT points within the same region. Since SIFT points inside a region are close to each other, their matched points in test image should be neighboring either.

iii. Apply triangle relations constraints on SIFT key points among regions if the number of users specified regions are larger than 2.

Step 3:

Global and local matching scores are linearly combined to rank the retrieved image results. Therefore, with our system, users are allowed to highlight the image sections of focus and do precise search.

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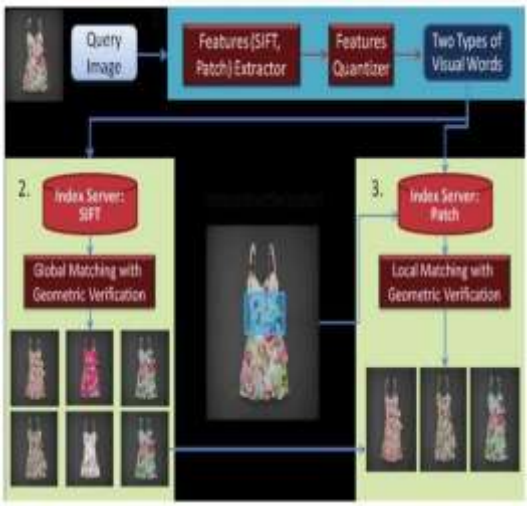
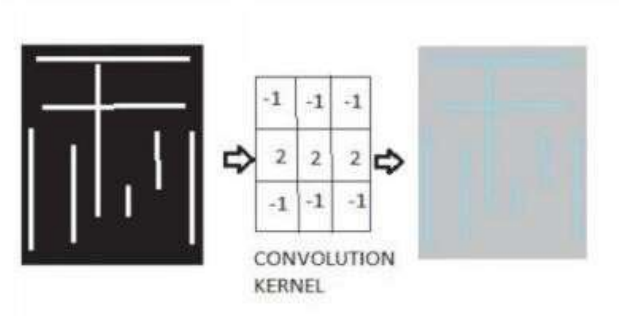


Haar Features

Convolution lattice otherwise called cover is a grid utilized for picture handling activities, for example, embellishing, edge location and so forth Convolution portion pixels, which are gotten from the white pixels in the dark foundation from the info picture consummately coordinates with the extreme focus pixels in the yield picture. Here any item location execution incorporates checking of the specific required article and filling the picture as highly contrasting pixels. A while later, figuring for the each haar include is done where amount of dark force pixels and white power pixels are determined. There are distinctive haar highlights utilized for the recognition of the item are as following:

1.) Edge highlights. 2.) Line highlights.
3.) Four square shape highlights



ADA Boost

Ada-Boost is an AI calculation used to distinguish highlights present in a specific sub window. Subsequent to discovering all the highlights, to distinguish specific article weighted aggregation of every one of these highlights are considered to check object is available or not. Ada-Boost calculation supports the way toward discovering the classifier. It is only the summation of all the feeble learning classifier. Frail learning classifier predicts the article recognized has a place with which class. Solid classifier is comprised of summation of all feeble learning classifier. Solid classifier gives the supreme worth, which gives the trust in that characterization. In each feeble classifier is each example is appointed some weight equivalent to the current blunder on that example. Ada-Boost is utilized to discover the edge as per the single rectangular item includes that different out sure and negative preparing tests as per the weighted blunder. Each feeble classifier can recognize half of the positive highlights. Remaining highlights can be recognized with the assistance of chain of feeble classifiers.

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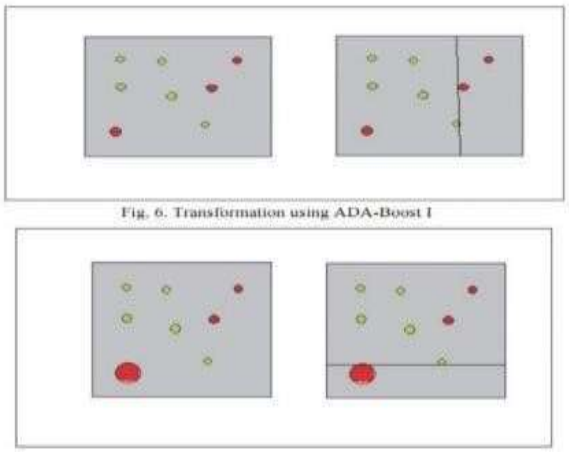


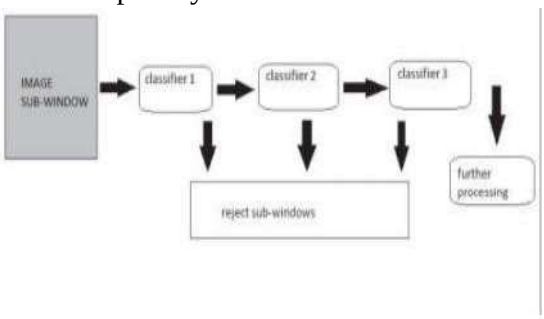
Fig. 6. Transformation using ADA-Boost I

Cascading Classifiers

While planning a solid classifier it is important to think about number of highlights, stages and edge of the classifiers. Arrange a similar picture with various window size is overhead as far as time and energy. Regardless of whether the picture contains some certain highlights however it might contain more negative highlights. Thus the calculation ought to be adequately effective to catch negative highlights and dispose of it. For this reason proficient classifier ought to be made with all solid classifiers. It is troublesome and tedious to acquire it in a direct manner. So new method came to presence known as course of classifiers. It contains all solid classifiers masterminded in course structure.

On the off chance that first classifier distinguishes the article, at that point it pass the sub window of a picture to the following classifier else it disposes of the entire picture. Contribution to the classifier is as sub window. At that point at next stage classifier again checks for positive highlights in a picture. Accordingly course of classifiers is shaped to quick and effective identification of positive highlights in a picture. Falling classifiers has degenerate tree structure.

Falling classifiers are appeared in beneath schematic portrayal.



Evidence of pattern flow:

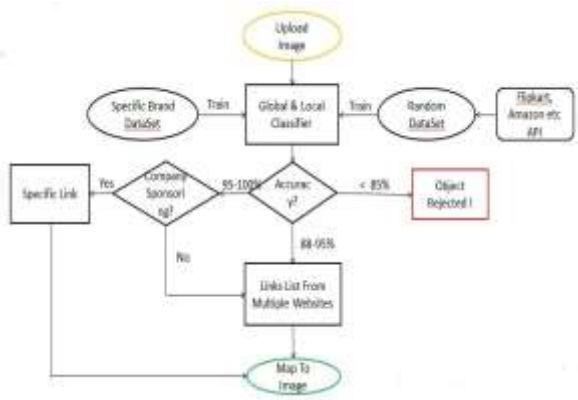
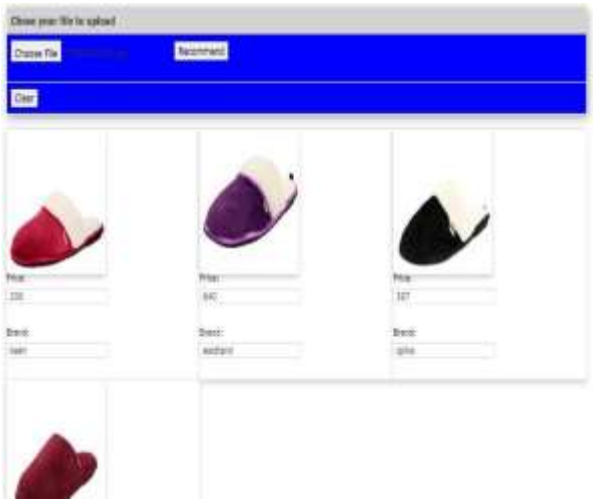


Fig 2: Illustrates the concept design of proposed solutions.

Initial Implementations

Initially the project was deployed as a web based portal due to lack of resources but later it has been improved, for the web portal **Flask** was used as the server interface and **Spyder** was used as the IDE for the process here are some screenshots of the same.



Conclusion

Information is very crucial in the sales and marketing environment. The lack of information may mislead the buyer or may cause heavy loss for the manufacturer. It's the human tendency to forget the product's name, which is necessary to find the information online. Therefore the use of Computer vision algorithms is done in order to track the object and the logos on them andidentify the products.

Based on this identification a token number is associated with them which is passed via REST API to object storage where the xml file containing the product information is stored. The web scraping tools are used further to get the required information from the xml file and display it in text format on the product itself including the website URL from which it can be ordered. Since the user ratings and all the properties are shown the product quality can be judged convincing the user to buy them. They can be used in the real life scenario where a user may like some product in real-time and can obtain the information by just scanning the logo and the product shape. Hence this on- demand information delivery can be promising and can boost the sales of the product.

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MANGO LEAF DISEASE DETECTION USING ADVANCED MACHINE LEARNING

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ABSTRACT— Fungal diseases not only ruin the economic importance of the plants and its products, but also abate their ecological prominence. Mango tree, specifically the fruits and the leaves are highly prone to diseases called Anthrocnose, Red Rust, Sooty Mould. The main aim of our project is to develop an appropriate and effective method for detection of the Mango leaf disease. Over the last few years, due to their higher performance capability in terms of computation and accuracy Machine Learning algorithms have gained popularity in assorted fungal diseases classification. Therefore, for this work a Convolutional Neural Network (CNN) is proposed for the classification of the Mango leaves infected by these three diseases. This work is trained and validated on a real-time dataset captured at our backyard. It consists 1558 images of the Mango tree leaves. Dataset contains both healthy and infected leaf images. Results envisage the higher classification accuracy of the proposed CNN model when compared to the other state-of-the-art approaches.

INDEX TERMS Machine Learning, Convolution Neural Network, Rectified Linear Unit, Fully Connected Layer

I. INTRODUCTION

The plant diseases affect the quality of the leaves, fruits, stem, vegetables, and their products. This heavily impacts on the productivity and thus reflects on the cost. Most of the farmers can manually identify and classify the disease but it takes lot of time. In order to overcome with all these problems there is greater need for an automated plant disease prediction system which will give an accurate result. The diagnosis and use of the pesticide are more often done in the fields. This process is time-consuming, challenging, and most of the time results in incorrect diagnosis with unsuitable exercise of the pesticide. Over the last few years, it has been recognized that Machine Learning has been predominately used in agriculture. DL is a special class of ML algorithms which have multiple layers for transforming the raw data into information. CNN is advanced ML algorithm which comes under DL algorithm.

Eventually, it has been applied to solve several complex tasks. like image classification, pattern analysis, feature extraction, and transformation. In this era of research, a number of deep learning architectures have been proposed by various authors. Among these, CNN is one of the most popularly deployed deep learning models. CNN is inspired by the biological nervous and vision system. It is an unsupervised deep learning classification model having high classification and recognition accuracy. This model possesses a complex structure as it constitutes large number of information processing layers. This multiplayer architecture differs it from the conventional Artificial Neural Networks (ANN's).

Anthracnose it appears as oval or irregular vinaceous brown deep brown spots of variable size scattered over the leaf surface. Sooty Mould this disease is characterized by the presence of a black velvety thin membranous covering on the leaf surface. The disease is readily recognized by the presence of rusty red fructifications of the alga on the surface of leaves, veins, petioles and young twigs.

II. BACKGROUND AND RELATED WORK

There are few works done already related to detect disease of mango leaf. The performance of detecting the disease needs to be improved further.

Uday Pratab Singh et al. in [1] propose an innovative model named as MCNN for the classification of Mango leaves infected from the fungal disease named as Anthracnose. The higher performance of the proposed work is confirmed with accuracy of 97.13% when compared with other state-of-the art approaches for its accuracy. The presented model is also computationally efficient and simple. The proposed model also reports a missing report rate of about 2.87% with 0% false report rate. This missing rate is due to the vulnerabilities present in the real-time database.

Sampada Gulavani et al. in [2] the paper indicates that disease identification from image with the convolution neural network

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ResNet50 is a strong technique for high precision automated identification of mango disease. Therefore, this study shows that deep learning neural network provides a strong channel for in-field disease detection using convolution neural networks using an object dataset, and is a powerful technique for high precision automatic mango disease identification.

Priyadarshini et al. in [3] this paper has developed a Convolution Neural Network, for the identification of plant disease identification using leaf images. The trained model required a low computational power to classify the images, make it feasible to integration into the mobile application. The DL takes longer time to train but its testing time takes less time.

Chutinan Trongtorkid et al. in [4] proposed model for mango disease identification has four main stages. To begin with, by rescaling, the images in the dataset are converted into a lower resolution, compared with the original size.

Benzy Nazar et al. in [5] has proposed the comparative study of these technique carried out as a literature review. Up to 10 papers in which one among these techniques are used for the classification and detection of plant diseases, on the basis of the images of their fruit or leaves.

III. SYSTEM ARCHITECTURE

The system design controls the major structural characteristics of the system. It as a major impact on the testability and modifiability of the system, and it affects its efficiency.

CNN algorithm efficient compared to traditional method. We are working on improving the accuracy of findings even in the presence of low-quality images of leaves. Figure 1. clearly shows the architecture of proposed Convolution Neural Network model.

Convolution Neural Network Design:
The construction of a convolutional neural network is a multi-layered feed-forward neural network, made by assembling many unseen layers on top of each other in a particular order. It is the sequential design that give permission to CNN to learn hierarchical attributes.
In CNN, some of them followed by grouping layers and hidden layers are typically convolutional layers followed by activation layers. CNN are very satisfactory at picking up on design in the input image, such as lines, gradients, circles, or even eyes and faces. This characteristic that makes convolutional neural network so robust for computer vision. CNN can run directly on a underdone image and do not need any preprocessing. The strength of a convolutional neural network comes from a particular kind of layer called the convolutional layer. CNN contains many convolutional layers assembled on top of each other, each one competent of recognizing more sophisticated shapes. With three or four convolutional layers it is viable to recognize handwritten digits and with 25 layers it is possible to differentiate human faces.

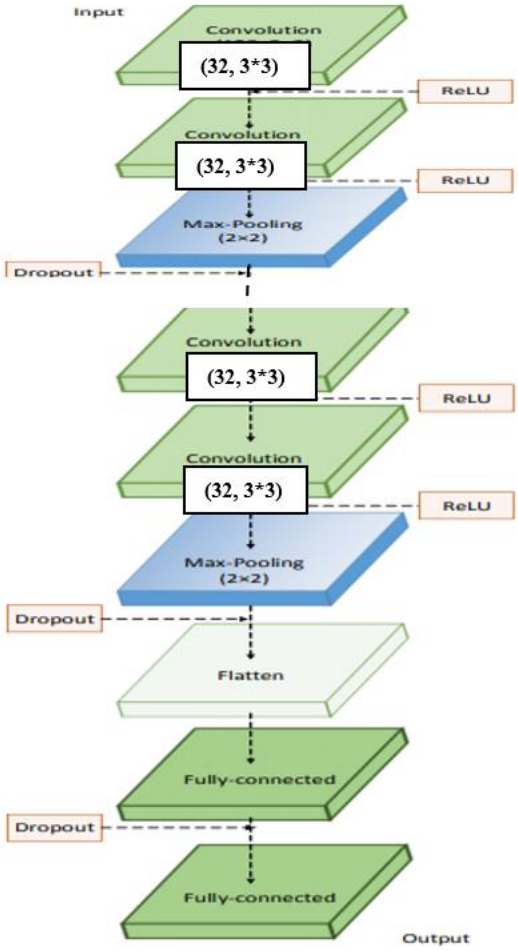

Figure 1. Proposed CNN model

Functionality of the some of the layers present in the Network are explained below.

Convolutional Layer: This layer is the first layer that is used to extract the various features from the input images. In this layer, the mathematical operation of convolution is performed between the input image and a filter of a particular size MxM in our case it is 3*3.

Pooling Layer: In most cases, a Convolutional Layer is followed by a Pooling Layer. The primary aim of this layer is to decrease the size of the convolved feature map to reduce the computational costs.

FC Layer: Connected layer consists of the weights and biases along with the neurons and is used to connect the neurons between two different layers.

Activation Functions: It decides which information of the model should fire in the forward direction and which ones should not at the end of the network. It adds non-linearity to the network. There are several commonly used activation function

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such as the ReLU, SoftMax, tanH and the Sigmoid functions. Each of these functions have a specific usage. For a binary classification CNN model, sigmoid and SoftMax functions are preferred an for a multi- class classification, generally SoftMax us used. Our model uses ReLU and SoftMax as activation function because it is a multi-class classification model. It classifies among 3 different diseases as well as healthy if leaf is not infected.

These layers altogether make this network more efficient, flexible and super active. Some of the parameters like number of filters and kernel size can be varied to get desired output.

IV. PROPOSED WORK

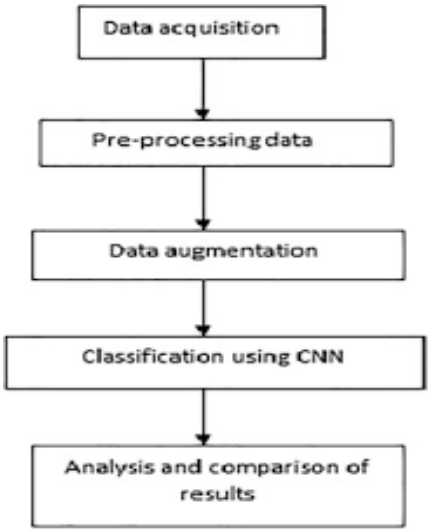

Figure 2. Flowchart of proposed work

The dataset required to train the model is has to be gathered initially. Then this raw dataset has to undergo preprocessing because this enhances the quality of the image. There are various stages present in data preprocessing. Before data feed to system all image has to be in same size, So, resizing will occur. In order to classify the diseases labelling of each class is mandatory. Then dataset will be divided among training set and testing set. Training set will have huge part of the dataset because if there is more data to train the model means more accurate system is. We have tried to collect as many as possible imaged of mango leaves with diseases and without diseases that is healthy mango leaves. Figure 2 clearly illustrates the same.

V. MATERIALS AND METHODS

A. DATASET

A total of 1558 images are used in this work. These were self-acquired images captured in the real-time. These images categorized among four classes namely Mango Anthrocnose, Mango Red Rust, Mango Sooty Mould and Mango Healthy. Based on the category these images are labeled to their respective classes. Fig. 3 shows the sample dataset consists of three diseases and healthy leaf which is captured from mobile camera.

Figure 3. Samples of dataset collected

B. ALGORITHM

Algorithm used in project work to design the model that solves farmers problem of disease detection.

1. Collect the real-time images of the Mango tree containing both diseased and non-diseased leaves.
2. Preprocess all the images for contrast enhancement and feature extraction.
3. Assign the class labels to the images.
4. Categorize the images among training and testing dataset selecting from all the class labels.
5. Train the CNN with the help of training images.
6. Test the CNN with the help of testing images.
7. Validate the performance of the proposed model and compare the results with the other state-of-the-art approaches.

C. TRAINING AND TESTING

Initially, the entire dataset is divided into two parts, the training and the testing dataset. This is done by randomly splitting dataset into training set comprises about 90% of the images and the testing set constitutes about 10% of the images. This ratio distribution is predominately used in the neural network applications.

Therefore, for the training of the CNN 1416 images are used and remaining 142 images are kept for testing the performance of the model. Training a CNN is the practice of running training examples through the model from the input layer to the output layer simultaneously making a prediction and figuring out the results or errors.

D. TESTING

The main aim of testing is to analyze the performance and to evaluate the errors that occur when the program is executed with different input sources and running in different operating environments. The testing steps are Unit Testing, Integration Testing, Validation Testing, User Acceptance Testing, Output Testing. Unit

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testing is a software development process that involves synchronized application of a broad spectrum of defect prevention and detection strategies in order to reduce software development risks, time, and costs.

Integration testing is any type of software testing that seeks to verify the interfaces between components against a software design. Performance of an acceptance test is actually the users show. User motivation and knowledge are critical for the successful performance of the system.

VI. RESULT

The proposed model consisting of training and testing process were implemented using an open-source software framework known to be TensorFlow with Python programming language. Project work deployed using Flask web frame System deployed Training was accomplished in about 3 hours and testing was completed in a few minutes. Primary task is to detect and classify the given Mango leaf. If it is healthy then system shows it as healthy leaf. We have created an web application that detects disease in a mango leaf with the help of training and testing process. The figure 4 shows the web user interface for mango leaf disease prediction system using advanced Machine-Learning.

CNN is one of best Advances Machine Learning algorithm when it comes about multi-class classification problem. In order to deploy our application as public model we have used Flask web platform. Flask is used in the trending sites like Pinterest. It is specifically designed for Python programmer.

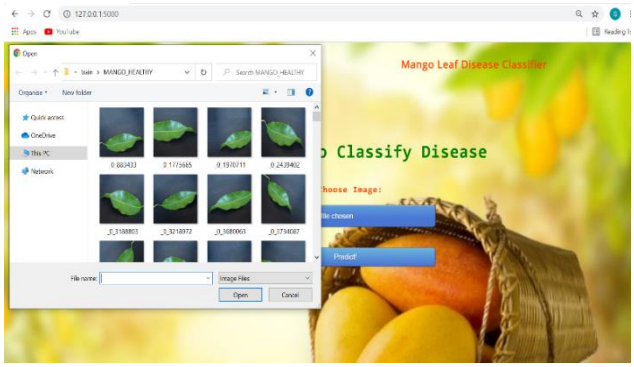

Figure4. Web Interface for Detection system

Above figure shows the interface for farmer to upload the mango leaf disease detection system.

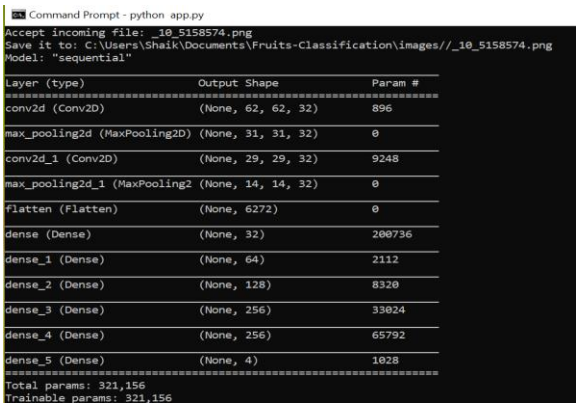

Figure 5. Showing details of each layer of model

Proposed model is Sequential model. Figure 5 shows a parameter of each layer conv2D, max_pooling2D, flatten and 6 Dense layers. Figure 6 successfully gives output when leaf is free of infection.

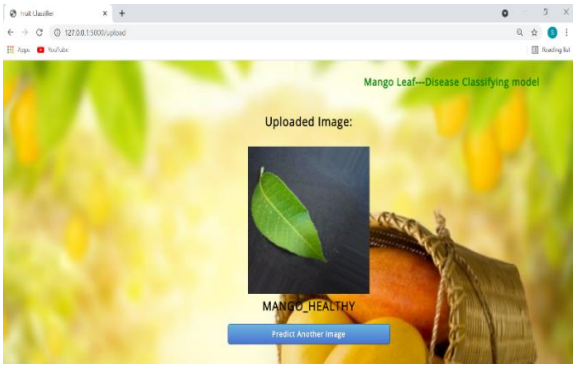

Figure6. System giving result as Healthy Leaf

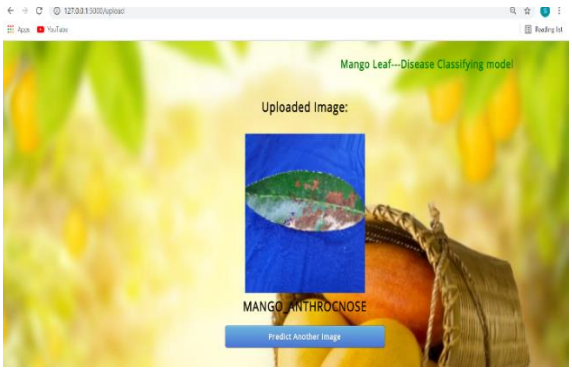

Figure 7. Leaf affected with Anthrocnose disease

Figure 7 shows clearly when farmer upload an image of mango leaf to the system, model will be running at the backend and it classifies it as Mango Anthrocnose.

VII. CONCLUSION AND FUTURE WORK

By controlling the fungal infections causing severe losses in the crop yield, we can enhance the productivity and quality of the plants and its products. This will not only increase the mango production rate but also fruit quality will be enhanced. Through our project farmer can just take a snap of the leaf, upload it to the system and the back-end processing will do analyze, detect and classify the disease. It also classifies as a 'Healthy Leaf' if leaf is not affected with any fungus. Further we are planning to transform the project from website to a complete end use product application. So that farmers can easily download the app in their smartphone and make use of it. The end product would be accurately predicting disease with even more accuracy. Larger set of data would be provided for training network. We will try to deploy our model to other level so that it could solves most of the problems of our farmer. An application which will have options like Mango leaf disease detection, classification, recommendation for pesticides and any precautions if required.

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"Identification of Leukemia from microscopic images using deep learning techniques"

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***Abstract*— Health is the highly marked statistical research aspect in which cancer is pruning. Cancer is the abnormal production of cells in the body. Now, if an imbalance occurs in blood forming tissue including bone marrow it hinders the body's ability to fight infection. This malfunctioning is termed as Leukemia. Traditionally, a hematologist manually examined the reports with microscopic images to test for Leukemia cells. However, this perusal explains an automated identification of the same by eradicating errors using deep learning methods, mainly Convolutional Neural Network (CNN). The dataset has blood smear images; both infected and non-infected which is initially preprocessed for feature extraction and further analysis. This follows- training the model, prediction of cancer and computing the accuracy. The inferred accuracy records to 97.75%, which finds to be better than other neural networks like ANN, RNN etc. This study with CNN is close enough to the initial architecture with less measurable time and increased automation. Therefore, the model can effectively work as a tool in identifying Leukemia.**

Keywords—Health, Leukemia, microscopic images, automated identification, CNN, prediction, accuracy, effective tool

I. INTRODUCTION

The word Leukemia that means 'white blood' derived from the characteristic high white blood cell count that presents in most afflicted people before treatment. The high number of white blood cells is apparent when a blood sample is viewed under the microscope; with extra white blood cells, it indicates frequently cells being immature or dysfunctional. The excessive number of cells can also interfere with the level of other cells, causing further harmful imbalance in the blood count.

In terms of how quickly it develops or gets worse, Leukemia's classification is either acute (fast- growing) or chronic (slow growing). Acute Leukemia rapidly progresses and results in the accumulation of immature, functionless blood cells in the bone marrow. With this, cells begin to reproduce and build up in the bone marrow thus reducing its ability to produce healthy cells. Chronic on the other hand progresses much slowly and results in accumulation of mature, but still abnormal WBCs. Hence, the broadly classified Leukemia types are –Acute lymphoblastic leukemia (ALL), Acute myelogenous leukemia (AML), Chronic lymphoblastic leukemia (CLL) and Chronic myelogenous leukemia (CML). Hematologist used manual methods to find the number of infected cells.

Nevertheless, in the fast growing we look forward for a quick and automatic approach. In such cases, Deep learning becomes the spotlight. Deep learning is a type of machine learning that uses a layered algorithmic architecture to analyze data. In such models, data filtering happens through a cascade of multiple layers, with each successive layer using the output from the previous one to inform its results. As they process more, data models become more accurate, essentially learning from previous results to refine their ability to make corrections and connections. Just as biological neurons connect with one another to process information in the brains of animals, electrical signals travel across subsequent layers of nodes to activate a stimulus in the neighboring neuron.

In particular, the subset of deep learning neural nets have thousands to millions of simple processing that are densely interconnected. Neural networks are organized into layers of nodes and they are "feed forward", meaning that data moves in one direction. An individual node connects to several sub-nodes in the layers beneath it. With these assumptions neural nets we broadly classify into Artificial Neural Networks (ANN), Recurrent Neural Networks (RNN) and Convolutional Neural Network (CNN).

The proposed model here focuses on CNN in deriving the required inference. Multiplying pixel values by weights and summing them is "convolution". Along with various components this nets has several convolution layers; in taking outputs from previous layers to feed as input to next layers, CNN plays a major role of classifying and recognizing complex objects. This algorithm has its own benefits and special features that surpass the abilities on choosing the latter, which we shall discuss further.

II. RELATED WORK

Every research begins by the influence of the previous works and results from various other pre-defined work. It becomes a motivation and inspiration to bring up innovations and betterment being it existing system or a new architecture to build. It paves way for a comparative and cumulative study to end up with newer things that leaves behind certain things un-noticed.

The proposed model by Faisal Asadi and team worked on digital image processing for identifying types of Leukemia using backpropagation methods [1]. Image processing on cotton leaf done to find color variations to check for plant disease rendered by ANN [2]. Using Matlab and image recognition techniques, ANN determination diagnoses

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Coronary disease [3] pops an interest over neural networks. Further study paves way to prediction of dengue using Recurrent Neural Network [4].Also, early glaucoma detection using RNN methods helps in finding the retinal fiber layer defects [5]. These algorithms gave their best results until we came across CNN methods of detection where image processing on unsupervised datasets of white blood cells detection were used [6]. Then leukemia automatic detection with image datasets using various other algorithm like SVM [7], all these gave results but with lesser accuracy but we wish to propose a model with more accuracy and minimum parameters.

III. METHODOLGY

The model is broadly divides into two parts, one is the dataset used and the second is the computation of results using Convolution Neural Network.

Fig 1. Shows the flow of the model architecture where
FMWNV-Feature mapping without negative values
FM-Feature mapping
PFM-Pooled Feature Mapping
Iter^n- Iterations

3.1 Data description

A dataset plays a very important role in training the model in order to make prediction for leukemia. For training, tuning, model selection to testing datasets are majorly used.

In this research work, we can find data in the form of a folder of two data files. One of these files has a number of sample images of blood cells infected by leukemia (Fig. 2) and the second file has images of those cells, which are healthy (Fig.3). This data further divides into training and testing datasets.

The training dataset trains the model to identify the class to which the input image belongs. The testing dataset, which is comparatively smaller to that of training dataset, uses the trained model in order to test for the correctness of the training results given by the model.

Individual images have 640*480 pixels approximately and are in .jpeg format.

3.2 Convolution Neural Network

3.2.1. Convolution layer

Convolution is a function derived from two functions by which we determine how the shape of one modifies due to the other.

$$(f * g)(t) \stackrel{\text{def}}{=} \int_{-\infty}^{\infty} f(\tau)\, g(t-\tau)\, d\tau$$

The above is a mathematical part of it where f and g are two functions, which then integrates as shown where τ is the integration function. However, the convolution layer works as follows.

Filter or a Kernel is an m*m matrix used to detect features in this step which has random values of integers. At first, each pixel of the input image is assigned with an integer (random).The image has more than 600 such pixels which are in the form of huge number of matrices aligned one after the other.

The filter which is the feature detector is a comparatively smaller matrix starts from the top left corner of the image and strides over each m*m matrix of its size across the entire image. Usage wide strides for the data in this study (Fig 3.)

If all the random values of the filter match the values of the pixels matrix then the model puts a '1' into the feature map but if they do not match then it puts a '0'. A feature map is a group of matrices as well which stores 0's and 1's as explained (Fig 4.). The creation of a feature map reduces the image pixels to its essential features and CNN develops multiple such maps, which refers to as convolution layers. This map also adjusts to the image, sharpens it and detects edges. There are small sections of input that come together to form a complete feature map called neurons. Neurons in general are mathematical functions that takes input, multiplies them with certain weights and gives an output.

3.2.2. Rectified Linear Unit (ReLU)

This is a supplementary step to convolution layer and serves the purpose of increasing non-linearity of images.

Non-linear features can be the transition between pixels, the colors etc. that form negative values, in the image and ReLU returns only non-negative values. ReLU is an activation function used in order to return '0' for negative input values and return same values if input is positive as shown.

$$F(\max) = \max(0, x)$$

3.2.3 Max pooling

The network has to acquire a property called "Spatial Variance". This makes it capable of detecting objects in the image without ambiguity, by the differences in image textures, distances, angles and distortions.

We use max pooling in order to create a pooled feature map, which is a matrix that contains only maximum values of the values in the individual matrices (feature map matrices). Therefore, a^2 of the matrix is reduced to a by picking one value from individual matrices as shown in (Fig.6)

This step reduces 75% of the original image information so that the network can proceed towards the result efficiently leading to providing the property of Spatial Variance.

This step solves another major issue of image processing that is "Over fitting" which reduces the complex model for idiosyncrasies.

3.2.4 Flattening

After the completion of the previous steps, it makes a pooled feature map. This step, like its name flattens the pooled feature map into a single column, as shown in (Fig 7.)This procedure is undergone to feed the vector of data into the neural network for further processing.

3.2.5 Fully Connected Layer

The vector of data shown as 'x' in the figure becomes the input to this step. This step takes the previous data, analyses the features, combines them and develops attributes also called classes (here, infected and non-infected) which are shown as 'y' in the figure. (Fig.8)

At the end of this step, the model will be able to differentiate any input blood smear images into those, which are infected, and those, which are not.

This thereby issues a prediction that will be in the form of a probability percentage. If the model shows more than 50%, probability of infection then the prediction shows true or false otherwise.

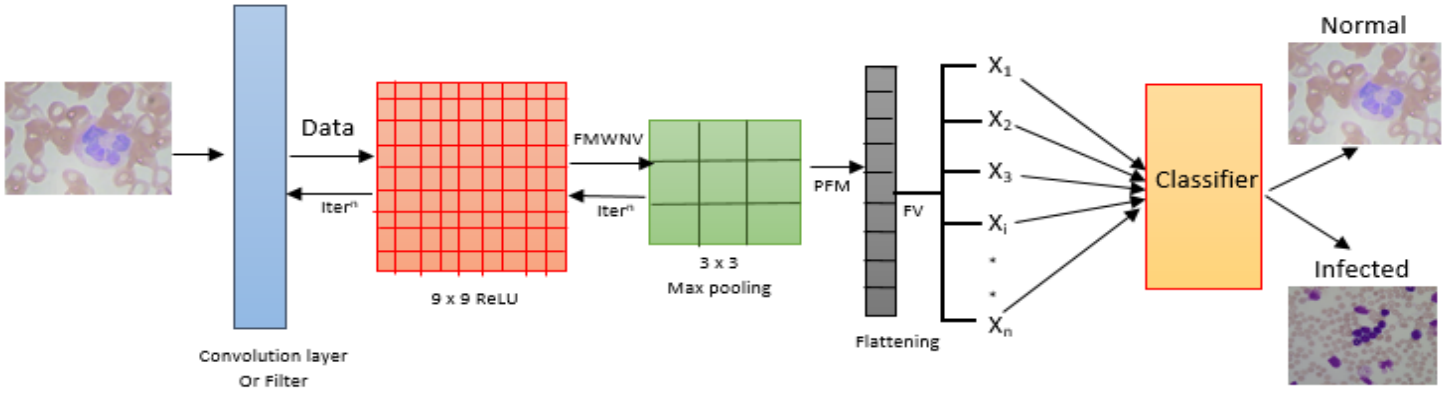

Fig 1.Model Architecture

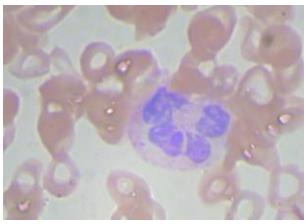

Fig 2. Normal Blood cell

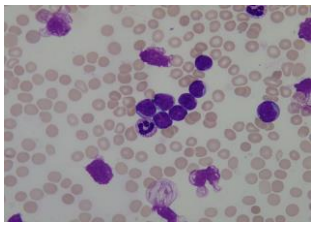

Fig 3. Cancerous cells

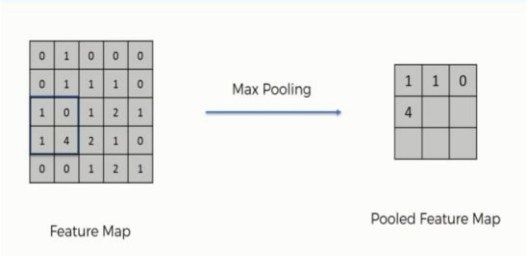

Fig 6. Max pooling matrix representation

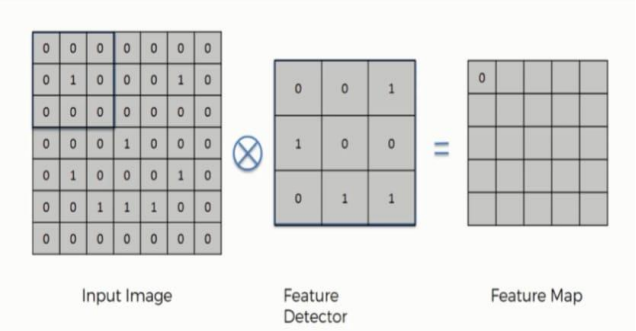

Fig 4. Convolution layer filtering

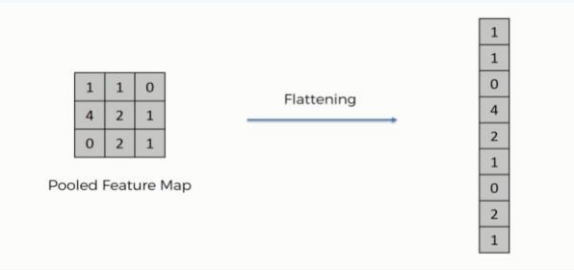

Fig 7. Flattening of pooled matrix

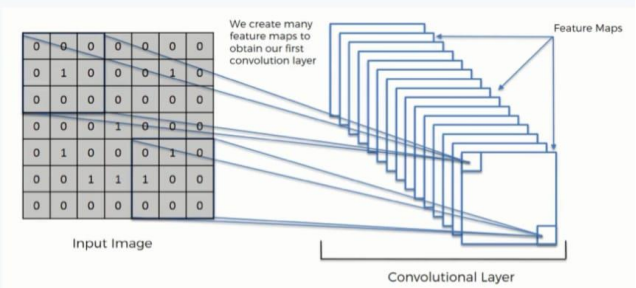

Fig 5. Feature Mapping

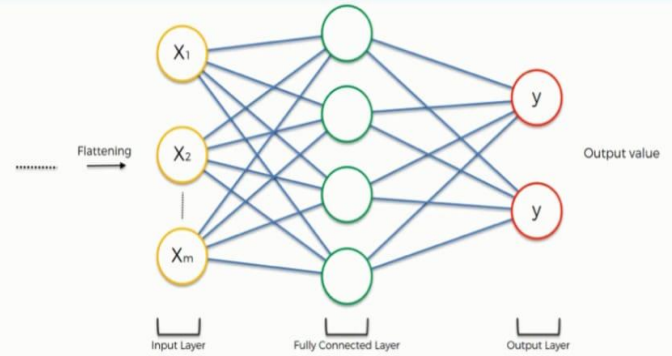

Fig 8. Fully Connected Layer

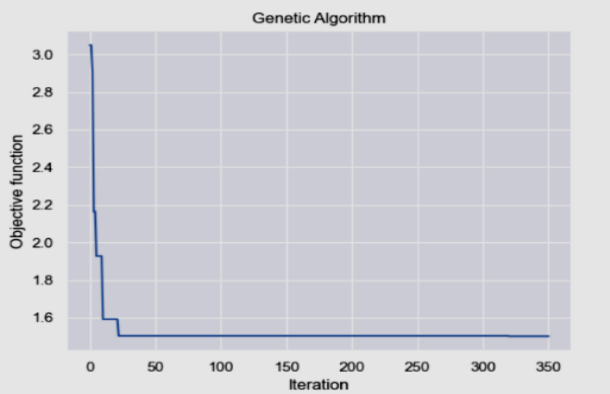

Fig 9. Genetic Algorithm Graph

Fig 10. Cluster Analysis

IV. RESULT ANALYSIS

Initially after classification into two classes, cluster analysis plots are as shown (Fig 10.) according to the probability percentage of infection in the dataset.

Next, the percentage above gets to give the prediction in terms of true or false. If more than, 50% of the features of the uploaded image match to the infected class then the prediction shows to be true for occurrence of leukemia or false otherwise.

Model accuracy, which is the measurement, used to determine how well the model is able to identify the relationships and patterns between variables in the dataset is ultimately computes the following

$$accuracy = \frac{TP+TN}{TP+TN+FP+FN}$$

Here TP and TN refers to true positive and true negative respectively similarly, FP and FN refers to false positive and false negative.

The accuracy of the CNN model in this study approximates to 97.75%, which is prominently higher than major Neural networks as shown in (Fig 9). CNN hence compared to Artificial Neural Network (ANN) and Recurrent Neural Network (RNN), finds to be the most accurate and effective for image processing in this research work, which includes 3D microscopic images of blood cells

V. CONCLUSION

Therefore, as discussed all along the article we have come across a model where a hematologist can eradicate his traditional manual counting method and get an automated output. This is very usual because it initially can satisfy the basic check before a patient takes an extra diagnosis. If the automated prediction tells the being of cancer to be null, then it provide a sense of relief from the fatal disease.

Coming to the accuracy, it mentions to have played a better role in comparison to other ML algorithms. The cluster analysis explains the result vividly. It sums up to 97.75% as per the available datasets with least number of parameters. However, the discussion does not show the proposed model with larger datasets and long training time to achieve great accuracy here.

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Big thanks to the Head of the department, CSE and our project guide Dhanraj. S, Assistant Professor, Dept. of CSE who had faith in our work and stood as a guiding force in accomplishing this research work smoothly.

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Innovative Game Based Educational Application for Learning

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***Abstract*—Video games, a multi-billion dollar industry is one of the most rapidly-growing industries in the world. With game-based learning becoming a growing trend among teachers and children to make play and learn go hand in hand. Researchers have demonstrated that games have the potential to create a learning environment for better achievement of educational and training goals. In this paper we study a game we have developed, that teaches even a layman the basics of science, commerce, arts or any other respective field and life lessons. The main objective of our application is to make learning fun and competitive even for a layman. This application not only makes learning fun but also keeps the user engaged with learning by competing with friends in multiplayer mode. Multiplayer games have good market in gaming industry. Current educational games don't have consistent user base, the plan is to create a multiplayer mode which will keep the users engaged with the game on every day basis to learn new things about the respective fields they are interested in.**

I. INTRODUCTION

Video games have brought a new era of entertainment, in mere decades the gaming industry has exploded in popularity. research suggests that video games teach a lot of soft skills like critical thinking, strategizing, teamwork, decision making. When learning becomes fun, people especially kids become curious and eager to learn more.

The gaming industry is rapidly growing and mainly due to the entertainment aspect of it, hence it's easy to loose focus on it's core value. There is a lot more to games than just entertainment. It's clear that when gaining knowledge becomes fun, people quickly get interested, engaged and benefit from it. It's also worth noting that children with learning disabilities and kids that struggle with regular

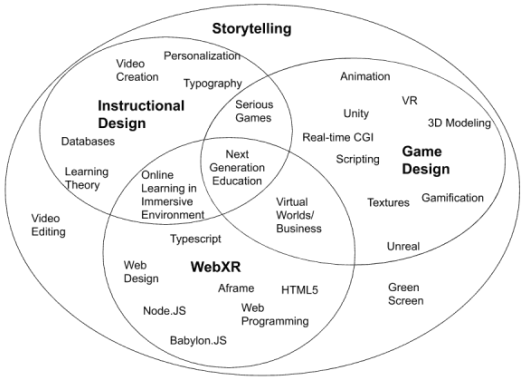


Fig 1: E-learning Convergence

traditional methods of learning would benefit from game based learning methods. Several studies have shown that game-based learning has helped dyslexic children and also children who struggle with traditional learning methods and made them eager to learn more.

Game-based learning is a growing trend among creative educators who are looking for alternatives to traditional learning methods. To incorporate educational games to children giving them access to knowledge in the palm of their hands. Many researchers are discovering that educational benefits of video games might be more useful than we have ever anticipated.

A study by Marcin Wardaszko[7] concluded that game based learning on mobile phones can be as effective as regular traditional textbook learning. When gaining knowledge becomes fun, people quickly get interested, engaged and benefit from it

II. LITERATURE REVIEW

Since the inception of video games, people have been competing against each other to test their skills and intelligence. Games-based learning is no recent innovation. Most early games were puzzles and strategy based, such as puzzle solver or Tetris.

In today's time we can use games to teach mathematics, science to literature and history. Video ames not only help us learn hard skills, research suggests games can also help us learn physical skills, such as flying an aeroplane or conducting surgery. From medical and engineering to literature and finance education, it is clear that we are only beginning to understand different ways of using educational games. Research suggests that from basic Kindergarten to Higher education, game based learning can help students get a better understanding of curriculum and help them excel.

Video game based learning and educational games have attracted the attention of many scholars and researchers because of its natural ability to evaluate and review. Games force players to participate in complex gameplay promoting high-level reasoning, inquiry, persistence, and creativity ([9]Asbell-Clarke, et al., 2017; [11]Stinkuehler & Duncan , 2008; [13] Qian & Clarke, 2016; [12]Shute, Ventura, & Ke, 2015;) game based learning is a very effective tool to

transfer facts, game based learning also promotes STEM learning, to effectively study science, technology, engineering and mathematics. ([4]Abdul Jabbar, 2015; [3]Hamari, Schernoff, Rowe, Coller, Asbell) -Clark, & Edwards, 2015; [12]Shute, Ventura, & Ke, 2015;) A study by [7]Marcin Wardaszko concluded that game based learning on mobile phones can be as effective as regular traditional textbook learning. When it becomes fun to acquire knowledge, people quickly become interested, engaged and benefit from it. Another study found game-based learning assessments to be a robust way to measure implicit and explicit learning. Another study found that video games can have a very positive effect on decision making and creativity.

To understand how we learn, it needs to be put in a broader context. How game science fits into the broader disciplinary framework is an important consideration. From an educational point of view, the notion of "game science" is part of what we might call "education science" and with its digital nature it is often referred to as a sub-discipline of technology-enhanced learning (TEL). [6](De Freitas, S. (2018)).

The review found that "game science" is emerging as a new terminology to replace "serious games" that have been an important term for the Games studies research community for the past decade. Similar to "serious games", the new terminology aims to link the study of Games to a greater scientific potential that has the potential to help us design and better understand: learning behaviors of individuals and groups in gaming environments, metaphors of sport Via learning design and how games work to help people learn [9](: Roe E., Asbell-Clarke)

The current games does not have a consistent user base, our goal is to keep users connected to the multiplayer mode, where questions pop up and users to answer them quickly and correctly in order to score more points than others. Competes are being updated for every correct answer with a time bonus. Establishing the effectiveness of games and learning from games is a complex endeavor.

III. METHODOLOGY

The project works based on the methodology that games will be played based on the tutorials, the users will have single player courses and also endless multiplayer mode where users compete for the highest score. Data gained from each game is analyzed and used to help the users learning experience, from Fig 3.1 we see the general working of the entirety of the game system.

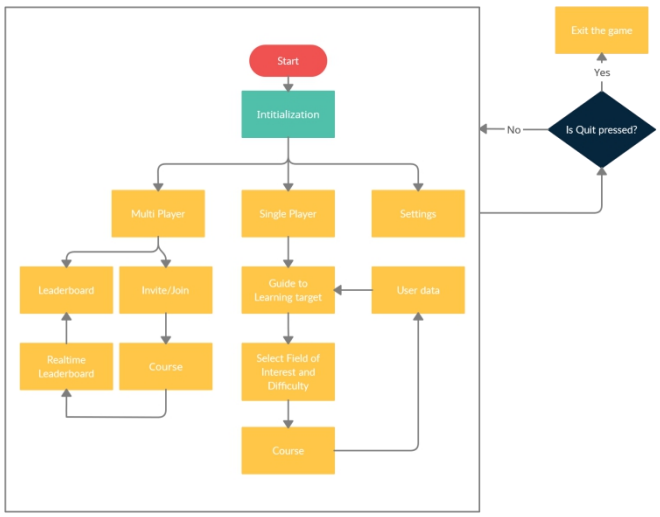


Fig 3.1: S ame

Figure 3.2 shows the details of general working of a course in the game system. Once the user has started the course, he will be supplied with questions. The user has to choose the correct answer for the questions which will assess the users level. Based on the data collected next level will be given to the user.

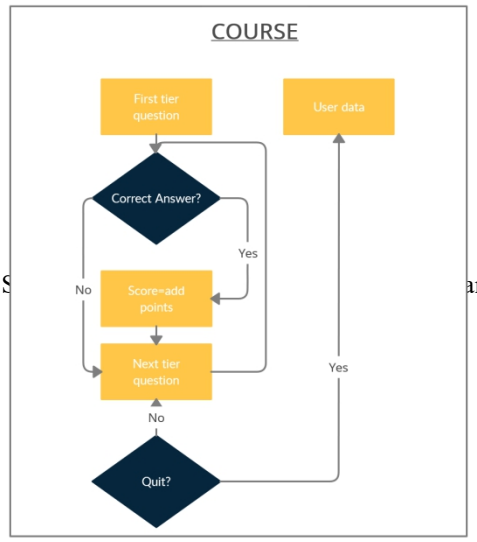


Fig 3.2: System Design for a Course

Game Module Design:

The game is built up of four Major modules which are mini games within the main game. The five modules are designed to cover necessary areas of studies, the five modules are Maths, Science, Languages, General Knowledge.

Maths:

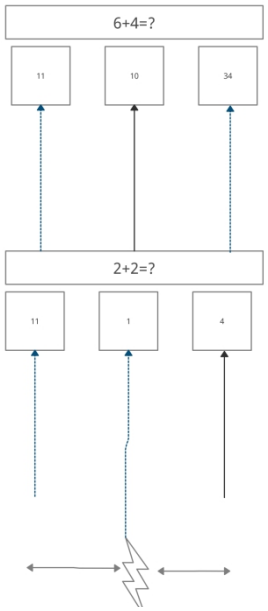


Fig 3.3.1: Game design for Maths module

The game design for building the math game will be similar to endless running games where the player can dodge blocks or collect them on his run. This can be done by swiping over the screen on three lanes, where the player will be provided with a lane and has to move his character to whichever lane that provides the solution for the question.

The question will be displayed on the top which consists of numerical equations depending on the level. The character has to collect the correct block with the answer for the question. After collecting the correct answer, the character will be moved further for next question.

Science:

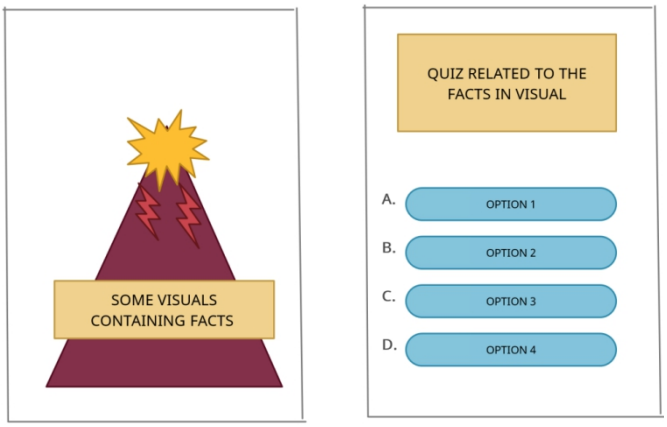


Fig 3.3.2: Game design for Science module

The science section is the most interesting as it provides the user with new facts and knowledge through visuals depicting the facts. This makes the user gain interest towards learning. After the visuals are presented, the user will be provided with a question regarding the same visuals which can be answered by selecting any one of the options provided. For the multiplayer mode endless amounts of science questions come one after the other without any visuals, if the user answers incorrectly then it's game over and the high score is recorded and put in the leader board.

Languages:

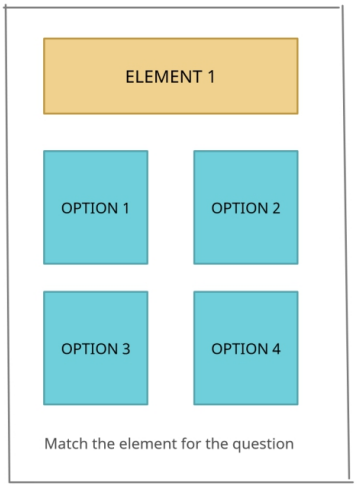


Fig 3.3.3: Game design for Languages module

The language section consists of question and element card with four options. The element card will display the question with the English word. The users will have four options depicted with illustrations of the word into the another language with the translation.

The player has to selected the correct option which matches the image translation of the English word into the other language. This makes it easy to learn any language by just recognizing the images of the word.

General Knowledge:

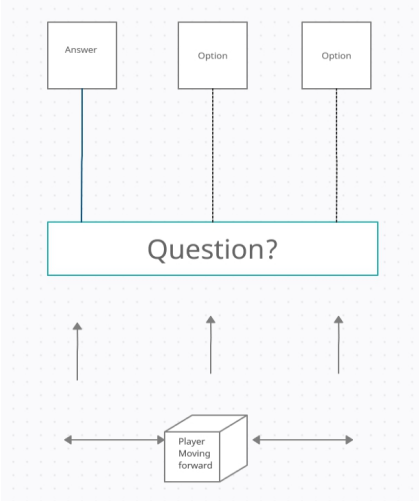


Fig 3.3.4: Game design for General Knowledge module

The game design for building the GK game will be similar to endless running games where the player can dodge blocks or collect them on his run. This is designed similar to the maths game. The player moves left to right by swiping over the screen on three lanes, where the player will be provided with a lane and has to move his character to whichever lane that provides the solution for the question.

The question will be displayed as a wall infront of the character, which consists General knowledge questions based on the level. Then after passing the wall the character will be provided with 3 options in different lanes, they have to collect the correct option with the answer for the question. After collecting the correct answer, the character will be moved further for next question.

IV. GAMEPLAY

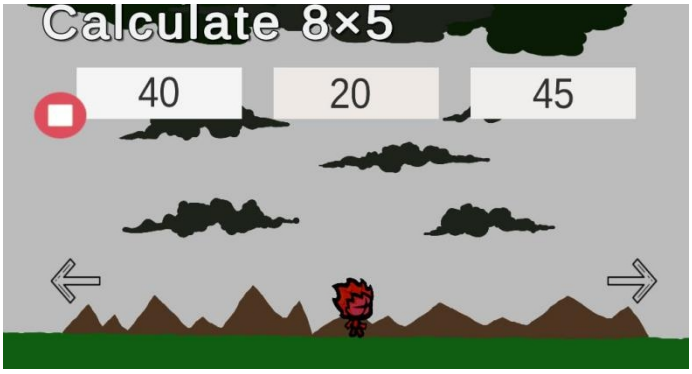


Fig 4.1: Gameplay for Maths game

The gameplay is as shown in Fig 4.1 for Maths game. The user will have options to choose from difficulties low, intermediate and high with respective level of difficulty in questions and time limit to answer them. For multiplayer they start at low speed and basic questions for Mathematics, as the users answers the questions the speed and difficulty level of the questions will increase accordingly in an endless survival game. If the player answers wrong it's game over and the highest score will be recorded in the multiplayer leader board.

The question will be shown at the top of the screen and the choice of answers will fall down from the top of the screen, the user has to solve the answer before the choices reach the player and the player has to stand below or catch the right choice of answer to gain points and move on to the next question.

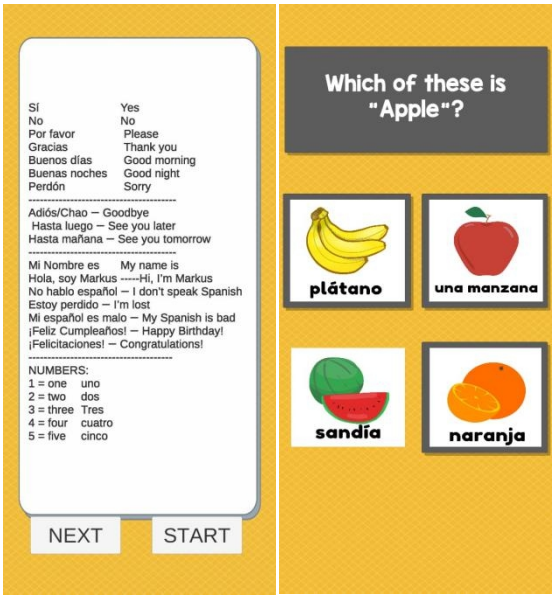


Fig 4.2: Gameplay for Language game

The gameplay is as shown in Fig 4.2 for Language game. The language game consists of question and element card with four options. The element card will display the question with the English word. The users will have four options depicted with illustrations of the word into the another language with the translation.

The player has to selected the correct option which matches the image translation of the English word into the other language. This makes it easy to learn any language by just recognizing the images of the word. The game has multiple levels and as the levels increase the game style and difficulty increases too.

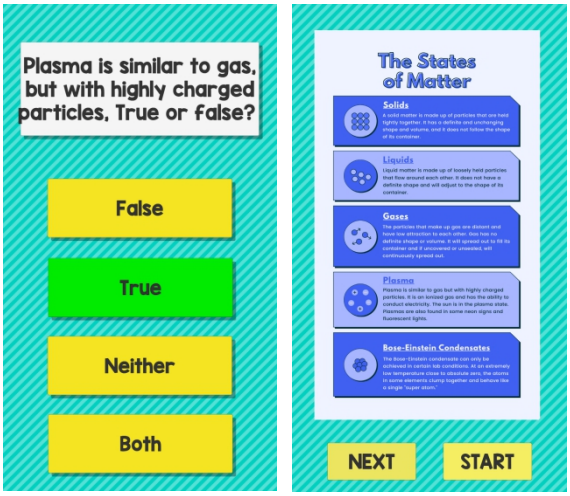


Fig 4.3: Gameplay for Science game

The gameplay is as shown in Fig 4.3 for Science game. The science section is the most interesting as it provides the user with facts and knowledge through visuals depicting the facts. This makes the user gain interest towards learning. After the visuals are presented, the user will be provided with a question regarding the same visuals which can be answered by selecting any one of the options provided.

The player has to selected the correct option for the given question to earn points. This makes it easy to learn new facts while playing a game. The game has multiple subjects, levels and as the levels increase the game style and difficulty increases too. For the multiplayer mode a total of around thousands of science questions come one after the other without any visuals, for every right answer the player gets points, if the user answers incorrectly then it's game over and the high score is recorded and put in the leader board.

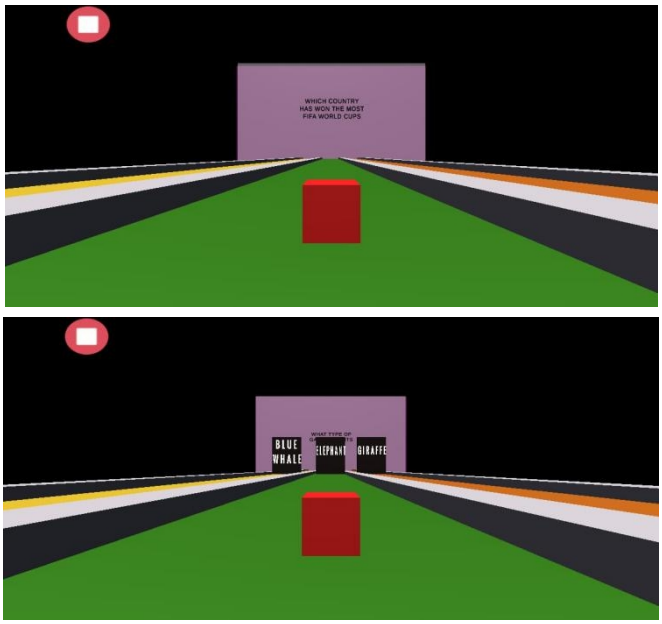


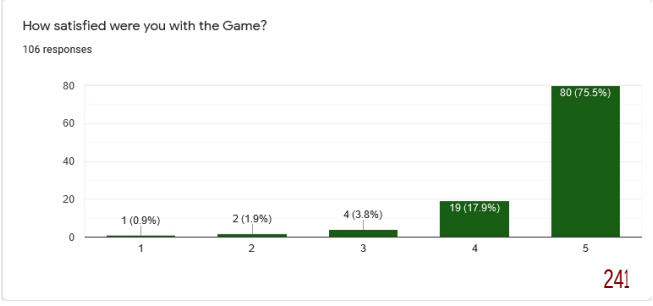
Fig 4.4: Gameplay for General Knowledge game

The gameplay is as shown in Fig 4.4 for General Knowledge game. The user will have options to choose from difficulties low, intermediate and high with respective level of difficulty in questions and time limit to answer them. For the multiplayer mode a total of around thousands of General knowledge questions come one after the other without any visuals, for every right answer the player gets points, if the user answers incorrectly then it's game over and the high score is recorded and put in the leader board.

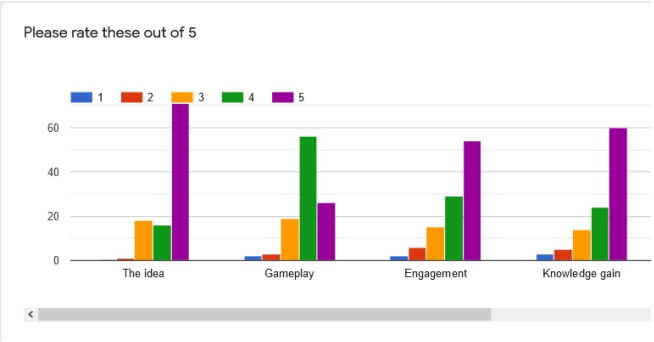
The question will be shown in a wall and the choice of answers will be shown once the user passes the wall, the user has to answer before the choices reach the player and the player has to move to the lane which has the right choice of answer to gain points and move on to the next question.

V. RESULTS

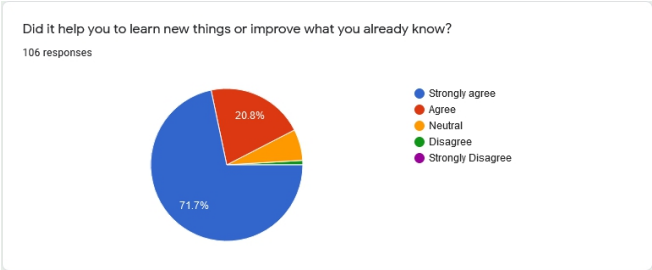
A survey was conducted among different age groups of people starting from 5 year to 50 year old and asked for their reviews on the criteria of Engaging, Knowledge, Gameplay, Art style. Pre test and post test opinions were collected from them and a graph was made.



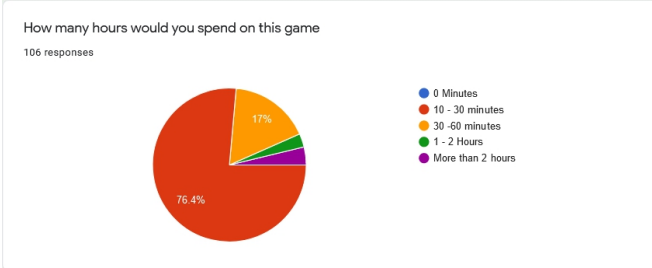
Graph 1: Overall review of the games



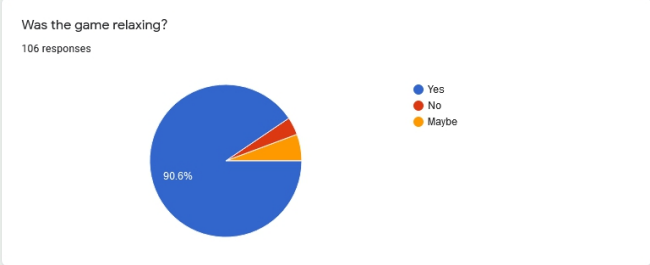
Graph 2: Feedback of users on Idea, Gameplay, Engagement, Knowledge gain



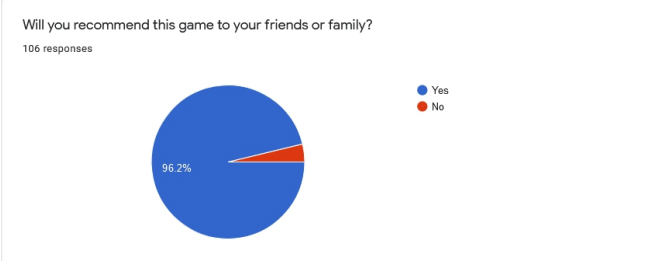
Graph 3: Feedback on learning new things



Graph 4: Amount of time users would spend on the game



Graph 5: Feedback on game's relaxing feature



Graph 6: Recommendation to family

The findings suggests the effectiveness of game based learning in learning support and attention improvement. Out of 106 people 15 were of age 5-10, 23 were of age 10-15, 11 of them of age 15-20, 38 were of the age of 20-25, 4 of them were of age 26-30, 9 of them were of age 30-40, 6 of them were of age 40-50. Evaluations showed good results towards the project. Surveys seemed to be the most feasible way for evaluation as it's a direct way of getting feedback from the users. The survey report was difficult to analyze given different age groups and diverse aspects of studies on Game based learning for comparative interventions and effectiveness. The following points summarizes the findings of our research and survey.

1. From the survey 71% of the users strongly agreed that the game was interesting and they learnt new things, 20% of them agreed. Which goes to show that game based learning can significantly increase interest in learning and impart knowledge.
2. 80% users were satisfied and happy with the learning application and suggested that it helped them learn new things.
3. The survey also revealed that majority of the users almost 90% found the game relaxing. Since mental health is also important, game based learning can significantly increase learning capabilities.
4. Almost all the users agreed that the idea of a game based learning app was helpful and should be promoted.
5. 96% of users said they would recommend the game to their family and friends.
6. The survey showed that people would normally spend 10 minutes to 30 minutes in a day in the game, which seems ideal amount of screen time.
7. Learning through games increases the students response time, decision making, skills and develops their ability to quickly grasp new information.
8. From reviewing the survey results and monitoring user gameplay it becomes clear what makes users interested and engaged to learning games. The gameplay, competitive nature and drive to achieve goals was demonstrated by players being confident, enthusiastic and strategic to achieve their goals

VI. CONCLUSION

This paper proposes an innovative, interactive game that involves learning and discovering the talent and fields of interest of the player which compete with mainstream gaming. This game regenerates the lost interest for learning as an alternate and utilize the available time period with learning. The game makes learning fun and competitive even for a layman. This application not only makes learning fun but also keeps the user engaged with learning by competing with friends in multiplayer mode.

ACKNOWLEDGMENT

The authors would like to thank the department of Computer Science Engineering at SMVITM College for guidance, assisting us in creating the game. We would like to thank Dr. Nagaraj Bhat, SMVITM College for the immense support he provided us during the coursework of this project.

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REAL TIME STOCK PREDICTION USING RECURRENT NEURAL NETWORK

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Abstract-

The goal of this paper is to design a system that will best forecast the future value of Stock Market. In this paper we are using Stacked LSTM approach to forecast the approaching worth of Stock Market. The main library used is Keras which provides the RNN model. The dataset collected will be on a big scale for more accurate prediction. We are going to create an UI Interface that will give user the control to select the required company he/she is interested in and then it will use the RNN algorithms and will represent the predicted value in a graph form.

Keywords- *Recurrent Neural Network (RNN), Long short-term memory (LSTM), Deep Learning*

I. INTRODUCTION

Stock market prediction is determining the upcoming worth of stock market trends. Stocks are bought by investors when they are cheap and sold when stocks are expensive. A stock market is where traders and brokers can buy and sell shares and bonds. The stock market is unpredictable which abstain people from investing in the stock market. Thus, the need to determine stock market value is even more crucial.

A stacked LSTM consists of various LSTM layers where every layer contains various memory cells. A stacked LSTM with high dimensionality is used. A stacked LSTM is a stable method for sequence prediction problem. Given that LSTMs work on order data, meaning that the addition of layers join levels of abstraction of input observations over time period. In effect, chunking observations over time or representing the difficulty at different time scales.

II. PRIOR AND RELATED WORK

The main purpose of our project to anticipate the future outcomes of any given share based on how the value of that particular share has varied in past in simpler sense we are take historical financial time-series data and predict how it may vary in future. There have been many works done in this field and also in fields related to them.

A group of scientists and computer experts did a comparative study and compared many machines learning as well as many deep learning techniques to foresee stock values and showed which method gave the most promising result. (Reference: - Forecasting Stock Market Patterns Using Machine Learning and Deep Learning Approaches Via Continual and Duplex Data; a Comparative Analysis)

Another group of scientists worked on the forecasting of stock market trends with the help of tick data. (Reference: Indian stock market value forecasting using ANN on tick data)

Behavioral Analysis

With fast paced digitalization, the amount of data which we have at our disposal is increasing exponentially. A bulk of these data comes from various social media platform where people express their feelings, thoughts, ideas, reactions etc. everyday.Thesedatacanbehighlyproductive in knowing the general sentiment and morale of people at any given time or on any given topic. Many important decisions, which can either be of political nature or economical, could be taken by considering this into account. Yuan in 2016 ventured into this field by exploring lexicon, rule and ML-based sentiment categorization. Lakshmi et al. (2017) surveyed on the demarcation of Twitter data using NB.

Stock Market Volatility

We all know how volatile stock market is in terms of its nature. Any false news or rumors can turn the market upside down and on top of that there are other external factors as well, such as financial crisis, recession etc., which can also affect the stock market adversely. Many efforts have been made to foresee such possible future events. Kumar and Patil (2015) used time series and machine learning techniques as well, in order to forecast volatility of S&P 500 index.

III. BUILDING THE PREDICTING MODEL

As human don't start thinking from scratch every second and understand each word based on your understanding of previous words while reading an essay or in general, in the same way LSTM also worklist based RNN models are able to connect precious information to the present task that is why they are used in time-series data for categorization, converting and building prediction.

LSTM recurrent neural network belongs to the group of machine and deep learning formulas, approaches and methods. It is a repeated network because of the response connections in its constructing design which allows it to operation the entire order of facts. LSTM are explicitly made to avoid the long-term decencies problem. Remembering data for a long period of time is practically their default behaviour something they struggle to learn.

All RNN has a configuration of a string of repeating modules of neural network. In normal RNNs, this reproduces section will have an easy design, such as a one tanh surface. But LSTM structure comprises of 4 parts: the cell, input, output and forget gateway. The unit part of the LSTM recall values over random time period, and the three gateways check the run of in and out of the unit. The unit of the prototype is used for storing path of the reliance between the element in the input order. The input gateway is responsible for amount of data that will move in the unit cell, the forget gate manages the size to which a data last in the unit, and the output gateway responsible the expanse to which the worth is used to calculate the LSTM unit.

IV. EXISTING SYSTEM

The existing system works on various different approaches such as applying OCR technique on finance news, tweets, some other approaches are feature selection, using different indicators such as EMA, RSI.

Some system uses SVM and Decision Tree approach but they are good only when the dataset is of small-time duration when the datasets become large it overfits with big noise.

Some studies show that deep learning methods such as RNN and LSTM works good when they use duplex datasets instead of unbroken one.

Author	Year	Focus	Approach
Pawan Kumbhare et. al.	2017	Predicting stock market using SVM & Decision Tree	SVM & Decision Tree Algorithm
Amir Mosavi et. al.	2018	Predicting Stock Market Trends via Continuous & Binary Data	Comparative Analysis using Machine Learning & Deep Learning Algorithm
Adarsh Paul et. al	2019	Machine Learning Algorithm to predict the longevity of stock	Random Forest Algorithm was used to predict the stock market trends.
Vineet Kumar et. al.	2019	Analyzed Indian stock market prediction using artificial neural networks (ANN) on tick data	They use neural networks based on three different learning algorithms Levenberg-Marquardt, Scaled Conjugate Gradient and Bayesian Regularization for stock market prediction

COMPARISON				
TITLE	**OBJECTI VE**	**TECHNOLOGIES USED**	**ADVANTAGES**	**DISADVANTAGES**
Stock Market Prediction Using Machine Learning Methods	This model obtains from the market figures making use of machine learning strategies and measure the future values in stock value growth	SVM & Random Forest Algorithm	It meets different region of experimentation including data preprocessing, random forest.	It tends to overfit; it is not that interpretable; target classes are overlapping.
SVM based method for stock market value forecasting	An SVM-based method is put forward for stock market value forecasting. The proposed method consists of two section: feature selection and prediction model.	SVM	SVM scales relatively well to high dimensional data .	Its over-fit with high noise dataset
Stock Market Value Prediction Using High-Level Information of Time Period	They launch a new method to make simple noisy-filled financial temporal period via order repair by holding motifs and then utilize a complex neural network to catch contiguous structure of time period	Convolutional neural network (CNN)	Their method put light on apparent pattern locate in financial time period and gives a novel solution for value forecasting	Examination is not common independent; a one chance affair may affect all later datasets tip.
Indian stock market forecasting using artificial neural system on tick dataset.	In this paper, they have used difference of ANN to forecast the stock cost.	Artificial Neural network (ANN)	The estimate results show that for the continual data, RNN and LSTM exceeds other forecasting models with a sizeable difference.	The accuracy of 15-minute dataset is remarkable poor in contrast with the output obtained using tick data.

Predicting Stock Market Trends Using Machine Learning and Deep Learning Algorithms Via Continuous and Binary Data Comparative Analysis.	In this research paper, they concentrate on comparing prediction performance of nine machine learning models and two deep learning approaches to forecast stock market patterns.	RNN, LSTM	The estimate results indicate that for the continual data, RNN and LSTM exceeds other prediction approaches with a sizeable difference.	The prediction model doesn't perform well with continuous data as compared to binary data.
Predicting Stock Market Trends Using and SVM Decision Trees and examine how these methods differ in performance	They work on the forecasting of financial motion with SVM. To judge the forecasting ability of SVM, they differentiate its performance with Decision trees.	SVM	SVM needs less memory to keep the forecasting model and outputs more clear results and a graphical explanation.	Only single dataset from Yahoo Finance was applied. The option of the indicator method can significantly increase/decrease the accuracy of the forecasting model.

CONCLUSION

In this study, we have worked on Recurrent Neural Network (RNN) and Long Short-Term Memory (LSTM) methods to forecast the stock market trends and patterns and created an interface that user can use to select a company to see the stock value for certain companies.

In future this might turn out to be a game changer in stock market. Everyone might refer to this idea before investing in the stock market. People can be sure that they will be getting something in return and they won't be at a loss.

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Detection of Fake News using Machine Learning Algorithms

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***Abstract*— The sharing of information via internet has been increasing over the years. The internet has been a source of easy information and is used more than traditional ways like newspapers or magazines. It is important to identify information from the internet as real or fake as mislead information could cause a lot of havoc in the society. Fake information can be the cause of riots, chaos and can affect a large group of society. In this paper, we talk about the methodology used to detect false news using machine learning classifiers and natural language processing to authenticate whether a news is real or not. For the generation of feature vectors, we use the proposed methods like count vectorizer and TF-IDF. To detect the news as fake or real we're comparing several classifying techniques to find out the best model that could be used to detect false news.**

Keyword—Fake news detection, SVM, decision tree, random forest, naïve bayes, NLP, Machine learning.

I. INTRODUCTION

People dwell on the internet for different reasons as data is present in abundance over the internet and one should be cautious that the data is original or not. We share our feelings or information over the internet via audio, video or text. These days a large population is blinded by the technology because of which there are serious consequences of fake news over groups of society.

According to a survey, people living in the USA reside on getting news online than print media. It's important to conserve this data thus, this paper discusses the vulnerability of individuals and the escalation of spread in fake new and also the required mechanism to detect fake news to protect the society.

Fake news spreads faster than the real news so in the proposed system we use a dataset from the dataset obtained from Kaggle. The data is labeled into two categories- real and fake news and then combined as one dataset. This dataset is used to train the machine learning model. In this project, we're trying to build a machine learning model using four different classifiers and using different vectorizers. The aim is to predict news which misleads the user and create chaos.

II. PROBLEM DEFINITION

In the world of internet, it is very important to check the source of information and judge whether the source is legit or not. Misled information can create a lot of chaos and could lead to bullying of people, instill fear amongst the people, might create political issues or riots, etc. To avoid that we're building a machine learning model that could detect false news.

The model detects fake news by judging the headlines and the body of the articles. We're training the model using a dataset from Kaggle.com. We're testing four different classifying algorithms to and comparing the one which gives the best accuracy. The model with the accuracy would be the final model for the detection of fake news. The four classifying techniques used are, SVM (Support vector machine), Naïve bayes, random forest and decision tree.

III. RELATED WORKS

There have been several approaches to detect fake news. A lot of research has been conducted by several people to bring some clarity into this field, so that the chaos due to mislead information could be avoided.

- The paper [1] used three classification algorithms and then combined all three to achieve a higher accuracy. The classifying techniques used were SVM and naïve bayes and then they were combined. It was found that the combined model yielded a higher accuracy of about 94% when compared with the other two. The news authenticator compares the news articles with other news on the internet. If it finds an authentic source, it marks it as true else it is fake.

- [2] involves using a tool designed to detect and eliminate fake news. Websites containing mis-information is flagged as false. The tool should be installed in the system of the user. It uses several classifiers like, logistic regression, naïve bayes, random tree etc, for the purpose. According to them naïve bayes provides the highest accuracy.

- [3] proposes four different models using different classifying techniques like logistic regression, K-nearest neighbor, decision tree and random forest and choses the best amongst them all. According to their result, logistic regression yields the max accuracy of 71%.

- [4] uses three classifying algorithms SVM, naïve bayes, logistic regression and compares the accuracy of all the results. According to them the naïve bayes model with lidstone smoothening yields the maximum accuracy of 83%. It tests the model on a dataset from Kaggle having about 2000 fake articles and 1800 true news articles.

- [5] used naïve bayes model for the purpose of detecting fake news. This simple model yields an accuracy of 75%. The accuracy could be increased by using a different dataset and also by combining several classifying algorithms.

IV. METHODOLOGY

The different steps involved in building the proposed system is as follows:

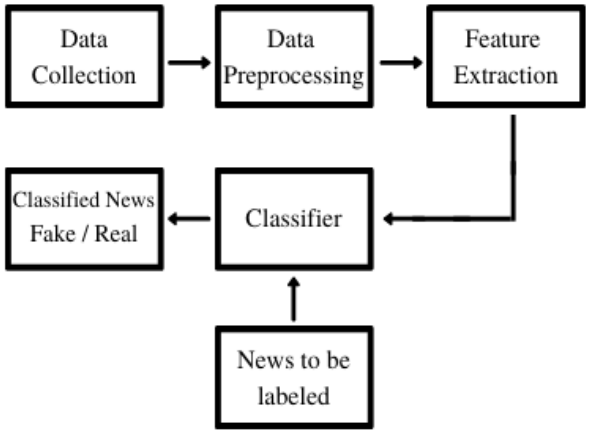

Fig 1: Flow Chart of Detection Model

1. Data Collection

The data is collected from the Kaggle database [6] which consists of labelled data. The dataset consists of around 20000 real news and 20000 fake news. The dataset has headlines and body section for each article.

2. Data Pre-processing

The dataset consists of title, body, subject and date for each news article. The title and body are

retained and the subject and date fields are removed. Any redundant data in the title column is also removed. Also, all the alphabets in the dataset are changed to lowercase.

3. Feature Extraction

The data has to be interpreted to analyze the text. The text should be converted into integer or floating-point values and then sent to the machine learning model. The vectorization method used in the given system is Bag of Words method using the TF-IDF and count vectorizer.

4. Classifiers

A total of 4 machine learning algorithms are used to predict the fake news in this proposed system. Count vectorizer and TF-IDF vectorizer is used to convert data into vectors. It is then passed into the model and the listed algorithms are applied to find the best algorithm for this proposed model.

a) Naïve-Bayes Classifier:

A Naive Bayes classifier is a machine learning model that is used for data classification. It is a supervised machine learning algorithm and the classifier mainly is based on the Bayes theorem.

The assumption is that the occurrence of one certain element is independent of the occurrence of another element. So, it is called Naïve. Such as if the fish is identified on the basis of size, colour and type of water then medium, glittery and sea water is recognized as a snapper. Hence each feature is considered independent to identify that it is a snapper without considering the other features.

b) Support Vector Machine:

Support vector machine is a supervised machine learning model that analyse text for classification and regression. It is first trained with training data and then used to predict for test data. After which a hyper plane is used which separates the classes which is used to classify the data.

c) Decision Trees Classification:

Among the other classification algorithms, one of the most commonly used classifiers is Decision Tree classifier. Decision tree classifier is a supervised learning algorithm and also a very powerful classifier. Decision tree classifier can perform both classification and regression like the support vector machines. All the possible solutions to a decision are graphically represented.

It is easy to understand as it uses tree analysis to classify the data. The data is broken into smaller parts and the decision tree is built. Decision trees support both categorical data and numeric data.

d) Random Forest Classification:

Random forest classification is a group of decision trees from a subset of randomly selected training data set. It combines the weight from each decision tree to find the final test object.

The random forest classification is based on ensemble learning. It is a type of learning where you join different types of algorithms multiple times to form a more powerful algorithm which can give higher accuracy. It combines multiple trees to form a forest hence the name random forest to give higher accuracy to the proposed model.

V. CONCLUSION

To tackle the increasing false information on the internet, the machine learning model created distinguishes an input as real news or fake news. A lot of social media sites like WhatsApp or Facebook are trying to implement such systems into their system to prevent the spread of fake news.

Amongst the four approaches or classifying algorithms used, ___ gives the best accuracy.

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Plant Leaf Disease Detection and Classification Using CNN Deep Learning Algorithm

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***Abstract*-The latest generation of convolutional neural networks (CNN) has achieved impressive results in the field of image classification. This paper is concerned with a new approach to the development of plant disease recognition model, based on leaf image classification, by the use of deep convolutional networks. Novel way of training and the methodology used facilitate a quick and easy system implementation in practice. The developed model is able to recognize three types of diseases of one plant and pesticides and/or fertilizers are advised according to the severity of the diseases. The type of green leaf diseases is recognized by CNN. After recognition, the predictive remedy is suggested that can help agriculture related people and organizations to take appropriate actions against these diseases.**

Keywords—Plant leaf disease, Deep Learning, CNN algorithm.

I. Introduction

India is notable for its generation of horticulture. The majority of the masses depends upon horticulture Farmers have a variety of cultivation options in the field. These crops are still cultivated in a technical manner for the best harvest and the highest quality of production. Thus, the yield can be increased and the use of technology can improve quality. Generally speaking, when a plant has disease, we can say that leaves are the fundamental marker of the plant's disease. We can generally observe the spots on her leaves due to illness. However, when the plant has a lot of infection, the whole leaf is secured by the sickness spots. India is quick creating nation and farming is the spine for the nation's advancement in the beginning times. Because of industrialization and globalization ideas the field is confronting obstacles. Over that the mindfulness and the need of the development should be imparted in the brains of the more youthful age. Presently multi day's innovation assumes essential job in every one of the fields yet till today we are utilizing some old procedures in horticulture.

The primary occupation in India is agriculture. India ranks second in the agricultural output worldwide. Here in India, farmers cultivate a great diversity of crops. Various factors such as climatic conditions, soil conditions, various disease, etc. affect the production of the crops. The existing method for plants disease detection is simply naked eye observation which requires more man labour, properly equipped laboratories, expensive devices, etc. And improper disease detection may lead to inexperienced pesticide usage that can cause development of long-term resistance of the pathogens, reducing the ability of the crop to fight back. The plant disease detection can be done by observing the spot on the leaves of the affected plant. The method we are adopting to detect plant diseases using Convolution neural network (CNN).

II. Literature Survey

Image acquisition, pre-processing of images, extraction of features, recognition and order of plant infection are the essential strides for ailment discovery utilizing image Processing. In the initial step we recognize the mostly green hued pixels. Next, these pixels are concealing dependent on explicit limit esteems that are processed utilizing Otsu's technique, at that point those for the most part green pixels are veiled. The other extra advance is that the pixels with zeros red, green and blue qualities and the pixels on the limits of the tainted group (object) were totally expelled. The trial results exhibit that the proposed strategy is a powerful procedure for the location of plant leaves infections. The created algorithms proficiency can effectively recognize and arrange the inspected illnesses [1]. The primary colors of the color image are red, green and blue. Because of its range, it is hard to implement the application using RGB. They therefore convert RGB to gray pictures. Detection of plant disease by some automatic technique is beneficial as it reduces extensive monitoring work in large crop farms and distinguishes the side effects of the illness itself at very early stages. They presented a survey on different techniques of classification [2]. Abdul bari et al used MATLAB in their paper to extract and recover images. Digital camera is used to capture images here [3]. Prashant and Mrunalini.R.Deshmukh compares the threshold of Otsu and the K is the clustering algorithm for the analysis of infected leaves K's clarity means clustering is more precise than any other method[4]. In this paper, J.K.Patil describes how low - level image features such as color and texture can be extracted [6].In his paper, Anand Kulkarni discusses the Gabor filter and ANN respectively for feature extraction and classification [7]. An Overview of the Research on Plant Leaves Disease location utilizing Image Processing Techniques introduced audits and outlines picture preparing procedures for a few plants animal groups that have been utilized for perceiving plant illnesses. The real systems for identification of plant infections are: back proliferation neural system (BPNN), Support Vector Machine

(SVM), K-closest neighbour (KNN), and Spatial Gray-level Dependence Matrices (SGDM). These strategies are utilized to investigations the solid and ailing plants leaves [8].

III. The Proposed System

The proposed system has concentrated on recognizing the green leaf diseases which assists the farmers to take a proper measurement and increases the production of plants. In this paper, an automated system is proposed for diagnosis three common green leaf diseases (Brown spot, Leaf blast, and Bacterial blight) and pesticides and/or fertilizers are advised according to the severity of the diseases. The type of green leaf diseases is recognized by CNN. After recognition, the predictive remedy is suggested that can help agriculture related people and organizations to take appropriate actions against these diseases.

Pre-processing and training the model (CNN): The database is pre-processed such as Image reshaping, resizing and conversion to an array form. Similar processing is also done on the test image. The train database is used to train the model (CNN) so that it can identify the test image and the disease it has. CNN has different layers that are Dense, Dropout, Activation, Flatten, Convolution2D, and MaxPooling2D. After the model is trained successfully, the software can identify the disease if the plant species is contained in the database. After successful training and pre-processing, comparison of the test image and trained model takes place to predict the disease.

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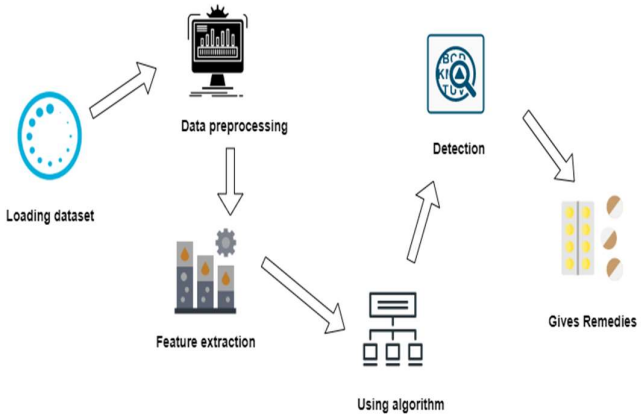

Fig.1 Proposed System Architecture.

1. *Data Pre-processing:*

For plant's leaf examination data, there is a large number of missing data due to human error. Thus, we need to fill the structured data. Before data imputation, we first identify uncertain or incomplete leaf data and then modify or delete them to improve the data quality. Then, we use data integration for data pre-processing.

2. *Feature Extraction:*

It is a type of dimensionality reduction where a large number of pixels of the image are efficiently represented in such a way that interesting parts of the image are captured effectively.

3. *Using Algorithm:*

Here CNN layer is used for analysis purpose. CNN is a very popular approach in deep learning technique in which multiple layers are trained robustly. CNN can be applied to construct a computational form that operates on unorganized Image inputs and transforms them into the correct output categories for classification. CNN structure is made up of several layers as shown below, which illustrates the architecture that we used to construct the CNN.

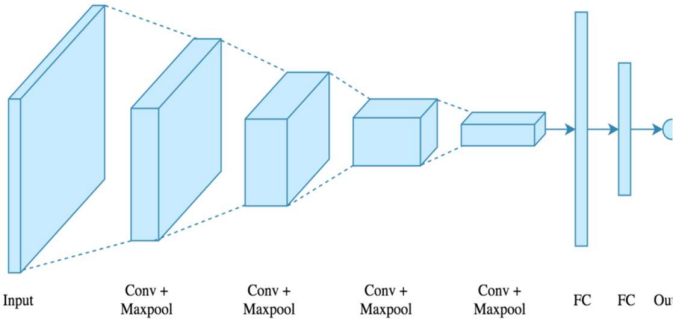

Fig.2 CNN Model Architecture.

CNN uses mainly three types of layers to form this architecture i.e., convolutional layer, pooling layer and Fully Connected layer.

A. *Input Layer:*

This layer contains the raw pixel values of the input images and in this case the input images are of size [50 x 50] with three colored channels, R, G, B hence the input images are of dimensions [50 x 50 x 3].

B. *Conv Layer:*

This layer applies a specific number of filters i.e., convolutional filters to the input image and the output computed is the dot product of the weights and the regions to which the input neurons are connected in the image. This layer generally contains the ReLu activation function to the output. Generally, these filters are nothing but the weight matrix which helps in extracting features from the images. The weight matrix moves along every pixel of the image and the convolved output is obtained. The weights are learnt such that they help in extracting certain required features such as edges, colors, etc. and they help in minimizing the loss function.

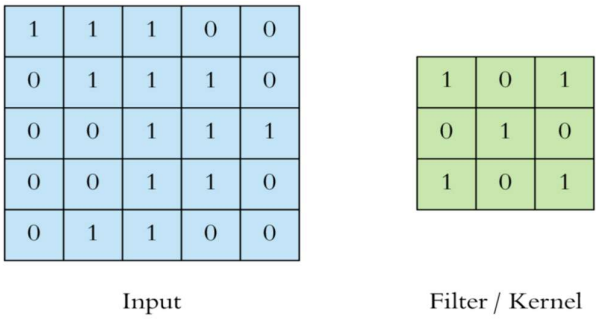

Fig. 3 Convolution Filter

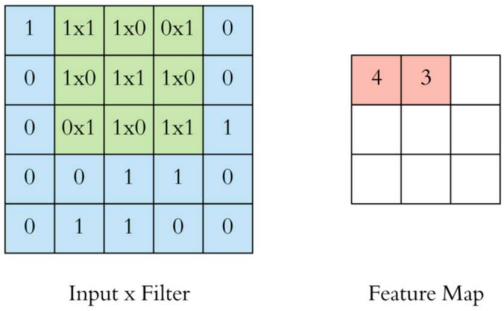

Fig. 4 Formation of Feature Map.

C. ReLU layer:

ReLU activation function is the abbreviated form of "Rectified Linear Activation Function". It computes the function f(x) = max (0, x), in simpler words it is thresholding at 0. This function helps to introduce non-linearities into the model.

D. Max pool layer:

At times when the image size is too large, the size needs to be reduced to in order to reduce the processing time. Hence pooling layers are introduced between successive convolution layers. Pooling layer helps in down samples the image dataset obtained from the convolutional layer. This reduces the dimensions of the feature map which helps in reducing the time required for processing. The below shown fig 5 represents the process of max pooling with 2*2 window and stride of 2. Here, the maximum value inside the stride is chosen to form the feature map.

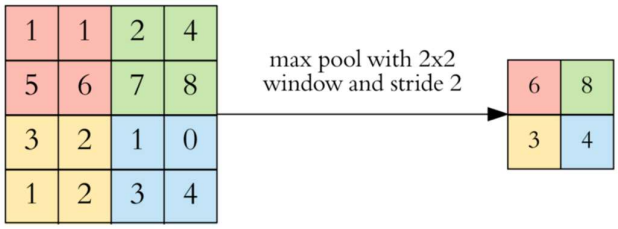

Fig. 5 Max pool layer.

E. Fully connected layer.

This layer takes the output of its preceding layer, i.e., either the ReLU layer or the Pool layer, as its input. Primarily this layer takes an input volume and gives out the N dimensional vector as its output, where N is the number of classes from which the program has to choose.
This layer works in such a way that, looking at the output of the preceding layer, it determines the features that match to that of a particular class. Usually, the Fully Connected Layer looks at the high-level features that strongly correlate to a particular class.

4. DETECTION:

After all the previous work, plant species diseases are detected and classified according to three types of plants, namely tomatoes, peppers, and potatoes. All results, detection and classification will be presented in the next section.

5. REMEDIES:

Based on the particular plant disease the remedy for that disease is suggested to cure the plant disease.

IV. Results

The experiments were performed using python framework with RAM of 128 Mb and processor Pentium P4 2.8GHz. We train the network and save the trained network so that the training process is not repeated and so the time taken for training is provided, after which the network is also tested by testing data and showing the accuracy. In the last stage, through which the diseases of plant leaves are detected and classified, a random selection is made for any image, here we chose a plant leaf, after loading it to the system and choosing the network that was trained and press the analyze button, the disease and the type of the affected plant will be revealed.

Fig. 6 CNN Detection and Classification

Once the classification of disease is done the remedies can be obtained by clicking the remedies button as shown in the below figure.

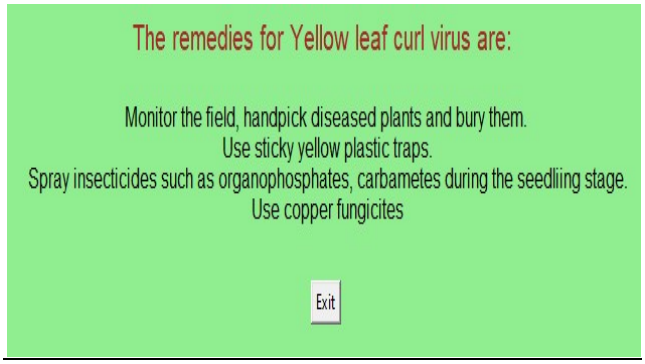

Fig. 7 Remedies for Classified Disease

V. Conclusion

The proposed system was developed taking in mind the benefits of the farmers and agricultural sector. The current study of deep learning used OpenCV, TensorFlow, and CNN to detect and classify leaf disease. This system has concentrated on recognizing the green leaf diseases which assists the farmers to take a proper measurement and increases the production of plants. An automated system is proposed for diagnosis three common green leaf diseases (Brown spot, Leaf blast, and Bacterial blight) and pesticides or fertilizers are advised according to the severity of the diseases. The type of green leaf diseases is recognized by CNN. After recognition, the predictive remedy is suggested that can help agriculture related people and organizations to take appropriate actions against these diseases. The optimization of accuracy of the model is a continuous process and we have built a highly accurate solution. The proposed system is based on python and gives accuracy.

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HEART PULSING RATE USING SENSING DEVICE OF IOT

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ABSTRACT

Heart rate is use for checking the blood pressure by sensing pulse rate in the system. It can be measure by ECG or through the sensing pulsing rate of blood.

We proposed system that monitors heartbeat of person using sensor, embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

Keywords:

Arduino, Microcontroller, Heartbeat sensor, Connecting wires, Buzzer alarm, LCD display, Power supply.

I. INTRODUCTION

Heart rate is use for checking the blood pressure by sensing pulse rate in the system.

It can be measure by ECG or through the sensing pulsing rate of blood.

Monitors the heartbeat of a person using sensor and embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

In this project, we have designed a Heart Detecting from Arduino and sensor. It will display in LCD. LCD are used in different applications include computer, display board, smartphones.

The heart rate is the rate use to check the patient's rate of blood and glucose in the body it will be detect and produce in the system. It is use to detect the heart by checking if it is less than 50 beat heart rate has got problem and if it is greater than 150 the heart rate is in some problem, if it is range 100 beat it is normal sensing of heart.

A number of times a heart increase per minute. Heart beat is a device that is use to check the rate of heart: bandwidth, speed, accuracy of the heartbeat. Heart is use to monitor the devices for the simple things that will help to keep healthy. Heart rate is use to monitoring the patients health condition of heart. It is use to check the heart in the form of sensing the pulse rate in the system or devices. It is use to check the speed and accuracy that will allow to measure the heartbeat it will range around 150 beats. There are many ways to measure they are ECG, Pulse rate of heart beat, GSM module.

The heart beat sensor which is interfaced with Arduino it will display all in LCD Display. System allows to monitor using App. Person can detect the heart rate from app developing from android app and monitoring the person heart rate and release the pulse from the rating of the heart rate from checking it from app.

Developing a small app in that person can easily use and check their heart rate.

II. METHODOLOGY

Monitors the heartbeat of a person using sensor and embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

In this project, we have designed a Heart Detecting from Arduino and sensor. It will display in LCD. LCD are used in different applications include computer, display board, smartphones.

We proposed system that monitors heartbeat of person using sensor, embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

III. EXISTING METHOD

Heart rate is useful for detecting the system and from the devices processing the accuracy from the person emergency manner. The existing system not monitors the heart beat continuously with well accuracy and not intimates the person in emergency situation. ECG is use to receive the signal and it is invalid to detect the system of heart rate.

II. PROPOSED WORKFLOW METHOD

Monitors the heartbeat of a person using sensor and embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

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V. CIRCUIT DIAGRAM

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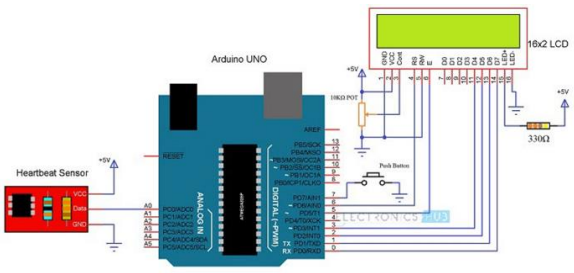

Figure 1: Circuit Diagram

The above circuit diagram shows the detecting the pulse rate in the module and also sending all the date to the LCD. It is a module that is

develop by using Alarm for detecting the rate and if the alarm sound raises then the heart rate has increased and it use the process to control the system for pulsing the rate of heart from the sensor.

It is connected from Vcc and GND. It is connected with Arduino in the module of 4-bit. It is control from RS and END is directly connected to GND and also it send data all to LCD board. It will display the rate of pulse of heart. Every five seconds it starts counting the rate of pulse from heart. It will move to pin 6 and it will again send to pin 7 and again reset the rate of pulse and also with respect to ground.

VI. COMPONENTS DESCRIPTION

1. Microcontroller (Arduino):

It is a open source device.it can be able to read the data from the LCD board. It is use for sending the data and also collecting the data back to the LCD and if it senses the pulse from Arduino it will make easy for getting output.

It will make the device to sense from the processing, sensor, microcontroller for processing the data. We use the language as C, C++.

2. Heartbeat sensor:

Heart rate is useful for detecting the system and from the devices processing the accuracy from the person emergency manner. The existing system not monitors the heart beat continuously with well accuracy and not intimates the person in emergency situation. ECG is use to receive the signal and it is invalid to detect the system of heart rate.

3. Buzzer alarm: -

A buzzer is a signal for sensing the patient abnormal state from that heart beat will increase or decrease rather than normal state.

3. LCD display:

It will display in LCD. LCD are used in different applications include computer, display board, smartphones.

The heart rate is the rate use to check the patient's rate of blood and glucose in the body it will be detect and produce in the system. It is use to detect the heart by checking if it is less than 50 beat heart rates has got problem and if it is greater than 150 the heart rate is in some problem, if it is range 100 beat it is normal sensing of heart.

5. Power supply:

The Power supply is use to supply the signal to the board. It is standalone application use to built the board for supplying the loan to the power.

6. Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform. It is used to read and write the function from C, C++. It will help for development the board.

It will see the sense of device from the source and environment.

VII. APPLICATIONS

Heart beat is a device that is use to check the rate of heart: bandwidth, speed, accuracy of the

heartbeat. Heart is use to monitor the devices for the simple things that will help to keep healthy. Heart rate is use to monitoring the patients health condition of heart. It is use to check the heart in the form of sensing the pulse rate in the system or devices. It is use to check the speed and accuracy that will allow to measure the heartbeat it will range around 150 beats. There are many ways to measure they are ECG, Pulse rate of heart beat, GSM module.

The heart rate is the rate use to check the patients rate of blood and glucose in the body it will be detect and produce in the system. It is use to detect the heart by checking if it is less than 50 beat heart rate has got problem and if it is greater than 150 the heart rate is in some problem, if it is range 100 beat it is normal sensing of heart.

Monitors the heartbeat of a person using sensor and embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

In this project, we have designed a Heart Detecting from Arduino and sensor. It will display in LCD. LCD are used in different applications include computer, display board, smartphones.

VIII. RESULT

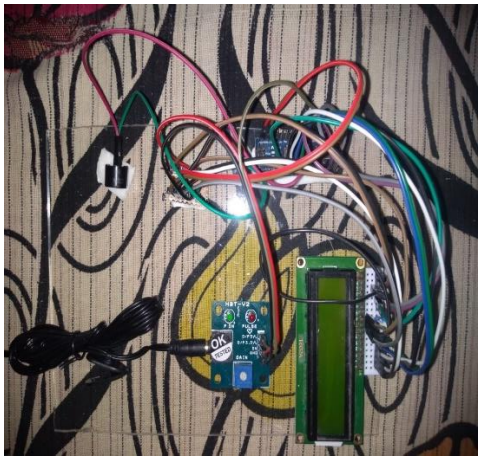

Figure 1: Heart rate Monitoring system

The system will check all the connections. Once the system is ready upload the source code. The code place the index finger on the heartbeat sensor. The heartbeat sensor will start monitoring the pulse rate. LCD is used for displaying the pulse rate. If it goes more than 150 and less than 50 it will sense the sound giving buzzler sound in the system.

IX. CONCLUSION

The existing system not monitors the heart beat continuously with well accuracy and not intimates the person in emergency situation. We proposed a system that monitors the heartbeat of a person using sensor and embedded system and display it on the LCD. We also included an alarm system which alerts the person in emergency situation.

X. FUTURE ENHANCEMENT

The heart beat sensor which is interfaced with Arduino it will display all in LCD Display. System allows to monitor using App. Person can detect the heart rate from app developing from android app and monitoring the person heart rate and release the pulse from the rating

of the heart rate from checking it from app. Developing a small app in that person can easily use and check there heart rate.

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REAL TIME FACE MASK DETECTION USING DEEP LEARNING

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Abstract – The end of 2019 witnessed the outbreak of Coronavirus Disease 2019 (COVID-19), which has continued to be the cause of plight for millions of lives and businesses even in 2020. As the world recovers from the pandemic and plans to return to a state of normalcy, there is a wave of anxiety among all individuals, especially those who intend to achieve resume in-person activities which has greatly helped the World Health Organization(WHO) has taken many measures to help prevent the spread but unsuccessful in terms of handling the situation with more number of people not following the rules such as wearing masks, to help prevent the virus spread. Studies have proved that wearing a face mask significantly reduces the risk of viral transmission as well as provides a sense of protection. However, it is not feasible to manually track the people with out masks. We introduce a Deep Learning based system that can detect instances where face masks are not used properly. A novel deep learning methodology based on Convolutional Neural Network(CNN) to tackle this problem. CNN along with max pooling2D layers will be used to solve the problem which was very important in achieving the task of detection of mask on person's face by capturing ROI. ROI is the region of interest that is only interested in part of the face where the mask is present by examination. The proposed methodology treats mask as an object Thus this is a object detection and classification problem that detects mask present in person's face and also classifies present or not. In this neural network we use the sequential model YOLOV3. By using the dataset we classify them using classifiers for need train set and the test set. This proposed methodology maintains a reasonable accuracy and also cost effective which can while a help to capture images through the webcam without the need for expensive hardware to recite for helping in along with the videos of public monitoring can be uploaded to it as well as it can be used for the best time monitoring for more than 1 people or as many people who can fit with in the frame. Both these problems may be tackled simultaneously with the help of this deep learning we can control the spread of the virus.

Keywords—YOLOv3, CNN, Computer Vision.

I. INTRODUCTION

As a result of the pandemic Face masks have been a very vital element in our day to day lives and is very much important. In order to control the spread of virus, wearing masks are necessary. To find whether person is wearing mask or not we are making a project that detects whether mask is present in person's face. A novel deep learning technology uses deep learning techniques to find the mask present in person's face which are object detection as well as the classification problem which treats mask as an object and classifies mask is present or not in Real Time. With the help of CNN algorithm along with deep learning framework like tensorflow or pytorch we can pass the image in to the neural network which consists of Convolutional 2D layers and max pooling 2D layers are used in the classification problem an with CNN classifiers and message can be sent to the authorized person in case the mask is not found. Thus helping in controlling the spread. This is the major objective of this project so that it can be used in well structured manner. This project does not require the use of expensive hardware as it can be deployed directly with the help of webcam. YOLOv3 is used in the project as it is very helpful for sequential model can be made very effective with the help of Mobile Net which is a Transfer Learning. This model consists of techniques which is supervised learning as it is done using classification task which comes under the Supervised Machine Learning technique. Tensorflow used is deep learning framework as images of the dataset can not be directly passed into a neural network directly so we have to flatten them and convert them into 1D tensors with making them pass easily inside the hidden layers into the a neural network. Deep Learning is popular now a days in solving complex real world problems that was very much difficult by using the traditional machine learning techniques used to solve the simple problems deep learning performs better under the circumstances. In this way we can send messages to people who are not wearing the masks and helping the country in controlling the spread of this pandemic. In this technique we can also pass video streams into the neural network which can detect and identify people who are not wearing the masks. Further for the people who are not wearing the masks will be sent alert message so that they can wear the masks or else suitable actions can be taken.

II. LITERATURE REVIEW

A succession of study that comes when the justification is unique. YOLO darknet, this is the first dealing with face mask detection by image visualization.

[1].YOLOv3 made connections with CNN by hidden layers which through research easily fetch the algorithm and can detect and localize any type image. According to this motivation we demand mask detection as a unique and public health service system during the global pandemic COVID-19 epidemic. As we mentioned below, a comparative study regarding what other researchers have done with CNN based on YOLOv3 and its old version by detecting the several types of image. Added with discussion proceeded by the configuration of CNN, output and trained image details.
[2].Approached vision learning concept about tracking accuracies of small and dense objects any movement from video using YOLO applying their own formed dataset.YOLO rather than detection result was poor on the other hand Image detection dataset gives more efficient output behind on detecting 44 images over 200 images. YOLOv2 technology has been used for these find out objects which can discover 9000 objects. This method is very good performer and faster with the different speed 76.8mAP. At the end of the working procedure joining optimization results based on COCO and Image net dataset are stunning for the image size gap between detection and classification. Depending on this work in future it could be made more elaborate for image segmentation, matching strategies for weak labels and also improve detect result.
[3].Face Mask Detection using Transfer Learning of Inception V3 The first phase deals with over Sampling with image augmentation of training data. 2nd phase deals with face mask detection using transfer learning of inception V3. It is a bit time consuming when compared with VGG16 and VGG19.This was the most important research of all the technologies used for the betterment of the logical ability to solve the classification problems using the methodology of inception V3 with the help of various classifiers such as random forest classifier and so on. The world that was facing the challenge of detecting the masks. As a result it is very faster means to detect the mask that is required which enables the task to be done more accurate than the computer vision tasks.

III. METHODOLOGY

In this section we divided our work into two parts. First part we will be discussing about data acquisition and annotation part. Here we briefly cover about our dataset also pre processing stuffs. Next data annotation will be used. There many ways to annotate the data but for our purpose we only care about 3 steps which will be discussed briefly. Later basic introduction about YOLOv3 and configuration discussed with setup environment and further training procedure introduced.
Fig-1 shows the workflow of our architecture.

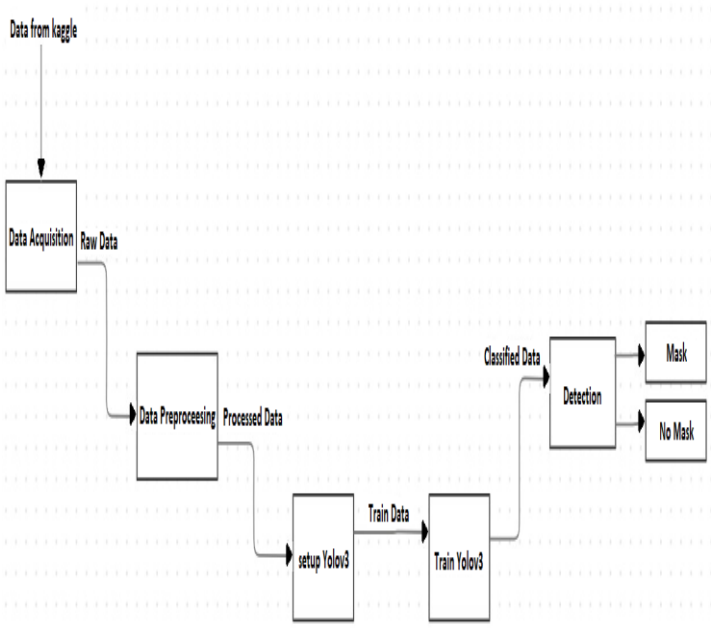

Figure 1. System Architecture

A. Data Acquisition

Data is really important aspect in data driven techniques like machine learning, deep learning. The more the data the more better result. For our purpose of working with YOLO we also need more data with proper annotate. But for our work we don't find any type of annotate data. Using web-scrapping tool from website we have collected 650 images of both mask and no-mask. Further annotation part discussed in data annotation section. Next our data is not suitable for fed into the model. Before feeding we do some pre-processing. There are some irrelevant images inside the dataset. We remove them & finally got our dataset with 600 images where 300 for mask and rest for no-mask. Fig-2 shows the sample of our dataset.

Figure 2. Dataset

B. Data Pre processing:

The affected part needs to be extracted without any noises and blurness from the images, so here we need to apply some pre-processing techniques like Filtering, Histogram equalization, Image enhancement, noise removal etc. Most of the pre processing for image is done with the help of Python software. The pre processing of image aims at selectively removing the redundancy present in scanned images without affecting the details which that play a role in the diagnostic process. Each image is pre processed to improve its quality. The Pre processing techniques which applied here are as follows:
Histogram equalization method was used to enhance the contrast of the image.
Median filtering is required to remove the effect of poor contrast due to Glare, noise and effects caused by poor is lighting conditions during image capture. A low frequent image was generated by replacing the pixel value with a median pixel value. Segmentation: There are two types of pixels with different density distribution. Pixels within the very dense body and chest wall structures (the body pixels) and low- density pixels. Optimal thresholding is applied on the pre-processed Bone image to select a segmentation threshold to separate the body and non body pixels through an iterative procedure. The pixels with a density lower than the threshold value are recognized assigned a value 1 and appear white, whereas other pixels are assigned the value of 0 and appear black.
The Fig-3 below shows some images that we have annotated.

Figure 3. Bounding Boxes.

C. System overview:

Here we divided the whole things into two parts. First will be covering setup of YOLOv3 for our problem next will be our applied yolov3.

1) YOLOv3 Setup

Now, YOLOv3 is the state of art object detection model followed by other versions of YOLO and YOLOv2. It's been given amazing results regarding object classification and detection. In previous version of Yolov2 Darknet-19 is used as a feature extractor. In yolov3 it changes with some improvements and they called it as darknet-53. Darknet is a framework for training neural network that written in c language which performs better in these tasks. Before working with this architecture some steps we need to mention –

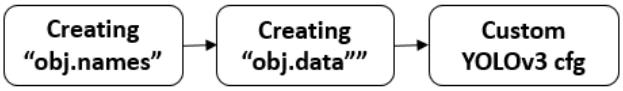

Figure 4. Configuration steps

From above Fig-4 of YOLOv3 configuration at first create a "obj.names" files which contains the name of the classes which model wanted to detect. Then a obj.data file which contains number of classes in here it is 2, train data directory, validation data, "obj.names" and weights path which gonna save on backup folder. Last a cfg file contains 2 classes. Next we change batch size as 64 and subdivisions as 16. For three yolo block set class as 2 and the previous convolution block set filter size at 21. Max batches for our case is 4000 which is calculated as "number of class x 2000".

2) Applied YOLOv3: An input here is an image is passed into the YOLOv3 model. This object detector is going through the image and find the coordinates that present in an image. It's basically divides the input into a grid and from that gird it'll analyzes the target objects features. From the neighbouring cells that features were detected with high confidence rate are add at one place for produce model output.

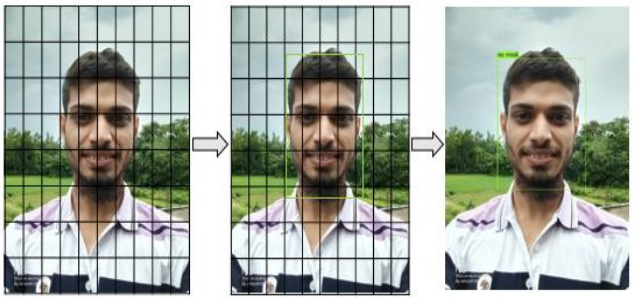

Figure 4. Workflow of YOLOV3

IV. IMPLEMENTATION

Face Mask detection using CNN Algorithm

The setup has been done for our custom model is ready for training. Unlike other networks YOLOv3 used logistic regression as loss function. As far our resources is limited we use the Google colaboratory for our training purpose. 80% data used for training, rest 20% used for validation.

The algorithm consists of the following steps:-

Convolution is the first layer to extract features from an input image. Convolution preserves the relationship between pixels by learning image features using small squares of input data. It is a mathematical operation that takes two inputs such as image matrix and a filter or kernel. Max pooling layers are used in conjunction with CNN where the ROI (Region of Interest) of person is detected.

There are 3 CNN layers used here as excess of this will lead to overfitting. Flatten is used to convert images into 1D tensors and are passed into the neural network.

The Final layer is a fully Connected layer here we flattened our matrix into vector and feed it into a fully connected layer like a neural network. The activation function used for all the convolutional hidden layers is ReLU where as for the output layer is softmax which will convert vector into probability distribution.

Over 400 epochs of training we got a good accuracy of 96% and average loss is reduce to 0.0730 and our mean average precision score is 0.96.After training with test data our model also detect the object more accurately.

Finally this model is able to predict whether the mask is present or not.

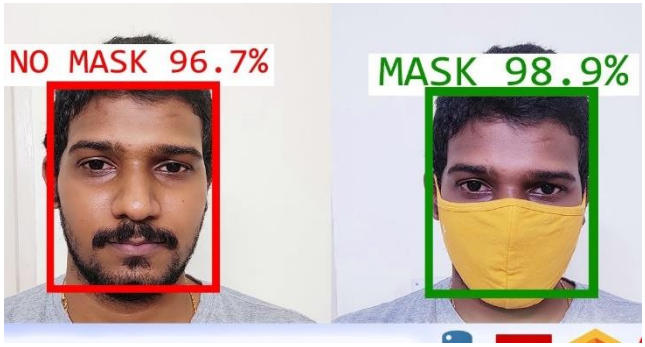

Figure 5. Final Result

V. CONCLUSION

The current study of deep learning used OpenCV, Tensorflow, Keras and CNN to detect whether the people are wearing mask or not. These models were tested in real time and video streams. The optimization of accuracy of the model is a continuous process and we are building a highly accurate solution by turning the hyper parameters.

MobileNetV2 along with YOLOv3 are the classifiers used build this sequential model and the activation functions used is Relu along with Leaky Relu for the input and hidden layers for output layer it is softmax. To produce reasonable accuracy along with the optimizer which is adam optimizer which gives results accurately. This is structured model that may be future deployed in malls, in air-ports Schools and colleges and other places of heavy traffic or in any entrance gates where only people wearing masks can come in. Also an alarm sound can be generated in case if needed to alert the person to wear the mask immediately alert signal shall be passed. Thus this system can be used to detect whether the person is wearing mask or not and recognize the person face in case if the person is not wearing mask and can be able to store the data according to the name of the person stored in the system.

VI. FUTURE WORK

In the future we will try to add more data to get more accurate result in detection. As far as our resources is limited we can not get higher fps rate in video. In the future we will be train and evaluate our model into a better machine. Recently, more object detection architecture i.e. Mask RCNN, Faster RCNN etc are introduced. A new version of YOLOv4 also come into play recent couple of days. We will apply these models for compare the performances all of them.

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USE OF GRAPH THEORY IN BIG DATA HANDLING AND KNOWLEDGE ENGINEERING

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***Abstract*— Using of devices like phones, software logs, camera, microphones, wireless sensor networks led to the generation of huge amount of data. Standard techniques cannot be used to handle these because of huge volume, velocity and variety. So, graph-based technique is used in which nodes and relation among them can be represented clearly.**

Graph is used in various applications like web technology, linked data, large scale data analytics, and cloud computing. Use of graphs have been spread by application like Google. However wide use of graphs has hampered the knowledge. However, to solve this we need to understand the basic terms of graphs.

Graphs are used in various applications like social networks, web search engines, and genome sequencing. However, while processing graphs pattern matching is required. Much work has been done in this field with solutions like sub-graph isomorphism and regular expressions matching. Many algorithms are used. We study the impact of these algorithms.

The knowledge suit is ontology based since the network is represented in the form of relations. The steps included are catching client data, knowledge creation and insertion and retrieving. In knowledge creation, representation is based on relation between components. Usage of tabular data creates problems while using tools and vision. In order to overcome these drawbacks, we use software implementation. Such software offers filtering and selection of resources to give way to isolation of small things.

In deep learning and artificial intelligence, the data, relation, symbols, representation and so on are very complex. They can be understood only by experts. Hence, graphs are used.

Keywords:

GRAPH, GRAPH ANALYTICS, GRAPH TOOLS, ANALYTICAL TECHNIQUES, KNOWLEDGE GRAPHS, KNOWLEDGE BASES, ONTOLOGIES, KNOWLEDGE REPRESENTATIONS, SEMANTIC WEBS, BIG DATA, DATA MINING, INDEXING GRAPH DATABASE, GRAPH SIMULATIONS, PARALLEL AND DISTRIBUTED ALGORITHMS, EXPLAINABLE ARTIFICIAL INTELLIGENCE, DEEP LEARNING.

I) INTRODUCTION

The handling of big data is a challenge. The first challenge is volume. The data is in huge amounts in terabytes and petabytes.
1 petabyte=1024 terabytes.

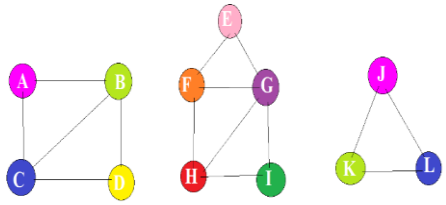
The second challenge is variety. Data is classified into:

1) Structured
2) Unstructured
3) Semi-structured

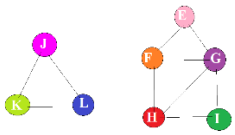
Structured data is stored in the form of spread-sheets and relational database. Unstructured data are in the form of text, images, videos. Xml comes under semi structured data which does not have specific standard. The third challenge is velocity. Applications like smartphones, social networks, e-science, healthcare systems generate data of huge velocity and so difficult to be queried.
Deep learning is an important field in Artificial Intelligence. In every field, their models are opaque and hence difficult to be understood.

It also has impact on people's life like recruitment tools, decision support systems for justice, prevention of terrorism, clinical application, just to mention a few sensitive domains.
Many mathematicians, computer scientists and software engineers, conduct research to develop systems which are compact and transparent to users. This field is so complex that only experts can understand the intricacies. The network consisting of semantic entities and their relations forms the backbone. Solution for these is ontology which provides mapping between input, processing, output units.

To overcome the above challenges various researches have been carried out.
Technologies in big data involves CouchDB for mining the social data, text mining, data mining and so on. To produce better results, the technologists used data indexing like Hadoop.
However, these failed. Therefore, indexing is done using graphs as shown in Fig–1 and Fig–2.

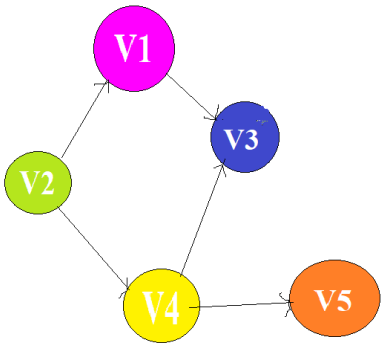


Fig–1: Sample graph database



Fig–2: Graph Queries

Graph theory was born out of very practical urban planning problem. There was a city named Konigsberg which consisted of two islands and seven bridges. The problem statement was to traverse all the nodes covering all the bridges. But this was not possible due to the odd number of bridges. So, Euler made a graph of the city by removing all other components except the vertices. The resultant model is a graph as in Fig- 3. In a graph, operations like removing or adding edges or vertices can be performed.



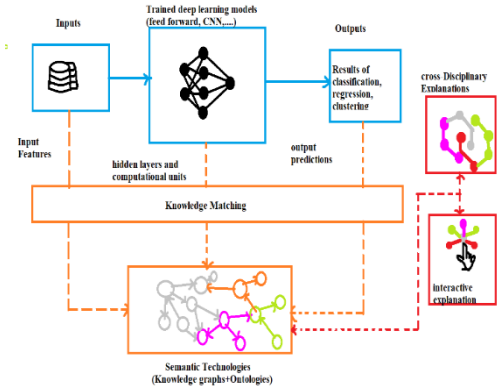
	V1	V2	V3	V4	V5
V1			1		
V2				1	
V3					
V4					
V5					

Fig–3: Sample graph and its representation using matrix

A lot of research has been made about graphs specially by semantic web community. This has brought various definitions. The information is available in Wikipedia. Definitions say that the synonym of knowledge graphs is graphical representation of knowledge.

Graph is a complex model which represents complex relations among objects. Many organizations compete with their peers in the reasoning. There are various graph analytics like path analytic, connectivity analytic, centrality analytic and community analytic based on solution to different kinds of problem. Each one uses different methods to get solution.
To handle huge graphs systems to store and process these graphs. Modern databases satisfy all these requirements and also overcomes previous drawbacks.
Graph based Database management Systems has facilities like graph storage, modelling and query management.
Use of graphs in big data has brought interest for people to research in this field.
Modern processing systems are based on four different processing models – Map-reduce, BSP and vertex-centric graph processing. Pregel, Giraph, GPS, Mizan, and GraphLab are important parallel processing models.

Pattern matching is important in graph processing. Various research has been made and the matching is of sub-graph isomorphism and regular expression. The result of sub-graph isomorphism is NP-complete and hence not efficient.
Solution for this is graph-simulation which relaxes the pattern matching in sub-graph isomorphism.



Fig–4: Schematic representation of AI system

Fig–4 represents how knowledge graph helps in finding solution for integrating input, hidden layers and output. Once the graph is done it can be queried. This makes it more efficient.
Ontology is a branch of metaphysics that represents the existence of things. GRUBBER and BATEMAN borrowed terms from philosophy about description and made theory about terms linked with definitions. DENNY modified this as ontology is a hierarchy of classes with attributes and behaviour. On integration of these we get knowledge. There is an excellent reference for the ontologies and its corresponding tools, space, storage, particular, good and bad definition.

II) SELECTED DEFINITION

Table I: Definitions

DEFINITION	SOURCE
A Knowledge Graph: i) represents the relation between the entities in a graph ii) defines classes and relationship between entities in a schema iii) allows entities to relate with each other	Paulheim [16]
Knowledge Graph: it is the huge network of entities, semantic types, properties and relationship	Journal of web semantics
Knowledge graphs are relation between various things of a domain. It is used for huge data	Semantic Web Company
A knowledge graph is an RDF graph consisting of an RDF triple (s,p,o) in which s – subject s € U ∪B p – predicate p € U o – object U ∪B∪L RDF term is either a URI u € U, a blank node b € B or a literal l € L	Farber et al. [8]
System exists which is capable of extracting facts from web. These facts are interrelated.	Pujara et al [17]

III) BIG-DATA NALYTICS

A) INDEXING TECHNIQUES

a) B-Tree and Hybrid B-Tree based indexing:

Extension of Steiner Tree is compact Steiner tree. Data of various lengths is obtained by big data analytics. So, a two-dimensional data structure known as B-tree indexing technique is used. Set of gradually decreasing temporal data with p sampling set data can be indexed in linear time and optimal use of resources. But however, for online data it is expensive. So, hybrid B-Tree indexing used.

b) Indexing on temporal networks:

For the given network a graph is made. Whenever a link is formed in the network, the corresponding edge is added to the graph. Time stamp is also noted.

Then everything is arranged in chronological order. To improve performance changes are made in algorithm. For retrieving skewed spatial data, an R+ -tree is proposed with KR+ index, which takes cloud data management into account. This is most efficient method to handle big data and also supports nearest neighbour querying in addition to range queries.

c) Bitmap and hash-based indexing

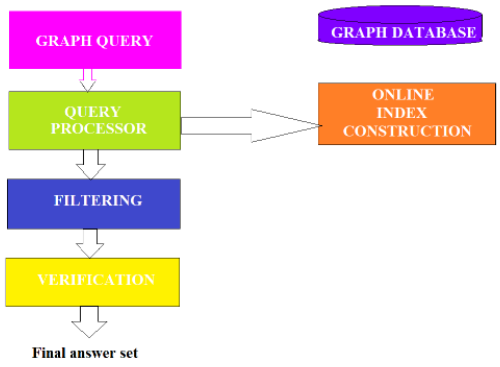
The Top-k CS tree helps Steiner key reduce cost to query. A bulk sequence of bits used to index represents that binary indexing is an efficient method because binary logical operations are performed to query.

Binary encoding helps in making bit-sliced indexing, but had some disadvantages. It failed to provide query response in minimum time.
In hash-binary techniques hashes are used to index data. Binary code is given to every data. Non-negative sparse coding is done to convert real-featured data space into low-dimensional dataspace and sparse hashing is done to search. Cloud semantic-based indexing uses ontology evolution to develop cloud service environment through which cloud services are distributed according to user requirements.

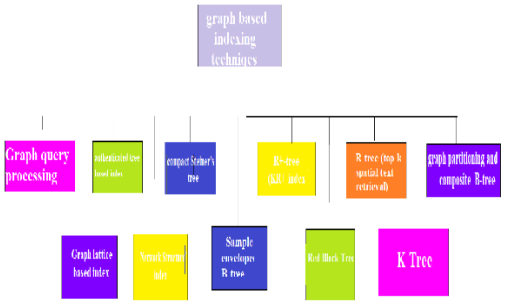
d) Fuzzy based indexing:

Simple fuzzy base can be used for indexing. But this is difficult for big data.
So dynamic fuzzy tuning is used with hybrid fuzzy classifiers by adjusting the rules to get high performance.
Fuzzy indexing is used to index huge number of objects in sub-seconds. Images are captured at high rate to reduce query access time. Whenever a new object is added the previous one is deleted to conserve space.
Fuzzy indexing is used for predictive queries. Response rate is high. Knowledge exploration and collaborating index uses this technique.

B) GRAPH BASED INDEXING TECHNIQUES



Fig–5: Query processing in graph database



Fig–6: Graph-based indexing techniques

Indexing is required for creating database, updating and querying. Batch processing helps indexing especially where graphs are required.
By Finding commonalities especially in nodes, edge, subgraphs and so on in the database, indices can be found. Indices are then filtered and verified as shown in Fig–5 and Fig–6.

a) Graph indexing-based query processor:

First, for all graph queries indices are generated, filtered and verified using database. These queries are then processed by graph indexing-base query processor using Integrated graph querying.
Advantage of these is that it is of low cost with filtering and verification facilities.
Graph patterns are matched and then indices are generated. These indices are stored in a tree like structure and is then processed.
This is used in three graphs.

1) Social graph database:

This represents relationship among people. Nodes represent people and edges represent relationship. Here triangular index is used.

2) Music database:

Nodes represent musician and their personal information like music track and the labels represents their released track. Here funnel shaped index is used.

3) Transaction database:

Nodes represent bank account number and the edges represents transactions. Here rhombus index is used.

Queries are processed by generating suitable index structures. More aggregate attributes, solution predicates improve the performance. Types of aggregate includes distributive aggregates, algebraic aggregates and holistic aggregates. Even on encrypted, efficient authentication is achieved.

b) A novel structure aware index:

Steiner tree for indexing is compact and meaningful. It helps us in understanding the index structure and gives approximate solutions for top-k queries.

A novel structure aware index is used to find the relationship among each index in the relational database. This doesn't disturb internal working.
Discussion is done to learn the entire thing so that any problem can be solved.

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Big data indexing is classified into Artificial Intelligence (AI) and Non-Artificial Intelligence.
Indexing is used to detect unknown behaviour in AI.

Commonly used AI techniques are:

1) Latent Semantic Indexing (LSI):
This helps us by retrieving the information by understanding the patterns between the unstructured data set. It identifies common concepts and the relation among them.
2) Hidden Markov model (HMM):
Used pattern relationship and data relationship. Based on current state query results are predicted for the future states.

c) KR+ Index and Secondary Indices

Based on current cloud data a flexible multidimensional data structure defined and values are assigned to the leaf nodes. One application of KR+ Index is data dividing in which the leaf nodes are square in shape called as grids. By adjusting the parameters, we can optimize grid access time and grid size.
One advantage is grids do not overlap and so redundancies are avoided as unique key is assigned to each grid.
In NOSQL the indices are split into embedded indices and standalone indices. In embedded indices a filter is embedded. In standalone indices a separate data structure is used. In LSM based NOSQL secondary indexing is used like eager, lazy and composite, zone maps and bloom filters are studies. Level DB++ system is used and the indexing is done at top using functions. These are indexed using graphs

d) R-Tree and B-Tree index

Retrieving top-k query for both location-aware and region-aware by an indexing technique is proposed. A novel based method is used which inverts the file to extract the data. R-tree used to query in database.
Algorithms are used for top query using indices is defined. Special proximity and text relevancy is used to reduce search space while processing the query.
A composite tree data structure is built for querying data. Here bidirectional reference is provided between leaf nodes. This reduces the processor cycles in comparing the data in B-Tree.

To process timestamp-based query efficiently search index data-structure is used. This provides quick response time compared to traditional method.

e) Lindex and network structured index:

Table II: Graph-based indexing technique survey

Author	Technique or Algorithm	Advantages/ Disadvantages	
		Indexing	Query Processing
Cheng ke et al	Graph query tree with low-cost index	Fast index creation Less space index	Faster query response
Li hadjlef et al	Authenticated tree-based index structures	Index is updated dynamically	Low-cost query execution Accurate query results
Li Feng et al	Steiner tree for keyword search in RDBMS	Less space index Less cost	Faster query response Accurate query result
Wei Hsu et al	R+ -tree in spatial data indexing (CDM)	Index takes more space	Query response time depends on query size and data size
Wa cong et al	R-tree for spatial web object retrieval	Index takes more space	Query response depends on buffer size
Sandu Zeitouni et al	B+ -tree with indexing in network trajectory flows	For large networks index requires more space	Faster query response even query size and data size are big
Yuan Mitra et al	Graph lattice-based indexing	Faster index construction Faster index update	Faster query results for sub graph querying
Maier Rattigan et al	Indexing network structures with shortest path trees	Index takes linear space	Accurate query results
Li Yi et al	B-tree based indexing for ranking	Faster index construction Less index	Faster query response

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	queries on temporal data	space	Less cost
HSU Lee et al	k-tree based indexing to process reverse k-nearest neighbours (RKNN) queries	Index takes less space Less cost	Faster query response Accurate query results

Lindex is a graph index comprising of all subgraphs. A key value is generated in which key represents subgraph in database and value represents the list of database graph which contains the key. This is used to improve efficiency. It is also used in false graph filtering, fast index lookups, quick index construction and maintenance, constructed using any choice feature set which results in scalable and rapid subgraph querying infrastructure.

A network structured with graph clustering is used to improve scalability in processing queries. K-Medoids algorithm which is a simple version of K-means clustering method is used. Also, Girvan-Newman algorithm is a clustering method based on centrality between edges. The index comprises of series of node annotation along with a distance measure as in Table II.

C) GRAPH ANALYTIC TECHNIQUES

a) Path Analytic:

Aim is to find best path from source to destination node. Best path is based on function optimization, node traversed and certain conditions. For example, in Google maps path may depend on road, traffic and weather.

Algorithm used to find shortest path is Dijkstra algorithm

b) Connectivity analytic:

Connectivity is the structure of the graph. Connectivity is determined by indegree (no of edges entering a node) and outdegree (no of edges leaving the node).

To compare similarity between two graphs degree histograms are used as in Fig–7. The formula given is

$$D = \sqrt{\sum_{i=0}^{k} (h_{1i} - h_{2i})^2} \quad (1)$$

There is another sophisticated method that is a joint, two-dimensional colourful histogram. For example, in network graph the indegree and outdegree gives more details about communication.

Robustness of the network is a measure of how much the system can be attacked. We use weighted spectral distribution (WSD) which uses eigen values.

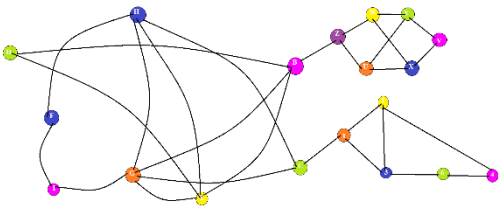
Graph 1	
Degree	count
0	1
1	3
2	0
3	3
4	0
5	4
6	2

Graph 2	
Degree	count
0	1
1	3
2	1
3	2
4	0
5	4
6	3

Euclidian Distance=(3)^(1/2)

Fig–7: Using histogram for finding graphs similarity

c) Community Analytic



Fig–8: communities

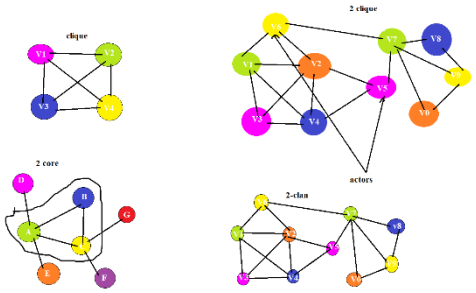
A cluster of nodes connected internally than outside is called community. Behaviour of community is monitored in community analytics. Like, who are the members of the community?

From where they belong to? Is the community stable? Dominant members of the community? Is the community evolving, growing, splitting or going to be dead? Internal degree is the summation of edges of all vertices inside the cluster and external degree is the summation of all the edges outside the cluster.

Communities are found by comparing internal and external degree. A Cluster having internal degree more than external degree is called a community as in Fig–8.

$$\delta_{int} = \frac{\#\ of\ internal\ edges\ in\ C}{n_c(nC-1)/2} \quad (2)$$

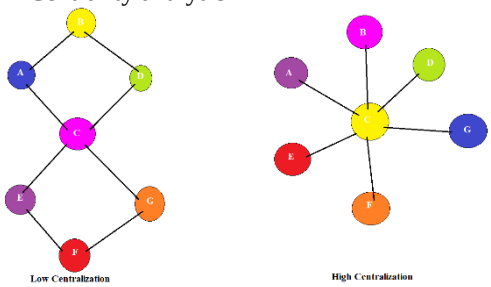
$$\delta_{ext} = \frac{\#\ of\ inter\ cluster\ edges\ of\ C}{n_c(n-nC)} \quad (3)$$



Fig–9: Clique, n-clique, n-clan, k-core

Community has local properties like clique, n-clique, n-clan and k-core. Modularity is global property which defines quality. Louvain is a method to detect modularity.
Clique is a perfect community in which every node is connected to every other node. n-clique and n-clan are distance based and k-core is density-based method used to find community. In n-clique distance between each node is at the most n. n-clan is n-clique with no other nodes connected. In k-core each node is connected to at least k other nodes. Fig–9 represents this.

d) Centrality analytic



Fig–10: Centralization of a network

In a network, centrality is the most important. Some nodes are given high importance than others. Centrality is the measure of the importance of any node. This is shown in Fig–10. Examples are junction station of transport, central server in computer network. If more nodes have high centrality, then the variation is low.
Formula is given as:

$$\text{Centralization}=\Sigma(C_{max}-C(v_i))/C_{max} \quad (4)$$

D) PATTERN MATCHING

a) Subgraph Pattern Matching:

Consider a graph G(V,E,L) where V is the set of all vertices, E is the set of all edges and L is the labels given to the vertices. $Q=(V_q,E_q,L_q)$ is the query function. The goal is to find all the subgraphs that matches the pattern above. Graph G'(V',E',L') is a subgraph of G if and only if $V' \subseteq V$, $E' \subseteq E$ and L'(u)=L(u) for all u.

b) Types of Pattern matching:

1) Sub-graph Isomorphism:

This is most widely used. It states that for a graph G(V,E,L), V is the set of vertices, E is the set of edges and L is the label set then for a query $Q=(V_q,E_q,L_q)$ and subgraph G'(V',E',L') there is a bijective relation. (u,v) is an edge in Q if and only if (f(u), f(v)) is an edge in G'. Ullmann has set an algorithm for this, called as VF2 algorithm.
But the result of this is NP-Complete which is a disadvantage.

2) Graph Simulation:

This overcomes sub-graph isomorphism by relaxing some rules. For relation $R=V*V_q$,

i) For every $u \in V_q$

there is u' $\in$ V such that (u,u') $\in$ R:

ii) $L_q(u)$ equals L(u')

For every v $\in$ child(u), there is (v,v') $\in$ R such that v' $\in$ child(v')

Child returns all the direct children of a given vertex.

Here HHK algorithm used but is not efficient.

3) Dual Simulation:

Here parent relation is also taken into account. This is more complex.
Query $Q=(V_q,E_q,L_q)$ matches a graph G(V,E,L) if and only if:

i) Q is a Graph-simulation match to G with a relation $R_D \subseteq V_q*V$
ii) For every w$\in$parent(u), there is (w,w') $\in$ R such that w' $\in$ parent(w').

The method parent returns all the parents of a vertex.

4) Strong Simulation:

This is dual simulation with another condition. Here the term ball is coined. Ball of vertex v of radius r returns all the vertices at a distance r from v. It also includes all the edges of those vertices.
Pattern $Q(V_q,E_q,L_q)$ matches graph G(V,E,L) via strong simulation if and only if there exist a vertex v$\in$V such that

i) $Q \underline{\blacktriangleleft}^{D}_{sim} G[v,d_{Q}]$ with maximum dual match set R^{d}_{D} in ball b where d_Q is the diameter of Q, and
ii) v is a member of at least one of the pairs in R^{d}_{D}.

The connected part of the result match graph of each ball with respect to its R^b_D which contains v is called a maximum perfect subgraph of G.

E) GRAPH STORAGE TECHNIQUES

Due to increase of data size, the number of nodes and vertices get increased because of which there occurs storage problem. The graphs are stored in RDBMS and NOSQL database. NOSQL is schema less. It is popular due to scalability and fault tolerance. It can store, key with value, documents and graphs. There are two ways for graph storage - graph stores and graph database.

- Graph store has facilities to store and query data. It can store graphs with a greater number of vertices and edges.
- Redis graph is python implementation of storing graphs.
- VertexDB++ has graph storage in the top of tokyoCabinet.
- Filament is a graph library along with Support for SQL.
- Along with these we can mention CloudGraph, Horton, and Trinity as prototypes of graph stores.

Graph database is more efficient compared to relational database. Graph query can be formulated based on path is efficient. Graph database should have query language, query optimizer, database engine, external interfaces, storage engine, transaction engine, management and operation features.

Database following above criteria are DEX, AlleoGraph, InfiniteGraph, HyperGraph DB, Neo4J, and Sones.

DEX is a graph database which can handle huge graph efficiently using java library. It uses bitmaps and other structures.

Alleograph is a graph database which has web semantics. It provides special features for geo-temporal reasoning and social network analysis.

InfiniteGraph database is a graph database to perform operations of complex distributed environment. Hypergraph database makes simple solution of complex problems. Traversing is made easier. It is used in complex applications like artificial intelligence, bio-informatics and natural language processing.

Most graph database model supports different features like graph structures, data definition and manipulation, storage, essential high graph queries, basic integrity constraints and representation of entities and relationship.

F) COMPUTATIONAL MODEL FOR GRAPH PROCESSING

Parallel computational model is used to demonstrate parallelism in execution. In this, the process is divided into components and each component is executed independently in a parallel way.

In shared memory model all processes are given common memory. In message passing model messages are sent directly or pipes are used.

Parallelism is of two ways:

1) Data parallelism:

In which data is divided into subunits and then each one executed independently.

2) Task parallelism:

In which tasks are divided into various subtasks which are then executed independently

Ways of implementing are:

- A customized distributed environment is required. Then each graph is processed in different way and different algorithm used.
- A distributed computing environment used like Map-reduce and SQL like queries. But the disadvantage is sub-optimal solution and difficulty in graph processing.
- Single computer graph algorithm libraries like JDSL, BGL, NetworkX, LEDA, Standford GraphBase, FGL. Scalability is the issue.
- Existing parallel graph systems like parallel BGL and CGMgraph can be deployed. Fault tolerance is the issue.

Different models used are:

a) MPI-like:

Many libraries like parallel BGI, CGMgraph use MPI for distributed graph processing. The issue is lack of fault tolerance.

b) Map Reduce:

MapReduce was used by Google to process big data. There is a master node along with workers. It has two phases:

1) Map phase:

Here the master node divides the work among the workers. Each workers do the tasks independently.

2) Reduce phase:

Here, after finishing, the work done by all workers are combined.

Map reduce was not ideal for many different graphs, for example: parallel BFS.

The disadvantages are:

1) Computational overhead
2) Sub-optimal performance
3) Poor usability

c) Bulk synchronous parallel

This has 3 attributes.

- Several concurrently running processes
- Communication layer
- Synchronization barrier

There are several super steps. In communication layer each process pair communicate. In each super step each process performs task parallelly. If any process finishes first, it waits for the other process to finish. When all processes are done the result is combined and then the next super step starts.
Synchronization barrier maintains synchronization among the process. When a process doesn't have any work, it is suspended temporarily. It reoccurs when a work is assigned again. When the entire thing is done all the processes are terminated. BSP is a simple efficient and scalable model for parallel algorithm design and analysis. It does not take account of heterogeneous clusters.

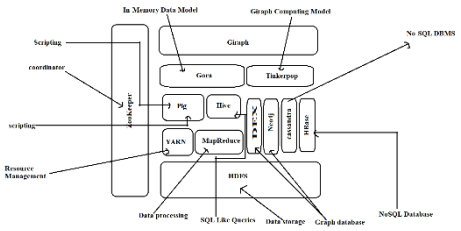
d) Vertex centric Graph processing

To apply BSP for big graphs, Google proposed vertex centric graph processing.
It is used especially for huge graphs. Each vertex is considered as a processor. It has various super steps. When process of any vertex is finished it waits for all other process to be completed. Then it enters next super step. This goes on until the entire algorithm is completed.

1) Pregel:

First implementation of this idea is Pregel, which is not available for general public. Pregel inspired others BSP based graph processing system like GPS (graph processing systems), Apache Giraph and GraphLab.
Pregel is a flexible, scalable and fault tolerant platform. It has many super steps separated by global synchronization points. Then a graph is formed. Each vertex receives message from previous iteration, sends or receives message from neighbour, also modify state of itself and also the state of its outgoing edge.
This consists of a master node along with worker nodes. The master distributes the work among all worker nodes. Here C++ API is used. Master signals the worker nodes to start the work. Each worker node then invokes compute() function. When any worker node finishes it calls halt and becomes inactive. When it is called again it gets reactivated. When any worker node fails master assigns the work to another node. when entire thing completes end is marked. Pregel offers fault tolerance, scalability, efficiency, ease and simplicity. It has additional features like combiners and aggregators. Combiners are used for message passing. Aggregators are mechanisms for global communication and data monitoring.

2) Apache Giraph:



Fig–11: Graph and Hadoop Echo System

Apache Giraph is an open-source system and extends BSP. Yahoo is implemented using JAVA and is places on Hadoop as in Fig–11. Apache follows message passing model and does global synchronization without using semaphores.
Hadoop is used for workers and HDFS is used for input and output data storage.
Apache Zookeeper is used for coordination, checkpointing, and failure recovery schemes.
Usability of Hadoop is excellent due to Hadoop web monitoring interface. Giraph also provides shared aggregates to avoid bottlenecks at the master, yield substantially memory savings, and reduced JAVA garbage collections overheads. It supports data structures for storing edges and vertices. It uses byte arrays to load faster but is inefficient for graph processing. So, map edges used, but it is inefficient for storing. It is parallelized and then multithreading is used which boosts up speed of graph-loading, dumping and computation. Additionally, global synchronization, debugging, monitoring progress is easy in Giraph.

3) Graph processing systems

It is used for huge graphs. It is faster than Giraph and is an extension of Pregel API, LALP, DP. The master node distributes the work among the worker node. it uses master.compute() function. LALP partitions adjacency list of nodes with maximum degree along with a mirror. Any modification made is sent to mirror. GPS minimizes thread synchronization by using message buffers per worker than per vertex. This exceeds overall benefits.

4) GraphLab/PowerGraph

It is an open-source project used to process huge graphs. It is implemented using C/C++. Gather, Apply and Scatter (GAS) data pulling method is applied to each node. Also, Shared Memory Abstraction is used. In Gather phase each node is fed with information of every other node. In apply phase, the vertex updates the values.
In scatter phase each node activates every other node. This helps in resource conservation since no message passed.

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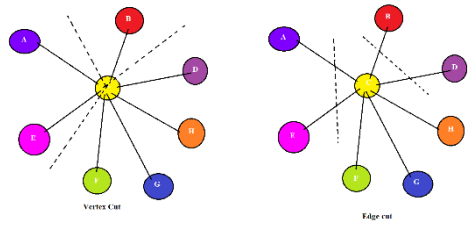


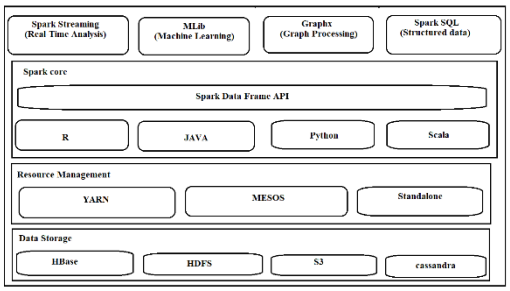
Fig–12: Vertex cut vs edge cut

GraphLab uses vertex cut, while GPS, Giraph and Mizan uses edge cut as shown in Fig–12. In vertex cut, the graph is partitioned. Vertices are replicated and edges are assigned to unique machines. This is an efficient way. Workload is balanced. It is suitable for asymmetrical graphs. Mutation is partially supported. Vertices and edges can be added, but can never be removed from the system.

5) Mizan:

It is optimized using C++ and is an open-source system. It monitors vertices and edges by dynamic load balancing and complex vertex migration.
This requires pre-partitioning of graph due to which it is not suitable for large graphs. However few bugs and many useful features are missing.

6) GraphX:

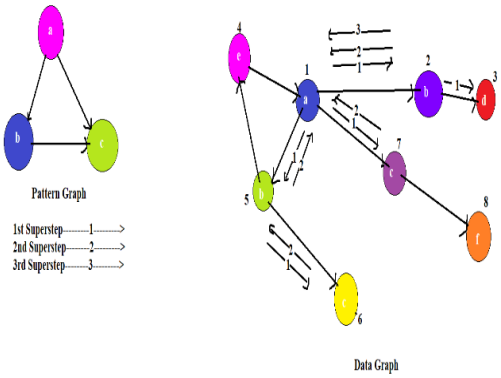


Fig–13: Apache Spark and Graphx

It is an embedded Graph processing system containing GraphLab and Pregel Abstractions. It is used in top of Apache spark which is a distributed system as shown in Fig–13.
Modifications need not be made in spark.
Computations can be made by using join, group by and map. It is an extension of Pregel and performs same operations on graph. The data is in tabular form, structured or unstructured. The graph can be expressed as collections, without data movement, duplication and sacrificing performance or flexibility.
It uses distributed join and materialised view maintenance for better performance. It is of low cost and better fault tolerance.
Its performance is compared with others. This provides better performance. But it takes longer time than GraphLab in graph processing.

G) DISTRIBUTED ALGORITHM FOR GRAPH, DUAL AND STRONG SIMULATION

a) Graph simulation



Fig–14: An example of distributed graph simulation

Here there should be match between components of query graph and that of subgraph.
Each vertex doesn't have information about others. So, they need to communicate. A Boolean flag is set for each vertex for this purpose
Each node sends information to child node. Child then acknowledges the parent and then pass on to their child node. Nodes which didn't receive acknowledgement, sets their flag to false.
Then match is found and then results are obtained as in Fig–14.

b) Dual Simulation

This is same as that of graph simulation except that dual simulation includes parent node.

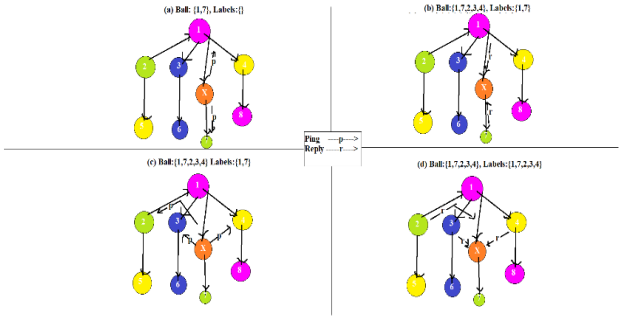
c) Strong Simulation

Here, there are two phases.
In first phase dual simulation is run on each node.
In second phase each vertex knows about other vertices and forms balls. Then on simulation result is obtained.
The challenge is that the balls occupy huge memory space. So, to overcome it, we use BFB and DFB:

1) Depth-First Ball:

In first super step, for each vertex v ball is formed such that v is the centre which passes its information to its neighbours.
In next super step Neighbour vertices acknowledges v and then send their information to their neighbours and forms balls. This continues in further super steps. In each super step ball size decrease. It goes on happening until ball size becomes zero. Since this approach is slow, this does not scale well.

2) Breadth-First Ball:



Fig–15: A breadth-first ball around a vertex X with d_q=2

This is based on simple ping and reply.
Here, consider a vertex X of radius 2. It pings its neighbours. The neighbours reply X with their details. This repeats again as in Fig–15.
The drawback is repetition. But it is efficient than other way.

H) IMPLEMENTATIONS OF DISTRIBUTED ALGORITHMS

Here we implement graph simulations in two different platforms and then compare the pros and cons

a) Graph Processing System (GPS)

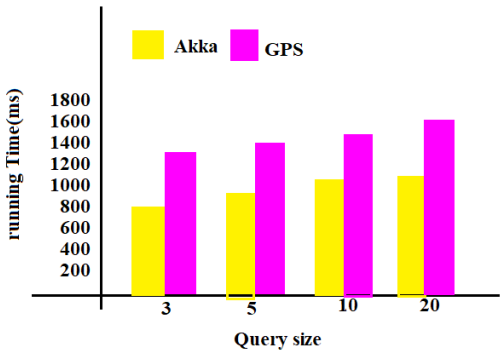
Since we used BFB and vertex centric we require processing system like Pregel.
Since GPS has all features of Pregel we use it. It is made using JAVA and it used master.compute() function.
As in Pregel it consists of master node and vertices. It partitions the graph and then distributes among all workers. Each Worker identifies its partition and then partitions it further and then distributes among vertices. It is then parsed.

b) Akka

It is a toolkit and run time environment. It is used to build concurrent, distributed and fault tolerant event driven system. It is implemented using java and scala. It has API used for handling service failures and load management. It is scalable when new components are added.

c) GPS vs Akka

GPS follows Pregel. But mechanisms like message passing requires effort which is not only time consuming but also prone to error. For example, to send a complex data, to serialize at sender and de-serialise at receiver end the use of serializer and de-serializers is a challenge.
Akka is a general-purpose toolkit, which is designed not only for graphs but also for other uses. We can make it to work like BFB. This is not only efficient for serializing and de-serializing data for communication it also provides efficient wrapping at sender side and unwrapping at receiver side.



Fig–16: GPS and Akka on Graph Simulation

An application is run with Akka and GPS and the results are compared. Akka performed better than GPS as shown in Fig–16.

I) EVALUATION OF DISTRIBUTED ALGORITHMS

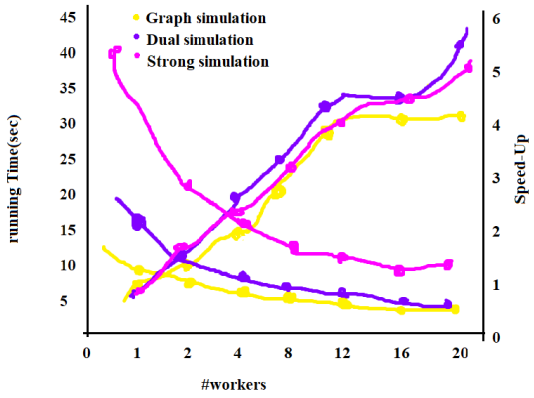
a) Experimental setup:

Both synthesizes and real-world graphs are used.
Having number of edges and number of vertices and a factor a formula given is
$|E|=|V|^a$
To study consistency of the result, we can run experiment for three datasets - one synthesised, and two real-world ones in which one is enwiki-2013 and other is uk-2005.
Parameters used in query graphs are $|V_q|$ indicating number of vertices and a constant a_q=1.2 .
To retrieve a query graph we took $|V_q|$ which is its size and a connected sub graph that adheres to q_n constraint and has $|V_q|$ number of vertices.

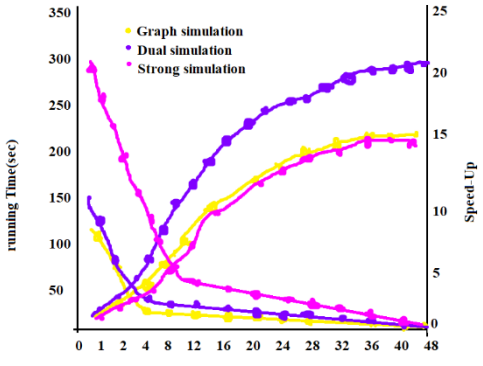
Experiments were conducted using GPS on a cluster of 12 machines. Each component has a 128GB DDR3 RAM, two 2GHz Intel Xeon E5-2620 CPUs, each with 6 cores.

The Ethernet connection was 1Gb. More than 11 workers were assigned in each case. Multiple workers were assigned to the same worker node in a round robin fashion.

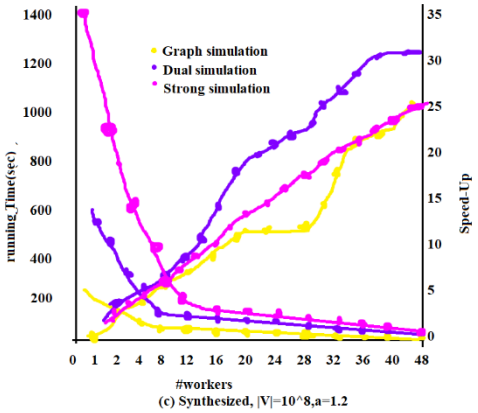
b) Experimental results:



(a) enwiki-2013, |V|=4*10^6



(b) uk-2005, |V|=3.9*10^7



(c) Synthesized, |V|=10^8,a=1.2

Fig–17: Running times and speed-up for distributed algorithm $|V_q|$=25, a_q=1.2

For a small dataset time taken was huge since each one had small share. Dual simulation showed better performance than graph simulation since in dual simulation double work is done in given time.
Stronger simulation keeps bouncing between graph and dual simulation results. Lesser the number of balls better is the performance. Performance is shown in Fig–17.

J) IMPACT OF GRAPH PARTITIONING

METIS is used for partitioning graphs either by multilevel recursive bisect or multilevel k-way schemes. In both ways the graph is split into k parts using edge cutting.

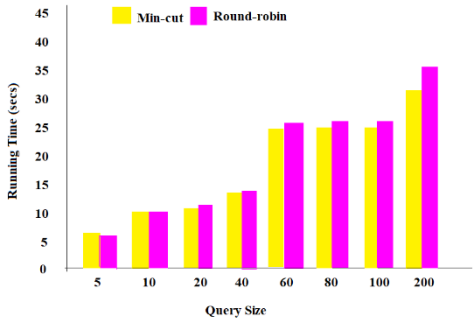
a) Experimental set up:

A synthesized and real-world dataset (uk-2001) is taken and performed min-cut partitioning on graph of |V|=10^7 and a=1.2 and results are obtained.

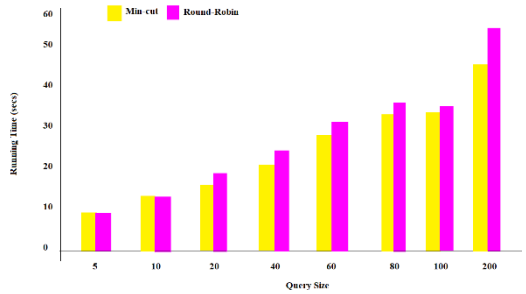
b) Experimental Results:

The complexity measures like runtime and network traffic.

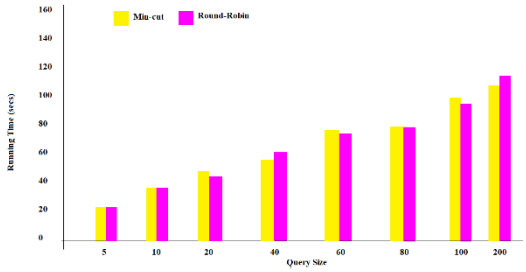
1) Runtime:



(a) Graph Simulation



(b) Dual Simulation



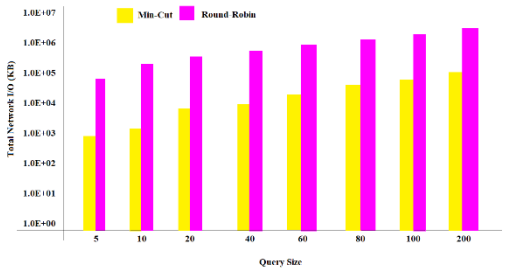
(c) Strong Simulation

Fig–18: Partitioning effect on the runtime of dataset uk-2002-hc, a_q=1.2

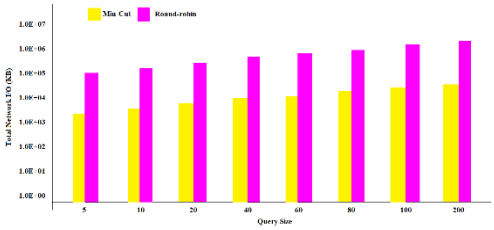
The runtime for min-cut and round-robin is compared as in Fig–18. Runtime for graph and dual simulation are always faster with min-cut since they communicate with adjacent vertices only.
And with min-cut partitioning there is high probability that cut vertex will be on same worker.

In strong simulation, each vertex forms a ball in each super-step. So, there is probability that vertex can communicate with vertex on other side. So partitioning is difficult.

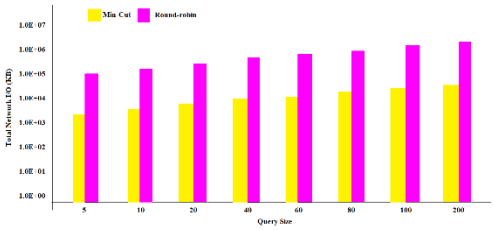
2) Network Traffic:



(a) Graph Simulation



(b) Dual Simulation



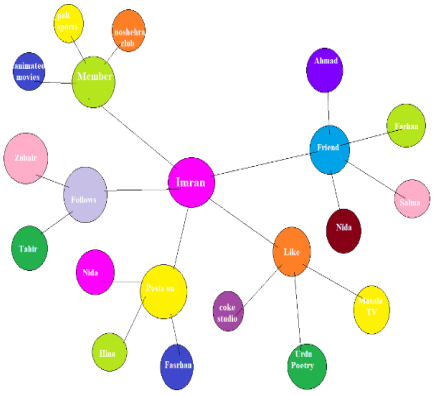
(c) Strong Simulation

Fig–19: Partitioning effect on the network I/O of uk-2002-hc, a_q=1.2

Work is distributed among the nodes. Network traffic is the most important factor. On reducing it we can reduce run time and cost. It is beneficial especially when Bandwidth is low.
On using min-cut principle the network traffic reduces drastically. Power law is used.
When a highly connected graph of few vertices is used network, traffic drops drastically as shown in Fig–19.

K) APPLICATIONS OF GRAPHS:

a) Social Media:



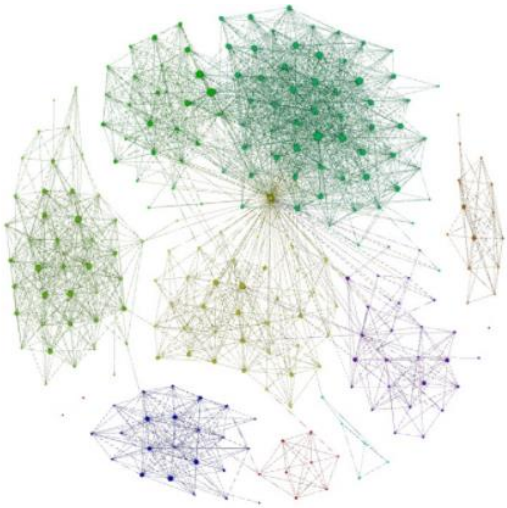
Fig–20: an example of a social media graph

In a Facebook page there are primary users, friends, groups, and posts. Posts may contain text, tags, and medias such as image, videos. Some people comment and like posts. Based on users, locations and interactions graphs can be made as shown in Fig–20.

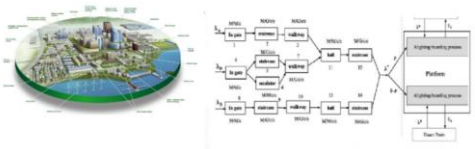
Graphs can answer the following questions:

- Psychiatrists want to know whether a person is becoming violent while playing game or not?
- Whether a person gets addicted with social media?
- Are there groups? Whose group? Who all are there in it? How are the interactions? Where they belong to? Who are they?

b) Analysis and planning of smart cities



Fig–21: Visualizing groups in graph



Fig–22: Graph in planning a smart city

In cities various networks are being used like transport network, water and sewage network, power transmission network and so on. Examples of transport network are bus network, railway network and subway network
City manager needs to traverse all the roads. For that he needs to have a graph like that shown in Fig–21 and Fig–22.

c) Fraud detections

Fig–23: Graphs in bank fraud detection

In points like accounts, individuals, devices and IP address fraud takes place. Fraud maker uses stolen or synthetic identities to escape. So, graph database is used to detect fraud. It is a difficult process.

In a bank following are frauds:

- A group containing two or more people organize a fraud ring.
- People open accounts using fictional identities with subset of shared contact information like phone numbers and address.
- New accounts are added to original unsecured credit lines, credit cards, overdraft protection and personal loans.
- When lines are increased, the ring enters, hack and disappear.
- Fraud ring access account using fake cheques and empty accounts.
- Frauds are identified but not reached.
- Debt is returned without paying.
- To avoid the above graphs like in Fig–23 can be used.

IV) KNOWLEDGE ENGINEERING

A) BACKGROUND:

These are implemented using artificial Intelligence. The main thing to be understood in connectionism is circuit formed by connecting various units called as artificial neurons. The input used is formed by connecting all the input units. The working is done by each unit invoking and de-activating other units.
A gradient descendant algorithm is passed over these units to optimize by adjusting the weights.
Then an optimal solution is obtained. These are done using resources and the value sets.

To make it transparent is the main issue. Various researches are being made in this field to cover gap between black box and Whitebox.
As opposed to connectionist, mathematical model cannot be used. So, the entire thing has a base called formal languages through which reasoning can be done. Using ontologies mathematical model, formal languages and Knowledge graphs can be used.
Knowledge graph can be constructed and then be experimented on the symbols.

Steps used are:
i) going through
ii) classifying
iii) analyse relationship between elements of graph
But disadvantage is that there is no way to handle noise in which research is going on.

B) METHODOLOGY

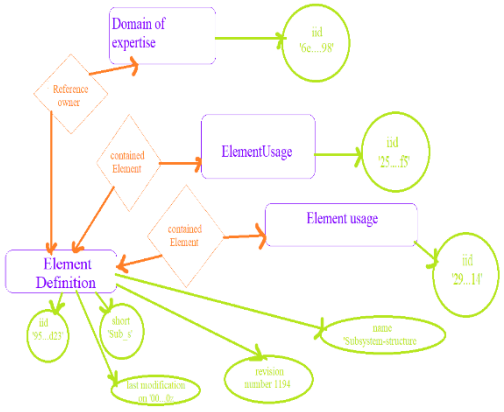
Various engineering models are used. The European Cooperation for Space Standardization (ECSS) provides the ECSS-E-TM-10-25A TM for model-based data exchange. This helps in data definitions and models.
The models are generated and are then exported via RHEA Group's Concurrent design and engineering platform 4 – community edition.

Each migration yields several JSON files containing all data related to one iteration of an engineering model along with parameters, templates, catalogues and reference data specific to a concurrent design facility, generic and model-specific concepts. Fig–24 shows an example of exported JSON file, featuring one element of a class element definition named "sub-system structure".
It shows various elements and their relationship.


```
ClassKind:          "ElementDefinition
containedElement:
    0:              "255f8a7b-8012-4ae8-93a8-26a318b1edf5"
    1:              "297e6467-76f7-4a48-9fce-c73e47004914"
definition:         []
excludedDomain:     []
excludedPerson:     []
hyperLink:          []
iid:                "95dfd909-325c-4de6-84c0-425348d5cd23"
modifiedOn:         "0001-01-01T00:00:00.000z"
name:               "subsystem - Structures"
owner:              "6ec9de88-0dcc-419e-bf02-4ed7c5f11d98"
parameter:          []
parameterGroup:     []
referencedElement:  []
revisionNumber:     1194
shortName:          "sub_5"
```

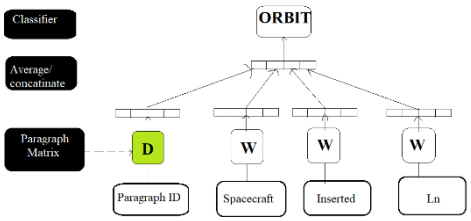

Fig–24: Extract of a migrated JSON file

Knowledge graphs help in organize data of different depth and complexity. They are modelled with different kinds of entities and their relation. It has an additional embedded layer called reasoner allowing to extract implicit knowledge from explicit concepts.

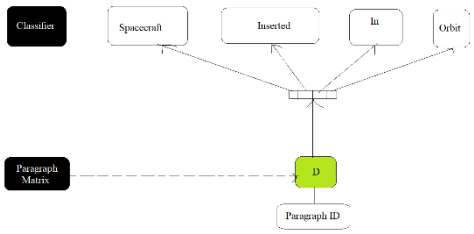


Fig–25: Representation of an Element Definition entity in the KG

Grakn is tool used to construct graphs. It is efficient. Graql compares Grakn with other softwares. It requires simple structure to process higher complex data.
Fig–25 shows how JSON structure can be converted into Knowledge graphs.
Here rectangles represent entities, circle represents attributes and diamonds represent relationships.



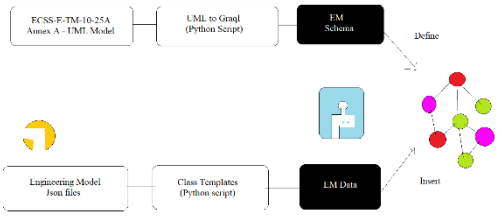
Fig–26: DM architecture



Fig–27: DBOW architecture

Data of EM and KG are unstructured. Embedding NLP layer to these can improve understanding.
Here document level embedding algorithm and paragraph vector algorithm is being used. A vector ID of a paragraph is used and placed in documental level independent of its length representing the document concept. It is known as doc2vec.

Here Distributed Bag of Words (DBOW) and Distributed memory (DM) algorithms used as shown in Fig–26 and Fig–27. DM consists of a bag of words. A word is predicted based on neighbour. It is known as words2vec. In DBOW paragraph vectors are used to classify words. It is like word2vec skip gram.
Although order of words doesn't matter the above two methods are widely adopted.



Fig–28: EM's Migration flowchart from CDP4-CE Ems to a Grakn KG

The graph should be structured using schema representing relationships among various entities. The data imported by EM should be inserted into the schema as shown in Fig–28.

a) Schema migration from UML to Graql:

Table–III: Mapping of UML concepts in Graql

UML Model	Graql Schema
Class: Class name Class attributes-value type Class attributes-reference types	Entity: Entity name: Entity attributes Entity roles
Association relationship Directed composition	N-ry relationship
Inheritance Relationship	Sub(ex e2 sub e1)
Property (Referencing to a value type)	attribute

The schema layer is based on ECSS-E-TM-10-25A Annex A unified Modelling Language (UML) model having all concepts found in EM which are then mapped into Graql as shown in Table–III. Graql includes "long", "double", "string", "Boolean", and "datetime" and by default other types found in UML are mapped to a "string".
All concepts of UML like 127 entities, 108 attributes and 148 relationships are mapped to a Grakn schema. To differentiate the relations are annotated either by containment (49% of relationships) or a reference (51% of relationships) in Graql.

b) Engineering Models Migration

Once the structure of KG is defined, the data are inserted. EMs iterations are exported from CDP4-CE as JSON files. Migration pipeline built in python 3, relying on Grakn Python client, to commit new data to the server.
Each entity requires a template function to generate a specific commit query to insert the entity, attributes, relationship into graph key space.

c) Training of Doc2vec model

Table–IV: Hyper-parameters for model training

Parameter	Setting	Parameter description
Vector size	300	Dimension of the representation vector
Epochs	400	Number of Training Iterations
Mode	DBOW	DBOW or DM mode
Minimum Count	1	Minimum word frequency in corpus threshold
Window	15	Left/right context window size
Subsampling	$(10)^{(-5)}$	Threshold to down sample high-frequency words
Negative Sampling	5	Number of negative word samples

Model is trained with open-source Gensim Python library. Hyper parameters displayed in Table–IV according to recommendations.
The ECSS requirements are divided into training and testing sets. Each requirement is known as a document.
In training set each document is isolated with accuracy 0.99. treating the testing set as unseen, the average cosine similarity of a document with itself is around 0.98.

C) EXPLANATION FOR AI EXPERTS: TECHNICAL ISSUES AND SOLUTIONS

The main goal is to make the system understandable by users.
Research by Adadi et al says that human factors are not considered. Miler argued that views of technicians are taken more than that of users.
There is a gap in the term Explainability. On discussing we can adopt various ways to overcome:

a) Technical issues in Connectionist perspective

These are as:

Complexity: Since the system structure is complicated it is difficult to be understood by the users as proposed by Adadi et al. there is high degree interactions which makes it difficult.

Multiplicity: since the systems are complex in nature there are different interpretations. Models created are different. Paths are similar but not same. This is known as multiplicity. This creates ambiguity.

Opacity: The main feature of interpretability is trade-off between interpretability and accuracy. To understand such complex structure, more complex methods are required. Simple methods cannot be used. First complex models are applied and then reverse engineering is done since inner working is not known.

b) Explainable Systems for AI Experts:

To overcome above drawbacks, we use two methods:

Transparency: It shows how the methods work internally in a model. It is at three levels. One is the whole model; another one is the individual components and then the specific training of the model. Mittelstadt et al represented the following notions:

i) Simulatability: It is heuristic that a human understands every part of the simulation method. In a study of thousand participants, Friedler et al measured human performance in operations that mimic the simulation. Runtime operation count is the measure

ii) Decomposability: In a model the input, output, working should provide clear understandable interpretation. Assaf et al used convolutional neural network which is used to predict multivariate time series in the domain of renewable energy. A salient map is made to:

- predict work done in the interval.
- time interval in which the joint contribution has contributed significantly.

iii) Algorithmic Transparency:

In linear models there is a margin of confidence that it will work perfectly. But this is not a case in deep learning. Datta et al designed a set of Quantitative Input Influence to capture the joint input impact on output to obtain transparency.

Post-hoc Explanation:

Post-hoc explanation does not describe how a model works but predicts its behaviour. Lipton introduced a post-hoc explanation which contains natural language explanation, interactive visualization, local explanation, case-base explanation.

- Natural language explanation is based on qualitative artifacts which represents the relationship that features from inputs to outputs.
- Interactive visualization explains the impact of the features or provide graphical user interface to explore visual explanations.
- Local explanation identifies behaviour of a model on particular prediction in two ways:
  - A simple and local fitting around a particular decision.
  - Variable's perturbations to understand the change in the prediction.
- Case based explanations consist of exploitation of trained model to identify which samples are similar to the prediction and the decision to be explained.

The above does not explain full behaviour of the model but partial. As said by Mittelstadt et al these approximations can be given to AI experts for both pedagogical purpose and to provide reliable predictions of the system behaviour. These are insufficient.

D) EXPLANATIONS FOR NON_INSIDERS: THREE RESEARCH CHALLENGES WITH SYMBOLIC SYSTEMS

The main aim is to make the data understandable. The developer should have the mental model of the receiver. For this symbolic representation is required in XAI. For this there are three approaches:

We should be able to explain the concepts by analysis, synthesis and elaborating the data in Knowledge graph and explain to others. The methods used are:

a) Knowledge mapping:

Here a neural network is made whose components are to be matched with the components of the graph. This is done in the prototype layer.

The various works done are:

- Seeliger et al identified matching the input neurons to classes of ontology.
- Sarker et al proposed objects within objects within images are mapped to components of ontology.
- Angelov et al introduced a deep learning architecture for image classification, that include semantic layer called prototype layer to provide explanation.
- Selvaraju et al proposed a method to learn a map between neurons weight to semantic domain knowledge.
- Batet el al exploit wordnet and its taxonomic knowledge to compute semantic similarities that conduct to more interpretable clusters.
- Geng et al exploit two external knowledge graphs in deep learning:

i. To provide explanations to understand to learn the transferability of features learnt by CNN
ii. To justify new classes predicted by graph convolution network, that were unseen by CNN.

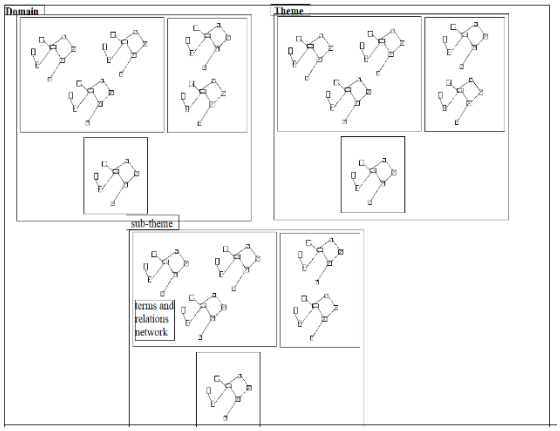
b) Cross-disciplinary Explanations:

Ontology and knowledge graphs were used to represent data. Both used symbolic ways of representation. Here, it consists of representation of various entities and relation among them.
Wickle et al mentioned the above how knowledge can be represented.

c) Interactive Explanations:

Here the neural network and the graph should be such that, they show interaction among the components. Various models are created for these.

E) THE DATA STRUCTURE MODEL FOR THE ONTOLOGY NETWORK



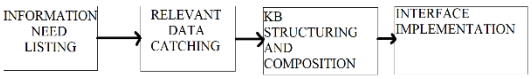
Fig–29: Ontology Structure for the knowledge base read by the software

Ontology models consist of various components connected by relations as in Fig–29.
Ontology consisting of terms and relations is inside a box called sub-theme which represents a particular subject. All these sub-themes are in a box called theme. Such model was constructed with the methodology described in HOESCHL.

F) KNOWLEDGE ENGINEERING SUITE

Knowledge engineering is designing of a system model using knowledge. It involves interaction between knowledge engineer who builds the system and a specialist. Since it is a multi-disciplinary system, this is quite a difficult process.
The knowledge engineering is a task to catch, grouping into domain specific fundamental knowledge, prognostics and control systems. This process including grouping the knowledge, make the engineer understand and process is a difficult task. Beyond that cumulative knowledge may be codified, tested and refined.

The knowledge engineer extracts procedures, rules and strategies from specialist and implement them inside an intelligent system.
The result of this is a software project, which solves specific problems like a specialist.



Fig–30: Basic steps to create information retrieval tools

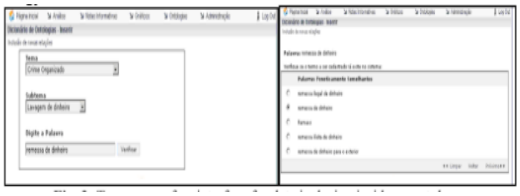
An aim of information retrieval inside the enterprise knowledge bases, allows a fast information recovery, by its employees, BUENO describes a method for ontology construction, denominated knowledge Engineering suite, composed of four steps as in Fig–30:

i. Listing the information needs inside the client enterprises.
ii. Catching the relevant data to the context of the information that may be represented.
iii. Structuring and composition of the knowledge, which contains the data.
iv. Implementing the final user interfaces with searching tools, which work over the knowledge basis.

It involves classifying among the professionals, tools and production procedure. This is to capture knowledge and then converting into information.
The production system is made by:

i. System analysts: who takes care of the technical implementation.
ii. Domain specialist: who has the technical knowledge of the system.
iii. Knowledge engineers: Build the model using knowledge.

After the vocabulary is done, the knowledge engineers relate each component with other and stores in the database using collaborative tools and navigable pages. It is then checked whether it matches ontology structure.



Fig–31: Two pages of an interface for data inclusion inside an ontology

In this process there are three super steps. Each one is dynamic to erase the complete vision of the process. In Fig–31 two pages are used for edition in one project.

Fig–32: Sample of a table formatted generated report about ontology terms e-relations

Search engines are used to review the entire thing. Each and every relation is checked. It is given in tabular form as in Fig–32. More the data, more difficult, slower and stressing is its management, demanding great attention from the knowledge engineer responsible for its production and increasing the risks for inconsistencies and correction work which is a bottleneck.

G) THE PROPOSED SOLUTION

On seeing above drawbacks of tabular data structure a graphic solution is introduced with which it is easier for knowledge engineer to view the result. All required resources help in navigation and search resources in an environment and all functionalities are reused.

i. Relevant Ontology Properties:

- It can be represented as relationship between components just as graph represented by vertices and edges. It has attributes like vertex length, line width, colours and term symbol.
- Constantly terms and relations are being added. It represents a vocabulary. It should be understood clearly.
- Terms and relations have internal data which refers to the concept and relations.

ii. Tool Requirements for graphical and integrated data presentation:

- Showing nodes and relationship among them in form of edges and vertices with properties like formats, colours and drawing styles.
- Loading ontology data according to user requirement.
- Positioning data on screen according to user requirement manually or automatically.
- Allowing full or partial vision of network according to requirement of knowledge engineer.
- Allowing users to understanding internal working by seeing the graph.
- Offering users searching and data refinement resources.
- Allowing user persist network transformation, for ulterior consult.
- Giving user appropriate environment and resources and tools to manage the new ontologies.

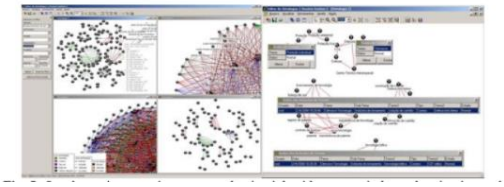
iii. Project considerations and limits:

- The existent framework classes for the network are given, like data viewing were used.
- The software loads data from only one type of database having only one type of data format.
-

- Data selection is done according to following criteria:
  - ➢ Chosen theme and sub-theme.
  - ➢ Initial term and connected ones.
  - ➢ Initial and final date and time for data inclusion.
- Terms are represented using points or icons with internal texts.
- Relations are represented Edges, coloured according to type and style according to storage situation on the knowledge base.
- Refinement can be using same criteria. The type should be mentioned.

Due to the existence of another type of knowledge base, the software will have generalised some items, which will compose derived framework made to ontology network management.
The new application is multiple document interface type, which can show the load data via many integrated but independent windows.
The application does not save the entire ontology but only the final edited one.

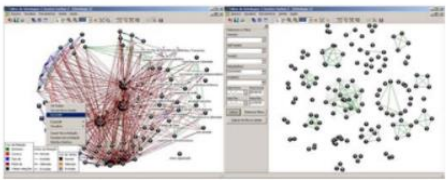
i) Final result and working model:



Fig–33: Ontology viewer main screen, and at its right side many windows showing internal terms and relations properties

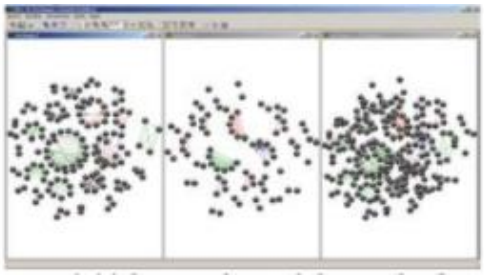
The steps involved are loading, editing and filtering.
The types of loading are
Selective data loading:
The criteria to select data are theme, sub-theme, terms, relationship and time.
Internal data viewing: Internal properties like terms and relation.

Data edition: editing according to human choice
Data drawing options: terms are vertices and the relations are edges.



Fig–34: Menu with operations over groups or isolated data. At its right side, a filter applied only over relations

Data filtering: Only required data is taken based on themes like time, theme, sub-theme based on time using regular expressions like * and ? according to Fig–33 and Fig–34.



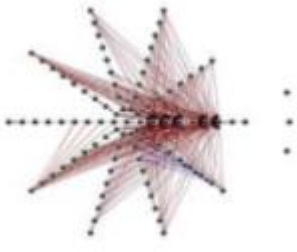
Fig–35: Windows showing two initial networks, and the result after network union option

Network union: to check data in theme or subtheme network union tool is used. It is used to merge components. If things are duplicated, it is taken only once according to Fig–35.
Persistence of visual disposition of data: for situations where it needs to report or ontology production generation, data visual disposing on planar space can be stored on bitmap or jpeg style pictures

H) COMPLEMENTARY RESEARCH APPROACH

i) Graph drawing algorithm for Ontology network

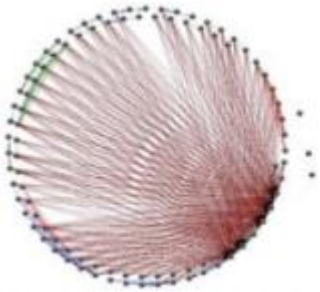
N-Part Radial Disposal:



Fig–36: 10-part Radial Disposal

Here the vertices are divided into N parts. Circle starts with small radius. It increases with increase in N count as in Fig–36.

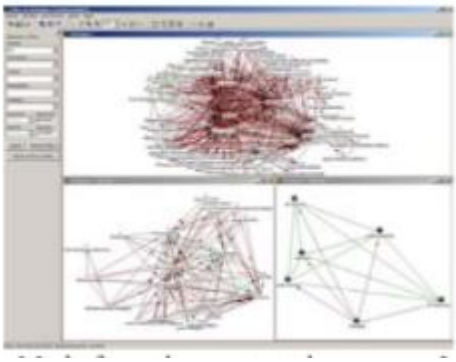
Radial Disposal by Constant Arc length:



Fig–37: Radial Disposal by CAL

Vertices are positioned along a circumference as in Fig–37. Circumference length between each vertex and the angle formed are calculated. Angle varies with radius.

ii) Textual search through wildcards



Fig–38: Wild-card filtering: made from the greatest data group. Left: filtering by the string "*o?a*". Right: filtering by the string "terr*".

In Ontology there are many components. There is chance of similar terms to occur. So, wildcard filter is used to detect these.

In left bottom “terr*” is used which is used to match any word starting with terr followed by any sequence. In right bottom *o?a* is used which matches words starting with any number of characters followed by ‘o’ followed by any single character followed by a followed by any sequence of characters as depicted in Fig–38.

I) APPLICATIONS OF KNOWLEDGE GRAPHS:

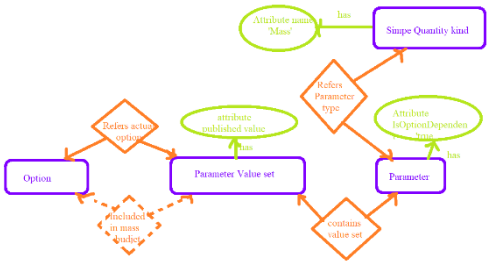
1) Used to integrate knowledge from various source in 1980.
2) Used to enhance web browser.
3) Used in a model that stores in a triple and then analyses it.

J) CASE STUDIES

a) Inferring mass budgets:

Inferring mass budget is system engineering task. In this we use certain rules and reasoning.

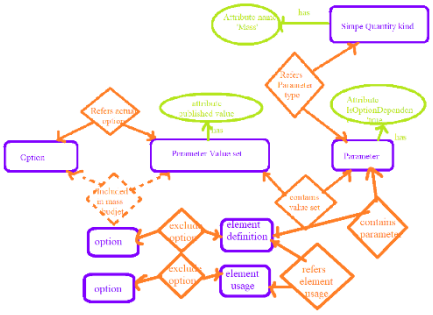
According to ECSS-E-TM-10-25A standard There is no relationship telling whether an element is present in mass budget. But it can be inferred. isOptionDependent is used to tell whether it is option Dependent or not which takes a Boolean value.



Fig–39: Inferring an includedInMassBudget relationship when the parameter is option dependent

If parameters are option dependent, as in Fig–39, parameterVaueSet having attribute mass refers to option it is dependent.

Since the value depends on option, their relation is made in ParameterValueset. Since parameters related to mass should be retained, the parameter must refer to SimpleQuantityKind having attribute mass. When the conditions are met, a new relationship IncludedInMassBudget is created between ParameterValueSet and the option. Inferred elements are indicated with dotted lines in the schema.



Fig–40: Inferring an includedInMassBudget relationship when the parameter is option Independent

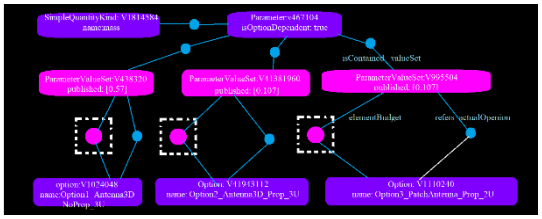
Even if it is OptionIndependent, it is not necessary that it has to be connected to all options. Element containing mass should be verified as shown in Fig–40.

TABLE V: Pseudocodes of Rules

Rule 1: The parameter is option dependent when:
{1. There is a ParameterValueSet, contained by an option Dependent parameter,
2.the same parameter refers to a SimpleQuantityKind with name “mass”
3) There is an element of class Option which the element of ParameterValueSet refers to as ActualOption.}, **then** { The elementnt of class ParameterValueSet is included in the option’s mass budget

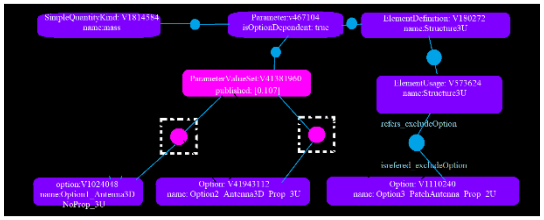
Rule 2: The parameter is Option Independent when:
{
1) there is *parameterValueSet*, contained by an option independent parameter,
2) The same parameterType refers to a s*impleQuantityKind* with name “mass”
3) The element usage associated with the same parameter through an elementDefinition does not include the option}, **then**
{The element of class ParameterValueSet is included in the Option’s mass budget}

Rules are given in Table–V:
Grakn requires “when” side of a rule to be a conjunctive pattern while the rule’s result, the “then” side is atomic, meaning only one fact is inferred.



Fig–41: Inference outcomes from Rule1 visualised with the Grakn workbase, the three inferred edged are denoted by purple circles and framed in boxes.

Graphs are represented in Fig–41. In this case relation is given between every option and parameter including new parameters represented in purple colour.



Fig–42: Inference outcomes from Rule2 visualised with the Grakn workbase, the two inferred edged are denoted by purple circles and framed in boxes

In Fig–42 relation is given only between parameters and options that have “mass” object.
The above methods reduce complexity. Relation *includedInMassBudget* is placed between parameter and option via the python client. Details like elements, scale and mass margins are associated with each value are extracted

K) CONCLUSION

The term graph is widely being used for a long time. It provides efficient way to represent data. Google reinvented it and is adopted by various other companies. It is used for both handicraft data as well as data which is browsed and processed. But however, it is not suitable for all applications. It resembles framework for mathematical model.
Efficient indexing can be done using graphs than other techniques because of low cost and less time in computing. Algorithms used are more efficient and provide better results. However, there are some challenges which need to be overcome. Graph database provides intrinsic support to data structure, modelling, querying and some integrity constraints that results in faster computation.

There is more to be developed in graph database. It should be able to process new query language.

For big graphs special parallel and computation models which offers features like fault tolerance, flexibility, simplicity, better usability, optimal performance, scalability, computational efficiency, and better resource utilization.
Graph pattern matching has become a prominent. This makes the entire thing simpler. The conclusions obtained are:

- They exhibit scalable behaviour as we increase the number of workers.
- Min-cut graph partitioning techniques improves the runtime of graph dual simulation consistency especially with bigger queries.
- Min-cut graph partitioning always reduces the network I/O among workers.
- Two different techniques are used that can be used to build balls around a vertex centric setting.

In Knowledge engineering techniques like AI, huge number of symbols are generated which is difficult to handle. So, knowledge graphs are used, which reduces complexity.

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Detecting Unusual Crowd Behaviour with OpenCV and Deep Learning

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***Abstract*:**

Suspicious behavior in open areas is sensitive and prone to serious consequences. There are many systems built based on video frame acquisition that monitors motion or identifies pedestrian but those systems are not smart enough to find out the unusual activities even in a real-life scenario. It is necessary to identify fugitive scenarios in real-time from video surveillance for rapid and immediate control before any casualties. To create a technology that can automatically identify suspicious behavior using computer vision, the system focuses on distinguishing suspicious scenarios and pinpointing the precise target of the activity. The system utilizes the Open CV library for distinguishing and categorizing several kinds of tasks or actions in real-life scenario. Automated event identification, movement-based recognition, person count tracking, autonomous robot navigation, and a variety of other disciplines are some of the other topics covered. The identification of objects in movement and tracking from videos is very critical. Separating objects from their background, on the other hand, is a challenging process. So, it very crucial to get clarity on the contents of the visual data and the background of the objects. A difficulty arises when an object appears from the background as a result understanding the footage and its elements with portrayed scenarios becomes the most essential requirement. The utilization of a typical human behavior approach is the predictable goal in the unpredicted activity detection phase. The technique is created at the start while working with certain common activity datasets. Actual information and facts are compared with the pattern during the verification step. Finally, a judgment is made about whether the behavior is expected or not. Unusual activity detection in the real-world security system is challenging due to the requirement of a specified typical human activity approach.

Keywords - Crowd Activity, YOLO algorithm implementation, motion detection, alerting systems, live telecasting, deep learning model, video surveillance, clustering mechanism, social distancing measures.

I. INTRODUCTION

In general terms, it is shown that humans appear to be prone to many immune diseases which mechanisms to both genetic and environmental related diseases. Human health is also affected by various agents present in the surrounding environments which may be physical, social, or mental well-being, not just by the mere illness that the human body is affected with.

The virus responsible for this is the “Corona Virus” which is one of the RNA Viruses that target mammals and birds. Coronaviruses are one among the family of viruses that infect human beings to certain illnesses that have preliminary symptoms such as acute respiratory symptoms, common flu, and few others.

The common public may adopt to maintain social distancing in certain public gatherings. Precautionary measures such as; staying indoors, limiting travel, avoiding crowded areas such as shopping centers, etc. can be implemented. Necessary unavoidable social events can be attended provided there are no contact greetings, distancing themselves from others of about 6-20 feet, and by wearing masks accordingly. Physical distancing helps limit the spread of COVID-19 or any similar sort of infectious disease. Acic Crowd detection allows for estimating the number of people in a defined area in many situations (cultural events, conferences, public sector areas like malls, etc.) Some of the top currently researched algorithms are:

a) Faster R-CNN
b) Histogram of Oriented Gradients (HOG)
c) Region-based Convolution Neural Networks (R-CNN)
d) Region-based Fully Convolution Network (R-FCN)
e) Single Shot Detector (SSD)
f) Spatial Pyramid Pooling (SPP-net)
g) YOLO (You Only Look Once)

With the tremendous advancements in the technological sector of excellent quality and non-expensive video recording equipment, modern computers have escalated their demand for analysis for such footage in every industry. Detecting moving objects and tracking them from the footage, on the other hand, is highly crucial and critical. Distinguishing objects from their surroundings is likewise a challenging job. Visual/Optical observation is one of the exceptionally recognized investigates, which has a more

noteworthy region, human behavior application movement checking, public wellbeing in spaces like banks, shopping areas, private regions, and so forth. In a number of fields, motion-based recognition, human counting, autonomous robot navigation, and other types of automated event detection are implemented. CNN's, the image configuration parameter for performing operations and neural networks (NNs) that integrate the image features from the CNNs with the picture that make up the system. This project is efficiently possible to demonstrate, with the use of Alerting Systems. The maximum probability determines the classification.

II. LITERATURE SURVEY

A. *Literature survey of the [4] reference paper:*

In a variety of emergency scenarios, crowd-sourced image processing has the potential to have a significant influence on reaction times. Because visuals might include a lot of information about an event of interest, it's important to send the right images to an analyst as soon as possible [1]. In this article, we will look at how to effectively assign local (phone CPUs) and remote (network-based GPUs) image processing resources to mobile devices, with the objective of sending those of interest to a centralized organization while also accounting for energy use. The use of the Network Utility Maximization (NUM) framework, in combination with a hit-ratio estimator and energy costs, enables the system's distributed implementation. To validate the findings, both synthetic simulations and real-world traces are employed. This project's goal is to classify all photos as quickly as possible, regardless of whether or not they include the item of interest [7] while some of their algorithms may process more images in less time, it manages to optimize for utility by posting positive hits as early as feasible. They addressed the challenge of distributing resources to mobile users who engage in crowd-sourced image processing, to increase the speed at which pictures containing the object of interest were sent to a centralized authority. The issue formulation takes energy consumption into consideration and differentiates consumers based on the hit-ratios of the items of interest in each user's mobile device. Methods for calculating each user's hit ratio are also mentioned in this study. The dual-path strategy that we suggest has been demonstrated to enhance performance significantly.

B. *Literature survey of the [1] reference paper:*

Various methods based on video frame capture have been created to detect motion or pedestrians. However, these systems were not sophisticated enough to recognize odd behaviors in real time. It is vital to identify such scenarios in real-time via video surveillance to respond promptly and efficiently before any casualties occur [1] [2]. The proposed system here focuses on identifying suspicious behaviors to develop a technology that can automatically utilize computer vision to identify suspicious behavior. It utilizes the libraries of OpenCV to categorize several types of activities in real-time [1]. The motion influence map has been used to represent motion analysis in which the position it has moved whether from one site to another, regularly. The system in this case makes use of the pixel-level display to make the actual situation easier to understand or recognize, and is developed to be analyzed to address simple human actions like walking, running, and many more, but they are not suited for busy areas. Using an OpenCV and motion influence map, the proposed system can detect abnormal human behavior in a crowd and respond appropriately [1]. The accuracy rate is a little greater than others, and there are fewer studies on this idea. Prior Appraisal against Crime is possible with the proposed method. The accuracy is 96.42 %, which is sufficient for detecting anomalous behavior in complicated environments. Using OpenCV and Motion Influence Map, the suggested system is capable of effectively recognizing anomalous human behavior in a crowd, greatly improving the accuracy and competence of the system. Unusual Crowd Activity Detection may be used in a variety of public settings to provide early warning of crime and improve casualty management [1]. However, accuracy is frequently crucial, and it must be improved to build an ideal system that can be applied in practice.

C. *Literature survey of the [6] reference paper:*

This study demonstrates how to leverage local group ties to address the problem of recognizing human group activity, rather than analyzing each human motion, it initially combines individual human entities into small groupings to depict the overall connectedness of the scene. The useful movement of data is maximized by simulating both individual human mobility and local group interactions [2]. With non-linear hidden units, the gated recurrent unit model was utilized to handle an infinite amount of trajectory information. They evaluated the performance of the suggested approach to that of other competing methods in this experiment with a publicly available dataset of human group behavior and found that the new method outperforms the others [6]. In a surveillance video, a new feature descriptor is used to detect group behaviors. Several human items are classified into local groups, and their relationships are taken into consideration. The model which is the GRU model was able to represent the temporal dynamics of a variety of interactions of varying duration. It also suggested that the local group feature outperforms competing techniques. By extending the given approach, the research was also able to deal with appearance features and diverse circumstances.

III. PROPOSED MODEL

Using CNN, the suggested model can detect human behavior in a crowd and determine if it is normal or odd. To categorize activity from the dataset, we will create a deep learning system. When the system receives an image, it assigns it to one of the classes (usual and unusual) using the algorithm YOLO which is a Deep Learning Object Detection Area. The system is made up of an ensemble of CNNs, as well as image preparation procedures and neural networks (NNs) that integrate image characteristics from the CNNs with the picture [1]. The ensemble combines the NN outputs into a set of prediction probabilities for the classes using unweighted averaging. The categorization is determined by the greatest likelihood. As shown in Fig.1, a CNN is composed of a series of processing layers. Each of the layers

in convolution filters is those that detect the picture characteristics. The feature detectors in the early layers resemble Gabor-like and color blob filters, as illustrated in Fig. 2, and subsequent layers produce higher-level feature detectors. Near the end of the series, the CNN integrates the detector outputs in fully linked "dense" layers, generating a set of predicted probabilities, one for each class. Unlike previous approaches like HOG and SIFT, CNNs need not create feature detectors from the algorithm creators. As it trains, the network trains itself which features to recognize and guides itself to detect them. A sequence of image feature detectors is applied to the input image.

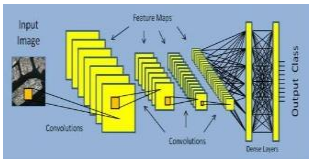

Fig 1: Convolution Neural Network (CNN) structure.

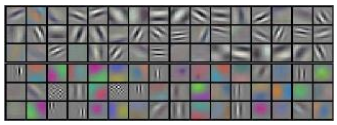

Fig 2: Examples of visual feature detectors that a CNN may "learn" during training.

A. Methodology

There are four steps to constructing a deep learning model:

1) Gather your Data
2) Split your Data
3) Train Your Network
4) Evaluate

The first step in creating a deep learning network is to collect our initial dataset. Then require both of the images and the labels associated with each image. These labels must be drawn from a specific finite category.

Now, we need to divide our initial data sample as two separate datasets:

a) Training Set
b) Testing Set

We can now train our network using the visuals from our training set. Our network's objective here would be to learn how to classify each of the categories using the labeled data. When the model makes a mistake, it learns from this and seeks to improve.

Evaluation of our trained network, we present each of the photos in our testing set to the network and asks it to predict what the label of the picture represents. The model's predictions for each image in the testing set are then tabulated.

Fig 3: Examples of common training and testing data splits

B. Working with the Data

In real-world applications, there is a need for bounding box detections in advance; therefore a detector is with the tracker. Assume we consider bounding box information for all items within a frame and then allocate IDs when provided with the information of the box for an ID in frame 1 using:

- Centroid based ID assignment:

We can allocate IDs based on the centroid of the bounding boxes. In frame 1, we achieve this by computing the centroid for each bounding box. In frame 2, we evaluate the new centroid and assign IDs depending on their relative distance from the former centroid. The underlying principle is that the centroid shifts only slightly from frame to frame. This straightforward method works effectively as long as the centroids are separated by a sufficient distance. When persons are near to one another, this method fails because IDs may be switched.

- Kalman Filter:

Kalman Filter is an improvement over simple centroid-based tracking. The Kalman Filter allows us to model track based on an object's location and velocity and forecast where it is most likely to occur. It forecasts future location and velocity using Gaussian distributions. When it receives a new reading, it may use probability to assign the data to its predictions and updates itself. It has a small memory footprint and operates quickly. Thus it outperforms centroid-based tracking in terms of accuracy since it considers both location and velocity of motion.

C. Group Detection Implementation

- Detecting individuals in a video feed with the YOLO object detector.
- Determining the centroid for each detected person.
- Computing the pair wise distances between all centroids.
- Checking to see if any pair wise distances were < N pixels apart and if so, indicating that the pair of people violating.

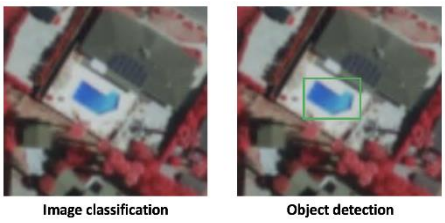

Fig 4: Object Detection from the given point of location

CONCLUSION

The configurations presented thus far are meant to comprehend fundamental human activity such as walking, running, and most other activities, but they are unsuitable for use in a busy space. The proposed device is capable of detecting irregular human behavior from the crowd and behavior using the motion effect map and OpenCV. The proposed system's accuracy rating is marginally higher than that of others, and the basic tracking algorithms play a pivotal role for any dealing with Previous Crime Appraisal. By using OpenCV and Motion Impact Diagram, the proposed device is capable of accurately detecting the

irregular human behavior of the crowd, which improves the device's accuracy and expertise to a great degree. The availability of using the already existing GPS systems in our project demonstrates that we are trying to showcase the utmost a verified, accurate, and précised data currently in use. We will be able to use this Project for the real-time scenarios for COVID-19 norms.

FUTURE ADVANCEMENTS

The data that has been working is merely limited to being processed in RAM rather than being explicitly stored locally or globally. The data is dynamic, and we plan to implement on storing it in the future on a cloud service such as Firebase, Azure Platforms, and so on.

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COMPUTER VISION BASED SMART MUSIC PLAYER

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***Abstract*— Music is a universal form of entertainment bringing joy and happiness to avid listeners throughout the world. Most music players require the user to select songs manually, leading users to create a playlist of songs for each mood. Though these music players have advanced features like providing lyrics and the ability to tweak listening parameters such as bass, temp among others there is room for improvement. We aim to automate the selection of songs through the system reacting to the user's emotion obtained using his facial expression and classifying them into 4 categories or moods namely - Happy, Angry, Sad, Neutral, saving time that would have been spent entering information manually. To provide a non touch music control experience our music player uses a hand gesture recognition system for all music control operations such as pause, play, skip, increase volume, decrease column and skip a song. Finally if due to the COVID19 pandemic the user is wearing a face mask then we detect it and instruct the user to specify the category of songs he wishes to listen to using predefined hand gestures. Finally, after each listening session, the recommendation system reorders the songs in the database so that the songs that the user frequently listens to is at the top of the playlist while the song the user skips are placed at the bottom**

Keywords—openCV, Computer Vision

I. INTRODUCTION

The main objective of our project is to develop an intelligent system that can easily recognize facial expressions and accordingly play a music track based on that particular expression/emotion recognized. Furthermore, we incorporate a hand gesture mechanism for pause/play, increase volume, decrease volume, and skip songs. We have utilized the open-source OpenCV library and Google's Mediapipie API to achieve both tasks. Firstly the music system will detect the face of the user, after that the detected faces will be classified into different emotions based on facial expressions. Then the music player will play music based on the classified emotion. Moreover, the system has a hand gestures recognition system to control the music player, thereby our system does not require any inputs through keyboard, mouse, or touch screens. Finally, the recommendation system personalizes the music player for the user's music preferences. Furthermore, the face mask detection module ensures that if the user is wearing a face mask then he can play songs from any category using pre-mapped hand gestures similar to how happy, angry, sad, or neutral music would have played through facial expression detection.

II. LITERATURE SURVEY

This section presents the existing methods and relevant approaches which are surveyed as follows.

Vasanthakumari, M. U. Peerzade, S. Nayak, Bhagya V, S. Padmanabhan [1] proposed face mask detection using MobileNetV2 with an accuracy of 96%.

F. Zhang, V. Bazarevsky, A. Vakunov, A.Tkachenka, G. Sung, Chuo-Ling Chang, M. Grundmann, [2] proposed mediapie hands, a real-time on-device hand tracking solution that predicts a hand skeleton of a human from a singleRGB camera for AR/VR applications.

P. Hosen, N. Himel, A. Adil, N. N. Moon, F. N. Nur [3] proposed Facial expression recognition for the classification of facial features such as happiness, sadness, fear, disgust, surprise, and anger. A playlist is created based on emotion and user interest and a model is built for the changing wallpaper.

A. Arora, A. Kaul, V. Mittal [4] depicted various algorithms based on classification to provide a clear methodology to i) classify songs into 4 mood categories and ii) detect users mood through his facial expressions and then combine the two to generate user customized music playlist.

L. Y. Mano, B. S. Faical, V. P. Goncalves, G. Pessin [5] proposed an intelligent agent that sorts a music collection based on the emotions conveyed by each song, and then suggests an appropriate playlist to the user based on his/her current mood. The user's local music collection is initially clustered based on the emotion the song conveys, i.e. the mood of the song. This is calculated taking into consideration the lyrics of the song, as well as the melody. Every time the user wishes to generate a mood-based playlist, the user takes a picture of themselves at that instant

P. Sarda, S. Halasawade, A. Padmawar [6] proposed a system where the mood is statistically inferred from various data sources primarily: audio, image, text, and sensors. Human's mood is identified from facial expression and speech tones. Physical activities can be detected by sensors that humans usually carry in the form of cellphones. It is a smart music player that keeps learning your listening habits and plays the song preferred by your past habits and mood, activities, etc.

K. Chankuptarat, R. Sriwatanaworachai and S. Chotipant [7] proposed a mobile music player application which is able to recommend songs based on the user's emotion. To classify the user emotion, the proposed application applies both the heart rate and face image.

S. Deebika, K.A. Indira and Dr. Jesline. [8] proposed a mobile music player application which is able to recommend songs based on the user's emotion. To classify the user emotion, the proposed application applies both the heart rate and face image.

A. Sen, D. Popat, H. Shah, P. Kuwor and E. Johri [9], proposed a user-intuitive smartmusic player. This player captures the facial expressions of a person working on the computer and identifies the current emotion. Since various sorts of music are available to boost one's enthusiasm, taking into consideration the tasks executed on the system by the user and the current emotions they carry, an ideal playlist of songs will be created and played for the person.

S. Tiwari and Dr. Aju D [10] proposed a system to detect facial expressions so as to operate an alert system that is very much needed to reduce the crime rate.

O. R. Chanu, A. Pillai, S. Sinha, P. Das [11] proposal illustrates two different techniques of vision-based hand gesture recognition and one data glove based technique. The vision - based technique is static hand gesture recognition technique.

R. Ramanathan, R. Kumaran, R. Rohan R, R. Gupta and V. Prabhu [12] proposed an intelligent agent that sorts a music collection based on the emotions conveyed by each song, and then suggests an appropriate playlist to the user based on his/her current mood. The user's local music collection is initially clustered based on the emotion the song conveys, i.e. the mood of the song

S. Gilda, H. Zafar, C. Soni and K. Waghurdekar [13] presented an effective cross-platform music player, EMP, which recommends music based on the real-time mood of the user. EMP provides smart mood based music recommendation by incorporating the capabilities of emotion context reasoning within our adaptive music recommendation system.

K. S. Nathan, M. Arun and M. S. Kannan [14] proposed EMOSIC, an efficient and accurate model that would generate a playlist based on the current emotional state and behaviour of the user. This proposed system is based on real-time extraction of facial expressions as well as extracting audio features from songs to classify into a specific emotion that will generate a playlist automatically such that the computation cost is relatively low.

A. Howard, C. Zang and E. Horvitz [15] examined the bias issue found in learning algorithms for intelligent systems by focusing on the emotion recognition problem. Firstly baseline outcomes are presented for a cloud-based emotion recognition algorithm applied to images associated with a minority class, in this instance, children's facial expressions. Then a hierarchical approach is presented that combines outputs from the cloud-based emotion recognition algorithm with a specialized learner, and shows that this methodology can increase overall recognition results by 17.3%.

S. G. Kamble and A.H. Kulkarni [16] proposed the detection of a person's expressions by extracting the facial features using the PCA algorithm and Euclidean Distance classifier. The results show that the proposed system achieves up to 84.82% of accuracy level in recognizing the expressions.

III. System analysis and design

A. Existing system and their drawbacks

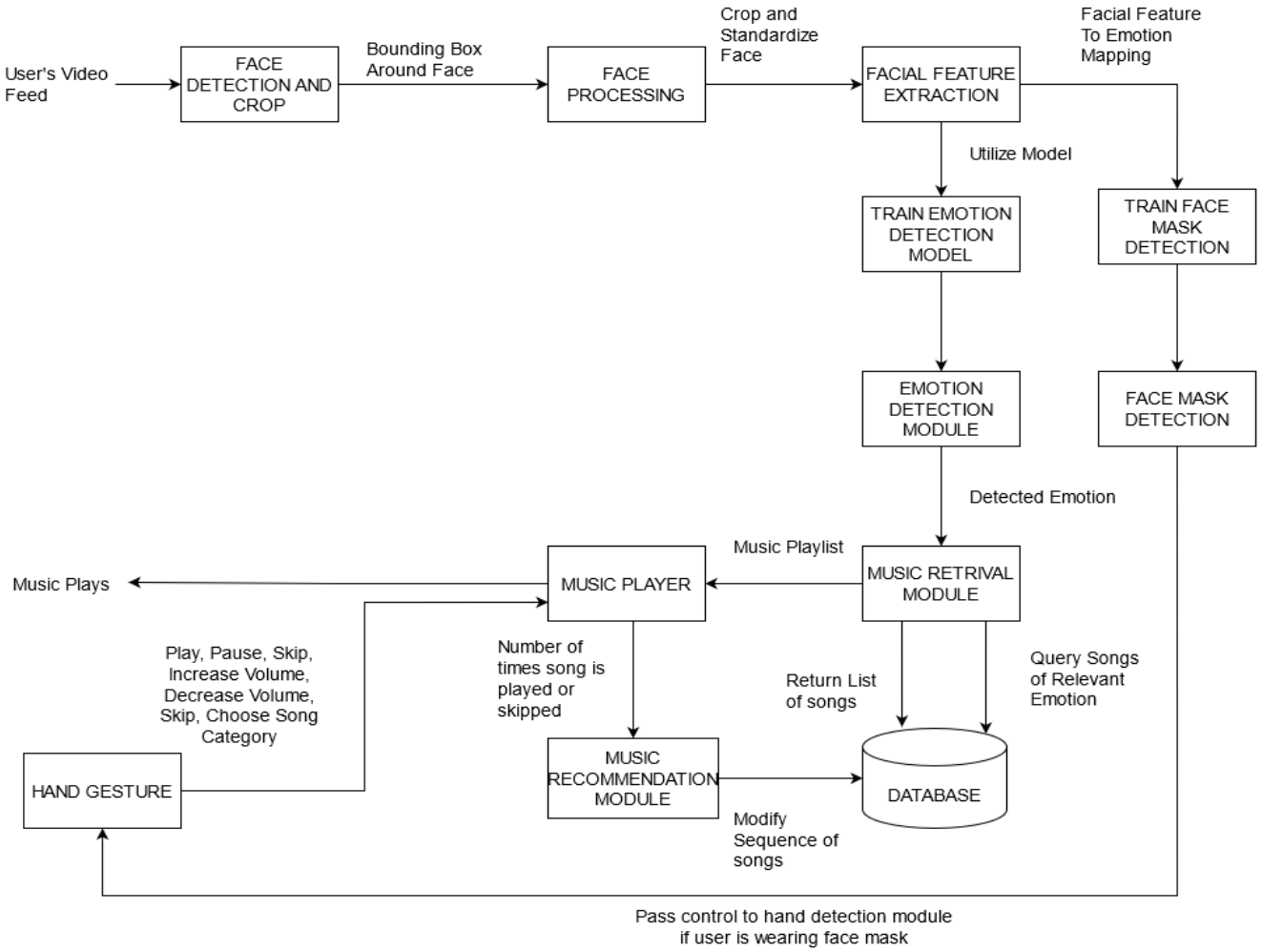
To develop an appropriate application, the existing music player applications are investigated. Currently, there are various type music streaming applications available in the market, but there are still some drawbacks that can be observed with the existing systems.few drawbacks are listed below:

1. The existing systems perform facial expression recognition either on still images or music is played only for the first identified emotion, these systems do not account for emotion changes in real time.
2. Music control mechanisms require touch interactions with the device.
3. A recommendation system does not exists to understand users preferences

B. System Design

In this section, we will discuss the Architectural System design of our proposed system and Description of the various modules involved.Module and their descriptions are listed below:

1. *Face Detection Module*- This module detects the presence of the user, crops their face, converts to grayscale and saves the image to the dataset. We use the HAAR classifier built into openCV to perform this operation.
2. *Training and Classification Module*- We use images to train a generalized model for emotion detection. We split the obtained dataset into training and classification sets.
3. *Emotion Detection Module*- Our customized model is now deployed to identify the emotion of the user through the real time camera feed. The user's facial expression is determined by the emotion detection module.



4. *Hands Free Control Module*- This module monitors the video feed for predefined hand gestures and on recognition sends pause, play or skip signals to the music player.
5. *Music Retrieval Module*- This module queries the database for the playlist of songs pertaining to the identified emotion. The obtained playlist of songs is forwarded to the Music Player.
6. *Music Player*- The selected music is played on the default music player on the user's computer.
7. *Face Mask Detection Module*- Here we detect if the user is wearing a fast mask. If yes we pass the control to the hand gesture module to specify the category of song to be played.
8. *Music Recommendation Module*- At the end of each session this module must extract statistics from Music player and Hands Free Control Module.

IV. ALGORITHMS

As we have discussed earlier our system includes various modules and functionalities. For the efficient working of the system, a tight integration is required between the different functional modules. This section presents the algorithms used within each module to achieve the respective specific subtask.

A. Face Detection: Haar cascade

For detection of faces in a video feed we use Haar cascade object detection. This method trains a cascade function by applying machine learning on a large set of positive and negative images. Once trained the classifier can detect objects in other images. Through the classifier we can extract features of the face such as nose, eyes etc. But since there are a huge number of potential features we need to extract, to decide the most useful technology known as Adaboost. OpenCV library provides a training method) or pre-trained model for this purpose. Input of the algorithm is a HAAR classifier supplied with OpenCV called haarcascade_frontalface_default. Output includes Detected Users Face since all human faces share some similar properties.

B. *Emotion Recognition: Fisher Face*

Fisherface is one of the popular algorithms used in face recognition, and is widely believed to be superior to other techniques, such as eigenface because of the effort to maximize the separation between classes in the training process. The Image recognition using fisherface method is based on the reduction of face space dimension using Principal Component Analysis (PCA) method, then applying Fisher's Linear Discriminant (FDL) method or also known as Linear Discriminant Analysis (LDA) method to obtain features of image characteristic. The algorithm used in the process for image recognition is fisherfaces algorithm while for identification or matching face image using minimum euclidean methods. OpenCV provides built-in functionality to create and apply Fisher Face Objects In our project we have classified facial expressions into 4 categories - happy, angry, sad and neutral.

C. *Hand Gestures for Music Control: Mediapipe Hands*

To achieve the music control functionality through the music player we detect the finger or combination of fingers held upright by the user's left hand. We then map each combination to a particular control signal. ex:- index finger raised is mapped to pause and play, index finger raised along with middle finger signifies increased volume and so on. The actual implementation of the system is achieved through the MediaPipe ML Library developed by google. MediaPipe Hands is a high-fidelity hand and finger tracking solution. It employs machine learning (ML) to infer 21 3D landmarks of a hand from just a single frame. It utilizes an ML pipeline consisting of multiple models working together: A palm detection model that operates on the full image and returns an oriented hand bounding box. A hand landmark model that operates on the cropped image region defined by the palm detector and returns high-fidelity 3D hand keypoints.

D. *Training Technique for Facial Expression Model Personalization*

To train the facial expression detection model. We instruct the user to depict a particular emotion, say happy and take multiple images, preprocess it and save it. We do this for all 4 emotions (Happy, Angry, Sad and Neutral). Using the images we train the detection model using openCV and fisherfaces.

E. *Face mask detection: MobileNetV2*

We use MobileNetV2 to train the face mask detection model. Then use the same model to determine if the user is wearing a face mask or not. If the user is wearing a mask then we transfer the control to the hand gesture module and instruct the user to specify the category of music using a pre mapped hand gesture.

F. *Music Recommendation Algorithm*

Step 1: Retrieve Number of times song has been played

Step 2: If song has never been played

Do: Favorability Score Remains the Same

Step 3. If song has been played more than n times:

Do: Increase Favorability Score

Step 4. Number of time song has been skipped:

Do: Decrease Favorability Score

Step 5. Reorder songs in the database in decreasing order of favorability score

V. Applications

The applications of the proposed system are as follows:

1. Can be used in automobiles where the users can focus on driving and music is played to them automatically.
2. Can be used in risk prone workspaces like kitchen, garage and workshops due to hands free music control.
3. Can be used in smart TV's at home to play content even without touching the remote.
4. Can be integrated into smart music apps such as spotify or youtube to serve more personalized content.
5. A more accessible Music player useful for differently abled users.

VI. Conclusion and Future Work

The Emotion-Based Music Player is used to automate music discovery and to give a better music player experience for the end user. The application solves the basic needs of music listeners without disturbing their workflow. The gesture control system improves the accessibility of the music player system. Finally the face mask detection makes the music player usable in the current pandemic situation.

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Smart Attendance System Using Face Recognition

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Abstract- To maintain the attendance record with day to day activities is a challenging task. The conventional method of calling name of each student is time consuming and there is always a chance of proxy attendance. The following system is based on face recognition to maintain the attendance record of students. This research focusing on a face recognition based attendance system using a threshold to confidence i.e. euclidean distance value while detecting unknown persons and save their images. Compared to other euclidean distance-based algorithms like Eigenfaces and Fisherfaces, Local Binary Pattern Histogram (LBPH) algorithm is better [11]. We used Haar cascade for face detection because of their robustness and LBPH algorithm for face recognition. It is robust against monotonic grayscale transformations. Scenarios such as face recognition rate, false-positive rate for that and false-positive rate with and without using a threshold in detecting unknown persons are considered to evaluate our system. We got face recognition rate of students is around 65-75%. This system is recognizing students even when students are wearing glasses or grown a beard. Face Recognition of unknown persons is nearly 60% for both with and without applying threshold value. Its false-positive rate is 14% and 30% with and without applying threshold respectively.

Index Terms—Face detection, Face recognition, LBPH algorithm, Harr Cascade.

1. INTRODUCTION

Every organization requires a robust and stable system to record the attendance of their students. and every organization have their own method to do so, some are taking attendance manually with a sheet of paper by calling their names during lecture hours and some have adopted biometrics system such as fingerprint, RFID card reader, Iris system to mark the attendance. The conventional method of calling the names of students manually is time consuming event. The RFID card system, each student assigns a card with their corresponding identity but there is chance of card loss or unauthorized person may misuse the card for fake attendance. While in other biometrics such as finger print, iris or voice recognition, they all have their own flaws and also, they are not 100% accurate [1] .

Face recognition is more accurate and faster technique among other techniques and reduces chance of proxy attendance. Face recognition provide passive identification that is a person which is to be identified does not to need to take any action for its identity [2].

Face recognition involves two steps, first step involves the detection of faces and second step consist of identification of those detected face images with the existing database.

There are number of face detection and recognition methods introduced. Face recognition works either in form of appearance based which covers the features of whole face or feature based which covers the geometric feature like eyes, nose, eye brows, and cheeks to recognize the face [3].

Our system uses face recognition approach to reduce the flaws of existing system with the help of machine learning, it requires a good quality camera to capture the images of students, the detection process is done by LBPH algorithm, Harr Cascade.

2. LITERATURE REVIEW

In recent years, a number of face recognition based attendance management system have introduced in order to improve the performance of students in different organization. In [4] Jomon Joseph, K. P. Zacharia proposed a system using image processing, PCA, Eigen faces, Microcontroller, based on Matlab. Their system works only with front face images and there is need of a suitable method which works with the orientation of the system. Ajinkya Patil with their fellows in [5] proposed a face recognition approach for attendance marking using Viola jones algorithm, Haar cascades are used to detect faces in images and recognition performs through Eigen face method. Another approach of making attendance system easy and secure, in [6] the author proposed a system with the help of artificial neural networks, they used PCA to extract face images and testing and training were achieved by neural networks, their system performs in various orientation. A 3D face recognition approach for attendance management system was proposed by MuthuKalyani.K, VeeraMuthu.A [7] has proposed, they marked attendance with monthly progress of each student. There is need for an alternative algorithm which can enhance the recognition on oriented faces. Efficient Attendance Management system is designed with the help of PCA algorithm [8], they have achieved accuracy up to 83% but their system performance decreases due to slightly changes in light conditions.

3. PROPOSED SYSTEM

The proposed automated attendance management system is based on haar cascade for face detection and the LBPH algorithm for face recognition. Graphical User Interface(GUI) for this system shown in Fig. 3 created using python module Tkinter which is the fastest and easiest way to create a GUI application.

This system provides functionalities such as taking images of students along with their details for the database, training the images in the database and on the camera and start tracking people entering the class. when students enter the classroom this system detects the faces of students who are entering the classroom from the camera and pre-processed for further processing. The stages in the proposed system are shown in Fig. 1. The implementation of each stage is mentioned in detail in the next section.[9]

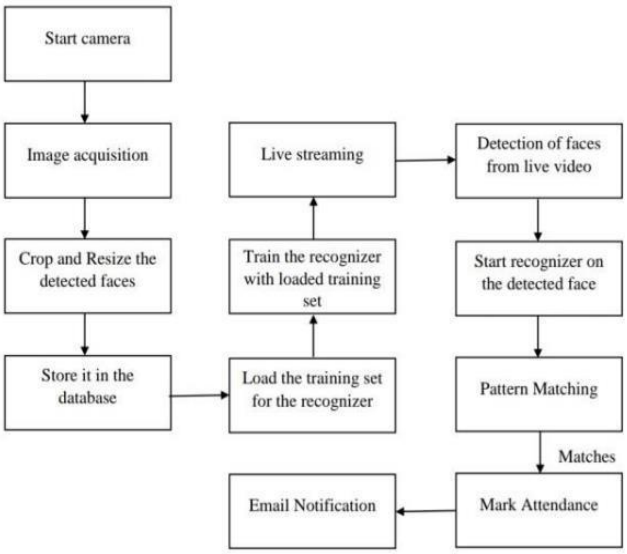

Fig 1: System Architecture

Fig 2: General Block Diagram

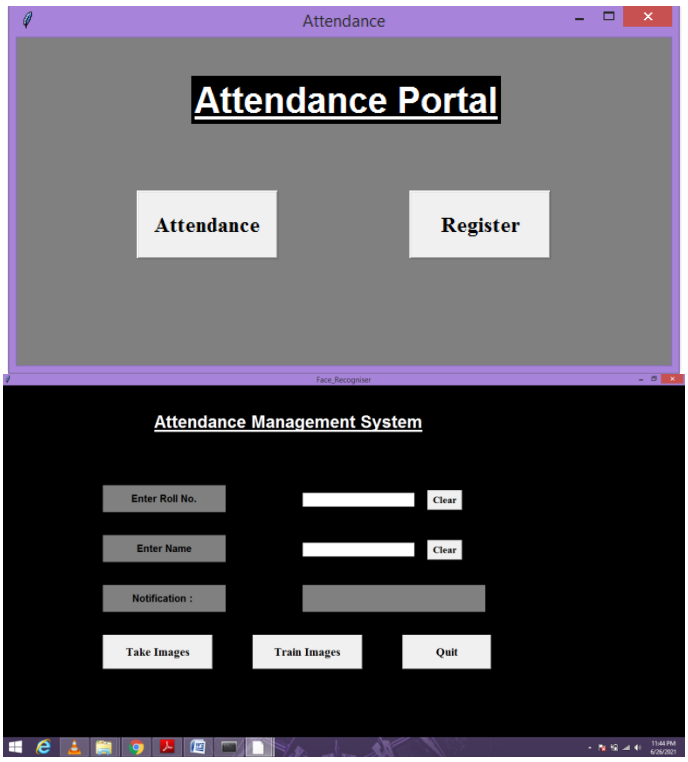

Fig. 3: System GUI

3. METHODOLOGY

We created our own dataset as we didn't find any dataset online containing 60 images for each person. There are consists of 5 individuals with 15 images of each that have been taken for this project. Additional 3 individuals are considered for testing recognition of unknown persons. We tested our system using a live real-time video in which students and unknown persons come and stand in front of the camera. Fig. 4 shows a few images after the pre-processing stage.[9]

Algorithm 1
Pseudocode for the proposed system

Input: live video with student face visible

Output: attendance excel sheet

1. Transform each frame from RGB to grayscale
2. Apply the Haar Cascade classifier for face detection and get the Region Of Interest (ROI).
3. Now apply the LBPH algorithm on the ROI to get the features.
4. **if** *for enrollment* **then**
   features are stored in the database
   else if *for verification* **then**
   do Post-processing

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Fig. 4: Extracted and pre-processed faces of students in the dataset

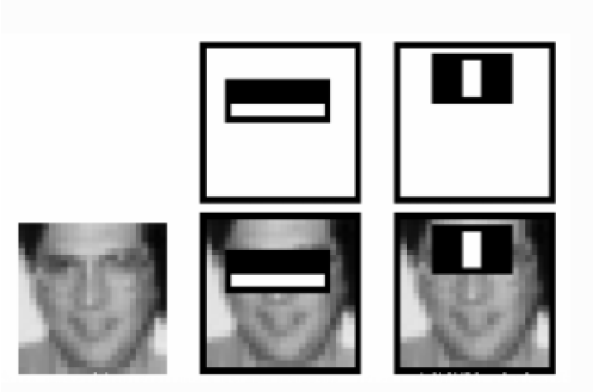


Fig. 5: example of relevant haar features

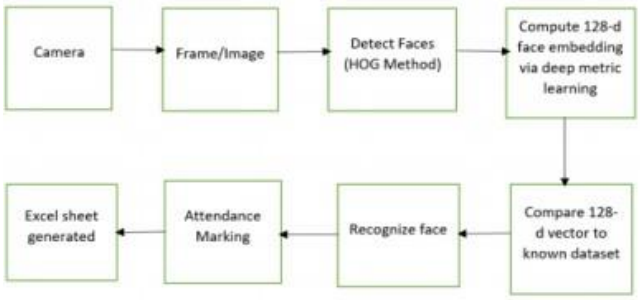
DATA ACQUISITION

Image Acquisition: Image is acquire using a high definition camera which is placed in the classroom. This image is given as an input to the system.

Dataset Creation: Dataset of students is created before the recognition process. For better accuracy minimum 15 images of each students should be captured. Whenever we register student's data and images in our system to create dataset, deep learning applies to each face to compute 128-d facial features and store in student face data file to recall that face in recognition process.

Storing: We have used JSON to store the student's data.

FACE RECOGNITION PROCESS



Face Detection and Extraction: Face detection is important as the image taken through the camera given to the system, face detection algorithm applies to identify the human faces in that image, the number of image processing algorithms are introduced to detect faces in an image and also the location of that detected faces. We have used HOG method to detect human faces in given image.

Face Positioning: There are 68 specific points in a human face. In other words, we can say 68 face landmarks. The main function of this step is to detect landmarks of faces and to position the image. A python script is used to automatically detect the face landmarks and to position the face as much as possible without distorting the image.

Face Encoding: Once the faces are detected in the given image, the next step is to extract the unique identifying facial feature for each image. Basically, whenever we get localization of face, the 128 key facial point are extracted for each image given input which are highly accurate and these 128-d facial points are stored in data file for face recognition.

Face Matching: This is last step of face recognition process. Our system ratifies the faces, constructing the 128- d embedding (ratification) for each. Internally compare faces function is used to compute the Euclidean distance between face in image and all faces in the dataset. If the current image is matched with the 60% threshold with the existing dataset, it will move to attendance marking.

ATTENDANCE MARKING

Once the face is identified with the image stored in JSON file, python generate roll numbers of present students and return that, when data is returned, the system generates attendance table which includes the name, roll number, date, day and time with corresponding subject id. And then passes the data to python to store the table into an excel sheet automatically. Each sheet is saved according to the subjects which already entered by the administrator, for example when system generates excel sheet by sending the compiled sheet in an array to python, the python first checks whether there exit any excel sheet of that date, if yes then it creates separate worksheet by subject id, so that attendance is differentiated for different subjects.

Fig. 6:. Recognizing the faces

	A	B	C	D
1	Id	Name	Date	Time
2	68	['Nikhil']	6/27/2021	0:12:06
3	12	['murali']	6/27/2021	0:12:12
4				

Fig. 7: Attendance sheet After completion of the program

4. RESULT AND ANALYSIS

We considered 3 feet as the distance of an object for recognition. As shown in Table 1, the Face recognition rate of students is 65-75%. This system is recognizing students even when students are wearing glasses or grown a beard. Face Recognition of unknown persons for both existing and proposed models is 60%. This happened mostly due to detecting random objects in the background as the face of a person by face detection algorithm. In the existing system, it is observed that when the person in the video turned his head greater slightly then confidence value for that frame may get greater than favorable filter value then the person in the frame is considered as an unknown person [11] favorable filter value considered as 50 [10]. But, in the proposed system, if confidence is greater than 50 and 95 then only a person is considered as an unknown person and that person's image is saved as an unknown person.

5. CONCLUSION

This system has been proposed for maintaining the attendance record. The main motive behind developing this system is to eliminate all the drawbacks which were associated with manual attendance system.
The drawbacks ranging from wastage of time and paper, till the proxy issues arising in a class, will completely be eliminated. Hence, desired results with user friendly interface is expected in the future, from the system.
The efficiency of the system could also be increased by integrating various steps and techniques in the future developing stages of the system.

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BOSS: A study on Efficient OS for Secure and Multilingual E-Governance Services

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ABSTRACT-The open source (OS) projects are gradual increase in the recent times and they are becoming more and more in number in technical word making big contributions in these projects so as to make profits from their investments. This is made possible by the development of indigenous projects by various IT Sectors, local companies, small and medium scale IT industry and government sectors. These public and private sectors are investing in Free and Open Source Software projects to fulfil their routine needs by customizing the traditional Open Source projects like LINUX Distribution. One of such effort is the customized version of LINUX called Bharat Operating System Solutions popularly known as BOSS. This is an initiative taken by Government of India to launch its own operating system parallel to the world wide famous operating system known as Windows OS. BOSS support in different languages used/spoken across the country India and is a very user friendly GUI based operating system. India is a land of different cultures, religions and languages and also every state in India has its own language. On this point of view BOSS becomes very important in the country because of its multilingual support for different states and hence different languages in the country.

1. INTRODUCTION

Other countries decided to move from windows OS to Linux OS with in the year 2022 because of security and open source (free) available OS. Bharat Operating System Solutions BOSS is free Linux distribution was developed by the National Resource Centre for Free and Open Source Software (also called as NRCFOSS) of India. The latest version 8.0 (Unnati) released on 15 October 2019 is considered as India's Desktop computer, Laptop, Education, and Servers, It is coupled with Cinnamon Desktop Environment. BOSS release aims is to developing a e-Gov technologies on FOSS, which seeks to build up a FOSS community across industries, government and academia thus drive the growth of FOSS in India leading to a growth of eco-system for FOSS in India. Aims of the release is best in

The user experience in desktops and laptops with latest applications. Requirements of the recommended pc is 2 Ghz dual core processor or 2 GB RAM and Over 40GB of free hard drive space. The Govt. of India has

Approved BOSS for implementation in a large scale. It was developed at C-DAC, Chennai INDIA. This Advanced Computing popularly known as C-DAC is the premier R&D organization of the Department of

Aim of this organization like, Electronics and Information Technology, Ministry of Communications & Information Technology (MCIT). Is to carry out research & development in the field of Information Technology, Electronics and its related areas.

BOSS is available in several Indian languages which are spoken across the country. These languages are Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Konkani, Maithili, Malayalam, Manipuri, Marathi, Odia, Punjabi, Tamil, Telugu, Urdu, Arabic, Persian, and Sanskrit. The languages not supported by BOSS are Nepali, Sindhi, and Dogri. The aim of this paper is present is to implementation of BOSS in Government, private and business sector in India focusing on different applications areas.

The current expectations and experience from the previous implementations in the recent years are taken into account. Also, the future for the developments are discussed. To understand and examine the value of BOSS and its influence on the professional world the various government bodies like public sectors, education sectors etc. are taken as subjects for analysis.

REVIEW OF LITERATURE

This study discusses about the history and motivates things related with the Bharat Operating System Solutions. India is different cultures, religions and languages Almost every state in India has its own language. With this point of view BOSS becomes very important in the country because of its multilingual

support for different States and different languages in the country. To conclude the development of BOSS is going to prove a significant stage or event in the development of something in the FOSS development era which has already started in the country.

2.1) Various Version of BOSS Operating System

Version	Code Name	Date of Release
BOSS GNU/Linux Evaluation	Sethu	-
BOSS GNU/Linux v1.0	Tarang	10/01/2007
BOSS GNU/Linux v2.0	Anant	17/09/2007
BOSS GNU/Linux Server	-	01/01/2008
BOSS GNU/Linux v3.0	Tejas	04/09/2008
BOSS GNU/Linux v4.0	Savir	02/08/2012
BOSS GNU/Linux v5.0	Anokha	23/12/2013
BOSS GNU/Linux v6.0	Anoop	04/03/2015
BOSS GNU/Linux v7.0	Drishti	August 2018
BOSS GNU/Linux v8.0	Unnati	July 2019

2. BOSS INITIATIVES

- BOSS has been deployed for e-governance applications in Chhattisgarh and Kerala. An MOU has been signed with the National Informatics Centre (NIC) for the deployment of BOSS/Linux across the country in e-governance applications developed and maintained by NIC.
- Many schools under Sarva Shiksha Abhiyan programme in Punjab State Government has implented BOSS. In a Punjab 1400 schools of the state have already implemented BOSS.
- Indian Navy adopted BOSS for their office applications.
- BOSS has also been deployed in Tripura, Tamil Nadu, Puducherry, Andaman & Nicobar Islands, and Haryana in various applications. Also, Tamil Nadu Government has released the Government Order for use of BOSS Linux as one of the Mandatory OS in all Government Departments.
- 20 lakh BOSS installations completed.
- MoU has been signed with HCL for BOSS Linux pre-installation in all their systems. BOSS preloaded HCL desktops are being deployed by Govt of Orissa and Chhattisgarh.
- EduBOSS has been deployed in schools under the EDUSAT project in Punjab schools, Pondicherry and Maharashtra.
- Under the free laptop scheme BOSS Linux has been deployed in Tamilnadu.
- NIC Trissur has migrated the RedHat desktop systems to update to BOSS Linux.
- Several promotions and training programs are conducted across various government departments, academic institutions, schools to implement BOSS.
- BOSS is ready to use in various states across the country. Some of them are Tamilnadu, Punjab, Haryana, Chhattisgarh, Tripura, Kerala, and Pondicherry.
- In Chandigarh also about schools are using BOSS. BOSS is used In a National research project. DRDL Hyderabad is also making use of BOSS.

3. METHODOLOGY

This study examines the BOSS's adoption in the government and private sectors in India. The scope is limited to this country and its governing bodies and various companies/concerns/enterprises. The data collected from existing surveys, BOSS studies, and internet articles in a mixed fashion. The study is conducted in an explanatory fashion because of the nature of the data collection used in the present study.

BOSS GNU/ or Linux is a Desktop and Server Linux Operating System, the scenario is somewhat different. It is a Government initiative. It is derived from Debian Linux. It is developed by C-DAC so it can be downloaded free of cost from its website. No doubt it is a FOSS-based OS. The Bharat Operating System Solution uses the Monolithic Kernel for the Communication between Software and Hardware. In Monolithic Kernel all services run along with the main kernel thread, thus also residing in the same memory area. BOSS available under free software licenses.

BOSS Variants:
The BOSS OS marked its presence in the different areas in the software industry offering a variety of software solutions. The few variants BOSS as follows.

4.1) BOSS Desktop: There is an integrated search facility available with BOSS Desktop which is helpful in switching windows launching applications and opening recent documents and settings. The integrated search allows you to look for different applications in an easier and faster way on your system. The latest Release of BOSS GNU/Linux is version 8 called unnati. It is coupled with Cinnamon Desktop Environment. This release aims to enhance the user & experience in desktops and laptops with the latest applications.

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4.2) EduBOSS: EduBOSS comes with a set of features that are relevant to the primary and secondary school environment, to provide a complete usable Operating System consisting of GUIs and console applications for routine tasks and additional utilities which are useful for teaching/learning in schools.

4.3) Advanced Server: the BOSS Advanced server is Intel and AMD x86-64 architecture. It is bundled with a web server, proxy server, database server, mail server, network server, SMS server, an LDAP server. The various administrative tools available are Webmin, Gadmin, PHP myadmin, PHP LDAP admin, and PG admin.

4.4) BOSS Mool: The purpose of MOOL (Minimalistic Object Oriented Linux) is to redesign the Linux kernel so as to reduce coupling and increase maintainability by means of OO (Object Oriented) abstractions.

5. BENEFITS OF BOSS

- Free and Open Source Software: Bharat Operating System Solution (BOSS) is totally Free and Open Source Software. It is free available on internet also available in shopping apps we can ordering from C-DAC.
- Secured OS could not able to hake easily as Microsoft Windows OS.
- Multilingual Support: Localization support for desktop in 22 Indian languages that is BOSS is available in various languages which are spoken across the country. These languages are Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Konkani, Maithili, Malayalam, Manipuri, Marathi, Odia, Punjabi, Tamil, Telugu, Urdu, Arabic, Persian, and Sanskrit.
- Microsoft OS can only be updated by Microsoft, while a deployed Linux distribution (BOSS) can be modified and updated by any agency of the Government's choosing. BOSS gives the Government its own OS that helps it control updates, vulnerabilities, and packages in all Government-issued computers.
- User-Friendly os Installer: BOSS Operating system supports a better graphical interface for the user. It supports the Tools like Migration Tool - Bulk document converter and Internet tools Pidgin, Ice weasel, X-chat, which is available in various languages.
- Indian version of Open Office – Bharateeya OS, provides Multimedia support, 3D Desktop, Auto detecting of devices, and Auto mounts of all Hard disk partitions
- Digital cameras, printers, scanners, Bluetooth, TV tuner. Smart Common Input Method is the best use in BOSS.
- Easy OS Installation: The OS installation process for BOSS Operating System is as similar as Linux-Ubuntu Operating System it is Debian distribution os. It can be done in few easy steps.

6. CHALLENGES (GAP ANALYSIS) OF BOSS IMPLEMENTATION

- Some of the employees don't have basic knowledge of BOSS OS(Linux distributed open-source software)
- Most of the data and information that was collected as a part of this research was based on news reports, websites, and other such means which may be considered as unsatisfactory means of providing unbiased, authentic, and accurate information.
- The scope is further limited by the fact that out of a large pool of activities associated with BOSS only a few of them were considered and included in the study.

Issues in Existing Systems: most of the government offices using Windows OS it can be easily hacked by hackers but Linux Boos is couldn't able to hack easily as windows Linux boss is command-oriented but government employees need a graphics-oriented display with simple operations. And mainly government employees need training on this OS.

How to overcome these challenges:

Creating awareness about this OS through social Media. Training the government employee's users on how this OS works.

Features:

Linux BOSS is the fastest Operating system in the world. It runs 2 to 3 times faster than windows OS and other OS.

Linux BOSS is the most secured OS because there is no problem with viruses Attack as compared to windows.

Linux file format is text format but the windows file format is a binary format. The kernel of BOSS Linux is very stable as compare to windows kernel not Crashed easily. Kernel of Linux is very small in size and we can be stored in a floppy disk.

Linux boss uses the window System which is an advanced network windowing system. Using this system

We can display the output of any workstation monitor attached to the network.

7. CONCLUSION

It can be said that BOSS has proved itself as a valuable alternative to various important applications including office applications and operating systems. Various state governments and public sector institutions have chosen it as a possible alternative to closed source software due

to different and varying reasons including low cost, being reliable and flexible with innovative trends, and freedom from manufacturers. Also, it has already been seen that migration to open source alternatives have proved to be fruitful and rewarding leading to stable solutions. Countries like India find open-source platforms have a great opportunity to bring the best access to the digital world in the country. In India, there are numerous languages. The official language of the country links India and the official languages its states are all different depending upon the language of the natives of a particular state.

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E-Commerce Applications Powered By Augmented Reality and Microservices

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***Abstract*— Although already an established market, E-Commerce does have its share of obstacles, resulting in a significant percentage of the population choosing to buy from their local vendors. With the ease of entering the E-Commerce market significantly lowered by increased engagement on the Internet, digital currencies, and organized delivery infrastructures, the challenge remains in developing trust with the consumers and hence ensuring their loyalty. The currently employed solutions face the following hurdles (i) Consumers reaching out to local businesses due to a lack of necessary physical engagement with products. (ii) Loss of consumers due to unreliable online infrastructure (iii) Cost ineffective solutions, leading to failing businesses. This paper aims to solve the problems mentioned above by providing improvements and alternatives based on (i) User Interfaces Driven by Augmented Reality (ii) Microservice Architecture on the Cloud.**

Keywords—Augmented Reality, Microservices, SAGAS, E-Commerce, Mobile Applications

I. INTRODUCTION

The media over which businesses occur have broadened in the 21st century. Before the age of the Internet, products were consumed and sold in person, via outlets. Today a new market thrives, E-Commerce. Andrew Bloomenthal defines e-commerce as a business model that lets firms and individuals buy and sell things over the internet a business model that lets firms and individuals buy and sell things over the internet [1]. It provides the ease of purchasing any product the seller has to over with the convenience of getting it delivered to a person's doorstep. Hence, giants like Amazon, AliExpress and eBay are thriving today. However, consumer experiences still do not fully replace onsite shopping, especially for products like clothing, shoes, jewellery, and furniture. This is because the website does not provide the full immersion of interacting with the product in physical absence. Hence the trust factor between the seller and consumer is not in favourable quantities. This gap, however, can be bridged with the help of Augmented Reality (AR), which aims to mix or overlap computer-generated 2D or 3D virtual objects and other feedback with real-world scenes, shows great potential for enhancing e-commerce systems [2]. Augmented reality overlays digital content and information onto the physical world [3]. The first half of this paper explores the impact of Augmented Reality on e-commerce user engagement mediums i.e. mobile applications and to a far lesser extent, web applications.

Another aspect of a sustainable e-commerce business is scalable, stable and cost-effective infrastructure. This includes client applications to engage the consumers, backend applications that handle the business logic, the hardware infrastructure it runs on, and any third party services consumed via integrations. The stability and scalability influence the impression left on both first-time customers and returning customers. Hence factors like code maintainability, minimum downtime on new feature deployments and outage due to bugs and load tolerance play a vital role in the popularity and sustainability of the business. Major companies like Amazon and eBay, tackle these issues by incorporating a trendy architecture known as microservice architecture. Lewis and Fowler define the microservice architectural style as an approach for developing a single application as a suite of small services, each running in its process and communicating with lightweight mechanisms, often an HTTP resource API [4]. The microservice architecture enables rapid, frequent and reliable delivery of large, complex applications. It also provides the flexibility to deviate from the company's established technology stack, hence enabling problem-solving which would otherwise be impossible. The second half of this paper focuses on the existing, battle-tested methods of using microservice architecture and its merits in e-commerce.

II. USER INTERFACES DRIVEN BY AUGMENTED REALITY

A. Choosing AR over VR (Virtual Reality)

Virtual Reality is another immersion-based technology, which, unlike AR, results in a complete shut out from the real world. No percentage of the real world influences the reality projected in VR. VR is distinctly used in areas like video gaming and education. VR is achieved with the help of specialized head-mounted devices, fitted with screens and accelerometers to simulate movement in the virtual world. Although the framework provides more freedom concerning design, it also comes with the following significant drawbacks:

- Immersive Virtual Reality requires specialized equipment, not easily accessible to the general public, whereas Augmented Reality can be achieved using generic smartphones.

- Virtual Reality replaces the physical world, hence depriving the user of the context of the real-world factors, which is a deciding factor during product preview.

AR enhances physical reality by integrating virtual objects into a physical scene, making it the most viable option for these applications.

B. Design and implementation using Unity

Unity provides powerful tools to make rich, deeply engaging augmented reality experiences that intelligently interact with the real world. It provides a framework that allows the development of cross-platform AR driven applications. It includes core features from each platform, as well as unique Unity features that include photorealistic rendering, physics, device optimizations, and more [5]. Using the game engine, the necessary application logic can be implemented and then be used to export application for each mobile platform i.e., Android and iOS. Figure 2.1 shows how a mobile application is designed to let the customers chose a furniture piece of their liking and purchase it.

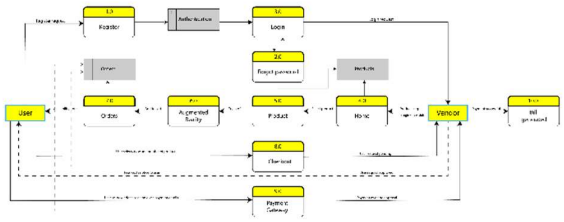

Fig. 2.1. Dataflow diagram for mobile application for customers.

C. Plane detection using trackables

As your phone moves through the world, ARFoundation uses a process called simultaneous localization and mapping, or SLAM, to understand where the phone is relative to the world around it. ARFoundation detects visually distinct features called feature points and uses these points to compute its location change.

In AR Foundation, a "trackable" [6] is anything that can be detected and tracked in the real world. Planes, point clouds, reference points, environment probes, faces, images, and 3d objects are all examples of trackables.

ARFoundation looks for clusters of feature points that appear to lie on common horizontal or vertical surfaces, like tables or walls, and makes these surfaces available to the app as planes. You can use this information to place virtual objects resting on flat surfaces.

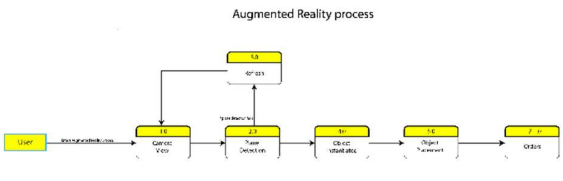

Fig. 2.2. Dataflow diagram for plane detection in Unity.

D. Object instantiation and interaction on detected plane

Once all the planes are detected the plane with the lowest height is inferred as the ground plane and the rest is discarded. The ground plane is now visible to the user and the furniture product/item selected will be spawned at the centre of the plane.

ARFoundation uses hit testing to take an (x, y) coordinate [6] corresponding to the phone's screen (provided by a tap or whatever other interaction you want your app to support) and projects a ray into the camera's view of the world, returning any planes or feature points that the ray intersects, along with the pose of that intersection in world space. This allows users to select or otherwise interact with objects in the environment.

Fig. 2.3. Object instantiation on the inferred plane in the mobile application.

III. Microservice Architecture on the Cloud

The microservice architecture (MSA) is an architectural style that structures the business logic of an application, as a collection of loosely coupled, isolated components, which make them easier to develop, test, deploy and maintain. Each component is owned by a small team, enabling focused development cycles and maintenance. Although it is not a one-strike-wins-all, it is largely suited for complex applications, consisting of several mission-critical components, making it very viable in this use case.

A. Why microservices over monoliths

A monolith, by its definition, is a single unified application, which consists of tightly coupled modules, serving the needs of the business. Generally following the server-client model, the server is responsible for all the necessary computations and integrations to serve the data required by the end-user. In a tightly coupled architecture, each component and its associated components must be present for code to be executed or compiled. This, in turn, increases the complexity of implementing a new feature at any

stage of development, as its effect on existing code must be monitored, which may sometimes lead to the rewriting of a significant portion of the application.

Using a monolithic architectural style comes with the following challenges [7]:

- Monoliths end up being a large codebase, making it tough for developers and quality assurance officers to understand the code and business knowledge.
- Tight coupling between components ensures the necessity for intensive manual testing as any changes to the codebase might have unintended effects.
- Monoliths do not follow the Single Responsibility Principle, making maintenance harder.
- Deployment of a new feature requires the re-deployment of the entire application.
- Increasing code base size leads to increasing startup and testing times.

Microservices provide the following advantages:

- Each microservice follows the Single Responsibility Principle, hence fault isolation becomes easier. If one of the components fail, developers have the option to use another service and the application will continue to run independently.
- Since components are isolated into separately deployed entities that are based on small components, it is easier for development teams to scale up or down following the requirements of a specific element.
- The microservice approach lets developers choose the right tools for the right task. They can build each server utilizing a language or framework they need without affecting the communication between microservices [8].
- Infrastructure automation allows reducing the manual effort involved in building, deploying and operating microservices, thus enabling continuous delivery [9].

B. *Deploying microservices using cloud infrastructure*

Applications in the cloud provide a workaround to problems that are just not possible using on-premise infrastructure; the applications can move around failures to provide resiliency and scale when workloads change. Components within the application can be mixed and matched to speed development and improve deployment efficiency [10]. The elasticity and rapid provisioning of resources that the cloud provides also greatly benefits the MSA.

Architecting microservices is not an easy task. It requires managing a distributed architecture, where components are hosted on different platforms and communicate through a network, and its challenges (e.g., network latency and unreliability, fault tolerance, data consistency and transaction management, communication layers, load balancing). Cloud infrastructures play a fundamental role in implementing MSA and managing the associated challenges and complexities [9].

C. *Deploying microservices as containers*

A microservice may run in a fully provisioned virtual machine in the cloud, but the better practice is to run microservices in containers. Containers encapsulate discrete components of application logic provisioned only with the minimal resources needed to do their job. What, in effect, it provides in OS-level virtualization [11]. Containers isolate the components from one another and the underlying infrastructure, providing an added layer of protection for the application. Furthermore, since containers are not tied to any specific infrastructure, they run on any computer, on any infrastructure, and in any cloud.

D. *Characteristics of MSA*

- MSA will primarily componentize their software is by breaking it down into services, which are out-of-process components that communicate with a mechanism such as a web service request, or remote procedure call. One main reason for using services as components) is that services are independently deployable [4].
- The microservice approach to division consists of splitting up into services organized around business capability, consequently leading to cross-functional, self-sufficient teams. The necessarily more explicit separation required by service components makes it easier to keep the team boundaries clear [4]. As seen in Fig 3.1, each microservice is responsible for a single business component, i.e., customer orders, cart billing etc.
- Microservices prefer letting each service manage its own database, either different instances of the same database technology, or entirely different database systems. As seen in Fig 3.1, each service has its own database. The necessary synchronization between these different databases is achieved via various design principles, with event-sourcing being the most popular. A message queue, like Apache Kafka or RabbitMQ, which uses a publisher-subscribers model, is used by microservices to share data amongst each other. Fig 3.1 below shows a sample architecture of an e-commerce application, with RabbitMQ as a message queue between the microservices.

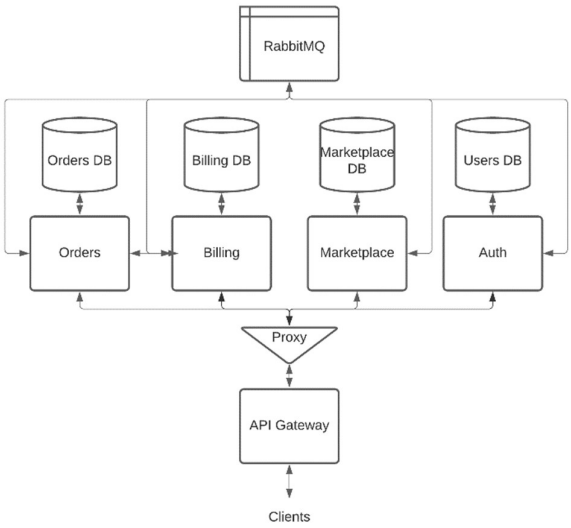

Fig. 3.1. Architecture diagram of application powered microservices.

- Putting components into services adds an opportunity for more granular release planning. With microservices, only modified services are redeployed. This can simplify and speed up the release process [4].
- Decentralized governance and data management allows services to be independent and avoid an application to standardize on a single technology [9].

E. SAGAS pattern

Consistency between distributed databases can be established using several modes, popular ones being two-phase commit, SAGAS, RESTful calls, GRPC and Event Sourcing. Any of these can be selected based on factors like availability, latency tolerance and consistency, each model coming with its advantages and drawbacks. SAGAS was chosen as the pattern for this project due to its compatibility with client technologies which also ensures lower latency, making the user experience seamless. SAGAS also enables careful monitoring, making maintenance and improvement easier. SAGAS enables local consistency, eventual global consistency and guarantees availability. Figure 3.2 [12] below shows the flow of events in a SAGAS pattern. The SAGAS pattern can be achieved using multiple implementations. One of them is the choreography pattern, which is implemented in the project. Figure 3.3 [12] shows a choreography pattern.

Fig. 3.2. The generic flow of events in the SAGAS pattern.

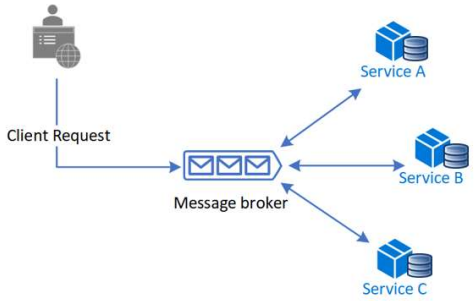

Fig. 3.3. SAGAS implementation using choreography pattern.

IV. IMPACT

On studying the results of various studies on the impact of AR on the user experience of the general public, it was found that AR e-commerce system is higher than the ratings for the traditional and VR e-commerce systems [2], with no statistically significant interaction effects for types and locations. One of the participants used in the study by Yuzhu Lu and Shana Smith (2010) [2] stated, "It is a very high potential method, especially for products like furniture." Therefore, the AR e-commerce approach appears to be generally useful in various environments. Although it was inferred that the current AR technologies do not ensure complete ease of use due to factors like AR e-commerce using more devices and needing more computer skills, and user's unfamiliarity with AR and AR system interactions. But the most significant attribute that is the user's confidence level in their decision to buy or not buy showed great promise in the field of AR over traditional interfaces and VR powered interfaces [2]. Participant comments included: "AR e-commerce makes shopping more visually intuitive."; "The user naturally sees what will happen before actually buying." [2].

On studying the results of studies on the relevance of microservices on applications, it was found that microservices can help in achieving a good level of flexibility while bringing bring higher complexity [9]. Microservices also seem to truly extend the scalability of an application. It is also seen that microservices are not technology-specific, which is a good indicator because approaches and solutions can be reused. Netflix reported that the time required for recovering from an outage was reduced from 45 minutes to 7 minutes after migrating to MSA [12]. Major companies have since then started migrating towards microservices. But it is also understood that industrial readiness and adoption is in their nascent stages. But the impact on the cost due to increased ease in maintenance, reduced downtime, quicker development and deployment cycles are significant.

V. CONCLUSION

To attract customers, an application is required to create a balance between interactivity, immersion, and connectivity. This can be achieved using Augmented Reality.

Although generally applicable, based on the type of product being sold, AR can result in a significant boost in sales, due to an increase in confidence level in users' decision making, ensuring a deepening of trust between the consumer and the seller. Microservices can make the development, deployment, maintenance and improvement of an application easier, while also promising stability and scalability, and when on the cloud, cost-effective. Hence, we can say AR and MSA show promise of having a significant positive impact on e-commerce applications.

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Image Super-Resolution using GANs

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***Abstract*— In spite of the breakthrough in precision and pace of single image super res one big challenge remains still unsolved: how to regain the final aspects of the texture? Latest analysis has concentrated primarily focusing on the enhancement of the picture quality and reducing the error to lesser factor. The subsequent predictions that are made are being determined by the ratio factor, but they are frequently missing details of prime factors that are unworthy and fail to fit the anticipated fidelity at high resolution. In this paper SRGAN, for picture super-resolution (SR), a generative adversarial network (GAN) this is our first system, to our knowledge which has a potential of inferring natural real-looking pictures for 4 times scaling than the usual. To do this we infer a prime loss function that consists of an adversarial loss and loss of prime factor information. The result is improved by the adversarial loss using the discriminator network that is thought to discriminate between high featured image and or natural real looking images. The mean square error, PSNR, SSIM score test shows incredibly significant outcomes using SRGAN. Super-resolution of an image is integrated with Streamlit, an open-source app framework to create an application. YOLO is a state-of-the-art, real-time object detection along with feature detection is integrated in Streamlit.**

***Keywords*: Super-resolution, GANs, Streamlit, YOLO V3, Feature Detection**

I. INTRODUCTION

Super-resolution is extremely tough job to estimate a super resolution image from its low-resolution equivalent

4× SuperResolutedGAN (Proposed) (Real image)

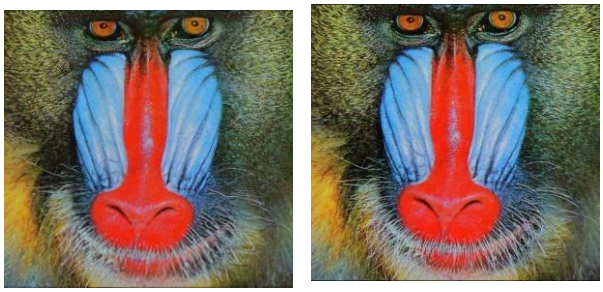

Figure 1: SR picture (left) is sort of indistinguishable from real image (right) (4 times scaling)

A essence is a underdefined SR question for high upscaling variables, it is especially pronounced for the specifics of the texture in the rebuilt Super-resoluted pictures are not found. Generally, the Supervised advancement Objective SR algorithms are also the diminishing of the Mean Squared error among the High Resoluted picture recovered & simple facts. This is convenient since it minimizes .MSE also amplifies ratio of signal-to-noise (PSNR),a typical measure utilized for evaluating and comparing algorithms of SR [60]. The skill of MSE, however, to obtain variations that are necessarily important like eyes, nose, ear in a human(prime factors).It is very limited as prime factor, as they are described centered on variations in pixel-wise images [59, 57, 25]. This is illustrated in figure 2.

bicubic SRResNet SRGAN original

(21.59/0.64) (23.53/0.78) (21.15/0.68)

Figure 2: Image of respective filters and its PSNR/SISM values.

Accordingly we give a abstract idea of generative super-resolution in this work. Super-resoluted (GANs) for which we hire a network of opponents with skip-connection and deep residual network (ResNet). As the sole optimization objective, diverge from MSE. Previously described a novel perceptual loss from previous works using significant feature maps of the VGG network[48, 32, 4]. In combination with a discriminator that promotes solutions perceptibly difficult to differentiate from the reference to HR images. Figure 1 provides an example of a photo-realistic image that was super-resolved with a 4-fold upscaling factor.

II. RELATED WORK

A. *Image Super Resolution*

Recent summary articles on image SR embody Kun Zeng, Jun Yu[1] presents a data-driven model named Coupled Deep Auto-Encoders (CDA) for single image SR. CDA mechanically learns the intrinsic representations of LR/HR image patches and their relationship by exploring intensive information.

Using a good combined optimization, the intrinsic representations and also the mapping operator co-dependently and effectively learned. In terms of potency, CDA so behaves as an easy feed-forward network that solely involves multiplication, addition, and activation operations. it's so in no

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time to conclude the high-quality unit of time image from a given input low resolution image. This work in [1] can embrace investigation of the dependability of CDA in different vision implementations and lengthening CDA to various networks like the denoising autoencoder and CNN.

In[2], the work have widely evaluated, performance of the newly projected SRCNN design for greater resolution pictures from low resolution manipulated by blur / noise. Proposal of a brand new design DBSRCNN in [2] that increases the reconstruction by boosting the applicable options that were initially lost within the SRCNN pipeline. This study with completely dissimilar levels of Gaussian blur demonstrates that revised deeper design achieves higher in each blind and non-blind testing situations.

In [3] bestowed a completely unique deep learning approach for single image super-resolution shown that convolution sparse coding based super resolution strategies will be redeveloped into a deep convolutional neural network. The projected structure in[3] ,with blessings of lustiness and simplicity, may well be applied to alternative low level vision problems, like image deblurring or coincident SR + denoising.

B. Loss Function

Pixel wise loss functions like mean square error struggle to handle the ambiguity in getting back the lost high-frequency specifics like texture: reducing MSE inspires searching pixel wise averages of probable outputs that are generally overly-smooth and thus have poor perceptual quality.

Reconstruction of variable perceptual quality are demonstrated with equivalent PSNR in Figure 2. we have a tendency to demonstrate the matter of reducing MSE in Figure 3 wherever multiple potential results with high texture details are averaged to form a swish reconstruction.

Previously written authors undertook this drawback using generative adversarial networks (GANs) for the applying of image generation. Also augment pixel-wise MSE loss with a person loss to coach a network that super-resolves face pictures with giant upscaling factors that is 8x. GANs were conjointly used for unsupervised illustration learning.

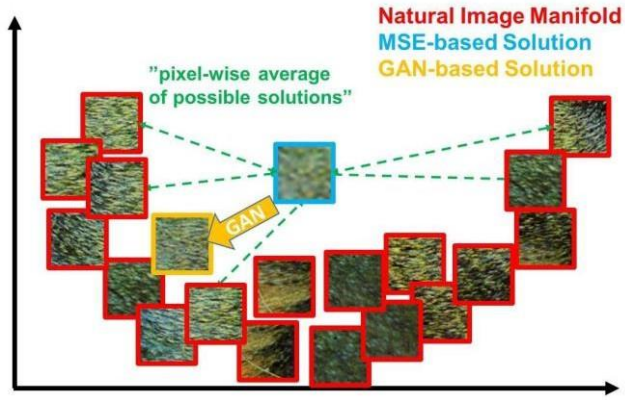

Figure 3: Illustration of patches from the ordinary image manifold (red) and super-resolved patches got with MSE (blue) and GAN (orange). The MSE-based answer appears excessively swish because of the pixel-wise average of possible solutions within the picture element area, whereas GAN drives the reconstruction near the natural image manifold manufacturing perceptually additional convincing solutions.

The thought of mistreatment GANs to be told a mapping from one manifold to a different is delineate for vogue transfer and for inpainting. Minimizing the square error within the feature areas of VGG19 and scattering networks.

Authors like Dosovitskiy and Brox used loss functions supported Euclidean distances calculated within the characteristic space of neural networks together with adversarial training. it's shows that the planned loss permits visually greater image generation and may be the usage to resolve the ill-posed inverse drawback of decoding nonlinear feature representations.

Like this work, Proposal of the utilization of options extracted from a pretrained VGG network rather than low-level pixel-wise error measures. Specifically the authors formulate a loss performance supported the euclidean distance among feature maps got from the VGG19 network. Perceptually a lot of substantial results were found for each super resolution and creative style-transfer . Lately, Authors like Li and Wand conjointly explored the result of comparison and mixing patches in element or VGG feature space.

C. PSNR and SSIM

Structural index similarity (SSIM) and Peak signal to noise ratio (PSNR) are two evaluating tools that are wide utilized in image quality assessment. Particularly within the steganography image, these two evaluating instruments utilized in measuring the imperceptibility. PSNR is employed previous to SSIM, is easy, has been wide utilized in varied digital image measurements, and has been thought of tested and valid. SSIM could be a newer measuring tool that's designed supported three factors i.e. luminance, contrast, and structure to higher suit the workings of the human sensory system.

Some analysis has mentioned the correlation and comparison of those two activity tools, however no analysis expressly discusses and suggests that measuring tool is additional appropriate for steganography.

III. OBJECT DETECTION

Object detection, in casual terms, be a technique that's detect and recognize various objects be in a picture or video and label them to classify these objects. Object detection generally uses completely different algorithms to perform this localization and recognition of objects, and these algorithms utilize deep learning to come up with meaningful results.

A. Bounding Box Prediction

Backing YOLO9000 Using dimension clusters our system predicts bounding boxes as anchor boxes . The network predicts 4 coordinates for each bounding box, tx, ty, tw, th. If the cell is offset from the top left corner of the image by (cx, cy) and the bounding box prior has height and width ph, pw, then the predictions correspond to:

$$bx = \sigma(tx) + cx$$

$$by = \sigma(ty) + cy$$

$$bw = pw \text{ e to the power of } tw$$

$$bh = ph \text{ e to the power of } th$$

During training we use sum of squared error loss. If the ground truth for some coordinate prediction is tˆ * our gradient is the ground truth value (computed from the ground truth box) minus our prediction: tˆ * − t* . This ground truth

value can be easily computed by inverting the equations above.

YOLOv3 predicts an object ground score for every bounding box using logistic regression. This should be one if the bounding box prior overlaps a ground truth object by over the other bounding box prior. If the bounding box prior is not the worth but does overlap a ground truth object by more than some threshold we ignore the prediction, following. We use the threshold of .5. In contrast to our system only assigns one bounding box prior for every ground truth object. If a bounding box prior is not assigned to a ground truth object it incurs no loss for coordinate or class predictions, only objectness.

B. Confidence score

The probability that an anchor box having an object. It is usually predicted by a classifier.

Intersection over Union (IoU) is defined as the area of the intersection divided by the area of the union of a predicted box (Bp) and a ground-truth box (Bgt):

$$IoU = area(Bp \cap Bgt)/area(Bp \cup Bgt)$$

Both IoU and confidence score are used as the conditions that determine whether a detection is a true positive or a false positive. This indicates how sure the model is that the box contains an object and also how accurate it thinks the box is that predicts.

C. Non-Max Supression

The algorithm could find more than one detections of the same object. Non-max suppression is a method by which the NMC algo detects the object only once.

Typical Object detection pipeline has one component for generating proposals for classification. Proposals are nothing but the candidate regions for the object of interest. Most of the ways looking at a sliding window over the feature map and declares foreground/background results depends on the features calculated in that window. The adjacent windows have same scores to some extent and are called as candidate regions. This leads to hundreds of proposals.

As the proposal generation technique could have high recall, we still may loose constraints in this situation. However moderating these proposals all to the classification network is unmanageable. This leads to a method which detects the proposals based on some terms called Non-maximum Suppression.

IV. METHOD

GANs offer a robust framework for getting the plausible-looking non-artificial images with high quality. The GAN method encourages the reconstructions to move towards regions of the search area with high chance of containing photo-realistic imageries and so closer to the natural image manifold as shown in the Figure 3. Having a tendency to describe the primary terribly deep ResNet design by means of the thought of GANs to create a perceptual loss function for photo-realistic single image super resolution. Main methodologies are:

- Tendency to establish a brand new state of the art for image super resolution with high upscaling factors that is 4x as measured by PSNR and structural likeness (SSIM) with our sixteen blocks deep ResNet (SRResNet) optimized for mean squared error.
- Tendency to propose SRGAN that could be a GAN-based network enhanced for a brand new perceptual loss. Here a tendency to trade the MSE-based loss with a loss calculated on feature maps of the VGG network , which are more invariant to variations in pixel element area (space).
- Tendency to ensure with an in depth mean opinion score (MOS) take a look at on pictures from 3 public standard datasets that SRGAN is that the new state of the art, by a huge amount, for the assessment of photo-realistic super resolution images with high upscaling factors which is 4x.

The main aim of single image super resolution is to evaluate a high-resolution, super resolved image I^{SR} from a low-resolution input image I^{LR}. Here I^{LR} is the low-resolution version of its high resolution counterpart I^{HR}. The high resolution images are only available during training. In training, I^{LR} is obtained by applying a Gaussian filter to I^{HR} followed by a down sampling operation with down sampling factor

A. What are Generative Adversarial Networks?

Generative Adversarial Networks, or GANs, are a deep-learning-based generative model. More generally, GANs are a model architecture for training a generative model, and it is most common to use deep learning models in this architecture. The GAN architecture was first described in the 2014 paper by Ian Goodfellow[4], titled "Generative Adversarial Networks."

The GAN model architecture involves two sub-models: a *generator model* for generating new examples and a *discriminator model* for classifying whether generated examples are real, from the domain, or fake, generated by the generator model. Figure 4 represents the GAN model.

- **Generator**. Model that is used to generate new plausible examples from the problem domain.
- **Discriminator**. Model that is used to classify examples as real (*from the domain*) or fake (*generated*)

B. The Generative model

A fixed-length random vector is fed as input to the generator model and it generates a sample in the domain. The vector is drawn from randomly from a Gaussian distribution, and the vector is used to seed the generative process. The points in the problem domain will correspond to that of in multidimensional vector space after training, this forms a compressed representation of the data distribution.

This vector space is referred to as a latent space, or a vector space comprised of latent variables. Latent variables, or hidden variables, are those variables that are important for a domain but are not directly observable.

C. The Discriminative model

An example from the domain model is fed as input(real or generated) to the discriminator model and it gives a binary label as real or fake. The real example comes from the training dataset. The generated examples are output by the generator model. The discriminator is a normal (and well

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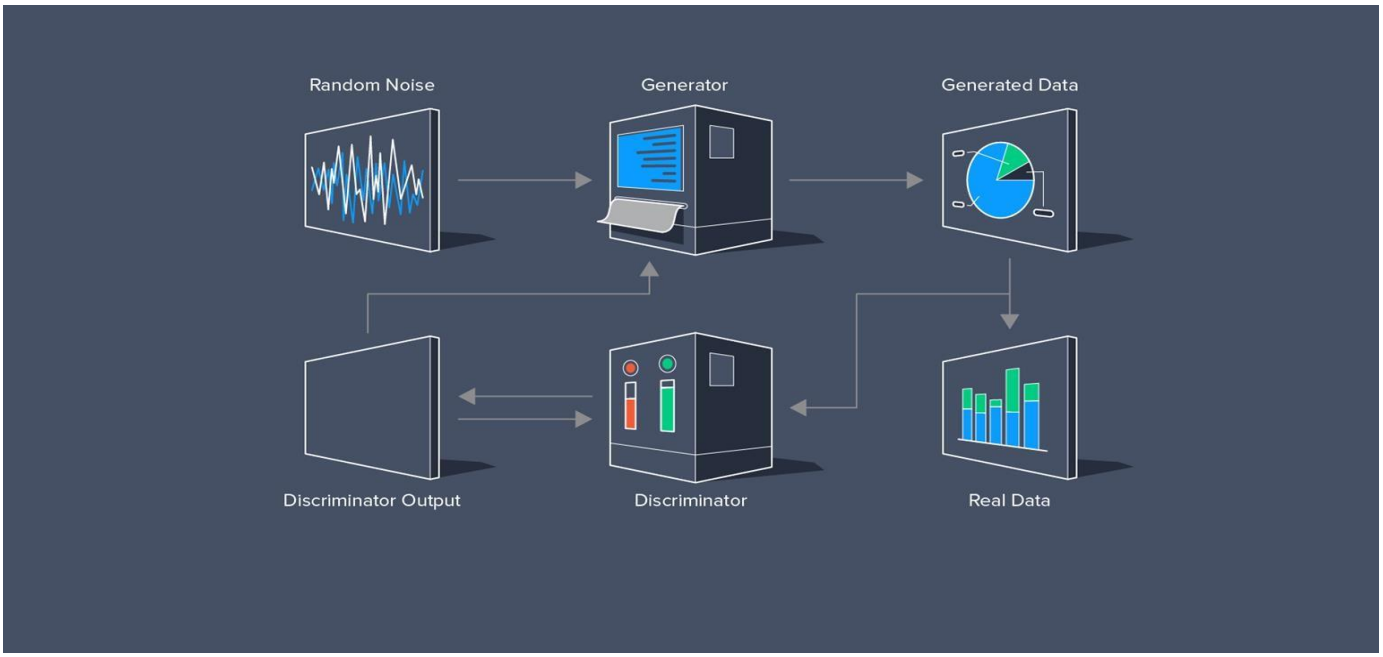

Figure 4: GANs have been implemented by transferring weights between the generator, discriminator and combined, to connect them and enable the right kind of training for GANs.

One of the many major advancements in the use of deep learning methods in domains such as computer vision is a technique called data augmentation.

Data augmentation results in better performing models, both increasing model skill and providing a regularizing effect, reducing generalization error. It works by creating new, artificial but plausible examples from the input problem domain on which the model is trained. The techniques are primitive in the case of image data, involving crops, flips, zooms, and other simple transforms of existing images in the training dataset.

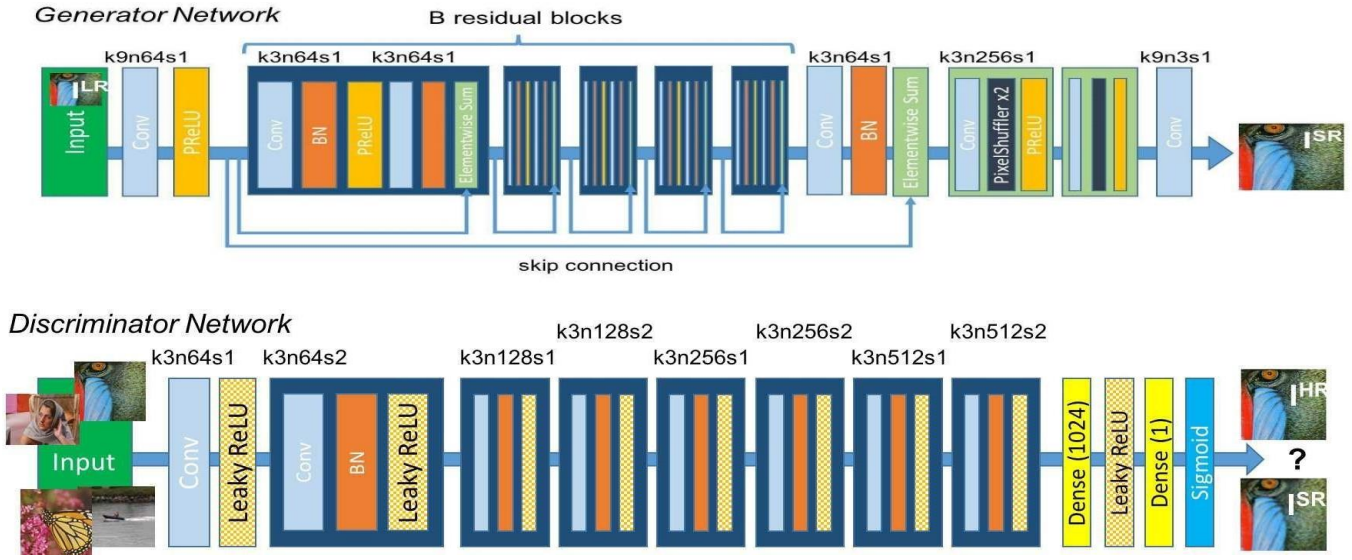

Figure 5: design of Generator and Discriminator Network with corresponding kernel size (k), range of feature maps (n) and stride (s) indicated for every convolutional layer.

understood) classification model. After the training process, the discriminator model is discarded as we are interested in the generator. Sometimes, the generator can be repurposed as it has learned to effectively extract features from examples in the problem domain. Some or all of the feature extraction layers can be used in transfer learning applications using the same or similar input data.

Successful generative modeling presents an opportunity and doubtlessly greater domain-specific technique for data augmentation. In fact, data augmentation is a simplified model of generative modeling, even though it is hardly ever defined this way. In complicated domains with a restricted quantity of information, generative modeling presents a course toward greater training for modeling. GANs have a lot of achievement on this use case in domain names which include deep reinforcement learning. Perhaps the maximum compelling cause that GANs are broadly studied, developed, and used is due to their success. GANs have been capable of generating images so practical that human beings are not able classify that they're of objects, scenes, and those that don't exist in actual life

D. Why Generative Adversarial Networks?

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E. Adversarial network architecture

The overall plan behind the methodology is that it permits one to train G, a generative model with the goal of lighting a differentiable discriminator D which is trained to tell apart super-resolved pictures from original pictures. By this approach our generator G will learn to form results that are extremely parallel to real pictures and therefore tough to categorize by the discriminator D. This inspires perceptually superior outputs exist in the subspace, the manifold, of natural images. This is in contrast to super resolution solutions obtained by minimizing pixel-wise error measurements, like the MSE. At the core of our deep generator network G, which is illustrated in Figure 5 are B residual blocks with similar layout.

Tendency to use the block layout planned by pre-existing models. Specifically, we use 2 convolutional layers with tiny 3×3 kernels and 64 feature maps followed by batch-normalization layers and Parametric ReLU like the activation function. Increasing the resolution of the input image with 2 trained sub-pixel convolution layers.

To disgrade real High resolution images from generated SR Samples, tendency to train discriminator network. The design is shown in Figure 5. To follow the study pointers and use LeakyReLU activation (α = zero.2) and avoid max-pooling throughout the network. It contains eight convolutional layers with associate degree increasing range three 3 × 3 filter kernels, increasing by an element of 2 from 64 to 512 kernels as within the VGG network. Strided convolutions area unit is used to scale back the image resolution anytime the amount of options(features) is doubled. The ensuing 512 feature maps area unit followed by 2 dense layers and a final sigmoid activation

F. YOLO V3

The newer architecture boasts of residual skip connections, and upsampling. The most salient feature of v3 is that it makes detections at three different scales. YOLO is a fully convolutional network and its eventual output is generated by applying a 1 x 1 kernel on a feature map. In YOLO v3, the detection is done by applying 1 x 1 detection kernels on feature maps of three different sizes at three different places in the network.

The shape of the detection kernel is 1 x 1 x (B x (5 + C)). Here B is the number of bounding boxes a cell on the feature map can predict, "5" is for the 4 bounding box attributes and one object confidence, and C is the number of classes. In YOLO v3 trained on COCO, B = 3 and C = 80, so the kernel size is 1 x 1 x 255. The feature map produced by this kernel has identical height and width of the previous feature map, and has detection attributes along the depth as described above.

Before we go further, I'd like to point out that stride of the network, or a layer is defined as the ratio by which it downsamples the input. In the following examples, I will assume we have an input image of size 416 x 416.

YOLO v3 makes prediction at three scales, which are precisely given by downsampling the dimensions of the input image by 32, 16 and 8 respectively.

The first detection is made by the 82nd layer. For the first 81 layers, the image is down sampled by the network, such that the 81st layer has a stride of 32. If we have an image of 416 x 416, the resultant feature map would be of size 13 x 13. One detection is made here using the 1 x 1 detection kernel, giving us a detection feature map of 13 x 13 x 255.

Then, the feature map from layer 79 is subjected to a few convolutional layers before being up sampled by 2x to dimensions of 26 x 26. This feature map is then depth concatenated with the feature map from layer 61. Then the combined feature maps is again subjected a few 1 x 1 convolutional layers to fuse the features from the earlier layer (61). Then, the second detection is made by the 94th layer, yielding a detection feature map of 26 x 26 x 255.

A similar procedure is followed again, where the feature map from layer 91 is subjected to few convolutional layers before being depth concatenated with a feature map from layer 36. Like before, a few 1 x 1 convolutional layers follow to fuse the information from the previous layer (36). We make the final of the 3 at 106th layer, yielding feature map of size 52 x 52 x 255.

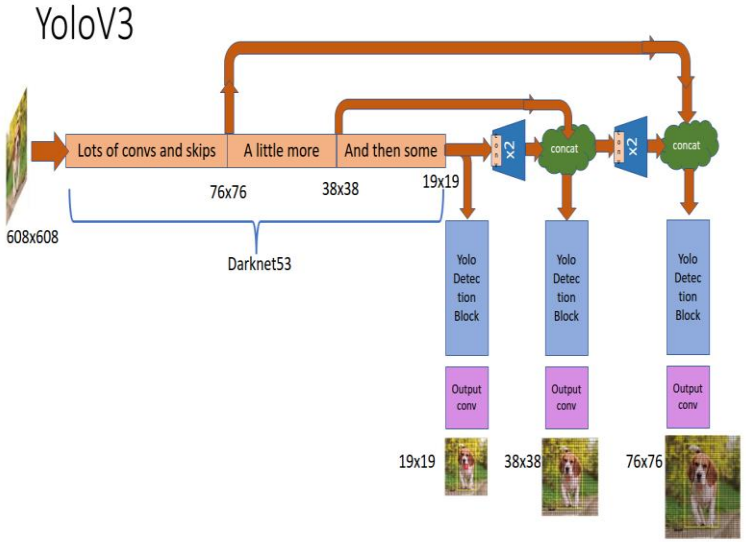

Figure 6: YOLO V3 architecture

G. Feature Detection

A feature is a piece of information which is relevant for solving the computational task related to a certain application. Features may be specific structures in the image such as points, edges or objects. Features may also be the result of a general neighborhood operation or feature detection applied to the image.

Feature detection and matching is an important task in many computer vision applications, such as structure-from-motion, image retrieval, object detection, and more. The feature detection includes many algorithms out of which we have used are SIFT and FAST.

SIFT stands for Scale-Invariant Feature Transform and was first presented in 2004, by **D.Lowe**, University of British Columbia. SIFT is invariance to image scale and rotation. This algorithm is patented, so this algorithm is included in the Non-free module in OpenCV.

FAST(Features from Accelerated Segment Test) is a corner detection method, which could be used to extract feature points and later used to track and map objects in many OpenCV tasks the most promising advantage of the FAST corner detector is its computational efficiency. Moreover, when machine learning techniques are applied, superior performance in terms of computation time and resources can be realized.

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IV. CONCLUSION

This paper describes a deep residual SRResNet that has a new state of the art on public benchmark. Also highlighted some PSNR focused super resolution image and introduced SRGAN, which enhances the content loss feature by training GAN with an adversarial loss. Also reported that SRGAN rebuilds have larger upscaling factors(4x) ,more photo-realistic than reconstructions obtained from comparison methods of state of the art

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ADVANCED IOT BASED GARDENING SYSTEM

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Abstract

This project aims at developing an auto irrigation/gardening system with raspberry pi. This system is easy to manage as all the users should be able to login by Smartphone and access the condition of garden. These features a sense that a user can access the parameters of the land such as moisture, temperature etc and can also water flow can be controlled, as well as supplies the water when required. In the system to be implemented, the data that is soil moisture, temperature, humidity, sunlight are logged into the Microcontroller. Web Server running on raspberry pi receives this data and can transit to the mobile phones or any other device, which requests the data. Based on this obtained data the end-user can then control the system, remotely. The extra feature of the model is that the user will ensure if his/her need of the plants, herbs are served based on the right need and there is over/under usage of the water. A Web-Server along with a web page will help in user being notified about the requirements of the water when required.

Keywords—Raspberry Pi, Microcontroller, Web-Server

1. Introduction

The large portions of land are used by the farmers to grow different types of crops. keep a constant eye on a irrigation/garden land. Sometimes a small portion of land receives excessive amount of water which leads to water logging. In this case the crops or may be some plants in the land get damage and the a farmer may suffer heavy loss.

To overcome this problem, we have proposed an "Advanced IOT (Internet of Things) based irrigation/gardening system using Raspberry Pi". This is a really handy project that allows the user to regulate and monitor his water supply from his current location.

This paper discusses the notion of sensors and how they are used in the creation of the Internet of Things (IoT).

The physical parameters of soil are determined using temperature, sunlight, and moisture sensors. Several analog and digital sensors, such as light, temperature & soil moisture, which are used to collect real-time data. After that, the sensors will be connected to an Arduino microcontroller.

Web Server running on raspberry pi receives this data and can transit to the mobile phones or any other device, which requests the data. Based on this obtained data the end-user can then control the system, remotely.

2. Methodology

Fig.1 below shows the block diagram of Advanced IoT based gardening system using Raspberry Pi.

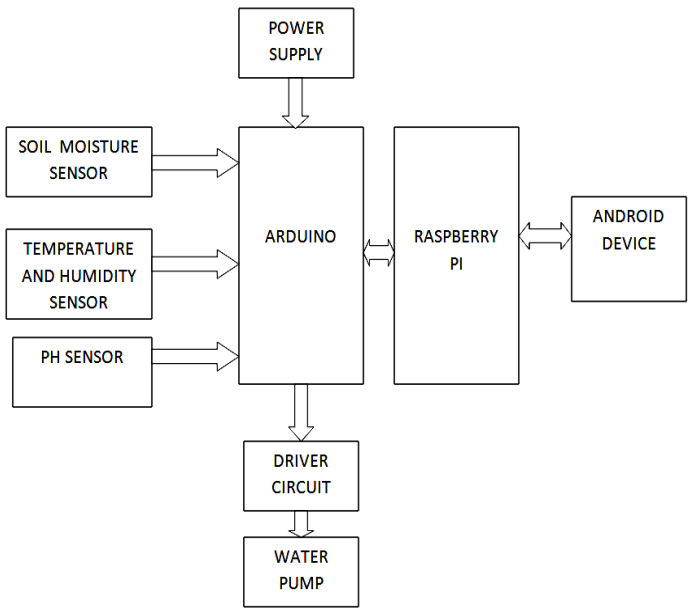

Fig1: block diagram of Advanced IoT based gardening system

We make use of moisture, temperature, Photoresistor sensors. All these sensors will be

interfaced to arduino board. Moisture sensor is gives the values real time moisture level in the soil. The temperature is measured using a temperature sensor. Photoresistor records the intensity of the sunlight. In the system to be implemented, the data that is, soil moisture, temperature, humidity, sunlight are logged into the microcontroller and the data logged are transferred to raspberry pi through serial communication via USB port.

Web Server running on raspberry pi receives this data and can transit it to the mobile phones or any device, requesting the data. Based on this obtained data the end user can then take a decision from the list of queries, remotely.

We create a Web Server using flask, a python Web-framework and have it running on raspberry pi, static IP address is assigned, which allows us to access the system remotely from any device by keying in that IP address.

The water pump is used to supply the water to the irrigation land. With this system a farmer can supply water that is he/she can also controlled the water pump (can be switched on /off or supply of required amount of water to land) using remote device. This advanced system is also be useful for people who has agricultural land, while it very hard for an individual person to be present at his/her land all the time. But This project can be used to monitor soil moisture and maintain proper water supply to the irrigation/gardening land even from remote devices..

3. Components

3.1. ARDUINO IDE

Fig.2 below shows Àrduino UNO board. Àrduino Uno is a microcontroller board based on the ATmega328P (datasheet).

Fig. 2. Arduino Uno

It consists of fourteen digital input/output pins (out of 14 6 can be taken as PWM o/p), six analog i/p's, a 16 MHz quartz crystal, a USB connector, a power slot, an ICSP header and a reset button. It has all the needed which supports the µc;

Simply use a USB cord to connect with computer. To get started, use an AC→DC adaptor or a battery . User can play with the UNO without being overly concerned about making a mistake, worst case scenario user can exchange the chip for a few rupees and restart it again. This is the most recent model of the Arduino -USB board.

It connects to the laptop/computer using a USB cable & it has all the requirements that user need to write the code and use this board. A variety of shields can be added to it.: custom daughter-boards with specific characteristic.

It is similar to the Duemilanove, but it has a different USB-to-serial chip the ATMega8U2, and It has redesigned labelling to make identifying inputs and outputs easier.

3.2. RASPBERRY PI 3

The Raspberry is a line of single-board computers created in the UK. by the Raspberry Pi Foundation. The Raspberry Pi Hardware has gone under much iteration, each with various memory capacities and peripheral/interfacing device support. Fig. 3 below the shows the circuit board of Raspberry Pi 3.

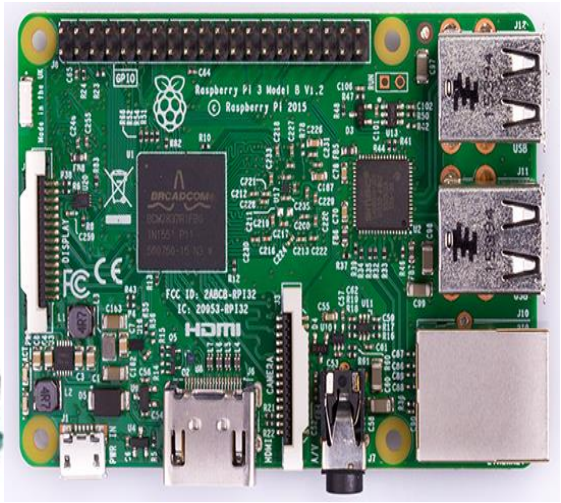

Fig. 3. Raspberry Pi 3

In this proposed system we have used **Raspberry Pi** -3. The Raspberry Pi 3 is the 3rd generation Raspberry Pi. It has been replaced with the Raspberry Pi 2 Model-B in February 2016. It has following components as shown in table below compare to Raspberry Pi 2.

Table:1 : Component in Raspberry Pi 3

1.	A 1.2GHz 64-bit quad-core
2.	ARMv8 CPU
3.	802.11n Wireless LAN
4.	Bluetooth 4.1
5.	Bluetooth Low Energy (BLE)
6.	1 GB RAM
7.	4 USB ports
8.	40 GPIO pins
9.	Full HDMI port
10.	Ethernet port
11. 12.	Combined 3.5mm audio jack and composite video
13.	One Camera interface (CSI)
14.	Digital Display interface (DSI)
15.	One Micro SD card slot (now push-pull rather than push-push
16.	Video Core IV 3D graphics core

3.3. Digital Temperature/Humidity Sensor

DHT22 is a low-cost digital temperature and humidity sensor with a basic design. The o/p is calibrated digital signal. It makes use of a unique digital signal collection technique as well as humidity sensor technology. Its technology offers a high level of reliability and long-term stability. Eight bit single chip computer is connected to the sensing elements. Each sensor of the model calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of program in OTP memory, when the sensor is detecting, it will cite coefficient from memory. Every sensor is temperature compensated and Small size & low consumption & long transmission distance (20m) enable. DHT22 used for all harsh application occasions.

3.4. CdS PHOTORESISTOR

A cadmium sulphide (CdS) photo resistor or photo cell changes its resistance depending upon the light intensity. It's very sensitive, and it has been around from decades. It is also called as LDR which is used in street lighting systems and also as an electric eye. In darkness the resistance decreases from millions of Ω and in bright light of about few hundred Ω.

3.5. VH400 -SOIL MOISTURE SENSOR

VH400 version sensor is used to measure soil water content and its of low cost. It uses Tx (transmission) line techniques to measure the dielectric constant of the soil, It is not affected by water salinity., and will not corrode over a time as conductivity based probes does. These probes are tiny, rugged, and low power.

3.6. PH SENSOR

The alkanity / acidity of the water solution can be measure using PH value based on relative number of hydrogen (H+) / hydroxyl (OH-) ions present in it. The pH value < 7 is acidic and >7 is basic. As temperature also changes.

4. Results

The following testing done for our project for different parameters.

CASES	TEMPERATURE	HUMIDITY	MOISTURE
DRY SOIL	29 C	57%	1023 m^3
WATER	30 C	53%	240 m^3
SAMPLE SOIL 1 (MEDIUM MOIST)	29 C	57%	670-880 m^3
SAMPLE SOIL 1 + WATER	29 C	57%	260-300 m^3
SAMPLE SOIL 2	30 C	53%	850-930 m^3
MOIST SOIL	29 C	57%	250 m^3

Based on the experiments performed using various test scenarios. We have the following outputs in our GUI.

4.1 SNAPSHOTS

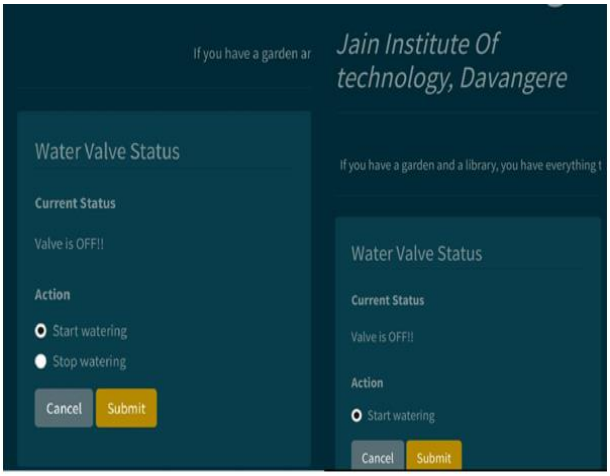

Fig 4: Initial Window

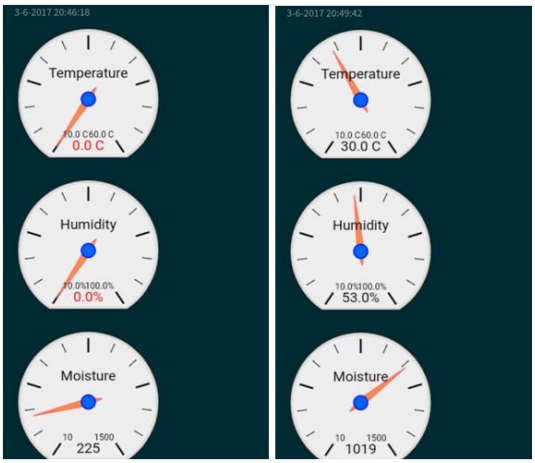

Fig 5: Gauge Readings

Conclusion

Automated irrigation/gardening system is a reliable and efficient system for efficiently and effectively monitors the irrigation/agricultural land parameters. Monitoring the land using wireless technology allows the user to reduce the human power, and also allows user to see changes in it. Using a Raspberry pi and other electronic parts allows supportable irrigation on land by with sensors to check soil moisture, as well as a web scraper to check future weather. It makes use of this details to conserve water by only using what is required.

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Generating E-Tokens for Public Transport

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***ABSTRACT*- Generating E-Tokens for public transport is an application prototype that provides tickets and passes to commuters who use public transport. Traditional systems have several shortcomings, which have inspired many smart alternatives. We have performed literature surveys on the same. The current trend is moving away from the traditional ticketing systems and stepping towards smart ticketing systems. The proposed system in this paper uses an SMS-based approach, where a passenger receives an SMS on successful payment, which serves as his travel ticket. The same is verified by the conductor who can fetch details of passengers from the server. The entire process involves the utilization of technology in a smart way. The main aim of Generating E-Tokens for public transportation is to track all the commuters, reduce misuse of tickets and have a database for all types of commuters and also conductors for easy analysis and improvisation in any service if required.**

Key Words*: *Public transportation; Pass; e-Ticket; Payment.

I. INTRODUCTION

A. Overview

Buses are the foremost popular and convenient mode of transportation in India. More than 1.6 million buses are registered in India, and also the public bus sector operates 1,70,000 buses carrying roughly 70 million people per day. As an outsized number of individuals board buses every day it's often difficult for passengers to buy the ticket and maintain it.

There are a lot of problems for both conductors and commuters while issuing the tickets and making refunds. The wastage of papers and misuse of tickets is also a problem. To overcome it, our application provides benefits for both conductors and users to save their time for cashless transactions, avoid misuse of tickets and minimize the usage of paper to save our environment.

B. Problem Statement

In the current pandemic situation, it is ideal to have no physical contact everywhere we go while using public transportation. Hence, It is useful to provide E-token to commuters by Public transport authorities like BMTC to keep track of payment and customer details.

There is always a chance of misuse of tickets which can be avoided otherwise. It is beneficial towards our society by not providing the tickets manually and thus saving paper and moving towards a greener environment which is essential in today's scenario.

C. Existing Technique

Initially (in practice) the tickets are issued by the conductor in the form of paper. The total expenditure required to produce tickets is very high, which was recently replaced by ETM (Electronic ticket Machine). This comes with an in-built LCD, keypad, printer and runs on rechargeable batteries.
This situation is quite possible that both the passengers and the conductor may not have enough change. This problem is commonly faced by every passenger and this may lead to a non-refunding balance to passengers.

The Existing System has many limitations such as Excessive waste of paper as it's a mode of issuing the tickets, Misuse of Tickets and passes, Inadequate time for getting tickets, non-refund balance, no identity of the daily commuter is traced.

D. Solution for the Problem

We have come up with an idea i.e., a general-purpose application that combines such existing solutions. Since the number of mobile devices is increasing day by day, a cross-platform mobile application is effective to reach people and is also user-friendly.

ISBN: 979-85-27243-61-1 328

An app that can be used by public transport commuters and organizations alike. Commuters can create their account and buy tickets or passes, whereas the administrator can add employees i.e., conductors, and conductors can view the list of passengers traveling in the bus through his dashboard. The ticket generated will be in the form of a text message with a validity period after which it expires.

E. Objectives

Track all the commuters, reduce misuse of tickets, and have a database for all types of commuters and also conductors for easy analysis and improvisation in any service if required. The proposed idea aims to achieve the following objectives: Prevention of fraud, increase in passenger loyalty, Reduction of operating and maintenance costs, increase boarding speeds by reducing transaction times, no fear of losing passes/cards/e-tickets, Organizations can have better control of revenue, also improve the image of public transport.

F. Scope of Project

The scope of the project is to provide E-Tickets to commuters thus avoiding physical contact, misuse, or misplacement of tickets. Options or features include real-time updating of the number of passengers in the conductor module, revenue collection can be easily obtained in the admin module, and also better identification of victims during a disaster.

G. Organization of Report

Chapter 1 consists of an overview of the problem statement, a brief scenario of the existing system and problems related to it, and its solution with the objectives and scope of the project to be implemented, Chapter 2 consists of the Literature survey from different IEEE paper, Chapter 3 consists of System Architecture, Use Case diagram, and Sequence Diagram, Chapter 4 consists of Methodology Hardware and Software Requirements, Chapter 5 deals with the conclusion and future enhancements, Chapter 6 contains the references which were found useful in implementing and designing the application prototype.

II. LITERATURE REVIEW

A. Impact of E-Ticketing Application on Bus Transportation in Bandung:

This project relies on the impact of the e-ticketing application system on bus transportation for the peoples of Bandung[1]. To support the research, the strategy used was qualitative. The results show that there are some positive impacts on the implementation of e-ticketing systems, one of which is to increase public interest in public transport to reduce traffic jams that often occur. The implementation of e-ticketing systems on public transportation provides convenience and comfort in ticket booking services, both for the people and for the providers of the transportation service. There is no procedure for how the conductor will verify the passenger e-ticket.

B. A Mobile Application for Bus E-Ticketing System:

In this system, tickets can be bought with just a smartphone application where tickets are carried on the smartphone[2]. The ticket automatically gets deleted after a specific period. The ticket checker is provided with a mobile application to search for the user's ticket with the ticket number which is stored in the database for checking purposes. The major problem with the system is that it will not be able to track the passengers entering the buses and checking each passenger's ticket using the ticket number is time-consuming.

C. Smart Bus Management System using IOT - DOI:

Users can scan the QR code rather than the paper tickets[3]. The passengers are given an android app where they register and have an e-wallet service where money is added by bank transaction by entering bank details manually. On entering from and to address, the app will automatically generate the number of buses running on that particular route with the amount details per head and the number of passengers traveling. The total ticket fare will be deducted from the wallet. The passengers will have to scan the QR code and the ticket will be notified through SMS. Admins will be notified of the number of passengers entering and departing the bus with the help of sensors that will be placed at the footboard of the bus. The application will not be useful for daily travellers. Sometimes the sensors which are placed on the footboard may not work, then the admin will not be able to record how many passengers are entering the buses and departing from the buses. The sensor which is placed on the footboard will generate a report of crowd condition only for 3 hours a day.

D. Online Bus Tracking and Ticketing System - Informatics Journals:

This application handles all the data like the current location of the bus, punching of bus passes having QR code, On-time ticketing using E-wallet or cash, and Ticket generation with the help of Bluetooth printing[4]. The real-time tracking of buses can be done and then this information is given to the remote user. Technologies like QR-Code, Blue-tooth printing, GPS (Global Positioning System), Cloud, E-wallet are used for development purposes. The main disadvantage is without Bluetooth connectivity the bus authority will not be able to print the particulars.

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III. SYSTEM DESIGN

A. System Architecture

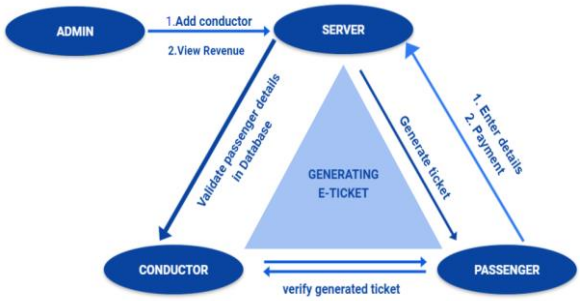

Fig 3.1**:** System Architecture

Fig 3.1 gives an idea of the organization and inter- connection between the various parts of the proposed system.
The users send data through the app server hosted on Firebase and can view the posted data in real-time. Data sent will be stored on the Firebase cloud and will be forwarded to the app where users can view it in real-time. All the data related to the e-ticketing system is stored in a server that can be accessed by the admin. The admin can add/delete/update any information regarding the employee or the user. First, the passenger will enter the details based on which the price of tickets will be generated. The passenger will proceed further for the payment, once the payment is processed, they will receive the ticket in the form of SMS. The conductor will fetch the details of passengers through the dashboard for verification and to identify the commuters who are fraudulent.

B. Use Case Diagram

Three Use Cases:

1) *View Data*: All actors can view the data present on the app.
2) *Add/remove data:* Admin and users can add/remove data based on the type of account.
3) *Analysis:* Admin can view the analysis report to get an overview of revenue.

Three Actors:

1. *User:*
   The users/volunteers are the actors who are one of the data generators. They generate data by buying tickets or passes and creating their profile or viewing their profile.

2. *Admin:*
   Another data generating actor is the admin who can add employees i.e., conductors. Organizations can view the generated data and can analyse the revenue received.

3. *Admin:*
   Another data generating actor is the admin who can add employees i.e., conductors. Organizations can view the generated data and can analyse the revenue received.

4. *Conductor:*
   Admin can approve organizations to use the platform, send helpful information and/or news and update the learn section. Has access to all three use cases.

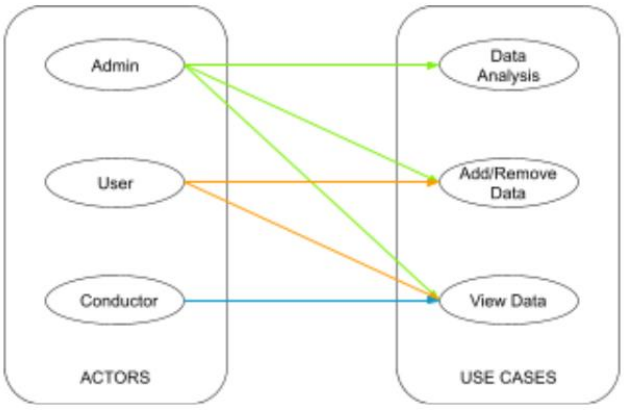

Fig 3.2: Use case diagram

C. Sequence Diagrams

a. Admin Module

The admin after successful login can approve/permit the employee i.e., conductor to use the application. This is done to ensure that no fraudulent activities occur. Admin can also manage profiles of the employees i.e., add or remove employees and update the learn section. They can view the revenue generated daily with an analysis option. They can also solve complaints/issues faced by users and organizations if any.

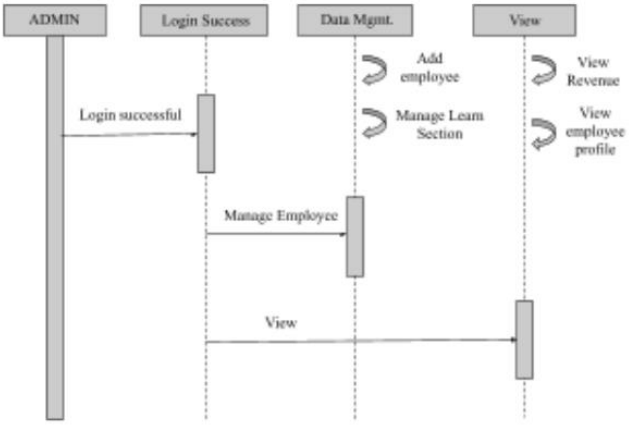

Fig 3.3: Admin module sequence diagram

ISBN: 979-85-27243-61-1
330

b. User Module

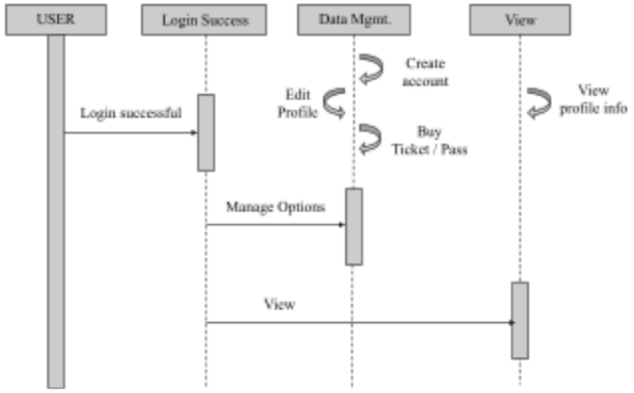

Fig 3.4: User module sequence diagram

The users after successful login to their account can manage personal details, buy tickets or passes as per their requirement. Users or commuters can also view their profile details and be able to edit their profiles.

c. *Employee Module*

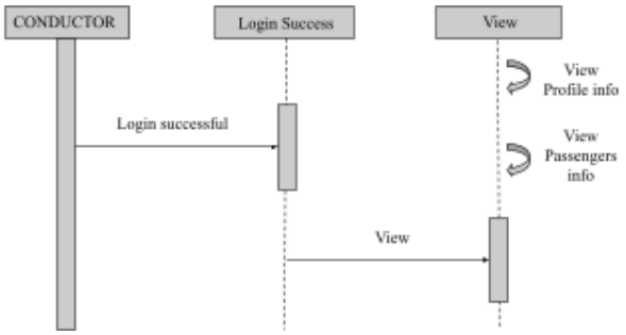

Fig 3.5: Employee module sequence diagram

The Employee after successful login can view his/her profile details. They have access to the dashboard so they can also view the passengers seated in the bus and their respective get-off points, and thus be able to identify the commuters who are fraudulent.

IV. PROPOSED SYSTEM

A. Methodology

Our application will be useful for the commuters as well as for the Bus Organization. The commuters and conductors can save time and also be able to maintain the database. It promotes cashless transactions. The application will increase the use of public transportation.

The application consists of separate registration for both conductors and commuters. The conductor registration is done by the admin itself. The admin has the credentials for registration for the conductor in our application by providing basic information such as name, date of birth, gender, email address, permanent address, and qualification. The conductor account can be verified by uploading the id proof (Aadhaar Card), photo, and signature.

The user has to register with basic information such as name, date of birth, gender, email address, and permanent address. The account can be verified by uploading the id proof (Aadhar card), photo, and signature. Once the user has done registration then the user can apply from the following e-ticket/pass: Daily Ticket, Daily Pass, Monthly Pass, Yearly Pass.

Users can book the ticket for many commuters such as seniors and children. After booking the ticket the user gets the payment details. Once the payment is done the user will get the message on the registered mobile number.

Our application is useful for both conductors and commuters. By seeing the current pandemic situation our application will help in the contactless transaction and also save time. It will help us to maintain the track record of commuters.

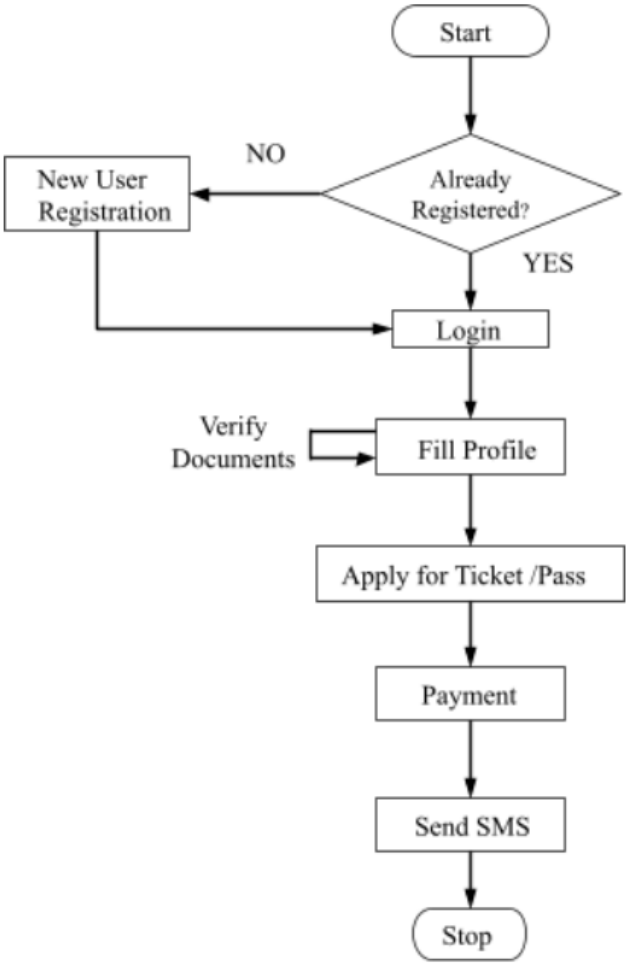

Fig 4.1: Flowchart for user

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331

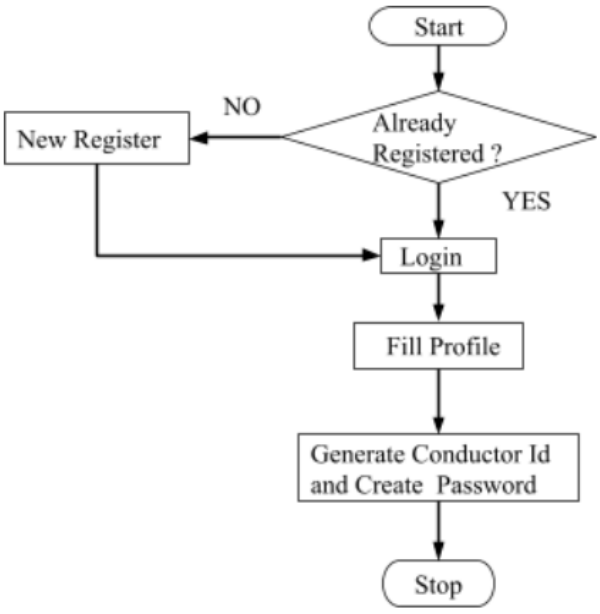

Fig 4.2: Add conductor details

V. CONCLUSION & FUTURE ENHANCEMENT

Traditional systems have several shortcomings, which have inspired many smart alternatives. The current trend is moving away from traditional ticketing systems and moving towards smart ticketing systems. The system proposed in this paper uses an SMS-based approach, where a passenger receives an SMS on successful payment, which serves as his travel ticket. This ticket can be verified by the conductor who uses the same application in his handheld device and communicates with the server to receive details of passengers. The entire process involves the utilization of technology in a smart way. This system, if implemented, avoids the use of paper tickets and avoids the felling of trees.

The Project will provide a smooth ticketing experience for commuters. The application after implementation will give a new ticketing experience for commuters and bus organizations. By seeing the current situation contactless transactions can be done. Most people nowadays using the smartphone it is right to implement this application so the everybody will be familiar with the application.,

The present system can be further developed to make it better and effective by adding route guidance. Possible routes present for that particular bus can be made available to the passengers. With the help of GPS, some of the data

fields in the ticket/pass can be auto-filled. The organization can verify if the commuter is fraudulent i.e., traveling beyond the destination as in the purchased ticket. The location of the buses can also be tracked and hence shall be easy for the users to board the bus.

ACKNOWLEDGMENT

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332

THE BIODEGRADABLE AND NONBIODEGRADABLE WASTE MANAGEMENT SYSTEM

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ABSTRACT

***ABSTRACT*-Waste Management is important in today's society. Due to population growth, waste generation is increasing day by day. In addition, the increase in garbage is affecting the lives of many people. Although there are a number of solutions provided by competent authorities, the waste management process is becoming increasingly tedious. The waste generated is highly comparable to the amount of waste that is managed on a daily basis. So in view of all of these factors, an intelligent system can provide an effective solution to waste management. In this paper we present an intelligent system based on Tensor flow and the internet of things with Raspberry pi. The system is designed in such a way that it will automatically detect and collect garbage and after collection a notification will be sent to the user. Garbage collection by hand and cleaning is a tedious, tedious and repetitive task. So to overcome this major problem of waste collection private waste collection this model is being developed. This robotic robot is able to detect garbage accurately and independently through a deep neural network of garbage information. In addition, for ground or floor separation a deep neural network is used. Test results show that the accuracy of detection of waste can reach as high as 95. Therefore, the proposed model could serve as a good aid in relieving the dusty body function of waste-disposal activities.**

I. INTRODUCTION

[1] A waste management system is a strategy in which an organization uses to recycle, reduce, reuse, and avoid waste. Disposal options include recycling, composting, incineration, landfill sites, bioremediation, waste - to-energy conversion, and a reduction of waste. Waste of time by humans. In areas with a low population density, waste generation, may be negligible. A high density of population, and even biodegradable waste that can be processed. Sometimes, it's been re-released into the ground water, with an impact on the environment. It had a fixed monthly ritual, in which all the villagers are gathered and burned in waste-to-large landfill sites. [2] The risks and threats associated with the disposal of waste that can be easily avoided by knowing the different types of waste. Biodegradable waste-is a type of wastes, mostly derived from plant or animal sources, which may be disposed of by other living organisms. Most of the inorganic wastes are non-biodegradable. Not for the production of biodegradable waste that can be recycled and reused, also known as the" Renewable Waste", which can't be recycled, which is known as 'non-renewable waste".[3] Treatment they may be biodegradable or not, they can be harmful to the human life and the destruction of other species and their natural habitat. They are also suitable for the disposal of waste should be carried out. It is the responsibility not only of governments but also of each and every individual. [4] The three Rs of Buckets, Reuse, and Reduce to the simplest of actions, which anyone can run on their part of the work is done. This will save energy, and other resources. Another step is to separate the biodegradable products, biodegradable, non-biodegradable ones at home, and then throw it away sold separately. The detection is carried out with the help of open CV, that will be used for pattern recognition and prediction. Raspberry pi camera to capture the image when an object is detected, the camera captures the image. Thus, the

collection of waste will be carried out with the help of a robotic arm. As soon as the camera detects the recycle bin, you will calculate the location of the calibration of the motors according to the location of the trash can, and will, be referred to the trash can. As soon as the waste has been, to a certain extent, the garbage collector will be in the control of the garbage level and send it to the nearest garbage truck [5]An autonomous, closed-loop, garbage collection, cleaning system, identify waste, and sends it to an all-wheel-drive truck to collect it. The discovery of a matter is to be done in a controlled environment, with the aid of image processing, as the obstacle detection systems, which is working to map the shortest path to the goal from the rubble of the rover. The data was collected by a camera located on top of the tubing and is attached to a mini-computer. [6]Finally, the image classifier is used to mark an image as a waste and non-waste. If it has been marked as garbage, rover will follow the shortest path, which is determined by the algorithm, to avoid all the obstacles in order to collect them.

II. PROPOSED APPROACH

The system will automatically sort the waste, so that human effort is, manual sorting of waste, and it saves time and effort on the part of the person. It is up to the user directly on the level of the garbage container, and there is no need to control it manually. It's a system that will send messages to the relevant department, on the waste-to-fill, and the administration of the system. The segregator, the "funnel" into the rover, it helps to sort the results, often, less and less waste in sort period of time. It offers a flexible and efficient way to manage your waste. The Robots will be used in order to pollution of the environment, and alert the management of the waste disposal authorities, and waste-to-get items. Separate waste particles, such as plastic and other waste, decontamination of the environment on the territory of the waste in the container and hygiene.

III. LITERATURE SURVEY

Robotic arm with real-time image processing using raspberry pi, both Automated and manually.

Author: Dr. A. brintha Therese1 and Prashant Gupta

Publication: IJAR, 2018

Abstract: This paper proposes to create a Robotic Arm with Real-Time Image Processing using Raspberry Pi which can either be automated or can be operated manually. In the present era, we are making a robot capable of detecting and placing the pre-specified object. The code for detection of color has been written in Python. For a hardware implementation, we are using raspberry pi which has Raspbian OS based on Debian which is Linux OS. The robotic arm detects the pre-specified objects and segregates them based on color (RGB). The program includes controlling the robotic arm, capturing the object image processing, identifying the RGB object, using a local page to control motor manually and perform all task automatically using Raspberry Pi.

Waste Segregation Management Using Object Sorting Robot

Author: S. Lokesh1, S. Kiran2, B. Vijay3, S. B. Yuvaraaj4, S.Yuvaraj5

Publication: International Journal of Engineering & Technology, 7 (4.6) (2018) 556-558

Abstract: Every year our world are facing a huge issue in the area waste goods management. The proposed system designed as an automated sorting of waste segregation management based on object recognition. sorting of different objects on a conveyor belt is generally carried out manually or by using sensors. In this paper we have proposed a low-cost automated system which uses Arduino, moisture sensor, ultrasonic sensor, IR sensor, metal detector and a USB camera. We use Camera for detecting the object and the four different sensors are used for the sensing purposes. In addition to that a ultrasonic sensor for distance measurements and dc motor for conveyor belt applications and for sorting purpose. The system discard the objects which are not of desired object or size by pushing them out of the conveyor belt.

Automation of Object Segregation

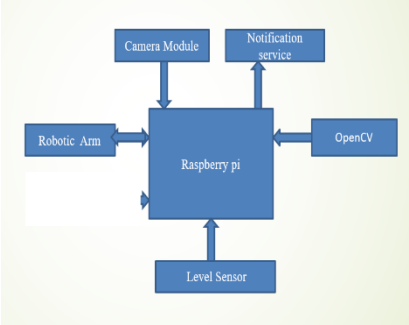
Author: Ranjitha S Rai1, Madan G 2, K.R Prakash 3, G. Ravi Krishna4

Publication: International Research Journal of Engineering and Technology (IRJET) 2019

Abstract: - Automation has led to the growth of industries in recent years. For best performance of industrial process, automated systems are used. Image processing has led to a great role in the applications of robotics and embedded systems. Sort out of objects are usually done by humans which takes a lot of time and effort. Detection of object is achieved using image processing technique and suitable sensor and hence robotic arm can be used to sort various objects. This reduces human effort, and also improves the time to market the product. The proposed model

includes the conveyor system, capturing and detecting the objects and placing the objects. Using image processing technique the captured image is compared with the pre-specified object. Based on image processing, the robotic arm will be controlled and place the objects in desired location. Raspberry Pi 3B+ model is used to process the captured image. Captured image is other than prespecified object, it involves the conveyor start to move and object is collected at the end of the conveyor system

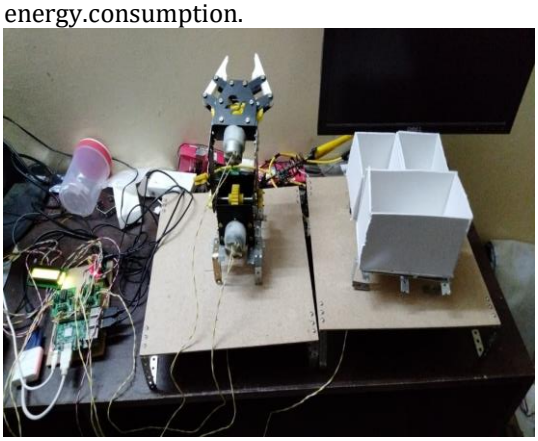
IV. DESIGN & METHODOLOGY



The tasks is a significant clue as to the hours of operation, and the range of products. Waste detection, which ends with OpenCV. The Raspberry pi camera that captures an image of a specific area, it is saved as the default settings for the view, and compares the captured image with the standard image. When an object is selected, the camera will capture the image. You can recognize an item to the trash bin, and an additional assortment of the trash can, it is finished, with the help of a robotic arm. The collected waste will be collected and put it in the trash in the basket and where the level sensor is installed, which will determine whether it is filled or not. As soon as the bucket is full, the camera will send a notification - notification center.

V. RESULT

This implementation of smart dustbin indicator receptable, gives a solution for unsanitary environmental condition in a city. This implementation of intelligent bin using internet, sensor and raspberry pi. This system assures to send the notification and status of bin in display when the bin level reaches to maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take action against the concerned contractor. This system will also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of vehicle for collecting the garbage and hence reduce the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanliness in the society and the environment. Therefore, this management system makes the garbage collection more efficient the use of solar panels in such systems may reduce the energy.consumption.



Such, system are vulnerable to plundering of components in the system in different ways which needs to be worked on. These bin model can be applied to any of the smart cities around the world. A waste collecting and monitoring team which is deployed for collection of garbage from the cities can be guided in a well manner for collection.

VI. CONCLUSION AND FUTURE SCOPE

CONCLUSION

The paper provides a structure for self-collection of household refuse on the ground this organic structure, to distinguish it from the waste, with no help from the outside. In a remarkable manner, and the recipe was to strengthen the basic division, which was planned to be. With the help of the controller and the waste that is collected and shared.

A FUTURE REPORT

However, this approach could be used for the simultaneous deployment of multiple robots in a variety of areas. In this economic system, as well as the best timing on my part. The image processing algorithm can be improved, without any restriction on the processing of the hardware, because it will only be used in a centralized server. The system can also include a wide range of applications. In particular, you can use it to collect nuclear waste, where the presence of man, it is too dangerous. It is mainly available for the smart city. if implemented correctly, can be successfully extended.

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Object Recognition and Localizing for Visually Impaired People

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***Abstract*—Visually impaired people represent a significant population segment, currently the number being estimated to tens of millions around the globe. Their integration in the society is an important and constant objective. A great effort has been made to assure a health care system. Various guidance system techniques have been developed to assist the visually impaired people in living a normal life. Often, these systems are designed only for specific tasks. Nevertheless, these systems can greatly contribute to the mobility and safety of such people.**

Keywords—YOLO, CNN, Object Recognition, Localizing, Computer Vision.

I INTRODUCTION

Visually challenged people make up a sizable population component, with estimates ranging from tens of millions to hundreds of millions worldwide. Their integration into society is a critical and ongoing goal for them. A considerable deal of effort has gone into ensuring a health-care system. A variety of guiding system strategies have been created to assist visually impaired people in leading regular lives. These systems are frequently created for a single purpose. Nonetheless, these devices will make a significant contribution to the mobility and safety of such people.

Advanced approaches in image processing and computer vision, as well as the speed performance of devices and unit processors, are all linked to the creation of cutting-edge guidance systems to assist visually impaired persons. Regardless of the technology used, the application must work in real time with swift actions and judgments, as speed may be required to take action.

Choosing the optimum solution is essentially a trade-off between the software component's performance and the hardware capabilities. It is necessary to fine-tune the parameters to their maximum potential. One of the key objectives of the aided system during a visually impaired person's indoor movement is to automatically identify and distinguish objects or impediments, followed by an auditory signal.

This system's suggested vision module for image processing is an integral aspect of a platform designed to assist visually impaired people. Furthermore, the suggested module can be used independently of the integrated platform and outside of the shell. The suggested vision-based navigation system is iteratively created, developed, and validated over tests. The module adheres to the notion of producing a high-performance gadget that is also cost-effective in practise. The module makes use of disruptive technology and allows for updates and the addition of new features.

II RELATED WORK

Assisted Movement of Visually Impaired in Outdoor Environments et al. (2009) [1] have proposed a technique stating, In recent years, many attempts have been undertaken based on innovative technologies and information technology, to produce ETA equipment as a replacement for blind and visually impaired people's lost sight. As a result, several of the issues in this area have adequate answers. The conventional tools used by visually impaired people to navigate in real outdoor surroundings (white canes and guiding dogs) have been replaced in recent years by electronic travel aids (ETA). These devices, which are based on sensor technology and signal processing, can help blind people move around in unfamiliar or constantly changing environments. The most important theoretical and practical results obtained in the field of ETAs are presented initially in this work. The author's team's original findings, which include innovative concepts in this field such as an integrated environment for supported movement, acoustical virtual reality (AVR), and bioinspired solutions, are then described in further depth. There are also some conclusions and future advancements in this area.

A CNN Based Correlation Algorithm to Assist Visually Impaired Persons et al. (2011) [2] have described how a CNN-based correlation algorithm can help visually impaired people. Given the enormous quantity of data that can be extracted from images, including a visual processing system in the framework of systems that assist people with visual impairments is critical, independent of the version displayed. This study proposes a correlational design based on the usage of cellular neural networks (CNNs) to improve the characteristics of assistive technologies by providing visually impaired persons with more information from their surroundings. Parallel processing can handle the majority of the operations (calculations) in the suggested approach. As a result, computing time can be lowered, and computing time does not increase in direct proportion to the size of the template images.

Multicore Portable System for Assisting Visually Impaired People et al. (2014) [3] have proposed a system stating, The mobile system is based on a cell phone; however, it addresses incorporates sensors from the outside. It covers visually challenged people's interior and outdoor mobility. The system's efficiency has been demonstrated in tests, and with the introduction of android-based mobile devices, it can be improved. This research describes a portable device for visually impaired people who need assistance in both indoor and outdoor settings. It employs a variety of sensors to detect impediments and, with the help of GPS and a compass, guide them through their movements. The system's main component is an Android device with several cores. When impediments are recognised, other sensory modules detect them and send important information to the primary component. If desired, the equipment can interact remotely for range surveillance.

Smart Glasses for the Visually Impaired People et al. (2016) [4] have proposed a system stating, People with visual impairment encounter a variety of challenges in their daily lives, as current assistive gadgets frequently fail to fulfil consumer expectations in terms of price and amount of aid. A new design of assistive smart glasses for visually impaired pupils is presented in this research. The goal is to use the wearable design format to aid with a variety of daily tasks. This study only shows one example application as a proof of concept, namely text recognition technology for reading documents in physical copy. The expenditure of assembly is kept low by using a Raspberry Pi 2 single-board computer as the computational heart and a Raspberry Pi 2 camera for image collection. The prototype is working as expected, according to the results of the tests.

Smart Specs: Voice Assisted Text Reading system for Visually Impaired Persons Using TTS Method et al. (2017) [5] have proposed stating, According to the World Health Organization, roughly 285 million people worldwide are believed to be visually impaired out of a population of 7.4 billion. It has been observed that people are still finding it difficult to go about their daily lives, and it is critical to take the required steps using emerging technology to assist them in living in the present world despite their impairments. We have presented a smart standard for blind people that can conduct text identification and provide a voice output in order to support them. This can assist visually challenged people in reading any printed material aloud. The text image from the printed text is recorded using a specs integrated camera, and the captured picture is processed using Tesseract-Optical Character Recognition (OCR). A little open-source software is then used to transform the identified text into speech. eSpeak is a speech synthesiser. Finally, using the TTS approach, the synthetic speech is created by the headset. The Raspberry Pi is the primary implementation target in this project since it serves as an interface between the camera, sensors, and image processing results, as well as providing functions to alter peripheral equipment (Keyboard, USB etc.,).

Assistive Technology for the Visually Impaired Using Computer Vision et al. (2016) [6] proposed a system to create a low-cost wearable gadget that employs computer vision to read any type of text in varied alignments and lighting circumstances surrounding the user. The device uses a Raspberry Pi and a suitable camera to capture content around the visually impaired or blind person and read it to them in their native language. A sensor is also included to inform the user of the distance to the nearest object at his eye level, and the gadget counts the number of things in its field of vision. Image processing, machine learning, and voice synthesis techniques are used to create the system. When both the optical character recognition and the object recognition algorithms were combined, the accuracy was determined to be 84 percent.

III Proposed Work

Various Frame rates are used to record the visual image. Each image is then processed. The findings will send the individual an alarm signal, with the message differing depending on the identified object and its location.

Various sample rates are used to capture the visual image. Then, based on the type of identified object, each recorded image is processed, with the processing result generating an auditory alarm message to the individual.

The processing framework includes the following steps, as indicated in the diagram below, despite of the roles and responsibilities of image processing

- An image acquisition block that can do some basic pre-processing processes, if necessary, in accordance with the module objectives.
- The image processing, detection, and object identification building blocks.
- The auditory alarm block, which alerts the visually impaired individual to an object that has been detected.

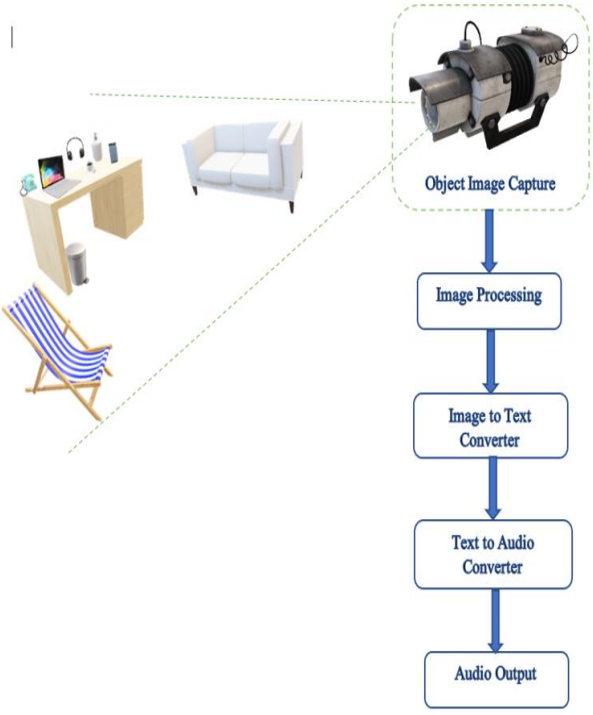

Fig. 1. Vision Module Proposed System

IV SYSTEM ARCHITECTURE

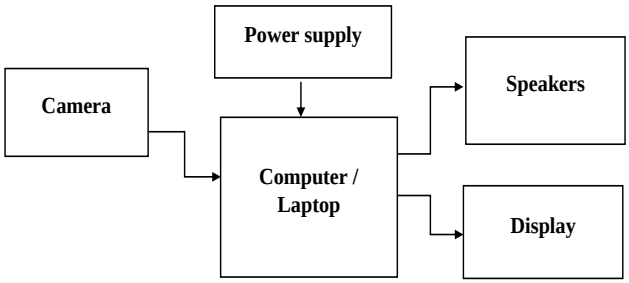

Fig. 2. Vision Module (Block Diagram)

Various Frame rates are used to record the visual image. Each image is then processed, and the results will send an alarm message to the person, with the message varying depending on the detected object and its location.

At various sampling rates the visual scene is captured. Following that, each acquired image is analyzed, and depending on the type of object discovered, an auditory alarm message is provided to a person when the processed output is triggered. The processing framework includes the following elements, regardless of the image processing functions and responsibilities:

- An image acquisition block that can do some basic pre-processing processes if needed, in accordance with the module objectives.
- The image processing, detection, and object identification building blocks.
- The auditory alarm block, which alerts the visually impaired individual to an object that has been detected.

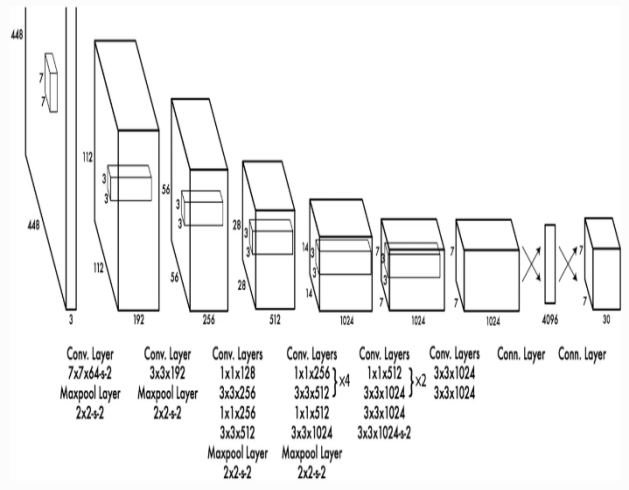

Fig. 3. A visualization of VGG architecture

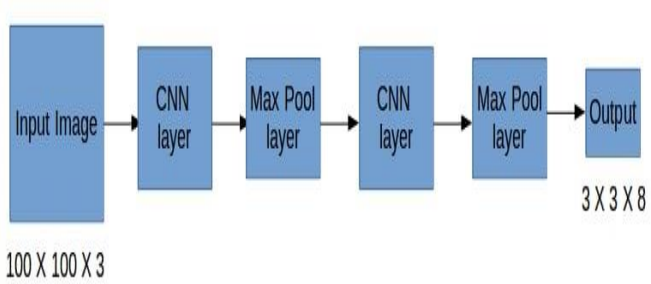

Fig. 4. CNN's supervised deep learning model

VGG Architecture is represented in Figure 2. The YOLO (You Only Look Once) period of time object detection rule is one of the most effective object identification algorithms that also covers a number of the most cutting-edge principles emerging from the computer vision analysis community.

Detecting the item is one of the most common problems in computer vision, where you're asked to recognise what and where — specifically, what things exist in a given image and where they're in the image. Object detection is more sophisticated than classification, which can recognise things but does not tell where they are located within the image. Furthermore, categorization does not operate on images with more than one object.

The CNN supervised deep learning model is depicted in Figure 3. YOLO has a unique attitude to life. YOLO could be a sophisticated convolutional neural network (CNN) for detecting objects over time. The rule divides the image into areas and predicts bounding boxes and possibilities for each region by applying one neural network to the entire image. The expected possibilities are weighted in these bounding boxes.

YOLO is popular because it achieves excellent precision while still being able to run in a short period of time. The rule "only appears once" at the image in the sense that the neural network only requires one forward propagation labour to generate predictions. When non-max suppression is used (which ensures that the object detection rule only detects each object once), the recognised objects and bounding boxes are output.

With YOLO, one CNN predicts many bounding boxes and sophisticated options for those boxes at the same time. YOLO improves detection performance by training on entire images. This model has a number of advantages over other methods for detecting objects:

• YOLO is extraordinarily quick.

• Because YOLO views the entire image during coaching and testing, it implicitly encodes discourse information about categories as well as their appearance.

•YOLO learns generalizable object representations so that, once trained on natural images and evaluated on design, the rule outperforms other high detection methods.

V FLOWCHART

Camera is used to capture the video which is then divided into sequence of frames. Object detection is done using CNN classifiers and text to speech conversion is done using pyttsx3.

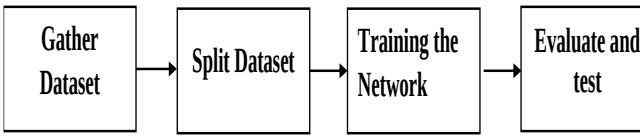

Fig. 5. Deep Learning Steps

Figure 4 represents the Deep Learning steps. For the complete person's movement in the indoor environment, the process image acquisition > image processing > acoustic notification is looped. The overall processing time is calculated by adding the three processing periods and determining the acquisition rate for the input image frames. The process must be rapid enough to avoid potential roadblocks in a timely manner. The image processing method is used to perform a specific object detection task, specifically traffic sign recognition, as demonstrated in Figure 5 shows Object Detection Algorithm workflow. This is used to integrate the OpenCV function named cv2.

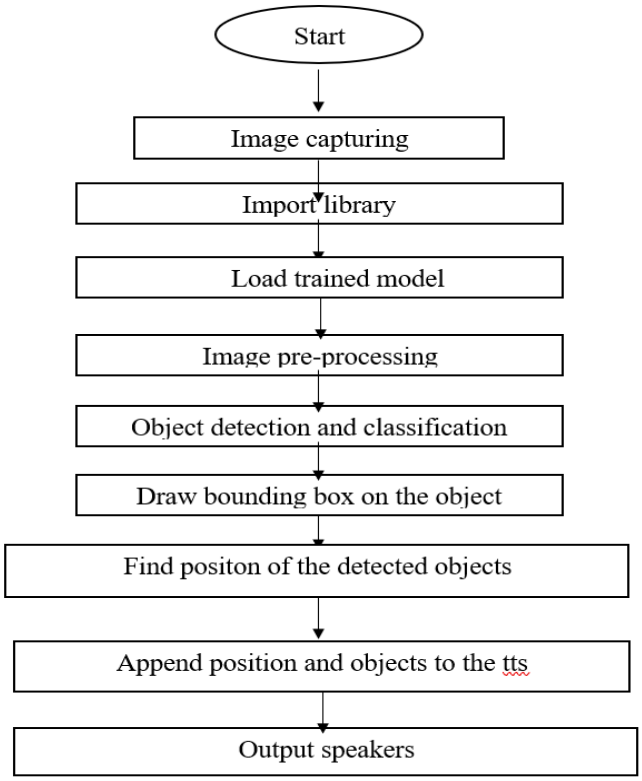

Fig. 6. Workflow of the object detection algorithm

For the Python version, match the template in the library. The design specifications addressed by the module were as follows:

- Time between two consecutive video frames is required, and each template must have a short processing time. This method was used on numerous scales, and the summed processing time was found to be small enough to allow real-time choices.
- In the multiscale method, each video frame is down sampled with different resolution factors, such as 5, 3, and 1. If the source image has a resolution of 9601280 pixels, down sampling with factor 3 will result in three lower resolution images with the following sizes: 9601280 pixels, 720960 pixels, and 480640 pixels. The template is then compared to each of these scaled picture source versions. Another factor to examine is the relationship between internal module settings and traffic sign size and image source resolution. We must account for many processing times at each stage, beginning with image acquisition, module communication, and finishing with the trigger action to emit the auditory alarm, in order to have an overall evaluation. An auditory message is provided to the user via headphones once an object has been spotted. The audio message is roughly 1.21.5 seconds long in its most basic version. This time span is used as a benchmark.

VI ALGORITHM

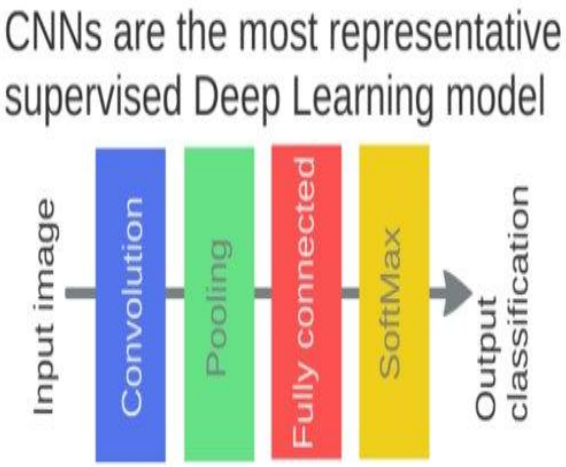

Fig. 7. CNN supervised Deep Learning Model

A. CONVOLUTIONAL

The role of the convnet is to reduce the images into a form which is easier to process, without losing features which are critical for getting a good prediction

B. POOLING LAYER

The pooling layer is responsible for reducing the spatial size of the convolved feature. this is to decrease the computational power required to process the data through dimensionality reduction.

C. FULLY CONNECTED OUTPUT LAYER

Gives the final probabilities for each label. we have an activation function such as SOFTMAX or SIGMOID to classify the outputs as cat, dog, car, truck etc.

VII EXPERIMENTATION AND RESULT

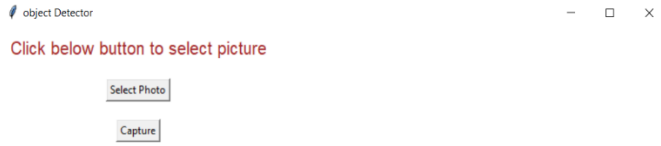

Fig. 8. GUI Output Window

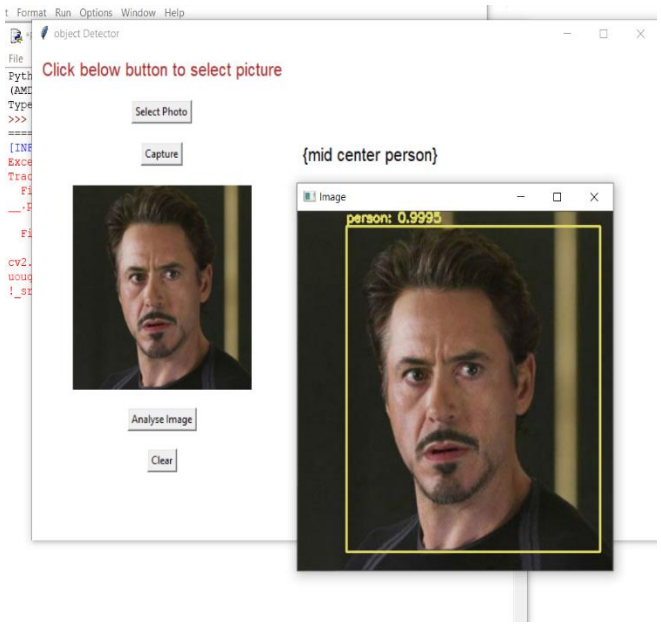

Fig. 9. Image selected from the device, analyzed and localized.

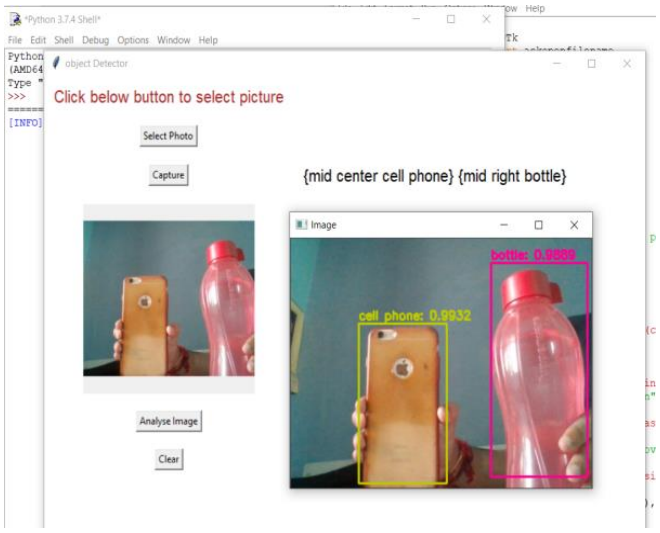

Fig. 10. Live Capture of Image which is analyzed and Localized

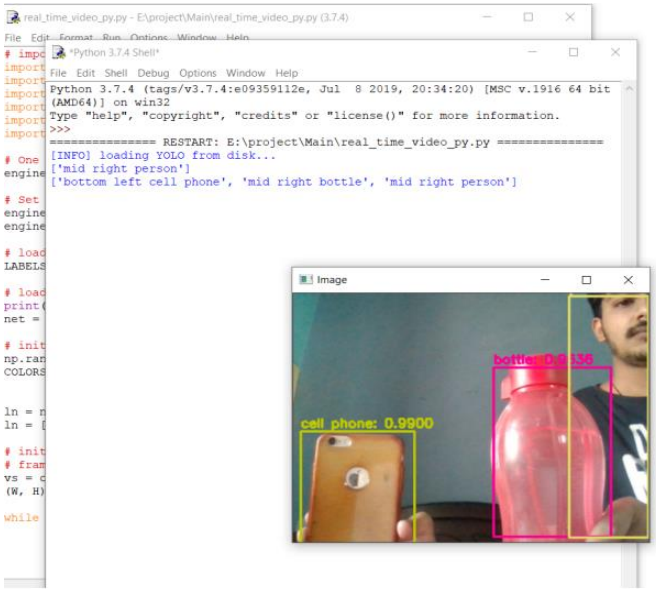

Fig. 11. Real Time Video of analyzing the image and localizing the image.

VIII CONCLUSION

To aid visually challenged people, a vision-based navigation module will be offered using the YOLO library, which may be successfully implemented for multiscale approaches with excellent indoor outcomes. Taking into account configuration modification to changing illumination situations in a real-world scenario could increase the accuracy of the vision module.

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Cancer Prediction model using Decision Tree

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Abstract

Abstract— Day by day cancer patients are increasing across the world. Since, Cancer cell grows and divide with extreme rapidity. Curing the cancer diseases is a very big challenge in the medical field. Late stage cancers are very difficult to cure. But in general the earlier a cancer is found, the higher the chance of cure. Early stage cancers are small, localized and highly curable. But identifying cancer disease in the early stage is not simple. So, this paper proposes an application named early prediction of cancer diseases using decision tree algorithm. Our proposed system can be used to diagnose the cancers of lung, oral, chest, cervix, stomach, and breast. To classify the facts and to mine common styles in dataset selection regulations are used. It is used to mine the common styles from the facts set, hazard rankings are taken into consideration for the attributes that constitute the widespread styles and affiliation regulations are framed for the symptoms. This version facilitates in early prediction and detection of most cancers earlier than going for medical and lab checks that are luxurious and time-consuming. This model used in the hospitals and clinical laboratory and in the healthcare environment for early prediction.

Keywords: Data mining, Decision Tree, Risk Score, Significant Patterns, Missing Values, Imputation, Accuracy.

1. Introduction

Among all diseases, cancer is one of the most common causes of mortality. While there have been several attempts to reducing the disease's deaths, early discovery are seen to be the best step toward effective treatment. Cancer is a potentially lethal illness produced mostly by environmental factors that cause mutations in genes that code for important cell-regulatory proteins. As an end result of the odd mobileular behavior, increasing clumps of odd cells form, which harm surrounding regular tissue and might unfold to key organs, ensuing in disseminated illness, which is often a signal of drawing close affected person death. More importantly, the globalization of dangerous behaviors, mainly cigarette smoking, and the popularity of many elements of the present day Western diet, which can be wealthy in fats and negative in fibre, will growth most cancers rates. According to the World Health Organization, most cancers claim the lives of eight million human beings every year, accounting for 13% of all deaths globally. Over the following decades, a 70% growth in new most cancers instances is projected. Overall 100 types of cancer exist each requiring unique treatment and diagnosis. The most commonly diagnosed cancer worldwide is of the Lungs (1.8 million, 13% of total) Breast cancer (1.7million, 12% of total) Lung cancer is the most often diagnosed cancer worldwide (1.8 million cases, or 13% of all cases) (1.7million, 12 percent of total) Colorectal cancer is a type of cancer that affects the (1.4 million, 9.7 of total). Lung cancer is the most common cause of mortality from cancer (1.6 million, 19.1 percent of total) Cancer of the liver (0.8 million, 9.1 percent of total) Cancer of the stomach (0.7 million, 8.8 of total).

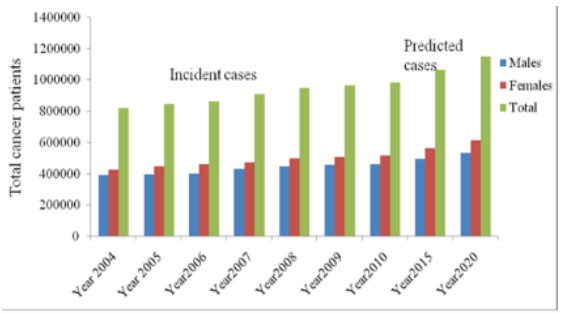


Figure1. World Cancer Statistics

Due to population expansion and ageing, it is predicted that by 2020, there would be a rise of 19.3 million new cancer cases each year. Cancer is one of the leading causes of death in many countries throughout the world. The total cancer cases across worldwide statistics have been given in the figure.

The technique of extracting hidden knowledge from massive amounts of raw data is known as data mining. Data mining is a technique for extracting knowledge from data and presenting it in a way that humans can understand. The healthcare business may benefit greatly from data mining since it allows health agencies to systematically use data and analytics to find inefficiencies and methodologies that improve treatment while lowering costs. Prediction and description are two of the most common goals of data mining. Prediction is the process of predicting unknown or future values of other variables of interest using some variables or fields from a data set.

II. Proposed Work

An attempt is made to develop the application which can be used in health care environment such as labs, hospitals to predict various cancer diseases. In the proposed system we are using decision tree algorithm for identifying patterns for interrelationships on trained data set with the help of rules for disease symptoms and finding the risk score. The risk score levels are used high level, mid-level, low level. There by predicting the cancer diseases. This application provides a user interface to interact with the users and the system and vice versa. Firstly, User has to provide details such as Name, Age, Gender, Smoking, Alcohol, Living area, Education, Hot beverage, Diet, occupational hazards, Anemia, Weight loss, Chewing, Family history of cancer diseases, Marital status, obesity etc. Related to organ symptoms are collected. Then the system calculates risk score based on these symptoms. Once the risk score is calculated then cancer status is displayed along with the type of cancer. The system also recommends the immediate lab tests along with the recommendation of particular hospitals for further treatment. At last the proposed system also provides analysis on the collected test cases -men v/s cancer, women v/s cancer, men v/s women and people v/s cancer types.

III Implementation Details

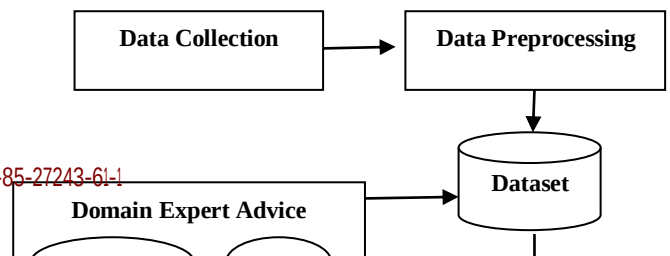
In this system, we have proposed a data model for an early prediction of cancer disease using efficient data mining techniques. The set of tasks that can be carried out in our proposed work is analyzed, designed, implemented and experimented using Python by modifying and applying existing decision algorithms.

Figure2. System Architecture

Data collection:
Data collection is a process of gathering data. There are many methods are available to collect Health care data, mainly, Primary data and Secondary data**.** We have used primary data i.e. we collected the data freshly for the first time under observation.

Data Preprocessing:
Missing values are very common in medical data as the patient wants keep his data confidential. Handling missing values is not a simple task. Missing values handling plays a vital role in health care data. Since, assigning wrong values may leads to wrong conclusion and wrong treatment. Proper care should be taken to handle missing values suitably and accurately. We used **Imputation technique** to handle missing values of various attributes of the records in a data set.

Rules for Decision Tree
A choice tree Classification procedure has a critical potential for examining the clinical informational collection. A choice tree is a stream diagram like tree structure, where each inner hub signifies a test on a property, each branch addresses a result of the test and each leaf hub holds a class mark. The highest hub is a root hub. The trait worth of the information is tried against a choice tree. A way is followed from root to leaf hub, which holds the class expectation for that information. Choice trees can be effortlessly changed over into grouping rules. So the choice tree is utilized to create successive examples in the dataset. The information and thing sets that happen regularly in the data set are known as incessant examples. The frequent patterns that is most significantly related to specific cancer types and are helpful in predicting the cancer and its type is known as Significant frequent pattern.



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Utilizing these huge examples created by the choice tree the informational collection is grouped appropriately and hazard scores are given.

- If manifestations = none and hazard score y = <35 then outcome = you might not have disease, tests = do basic clinical tests to affirm.
- If manifestations = identified with chest and shoulder and hazard score y>= 40 then, at that point outcome = you may have malignant growth, disease type maybe= chest, tests = take CT output of the chest.
- If manifestations = related to head and throat and risk score y>= 40 outcome = you may have cancer, cancer type = oral,tests = biopsy of tongue and inner mouth.
  else manifestations = other symptoms and risk score y>= 40 then outcome = you may have cancer,cancer type = leukemia, tests = biopsy of bone marrow.
- else if manifestations = related to stomach and risk score y>= 45 then outcome = you may have cancer, cancer type = stomach, tests = endoscopy of stomach
- If manifestations=identified with breast and shoulder and hazard score y>= 45 then outcome = you may have malignant growth, disease type = breast, tests= mammogram and PET output of the breast.
- If manifestations = related to pelvis and lower hip and risk score y >=55 then outcome = you may have cancer, cancer type =cervix, tests = do a pap smear test

In view of the previously mentioned rules and the determined danger scores the seriousness of the malignancy is referred to just as certain tests were recommended to affirm the presence of disease. This framework predicts different sorts of malignancy infections, for example, Lung, Stomach, Breast, Oral, and Leukemia alongside the suggestion of specific clinics for additional discussion to fix the illness. The created framework likewise gives the measurable investigation on men v/s malignancy, ladies v/s disease, men v/s ladies, and individual's v/s malignancy types.

IV Results and Discussion

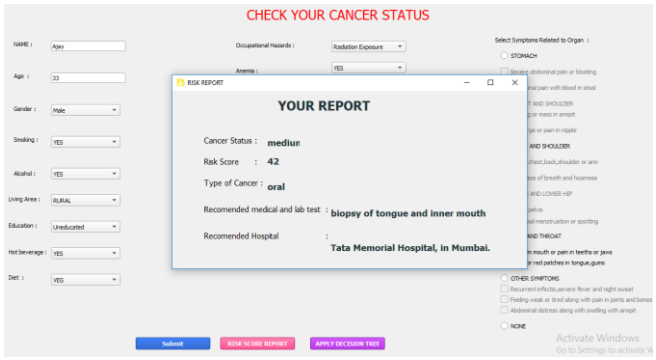

Figure 3. Checking the Cancer status using "CANPRE MODEL USING DECISION TREE

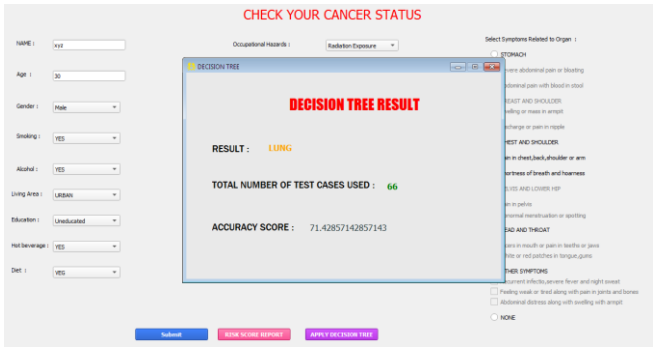

Figure 4. Accurracy of the system.

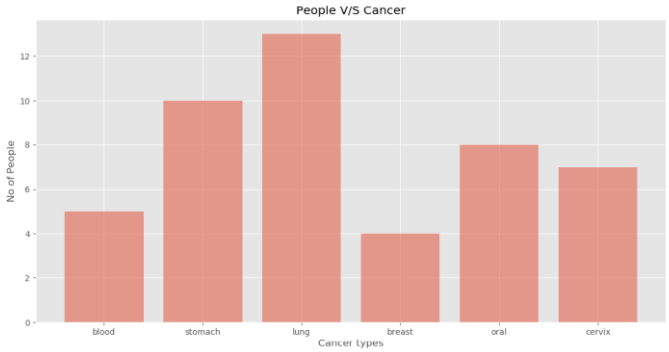

Figure 5. People v/s Cancer analysis.

Advantages:

- The principal goal of this version is to offer sooner caution to the users.
- Less cost and time-saving.
- This prediction machine is may be used to test their hazard and take suitable motion primarily based totally on their hazard status.
- The machine also can be used as a supply of reports with designated affected person records withinside the hospital.

Limitations:

This version works for the prediction of most cancers susceptibility, however it does now no longer works for

- Prediction of most cancers recurrence
- Prediction of most cancers survivability.

V Conclusion and Future Enhancement

Cancer is a doubtlessly deadly disease. Detecting most cancers remains tough for medical doctors withinside the discipline of medicine. Even now the real cause and entire therapy of most cancers aren't invented. Detection of most cancers in in advance ranges is curable. In this work, we've got evolved a device known as records mining primarily based totally on the early prediction of most cancers disease. The foremost intention of this version is to offer sooner caution to the customers and it's also a cost-powerful and time-saving advantage to the user. It predicts 3 unique most cancers risks. Specifically, the Cancer prediction device estimates the hazard of breast, stomach, oral, and lung cancers via way of means of inspecting some of user-furnished genetic and non-genetic factors. This prediction device could make to be had online, humans can effortlessly take a look at their hazard and take suitable movement primarily based totally on their hazard status. So, early prediction of most cancers locations a critical position in lowering the deaths of most cancers patients. The version is only primarily based totally on the signs and symptoms and the overall performance of the device is operating out for 70%. This version may be advanced with different factors efficiency, most cancers recurrence, and survivability with the assist of deep mastering strategies for CT, MRI, and Biopsy Images.

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Bone Tumor Detection By Image Processing

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***Abstract*— Cancer is one kind of dangerous disease which can cause by the growth of unwanted cell. There are many different types of cancer and bone tumor is one of the part of it and this has to be detected at earlier stage. Here, Magnetic Resonance Images will be used as input data and then preprocessing operations will be done and then features will be extracted and given to the convolution neural network which is an algorithm used in order to classify the images as tumor and non tumor. This algorithm gives best accuracy and performance with minimum loss.**

Keywords—convolution, network, tumor, accuracy, benign, malignant

I. INTRODUCTION

This Cancer, which causes unlimited cell multiplication, will divide the cells and grow out of control, forming malignant tumors and targeting nearby body components. This tumor has the ability to develop and impede the digestive, neurological, and circulatory systems, as well as release hormones that can cause body function to change. Cells are classified as cancer cells when their DNA has been damaged. In a normal cell, when DNA is broken, the cell either fixes the damage or it may die. If the DNA which has been damaged is not repaired before a person dies, the body will make unnecessary new cells as a result of the broken DNA.

Cells in the body frequently travel to all the other parts of body, forming tumors that eventually turn back into normal tissue. Metastasis is the medical term for this. Cancer cells then reach the circulation or lymph arteries of the human body.

Bone cancer is of two types that is benign which is non cancerous and malignant which is most cancerous. They are frequently treated with surgical surgery. Bone tumours are dangerous because they can spread and endanger one's life.

Bone cancer is a complicated disease that can result from a number of hereditary and physiological factors. It promotes uncontrolled cell proliferation, which leads to demonic bone tumours that spread throughout the body. At any joints there is a possibility of the bone that can turn to cancerous. Hemipelvectony, often known as a hindquarter removal, is a treatment that involves removing the complete leg.

Magnetic resonance Imaging is better than other scanning images because this gives better accuracy. The term "segmentation" refers to the partition of an image into many parts and the subsequent extraction of usable data from these areas. A variety of segmentation approaches have been applied on the MR images.

Tumors are abnormal new tissue growths that can appear in any organ of the body. Various types of cancer include lung cancer, brain cancer, and bone cancer. When cells in the body go rogue, cancer occurs, and bone cancer develops in the bone. Other bodily tissues may be damaged as well. As a result, other parts of the body will be affected by these tissues.

Bone cancer is today considered one of the most serious and lethal tumors in the world, with the lowest survival rate after diagnosis. It is impossible to stress the importance of early detection of the cancer-prone area in an MRI scan for successful diagnosis and treatment of bone cancer.

Despite the fact that the specific cause of bone cancer is unknown, scientists have determined that some factors are associated to a higher risk. When the bone is subjected to therapy for more times then, lot of radiations will be passed into the bones so this may lead to the bone cancer in future.

When cells in the body go rogue, cancer occurs, and bone cancer develops in the bone. Other bodily tissues may be damaged as well. As a result, other parts of the body will be affected by these tissues.

Based on MRI scans, this method attempts to classify tumors as non-cancerous or malignant.

In this paper, to develop the model we will be using bone region Magnetic resonance imaging in order to identify the bone tumor. This collection of MRI images from the different sources is called dataset. We have

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collected four different types of bone dataset that is normal bone, Stage 1 tumor bone, Stage 2 tumor bone and Stage 3 tumor bone MRI images. In total we have 300 bone images. These images will be splitted for the training and testing purpose. For training, the dataset is splitted to 70% and for testing this will be splitted to 30%. Tumor can be identified or classified by using the convolution neural network algorithm which takes the image as input. In order to give the input to the model, first it should be preprocessed that is converting the RGB scale image to the grey scale image and then forming the array by the pixel in the grey scale image and then normalizing the array that is dividing each value of array with the maximum value of the array so that the values will be between -1 and 1. Then this normalized array will be given as input to the model.

There will be three layers in the Convolution Neural Network that is input layer, output layer and the hidden layer. The normalized array will be given as input to the input layer and then the processing carries out in the hidden layer with the array, predefined weights ad bias. After every epoch, the pooling operation will be done to the image which is nothing but resizing the image so that it will be sufficient enough for providing the input in the next epoch. There are different types of pooling like max pooling, average pooling etc. In this paper, to develop the model we will be using max pooling layer where maximum value will be taken from each of the segmented image matrix. We can segment the matrix by different strides but we should make sure that all the segmented matrix should be same. We will also be using activation layer in order to classify the image.

There are different types of activation functions like relu activation function, sigmoid activation function, softmax activation function, exponential linear functions, Tanh functions and so on. In this paper, we used two activation functions that is relu and the sigmoid. In relu activation function, the vector (which is obtained by resizing the input matrix) will be converted to the values of 0 and 1 and this will be used in all the layers except the output layer because at last if the classified output is malignant then the stage of the bone tumor must be known.

So, in order to classify the classes that 3 classes(First stage, Second stage and third stage) with if the bone is benign so totally there are 4 classes so to get the values like this, in this paper we will be using the sigmoid function at last.

Then the classification is done and the result will be displayed accordingly how the model has been classified. In each epoch, the accuracy will be increasing and the loss will be minimized because over and over we will be giving same image as the input.

II. RELATED WORK:

- R. M. M., T. N. L., A. C. N., and C. K. Subramanian done a survey called bone malicious growth identification which uses CNN algorithm for image processing steps like image segmentation, pre processing. Here ultra sound resemble is used which are of bones. The results will be outputted with a precision of 98.11 % or up to it.In this survey paper, it contains process like pre processing, edge detection, segmentation and also feature extraction. Here by using feature extraction process the resulted features of the images will be evaluated with training dataset. This is efficiently highlights bone tumours[1].
- The study by E. Hussein and M. A. Rahman employs a connected component labelling algorithm to detect bone tumours. The artificial neural network (ANN) is employed in this study to classify bone tumours. In this study up to 220 bones of MRI scans are under evaluation .with texture properties of these pictures being used to instruct and test the neuronal network. The classification results show that the neural network has a success rate of 92.50 percent when it comes to bone tumour classification. This study focuses on bone tumour identification is done using element labelling process .where in this process tumour size and category is identified easily. The proposed categorization approach has a 92.5 percent accuracy rate, which is acceptable. The goal of this project is to create a tool that can distinguish between malignant and benign bone cancers and thereby help with clinical diagnosis[2].
- M. Aula, N. P. Lukaku, and M. P. Raja: For bone image segmentation, this paper used the CNN approach. By measuring the mean intensity of the selected area, the resulted image have to under go that process for bone cancer analysis. For the categorization of medical images with the appearance or non-appearance of tumor, and where threshold values have been proposed. This approach yields 95 percent accuracy while requiring less computational time. The focus of this article was on the early diagnosis of tumor. It will also used for determining the different phases. Bone Cancer is a significant contributor to the worldwide illness burden. By 2025, the predicted number of new cases per year will have risen from 10 million in 2002 to 15 million. This study proposes a formal technique for selecting average pixel potency values in images which differentiates the cancer and non-cancer. For extraction of a bone tumour portion, a method for segmenting a tumour from a picture using pixels based on the CNN algorithm. The identification process of bone cancer is more accurate when the mean pixel intensity value thresholding is used. This paper proposes a computer-aided featured system for detecting bone cancer through computed tomography scan or magnetic resonance imaging pictures, which is also relevant to DICOM actual format (digital imaging communication of medicine) medical photos[3].
- M. A. Rehman and E. Hossain: This research uses fuzzy C-mean clustering to develop a method for detecting bone cancer. For the accuracy testing of the suggested approach, a

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total of 120 validated victim MRI scans of bones were used. The adaptive neuro fuzzy inference system (ANFIS) is used in this work to classify benign and malignant tumours. The ANFIS network was trained and tested using grey level co-occurrence matrix (GLCM) data extracted from MR images. The gathered bone pictures were properly cross validated to divide them. The precision, responsiveness, and specificity performance matrices are to be used to check the categorization outcome. In this case of bone cancer, the proposed categorization technique has a 93.75 percent accuracy rate. The developed technique can be used to detect and classify tumours in MR images of the bones[4].

- In this study, H. Watanabe, T. Ogawa, and M. Hillman propose using CT scans to identify bone cancer. Bone cancer can spread from the main cancer to other organs, causing excruciating pain. As a result, in addition to primary cancer, it is critical to detect metastatic tumours early. In this scenario, the concept of anomaly detection may be regarded appropriate. The suggested method, which is form on aoriginating adversarial network representation, is unsupervised machine learning model which teaches with non-metastasis bone cancer pictures. The peculiarity score for each exam CT image is then determined. The pecuilarity scores between the non-metastasis pictures and metastasis are completely processed, according to the results of the experiments. The anomaly detection method could be useful for detecting bone metastatic tumours in CT scans[5].
- M. A. Rehman and E. Hossain: This paper compares and contrasts living bone tumor separation techniques and proposes a device labelling process for bone tumour segmentation using MRI scans. On the basis of quantitative approaches, the living bone tumour separation algorithms are distinguished with the other one. Over the other segmentation approaches, the device labelling algorithm delivers the hugest average of the DSC 96.05 percent and average of the SSIM 97.33 percent, According to the comparative evaluation. On the basis of MR scans, this study compares and contrasts existing bone tumour segmentation approaches. This article also looked at an object labelling algorithm for bone tumour segmentation and evaluated it. The results of each algorithm's segmentation are also reported in this publication. The object labelling method performs well in terms. According to the comparison results. The region growth algorithm is shown to be the most efficient of the three techniques[6].
- **S**. K. Shrivastava and A. Pandey: They are using a Computer Aided Diagnosing (CAD) system to analyse Computed Tomography images in this paper. Canny edge detector is to be used in image edge detection. though the Canny edge detector has significant drawbacks, such as the inability to differentiate edges that occur around objects, it is still superior than other standard edge detector approaches[7].
- **K. Sujatha:** Our proposed study was coupled with pre-processing approaches in order to reduce noise and obtain smooth photos during the session. This procedure will help to increase the image's quality while also removing the false portions. The K-means method was used to detect the presence of bone cancer and assess its stage, and then edge segmentation was utilised to provide a smooth image. Our main goal in this study was to predict or detect a bone tumour at the proper time and stage. With our method, which included image processing and genetic algorithms, we were able to detect bone tumours successfully without any incorrect interpretations, allowing therapists to provide suitable treatment[8].

III. Proposed Work

The entire technique for detecting bone cancer has three main components: MRI images are given as input and processed in three stages: image processing, image segmentation, and feature extraction and classification.

The datasets are MRI pictures that are utilized for both training and testing. In the training set, we offer photographs of patients with bone cancer pneumonia and photos of persons who do not have bone cancer pneumonia.

The Convolution Neural Network technique is used to train the model. Dicot is a technology that displays a two-dimensional depiction of bone density and detects all supplements in the bone.

For detecting the degree of malignancy and bone fractures, MRI images provide excellent resolution. Our suggested system's main goal is to establish a quick accurate method for detecting bone cancer in its early stages.

The diagram below shows the system architecture.

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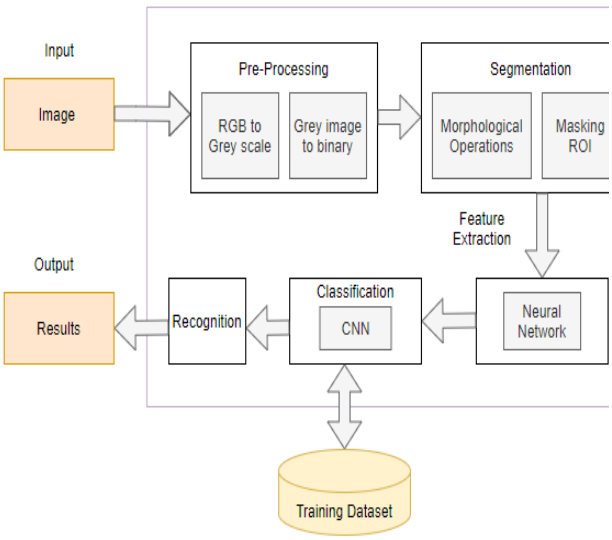

System Architecture

Pre-Processing: This is the first stage in improving the image's quality. The filtering technique is used to begin the picture processing stage. Noises such as occlusions, fluctuations in illuminations, and so on are common in images. As a result, these sounds must be eradicated. The Gabor filter is used to smooth out the pictures and eliminate noise.

When compared to other filters, the key advantage of this filter is that it delivers great noise reduction with minimal blurring. The grey conversion is the next stage in the pre-processing. This is the process of transforming RGB-level pixels to gray-level pixels. This is done because, in comparison to a colour image, the grey level image is easier to process. The purpose of this conversion is to keep the brightness while removing the hue and saturation information.

Edge Detection: A type of edge detector that is used to determine the boundary between two areas with different grey level attributes. In cancer photos, edge detection was employed to extract important features for pattern identification. The Canny edge detector is used to identify an image's edge. It blurs the image first, then uses an algorithm to effectively thin the edges down to one pixel. This canny detector has the advantages of good detection, localisation, and reaction time.

Morphological operation: Morphological operations are used to determine the form, size, and connectedness of an object. The morphological technique's two main procedures are dilatation and erosion.

To extend the zone, a dilation procedure is employed. Erosion is a technique for removing or destroying tiny items.

Segmentation: The technique of splitting a picture into several segments is known as segmentation. Super pixel segmentation and multilayer segmentation were employed in this approach. In comparison to previous segmentation approaches, this approach divides the picture into larger pixels.

Feature Extraction: The most significant approach in image processing is picture feature extraction. It is crucial in the early identification of cancer. To identify cancer, visual characteristics are taken from the picture after segmentation. Feature extraction is a crucial stage that reflects the final findings in predicting whether a picture is cancerous or not.

The quantity of resources needed to explain a huge quantity of data is reduced via feature extraction. It is the technique of detecting and representing particular elements of interest inside a picture for subsequent processing.

IV. EXPERIMENTATION AND RESULTS

Once we collect all the dataset which is nothing but Magnetic Resonance images of bones which containing tumor and which are not having any tumour. These MRI images will be given for pre processing purpose. In this Step, the image will be converted from RGB level to grey level and then according to this gray scale image, the numpy array will be created. These numpy array will be normalized by taking the each and every array value and dividing it by the number which is largest in the array. Then these will be given for edge segmentation in order to identify smooth edges and then segmentation is done that is making few parts or making small segments of images so that it will be easy for processing. Then the required features will be extracted and then given to the CNN algorithm and thereby predicting the proper result. The most dense component among these related components is removed and designated as a tumour part. Following segmentation, a total of 12 characteristics are collected from the segmented tumour for categorization purposes.

A total of 220 bone MR photos were gathered from various tumour and orthopaedics websites, with 110 photos for each category of bone tumour.

There are different layers in the CNN model and those layers which we use for experimentation are,

Sequential layer: This is one of the machine learning model which takes the input and produces the output which is sequential. This may contain the information like text, any audio records, video records and so on. This acts as the input for the models like recurrent neural network and convolution neural network.

Batch Normalization: Batch normalization is a separate layer which we will be using in order to normalize the output values of the previous layer the input for this layer is the output from any of the activation layers.

Convolution 2D layer: In the convolution two Dimension layer, the image will be taken as input and then we will take another matrix which will be used as multiplier matrix for multiplying the initial or the input matrix then the multiplication of these two will be done and finally we will include the result in the other matrix as the summation of first result matrix. For multiplying, we can take any strides in input matrix but whatever

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the size of the stride is taken, that must match with the multiplier size. The multiplier will be the subset of the original matrix.

Max Pooling Layer: In this type of pooling, we will be taking or dividing the array into smaller sizes and then we will check the maximum number in each of the smaller matrix, then this larger number or the maximum value will be placed in other matrix of same size.

Activation layer: Activation functions are the functions that we will use in various neural network methods to compute based on the weights of the input and the bias that we will provide in each layer. In order to compute and minimize the loss and acquire the outcome in the desired manner, this employs methods such as gradient descent.

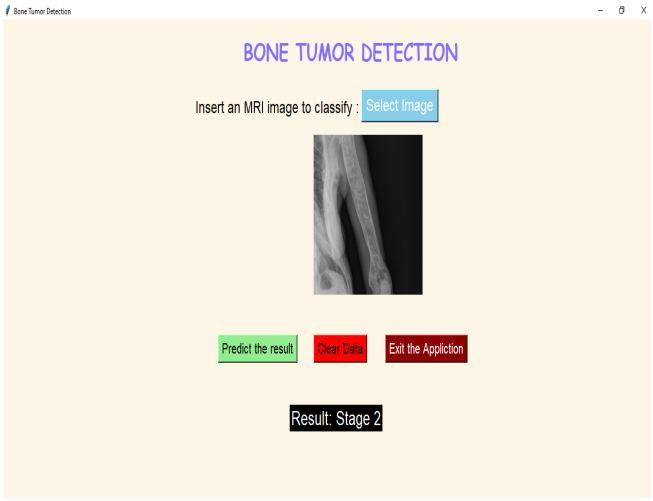
Sigmoid activation function: This is a non-linear function, and it's common in feed forward networks. This is where you'll find the curve that looks like a S. We'll use the vector as input in this case. When we restructure the matrix, this vector will appear. This vector will be used as an input, and output values will be produced based on the formula, with values ranging from 0 to 1.

RELU: This is a linear unit that has been rectified. This function is utilized in virtually all neural network models, and it is the most popular activation function in the deep learning concept since it is considerably faster than the other activation functions, and it also has a very high performance. Because this function is extremely similar to a linear function, finding the gradient descent becomes quite simple and the loss is minimal when using any linear model. All of the negative values in the matrix will be set to zero, making all of the values positive only. As a result, calculating becomes simple.

Flattening image: This is the layer we'll use to acquire our result. Following the pooling operation, the image must be flattened, which can be accomplished by transforming the matrix created after pooling into an input. As a result, this layer flattens the matrix values and outputs the vector.

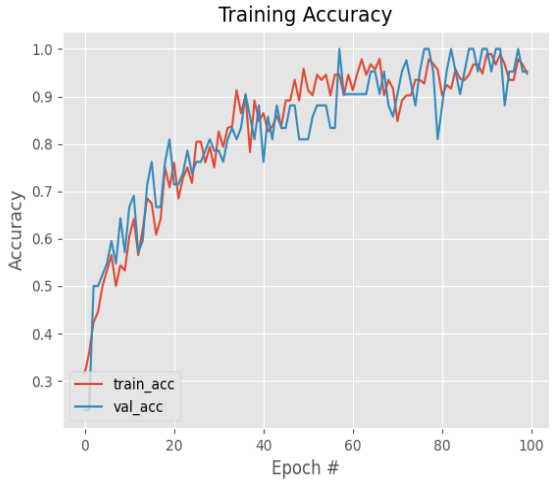
Dropout: This approach is quite useful when we are primarily concerned with performance or quickness. Dropping out the neurons will be very helpful in this case since certain neurons may act useless when we conduct many iterations, that is, when the precision of each back propagation increases, thus all of the neurons may not be useful. If we don't do any neurons dropout, the unwanted neurons will participate as well, requiring a significant amount of time. The dropout will be used because of this. Each back propagation has its own set of rules. It is possible to remove a small percentage of neurons and yet get good performance.

Dense: The dense layer is a deep-connected neural network layer, meaning that each neuron in the dense layer receives input from all neurons in the previous layer. It has been discovered that this is the most regularly used layer in models. The dense layer executes matrix vector multiplication in the background. The values in the matrix are actually parameters that can be learned and modified using the back propagation technique. The dense layer produces an m-dimensional vector as its output. As a result, the dense layer is mostly employed to change the vector's dimension. Dense layers also apply operations to the vector, such as rotation, scaling, and translation.



Developed Model

The above figure shows the developed model. Where we will input the image then that image will be displayed after this will be given as input to model there by it predicts for the above image as tumor is in Stage 2



Accuracy of the model

Accuracy is nothing but how proper the model is going to work. As number of epochs increases then the accuracy will be increased as shown in the above figure.

Loss of the model

As the epochs are more then the loss will be decreased as we can see in the above figure.

CONCLUSION

The Bone Cancer is one of the most dangerous cancer so this must be taken care in the early stages only. In this model Magnetic resonance images will be used as the input. Our proposed system detects whether the cancer is present or not also if the cancer is present then it detects at what stage the cancer is that is either it is first or second or third stage. If the image have no tumor segments then this model gives the result as normal. This model achieves expected desired result at the end of the model. The extracted features from the image contain some specific information to understand the details of the image. The main purpose of extracting the features is to reduce the process complication and also to isolate various desired shape of the image. The accuracy of the classification stage depends on extracted features.

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Design of Hierarchical Data Aggregation for Internet of Underwater Things

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***Abstract*— Internet of Under Water Things (IoUWT) is one of the most emerging technology which consists of large number of sensor nodes with each having the capacity to sense, compute and communicate the data. IoUWT has great deal of applications in various fields like military, agriculture, industry healthcare etc. Sensor nodes are randomly and densely deployed. This kind of deployment creates large number of redundant sensor data. Routing of such redundant data not only saturates network resources, but also consumes more energy. Data aggregation is the effective technique which reduces the number of transmissions to sink node by aggregating the similar packets in an energy efficient manner to enhance the lifetime of network. There exist different data aggregation techniques which perform aggregation in single level or two levels. This project proposes a multilevel hierarchical data aggregation technique which handles the redundancy in sensor data very efficiently .**

Keywords—Internet of things; wireless sensor networks; sensor nodes; data aggregation; Internet of Underwaterthings

I INTRODUCTION

Internet of Under Water Things (IoUWT) is widely considered as one of the most important technologies for the twenty-first century. From the past decades, sensor network has accumulated a lot of attention from both industry and academics all over the world. Under Water Sensor Network typically consists of several low-cost, low-power, and multifunctional Under Water sensor nodes, with each having sensing, communicating and computing capabilities? These sensor nodes can communicate over short distance via a wireless medium and collaborate to accomplish a common task, for example, analysis of aquatic creature life cycle, under water surveillance, and oil spill detection.

The sensor nodes in the Under Water Things have limited energy, limited bandwidth, small communication range, limited memory, and limited processing speed. In many IoUWT applications the sensor nodes are deployed in the ad hoc fashion without careful planning and engineering. The sensor nodes are randomly and densely deployed in the specified region. Once deployed, the sensor nodes should organize themselves into a wireless communication network. Then sensor nodes will sense the data and transmit the sensed data to the sink node via intermediate nodes. But data generated from neighbouring sensor nodes are redundant in nature and they are highly correlated. Hence there is a need for the method which aggregates the data and reduces the redundant transmission.

There exist different data aggregation methods, few of them are flat based and some others are hierarchical based techniques. These techniques perform the aggregation at single level or two levels. Energy Efficient Multilevel Data Aggregation Technique for Under Water Sensor Networks is a data aggregation technique which performs the aggregation at multiple hierarchical levels hence reduces the redundant transmission and energy consumption effectively. Design of Hierarchical Data Aggregation for Internet of Underwater Things.

As Sensor nodes are resource constrained devices many nodes are deployed in shorter region. This leads to the sensing of redundant information. Transmitting redundant data will leads to the wastage of energy and other resources. Redundant data transmission can be controlled by data aggregation techniques. There are different data aggregation approaches: In-network data aggregation, Tree based data aggregation, cluster based data aggregation, Grid based data aggregation and hybrid data aggregation. There can be single level or multiple levels of data aggregation

In this paper we are proposing a data aggregation technique for Internet of Underwater Things which involves intelligent data aggregation technique and. Proposed approach aggregates the data as well as provides intelligence to nodes to detect whether to send the data or not. The paper is organized as follows: Related work is given in Section 2, proposed approach is described in Section 3, Section 4 describes the simulation and results, conclusion is provided in Section 5.

II RELATED WORK

The cluster-based concept splits the network into sets of nodes called as clusters and states a method that connects all clusters to each other. The cluster based arrangement creates a concise and stable network. Moreover, it is a challenging phenomenon to reduce network's energy consumption, which has recently gained attention in IoUWT.

As the name suggests the similarity based clustering involve the pairing or the group of objects with similar functions. In a way this minimizes the data redundancy however it remains unknown that under which conditions the selected similarity function produces the required form of

cluster. Later on it has been seen that similarity function based clustering may increase data latency in a cluster.

Tran et al. (2014) [1] have designed a technique named as round-based clustering (RBC). It performs in rounds which constitute four phases that are initialization, cluster-head selection, clustering and data aggregation phase. In the initialization phase, the sensor nodes and the sink node are deployed in the network. Here sink node initiates a round by setting up its time. In the second phase there occurs selection of cluster-heads. During this phase, information about residual energy, position, and distance to the BS/sink node is gathered. In the clustering phase, clusters are formed for each cluster head and its members. Then, in the last phase, data is aggregated and transmitted to the sink node by cluster-heads. In re-clustering phase, the clusters are reconstructed and the cluster heads are reselected whenever any changes occur in network conditions due to energy consumption network movement etc. This process of re-clustering prolongs the network lifetime. This technique saves energy consumption thereby enhancing throughput of the network.

Harb et al. (2015) [2] have presented clustering technique based on similar node reading function. They assumed that data is sent from node to cluster head (CH)in the form of readings. The scheme constitutes two levels of data aggregation Firstly, to reduce data duplication; the reading at each node is cleaned periodically, before sending its data set to its CH. After data transmission, Kmeans algorithm based on alone-way ANOVA model is applied to notify the nodes that generate similar sets of data thereby aggregating the similar sets and transmit them to sink.

Saranya and Arthi (2016) [3] have proposed a new clustering method used to handle similarity between node readings which are sent periodically to the cluster-head. A two tier data aggregation technique is proposed in which at first level node eliminate data redundancies and at second level identify nodes generating identical data sets and aggregated them before sending to sink. In general, the readings are sent periodically from sensor nodes to their appropriate CHs. They also used distributed energy-efficient clustering algorithm for efficient communication between cluster head and base station.

Domingo et al. (2007) [4] have presented DUCS (Distributed Underwater Clustering Scheme), where random mobility of nodes is assumed and timing was adjusted continually to reduce loss of data. It uses GPS-free routing protocol without using any flooding technique. It minimizes the proactive routing message exchange. Further data aggregation is used to reduce data duplication. The scheme also reduces high propagation delay in the aquatic medium along with better communication, using a continually adjusted timing advance combined with guard time values .

Ayes et al. (2010)[5] have proposed a protocol suitable for even hybrid networks apart from the stationary and mobile networks. Here preference is given to shortest path while sending data and smaller number of nodes are engaged in the process of end-to-end routing. Moreover, it does not require any location information of sensor nodes. In this way, the same amount of energy is consumed by each node thereby saving energy.

Nowsheenet al. (2016) [6] proposed a scheme for improving the reliability of delay tolerant underwater medium. Here a node with higher transmission reliability is selected as next hop forwarder to improve the data delivery in the network. The same node is also expected to have good reachability to gateways and better coverage probability. Mobile message ferries are used to collect urgent data from the gateways. A gateways election technique is also proposed to maximize their lifetime. PRADD requires the technique of active localization only during initial coarse location to detect the approximate location of sensor node. The movement of an anchored node is exploited to estimate its coverage probability. Further Data forwarding solution is also used in the network to improvise the data delivery along with reduction in overheads.

Ilyas et al.(2015) [7] have presented a scalable data gathering protocol SEDG that improvises the data delivery ratio and saves energy by assigning member nodes with gateway node optimally. Further, the variable time span of AUV is used that reduces the packet drop ratio and exhibits better network throughput.

Liet al. (2013) [8] proposed an algorithm to determine both clock skew and offset. These were required to attain high level time synchronization accuracy with less energy consumed. But in this scheme synchronization error is larger than mean value.

Huang et al. (2011a,b) [9] developed a protocol to tackle the problems in underwater network. Here an idea of a forwarding node selector is used that determines the suitable sensor to forward the data packet further. A forwarding tree trimming method is applied to avoid excessive widespread of forwarded packets.

Dhurandher et al. (2013) [10] have designed a geo-cast technique for an energy efficient IoUWT. This is an extended work on RMTG protocol. The ERMTG algorithm takes into account the presentenergy state of the node to identify the next relay node. The transmission energy of a node dependson the distance between itself and the next hop node to which it wants to transmit. By preferring shorter paths, the suggested algorithm reduces the energy consumption, hence enhances the lifetime of the node.

Wu et al. (2011) [11] proposed a realistic aggregation scheduling scheme along with theoretical latency bound based on the hop radius and max degree of the network. Their scheme was based on virtual slot concept to explore multiplexing opportunities of time domain.

Hong et al. (2013) [12] proposed a receiver oriented strategy by using TDMA slots with sleep scheduling. The scheme detects and corrects both types of conflicts namely intra-family conflict and inter-family conflict. In this scheme tree structure is used and collisions avoided.

Hongzhi Lin et al. (2015) [13] have developed a framework for three dimensional underwater acoustic sensor networks (UASNs). Its goal is to minimize the total energy consumption during the data transmission sensed by nodes. It consists of two layers, lower layer and the upper layer. Lower layer is the compressed sampling layer, where nodes are divided into clusters. Upper layer is the data aggregation layer, where full sampling is adopted. They also incorporated the method to determine the number of clusters and the probability that a node will participate in data sampling or not.

III PROPOSED WORK

A. Architectural Setup and Assumptions

The network is divided into equal sized grids at bottom level. Four grids form one level-1 cell. Four level-1 cell forms one level-2 cell.

At grid level the sensor node senses the data then processes it and transmits to grid head. The grid head receives the data from multiple sensor nodes and transmits place it in buffer. Then aggregate the data by taking the average and transmits to cluster head. At cluster level the cluster head receives aggregated data from multiple grid heads and again perform aggregation on it and transmits to in-network node. At in-network level the in-network node aggregates the data from multiple sources and transmits to sink node through neighbour nodes.

Fig.1 shows the network architecture used in the proposed scheme. Fig 2. Shows the block diagram.

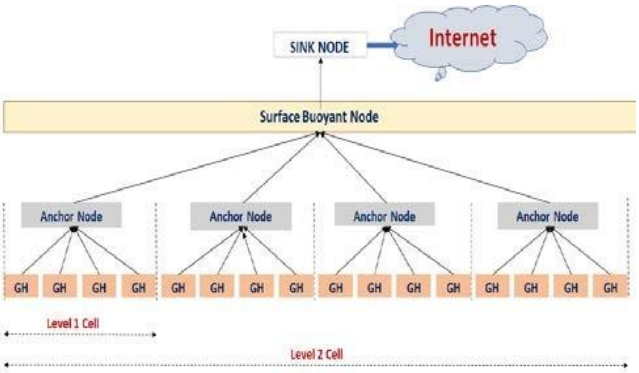

Fig. 1. Network Architecture

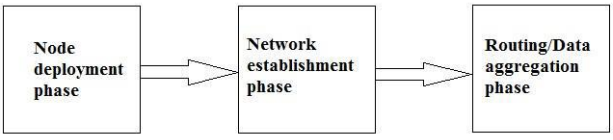

Fig. 2. Basic block diagram

B. Node Deployment Phase and Network Establishment

1) Three different levels of nodes are deployed.
   - Bottom level sensor nodes: They are capable of sensing the oil density at the preliminary level and intensity of light.
   - Anchor nodes at middle level: They act like second level grid head. They gather the data from multiple grids and transfer it to surface buoyant node.
   - Surface buoyant node: They are at the surface level, they can sense the PH level of the water.
2. These nodes are deployed at the required locations using an underwater automatic vehicle (UWAV).
3. Each High power node broadcast a beacon message to the ground level sensor node to indicate its presence in the grid.
4. Each ground level nodes respond back to their grid heads by sending the response beacon. Same Procedure is followed between grid heads and anchor nodes, Anchor nodes and surface buoyant nodes.

C. Routing and Aggregation Phase

1) All the ground level sensor nodes sense the data and send the sensed data to its Grid head. Grid head aggregates the received data.
2) Grid Head adopts threshold aggregation: based on the percentage of area generating similar readings. Each unit cell has a designated high power node acting as cell-sink. Communicate reading only if at least three out of four nodes report similar readings. Figure 3 shows the flowchart.
3) Grid Head sends data to Anchor node. Anchor node aggregates the data. Anchor node also adopts threshold Aggregation.
4) Anchor nodes send the aggregated data to surface buoyant node. Surface buoyant node performs boundary detection aggregation and sends the data received as well as PH information to sink.
5) Surface buoyant node adopts Boundary detection aggregation to identify the boundary of event occurred: region under observation has a sink node that acts as a data aggregator. boundary survey is made periodically at three lengths of boundary or the number of Anchor Nodes sending the data to the Surface Buoyant Node- minimum, nominal and maximum. Minimum is one Anchor Node; Nominal is two Anchor Nodes and Maximum is more than two anchor nodes involved in the intimation to the Surface Buoyant Node.

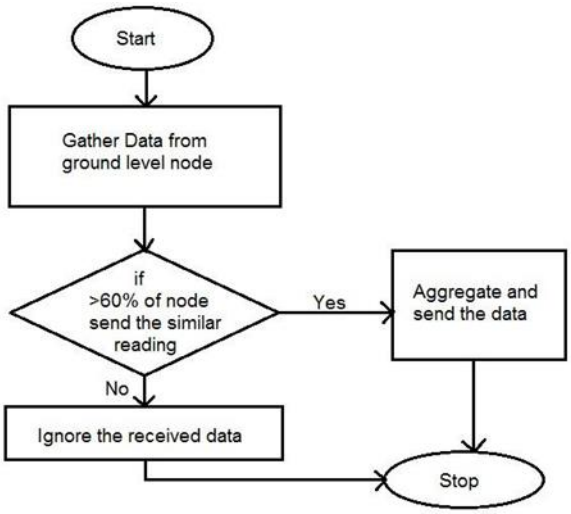

Fig. 3. Threshold aggregation flow chart

D. State Transition Diagram of ground Level node

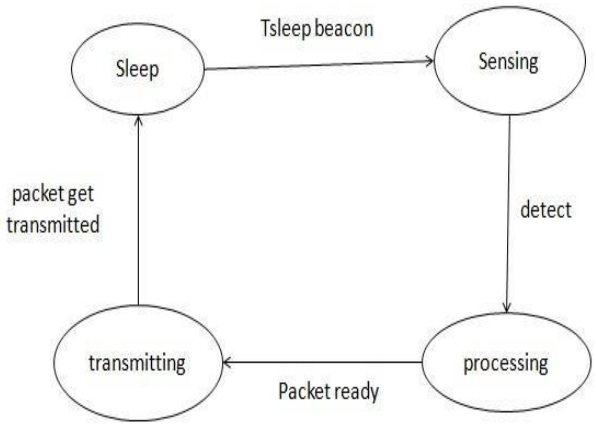

Fig. 4. Transition diagram of ground level node

The fig.4 shows the state transition diagram of the ground level node. Initially the sensor node will be in the sleep state after the timeout period it will move to the sensing state, where it can sense the information. Once it detects the information it will move to processing state and process the sensed information to form a data of appropriate format. Then it will enter into the transmit state, where it can transmit the data. Once the data is transmitted it will come back to sleep state and waits for timeout.

E. State Transition Diagram of anchor node and surface buyont node

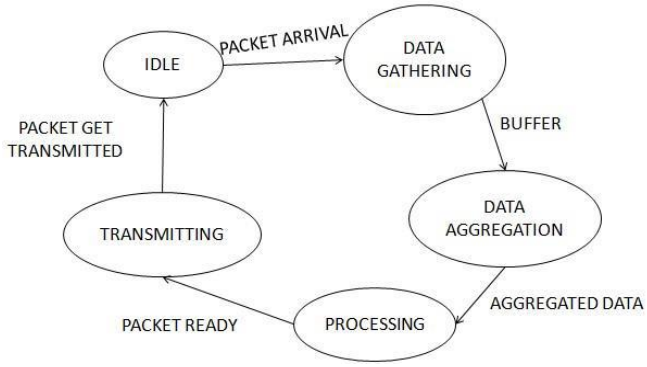

Fig. 5. Transition diag. Of anchor node and surface buoyant node

The fig.5 shows the state transition diagram of anchor node and surface buoyant node. Initially it will be in idle state, when the packet arrives from ground level node it will move to data gathering state. In data gathering state the anchor node will capture the arrived data and then transfers the data to buffer. Then it will enter into data aggregation phase, there it will aggregate the data received from multiple anchor nodes. Then processes the aggregated data in processing state and transmit the processed data in transmit state. Once the transmission of data is over the anchor node will come back to idle state. Similarly, the same process will be carried out when the data is sent from anchor node to the surface buoyant node.

F. State Transition Diagram of ground Sink Node

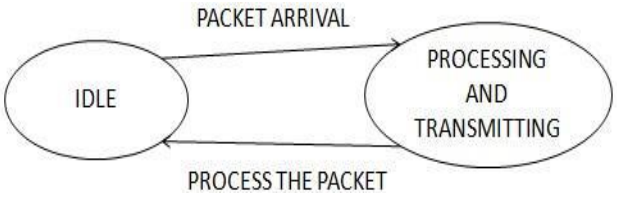

Fig. 6. State transition Diagram of sink node

The fig.6 shows the state transition diagram of sink node. Initially it will be in idle state, when the packet arrives from surface buoyant node it will move to processing state, where data is processed and transmit the processed data to internet or cloud. Once the transmission of data is over the sink node will come back to idle state.

IV SIMULATION

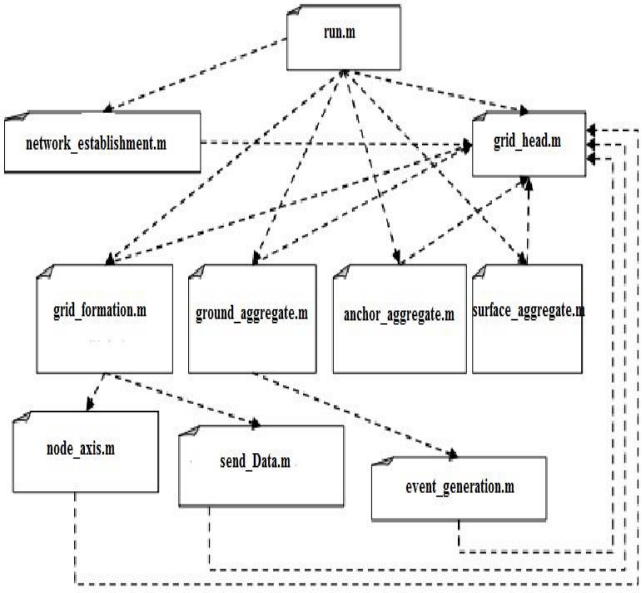

Fig. 7. Implementation Layout

Figure shows Implementation Layout of the Proposed Protocol. Here run.m is the main file from which the execution starts. run.m calls the various functions which represents the different phases of the project.

Node.m describes the Node class which contains the various properties representing the physical parameters of the sensor node and properties required for the simulation. The event_generation.m file contains the event generation () function, which allows each sensor node to sense the temperature or humidity based on the type of sensor it has.

A. Simulation Setup

MATLAB is used as a programming language to simulate the proposed protocol. The various parameters used for simulation and its values are listed in Table I. Initially, Low power sensor nodes, High power sensor nodes are deployed

in the 80 X 80 area. Figure 8 shows simulation setup, Figure 9 shows the node deployment, figure 10 shows grid formation and routing, figure 11 shows the transmission of data.

TABLE I. SIMULATION PARAMETERS

Parameter Type	**Parameter Value**
Area of application region	80 X 80 m2
Grid/Cluster range	20m
Number of ground level node in each grid	2
Number of high-power nodes in each grid	1
Number of Anchor Node in level1 cell	1
Number of Surface buoyant in level2 cell	1
Payload length	512 bytes
Parameters of Ground Level node	
Initial Energy	4J
Transmission Range	20m
Data rate	4kbps
Parameters of High-power Node	
Initial Energy	7J
Transmission Range	25m
Data rate	6kbps
Parameters of Anchor Node	
Initial Energy	10J
TransmissionRange	30m
Data Rate	8kbps
Parameters of Surface buoyant Node	
Initial energy	14J
Transmission Range	35m
Data rate	12kbps

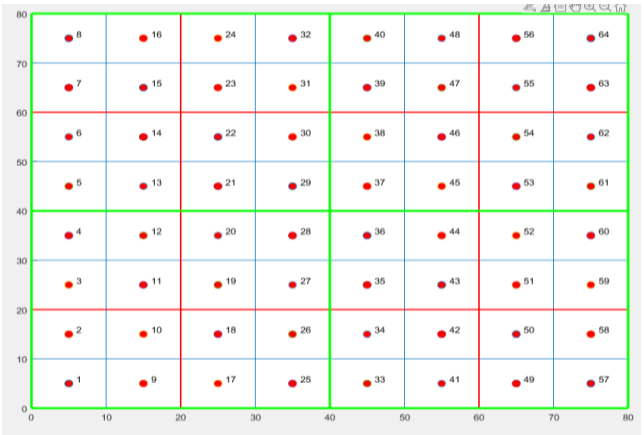

Fig. 8. Simulation Setup

B. Node Deployment, grid formation and Routing

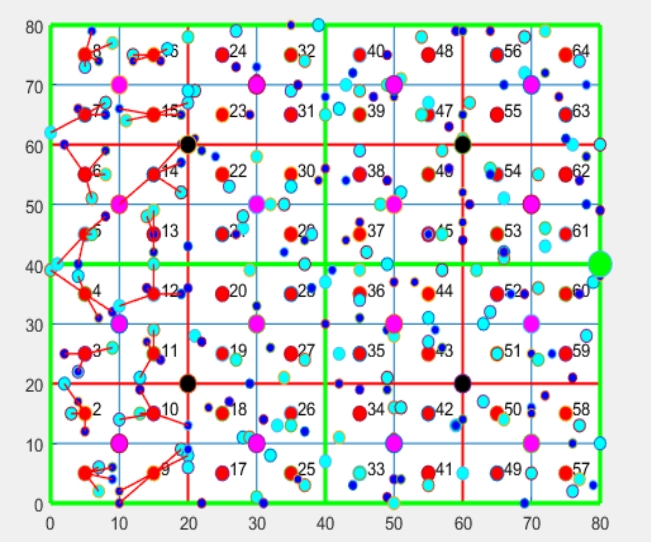

Fig. 9. Node deployment

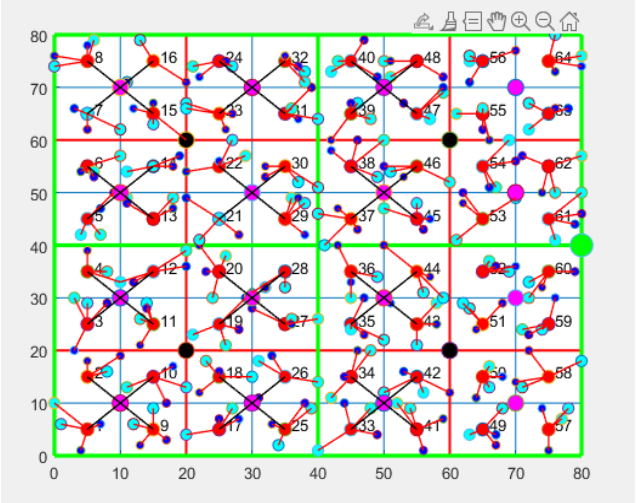

Fig. 10. Grid Formation

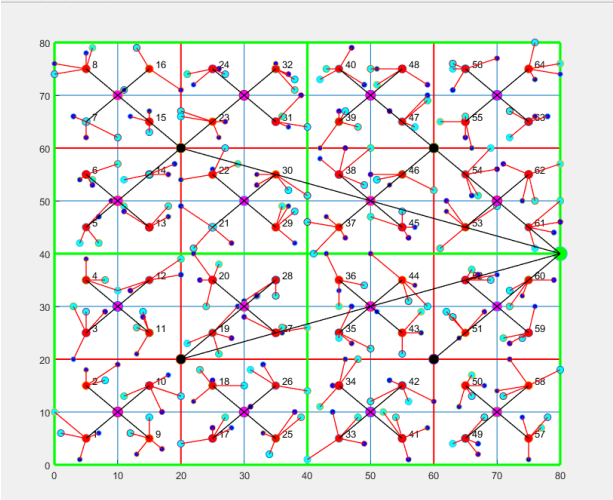

Fig. 9. Transmission of aggregated Data

V. CONCLUSION

The Denser deployment of sensor nodes leads to the generation of redundant data in the sensor network. The transmission of such redundant data results in more energy consumption. The Data Aggregation techniques can be used to overcome this problem. The existing approaches reduce the redundant data transmission to certain extent. In order to reduce energy consumption and redundant data transmission in much better way a new hierarchical data aggregation technique used for Underwater Sensor Networks have been proposed in this work, which performs the aggregation at multiple levels. The Data Aggregation Technique for Underwater Sensor Networks is simulated using MATLAB.

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Coronavirus: Disease Pattern Study dependent on Semantic-Web Approach utilizing Description Logic

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***Abstract*— Description good judgment elucidates statement the use of the methodology of reasoning. Description logic blended with semantics forms the valuable Description good judgment ontology. Numerous researches have depicted semantics of Description common sense, the use of concepts and roles. In this paper, the disease pattern with admire to pandemic COVID-19 is studied. The proposed examine ambitions to deliver semantically wealthy that means to the disease sample of COVID-19. The outbreak of Coronavirus has deeply devastated all forms of human pursuit. The principle goal of our paper is to use description logic Ontology and the semantic web-primarily based approach to put off ambiguity developed around spread of COVID-19. Semantics combined with Description common sense, therefore serves the reason of offering which means to words, in order that their interpretation is correctly performed. In this paper, proper reasoning is furnished to statistics in order that they can be depended on without any further doubt or notion.**

Keywords* — *Ontology, Semantic Web Engineering, COVID-19, Description Logic,

I. INTRODUCTION

Semantics validate and govern policies to store the facts and manipulate it as and whilst required. It is imparted suitable meaning in order that it's far properly understood, without any hassle. This is confirmed with the contemporary pandemic of COVID-19 disorder sample. Semantics validate and govern guidelines to keep the statistics and manipulate it as and while required. It is imparted appropriate that means so that's why properly understood, without any trouble. This is confirmed with the present day pandemic of COVID-19 disease sample. This paper, the case examine of COVID-19 is taken as far defined the use of Description good judgment (DL)[1] and semantic net-primarily based technique. Primary aim is to offer a reasonable method to the ailment sample of COVID-19,

Using DL standards and position utilization [2]. DL [3] uses reasoning to understand, remedy, diagnosis and different extra records regarding the family and form of virus. The data to be had is within the form of herbal language this is translated into axioms to create an ontological version primarily based on novel.

DL version the dating between different entities. Entities are put into three categories: individual names, roles, and ideas. names function constants, they may be used to depict single people. Roles depict relationship among individuals and ideas alternatively, depict a large set of individuals.

Ontology [four] defines representational entities with which the domain of knowledge gets modeled. inducement behind this ontology examine is to deepen the research the usage of DL [five] which presents more insightful structure of the hassle. DL allows in breaking inferences which can be used for powerful choice making. addition, DL ontology makes it possible to logically deduce information to collect records from them and check their consistency. DL ontology is nothing however axioms which might be real in line with the given situation and state of affairs.

Axioms are classified into three categories: axioms [6], axioms [7] and axioms. or axioms are used to represent named people, their ideas, and their courting with one another. E.g. Brother (name: Bharath) or terminological axioms are used to represent concept relationships. E.g. Brotheró Sibling i.e. brother belongs to the subset of siblings. or relational axioms are used to constitute the different residences assigned to roles. Taking example, where is a of i.e. every individual defined with also can be properly described with the aid of The paper is organized as follows: segment II explains Description ,the term's simple which means after which is going on, to provide an explanation for illustration of DL and inconsistency visible in DL. III and IV explains the proposed COVID Ontology and it's modeling. V states the realization and future scope of the paper, followed by means of references..

II. DESCRIPTION LOGIC

DL formal notions used for reasoning [8] and illustration. two or more relational statements are merged, to offer upward push to a illustration. illustration for this reason shaped, describes specific form of construct like conjunction [nine], negation [10], disjunction [eleven]. The know-how base of description common sense, is given by means of = (S, T) wherein, S represents set of statement-based statements or e.g. (Mammal (Bat)) and T represents terminological axioms or e.g. (Mammal). are few statements and their equivalent DL representations:

x COVID-19 or corona virus, the lethal pandemic inflicting disorder has placed mankind at a vulnerable spot. Coronavirus ≡ COVID-19 (1)

Deadly Pandemic Causing Disease ≡ DPCD (2) Factors Responsible For Mankind At Vulnerable Spot ≡VS (three) COVID-19´DPCD (4) COVID-19´VS (5) COVID-19ĎPCD □ VS (6) COVID-19 additionally recognised by using the name coronavirus, is expressed in axiom (1), with the equity signal depicting that each the terms on left-hand facet and proper-hand facet are equal. COVID-19 belongs to the set of deadly pandemics inflicting sicknesses.

That is depicted via subset representation in axiom (4). It also belongs to the magnificence of things accountable for putting mankind at a inclined spot or tough situation. This is depicted via subset representation in axiom (five). Combining axiom (four) and axiom (five), we find that COVID-19 is an intersection of both lethal Pandemic causing sickness and factors accountable for mankind at a vulnerable spot as shown in axiom (6). x A minor fragment of coronavirus, fits with the one, found in Pangolins and bats. Coronavirus therefore seems like each bat virus [12] and pangolin virus [thirteen]. Fragment of Batvirus ≡ BV (7) Fragment of Pangolin virus ≡ PV (8) BVó Fragment of Coronavirus (nine)ó Fragment of Coronavirus (10) (BV□PV□ Fragment of Other viruses)´ Corona virus (eleven) A small fragment of bat virus is determined to be identical as corona virus, represented as a subset of corona virus in axiom (9).

A small fragment of pangolin virus is also discovered to be matching with the fragment of coronavirus, represented as a subset notation in axiom (10). Combining each the axioms, we infer Coronavirus to have originated from fragments of bat virus [14], pangolin virus and other viruses. x SARS-COV-2, the known factor of causing the fatal ailment is found in bats. each SARS [15] and COVID19 outbreak originated from bat species. SARS-COV-2ó

component of causing coronavirus (12)

starting place of SARS ≡ OOS (13)

starting place of COVID-19 ≡ OOC (14)

Root of the Origin from Bat species (15)

OOCó OriginFromBatSpecies (sixteen) (OOC□OOS)ó OriginFromBatSpecies (17) SARS-COV-2 is a subset of factors inflicting coronavirus, as depicted thru axiom (12).

Sstarting place of SARS and COVID-19 is a subset of bat species, represented one at a time thru axiom (15) and axiom (16) and mixed to form axiom (17).x COVID-19 or coronavirus, the lethal pandemic inflicting ailment has positioned mankind at a prone spot. Coronavirus ≡ COVID-19 (1) Deadly Pandemic Causing Disease ≡ DPCD (2) Factors Responsible For Mankind At Vulnerable Spot ≡ VS (three) COVID-19´ DPCD (four) COVID-19´ VS (five) COVID-19ĎDPCD □ VS (6) COVID-19 additionally regarded through the call coronavirus, is expressed in axiom (1), with the equity signal depicting that both the terms on left-hand side and right-hand facet are same.

COVID-19 belongs to the set of lethal pandemics inflicting diseases. this is depicted via subset illustration in axiom (four). It also belongs to the elegance of factors liable for putting mankind at a vulnerable spot or hard state of affairs. This is depicted through subset representation in axiom (five). Combining axiom (four) and axiom (5), we discover that COVID-19 is an intersection of both deadly Pandemic inflicting ailment and factors responsible for mankind at a prone spot as proven in axiom (6). x A minor fragment of coronavirus, fits with the one, discovered in Pangolins and bats. Coronavirus as a consequence seems like each bat virus [12] and pangolin virus [thirteen]. Fragment of Batvirus ≡ BV (7) Fragment of Pangolin virus ≡ PV (eight) BVó Fragment of Coronavirus (nine)ó Fragment of Coronavirus(10) (BV□PV□Fragment of Otherviruses) Coronavirus (eleven) A small fragment of bat virus is located to be same as coronavirus, represented as a subset of coronavirus in axiom (9). A small fragment of pangolin virus is likewise found to be matching with the fragment of coronavirus, represented as a subset notation in axiom (10). Combining each the axioms, we infer Coronavirus to have originated from fragments of bat virus [14], pangolin virus and different viruses. x SARS-COV-2, the acknowledged component of inflicting the deadly ailment is found in bats. both SARS [15] and COVID19 outbreak originated from bat species. SARS-COV-2ó thing of causing coronavirus (12) origin of SARS ≡ OOS (thirteen) starting place of COVID-19 ≡ OOC (14) OOSó OriginFromBatspecies (15) OOCó OriginFromBatSpecies (sixteen) (OOC□OOS)ó OriginFromBatSpecies (17) SARS-COV-2 is a subset of factors causing coronavirus, as depicted via axiom (12). beginning of SARS and COVID-19 is a subset of bat species, represented separately via axiom (15) and axiom (sixteen) and mixed to shape axiom (17) become incomprehensible when they contradict the statements used in their illustration.

This happens with the logical statements belonging to disjoint units [16], having nothing in commonplace. Incoherent Ontology ContaminationDiseases ≡ CD (18)ó CD (19)ó ¬ CD (20) COVID-19 follows incoherent assets as it belongs to both disjoint units. This makes it an announcement [17] good judgment. The identical instance COVID-19 is blanketed in both the sets which don't have anything in common. Reasoning to the above Ontologyó CD (21) Virus ≡ V (22) bacteria ≡ B (23) Fungi ≡ F (24) Parasites ≡ P (25) CDó illnesses(V□B□P□F) (26)27) ó) The above axioms deduce to be a subset of sicknesses from axiom (21) and (26). Axiom (20) on the other hand suggests to be outdoor the set of diseases.

This suggests incoherent ontology because the axioms turn out to be by means of falling in disjoint sets. B. Inconsistent Axiom Ontology SARS-CoV-2: Family Of Virus (28) SARS-CoV-2: Family Of Bacteria (29) Family Of Virusó Family Of Bacteria (30) SARS-CoV-2 [18] is determined to be of each turn out to be by means of falling indisjoint sets.

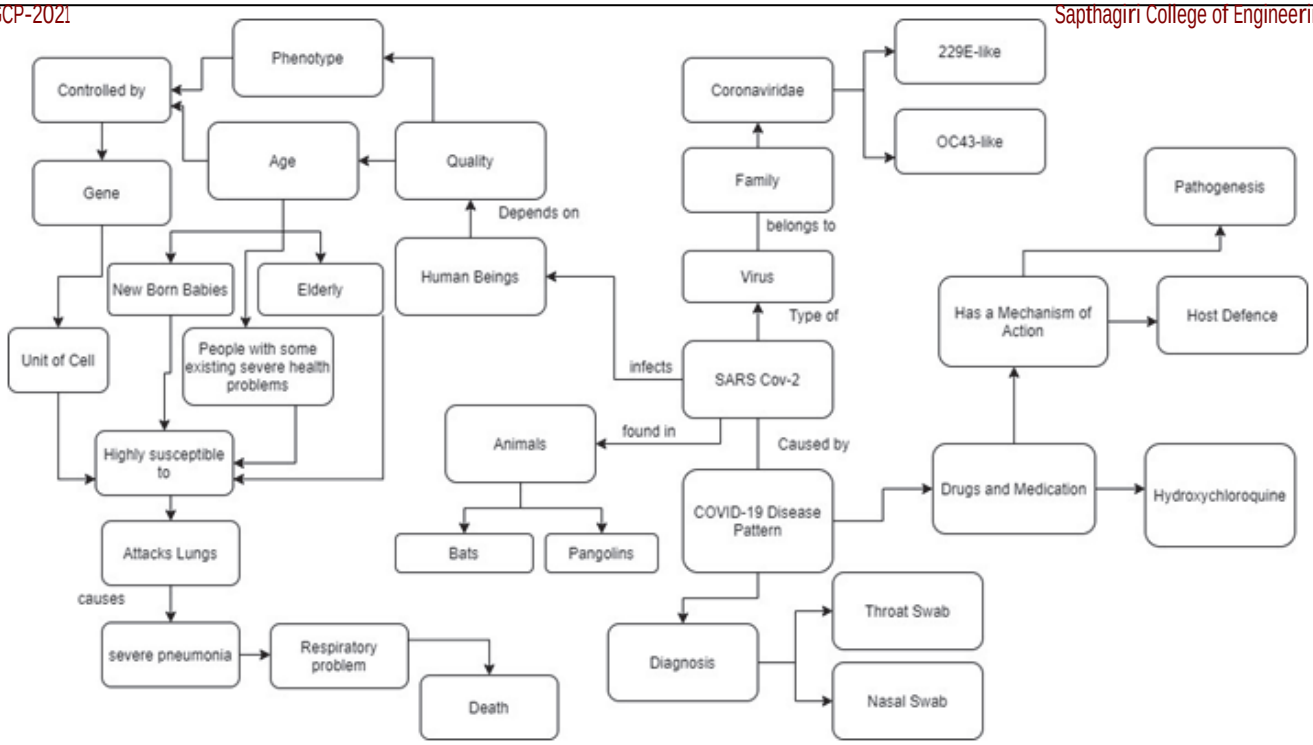

Fig. 1. Proposed COVID -19 Disease Pattern Ontology

B. Inconsistent Axiom Ontology SARS-CoV-2: Family Of Virus (28) SARS-CoV-2: Family Of Bacteria (29) Family Of Virusó Family Of Bacteria (30) SARS-CoV-2 [18] is determined to be of each, Family Of Virus and Family Of Bacteria. axiom (26) states virus and to be disjoint with each other.

This makes the axioms inconsistent and risky. Few styles which prompt pair of incoherent and inconsistent are given underneath: x unmarried is Solitude (SIL) example:

SIL1: Xó . Y (31) SIL2: Xó . Z (32) SIL3: Yó ¬Z (33) X is related to the position (given through r) to Y and Z. right here, Z used in axiom (32) is disjoint with B. example:

SIL1: Antibioticsó . FamilyOfVirus (34) SIL2: Antibioticsó . FamilyOfBacteria (35)

SIL3: FamilyOfVirusó ¬ FamilyOfBacteria (36) x Singular existence SE example: SE1: Xó . Y (37) SE2: Xó . Z (38) SE3: Yó ¬Z (39) Axiom SE2 depicts existential restrict contradicting with standard limit [19] represented through SE1.

Concepts gift conflicting nature:

SE1: Antibioticsó . Family Of Virus (40)

SE2: Antibioticsó . Family Of Bacteria (41)

SE3: Family Of Virusó ¬ Family Of Bacteria () Axioms (40) and (41) depict inconsistent and incoherent nature of SE1 and SE2. Reasoner [20] equipment alerts regulations to be distinct and unstable.

III. PROPOSED COVID ONTOLOGY

In this paper, an ontology for the ailment pattern [21] of the spread of novel is proposed that's as a result of SARS Cov-2, a sort of virus belonging to the family of the human fall under these two classes: 229E-like (which can be secluded in human embryonic cultures) and OC43-like (which can be within the brain of mice).so that you can treat the virus the supply and the sample should be recognized in which it became infected. Virus being communicable [22] in nature can without problems transmit and infect individual.

number of the conspicuous signs start from moderate fever, coughing, sneezing to trouble in breathing. 's far difficult to distinguish it from different viruses so a right remedy and prognosis process has to be followed which incorporates taking a pattern of throat and nasal swab that is similarly tested with a number of care in laboratories. like age and people affected by other sicknesses are greater vulnerable to this virus. , they need greater care and attention. In people, this virus in extreme cases can input the lungs inflicting pneumonia[23] which makes it tough for the man or woman to breathe as it has been discovered beneath [24] that this virus affects respiration cells and organs within the body. may be no vaccine to be had as of now, but the use of [25] and pills used in antiviral remedy can be useful to deal with the sufferers stricken by this lethal virus.

IV. MODELLING THE DIAGNOSIS OF COVID-19

nasal swab [26]. The amassed records within the shape of natural language is then modeled [27] into an ontology. The specific ideas and relationships may be studied by way of examining fig 2 in which the primary frame revolves around the instance take1 having two values: throat swab and nasal swab. The equal description common sense of the equal is given under : Take´ dul: event take1: Take swab1: NasalSwab dul:has Quality (swab1,Nasal) vn.role:region(take1,diagnosis) vn. Position : fee(take1,Throat Swab, Nasal Swab) further, we can model the relaxation of the standards of our proposed ontology on COVID-19 and formulate its equivalent description logics.

From fig 1, the proposed COVID -19 disorder sample ontology, may be modeled for its analysis with the aid of taking throat swab and

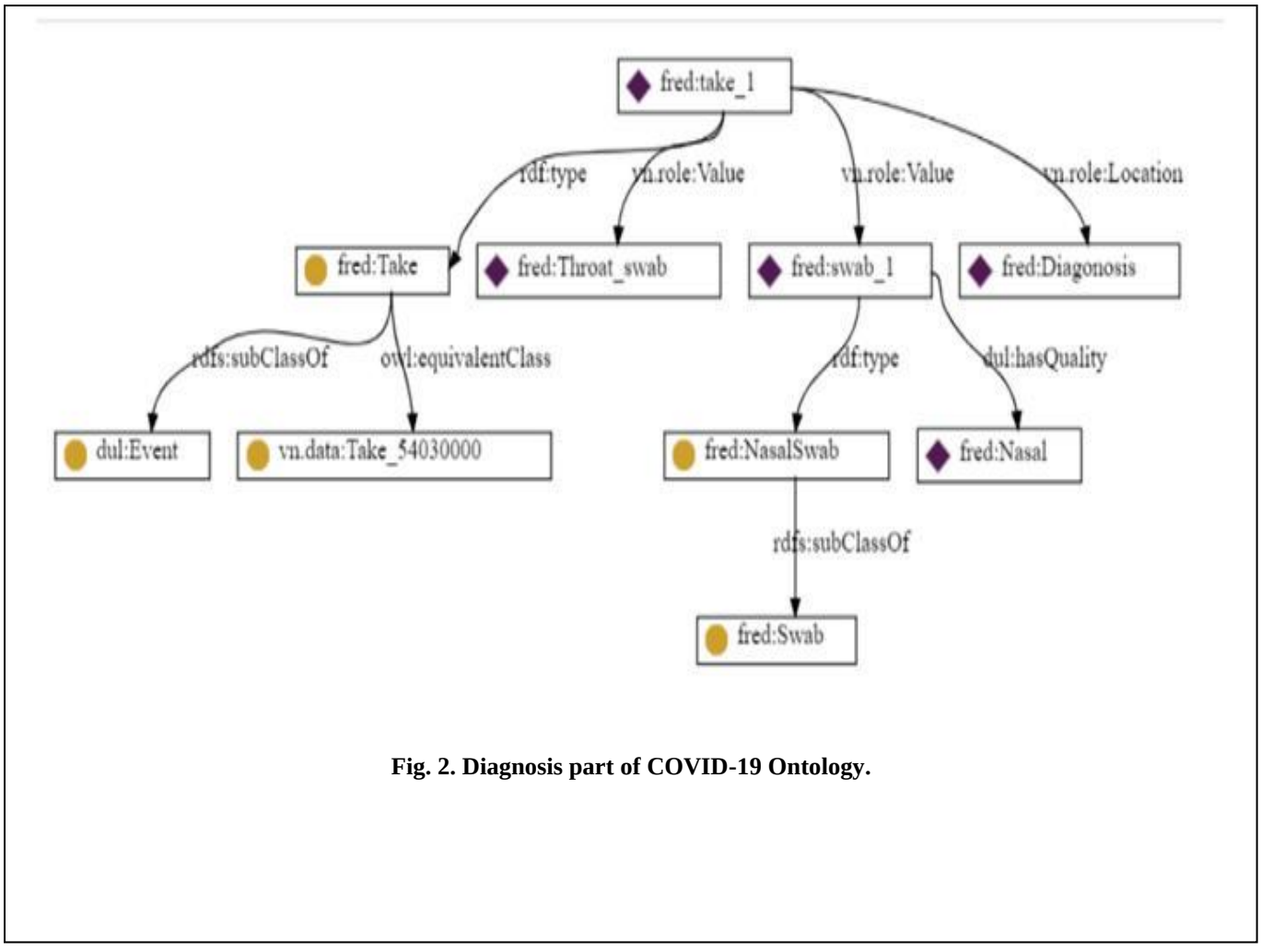

Fig. 2. Diagnosis part of COVID-19 Ontology.

V. CONCLUSION AND FUTURE SCOPE

Description common sense [28] and Semantic Ontology had been aptly defined in the paper. The properly defined semantic approach has made the sickness pattern of COVID-19 easily comprehensible. Ontological axioms [29] used for depiction, have granted a fulfilling formal which means and definition to the model. COVID-19 as a domain is explicitly explained at some point of the paper. DL [30] has effectively supplied the axioms and ontology version in brief by way of tracing the entire development of COVID-19 from its origin.

The proposed disorder pattern has been converted to assign it an ontological that means. The capabilities of the proposed ontological version collectively awareness on the sole purpose of creating the treatment simpler by seeing it through the attitude of reasoning in semantics. In this paper the focal point became on modelling and providing the practical functions of COVID-19 ontology.

The destiny plan includes formulating a technique to confirm the consistency of ontology-based totally feature-model [31]. The paper may be prolonged to formally verify the configuration and integration of various concepts and functions present in the version. also, it is able to be prolonged for evaluation of the version made by means of incorporating ontology and explaining the motives of conflicts produced by using any shape of inconsistency if raised through the reasoning tool [32].

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place-Que: Web and Andriod based application for career path development of the student

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***Abstract*- Campus Placement Automation (CPA) aims at providing the Training & Placement Office (TPO) of an Institute to automate the process of the office. This automation out-turns collecting required student data necessary for registration in Campus Placement process and notifying eligible candidates about the important dates and other updates. Campus Recruitment System aims at providing the compatibility to simplify the process of placement for students. This system that consists of a student login, company login and an admin login. This is beneficial for college students, various companies visiting the campus for recruitment and even the college placement officer. The software system allows the students to create their profiles and upload all their details including their marks on to the system. The admin can check each student details and can remove faculty accounts. The system also consists of a company login where various companies visiting the college can view a list of students in that college and also their respective resumes. The software system allows students to view a list of companies who have posted for vacancy. The admin has overall rights over the system and can moderate and delete any details not pertaining to college placement rules.**

This Automation is accomplished through the medium of a Website and smart phone application. The front end of this system is built with Bootstrap. Bootstrap is the most popular HTML, CSS and JS framework which scales the website and application with a single code base, from phones to tablets to desktops with CSS media queries. The back end of this system is built with FIREBASE. Fast, flexible and pragmatic, JAVA SCRIPT is a server scripting language that empowers some of the most popular websites. FIREBASE is the most popular database system used with JAVA SCRIPT for storing information categorically. The whole project is also featured with the firebase cloud messaging and email services which will provide the notifications to students for every small update pushed.

Keywords- Placement Management system, Web application, Android application, Campus Placement automation

I. INTRODUCTION

Most of the important processes in the institutes are carried out manually such as the registration of the students, managing huge information about students, faculty members. A college campus recruitment system that consists of a student login, company login, and admin login.

The project is beneficial for college students, various companies visiting the campus for recruitment and even the college placement officer. The software system allows the students to create their profiles and upload all their details including their marks onto the system. The admin can check each student's details and can remove faulty accounts. The system also consists of a company login where various companies visiting the college can view a list of students in that college and also their respective resumes

A college campus recruitment system that consists of a student login, company login, and admin login. The project is beneficial for college students, various companies visiting the campus for recruitment and even the college placement officer. The software system allows the students to create their profiles and upload all their details including their marks onto the system. The admin can check each student's details and can remove faulty accounts. The system also consists of a company login where various companies visiting the college can view a list of students in that college and also their respective resume.

Now a days we all are using the internet to do multiple things like booking, academic search, blogging, apply for any job, etc. This system can be used as an application to manage student information to related placement. The system handles student as well as company data and efficiently displays all this data to respective sides. This System will do all operation with respect to placement like gathering student information, verify and accurate the student profiles, inform desirable students through automatize e-mail communication, Check the percentage of students placed and not placed students. Correct access with time

and play role based fixed access is given to recruiting officer and the organization faculty and students. Once after sign in students are able to

add their details to resume. Placement officer can get the view details of the users and arrange the schedule of all actions regarding placements.

Organization can give their application procedure by providing link. Placement Officer can see the registered students and their status. Since the automated system is demanded now-adays, educational infrastructures like colleges needed their manual system to function on computer

system. One of such system which is of major importance is placement automation for campus recruitment. This project is aimed at developing a web application for the Placement Department of the college. This system can be used as an application for the Placement Officer of the college to manage the student information with regards to placement. Students logging should be able to upload their information in the form of a resume. So, all the information will store the details of the students including their background information, educational qualification, personal details, and all the information related to their resume. This system helps Company to access the student information with regards to placement. Computer based information system are designed to improve existing system.
Company can notify the students about the recruitment online via sending e-mail.

II. Related Work

There are many works published regarding campus placement automation. But these approaches compenetrate on only few aspects of placement automation[1-7].

There are many job searching portals as listed below.

LinkedIn [9] - LinkedIn is an American business and employment-oriented online service that operates through websites and mobile apps. Launched on May 5,2003 this platform is mainly used for professional networking and allows users to post their CVs and employers to post jobs. LinkedIn's jobs feature lets users search thousands of employment listings, with options for filling out applications directly on the site particularly search for jobs site. But there are some limitations in this site that is we cannot build online resume and there are no specific portals for online job recruitment test.

Naukri.com [10]– Naukri.com is an Indian employment website operating in India and Middle East founded in March 1997. The company was started as a floorless employment exchange. It is a database of resume, jobs and recruitment consultants. In this site there is a dedicated dashboard to view the activities summary, automate or customize your referral mailers, attach additional questionnaires for the applicants, complete transparency of system with easy status and comment sharing, easy search and filter on applications. There are some limitations: it has a large number of employees and hence the company incurs a high cost for managing salesforce. There is also a high level of attrition. Employer Branding on Naukri.com is hardly visible which is a major product flaw on the portal.

Monster [11] – Monster.com is a global employment website owned and operated by Monster Worldwide, Inc. It was created in 1999 through the merger of the Monster Board and Online Career Center. Monster is very functional. The most unique feature is the ability to block your resume from certain companies. This is beneficial if you're currently employed and looking for a new job, but don't want your current employer to know you're on the hunt. Monster also offers incredibly advance filtering options and a helpful resource center. Limitations of this website are: The biggest downsize to the size and popularity of Monster is the presence of spam and redundancy. Businesses know that Monster has a huge audience and will attempt to take advantage of this exposure. Unfortunately, this often ruins the user experience and frustrates people who regularly visit the site.

Indeed [12]– Indeed is an American worldwide employment website for job listings launched in November 2004. In 2011, Indeed began allowing job seekers to apply directly to jobs on Indeed's site and offering resume posting and storage. While relatively new compared to Monster, indeed has skyrocketed in popularity over the past few years. The power of Indeed lies in the aggregated database. In theory, it's supposed to streamline the job search process by eliminating the need to visit dozens of different sites to find relevant opportunities. Another benefit is the email feature, which sends updates straight to your inbox. There are some limitations: Indeed, is sort of a no-frills job site. The navigation and layout aren't as aesthetically pleasing as other sites, and it offers very little in terms of additional resources. It's just a search engine for job listings, which makes it somewhat redundant if you're already using other sites.

Our aim is to integrate the features of job searching portal and features of campus placement automation software

III. Proposed Work

The proposed system is completely automated and computer system , which removes limitations of the existing system. The proposed system is a web and android application that can accessed by the collage placement officer students and company with a separate login. Students once if the login and validated by the admin he can edit the details and he can create the resume. The admin has to validate the students and the students will be able to use the application. After validating students enter the dashboard page, he has to update his information and information are validated by the admin. All the students are having some common property like changing password, updating information , searching for details of company ,get a update about the , mail a query to administrator, and reading the material related to placement training uploaded by admin. Admin has to do add events, post a achievements on time line and he can reply to the mails sent by students regarding the query. He can upload materials related to placement training like previously asked question for practice, search for student details, and he has the right to accept and reject the students in the validating process.

Advantages:

- Proposed system that is a place-Que is an web and android application that can be accessed by the college for the placement related activity.
- In this system all the students data is stored in the database it will secured and it will give the data accuracy.
- This system makes easy report generation and only eligible students get the opportunities.

- Students can upload their information, area of interest and their skills based on their profile. They can get the suggestions to improve their skills.
- All the users will have the some common functionality to do they can change passwords, searching the details etc.
- Students can send a mail to the placement officers regarding the information about the company or training.
- As it is an online application communication between the student's placement officers is easy.
- Companies can also view the skills and achievements of the students so that they can select eligible students for the company.
- Placement officers can put up the required materials for the preparation of placement.
- This application also provides cloud messaging and email services so the students can receive the updated information.

A. System Architecture

The automated web and app application are created to overcome the limitation of the existing system. This is the user friendly interface for the students and admin and company having quick authenticated access to information. It maintains the details of. It will red the students.it will reduce the paper work that are to be done manually and utilize functionality of the application and college as well as it will save time and space and money which are required in making reports and collecting data. It can be accessed throughout the college by logging into the system.

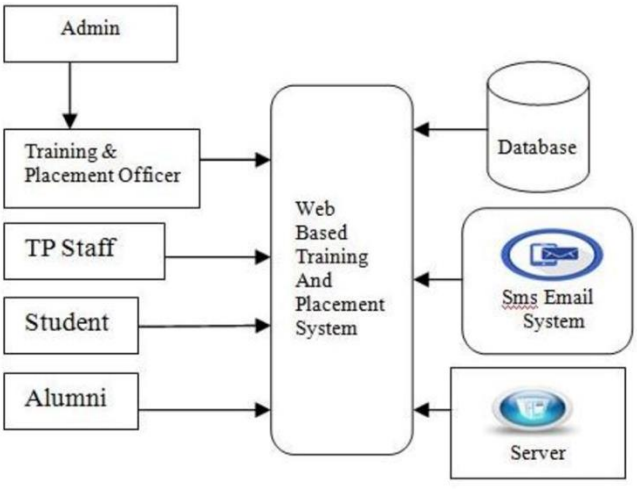


Fig.1. System Architecture

In the architecture of training and placement system there are three modules namely admin module, student and company module. All these are controlled by the automated system. The placement officer of the college is the main admin of the application . The another important parts of the training and placement system are student, company who will be accessing this application . In student there are further two types users that is student an alumni. For this different functionality is u are there in the application. And there are separate module for all are component of architecture. Web server and firebase database is used in application to store data in the Database is the important part of the this system. Automated email system is also provided in application to get the UpToDate information to the students. In this application automatically information regarding placements is send it to student vie email. In overall architecture data is stored on the firebase database and then as per rule and condition data is obtained used for making report and sending mail to student.

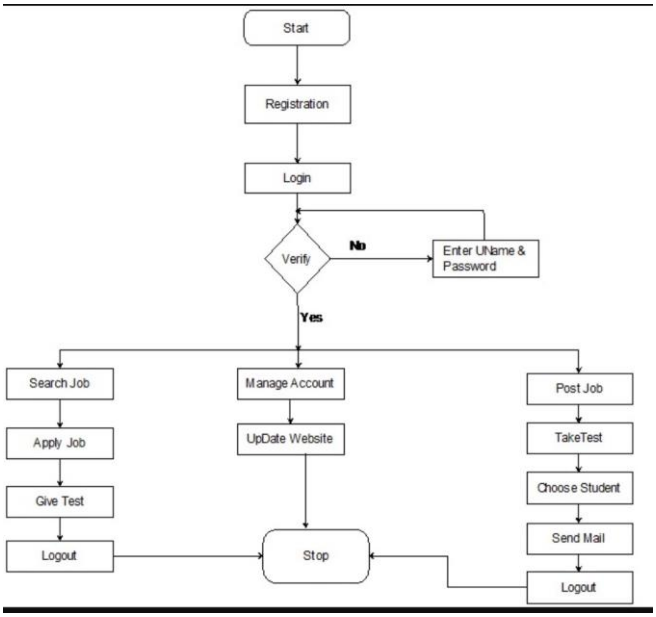
Students: Students module is main module the system according to the company criteria students get notify through email to get participate in the placement activity.

TPO: He is the admin having overall control on the application in managing and maintaining the application.

TP Staff: These are the other staff members of various department which are members of the application

Alumni : These are students of our college who all are already passes out but they are eligible for the placement they also get updated though the email.

B. Flowchart



Flow chart describes the step by step procedure how the application will run,

1. Student has to register then login into the application by entering the username and the password if authentication is successful he can access the application
2. If user is a admin he has to login to the system by entering the user name and the password one the authentication done for the admin he can manage all the activity of the application.
3. Student can enter the basic information and send the request to the admin will verify and he will accept the user.
4. Once the students get validated he can do the necessary task on the application.
5. Student can apply for the job which is sent by the admin.

6. Student can take the test and they can view the result of the quiz.
7. Student can view the post on the time line and they can comment on the post.
8. Students can send the query regarding the placement or the training.
9. They can create the resume on this application.
10. Admin has to manage all the accounts of this application.
11. He can post the job and he can send the students via email.
12. Admin can create the quiz and send the quiz to the students.
13. He can post on the timeline and reply to the student comments.
14. Company can login and they can update the company information and job description.
15. Company can see the student profile and they can choose the eligible students for the job.

C. Modules

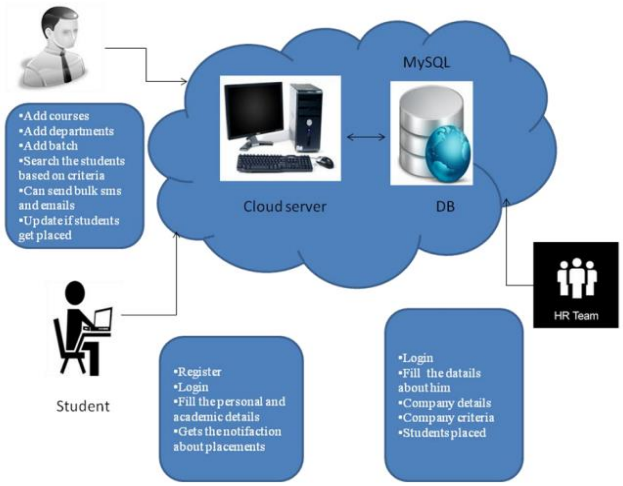


Fig.2. Block Diagram

- **Student :**

Students module is the main module of the application. The student has to register to the application by entering the details, he has to login . Once the student fills the placement registration form they get verifying email link to verify the email address. Once the student get authentication to the account they can login to the system through the username and password and they can fill the information for validation of the account .The application form will contain the information of the students such as personal details and educational details .Once the application form is filled by the students he has to request for validating. The placement officer will check the information of the student and accept it. Once the validation process is done by the admin student cam login to the system and he cam to the necessary task. This validation to be done because most of the student can login to the system and can change their details. So to order to avoid this type of situation , the option is disabled for the student .He can take the quiz in the portal by entering the quiz id and he can view the result in the portal.

- **Admin :**

The college placement officer is the admin of this application. The admin plays an important role in the application in maintaining the all the functionality of the application . The admin can add the newly added courses for the students , departments and also can add new batch of the students that came to the college. The admin has to login to the application then he can maintain all the process of the application . The admin can filter the placed and unplaced students .and he can easily separate the students based on their education details .The admin have the searching features there he can search the students through name and USN. Admin have the option to send the update about placement events that are happening in the college via Emails. Once the students submit the application form in the placement officer the placement officer can verify the students information and he can validate the students in order to use the features of the application. The admin can also create quiz and add the guidelines of the quiz and send it to the students. He can post the achievements of the students on the time line and he can reply to the comments done by the students.

- **Company :**

The company has the different login in order to use this application . The company can add the information of the company and job description which help for the drive. and he can send a notification to the students .The company can view the students profiles and select the students based on their requirement. The company can also create the quiz on the portal and send the result to the students as well as the college placements officer so it will help for the placemen officer to know about the who got selected in the particular company.

IV. IMPLEMENTATION

Implementation for Web application:

- Front End Technology: HTML, CSS.
- Back End Technology: Java Script and Node Js.
- Java Script framework allows a developer to handle data updates from the front end and build scalable network applications able to process many simultaneous user requests, amongst other things.
- Node Js to communicate with the google server for deploying the cloud functions and sending the notifications.

Algorithm:

Rule based classification algorithm: - The term rule-based classification can be used to refer to any classification scheme that make use of IF-THEN rules for class prediction. Therefore, we are using this algorithm to classify the students based on their skills and suggest them the proper path for their future.

Implementation for App:

- Front End Technology: Dart
- Back End Technology: Java Script and Node Js
- Framework: Flutter [8][9]
- Database used: Firebase Realtime Database

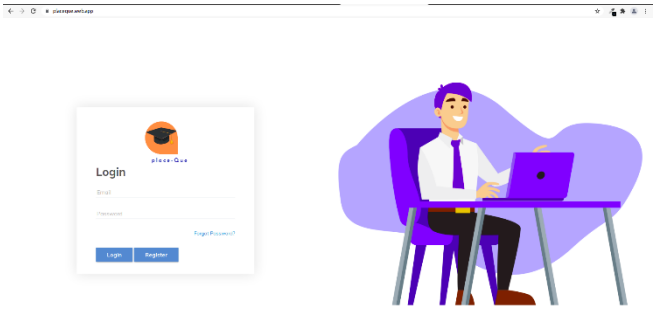


Fig.3. Student login Page

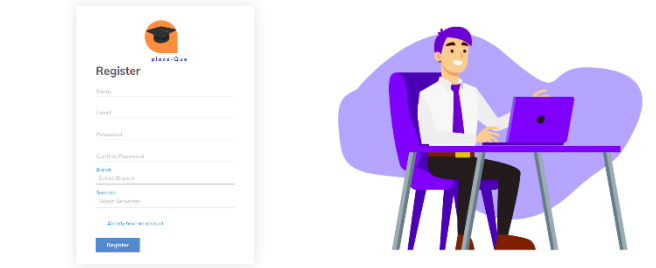


Fig.4. Student Register Page

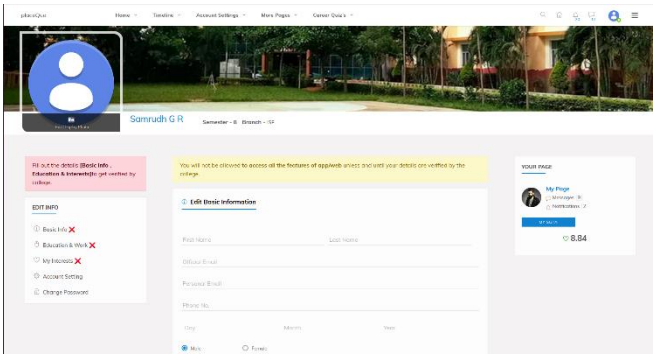


Fig.5. Student Profile Page After Login

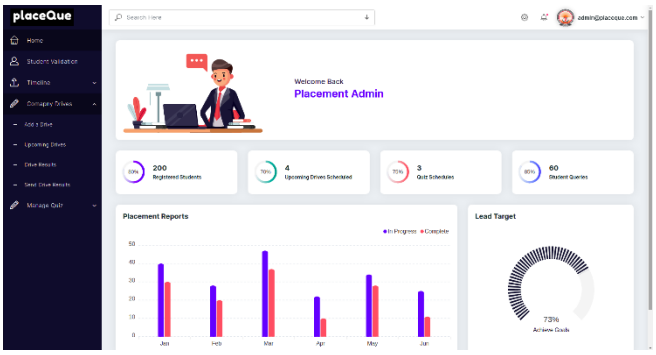


Fig.6. Admin Panel

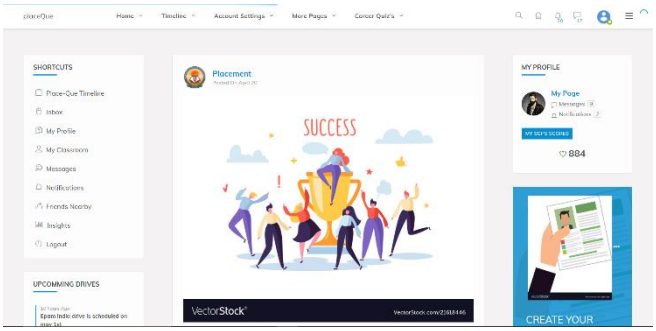


Fig.7. TimeLine

V CONCLUSION

As existing system does all the process manually so work will become slow with lot of confusion and error but this place que app will make the process through online. As mentioned in linked in we cannot build online resume there is no proper portal to take test. Place que web and app will provide a platform to build their resume and there is a proper portal to take an online recruitment test. This application can run on any operating system with active internet and for app any android version is sufficient. Place queue will do every work through online so the students can get the updated notification, they can get a suggestion on their skills, they can see view the time line, they can take online test etc.

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Fake News Detection using Machine Learning Classifiers

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Abstract – **Information sharing on the web particularly via web-based networking media is increasing. Ability to identify, evaluate and address such information is significantly important. Fake in news is a phenomenon which is having a significant impact on our social life, in particular in the political world. Fake news detection is an emerging research area which is gaining interest but involved some challenges due to the limited number of resources available.**

This paper illustrates model and methodology to detect fake news with the assistance of Machine Learning. In this proposed work different feature engineering methods like count vectorizer, TfidfVectorizer and ngram are used to generate feature vector. Also machine learning techniques were used namely NavieBayes, Random Forest, Logistic Regression, SVM.

Keywords – Fake news, SVM, Logistic Regression, Feature Extraction, NavieBayes & Machine learning.

I.Introduction

The advent of the World Wide Web and the rapid adoption of social media paved the way for information dissemination that has never been witnessed in the human history before. The internet is an abundance of data and exceptionally worthwhile for different reasons. Due to overwhelming information available on the internet, one must be cautious about the originality.

Fake information's are deliberately created and are purposefully or unexpectedly engendered over the internet. According to a survey, 77% of the USA population prefer to get news online over print media. This shows how important it is to conserve these data.

There is been a rapid increase in fake news in the last decades. However, such platforms are also used with a negative perspective by certain entities commonly for monetary gain and in other cases for creating biased opinions, manipulating mindset.

Our ability to take decision relies mostly on the type of information we consume; our world view is shaped on the basis of information we digest.

Since Fake news tends to spread faster than real news there is a need to classify news. In general, Fake news could be categorized into three groups. The first group is fake news, which is news that is completely fake and is made up by the writers of the articles. The second group is fake satire news, which is fake news whose main purpose is to provide humor to the readers. The third group is poorly written news article, which have some degree of real news, but they are not entirely accurate. In short, it is news that users, for example, quotes from political figures to report a fully fake story. Usually, this kind of news is designed to promote certain agenda or biased opinion. Fake news is a phenomenon which is having a significant impact on our social life, in particular in the political world. Fake news detection is an emerging research area which is gaining interest but involved some challengers due to the limited number of resources (i.e., datasets, published literature) available. A fake news detection model is proposed that use machine learning techniques. It is investigated and compared with three different evaluation models namely Count Vectorizer, Tfidf Vectorizer and ngram and four machine learning techniques were used namely NavieBayes, Random Forest, Logistic Regression, SVM. Experimental evaluation yields the best performance using Term Frequency-Inverted Document Frequency as feature extraction technique, and logistic regression. Machine learning technique is used to detect fake news, which consists of using text analysis based on classification techniques. Two different supervised classification techniques, namely support Vector Machine, Logistic Regression are used.

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the first step involves the creation of datasets we are using web scraping techniques to scrap the headlines and its contents. We are applying vectorized techniques to preprocess and extract the collected data. After extraction we are applying the machine learning algorithms to classify the news, and determine if the news is original or fake.

II. Related Work

Social networking sites have changed the manner by which information is exchanged. Shu, k, sliva a, Wang, S., Tang, J., & Liu H have worked on fake news detection on social media: A data mining perspective. Here, they present a comprehensive review of detecting fake news on social media, including fake news characterizing on psychology and social theories, existing algorithms from a data mining perspective. And the accuracy was less than 62%.

Rubin, V.L., Chen, Y., Conroy, N.J developed depiction detection for news: three types of fake news This paper discusses three types of fake news, each in contrast to genuine serious reporting and weighs their pros and cons as a corpus for text analytics and predictive modeling. Filtering, vetting, and verifying online information continues to be essential in library and information science, as the lines between traditional news and online information are blurring.

Rubin, V.L., Chen, Y., Conroy, N.J developed automatic deception detection: Methods for finding fake news. The paper provides a typology of several varieties of veracity assessment methods emerging from two major categories- linguistic cue approaches and network analysis approaches. Conroy, Cornwell provided: Fake News or Truth? Using satirical Cues to detect potentially misleading news. This is a conceptual overview of satire and humor, elaborating and illustrating the unique features of satirical news, which mimics he format and style of journalistic reporting.

Sl no	Title of paper	Author	Limitation
1	Deception detection for news: three types of fakes	Rubin, V.L., Chen, Y.., Conroy, N. J	Accuracy is than 60%
2	Fake News or truth? Using satirical cues	Rubin, V., Conroy	It consumes more time
3	Fake news detection on social media: A data mining perspective	Shu, k., sliva, A., Wang, S., Tang, J., & Liu, H	Accuracy is less than 60%
4	Automatic deception detection: Methods for finding fake news	Rubin, V.L., Chen, Y., Conroy, N. J	It is having more complex steps

III. System Design

The system is divided into hardware and software section.

1. Software is responsible for the connection between the product and other specific software components, including database, operating system, tool, libraries and integrated commercial components.
2. Hardware requirements describe the logical and physical characteristics of each interface between the software product and the hardware components of the system.

Machine Learning technique is used to detect fake news, which consists of using text analysis based on classification techniques. Two different supervised classification techniques, namely, Support Vector Machine (SVM), Logistic Regression (LR) are used.

A. Objectives

- Objective of the study is to propose a feasible method, which contain several aspects to accurately tackle the fake news detection issue.
- The first step involves the creation of the dataset we are using the web scraping technique to scrap the headlines and its contents.
- We are applying the three vectorized techniques to preprocess and extract the collected data.
- After the extraction er are applying the machine learning algorithms to classify the news, news is original or fake.

B. Block Diagram

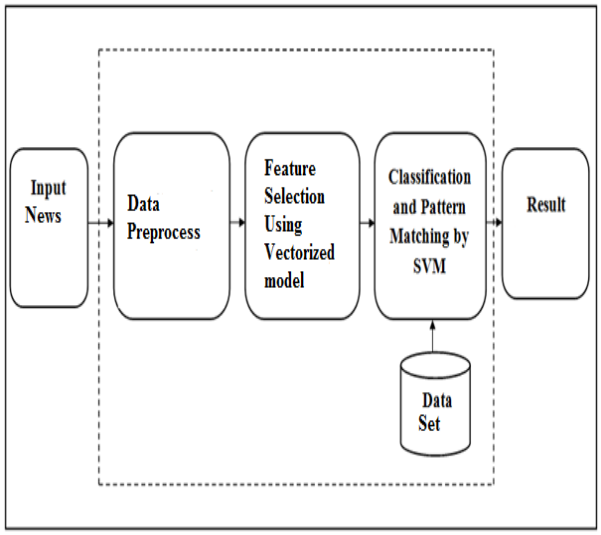

Fig 1: *Block Diagram of proposed framework*

C. Feature Extraction

For the text needs to be parsed to evaluate words and words should be encoded as integers or floating-point values before giving it into the machine learning algorithm.

- *Count vectorizer:*

The count vectorizer gives a basic method to both tokenize an assortment of content archives and fabricate a jargon of known words, yet additionally to encode new reports utilizing the jargon.

- *TF-IDF:*

This is utilized to change over content to vectors thinking about the semantics of the words. Example., 3 is calculated by multiplying term frequency (1) and inverse document frequency (2).
TF = (Number of time term t appears in a document)/ (number of terms in the document) (1)

D. Classifiers

In this proposed system different Machine Learning algorithms are used to do the prediction. TF-IDF is used to generate vectors and all the listed algorithms applied to investigate the best calculation for counterfeit news recognition and the same procedure applied on word embedding and count vectorization.

1. Support Vector Machine

   Machine to precisely classify SVM is used. Drawing decision boundaries are known as hyperplane which separates two classes, unoptimized decision boundaries cloud result in misclassification, to overcome this SVM are considered as important by looking at extreme cases. Nonlinear SVM could be converted into linear by using some functions. Calculation creates the most ideal hyperplane which characterizes new data normally.

2. Logistic Regression

   It is used for binary classification. Linear regression is used every time to create the best bit line for binary classification. Logistic regression applied to problems where two classes would be linearly separable.

3. Decision Trees

   It's a predictive analysis. Here the graphical representation of all the possible solution to decision is made. A decision is based on some condition.

Focal points are to incorporate word highlights, a direct partition of classes isn't required, effective treatment of exception, and a simple translation of the decision tree are required. Be that as it may, a decision tree would overfit when there are countless inadequate highlights, and consequently perform ineffectively on the testing information

4. Random Forest

It's a troupe tree-based learning calculation. Builds multiple decision tree and merges them to produce more accurate and stable predictions. Trained with the bagging method. High variance obtained in the decision tree converted into low variance by using row sampling and feature sampling. Using hyperparameter the number of decision tree could be decided. Its an ensemble algorithm, which consolidates more than one calculation of the equivalent or distinctive kind for characterizing objects.

5. Gradient Boosting

Machine Learning gradient boosting used for regression and classification. It's a boosting technique. Leaf represents an initial prediction, which is log(odds) which is used for classification, this is converted, into a probability with logistic function.

$$\text{Probability} = e^{\log(\text{odd})}/(1+e^{\log(\text{odd})})$$

6. XG-Boost

Its an extreme gradient boosting. Designed to be used with large and complicated datasets. Its an ensemble method, regularized boosting by preventing overfitting. Its scalable in all scenarios. It can handle sparse data and also parallel and distributed computation which makes learning faster and quicker.

III. Conclusion

Detecting fake news is believed to be a complex task and much harder than detecting fake product reviews given that they spread easily using social media and word mouth. Our aim is to detect fake news, which consists of using text analysis based on classification techniques. Two different supervised based on classification techniques namely support vector machine (SVM), logistic Regression (LR) are used.

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Watch Your Driving: A Driver Health Monitoring System Using Raspberry Pi

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***Abstract*— Road accidents continues to be a major issue in India and it ranks first in the number of road accidents deaths across the 199 countries. it is important to monitor the driver health condition before driving. We propose a model that can monitor the driver health condition based on the result system unlock the car ignition system. "Watch Your Driving: A Driver Health Monitoring System" is designed to continuously track and monitor driver's vital health parameters such as (BLOOD PRESSURE, BODY TEMPERATURE, SLEEP ACTIVITY, HEART BEAT AND ALCOHOL LEVEL). This system can monitor the state or condition of the driver which is the major reason for road accidents. In this system the analysis of vital health parameters is done before driving so that this information is used to alert the centralized controller installed inside the vehicle that controls the car ignition system. This project aims at reducing the reckless driving situations which leads to major accidents. Decision tree algorithm is used to analyze whether user condition is normal or abnormal the algorithm result is passed to centralized controller where it analyzes the result based on that either it allows the user to drive the car or alert the user.**

Keywords*— *Internet of Things; Centralized system; Decision tree algorithm; health monitoring; Alcohol detection

I. INTRODUCTION

As per the accident reports, a total of 4,49,002 accidents took place in the country during year 2019. Accidents not only occur due to poor road condition, speed or driver fault they fail to understand the health condition of driver. This driver health monitoring system provides the solution for the above problem by tracking and monitoring the driver health condition before driving. This system keeps track of driver's vital status such as sleep, heart rate, blood pressure, body temperature and alcohol content in the body. There will be a centralized controller along with alcohol sensor fixed inside the car which controls the car ignition system. Once the driver enters the car the drivers smart phone gets connected to the centralized controller which has access to the data that is tracked and monitored for the last 24 hours which is stored and processed in the application. The centralized controller checks all the vital stats, if found normal then the controller checks the alcohol level of the driver, if in permissible range then the car ignition system is unlocked.

II. RELATED WORK

Accident and Alcohol detection in Bluetooth enabled Smart Helmets for motorbikes (2018) et al [1] has proposed a mechanism that can detect if a person is wearing helmet, it also detects accidents and also detects the alcohol level in the body. This can help in preventing accidents by detection process by gathering data to provide an accuracy

Alcohol detection for car locking system (2018) et al [2] they made an attempt to develop locking system for cars and it will not unlock the car without checking alcohol level. Alcohol sensor is used for prediction. The main aim is to prevent the accidents by system developments.

Safe Drive: An automatic engine locking system to prevent drunken driving (2018) et al [3] has proposed a model using Internet of things to avoid reckless driving. This system uses MQ3 sensor, location tracking, sobriety test and so on. Based on result obtained by alcohol detection, system determine whether driver is drunk or not before driver starts the car.

Drunken driving detection and prevention models using Internet of things (2017) et al [4] has proposed a model based on IoT for drunk detection and drowsiness especially at night. This model includes analysis of alcohol concentration, eye blinking rate and for drunken or drowsy state detection it analyses the rate at which car is made to turn. This includes speed reduction, triggering, alarm, informing traffic control.

Portable alcohol detection system for Driver Monitoring (2019) et al [5] has proposed a portable alcohol detection based on exhaled breath analysis. This system uses breath sensor unit, smartphone and data cloud system. It can monitor driver status from a remote location. Breath sensor contains four separate sensors first is water vapor other are semiconductor gas sensor to detect ethanol, acetaldehyde and hydrogen level it checks the result and send it to cloud and future detection is made.

Drunk Driving and Drowsiness Detection (2016) et al [6] has proposed a mechanism for detection of driver's drowsiness using visual features along with this the drunk detection using alcohol sensor is done. Drowsiness detection is done using HAAR-Cascade classifier for face and eye, for yawing detection – template matching in the mouth region is done. Finally, alcohol detection is done.

III. PROPOSED SYSTEM

We propose a complete health tracking and monitoring system along with prevention technique so that we can reduce possibility of being in accidental situations due to variations in health conditions. Driver's vital health parameters such as (blood pressure, body temperature, sleep activity, heart beat and alcohol level) can be the main contributing factors to tell how fit a person is, so variations in these parameters may cause fatality. There will be a centralized controller (Raspberry Pi) along with alcohol sensor installed inside the car which controls the car ignition system. Then the driver's vital health parameters have to be recorded with the help of On-Body sensors or wearable device like smartwatch. The health parameters are recorded and sent to web application installed in the driver's smartphone. The sensor data is tracked, monitored and processed in the application. When the driver enters the car the driver's smartphone gets connected to the centralized controller and gets activated. Controller has access to the processed data, if there are no abnormalities then the controller finally checks the driver's alcohol level, if in permissible range then the car ignition system is unlocked and then the driver can start the vehicle.

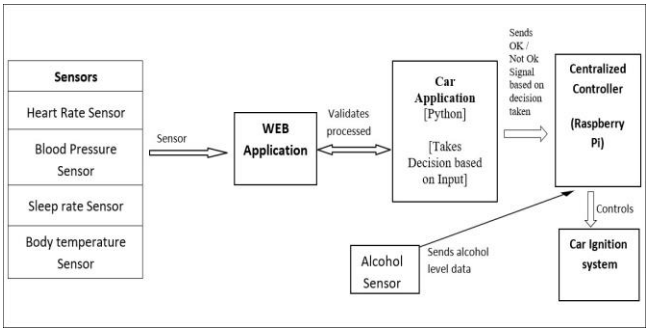

Fig 1: Basic Block diagram

A. Sensors [Data collection]

In this module, various sensor data such as heart rate, blood pressure, body temperature and sleep activity are continuously sensed from on-body sensors such as smartwatch. These health parameters determine the driver's health condition hence need to be transmitted to web application.

Health parameter & Sensor Name	Normal Range	Permissible Range	Non-Permissible Range
Heart Rate Optical Heart Rate Sensor	80-120 bpm	≥ 50 and ≤140 bpm	< 50 and >140 bpm
Blood Pressure Pulse oximetry	80/120 mmHg	(80 – 89) / (130 – 139) mmHg	>90 / > 140 mmHg
Body Temperature Temperature Sensor ICs	97 F to 99 F	≥ 97 F to ≤ 99 F	< 97 F to >99 F
Sleep Rate / Activity Bioimpedance Sensor	8 to 10 hrs	≥ 4 hrs to ≤ 12 hrs	< 4 hrs to > 12 hrs
Alcohol Level MQ3 Alcohol sensor	0.03% per 100ml	≤ 0.03% per 100ml	≥ 0.03% per 100ml

Table 1: Permissible and non-permissible range of all sensors

B. Web Application

In this module, the web application receives the sensor data from sensors. This data is stored dynamically and this data is continuously tracked and monitored for any variations in anyone of the vital health parameters. These health parameters determine the driver's health condition hence need to be continuously monitored for any slight variations. The web application produces a processed data file from the recently obtained data, when requested from centralized controller.

C. Car Application [Python]

This module is installed in the Car Console as a software which is triggered when the driver wants to start the car. This feature allows the Driver a smooth interface where the driver can trigger the start car functionality, upon clicking a decision will be taken by the processing unit and then a suitable action will be taken i.e., Locking / Unlocking the Car Ignition System if all vitals are normal else displays an error message on the screen.

D. Centralised controller [raspberry Pi]

In this module, when the driver enters the vehicle, his smartphone connects to the Centralized controller in order to activate the controller. After that the controller requests the web application for the recently processed data file. Further validates the data file for any abnormalities in health parameters. If all OK, then the controller unlocks the Car ignition system else it won't unlock.

E. Car ignition system

In this module, the car ignition system controls the car ignition process, i.e., controls the on/off of a vehicle. After only successful validation and OK signal from the centralized controller this unit will be unlocked and allow the driver to start the vehicle.

IV. SYSTEM ARCHITECTURE

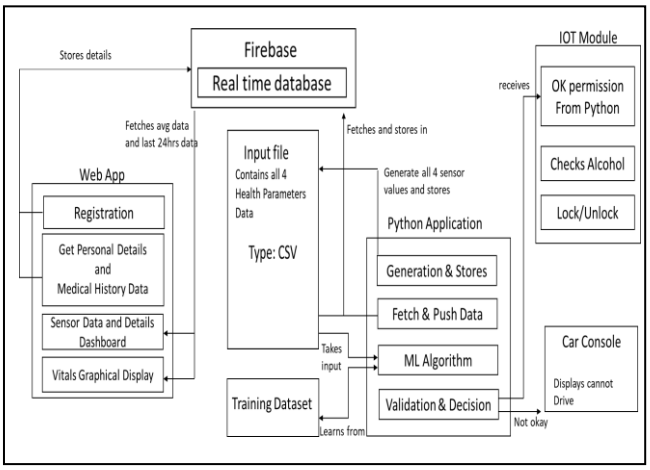

Fig 2: System Architecture

A system architecture is the conceptual model that defines the structure, behaviour, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviours of the system

A. Web Application

It contains four sub – modules:

Registration: This page provides the driver to Sign Up to our Product by providing email id and password and the credentials will be verified by email verification module. Get Personnel details and Medical History Data: This page provides the driver to enter their personnel details upon successful User verification through Sign Up and to provide details about their present and past medical conditions.

Sensor Data and Details Dashboard: This page provides the user a complete information about their vitals of various health parameters with a Dashboard view. It also contains details about the sensors used and displays the users Avg value of each parameter which is calculated dynamically based on the last 24 hrs. data that is collected and stored by the sensors.

Graphical Display of Vitals: Graph provides a quick and easy understanding of variations. To provide the user with easy understanding of the variations in their health parameter this feature is implemented so that it shows a graph view for each individual parameter and individual sensor and displays the variations from current time to previous 24 hrs.

B. Firebase server

This Server contains various databases for different purposes and in our project, we have utilized two kinds of databases. One for storing user login credentials for authentication and other is the Real time database for storing sensor values and other user details. It performs storing and data sending and retrieval tasks.

C. Input file

It contains all the 4 sensors dynamic data i.e., in each column individual sensor data keeps getting updated every 5 secs and this input data is then pushed to the Firebase server for the Web application to access data for displaying. The data of individual sensor will in accordance to its standard data type and will be generated dynamically. The generated data will be sent to Processing unit i.e., Python application for further data processing, validation and decision taking based on the input generated.

D. Training dataset

It contains a sample dataset where the data of all 4 sensors are populated randomly and the data is then classified as valid input or not by assigning a Boolean value at the end of each row consisting of all the 4 sensor values.

In this dataset, all kinds of possible variations and circumstances are drafted and for each possibility a valid value is assigned to make the ML algorithm learn based on these variations.

E. Car Application [python]

This is the main component which carries out the processing task for the entire project. This is installed on the Car console as software.

When the Driver press the Start button then this application fetches the data from the input file i.e., the last 24 hrs. data and then refers the training dataset to learn and based on these two files a decision is taken by the ML algorithm running in the application and further the result is indicated to the IoT module and also an appropriate message is displayed for the Drivers understanding. The ML algorithm used is decision tree based ID3 algorithm which takes the input and learns from the drafted training dataset and takes a decision.

The other functionalities of python application are to push the last 24hrs data to the firebase server and since this is Computer Science projected the hardware task of generating sensor values is also carried out by this application. It randomly generates the values for all 4 sensors according to the individual health parameter permissible range and keeps in mind the type of data that needs to be generated for individual sensor.

F. IOT module

In this module it waits for the processing unit to send the decision based on the input. The decision sent by the

Processing unit is a Boolean value 0 or 1, if it is 0 then it indicates that there is some variation observed in the driver's health parameters and the driver is not fit to drive. Based on this decision the IoT module does not further check for the alcohol level and does not unlock the Car ignition system.

If the value is 1 then the IoT module further checks for the Drivers alcohol content in the body using alcohol sensor integrated on the Centralized controller installed in the car. If the alcohol level is also in the permissible range, then it further Unlocks the Car ignition system indicating that the driver is fit to drive.

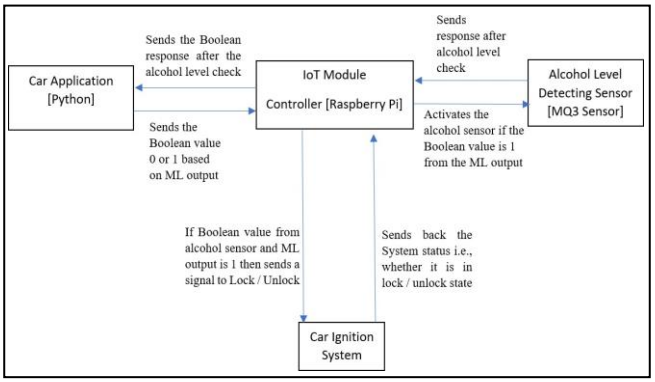

Fig 3: IOT Module

G. Car console

It is basically a GUI [Graphical User Interface] which provides an interface for the driver to Start the vehicle and also displays appropriate message after processing.
If the driver is fit to drive then it displays "Welcome to Your Journey Has started Keep Calm and have a Safe Travel"
If the driver is not fit to drive then it displays "Sorry You cannot Drive" This software is installed in the Car console.

V. FLOW CHART

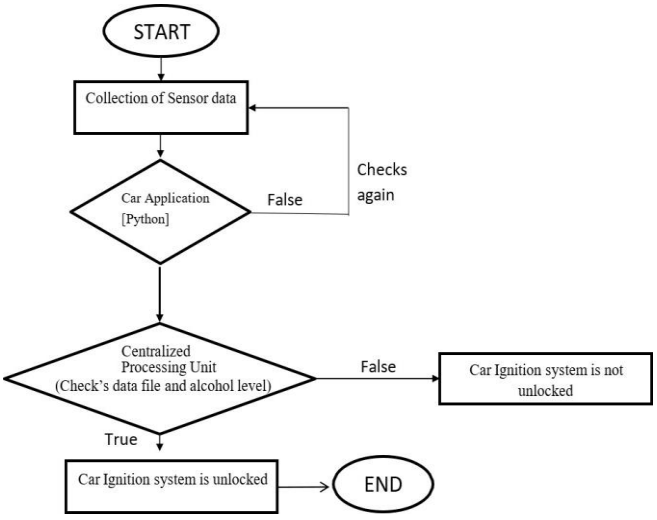

Fig 4: Flow chart

A flow chart could be a kind of diagram that represents a advancement or method. A flow chart may also be outlined as a diagrammatical illustration of associate degree rule, a stepwise approach to finding a task. The flow chart shows the steps as boxes of varied types, and their order by connecting the boxes with arrows.

VI. ALGORITHM

A. Decision tree Algorithm

Decision tree algorithm is a supervised machine learning algorithm used to build classification and regression model to form tree structure. The node in the tree represents the feature, the branch in the tree represent decision made by the algorithm and the leaf which represent final outcome of the algorithm. There are many algorithms which uses decision tree algorithm. Among those algorithms we use ID3 algorithm.

ID3 Algorithm means Iterative Dichotomiser 3 algorithm. ID3 algorithm is a classification algorithm which follows greedy approach (it always makes the choice that seems to be best at that moment) by selecting best attribute that yields maximum information gain or minimum entropy.

Step 1: Begin the tree with the root node which contain dataset

Step 2: Find best attribute in dataset using Attribute selection method

Step 3: Divide root node into subsets that contain possible value for the best attribute

Step 4: Generate decision tree node which contain the best attribute

Step 5: Recursively make new decision trees using subset of dataset created in step 3. Continue process until a stage is reached where it cannot further classify the nodes and called final node as a leaf node.

VII. EXPERIMENTATION AND RESULT

A. Sensor module in web application

This module is implemented with help of chart.js package which requires data as input and need to specify the X axis and Y axis values and range and also write the function call backs to go and locate the firebase remote database and then fetch the values from the database and use the same fetched data for displaying.

Provides the User with a sensor dashboard consisting of information about each sensor and can also know the average value of each individual sensor.

Provides a Graphical representation of the sensor data of all health parameters and help the users to quickly understand the variations and changing trends in the health parameters. The data is dynamic and responsively coming from the server every time the data gets updated.

Fig 5: Sensor details with average value display

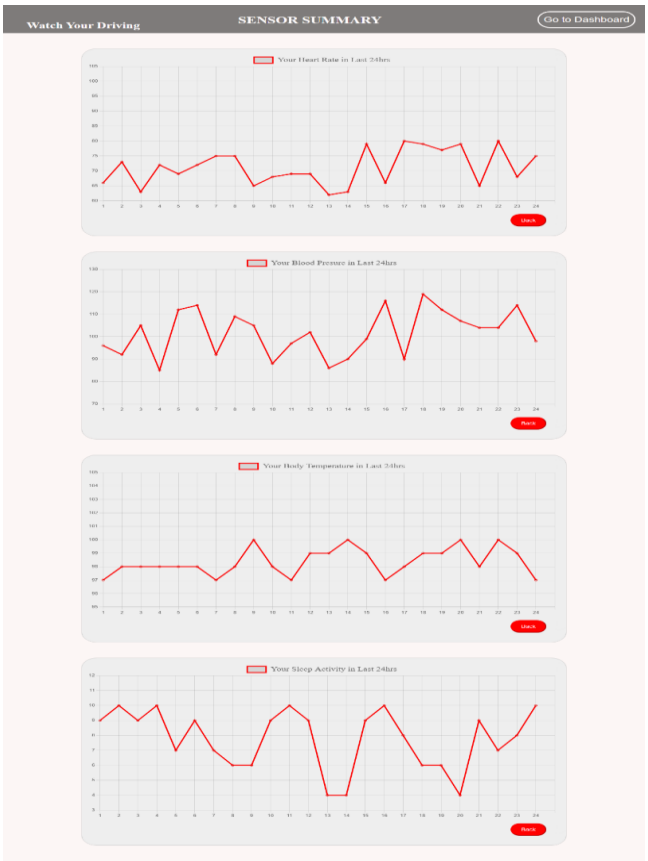

Fig 6: Graphical representation of sensor data

B. Algorithm model

In our project when health.csv is given to the ID3 algorithm it calculates the entropy of health.csv and entropy of each attribute in health.csv and it calculates information gain. Algorithm makes decision on information gain it chooses the highest information gain attribute and assign that attribute as a node under the root node, again root node make decision either it terminate node or it will analyse the next highest information gain attribute and assign that as next node. This process continues until final node is reached where there is no other attribute for classification. Based on leaf node the algorithm make decision by allowing user to continue with python application or alert user by a message "Sorry you can't drive because your health condition is not under limit ".

If the Boolean value is 0 then without the consent or without waiting for response from the IoT module the Python application takes the decision that the driver is not fit to drive because Boolean value 0 indicates that there is a variation in the 4 vital health parameters and these values cannot be accepted to drive. The Boolean value 0 is sent to the IoT module indicating to lock the car ignition system. According to the output the Python application displays appropriate message in the car console. If the driver is fit to drive then it displays “Welcome to Your Journey Has started Keep Calm and have a Safe Travel” If the driver is not fit to drive then it displays “Sorry You cannot Drive”

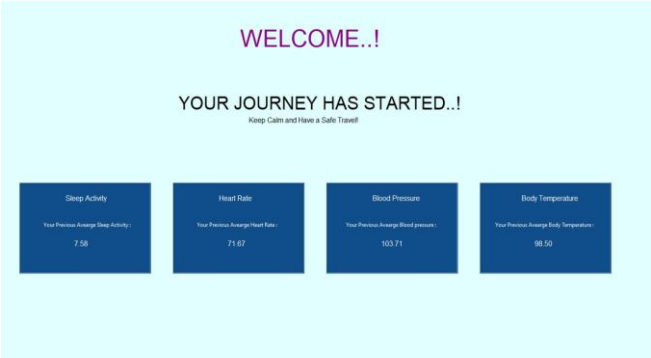

Fig 7: Allowing user to drive

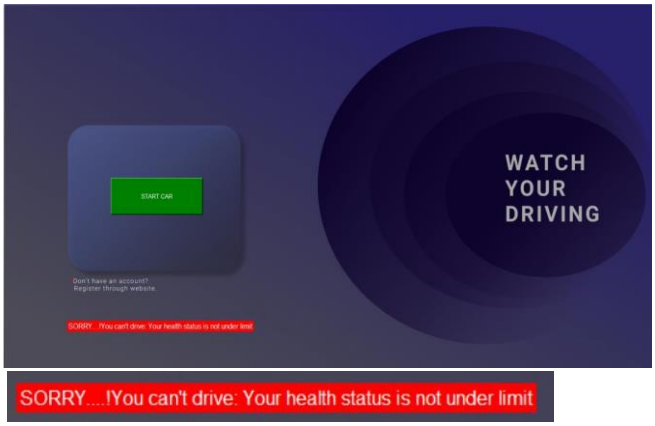

Fig 8: Alerting user

C. IOT Module

Car application sends a Boolean signal 0 or 1 based on the ML output. Based on the Boolean value obtained the controller i.e.; Raspberry Pi decides which step to proceed further. If the Boolean value is 1 from the ML output, then the controller activates the Alcohol detecting sensor and checks the alcohol level in the driver's body and sends the response back to the controller indicating the alcohol level value and status. If the Boolean value from alcohol sensor is 1 then the controller indicates the car ignition system to unlock else it indicates to lock it.

If the Boolean value is 0 then the controller indicates the car ignition system to lock and asks back the system status of car ignition system. The status sent by the car ignition system is then sent back to the Python application to display appropriate message in the car console.

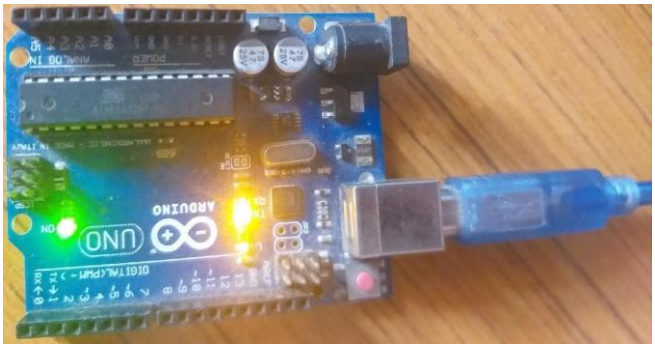

Fig 9: If Boolean value is 1

Fig 10: If Boolean value is 0

VIII. CONCLUSION

The main objective of the project is to ensure safety in driving and to avoid accidents by developing a reliable and a cost-effective system to safe guard human life. The system will help the drivers to a much larger extent. It is a real time model that can monitor and track the status of driver's health and automatically unlock the car ignition system.

ID3 algorithm used because of Understandable prediction rules are created from training data. It builds a short tree in relatively small time.

This system can be used by automobiles manufactures by integrating it in the manufacturing process of vehicles. It can be concluded that this driver health monitoring system using Raspberry Pi is a cost effective, reliable and feasible solution for prevention of accidents.

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Accidents Detection and Safety Monitoring System using Raspberry Pi

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***Abstract*—** In recent years driver fatigue is one of the major causes of vehicle accidents in the world. A direct way of measuring driver fatigue is measuring the state of the driver i.e. drowsiness. So it is very important to detect the drowsiness of the driver to save the life and property. This project is aimed towards developing a prototype of drowsiness detection system. This system is a real time system which captures image continuously and measures the state of the eye according to the specified algorithm and gives warning if required. Though there are several methods for measuring the drowsiness but this approach is completely non-intrusive which does not affect the driver in any way, hence giving the exact condition of the driver. For detection of drowsiness the per closure value of eye is considered. So when the closure of eye exceeds a certain amount then the driver is identified to be sleepy. For implementing this system several OpenCv libraries are used including Haar-cascade. Also in order to improve the security and safety of the driver and also strictly monitor if the driver is following "do not drink and drive" rule. The alcohol is been sensed before the vehicle is started if at the driver consumption of alcohol is detected by the driver the vehicle will not start. This avoids the driver to violate the rules and also to be safe at the same time.

I.INTRODUCTION

Among many other issues concerning traffic accidents in this busy world, drowsy driving is one of the major issues that is highly required to be brought into consideration. According to, 846 deaths have occurred due to drowsy driving in the year 2014. An estimated average of 83,000 crashes per year was identified with drowsy driving between 2005 and 2009. This annual average incorporates approximately 886 deaths, 37,000 injuries, and 45,000 property damage only due to car crashes. Drowsy driving occurs when the driver is extremely worn out while driving, making him impossible to stay alert. This usually occurs when the driver does not get sufficient amount of sleep or is under medications. This can also occur when he suffers from sleep disorders such as insomnia or shift work sleep disorder (SWSD). As a result, the driver tends to have a mild cognitive impairment and also slow reaction times. In the most pessimistic scenario, the driver may fall asleep behind the wheel . Several attempts were taken to detect the drowsiness of the driver by considering various parameters. Many existing methods implemented vehicle- based measures which involve mounting sensors on various components of the vehicle. The sensors are usually placed on acceleration pedal and steering wheel, to evaluate the intensity of the drowsiness. The process of implementing vehicle-based measures can be further broken down into two categories. The evaluation can be performed based on two approaches, namely Steering Wheel Movement (SWM) and Standard Deviation of Lane Position (SDLP). In order to measure SWM, an angle sensor is utilized to determine the driver's level of drowsiness based on his steering pattern. On the other hand, SDLP implements an external camera which is used to determine whether the vehicle is drifting out of its lane. However, evaluations based on vehicle-based parameters highly rely on the physical aspects of the surrounding environment and the driver himself. These factors basically involve the structure of the road, the type of vehicle used and the driving pattern of the driver which affect the accuracy of the evaluation. Besides, such measurements are also used to detect other sources of traffic accidents such as the drowsiness based on alcohol consumption. As a result, vehicle-based measurements would not be able to detect the cause of the drowsiness particularly. Apart from this, some approaches implemented psychological measures to monitor the drivers' fatigue status which is executed by recording psychological signals using either electroencephalogram (EEG), electrooculography (EOG), electromyography (EMG) or electrocardiography (ECG). One advantage of using psychological measurements is that the evaluations based on such parameters can predict drowsiness with better accuracy since the psychological signals can well represent the cognitive activities of the brain. However, such techniques are intrusive since sensors are required to be placed on the driver's body in order to collect the data. This may make the driver feel uncomfortable and also divert his attention from driving . Few existing approaches used subjective measurements which are conducted through self-rating of the driver or through questionnaire . Nevertheless, such techniques can lead to anomalous result as the self assessment method can alert the driver subconsciously, decreasing the intensity of drowsiness.

II.LITERATURE SURVEY

In this busy world, drowsy driving is one of the major issues that is highly required to be brought into consideration. According to **[1]** ,1846 deaths have occurred due to drowsy driving in the year 2014. This annual average incorporates

approximately 886 deaths, 36,000 injuries, and 45,000 property damage only due to car crashes. The report of National Sleep Foundation (NSF) says that above 51% of drivers drive their vehicle in a drowsy or sleepy state and about 17% had actually fallen asleep. Drowsy driving occurs when the driver is extremely worn out while driving, making him impossible to stay alert. Vehicle drivers lose their control on the vehicle when they are feeling sleepy or when they are consuming liquors. Road accidents cause damage to property as well as life. Thus there is need of development of methods for avoiding hazardous effects of drowsiness on roads [2].

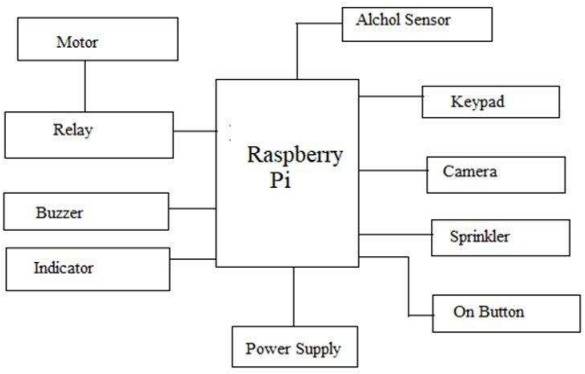
This usually occurs when the driver does not get sufficient amount of sleep or is under medications. This can also occur when he suffers from sleep disorders such as insomnia or shift work sleep disorder (SWSD). According to [3], the driver tends to have a mild cognitive impairment and also slow reaction times. In the most pessimistic scenario, the driver may fall asleep behind the wheel. The purpose of our work is to detect different mental conditions and effect of alcohol on the brain signals based on EEG signals. The drowsiness and alcoholic state can be detected from the frequency plot of different brain signals [4,5]. According to [6-8] the evaluation can be performed based on two approaches, namely Steering Wheel Movement (SWM) and Standard Deviation of Lane Position (SDLP). In order to measure SWM, an angle sensor is utilized to determine the driver's level of drowsiness based on his steering pattern. According **to** [9] evaluations based vehicle-based parameters highly rely on the physical aspects of the surrounding environment and the driver himself. These factors basically involve the structure of the road, the type of vehicle used and the driving pattern of the driver which affect the accuracy of the evaluation. Referring to the previously specified issues [10-13, 14-17]; we have proposed a method, which is based on the behavioral measurements, in which the eye closure ratio is used as the input parameter for detecting driver's drowsiness. From earlier research it is found that there are many number of methods to detect the drowsiness condition, out of which some techniques are very popular like change in position of driver which is detected by the camera, measuring physiological parameters i.e. eye blinking, EEG activities. EEG is well known for noninvasive measurement of different brain waves with high resolution in mill range [18]. The presence of alcohol in body affects the normal range of brain signal . In this study a set of EEG signals is used to detect whether a person is drunk or not [19]. In reality the signals received from the human brain contains the information about the person's current status. Researchers have been trying to prepare different drowsiness detectors [20]. The alcohol detectors to avoid drunk and drive accidents have also been the fascinating research issue. Existing methods use both active and passive techniques to develop real-time monitoring systems. Active methods use special hardware such as illuminators [21], infrared cameras, wearable glasses with special close-up cameras observing the eyes [22], electrodes attached to the driver's body to monitor biomedical signals, like cerebral, muscular and cardiovascular activity [23,24]. Passive techniques in monitoring systems majorly rely on the standard remote camera. A set of these passive methods are based on the driver's performance, by evaluating variations in the lateral position of the vehicle, velocity and steering wheel angle [25]. Another category of passive methods is based on real-time visual analysis of the driver, using image processing techniques. Computer vision can be a natural, nonintrusive and intuitive solution for monitoring drowsiness and loss of vehicle control due to stupor under the influence of alcohol. These approaches are both cost effective and efficient, as the indications of drowsiness and drunkenness can be easily detected through facial and head/body movements. Several analysis algorithms and cameras have been documented in the literature for this approach, techniques using visible spectrum camera [26] and [27]. Effective method for the correct identification of drowsiness is iris scan. Researchers have been developing several prototypes and modules for iris scanning. When there is drowsiness, blinking of eyes is abnormal. Detection of frequency of opening and closing rate of eye is fundamental objective kept for developing the prototype. Drowsiness is intermediate stage between wakefulness and sleep that has been defined as the state of progressive impaired awareness associate with the desire or inclination to sleep [28].

In order to effectively capture the face, the Pi camera is mounted on the vehicle dashboard and is kept approximately 20 cm away from the driver's **face** [29]. This Pi camera is connected with the Raspberry Pi with the help of a flexible cable and the Raspberry Pi itself, can be placed anywhere inside the vehicle, out the human eyesight. The existing systems based on real-time driver monitoring, using image processing techniques are largely tackling one aspect of the problem, i.e. either drowsiness or drunkenness. To the best of the authors' knowledge, there are no software solutions using image processing techniques, for tackling both these problems as a whole and providing a complete analysis of whether the driver is fit to drive or not. The present approach requires no sophisticated or costly hardware equipment or difficult calibration processes and is simple, user – friendly and cost - effective. In order to effectively capture the face, the Pi camera is mounted on the vehicle dashboard and is kept approximately 20 cm away from the driver's face [30]. This Pi camera is connected with the Raspberry Pi with the help of a flexible cable and the Raspberry Pi itself, can be placed anywhere inside the vehicle, out the human eyesight. Initially, the detection of facial landmarks was performed using the Haar Cascade classifier. Once the various areas of the face were detected, the eye regions were extracted to measure the eye closure ratio. If the eye closure ratio of the driver deteriorates from what is considered to be the standard ratio of an individual in a normal state, the diver is instantly alerted with the help of the buzzer. Moreover, to ensure the driver is taking proper measures to not fall asleep, the owner of the vehicle is notified as well through an e-mail which will be sent automatically if the driver is found to be dozing off more than a couple of times. The entire system was integrated using a Raspberry Pi and a Pi camera was used for tracing the eye movements.

III. PROPOSED METHODOLOGY

This project can be executed in two ways: measuring changes in physiological signs, for example, brain waves, heart rate, and eye flickering; and measuring physical changes, for example, sagging posture, inclining of the driver's head and the open/shut conditions of the eyes. In spite of the fact that this procedure is most precise, it is not reasonable, since detecting electrodes would need to be put straightforward onto the driver's body, and thus be irritating and diverting to the driver. Also, long time driving would bring about sweat on the sensors, reducing their capacity to screen precisely. Hence this approach will be mostly focusing on amount of eye closure also called (PERCLOS) percentage of closure as it provides the most accurate information on drowsiness. It is also nonintrusive in nature, hence does not affect the state of the driver and also the driver feels totally comfortable with this system. Environmental factors like road condition does not affect this system. The case of micro nap is also detected according the given threshold value. The development of this system includes face identification and tracking, detection and location of the human eye, human eye tracking, eye state detection, and driver fatigue testing. The key parts of the detection framework fused the detection and location of human eyes and driver fatigue testing. The improved technique for measuring the PERCLOS estimation of the driver was to compute the proportion of the eyes being open and shut with the aggregate number of frames for a given period. And adding to it will be the Alcohol Sensor to detect the level of consumption of alcohol if the driver has consumed alcohol more than the threshold value the vehicle ignition is not enabled.

IV. ARCHITECTURAL DESIGN



The central component here is the Raspberry Pi. All the various working modules are connected to it. The various other components include the Alcohol Sensor, Keypad, Camera, Water Sprinkler, on and off buttons, power supply, back indicator, buzzer and relay which is thereby connected to the motor. All the devices work in co-ordination with each other.

V.CONCLUSION

Implementation is done using Open CV library, which is used to detect the drowsiness of the driver by capturing the image. Raspbian OS is used in order to get input from the all the sensor and to react according to data given in order to wake up the driver from the drowsiness. In unit testing, we have certain modules to test the alcohol sensor, buzzer and water sprinkler respectively. In integration testing we have certain modules in which two components are combined together and tested as a single system. In System Testing we have certain module to test the system as a whole to ensure that our system is working effectively. By using all this we can detect the drowsiness of driver and wake up him by using alerting device. The certain things which our system performs are: Capturing the video when the car is in movement and then Captured video was divided into frames and each frame were analyzed. Successful detection of a face followed by detection of eye. If closure of eye for successive frames were detected then it is classified as drowsy condition else it is regarded as normal blink and the loop of capturing image and analyzing the state of the driver is carried out again and again.

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Novel Method of Covid-19 Detection Using Deep Neural Networks

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Abstract: The novel coronavirus 2019 (COVID-2019), which first appeared in Wuhan city of China in December 2019, spread rapidly around the world and became a pandemic. It has caused a devastating effect on both daily lives, public health, and the global economy. It is critical to detect the positive cases as early as possible so as to prevent the further spread of this epidemic and to quickly treat affected patients. The need for auxiliary diagnostic tools has increased as there are no accurate automated toolkits available. Recent findings obtained using radiology imaging techniques suggest that such images contain salient information about the COVID-19 virus. Application of advanced artificial intelligence (AI) techniques coupled with radiological imaging can be helpful for the accurate detection of this disease, and can also be assistive to overcome the problem of a lack of specialized physicians in remote villages. In this study, a new model for automatic COVID-19 detection using raw chest X-ray images is presented. The proposed model is developed to provide accurate diagnostics for binary classification (COVID vs. No-Findings) and multi-class classification (COVID vs. No-Findings vs. Pneumonia). Our model produced a classification accuracy of 98.08% for binary classes and 87.02% for multiclass cases. The DarkNet model was used in our study as a classifier for the you only look once (YOLO) real time object detection system. We implemented 17 convolutional layers and introduced different filtering on each layer. Our model (available at can be employed to assist radiologists in validating their initial screening, and can also be employed via cloud to immediately screen patients.

1. Introduction

COVID-19 pandemic is the most widely pandemic in the 21st century and is caused by the SARS-COV2 virus. The COVID-19 spreads between people mainly through direct contact or air droplet. Currently, there are 179 million infected people with more than 3 million deaths worldwide. The number continuously increases. The most common symptoms of COVID-19 are fever, weakness, cough and diarrhea. More than half of patient report shortness of breathes with few developing acute respiratory distress syndrome. The disease is estimated has the mortality rate around 3.4%, however, the number could vary among countries or areas. The COVID-19 pandemic is not only a health crisis but also affecting societies and economies at their core. The pandemic has major impact in many aspects of human life such as in education, tourism, energy (especially oil and gas), transportation, manufacture, healthcare, politics as well as economics. Many efforts have been made to deal with the pandemic such as reducing the spread of the diseases, improving the disease detection methods, as well as accelerate the availability of COVID-19 vaccine. There is increased demand for testing, diagnosis, and treatment due to the massive cases of COVID-19. The definitive test for COVID-19 diagnosis is reverse transcription polymerase chain reaction (RT-PCR). Using the technique, the test samples need to be processed in the lab. With a very large number of samples, and each sample waits its turn to be processed; it may take several days to obtain the result. Due to the low RT-PCR sensitivity of 60%–70%, even if negative results are obtained, symptoms can be detected by examining radiological images of patients. It is stated that CT is a sensitive method to detect COVID-19 pneumonia, and can be considered as a screening tool with RT-PRC. CT

findings are observed over a long interval after the onset of symptoms, and patients usually have a normal CT in the first 0–2 days. In a study on lung CT of patients who survived COVID-19 pneumonia, the most significant lung disease is observed ten days after the onset of symptoms. An alternative test for the diagnosis of COVID-19 is using chest X-ray radiography. It is a fast, effective, and affordable test that identifies the possible COVID-19-related pneumonia stated that there are differences of X-ray and CT scan result before and after experiencing COVID-19 symptoms. These reveal that the results of CT scans and X-rays can be used to determine whether a person infected by SARS-COV2 virus or not. In response to the pandemic outbreak, many researchers from various backgrounds actively participate in finding effective diagnostic mechanism and vaccination for its treatment. The researchers' domain not only limited to the medical and biotechnology fields but also involves researcher from other fields such as data science, machine learning and deep learning. An example of deep learning approach to detect COVID-19 is based on the X-ray or CT scan images. The use of X-ray images is based on the fact that once the corona virus enters the respiratory tract; it will affect the lungs of the person and causing pneumonia. In this case, the lungs become filled with fluid, get inflamed and develop patches called "Ground-Glass Opacity" (GGO). Therefore, it is possible to detect COVID-19 based on the chest X-ray of infected people. X-ray machine is well known for scanning various human organs. Commonly, the interpretation of X-ray images is performed by expert radiologists. The advanced development of deep learning, especially Convolutional Neural Network (CNN), enable the interpretation of X-ray images conducted automatically by system. A good system is a system that can be relied on and has high accuracy to minimize misdiagnosis. It is also important to consider common disorders so that they do not lead to misdiagnoses.

2. Related Works:

In reference 1, The proposed model is based on 14 layers of convolutional neural network with a modified spatial pyramid pooling module. The multiscale ability of the proposed network allows it to identify the COVID-19 disease for various severity levels. According to the performance results, the proposed SPP-COVID-Net achieves the best mean accuracy of 0.946 with the lowest standard deviation among the training folds accuracy. It comprises of just 862,331 total number of parameters, which uses less than 4 Megabytes memory storage. The model is suitable to be implemented for fast screening purposes so that better-targeted diagnoses can be performed to optimize the test time and cost.

In reference 2, the deep studying based totally methodology is usually recommended for the detection of COVID-19 infected patients using X-ray images. The help vector gadget classifies the corona affected X-ray images from others through usage of the deep features. The technique is useful for the clinical practitioners for early detection of COVID-19 infected patients. The suggested system of multi-level thresholding plus SVM presented high accuracy in classification of the infected lung. All images were of the same size and stored in JPEG format with 512 * 512 pixels. The average sensitivity, specificity, and accuracy of the lung classification using the proposed model results were 95.76%, 99.7%, and 97.48%, respectively.

In reference 3, DCNN based model Inception V3 with transfer learning have been proposed for the detection of coronavirus pneumonia infected patients using chest X-ray radiographs and gives a classification accuracy of more than 98% (training accuracy of 97% and validation accuracy of 93%). The results demonstrate that transfer learning proved to be effective, showed robust performance and easily deployable approach for COVID-19 detection.

In another attempt, the authors in [5] have worked on the same issue in a different way. The model here is trained using 120 X-ray images (60 COVID-19 and 60 normal) and 339 CT scan images (192 COVID-19 and 147 normal) [5]. The dataset is divided into two categories: 50% to train the CNN and remaining 50% to validate the model 3 times in each epoch [5]. The testing of the model was done on a total of 67 images comprising both X-ray and CT scan images. The proposed model here consists of a CNN with one convolution layer which is followed by a Batch Norm layer followed by ReLU activation [5]. The fully connected layer is followed by a SoftMax layer which outputs '0' or '1'. The concepts of transfer learning have also been implemented here and the pretrained model Alex Net has been used which has been trained on over a few million images on ImageNet and in the range of 1000 classes [5]. The last layer of the Alex Net has been replaced to obtain binary results [5]. The comparisons in the results show that the proposed CNN performs better than the Alex Net in case of CT scans with an accuracy of 94.1% as compared to 82% for the Alex Net

3. Methodology

The invention of the CNN in 1994 by Yann LeCun is what propelled the field of Artificial Intelligence and Deep learning to its former glory. The first neural network named LeNet5 had a very less validation accuracy of 42% since then we have come a long way in this field. Nowadays almost all giant technology firms

rely on CNN for more efficient performance. The data training in our CNN model has to satisfy following constraints:

1) There should be no missing values in our dataset.

2) The dataset must distinctly be divided into training and testing sets, either the training or the testing set shouldn't contain any irrelevant data out of our model domain in case of an image dataset all the images must be of the same size, one uneven distribution of image size in our dataset can decrease the efficiency of our neural network.

3) The images should be converted into black and white format before feeding it into the convolution layer because reading images in RGB would involve a 3-D NumPy matrix which will reduce the execution time of our model by a considerable amount.

4) Any kind of corrupted or blurred images should also be trimmed from the database before feeding it into the neural network. Now we have learned the data pre-processing rules, let us dive right into the working of the convolutional neural network.

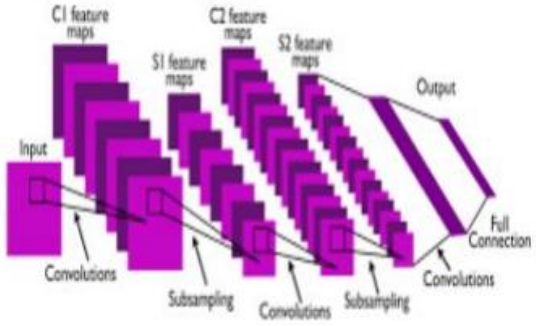


Fig 3: CNN layers

The Algorithms\Layer Used in our model are:

A. Convolution layer:

This layer involves scanning the whole image for patterns and formulating it in the form of a 3x3 matrix. This convolved feature matrix of the image is known as Kernel. Each value in the kernel is known as weight vector

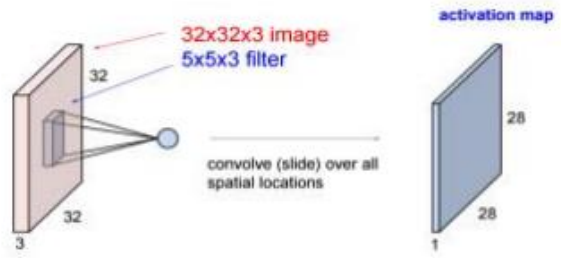


Fig 4: Convolution layer

B. Pooling layer:

After the convolution comes to the pooling here the image matrix is broken down into the sets of 4 rectangular segments which are non-overlapping. There are two types of pooling, Max pooling and average pooling. Max pooling gives the maximum value in the relative matrix region which is taken. Average pooling gives the average value in the relative matrix region. The main advantage of the pooling layer is that it increases computer performance and decreases over-fitting chances.

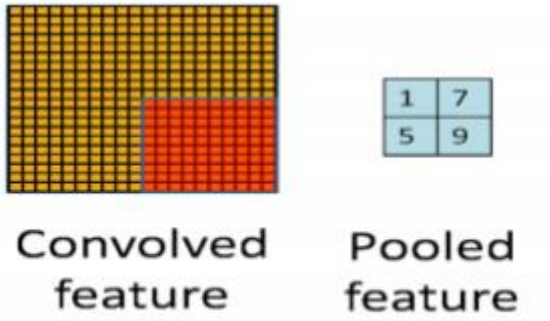


Fig 5: Pooling layer

C. Activation layer:

It the part of the Convolutional Neural Networks where the values are Normalized that is, they are fitted in a certain range. The used convolutional function is ReLU which allows only the positive values and then rejects the negative values. It is the function of low computational cost.

D. Fully connected layer:

Here the features are compared with the features of the test image and associate similar features with the specified label. Generally, labels are encoded in the form of numbers for the computational ease, they will be later converted into their respective strings.

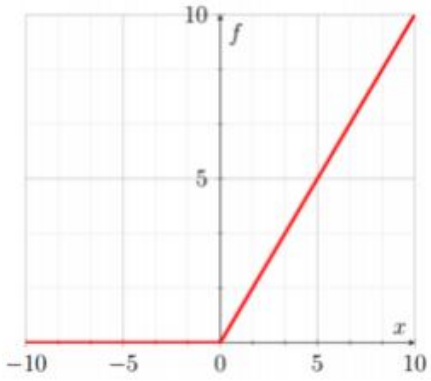
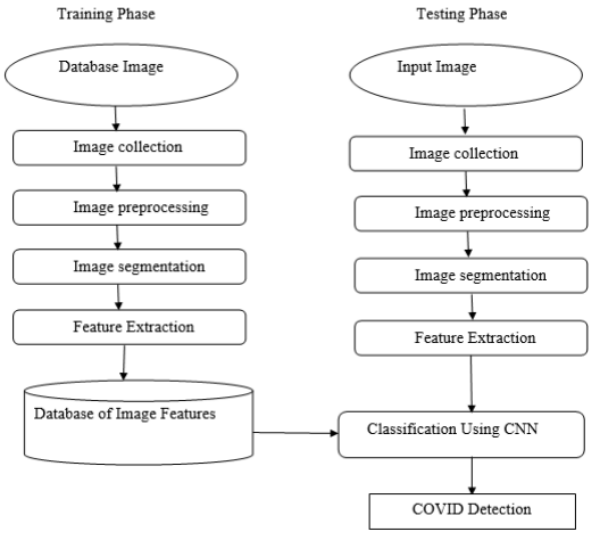


Fig 6: ReLU function

4. Proposed Model



System Architecture

The system design mainly consists of:

1. Image Collection
2. Image Pre-processing
3. Image Segmentation
4. Feature Extraction
5. Training
6. Classification

1. Image Collection:

Input to proposed system is Classification of X-Ray Scan images, CT images are images taken . It is kind of magnifier used to take pictures of CT Images.

2. Image Pre-processing:

Goal of pre-processing is an improvement of image data that reduces unwanted distortions and enhances some image features important for further image processing. Image pre-processing involves three main things

a) Gray scale conversion b) Noise removal c) Image enhancement.

a) Grayscale conversion

Grayscale image contains only brightness information. Each pixel value in grayscale image corresponds to an amount or quantity of light. The brightness graduation can be differentiated in grayscale image. Grayscale image measures only light intensity 8 bit image will have brightness variation from 0 to 255 where '0' represents black and '255' represents white. In grayscale conversion colour image is converted into grayscale image. Grayscale images are more easy and more faster to process than coloured images. All image processing technique are applied on grayscale image. In our proposed system X Ray image is converted into grayscale image.

b) Noise Removal:

The objective of noise removal is to detect and remove unwanted noise from digital image. The difficulty is in deciding which features of an image are real and which are caused by noise. Noise is random variations in pixel values. In our proposed system we are using median filter to remove unwanted noise. Median filter is nonlinear filter, it leaves edges invariant. Median filter is implemented by sliding window of odd length. Each sample value is sorted by magnitude, the centre most value is median of sample within the window, is a filter output.

c) Image Enhancement:

The objective of image enhancement is to process an image to increase visibility of feature of interest. Here contrast enhancement is used to get better quality result.

3. Image Segmentation:

The next step after image pre-processing was to segment the Lung area from the surrounding X-Ray Images. A black and white image was produced with its contrast adjusted to provide better segmentation.

4. Feature Extraction:

Feature extraction plays an important role in extracting information present in given image. Here we are using GLCM for texture image analysis. GLCM is used to capture spatial dependency between image pixels. GLCM works on Gray level image matrix to capture most common feature such as contrast, entropy, energy, homogeneity, correlation, ASM, cluster-shade. Contrast

$\sum i \sum j$ $(i-j)$ 2 $C(i,j)$ Energy $\sum i \sum j C$ 2 (i,j) Homogeneity $\sum i \sum j$ $C(i,j)$ 1+|i−j| The purpose of feature extraction (glcm) is to suppressed the original image data set by measuring certain values or features that helps to classify different images from one another.

5. Training:

Create training dataset from images of known Cancer types. Train classifiers on the created training dataset. Create testing dataset in temporary folder. Predict results from the test cases. Plot classifiers graphs. Add feature-sets to test case file, to make image Processing models accurately.

6. Classification:

The binary classifier which makes use of the hyper-plane which is also called as the decision boundary between two of the classes is called as Convolution Neural Network. Some of the problems are pattern recognition like texture classification make use of CNN. Mapping of non-linear input data to the linear data provides good classification in high dimensional space in CNN. The marginal distance is maximized between different classes by CNN. Different Kernels are used to divide the classes. SVM is basically binary classifier which determines hyper plane in dividing two classes. The boundary is maximized between the hyper plane and two classes. The samples that are nearest to the margin will be selected in determining the hyper plane are called support vectors.

5. Experimental Results

First, based on three confusion matrices, the overall 3-class classification accuracy levels are 93.9 % (796/848), 94.7 % (803/848), and 94.9 % (805/848), respectively. The difference is approximately 1%. Then, based on the confusion matrix of the combined data, we compute the precision, recall rate, F1-score, and prediction accuracy of the new transfer learning VGG16 based CNN model, as shown in Table 3 . Among 2544 testing cases, 2404 are correctly detected and classified into 3 classes. The overall accuracy is 94.5 % (2404/2544) with 95 % confidence interval of [0.93, 0.96]. In addition, the computed Cohen's kappa coefficient is 0.89, which confirms the reliability of the proposed approach to train this new deep transfer learning model to do this classification task.

Table 3

Classification report of the proposed method.

	Precision	**Recall**	**F1-score**	**Support cases**
Normal	0.96	0.91	0.93	864
Other Pneumonia	0.96	0.96	0.96	1554
COVID19	0.73	0.98	0.84	126
Accuracy	---	---	**0.95**	2544
Macro avg	0.88	0.95	0.91	2544
Weighted avg	0.95	0.94	0.94	2544

To further evaluate the performance of our model in detecting the COVID19 infected cases using chest X-ray images, we place both normal and community-acquired pneumonia images into the negative class and COVID-19 infected pneumonia cases into the positive class. Combining the data in the confusion matrix, as shown in, the model yields 98.4 % detection sensitivity (124/126) and 98.0 % specificity (2371/2418). The overall accuracy is 98.1 % (2495/2544).

Next, Table 4 shows and compares confusion matrixes generated by four models trained and tested using different input images and three data subsets generated from the data partition, as well as overall classification accuracy and 95 % confidence intervals. The results indicate that without using the data augmentation technique, the model accuracy on data of the testing subset drops to 82.3 % with the kappa score of 0.71. Without applying image pre-processing and directly feeding the original chest X-ray images into the VGG16 based CNN model ("simple model"), classification accuracy is 88.0 % with a Cohen's kappa score of 0.75. Using image filtering and pseudo colour images without removing the majority part of diaphragm regions, the "filter-based model" yields 91.2 % accuracy and a Cohen's kappa score of 0.83. All three models yield lower classification accuracy than the proposed model involving data augmentation technique and two steps of image pre-processing.

Table 4

Confusion matrix of four CNN models on X-ray Images. 95 % confidence interval (CI) for the accuracy is shown in the last column.

		Normal	Pneumonia	COVID19	Accuracy	95 % CI
Proposed Model	Normal	788	56	20	94.5 %	[0.93,0.96]
	Pneumonia	35	1492	27		
	COVID 19	1	1	124		
Filter-based model	Normal	750	89	25	91.2 %	[0.90,0.92]
	Pneumonia	64	1452	38		
	COVID19	2	6	118		
Simple model	Normal	701	123	40	88.0 %	[0.86,0.89]
	Pneumonia	72	1431	51		
	COVID19	6	13	107		
No-augmentation	Normal	653	158	53	82.3 %	[0.80,0.84]
	Pneumonia	124	1346	74		
	COVID19	8	23	95		

True Label

Study results demonstrate that this transfer learning approach can yield higher performance with the overall accuracy of 94.5 % (2404/2544) in the classification of 3 classes and 98.1 % (2495/2544) in classifying cases with and without COVID-19 infection, as well as the high robustness with a Cohen's kappa score of 0.89.

6. CONCLUSION

In this study, we proposed and investigated several new approaches to develop a transfer deep learning CNN model to detect and classify COVID-19 cases using chest X-ray images. Study results demonstrate the added value of performing image preprocessing to generate better input image data to build deep learning models.

We are almost certain that it is possible for the proposed CNN model shows the equivalent of the highest score for the accuracy of a specialized chest radiologist, represents a very effective examination tool for the rapid diagnosis of many infectious diseases such as the Covid-19 epidemic that do not require the introduction of a radiologist or physical examinations. The aim of this work is to evaluate the ability of the proposed CNN algorithm to discriminate between healthy and covid. It can be concluded that the system gave very encouraging results. the used texture and color features enhanced the performance of our system and gave high recognition accuracy. This accuracy proves that the texture features are very useful as recognition features for diagnosis of covid.

The system can be also used for detecting Pneumonia diseases by choosing the proper training sets.

In future studies, we recommend addressing other topics such as outbreak escalates, as well as trying to explore different approaches to Convolutional Neural Networks, including deep learning models and improved interpretation of CNN models.

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Smart Water Quality Monitoring System Using IoT

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Abstract: *Water is one of the most essential elements for the existence of life. The safety and accessibility of drinking water are major concerns throughout the globe. Health risks may arise from the consumption of water contaminated with infectious agents, toxic chemicals, etc. Water is one of the major compounds that profoundly influence ecosystems. But nowadays it is being exploited heavily due to rapid industrialization, human waste, and random use of pesticides and chemical fertilizers in agriculture, which leads to water contamination. Thus, Smart Water Quality Monitoring System is used to check the water quality and warn the user if water is contaminated. This system comprises numerous sensors. The different sensors are used to monitor the different parameters of water i.e., pH, turbidity, conductivity, temperature, and flow rate. These parameters are taken into account and used for predicting whether the water is good for drinking or not. All the sensors are connected with Arduino. Arduino converts the signal form into a system readable form and sends it to the Wi-fi module. Finally, the sensor value can be viewed on the LCD and on ThingSpeak Channel using the Wi-Fi module.*

Keywords: IoT, ThingSpeak, Arduino, LCD, Sensors

I. INTRODUCTION

It is a well-known fact that pure water is absolutely essential for healthy living. It is a vital natural resource that impacts almost all ecosystems and life sustainability. An adequate supply of pure and clean drinking water is a basic need for all human beings on the earth, yet it has been observed that millions of people worldwide are deprived of this. With the continuous economic growth, the water demand is also increasing. Almost 71% of the Earth's surface is covered by water, and over 96% of water is saline in the oceans. The amount of fresh water on the planet is limited to around 2.5% and less than 1% of the total amount of water is consumable. It can become even more scarce every year, which affects part of the world population that is growing.

Environmental pollution is the main reason to measure and understand the toxic, chemical, and biological quality parameters of water. Most of the water bodies are polluted by humans. According to resources 11% of the world's population, that is 780 million people, are deprived of adequate amounts of water. 25 % of the people do not have proper sanitation.

IoT is a technology that is currently booming with a wide range of applications. IoT, Internet of Things is a system of interrelated computing devices, mechanical and digital machines, physical objects, controllers, sensors, actuators, and internet that is used for the purpose of connecting and exchanging data with other devices without requiring human to human or human to computer interaction.

The principal architecture of IoT is based on three layers:

- Physical Layer: In the physical layer, sensors measure the data from the outside environment and turn into valuable data.
- Network Layer: In the network layer, the raw data are collected from various sensors to be aggregated and converted to digital streams for data processing.
- Application Layer: The application layer delivers specific services to the user.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of

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the work without human intervention, although people can interact with the devices for instance, to set them up, give them instructions or access the data. With the Internet of Things (IoT) paradigm, smart devices like smart showers, water monitoring systems, and swimming pool automated treatment systems can be interconnected in integrated solutions, granting the best co-operation and interoperability among them.

The main purpose is to develop a Water Quality monitoring System Using Internet of Things (IoT) which has different sensors and they are used to monitor the different parameters of water in real time.

II. RELATED WORK

1. "IoT based Water Quality Monitoring System and Evaluation"

This work discusses the proposed Smart Water Quality Monitoring System (SWQMS) design, and the evaluation of factors influencing pH value and temperature of swimming pools using DOE and ANOVA statistical tools. The experimental findings reveal that time of day, pool volume and their interaction factors do not influence the pH value however time of day does have an effect on the water temperature of the swimming pool. The project focuses on finding significant factors that influence the pH value and temperature based on the Design of Experiment (DOE) approach. The data of the pH value and temperature were analyses using the Minitab 16 software and two-way ANOVA (Analysis of Variance) are chosen to run the statistical analysis. In the system implementation, the staff will be able to monitor the pH value in real-time using their mobile phone or personal computer. Hence, prompt action can be taken in order to ensure the swimming pool is safe to be used all the time [1].

2. "IoT based Smart Water Quality Monitoring System"

This work represents an IoT (Internet of things) based smart water quality monitoring (SWQM) system that aids in continuous measurement of water condition based on four physical parameters i.e., temperature, pH, electric conductivity and turbidity properties. Four sensors are connected with Arduino-uno in a discrete way to detect the water parameters. Extracted data from the sensors are transmitted to a desktop application developed in .NET platform and compared with the WHO (World Health Organization) standard values. Based on the measured result, the proposed SWQM system can successfully analyses the water parameters using a fast forest binary classifier to classify whether the test water sample is drinkable or not [2].

3. "Automated IoT based Smart Water Quality Assessment System"

The main objective of this work was to implement a water parameter monitoring system through Smart Technologies/ Internet of Things/ smart imaging technique or other relevant method for Bhimtal/ Nainital Lake or various water bodies of Uttarakhand. This paper presents Development of Internet of Things (IoT) based Water Quality monitoring System. The different sensors are used to monitor the different parameters of water. The whole system has Arduino to interface the sensors and GSM module for remotely monitoring the data. This complete system is solar powered. The device is useful for accessing the quality of water. Also, the device can measure other physical and chemical properties of the water. The apparatus consists of modules like turbidity sensor, pH sensor, temperature & TDS Sensor. All sensors are connected with Arduino. Arduino converts the signal form into system readable form and sends it to the GSM module. The GSM Module will send the sensed data to Smart devices/ cloud through the IOT platform. The result can be accessed daily/weekly or monthly [3].

4. "Smart Water Monitoring System for Real-time water quality and usage monitoring"

This work presents designing a Smart Water Monitoring System (SWMS) for real-time water quality and usage monitoring. It consists of two parts: Smart Water Quantity meter and Smart Water Quality meter. The objective of designing Smart Water Quantity Meter is to ensure water conservation by monitoring the amount of water consumed by a household, notifying the consumer and the authority. A three-slab billing system generates consumption bills according to the quantity consumed. The Smart Water Quality meter checks the purity of portable water that the consumer receives, by measuring five qualitative parameters of water viz. pH, temperature, turbidity, dissolved oxygen and conductivity. The system ensures to prevent any health hazards or potential threats caused due to accidental seepage of sewage or farm release into the potable water. An online monitoring system is to provide these data on the cloud in real-time. Any violations in either the usage limit or water quality is immediately notified to the consumer and authority via SMS and an alert signal generated by the system [4].

5. "IoT technology for Smart Water System"

This work focuses on discussing the architecture, applications and need of IoT in water management systems. This paper surveys the same cause in a few steps. In the first step, a basic architecture is selected and applied in the water distribution system (WDS) by analyzing and comparing different technologies, equipment, cost and methods to build a

ISBN: 979-85-27243-61-1

smart water system. The selection of the best choice can be identified for a smart water system at the end of this step. The next step involves selection of the parameters required using IoT for water distribution. Finally, an overview of the benefits which are necessary to implement IoT in smart water systems is discussed. They discuss the architecture of the IoT, analyzing the factors involved in each of it [5].

III. PROPOSED APPROACH

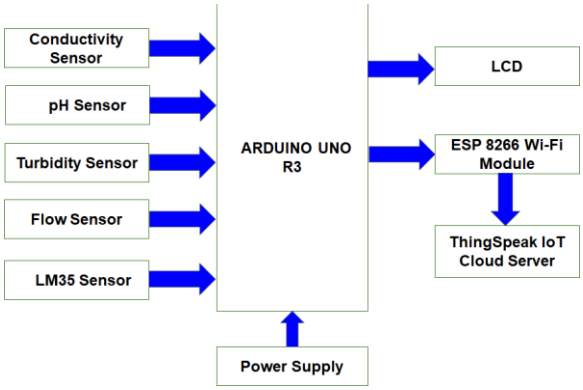

Fig 1: Block diagram of proposed system

Fig 1 is a proposed block model, which monitors the purity of water. It consists of flow sensor, pH sensor, turbidity sensor, LM35 sensor, and conductivity sensor which are connected to Arduino Uno R3 with ESP 8266 module to which power supply is provided. The measured values are displayed to the user on LCD and are stored in the ThingSpeak using Wi-Fi which is used to assess whether the water is drinkable or not.

IV. METHODOLOGY

The system consists of 3 modules:

1. **Data sensing module**: It includes Arduino as microcontroller and all the sensors. The data sensed by the sensor will be passed through Arduino in order to manipulate the analog signal. Data sensing module comprises the sensors and their functionalities that are implemented. All of the sensors are used to measure water quality parameters. Sensors are connected to the respective analog pins on Arduino. The code is written in embedded C and is run on the Arduino IDE. The Arduino is connected to the PC running the IDE. Analog data read from the sensors is processed and converted to digital by the Arduino microcontroller. User defined functions for each of the sensors, calculate the values using the input obtained from each of the sensors. The procedure is as follows:
   a. The system is powered on.
   b. Water to be tested is collected.
   c. The sensors are dipped in the water.
   d. pH sensor is a glass membrane electrode which measures the difference in potential of hydrogen ions between the solution inside the electrode and water to be tested.
   e. Turbidity sensor detects the amount of light that is being reflected by the dissolved particles.
   f. Flow sensor measures the flow of water based on voltage induced when the rotor within the sensor rotates.
   g. Temperature sensor (LM35 sensor) measures the temperature of the water based on the linear scale factor. With an increase in output of 10 millivolt by the sensor, the temperature value increases by one.
   h. Conductivity sensor measures all the overall conductance of the water, based on a voltage divider circuit.
   i. The values measured by the respective sensors are processed by the respective user defined functions running within the Arduino microcontroller.
   j. This data is processed by it and converted to digital.
2. **Display module:** Users can use LCD to access the data read from each of the sensors. The calculated values from each of the user defined functions is sent to the LCD. When a sensor is measuring its value is displayed on the LCD using the pre-defined functions for lcd that are present in the liquid crystal header file.
3. **Server module**: It consists of ESP8266 Wi-Fi module and a PC running the ThingSpeak cloud application which is used to upload and store the data respectively. This module comprises the ESP8266 Wi-Fi module and ThingSpeak cloud server After the connections of the respective components are made, the ESP8266 is connected with Arduino Uno. ThingSpeak is opened a new channel is created. We upload the code which has the Wi-Fi data such as host name, port number, API keys and password relevant to the Wi-Fi module under use. The sensor data are uploaded to ThingSpeak using the user defined functions within the same code. Using the charts, we can monitor the sensor data through graphical representation that ThingSpeak creates.

V. EXPERIMENTAL ANALYSIS

The proposed system is using a Wi-Fi module (ESP8266) to send the sensor data to the cloud. All the sensors are connected to the Wi-Fi module. The Wi-Fi module needs the internet. Hence, mobile data or Wi-Fi can be used as the access point for the internet and then, the data can be sent to the

ISBN: 979-85-27243-61-1

cloud. The server used here is the ThingSpeak IoT platform. This platform provides the features of data analysis and visualization. By having a ThingSpeak account, we can create a channel in it. Each channel can store data in 8 fields. Here 5 data fields of the channel are used to save water quality sensor data. The following figures show the live visualizations of all the different sensors stored in the cloud.

Water pH Result

When a pH sensor is placed into the water sample, it takes some time to measure it and the value is settled. Response time of pH sensor is approximately 1 minute. The pH of acidic water is below 7 and pH of basic water is above 7. The pH of pure water is equal to 7. Water is drinkable if the pH remains between 6.5 and 7.5. Figure 2 shows the results obtained by the pH sensor.

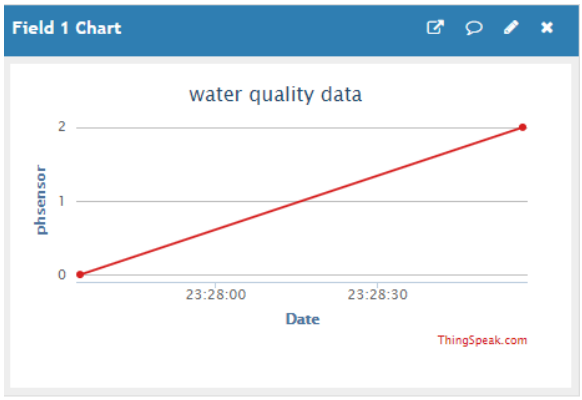

Fig 2: pH result for water sample

Water Temperature Result

Response time of the temperature sensor is less than 10 seconds. As soon as the temperature of water changes, it settles down within a few seconds. Figure 3 shows temperature results for the water sample.

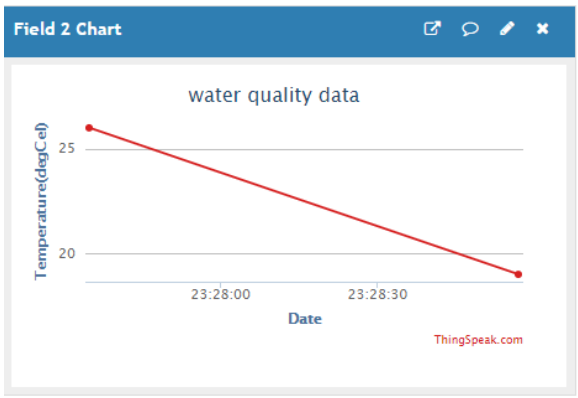

Fig 3: Temperature result for water sample

Water Conductivity Result

The conductance of the water is tested using the conductivity sensor. Figure 4 shows the conductivity of the water sample.

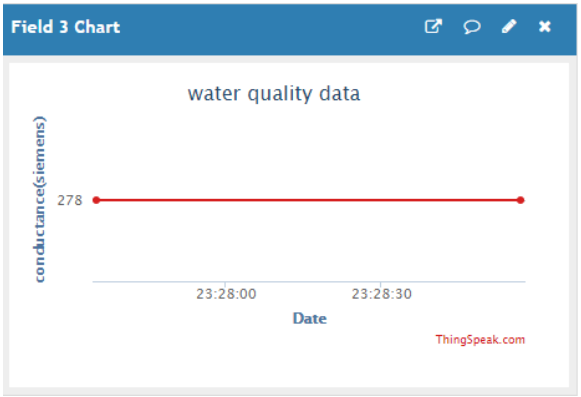

Fig 4: Conductivity result for water sample

Water Turbidity Result

Turbidity measures transparency of water, therefore if water becomes muddier then turbidity increases. Figure 5 shows the result of water turbidity. As long as the turbidity sensor is inside same water sample, turbidity values are constant but while turbidity sensor is taken outside muddy water then turbidity values sharply goes down and soon after it rises up because of new water sample and shows new turbidity value.

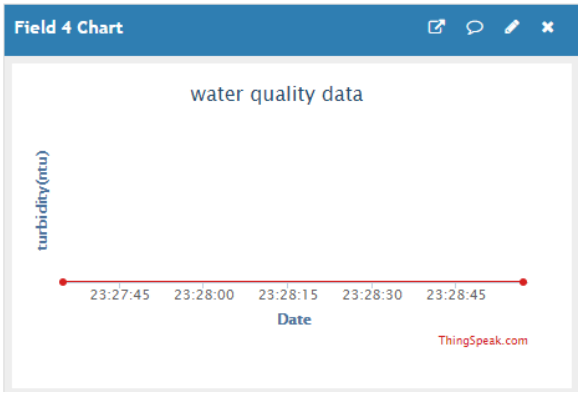

Fig 5: Turbidity result for water sample

Water Flow Rate Result

Flow rate shows the rate of flow of water. Figure 6 shows the flow rate of the water sample.

ISBN: 979-85-27243-61-1

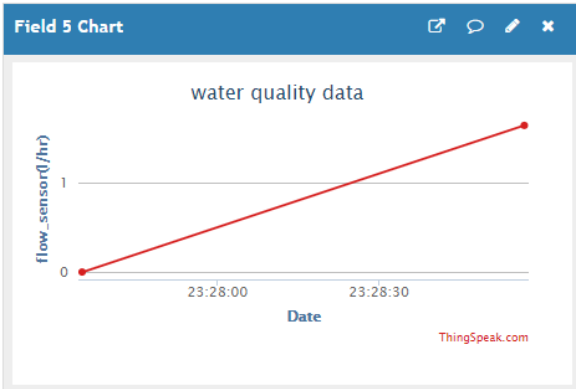

Fig 6: Flow rate result for water sample

VI. ADVANTAGES

- **Time saving:** By using this technique, we can assess the quality of water in a few minutes.
- **Portable:** It can be carried or moved anywhere because it is a lighter and smaller version than usual.
- **Low power consumption:** All components of the system run at a low power of 5v, hence it is efficient
- **Reduction in Manpower:** Since the system is portable, the water quality can be measured at the source itself which reduces the amount of manpower required.
- **Low cost:** It can be purchased or acquired at relatively little cost.
- **High detection accuracy:** High quality sensors enhance the accuracy of the system for assessing the water quality.

VII. APPLICATIONS

Smart Water Quality Monitoring System can be implemented in various fields they are:

1. Smart Water System

Wastewater monitoring and treatment is another upcoming application in IoT to treat the wastewater and use it for household activities and thereby saving the amount of water to a great extent.

2. Smart Irrigation

In farming to control the amount of water for crops based on the surrounding temperature IoT based web applications developed. It also manages the whole irrigation system by smartly monitoring the soil and growth of the crops and the irrigation sprinkler will get activated whenever necessary thereby reducing the water wastage and workload.

3. Smart Gardening

On improving the mental health of the elderly people interested in gardening which uses IoT based web applications developed implementation. It uses a set of sensors to detect the temperature, light, water, soil moisture and a web application to remind the need and amount of water and nutrients for the plants.

4. Aquaculture System

Aquaculture is a technique of determining and alerting users about the water quality for culturing of aquatic organisms using IoT. This application is also used to monitor the plant's environment in aquariums. It helped the aquatic farmers to recycle the water and resulted in increased productivity. Most of the applications mentioned above are developed in the last year which clearly depicts the growth of IoT, especially in water. There is a need for more research in water with the growth of new technologies such as IoT.

5. Prevent Legionella with IoT flow monitoring.

The EPA (United States Environmental Protection Agency) has noted that one of the dangers associated with reopening buildings after a prolonged closure (such as during the COVID-19 pandemic) is the potential presence of Legionella bacteria in building plumbing systems, which can lead to illness. Such bacteria are known to grow when hot water temperatures decrease from the recommended temperature of 140 degrees Fahrenheit to lukewarm (usually anywhere from 77 degrees to 108 degrees Fahrenheit), and disinfectants (like chlorine) dissipate due to inactivity in the pipes over a long period of time (that could be days, weeks, or months, depending on the specific building). Placing IoT sensors on water pipes is one way for building managers to combat Legionella. By monitoring the building's water and plumbing systems, you get a real time analysis of what systems are being used and where. This system allows you to be proactive about finding and solving the problem, rather than doing water quality testing everywhere unnecessarily, or waiting t**o s**ee if a problem crops up later.

VIII. CONCLUSION

The proposed system can monitor water quality automatically. The developed system having Arduino Uno and NodeMCU target boards are interfaced with several sensors successfully. The system has good flexibility. Designed device is low cost as it uses hardware for measuring five water quality parameters (temperature, pH, turbidity, flow and conductivity) using respective sensors with IoT. Hence, the water quality testing is likely to be more economical, convenient and fast. A web-based application i.e., ThingSpeak is used to monitor the parameters such as pH value, the turbidity of the water, flow rate, conductivity of water and temperature through the webserver. The collected data from all the sensors are processed

ISBN: 979-85-27243-61-1

by the Arduino and then each sensor value is displayed through LCD. The data obtained from the sensor is compared to the expected range of the parameters to assess whether the water is drinkable or not. The data is then sent to the web server via Wi-Fi module ESP8266. The operation is simple.

IX. FUTURE ENHANCEMENTS

1. System could be implemented for measuring other chemical parameters.
2. Sending push notifications to mobiles of the users that are saved in the database, along with the email.
3. Developing a custom dashboard using mobile apps would be ideal for such applications in consumer networks.
4. System can be expanded to monitor hydrologic, air pollution, industrial and agricultural production.

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INTELLIGENT AND INNOVATIVE SHOPPING CART FOR SMART CITIES USING INTERNET OF THINGS(IOT)

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Abstract: Humans' level of living has improved as a result of contemporary technologies. In supermarkets, there has been a growing need for quick and fast bill payment. Every one of us desires high quality in the products we use on a regular basis. This project explains how to create an automated, time-saving solution for the retail industry that will make shopping more efficient, customer-friendly, and safe. With the advancement of wireless technology, there are a variety of industries in which we may apply it, and its usage is becoming increasingly popular. We propose our ideas for an autonomous shopping cart employing a Raspberry Pi device with a camera and a digital display screen in this article. As we all know, there is a rush at supermarkets during promotions and holidays, which makes the billing process more time consuming. Customers cannot stay in line for lengthy periods of time for billing purposes, so we may utilize the automated shopping trolley, which includes a camera, Raspberry Pi, mass detection, and a digital display panel. The development of a web application for online processing and cash payment. The consumer will self-scan the merchandise and prepare the bill using this cart. As a result, there will be no long lines at the supermarket's billing counter for the purpose of billing.

Keywords: automated shopping trolley, Raspberry pie, camera, digital display panel, mass detection, web application.

I. INTRODUCTION

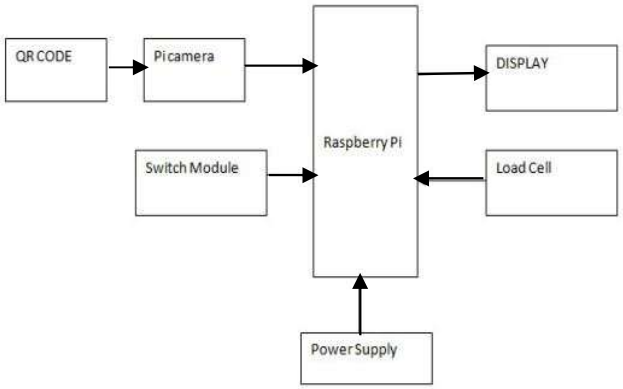
The rapid development and introduction of new and interesting developments in the field of IoT (Internet of Things) have opened the way for novel applications of technology in a variety of industries. With the rising dependability and cost efficiency of Internet of Objects (IoT)-based linked smart things in the sphere of consumer applications, it makes more sense to ensure that such technologies are used to solve the common man's day-to-day issues. We depict the implementation of a trustworthy, sensible, and cost-effective Smart Shopping Cart in this framework. Such a framework is appropriate for usage at Walmart and other retail locations, such as general shops, where it may aid in the reduction of labor and the creation of a greater shopping experience for customers. Rather of forcing customers to wait in a long line to inspect their purchases, the framework aids in the automation of the billing process. In addition to this capability, the framework design ensures that instances of deception created by dishonest clients are identified, making the clever framework reasonable and appealing to both buyers and merchants. This page displays the framework outline as well as the execution. The results are powerful and make purchasing easier and more convenient for customers. The suggested framework's main goal is to provide an innovation-oriented, sharp, simple, flexible, and rough framework for a better in-store experience for the cutting-edge world client. With the growing demands of humanity, new technology is required to make day-to-day tasks easier simple and uncomplicated. We will use RaspberryPie to create an interactive smart trolley system in this project. This solution not only allows users to use real-time spending feedback with the trolley's budget detection system, but it also allows them to communicate with the online application. Users may make a shopping list on the online application before utilizing the smart trolley system for shopping. The user must then enter their account in order to synchronize their shopping lists when utilizing the smart trolley system. This system's concept offers users a straightforward and engaging method to shop for food. They would not lose out on anything they wanted to buy if they used this strategy, and they would stay inside their budget. Without the requirement for additional human resources on the shopkeeper's side, the client will add a product and charge themselves. The suggested method offers a way to increase the speed with which things are purchased and payments are made. This technique offers a way to increase the speed with which things are purchased as well as the speed with which payments are made. We used a Raspberry Pi, a Barcode scanner, a display panel, and a button in the shoppingcart to create this solution. Once the shopping is done, automatic billing creates the bill. As a result, the smart shopping cart's primary goal is to shorten shopping time. Customers may create their own invoices, making it simple for them to estimate their bill. Shopping malls may lower thenumber of people working at billing counters and the amount of space used, which saves time and money. These efforts and investments may be put to bettering the quality and experience of consumers. To entice consumers, more merchandise might be displayed instead of charging counters. The proprietors of shopping malls also minimize the economy at the cash registers. To entice consumers, more merchandise might be displayed instead of charging counters.

II. LITERATURE SURVEY

The article that goes with it examines the many options that researchers have proposed for an IoT-based shopping cart. The author of article [1] addressed the current problem of waiting in a long queue during the billing procedure, and how people rush to avoid it during festival season. The author proposed a smart shopping cart as a solution to this problem. It contains an LCD, a barcode technique, a microprocessor, and Bluetooth. The barcode is used to scan and save the items that the customer purchases in the database. The entire bill is sent to the owner through Bluetooth, and a microprocessor generates the sales slip by calculating the total amount for all purchased items and displaying it on an LCD. The authors of article [3] developed a concept model that used RFID tags on items as well as ZigBee to send invoices to a central server. The disadvantage here is the absence of alternate payment methods for bills other than typical counter payments. Once the consumer has been recognized, the worker is intended to collect the bill, which results in the consumer waiting in lines.

In paper [4] author discussed the current problem of shopping mall for buying the items, which requires a trolley. A customer has to check those items and need to compare with his pocket money. So, to avoid this problem author proposed smart trolley in a mega-mall. It is microcontroller based automatic trolley and it chases the customer while, he is buying the items and it will maintain distance little bit away from the customer. A consumer must position the item in front of the colour sensor, which detects the product's color wrapper and displays the product name and price on the LCD. We looked at a number of articles on smart retail systems. We may deduce from the aforementioned articles that they employed the notion of RFID tags and RFID readers to scan things and generate a bill for the total amount of things purchased. RFID systems, on the other hand, are more costly than ORCode systems and may be less dependable. To circumvent this limitation, we developed an autonomous shopping trolley idea utilizing a Raspberry Pi and a camera with LCD display, which uses ORCode instead of RFID tags. Instead of RFID tags, the client will scan the QRCode. Furthermore, we do not need to attach separate tags to the merchandise when using QRCode because the barcode is printed on the product itself. Furthermore, the proposal included a system in which RFID tags are connected to items and scanned by an RFID reader. However, with this system, it's possible that many RFID tags will reply at the same time. RFID tags are also often bigger than QRCodes. To solve this limitation, we scan QRCodes with a camera, which is more efficient.

III. BLOCK DIAGRAM



IV. PROPOSED SYSTEM

The main purpose of this paper is to reduce and eliminate time spent at grocery store charging counters by designing a smart Shopping Trolley for Shopping Centers Using Web Application that uses standardized tags to allow customers to self-checkout and increase efficiency time. Regardless of the domain, the primary goal of technological progress has been to make ordinary tasks simpler, quicker, and more efficient. Shopping is a minor task in which humans spend a significant amount of time. The shopping carts, on the other hand, have remained the same since their inception, providing simple functions and suffering no modifications in design or purpose. This inspired us to create a novel shopping cart that makes shopping not only efficient, but also pleasurable and convenient for clients. A camera, a weight sensor, a tiny computer for local processing, and a digital display screen are all included in every Shopping Cart. The Base Station, which is located in a central place, contains a database that holds product information and can connect with all Smart Carts over the Wi-Fi network. When a client begins shopping, she or he must first log in with a Customer ID and link the Basket ID to the Customer ID. Once registered, they can scan goods one by one with the Camera using the Barcode found on each product and continue to add them to the cart. They obtain a list of items offered in the store and show current promotions on a digital display. The concept incorporates the usage of a weight sensor at the cart to manage all scenarios of error or dishonesty Furthermore, we may set a budget before we begin buying. When the purchase cost reaches the budget figure, a buzzer sounds, signaling that the budget has been reached. After the consumer has finished shopping, she or he goes to the payment counter to settle the cost. Furthermore, supermarket management will be able to analyses the buying habits of distinct clients in order to get useful commercial insights. These will be extremely beneficial to retail establishments. Overall, this strategy will ensure that customers love their purchasing experience and return to purchase more frequently.

V. ADVANTAGES

- Less Personnel decreases the amount of manpower needed in the billing segment. The management's cost will be reduced as a result of this.
- Users are informed about additional costs, and customers are informed about the total charge at the moment of purchase.
- Reduces time spent at the billing counter and enhances efficiency.
- Enhance customers' shopping experiences at supermarkets.
- When the expected budget is exceeded, notify users.

VI. DISADVANTAGES

- Reading each and every product's barcode by biller for each client becomes a tedious task.
- Any impurities, such as dirt, dust, abrasion, or package contours, should be removed from the barcode.
- If the barcode is not verified, the biller will manually enter the product description.

VII. MODULES OF THE PROJECT

Login Page: The user must first log in via the login page. If the user is already a member of the application, it willprompt them for their login credentials.

Sign-Up Page: If the user is a new user, the system will ask for their registration information. Name, email address, phone number, and password are among the registration data.

Main Window: The shopping mall app's info screen appears when you log in. Product list, budget setting, cart, and payment are all included.

Product List: The product list shows which goods are in the

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stock and which are out of stock at the shopping mall.

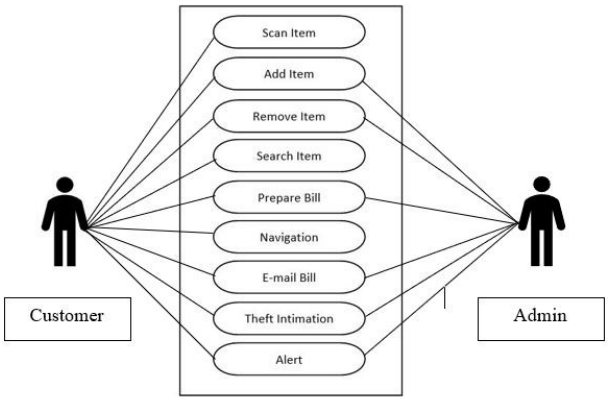
Budget setting: Budgeting aids in budgeting by sounding a buzzer when the purchase price crosses the budgeted amount. Before we begin shopping, we may determine a budget.

Cart: Scanning the Barcode, comparing the product name and pricing to data saved in the Pic microcontroller and shown on the Cart screen. We may add and delete goods here, and the total bill and budget cost will be presented on the screen at the same time**.**

Payment: Once a consumer has completed their purchase, they have two options for paying their bill: using a credit card or making an online payment.

Successful payment: After finishing their buying, the buyer fills out the payment information online. When the payment is completed, it displays "payment successfully completed!"

VIII. USE CASE DIAGRAM



IX. IMPLEMENTATION PLATFORM

We are employing both hardware and software to accomplish this solution. The following are the tools that were employed to put this concept into action.

Hardware Requirements:

- Raspberry Pi
- Load Cell
- Power Supply
- Camera
- Buzzer
- LCD Display

Software Requirements:

- Open cv
- Python
- Linux

Raspberry Pi 3 Model B Raspberry Pi 3 The Raspberry Pi 3 is the project's main component. Raspberry Pi is a credit-card-sized computer that may be used to make smart devices or utilised as a desktop computer. The Raspberry Pi was designed to be a microcomputer that could be used to educate youngsters how to code. After enthusiasts and engineers discovered its potential, it was enlarged, and it is today one of the most popular technological goods on the planet. Basic programming was supposed to be possible with these small computers. Pi was predicted to be simple to operate due to its low power consumption and inexpensive cost**.**-Quad Core 1.2GHz Broadcom BCM2837 64bit CPU supported by 1GB RAM on board, BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board, 40-pin GPIO, 4 USB 2 size HDMI ports, 4 Pole stereo output and composite video port, Full CSI camera port for connecting a Raspberry Pi camera, DSI display port for connecting a Raspberry Pi touchscreen display, Micro SD card slot Switched Micro USB power supply has been upgraded to 2.5A.

Load cell a force transducer is a load cell. It turns a force like tension, compression, pressure, or torque into a measurable and standardized electrical output. The electrical signal varies proportionately to the force applied to the load cell. The weights of the scanned goods are verified using the Load Cell in this project.

Power Supply Electricity A regulated power supply is an embedded circuit; it converts unregulated AC into a constant DC. With the help of a rectifier, it converts AC supply into DC. Its function is to supply a stable voltage to a circuit or device that must be operated within certain power supply limits. A micro-usb plug power supply capable of delivering at least 1A is utilised. It is also poweredby a battery.

A Camera reader A camera reader is an electrical device that reads images from a camera and prints them to a computer. It is made up of a light source, a lens, and a light sensor that converts optical to electrical impulses. Furthermore, all Camera readers have decoder circuitry that analyses the picture data produced by the sensor and sends the content of the camera to the scanner's output port.

Buzzer In this project, a buzzer is a beeper gadget that is used for alert reasons.

Liquid Crystal Display (LCD) is very important device in embedded system. It is an electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. It offers high flexibility to user as he can display the required data on it.

OpenCV is an Intel-created and Willow Garage-maintained image processing library. The most recent update is version 2.2, which is available for C, C++, and Python. It's free and open source. It's simple to use and set up.

Python is a high-level, interpreted, interactive, and interactive programming language. Object-oriented programming language This programming language is a kind of It's written in a way that's easy to understand, with a lot of English keywords. Because of its writability, error minimization, and readability, this language supports a wide range of hardware platforms.

Linux is a collection of free and the open-source operating systems centred on the Linux kernel. For both desktop and the server use, Linux is typically packaged in a form known as a Linux distribution. The Raspberry Pi was created with the Linux operating system in mind, and many of the Linux

distributions now provide a Raspberry Pi-optimized version.

X. IMPLEMENTATION

Hardware implementation

The Raspberry Pi board features a number of connections that allow it to interact with other devices. We have linked Raspberry Pi to the Liquid Crystal Display. The python file to start the shopping will be displayed if the camera is connected to one of the Raspberry Pi board's four USB ports. It explains how to utilise the Barcode in the smart shopping cart and how to remove the button.

Software Implementation

After the hardware interface is finished, we must move on to software implementation. We need an operating system to run any machine (OS). To operate our RPI board in this solution, we're utilising the classic Raspbian stretch OS. Raspbian is an open-source operating system based on the Linux platform. We must first download it from the raspberrypi.org website and then install it on an SD card that can be inserted into the RPI board's SD card port. After placing the SD card into the RPI board, power it up using the power bank. Once the Pi has launched, it will display a desktop screen with a variety of choices for controlling the computer We'll need to use a Linux terminal session to install the python3 packages later. Programming is a crucial part ofsoftware.

XI. RESULT AND DISCUSSION

1. The main goal was to design and build a shopping trolley prototype and apply it. Both the hardware and the software were well-integrated.
2. The suggested model is realised by delivering a convenient, easy-to-use, and ready-to-use buying experience.
3. This technique assists not only customers but also business owners in increasing profits when clients are in greater numbers and enjoy the taste of comfort.

FUTURE WORK

- We can monitor the trolley using tracker.
- Using facial detection and finger print recognition, pay your bill.
- A mobile application should be added to this system to make the user feel more at ease and to make it easier to use. This is because, nowadays, everyone has a smartphone with them when they go shopping; therefore, it would be much easier for users to build a shopping list using a mobile application whenever feasible.

- Because of its wireless nature and ability to provide improved security, this technology may be used in airports.
- Currently, web application design is inconvenient and ineffective for users. A mobile application should be to this system to make the user feel more at ease and to make it easier to use.
- Aside from that, a mobile application might incorporate features like shopping list notifications, daily sales on specific goods, or user preferences for foods.

XII. CONCLUSION

Given the shifting trends in retail buying, we believe that the Intelligent Shopping Basket is a must-have for the retail marketing sector to expand their portfolios, keep up with technological advancements, and to save time and personnel. The suggested paradigm is simple to use, inexpensive, and requires no specific training. The gadget is simple to use and does not require any assistance. This model tracks current advances and different types of radio frequency identification and detection technologies that are used for item recognition, invoicing, and inventory updates. As the entire system becomes smarter, the need for people will reduce, which will help merchants. Theft at the mall will be managed by this smart technology, which will increase the mall's cost efficiency even further. Because this technique eliminates waiting lines, time efficiency will rise dramatically. More clients can be served in the same amount of time, which benefits both businesses and customers.

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FIRE AND GAS ACCIDENT AVOIDER SYSTEM USING ARDUINO IDE AND GSM MODULE

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Abstract

Fire and gas leakages cause huge loss of lives and properties every year in the world. Some of the main causes are insufficient fire defense materials, the electric short circuit from faulty electrical wiring, the presence of inflammable materials and violation of fire safety and lack of adequate awareness, etc. Gas leaks in the home are usually the result of poorly fitted, badly maintained, or faulty appliances like boilers and cookers. The existing fire and gas leakage protection system does not work on the intensity of the fire and moreover raises an only alarm whenever the fire and gas leakages are detected. The Proposed project of Fire and Gas detection system is an intelligent self-controlled smart fire and gas detection system assembled with fire sensors, gas sensors, Arduino Uno. This proposed system minimizes fire and gas leakage hazards with fire alarm and also through SMS announces fire and gas leakage and also detects the severity caused by these hazards.

Keywords: - IoT, Arduino Uno IDE, Gas Sensor, Temperature Sensor, DC Fan, GSM module, LCD display, Fire and Gas Detection System.

I. Introduction

In the recent day's occurrence of domestic hazards due to the highly inflammable LPG gas leaks and the resulting fire accidents have reached alarming rates. Such life- threatening found to occur frequently. The major reason for this being lack of proper forewarning. Such issues have been the motivation to design a system that prior alert on LPG gas leakage before it could break out into the fire. The aim is to design a cost-effective and low power consuming alarm system that provides complete security alerts the people in the event of a gas leak or fire along with the indication of their concentration levels It also analyses the level of danger and takes proper action to avoid fire using a relay mechanism activated by means of wireless communication. The proposed solution is an extension of an electronic system designed specifically for a gas and fire. The '*Fire and gas Accident Avoider System'* is designed to detect smoke along with fire and provide a visual indication to show the gas leakage levels and fire levels continuously as well as display the values periodically on a computer screen using the Arduino IDE. Annually lots of families and organizations face fire and its various consequences starting from property loss to human loss. Due to that, fire detection systems are considered as one of the most important and vital surveillance Accordingly, fire and gas detection systems need to have higher accuracy, faster and smarter ways of detection. Many of the current fire and gas detection systems depend only on smoke sensors which are not usable in some places. For instance, the large open areas, like gardens, parking yards, and many more, cannot have detection systems that depend on smoke sensors since these sensors are restricted to the existence and height of the building's ceiling. Besides, having many flammable objects in these open large areas, such as trees, the fuel of cars, and more importantly the oxygen in the air can make the fire grow and expand very fast. Therefore, this project aims to develop a better

fire and gas detection system that has higher accuracy, reliability, and faster detection during the early stages of the fire. Conventional fire alarms based on smoke detection do not trigger the alarm until smoke or combustion particles are produced in fires. Nevertheless, in certain types of fires, volatile appear before smoke. Most of the fatalities related to fires in buildings are caused by toxic emissions that conventional fire alarms are unable to detect. Here, we present a fire detector and gas detector system this aims to help fire hazards and can save some lives in such conditions.

II. Analysis of the System

In our daily life today the need for LPG Gas cylinder for cooking has become imperative. As it has become a necessity it also has many harmful effects as it can be very dangerous sometimes. A LPG cylinder is like a bomb during certain situations which have caused many lives on many occasions. A LPG gas cylinder consists of Liquefied petroleum gas which is a mixture of butane and propane gas. These gases are very much proficient as they are cheap and eco- friendly. But butane and propane gas are highly extinguishable and also they are colourless and odourless. Therefore if sometimes there is a leak from the cylinder it is very difficult to detect a leak. For that reason gas is added in the cylinder with butane and propane which is Ethyl Mercaptan. It has a very strong odour which helps to detect a gas leakage.
But at many times it also becomes very difficult to smell the gas that causes the gas explosion. The statistics of the fire and gas incidents in India are very frightening. We analyzed the data of gas explosion incidents in India till 2014. In 2014 3,525 deaths occurred due to gas explosions which are more, compared to the deaths in 2013. In 2017 the deaths due to gas incidents were 315 across India. The cases are reducing but even if a single life can be saved by technology then we have to use it.

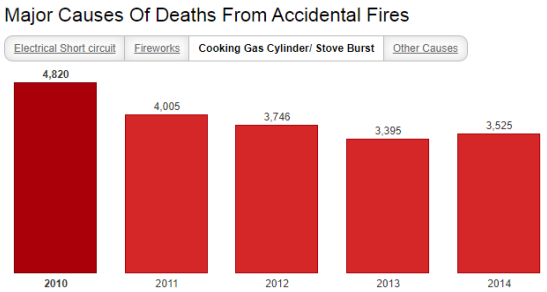

Figure 1:- Gas Cylinder Accidents in India (2010-2014).

Causes-wise Number of Accidents, Persons Injured and Died due to Other Causes during 2017 (All India)

Sl. No.	Cause	No. of Cases		% Variation in 2017 over 2016	Persons Injured - 2017				Persons Died - 2017			
		2016	2017		Male	Female	Trans-gender	Total	Male	Female	Trans-gender	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6	Accidental Explosion (Total)	851	657	-22.8	155	66	0	221	348	381	0	729
	6.1 Domestic Gas Cylinder	347	309	-11.0	32	52	0	84	90	225	0	315
	6.2 Industrial Boiler/ Gas Cylinder Explosion	55	34	-38.2	51	1	0	52	85	2	0	87
	6.3 Ammunition Explosion in Armed Forces/Police/CPMF	11	10	-9.1	0	0	0	0	21	0	0	21
	6.4 Other	438	304	-30.6	72	13	0	85	152	154	0	306

Figure 2:- Gas Cylinder Accidents in India (2016-2017).

Not only gas explosion, but fire incidents in India has caused various lives. Fires are caused majorly due to short circuits in residential, offices, and at various places. A short circuit fire causes a lot of smoke due to the burning of various materials releasing toxic fumes and CO gases causing suffocation and death.

In many Fire incidents, the deaths occur due to suffocation rather than burns. Fire at many places causes a lot of loss in property and in lives. Therefore necessary steps must be taken in order to stop these incidents to occur and to act fast in these situations. The statistics of several fire incidents that have occurred in India are shown below in Fig 3 and Fig 4, showing the loss of lives that was caused due to various fire incidents.

The following statistics made us think of making a system that can not only detect a gas leakage but also detect fire and smoke incidents in an area and alert the person who is responsible for that area as soon as it is detected.

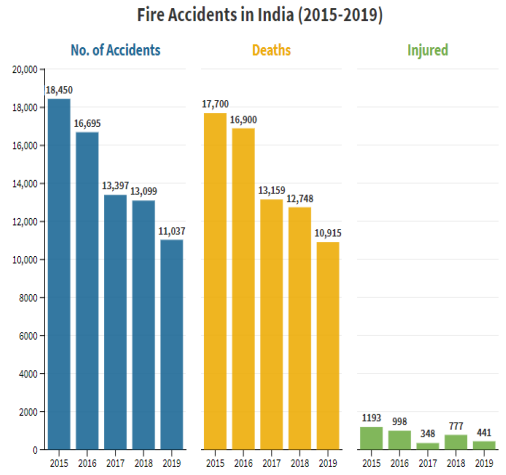

Fig 3:- Fire Accidents in India

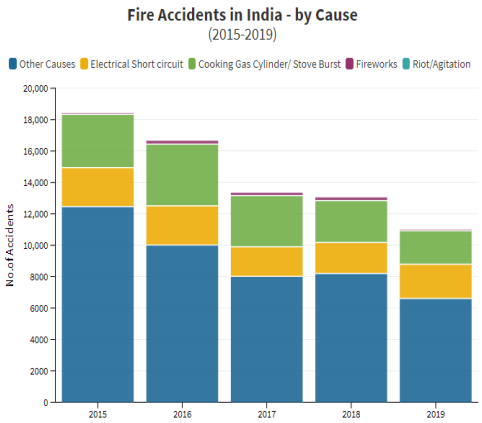

Fig 4:- Fire Accidents in India-by place of occurrence

This can save loss of property and loss of life to a great extent. Using the technology of IoT we have created this "Fire and Gas detection system", which can not only detect gas leakage but also any fire and smoke incident, and thus sending a user a SMS alert on his mobile alerting that an incident has occurred at his area and sending the fire station number with it to call immediately the fire services and making him think to take the necessary action possible, and thus saving as much possible.

III. Literature Review

Salhi, L., Silverston, T., Yamazaki, T., & Miyoshi, T. ***Early Detection System for Gas Leakage and Fire in Smart Home Using Machine Learning, 2019 IEEE.*** In this paper, they are proposing an efficient system model to integrate the gas leakage and fire detection system into a centralized M2M home network using low cost devices. Then, through machine learning approach, they are involving a data mining method with the sensed information and detect the abnormal air state changes in hidden patterns for early prediction of the risk incidences. This work will help to enhance safety and protect property in smart houses. [1]

Ghosh, P., & Dhar, P. K. ***GSM Based Low-cost Gas Leakage, Explosion and Fire Alert System with Advanced Security. 2019 IEEE.*** In this paper, a system is proposed that can detect not only gas leakage, it can detect explosion, and fire as well. And can take some protective steps. It is equipped with gas sensor to detect the leaked gas and flame sensor to detect the explosion and fire. It has exhaust fan system to clear the leaked gas and solenoid valve to inlet the water or carbon dioxide gas (CO2) if explosion and fire occurs. The explosion security system response individually when there is only a fire with no relation to gas leakage. If any incident occurs, that information is sent to owner through wireless media, a display shows the alert message and buzzer makes the alarm. It is equipped with Global System for Mobile communications (GSM) modem as wireless media to send information to owner through Short Message Service (SMS). This ensures preventive actions immediately even in the absence of people on-site. A prototype of this system has been developed and tested with Liquefied Petroleum Gas (LPG) and Fire as well. [2]

Shrestha, S., Anne, V. P. K., & Chaitanya, R. ***IoT Based Smart Gas Management System, 2019 IEEE.*** In this paper, they design an IOT based Smart Gas Management System that will be able to detect gas leakage and fire. With the help of load sensor, automatic booking of a gas cylinder is also facilitated. Notification is sent to the booking agency to book a gas cylinder whenever load cell detects that the weight of gas cylinder has reached below a threshold value. At the same time, user will be notified about gas cylinder going empty. [3]

Devan, P. A. M., Manisha, G., Rajarajeswari, K. G. T., Priyanga, M., & Sangeetha, K. ***FIRE SAFETY AND ALERTING SYSTEM IN RAILWAYS, 2018 IEEE.*** In this paper, they proposed method which provides longer communication using GSM and enables the rescuing methodology while fire accidents in the train by utilizing gas/smoke sensors integrated with LM35 along with automated fire suppression systems. There are many suction ducts will be present at each partition of the train compartment along with CO2 fire extinguisher for fire suppression. If the temperature is greater than 80°C and the output value from the gas and the smoke sensor senses the smoke then the Arduino gives the command to enable buzzer, alerting signal to GSM network, fire extinguisher. The automatic braking system is enabled which will be utilized to split the fired compartment from the unaffected compartments, else there is no action will be taken. [4]

Giandi, O., & Sarno, R. ***Prototype of fire symptom detection system, 2018 IEEE.*** *In this paper,* the research applies the new system of fire detection using gas leak concentration to predict the explosion and fire earlier called fire predictor and the fire appearance detector. The fire predictor just show the gas leak concentration and make an alarm rang. The fire detector use fuzzy system to make the fire detector classification. The output simulation system can send the data to MFC, but the MFC reader cannot parse it in real time. [5]

Solorzano, A., Fonollosa, J., Fernandez, L., Eichmann, J., & Marco, S. Fire detection using a gas sensor array with sensor fusion algorithms, 2017 ISOCS/IEEE. In this paper, they investigate the behaviour of a gas sensor array coupled to sensor fusion algorithms for fire detection when exposed to standardized fires and several nuisances. Results confirmed the ability to detect fires (97% Sensitivity), although the system still produces a significant rate of false alarms (35%) of nuisances not presented in the training set. [6]

Hutauruk, A. R., Pardede, J., Aritonang, P., Saragih, R. F., & Sagala, A. ***Implementation of Wireless Sensor Network as Fire Detector using Arduino Nano, 2019 IEEE.*** This paper presents the application of a fire detection system. This fire system will use Arduino Nano as a microcontroller and the wireless nRF24L01 as communication data. this system has 2 microcontrollers that have different functions. The first microcontroller will be used as the slave that detects fires by using fire, smoke and gas sensors. the second microcontroller will be used as a master that functions as an access point and is used to activate a fire warning in the form of a lamp and a buzzer sound. Tool design has a small size, efficient, easy to use and has met the system that has been designed without reducing the reliability and power of the system. [7]

Bayoumi, S., AlSobky, E., Almohsin, M., Altwaim, M., Alkaldi, M., & Alkahtani, M. ***A Real-Time Fire Detection and Notification System Based on Computer Vision, 2013 IEEE.*** In this paper they present the project they worked on with the aim of implementing a more efficient and trustworthy fire detecting system. The project was done by using computer vision and image processing techniques to detect fire flames based on studying the fire properties besides an alarm notification system. [8]

Fraiwan, L., Lweesy, K., Bani-Salma, A., & Mani, N. ***A wireless home safety gas leakage detection system. 2011 IEEE.*** In this paper, a wireless safety device for gas leakage detection is proposed. The device is intended for use in household safety where appliances and heaters that use natural gas and liquid petroleum gas (LPG) may be a source of risk. The system also can be used for other applications in the industry or plants that depend on LPG and natural gas in their operations. The system design consists of two main modules: the detection and transmission module, and the receiving module. [9]

Ilie, A. M. C., & Vaccaro, C. (2017). ***Design of a smart gas detection system in areas of natural gas storage. 2017 IEEE.*** This paper focus on the development of a new device suitable to detect and measure methane gas in areas of natural gas storage site. This device can measure the air and water quality, including all the parameters that can have outliers by an eventual gas leak in the aquifer or atmosphere. The air quality parameters measured by low cost sensors, include CH4 and CO2 gas, while for water quality parameters measured include temperature, pH and electrical conductivity. The sensor node is based on Arduino UNO microcontroller, receiving the data from the sensors and transmitting to the database on Raspberry pi 3, remotely accessing all the data. [10]

IV. Key Objectives of the System

1. To Detect Gas Leakage from LPG gas Cylinder using a gas sensor.
2. To Detect Fire using Fire sensor.
3. Reading the Values from a sensor using Arduino IDE and analyzing it.
4. Based on the values detected send the signal to DC Motor Fan and GSM module and LCD Display.
5. To Display values on LCD Display.
6. Send SMS alert to the user stating alert for fire on user Mobile number.
7. Staring the DC Motor fan at set rpm for removing gas from the area.

V. Proposed Methodology

Figure 5 below shows the block diagram of the fire and gas accident avoider system. The system mainly consists of MQ-6 Gas sensor, LM-35 Temperature sensor, Arduino Uno board, GSM module, 16x2 LCD display, and a DC Motor Fan.

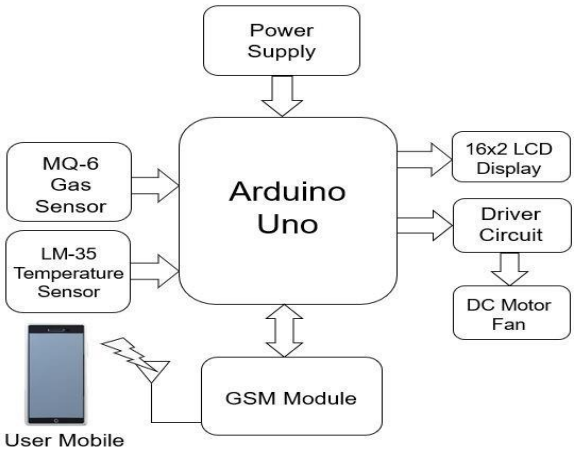

Figure 5: Block diagram of Fire and Gas Accident Avoider System

Initially, the microcontroller sends a signal to the GSM module. If the connection between the GSM module and the microcontroller is found, then the GSM module sends an acknowledgment signal back to the microcontroller.

Then if there is any gas or fire leakage detected in the atmosphere with the help of Gas and Temperature sensors, a signal will be sent to the ADC unit of the microcontroller, which then sends an activation signal to the GSM module. Finally, the GSM module gets activated, which will send an SMS alert to the respective user's mobile number.

Figure 6 shows the flowchart of the system. The flow of the system begins with the gas and temperature sensor readings. Based on these sensor readings, the system checks whether the gas or fire leakage is detected or not. If it is not detected then the system will check the next reading. And if it is detected, then the exhaust fan turns on, which will suck out all the gas or smoke present in the surroundings. The status "Smoke and Fire" will be displayed on LCD and the same will be sent as an SMS alert to the user mobile number through the GSM module.

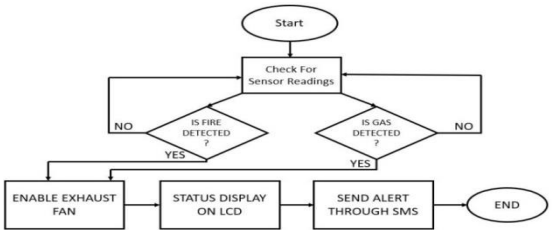

Figure 6: Flowchart of the proposed system

VI. Results and Discussions

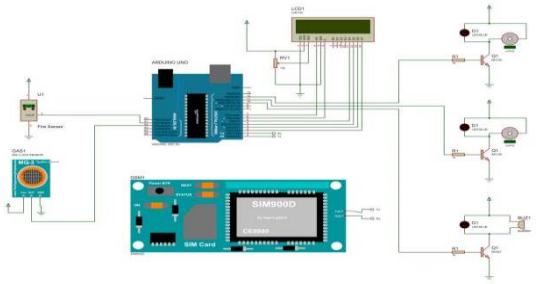

Figure 7: Circuit diagram of Fire and Gas Accident Avoider System

The implementation circuit diagram of the proposed system is shown in Figure 7. The proposed system is implemented and tested in the following ways: -

1. Gas leakage detection testing using MQ-6 gas sensor.

2. Fire or smoke leakage testing using LM-35 temperature sensor.

1. Gas leakage detection testing using MQ-6 gas sensor

Note: - Threshold gas sensor value: 80.00

If gas sensor value >= 80.00: SMS alert sent If gas sensor value < 80.00: SMS alert not sent.

Table 1: Readings of the gas sensor for testing

SL. No	Gas Sensor Value	SMS Alert Sent
1.	76.00	NO
2.	78.00	NO
3.	82.00	YES
4.	75.00	NO
5.	117.00	YES
6.	107.00	YES
7.	102.00	YES

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2. Fire leakage detection testing using the LM-35 temperature sensor

Note: - Threshold temperature sensor value: 54°C

If gas sensor value >= 54°C: SMS alert sent

If gas sensor value < 54°C: SMS alert not sent

Table 2: Readings of temperature sensor for testing

SL. No	Temperature Sensor Value	SMS Alert Sent
1.	53.68°C	NO
2.	54.66°C	YES
3.	53.68°C	NO
4.	55.63°C	YES
5.	54.17°C	YES
6.	52.10°C	NO
7.	55.14°C	YES

3. Hardware setup

Figure 8 shows the entire hardware setup. The setup gives brief data about the interfacing of segments to the Arduino Uno board and GSM module. This setup demonstrates the connection between different components of the system, which is associated with relating port pins. The Arduino IDE detects this hardware setup by enabling the respective hardware port pins.

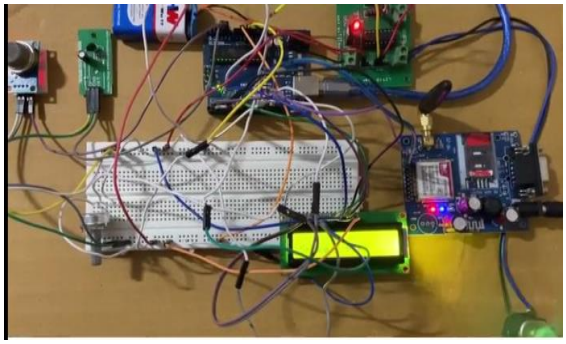

Figure 8: Entire Hardware Setup

4. SMS alert via GSM module after detecting leakage

Figure 9 shows the “Smoke and Fire” SMS alert on the LCD display. In the event of fire and gas leakage, the microcontroller sends an SMS alert to the LCD, and the same alert message will be displayed on the LCD.

Figure 9: “Smoke and Fire” alert displayed on LCD

Figure 10 shows the "Fire and Smoke" alert message on the user's mobile number. When the fire and gas leakage is detected, the GSM module sends an SMS alert message to the inserted SIM card number.

Figure 10: “Fire and Smoke” alert displayed on user mobile screen.

VII. Conclusion and Future work

The implementation of an automatic fire and gas leakage detecting system is enormously required to protect lives and assets from fire and gas spilling hazards. The proposed system will detect the leakage of gas and fire and it will be informed to the user through SMS. This system provides an approach that is more accurate, secure, and cost-effective. This system is more effective than the existing system since it collects the data from sensors and depending upon the captured data, the necessary actions will be carried out such as sending an SMS alert to a registered user and starting up of DC motor. The gas sensor is needed to be kept in proximity to the source for quick detection while the smoke detector needs to be kept as high as possible. The solution is to place the system at an optimum distance. However, a better alternative would be to use a highly sensitive gas sensor which would enable the location of the system at any distance. The system can be made

more intelligent by designing it to alert the nearest fire station or the user wirelessly and more sensitive transducers can be interfaced with the design. The components of the module, particularly the sensors are sensitive to temperature. So, the module can be made more efficient by including temperature compensation. Overall, the system has more scope to employ in different applications such that it will give a more effective outcome.

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Human Activity Recognition Using Machine Learning

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Abstract: *The purpose of this project was for us to develop a model that would take the video input from different sources like security cameras and recorded videos and detect actions that are being performed in them by the people also commonly referred to as HAR or Human Activity Detection.*

The project began with the analysis of models and procedures that already exist to perform this activity along with the assessment of their advantages and disadvantages respectively. There were many approaches to build this project that mainly modeling procedures such as CNN's (Convolutional Neural Networks) and few Image Processing techniques. The goal is to come up with a model that is able to detect a selection of activities on which the model was trained during the development phase. The designed model helps to overcome the disadvantage of the previously built models that relied on the use of sensors. With the elimination of sensors, we eliminate the cost associated with respect to the sensors and the errors that can be caused due to the use of sensors.

Our team has used the trained dataset to help detect a set of activities. It compares the action performed in videos given as input to the trained model used to detect these actions and if the similarity to the action is found to be greater than the set threshold it is displayed on the screen.

Keywords*: activity recognition; computer vision; machine learning, Environment Independent.*

1. INTRODUCTION

According to the activity lexicon in the ATUS survey, there are at least 1104 different activities that people perform in their everyday life.

Currently, human behavior data can be acquired in two ways: one is based on computer vision and the other is based on sensors. However, the sensor-based approach is very costly and requires proper preparation it. To perform the activity recognition using the videos feed requires less equipment like the perfect video lenses and other external factors like perfect light, positions, angle, potential obstacles, and privacy invasion so we need to look after all this to perform this project.

Human activity recognition has emerged as a very interesting problem in human activity detection. The demands for understanding human activities have grown in the healthcare domain especially in elder support, rehabilitation assistance, surveillance videos, sports activities like cricket, football, sprinting, etc. The basic technique used is by recognizing the activities and this activity is given as input (video feed) and the algorithms used are applied on it by converting these data collected into hardcoded values and based on some of these values the activities get recognized and gives the required and efficient output. A huge number of resources can be saved if "Human Activity recognition" can help caretaker records and monitor the patients all the time and report automatically when any abnormal behavior is detected. The application of this project is mainly in health care due to advances in the artificial neural network especially to caretakers where every time man power cannot be provided by using this project based on the abnormal activities performed by a person will be detected the manpower can be provided. And another main application is used in surveillance cameras if any theft occurs easily can

be detected based on the activities using this project. And other applications are in the field of sports like cricket, football, sprinting, etc. same as we mentioned above the video feed provided will detect the type of activity performed.

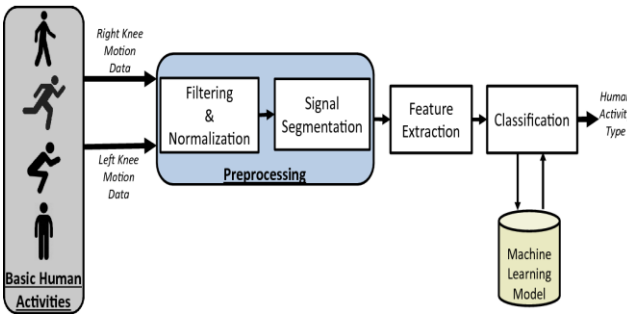

Fig 1: Process of classification

2. BACKGROUND

Basically Human Activity Recognition is done using sensors, but it has several disadvantages like subject sensitivity, Activity Complexity, location sensitivity, etc. If the activity recognition wants to be used in various fields we have to use more additional sensors and
we have to implement a separate setup for that recognition these process increases the cost and also its consume more time.
If the sensor fails then we have will lose the accuracy of recognition.
To overcome the above scenarios we will be using the camera feed input in our project. This reduces the effort of using sensors and also the failure caused by sensors.
The main objective of our model is to predict the activity which a person is performing accurately by the video input. To predict activity wee use packages like Numpy, OpenCV, Keras, and the Algorithms like CNN. Using this algorithm we Recognized the activity with an accuracy of 91%.

3. METHODOLOGY

For the developing the system, we have used certain methodologies. They are as follows: Dataset, Convolutional Neural Network, Supervised learning algorithm, etc.

Algorithm:

In this experiment, a supervised learning algorithm has been used for developing the system. Supervised learning is the type of machine learning in which machines are trained using well "labeled" training data, and on basis of that data, machines predict the output. The labeled data means input data is already tagged with the correct output for training. In supervised learning, the training data provided to the machines to predict the output correctly. Supervised learning is a process which provides input as well as correct output data to the machine learning model. The aim of a supervised learning algorithm is to **find a function to map the input variable(x) with the output variable(y).**

The deep learning algorithm used to learn more about the images it goes through each neutral network layer. For classifying **Neutral Network** is used. Fig 2 represents layers of neural networks for feature extraction. It is a framework for many machine learning.

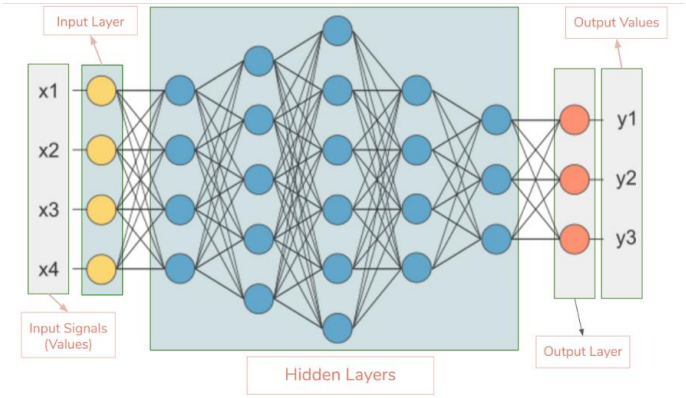

Fig 2: Three layers of Neural Network

A **Convolutional Neural Network (ConvNet/CNN)** is a Deep Learning algorithm that can take in the input image,

assign importance (weights and biases) to various aspects/objects in the image, and is able to differentiate from one another. The pre-processing required in a Convolutional Neural Network is lower than other classification algorithms. Convolutional Neural Network has ability to learn these characteristics.

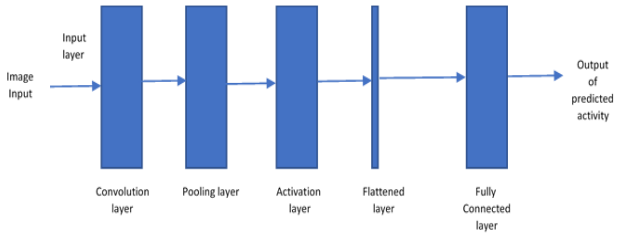

Fig 3: Convolutional Neural Network Layers

It consists of four layers: convolutional layer, activation layer, pooling layer, and fully connected. The convolutional layer allows extracting features from an image in small amount. Pooling is used to reduce number of neurons from the previous convolutional layer but maintaining the important information. The activation layer passes a value through a function that compresses values into range. A fully connected layer connects a neuron from one layer to every neuron in other layer. As CNN classifies each neuron in-depth, so it provides better accuracy.

***Image classification**:* image classification in ML is commonly done in two ways:

1) Grayscale
2) Using RGB values

Normally all the data is mostly converted into grayscale. In the grayscale algorithm, the computer will assign values to each pixel based on how the value of the pixel is it. All of the pixel values are put into an array and the computer will perform an operation on that array for classification of the data.

Dataset:

we used videos of different activities with labeled output as a dataset. These videos contained the activities such as Football, Cricket, Chess, Boxing, etc.

Library:

The libraries which we used are:

Sklearn: Scikit-learn is a free of cost machine learning library for Python. It has various algorithms such as classification, regression and clustering including support vector machines, gradient boosting, random forests, k-means, and it also supports Python numerical and other scientific libraries like NumPy and SciPy.

Numpy: NumPy is a Python library. Which is used to support large multi-dimensional arrays and also matrices, along with the collection of high-level mathematical functions to operate on these arrays. It is open-source software and has many contributors.

OpenCV: OpenCV stands for Open-Source Computer Vision. OpenCV is high-performance library for image processing and computer vision, which is free and open source. OpenCV is has a large set of functions and algorithms for real-time computer vision and predictive mining.

Keras: Keras is the high-level deep learning API which is written in Python, running on top of the machine learning platform TensorFlow. It is a highly productive, approachable, highly productive interface for solving machine learning problems, with a focus on modern deep learning. The main core data structures of Keras are models and layers. Neural layers,

optimizers, cost functions, initialization schemes, activation functions, and regularization schemes are all standalone modules which can be combined to create new models. New modules are easy to add, as new classes and functions.

4. PROPOSED APPROACH

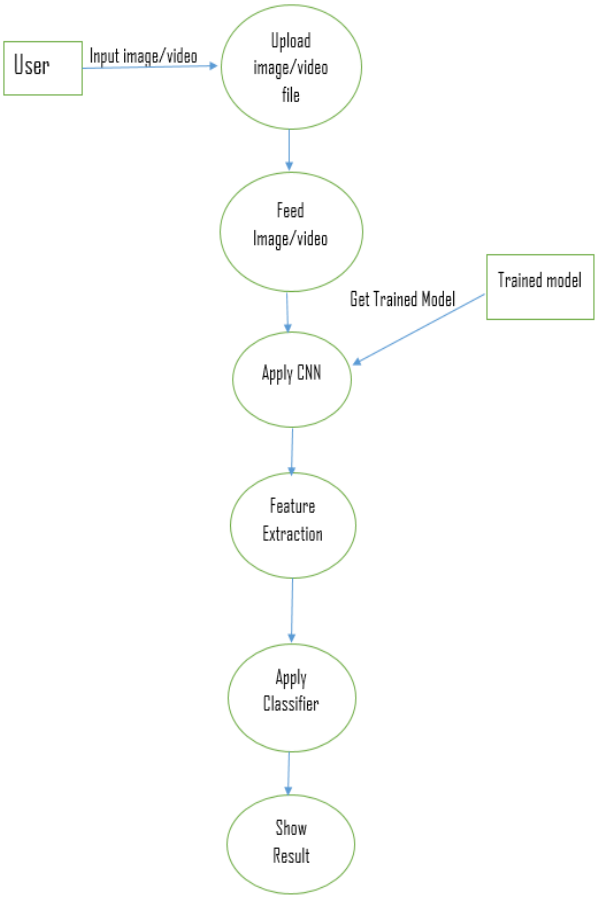

Fig 4: Flow of System

Here, the user input is compared against the trained dataset/model to generate results. These feature extractions are then aggregated and forwarded to the classifier. And then the result will be detected. Detection of human activity without the use of additional sensors and only relying on camera/video feed. Data of human activity taken over a fixed time intervals for activity determination and fed to model for detection and output shows the activity being performed.

5. EXPERIMENTAL ANALYSIS:

5.1. Experiment Dataset. Table 1 is an overview of the dataset used in this study. The dataset was in the form of images and the number image samples for each activity is given in the below table. The task was to distinguish the following 6 activities. We pre-processed the dataset and feature extraction were performed. After we extract range of features that are associated with the activity, then classification was performed. In this the training of dataset was done by using Jupyter Notebook, which is a platform to train dataset by your local machine.

Activities	No. of Samples#
Cricket	715
Badminton	938
Chess	481
Boxing	705
Swimming	689
Basketball	495

TABLE 1: The number of raw data

After training of data was done the model recognizes the activity being performed. The input is taken in the form of video or image whose activity has to be recognized. As seen in Fig 5 the sample video is taken as the input and the output of the activity being performed in the input video is as shown in the Fig 6.

Fig 5. Sample input

Fig 6. Sample output

Comparison:

Activity	Accuracy
Chess	100.00%
Badminton	84.28%
Boxing	93.71%
Swimming	94.12%
Basketball	92.57%
Overall accuracy	91.03%

TABLE 2: Accuracy of each activity

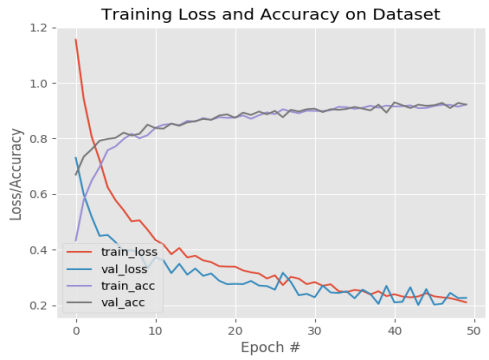

Fig 7. Graph of Accuracy

After analysing the model we observed the accuracy of each activity and overall accuracy of all activities which can be seen in TABLE 2 and Fig 7 respectively.

6. CONCLUSION

Our Human Activity Recognition System is classifying the activities with an accuracy of 91%. Human activity recognition has a wide range of application like video surveillance to detect any abnormal activity, human-computer interaction and it also helps blind people. Our system can recognize various activities like boking, chess, swimming, cricket, etc.

7. FUTURE SCOPE

- Implementing the system with a greater amount of resources to improve accuracy.
- Using the computer with a better GPU would allow the system to recognize more number of activities.
- Further optimizing code to recognize the activity within a more complex background.
- Other future enhancements can include the use of IoT-based smart devices.

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COMPUTER VISION AND ML BASED UNOBTRUSIVE ATTENDANCE SYSTEM

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I. ABSTARCT

The management of the attendance can be a great burden on the teachers if it is done by hand. To resolve this problem, smart and auto attendance management system is being utilized. But authentication is an important issue in this system. Face recognition is one of the biometric methods to improve this system. Being a prime feature of biometric verification, facial recognition is being used enormously in several such applications, like video monitoring and CCTV footage system, an interaction between computer & humans and access systems present indoors and network security. By utilizing this framework,the problem of proxies and students being marked present even though they are not physically present can easily be solved. The main implementation steps used in this type of system are face detection and recognizing the detected face.

This paper proposes a model for implementing an automated attendance management system for students of a class by making use of face recognition technique, by using haarcascade algoritham and Convolutional Neural Network(CNN). After these, the connection of recognized faces ought to be conceivable by comparing with the database containing student's faces.

This model will be a successful technique to manage the attendance and records.

Keywords— facial recognition, attendance management system, Convolutional Neural Network, Haarcascade algorithm.

II. INTRODUCTION

To verify the student attendance record, the personnel staff ought to have an appropriate system for approving and maintaining the attendance record consistently. By and large, there are two kinds of student attendance framework,

i.e. Manual Attendance System (MAS) and Automated Attendance System (AAS). Practically in MAS, the staff may experience difficulty in both approving and keeping up every student's record in a classroom all the time [1]. In a classroom with a high teacher-to-student ratio, it turns into an extremely dreary and tedious process to mark the attendance physically and cumulative attendance of each student. Consequently, we

can execute a viable framework which will mark the attendance of students automatically via face recognition. AAS may decrease the managerial work of its staff. Especially, for an attendance system which embraces Human Face Recognition (HFR), it normally includes the students' facial images captured at the time he/she is entering the classroom, or when everyone is seated in the classroom to mark the attendance [1].

Generally, there are two known methodologies to deal with HFR, one is the feature-based methodology and the other is the brightness-based methodology. The feature- based methodology utilizes key point features present on the face, called landmarks, of the face, for example, eyes, nose, mouth, edges or some other unique attributes, as shown in fig.1.

In this way, out of the picture that has been extricated beforehand, just some part is covered during the calculation process. There are different advances that are done during the process of this face recognition framework, yet the essential steps of these are face detection and face recognition. Firstly, to mark the attendance, the images of students' faces will be required. This image can be captured from the camera, which will be installed in the classroom at a position from where the entire classroom is visible. This image will be considered as an input to the system. For efficient face identification, the picture should be upgraded by using OpenCV. After image quality upgrade, the image will be passed to perform face detection. The face identification process is trailed by face recognition process. There are different strategies accessible for face recognition like haarcascade and CNN.

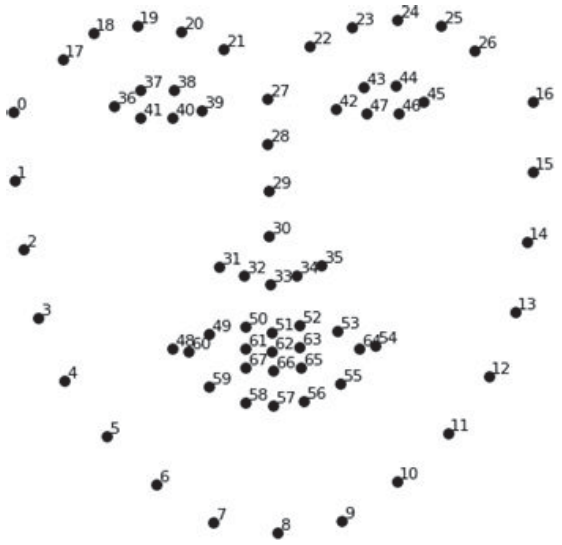

Fig. 1. 68 landmarks present on the face

III. Literature review

The main objective of this paper is to develop a smart attendance management system using facial recognition that will take care of the problems which are being faced in other automated systems which are in operation in today’s modern-day world. The main approach which needs to be followed is to tally a fairly recent image of a student to that of some images which taken deliberately and stored in a

database, which further be used to mark the attendance if the images in database match to the real-time image.

A model as specified by Naveed et al [4], which is linked with two databases. One for the faces and the other one is used for marking the attendance. The image before the detection and recognition phase, the camera is used to click the face image of the student and performs background and noise removal.

In another implementation of a similar system, Kawaguchi et al [5], proposed a model in which the faces are compared to the images in a database along with the fixed seating positions. This is a method of continuous examination which uses video streaming camera to sense the presence of the students in the class. They even estimated the seating arrangements using several different types of calculations. It is a very common architecture, which implemented using two different cameras, one is used to sense and the other one is used to capture images. MuthuKalyani et al [6] proposed a different approach tothis, by using Android Devices to accomplish this task. This was done by the linkage of the android phone to the CCTV camera. After the picture being captured in the camera, it was then exposed to 3D modeling and canonical techniques were used on the pictures for the comparison.

The model proposed by Marko Arsenovic et al. [7] makes use of the topmost advancements; Convolutional Neural Networks cascade to implement face detection and Convolutional Neural Networks for the face embeddings. CNNs accomplish the best outcomes for bigger datasets, or, in other words, case underway condition, the primary test was applying these strategies on small datasets.The general precision was 95.02% on a little dataset of the first face pictures of workers in the ongoing condition.

The facial detection model proposed by Kruti Goyal et al. [8], is a facial detection model which is built using different types of algorithms like AdaBoost, Haar Cascades. This model uses MATLAB and OpenCV for its implementation. Extraction of facial features is done as a localization of the face which is performed using patternrecognition.

Nusrat Mubin Ara et.al [3] in their paper have discussed about the developments in the field of technology they used, such as face detection, normalization, face recognition, and neural networks. The authors also wrote about the methodology in which face detection is done using History of Oriented Gradients, Face Alignment using face landmark estimation, extracting features using Convolutional Neural Network and lastly generating embedding. Although their system found some false predictions, they achieved an accuracy of more than 95%. Samuel Lukas et.al [1] in their

Student Attendance system integrated the recognition system with Discrete Wavelet Transform (DWT), Discrete Cosine Transforms (DCT) and Radial Basis Function Network (RBFN), along with their respective mathematical equations. They have represented the system design of their proposed framework with the help of a block diagram to show the process flow. According to their experiment result, they attained an accuracy of 82% as some students were recognized as others.

Priyanka Wagh et.al [2] discussed about the various face recognition techniques like Principle Component Analysis (PCA), Eigenface, Support Vector Machines (SVM) and Neural Networks and compared them based on their success rate. The authors also wrote about system architecture, step- by-step methodology and supported it with its algorithm. They have also provided a mathematical model using mathematical concepts and language.

Abhishek Jha et al. [10] proceeded further to a superior system for the recognition process by utilizing statistical methods PCA and LDA in addition to likewise comparing the picture taken and the saved images for marking the attendance. They suggested to the extensive and blunder inclined procedure of participation making which whenever bargained may influence the understudy definitely. They proposed a framework for figuring the pictures in a specific procedure with the goal that matches scoring should be possible. While it very well may be accomplished by utilizing certain calculations, like color detection, PCA and LDA. They made many extractions of facial features from the picture for instance framework of face, nose, and eyes and so on. The PDA and LDA make use of the Eigen Values for students' attendance to be marked accurately.

IV. Proposed Methodology

Architecture

The automated attendance management system has a very simple and easy to implement the architecture. The system consists of two databases, a student database, and an attendance database. The student database is for storing the details of the student in a particular class. On the other hand, the attendance database, as the name suggests, is for marking and maintaining the attendance records of students attending a particular lecture.

For the accomplishment of marking attendance, this system will have a high-definition camera installed outside the classroom. Students will avail the access to enter the classroom, by scanning their faces in that camera. Another camera will be installed inside the classroom in such a way that every student in the class will be visible to the lens of the camera. Facial detection and recognition algorithms will be applied to both the cameras to analyze the faces and mark their attendance accordingly.

Methodology

To develop the smart attendance management

system, some steps are required to be followed for accomplishing this task successfully. The steps can be defined in the following ways:

- Enrolment
- Face Detection
- Face Recognition
- Confirmation by the class camera
- Attendance Marking

Enrollment

In this step, the student is enrolled in the student database. General information like Name, Enrolment Number, Class, and Section is stored in the database. Along with all this information, pictures of the student's face appearing in the camera window are also stored in the student database.

With the help of all the images stored in the student database, facial recognition can be performed for all the students are coming to attend a lecture.

Face Detection

For detecting the faces, we will be referring to the above mentioned 68 landmarks present on a person's face. Based on these landmarks of the face, the Viola and Jones algorithm [9] will be used for face bounding box detection and constrained Local Model-based face tracking and face landmark identification algorithm. It can also be cited as AdaBoost algorithm for face detection. Once the detection part is successfully completed, we will be moving on to the next phase. The next phase in this system is Face Recognition.

Face Recognition

The next phase of our proposed system involves detection of faces from the pre-processed image. We have used Haarcascade classifiers to perform face detection as it performs detection of faces with high efficiency and high accuracy even with different orientations of the faces to be detected under different lighting conditions.

Under the face detection system proposed by Viola and Jones [12], the system is designed by giving input of faces and non-faces. The images containing faces are called as positive images and the images not containing any faces are called negative images.

This is used to train the classifier for differentiating a face from a non-face and thereby, identifying positive images. Haar features are analogous to convolution kernels in terms of their use in the detection of the presence of the concerned feature in any given image. When each type of Haar features is applied on a given image, the output given is the highlighted regions of the image where that Haar feature is present.

If the student's face is present in the respective database, then he is allowed the access to enter the class, else if his face image is not present in the database then the system will ask the student to enrol himself in the student database before gaining access in the classroom.

Confirmation by the classroom camera system

After the face of a student is recognized successfully and in order to confirm that the student is present in the class for the lecture, a camera installed inside the classroom will be set up in such a way that all the students are visible. This will help in cancelling out the proxies.

Attendance Marking

At the end of the lectures, the camera inside the classroom will be used to provide the list of students present in the classroom. With the help of this, attendance for that lecture will be marked in the attendance database.

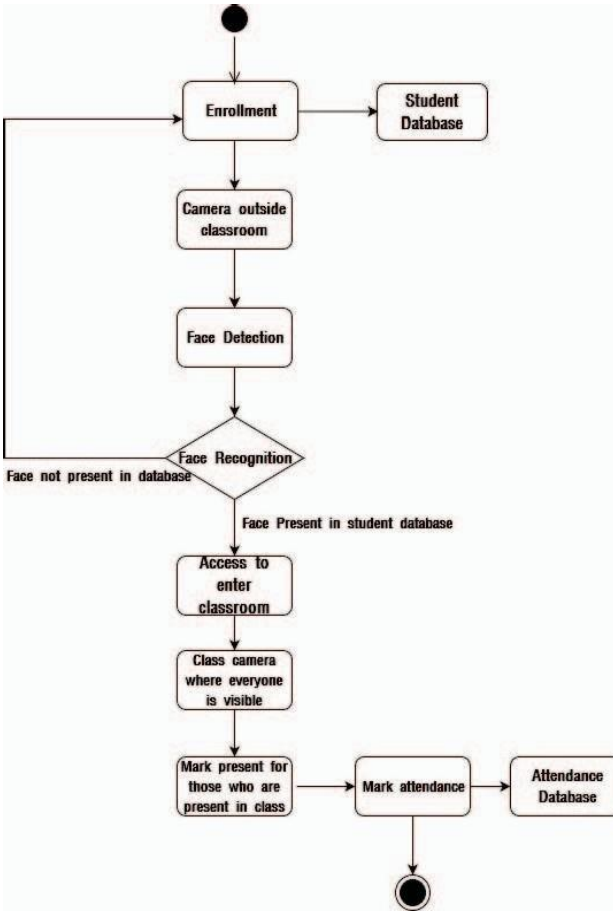

Fig. 2. Activity diagram for the smart attendance

ALGORITHM:

REAL_TIME_SMART_ATTENDANCE_USING_FACE_RECOGNITION

INPUTS: Faces of students at Entrance, Inside Classroom.

OUTPUT: Automatic Marking of the attendance.

PROBLEM DESCRIPTION: Recognition of faces and marking attendance accordingly.

Step I: Commence

Step II: Enrolment of students' details in the student database.

Step III: Setup a camera outside the classroom. Students' face will appear in the camera.

Step IV: Face Detection

Step V: Face Recognition by comparing the students' face with images in the student database.

Step VI: IF: student is present in database.

Grant access to the classroom ELSE: Go back to Step 2.

Step VII: Camera installed in the class is used to check the presence of the student in the class.

IF: Faces recognized in step 6 are present, Mark them present.

ELSE: Mark absent.

Step VIII: Mark the attendance in the attendance database.

Step IX: End.

V. Conclusion

The proposed automated attendance system using face recognition is a great model for marking the attendance of students in a classroom. This system also assists in overcoming the chances of proxies and fake attendance. In the modern world, a large number of systems using biometrics are available. However, the facial recognition turns out to be a viable option because of its high accuracy along with minimum human intervention. This system is aimed at providing a significant level of security. Hence, a highly pro-efficient attendance system for classroom attendance needs to be developed which can perform recognition on multiple faces at one instance. Also, there is no requirement of any special hardware for its implementation. A camera, a PC and database servers are sufficient for constructing the smart attendance system.

VI. Future Scope

The proposed system here is only used for classroom attendance for students. However, this system can be improved and enhanced in a way that it can also be used in multi-national companies for maintaining the surveillance of a much larger database, filled with huge amount of entries of the employees working in a particular organization. This will be able to help in maintaining security and also the company will able to keep a track on its workers whether they are completing the desired working hours in a day or not. This can also be implemented in banks. The ATM machines can be equipped with a facial recognition algorithm. The customers will only be able to access their bank accounts, once their faces have been recognized by the ATM machine on comparison with images which are already saved in the database. This can help in preventing money thefts hence increasing the security while operating ATMs.

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TRAFFIC SIGN DETECTION & RECOGNITION SYSTEM USING ML

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Abstract- *The traffic sign detection and recognition is an integral part of the Advanced Driver Assistance System (ADAS). Traffic signs provide information about the traffic rules, road conditions and route directions and assist the drivers for better and safe driving. Traffic sign detection and recognition systems have two main stages: The first stage involves the traffic sign localization and the second stage classifies the detected traffic signs into a particular class. This article provides the challenges involved in the real-time detection of traffic signs. A review of the existing detection methods such as color based, shape based and learning based detection is presented. It also discusses the feature matching and machine learning algorithms used in the traffic sign recognition stage.*

Keywords- *Traffic signs,webcam,alert message, CNN, GTSRB dataset*.

I. INTRODUCTION

Automatic recognition of road signs can be of use in such applications as driver assistance systems, maintenance of traffic facilities, route planning and management, as well as administration of transportation securities and efficacy all toward the ultimate goal of intelligent transportation systems. The implementation of an advanced driving system by detecting traffic symbols will always help to improve the efficiency of smart driving. This detection process will always try to give the best performance of driving by reducing the man made mistakes in a frequent manner. Usually the traffic symbols in India have lots of symbols on both national and regional roadways. In that few of them are easily understandable by the human to take quick decisions, this process changing their driving attitude. Apart from this most of the traffic symbols are very hard to detect and analyze by a layman. This is the one of the reason the accident rate has been drastically increased from the past two decades. Traffic symbols and signals are one of the most important indications on the roads. Every person who drives the vehicles on the road they must require the knowledge on road safety and conditions methods and road signal indicating symbols. This traffic symbols has provided the information about road condition a heady. The road condition like major crossroads, prediction crossing area, school zone, direction of the road and junctions warn and guide the driver and make sure smooth driving on road & traffic. If drivers are unaware of these road signs it can lead to the loss of their valuable lives and properties.

II. LITERATURE SURVEY

Yan Lai et.al [1] represents a novel traffic signs recognition and classification method based on Convolutional Neural Network and Support Vector Machine (CNN-SVM). In this method, the YCbCr color space is introduced in CNN to divide the color channels for feature extraction. A SVM classifier is used for classification based on the extracted features. The experiments are conducted on a real world data set with images and videos captured from ordinary car driving. The experimental results show that compared with the state-of-the-art methods, this method achieves the best performance on traffic signs recognition and classification, with a highest 98.6% accuracy rate. Even though traffic signs detection and classification had been

developed for a long time, a complete data set was inadequate until the launch of the German Traffic Signs Recognition Benchmark (GTSRB) (Stallkamp et al., 2012) and Detection Benchmark (GTSDB) (Houben et al., 2014).

Yuga Hatolkar et.al [2] represents Traffic Symbol recognition which is basically a methodology in which the vehicles are able to determine road traffic signs and avoid the accidents taking place. These signs may include various road symbol alerts like “speed limits”, “one-ways”, “school ahead”, etc. This is one of the hot topics in research Automobile industries. Considering the current Traffic management system, there is high possibility that the driver would miss out the road traffic symbol plate alerts due to overcrowding of the traffic on-road. The condition is even worsening due to overpopulation in urban cities. Some of the road traffic sign information can also be obtained from GPS, but it is not always up to-date. After extraction of the road traffic signs from the system, they can be displayed on the panel of the cars, or could be converted to audio signals for providing notification alerts to the driver. Traffic symbol recognition is one of the solutions proposed for Driver Assistance Systems (DAS) and Automated Driving (AD). However, this task is not that easy for a computer because of changes in environmental conditions such as shadows, lightening, etc. Bright images are captured during sunny days. Recognition of traffic symbols in an image involves two main steps: detection and classification.

Domen Tabernik et.al [3] represents a relatively small number of all traffic signs (around 50 categories out of several hundred) and performance on the remaining set of traffic signs, which are required to eliminate the manual labor in traffic-sign inventory management, remains an open question. Here, the issue of detecting and recognizing a large number of traffic-sign categories suitable for automating traffic-sign inventory management. The DFG traffic-sign dataset consists of 200 categories including a large number of traffic signs with a high intracategory appearance variations. Here, a convolutional neural network (CNN) approach, the mask R-CNN, to address the full pipeline of detection and recognition with automatic end-to-end learning is adopted. Several improvements that are evaluated on the detection of traffic signs and result in an improved overall performance is proposed.

Xie Bangquan et.al [4] here firstly, proposed an innovative network construction method, to build a new efficient TSC network called ENet which can achieve an accuracy of 98.6% on the GTSRB. And we build a new efficient TSD network called EmdNet which can solve the practical problems, such as partial occlusion, illumination changes, cluttered background and so on. Second, the theory used is of data mining to divide the validation set and perform data augmentation for ENet, and use multiscale operation for EmdNet. And the training samples which include the GTSRB and the LISA US Traffic Sign Dataset (LISA), are from application scenes. All of these can improve the generalization ability of network. Third, in Traffic Sign Classification, the key to constructing a network is how to extract and integrate features efficiently. Generally, the five networks all benefitted from DSC. And construct ENet using two novel methods of DSC and Shortcuts, which makes the appropriate trade-off between accuracy TRAFFIC SIGN DETCTION AND RECOGNITION SYSTEM Dept of ISE, SCE 2020-21 Page 6 and speed. ENet has 0.9M parameters, and spends only 0.62 ms to identify a sample. In Traffic Sign Detection, there are two approaches: the two-stage and one-stage methods. There is a close connection between ENet and EmdNet.

Safat B. Wali et.al [5] provides a comprehensive survey on traffic sign detection, tracking and classification. A comparative study on each section has been provided to evaluate the TSDR data, performance metrics and their availability. This provides information about the current state of the road, restrictions, prohibitions, warnings, and other helpful information for navigation. This information is encoded in the traffic signs visual traits: Shape, color and pictogram. Disregarding or failing to notice these traffic signs may directly or indirectly contribute to a traffic accident. However, in adverse traffic conditions, the driver may accidentally or deliberately not notice traffic signs. In these circumstances, if there is an automatic detection and recognition system for traffic signs, it can compensate for a driver’s possible inattention, decreasing a driver’s tiredness by helping him follow the traffic sign, and thus, making driving safer and easier.

Ali Behloul et.al [6] represents a fast and robust traffic sign recognition system constituted of three modules which are: segmentation, detection and recognition of sign type. In the first module we start by applying a filter after normalization of the three RGB channels to extract red,

green, blue and yellow maps. To detect the signs and identify their forms, in the second module we propose a new and fast approach for pattern recognition based on minimum bounding rectangles. For the third module, the recognition is made by using a matching directly between the SURF descriptors of the detected traffic sign and the traffic signs in the database. In this module we apply a filtering interest points detected and we keep only the points that are inside the pictogram's sign. To identify the signs, the most researchers divide the task in a three sequential stages: segmentation, detection and recognition. The role of the first stage is to determine the area of the signs in the road scene, whereas the detection selects areas that have an appropriate traffic sign shape. Next, recognition stage identifies the information of the extracted traffic signs.

III. PROPOSED METHODOLOGY

In general, road signs convey traffic information through their shapes, colors, and contents. To attract human attention, road signs are usually designed using particular colors and shapes. Thus, color and shape are two important features of road signs, which are useful to be a priori information for automatic road sign detection. The image of an input image sequence is fed into the road sign detection system. The color and shape features are integrated to locate the centers of road signs, and this is the result of road sign detection.

In our proposed system it is planned to use the computer webcam to give input for the model. The output is going to generate an intelligent voice command to enlarge or to give an alert to the person. Fig 1 shows the structure of the proposed system. This mainly focuses on gathering and analyzing the traffic signs to generate an appropriate alert message to the driver by processing the directions of the symbols and indications. To do this the image processing technique like Canny Edge Detection and Gaussian filters will help.

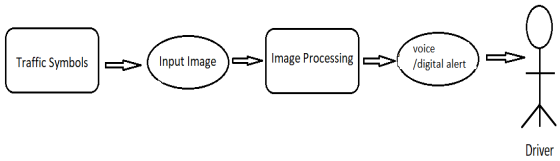

Fig 1: System Architecture

Input module: A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet.

Image processing : Image preprocessing is an important part of the TSDR system whose main idea is to remove low-frequency background noise, normalizing the intensity of the individual particle images, removing reflections, and masking portions of images.Here we converting input image into feature matrix of size 3x3 pixel.

CNN model creation: Convolutional neural networks have proved the state of art in image classification and this is what we used to create the model.The model type is Keras Sequential model.

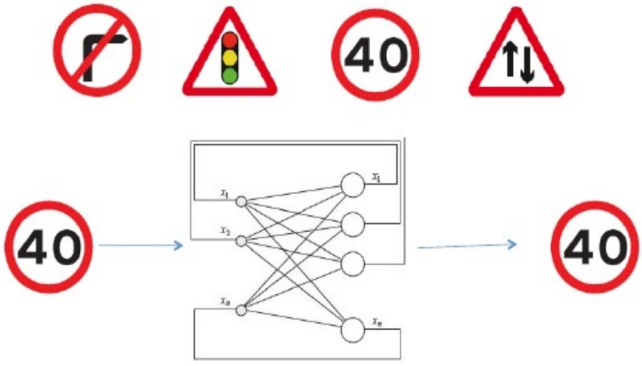

Fig 2: Convolutional neural network

Training the model: GTSRB (German TrafficSigns Recognition Benchmark) is a dataset we used for training and testing the module.It has the different folders of 43 different classes of traffic signs.

Output module: Once we got the output from the image processing system, then we transfer that into an analytical Display/ Navigation screen display device or an audio device to give the immediate instruction to the user.After getting the output from either the voice device or a display device, the driver or use can take the action against the instruction.

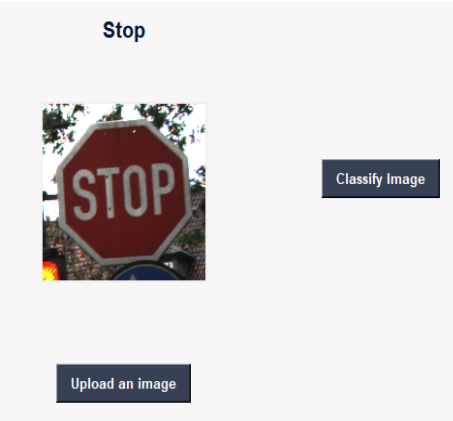

Fig 3: Outcome of system

Accuracy: Model accuracy is defined as the number of classifications a model correctly predicts divided by the total number of predictions made.Training and validation accuracy of proposed model is 0.948.

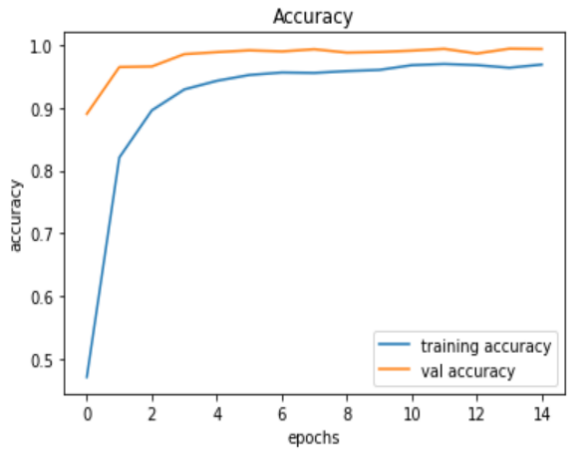

Fig 4: Accuracy Graph

IV. CONCLUSION

In this article, we can examine the possibilities of speeding up the processing of high-definition traffic images to achieve real-time performance for automotive applications, including driving assistance, detection of near-road objects, autonomous driving, and automatic traffic sign inventory maintenance. Shall propose a region-of-interest based approach to achieve a favorable trade-off between detection accuracy and processing time. Employing regions of interest increases overall performance since less data can be propagated through the network. Can achieve real time processing with the support of appropriate hardware, e.g., a graphics processing unit. Moreover, several regions can be processed in parallel if multiple graphic cards are available. Throughout the series of experiments, we show a gradual improvement in detection performance.

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REAL TIME FACE MASK DETECTION USING DEEP LEARNING

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ABSTRACT: *Covid-19 has affected the world seriously and is causing a global health crisis. The major protection method for people is to wear masks in public areas. Many public service providers require customers to use the services only if they wear masks properly. However, only a few research studies regarding face mask detection based on Image analysis. In this paper, we propose Real time Face Mask Detection, which is a highly-accuracy and efficient face mask detector. A composite model using classical and deep machine learning for face mask detection will be proposed.*

Key Words: **Machine Learning, Deep Learning, OpenCV, TensorFlow, Keras.**

1. INTRODUCTION

Face mask detection has emerged as a very interesting problem in image processing and computer vision. It has a confidential range of applications from facial motion capture to face recognition which at the start needs the face to be detected with a very good accuracy. Face detection is more common in today's days because it not only used on images but also in video applications like real time surveillance and detecting faces in videos. More accuracy classification of images is possible now with the advancements of Convolutional networks. After face detection Pixel level information is required which most face detection methods will fail to provide. But obtaining pixel level details has been one of the challenging parts in semantic segmentation. Here Semantic segmentation is the process of assigning a label to each pixel of an image. In our case the labels are either face or nonface. Semantic segmentation is used to separate the face by classifying each pixel of the image as face or a background. This project proposes a model for face detection

using semantic segmentation in an image by classifying each pixel as face with mask and face without mask i.e. beneficially creating a binary classifier and then detecting particular segmented area. The model works very well only for images having frontal faces. The pandemic situation reports 96 of WHO presented that COVID-19 has globally infected over 2.7 million people and caused over 180,000 deaths. In addition, there are several similar large scale serious respiratory diseases, such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), which occurred in the past few years [3, 4]. Meanwhile Mask wearing can reduce the transmission of virus. Many public service providers requires the customers to use the services if and only if they wear masks. Therefore, detection of face masks has become a major computer vision and image processing task to help the global society.

1.1 MACHINE LEARNING

Machine learning (ML)is the study of compute algorithms which improves automatically based on experience. Machine learning algorithms build a mathematical model based on sample data, referred to as "training data", so as to form predictions or decisions without being explicitly programmed to try to do so. Machine learning algorithms are utilized in a good sort of applications, such as email filtering and computer vision, where it's difficult or infeasible to develop conventional algorithms to perform the needed tasks.[10] Machine learning is closely related to computational statistics, which focuses more on making predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the sector of machine learning. Data mining may be a related field of study, that specialize in exploratory data analysis through unsupervised learning.

AI approaches are customarily partitioned into three general classes:

1) Supervised Learning: The computer is introduced with model information sources and their ideal yields, given by a "educator", and the objective is to get familiar with an overall standard that maps contributions to yields.

2) Unsupervised Learning: No names are given to the learning calculation, leaving it all alone to discover structure in its info. Unaided learning can be the objective in itself (finding shrouded designs in information) or implies towards an end (including learning).

3) Reinforcement Learning: A computer program associates with a dynamic climate in which it must play out a specific objective, (for example, driving a vehicle or playing a game against an adversary). As it explores its issue space, the program is

given input that is practically equivalent to rewards, which it attempts to boost.

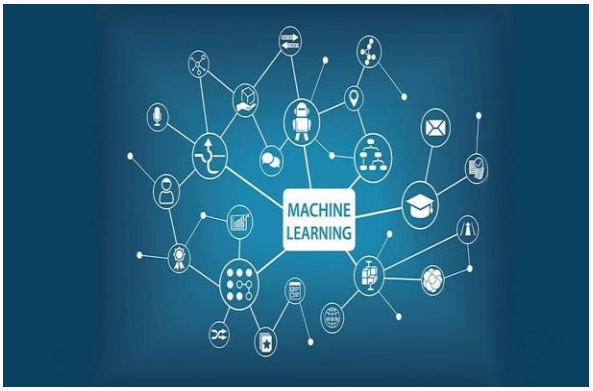

Fig 1: Machine Learning

1.2 DEEP LEARNING

Deep learning is an AI function that mimics the workings of the human brain in processing data for use in detecting objects, recognizing speech, translating languages, and making decisions. Deep learning is an AI work that mirrors the functions of the human mind in preparing information for use in identifying objects, perceiving discourse, deciphering dialects, and deciding. Profound learning AI can learn without human oversight, drawing from information that is both unstructured and unlabeled. Deep learning AI is in a position to find out without human supervision, drawing from data that's both unstructured and unlabeled.

Artificial Neural Network: In ANN first thing you learn is the way ANN work. how forward engendering in reverse spread work in ANN. what is misfortune work then you will learn a diverse kind of streamlining agent like inclination, respect, stochastic angle nice, Adagrad, RMSprop, Adam analyzer how it works or help to decrease misfortune work. What are the diverse weight introduction strategy? These are the fundamental terms we should figure out on how to invent+ an idea in machine learning.

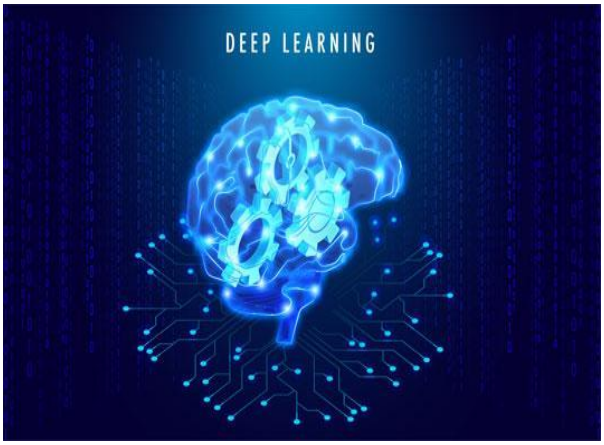

Fig 2: Deep Learning

3. LITERATURE REVIEW:

A Real-Time face mask detection consists of mask and without mask images as datasets, we are using OpenCV for real-time face mask detection from a live stream via our webcam in streamlit module of Python. We are using datasets to build a COVID-19 Real-Time face mask detector with computer vision using Python, OpenCV, TensorFlow Keras and Streamlit (for Framework). Our aim is to find whether a person on an image or video stream is wearing a face mask or not by the help of deep learning and computer visions. Many

algorithms are being devised using convolutional architectures to make the algorithms as accurate as possible. All these convolutional architectures have made it possible to extract even the pixel details. We aim to design a Real time face mask detection using computer vision techniques. We are presenting a method for generating accurate face segmentation masks from any arbitrary size input image. Starting from the RGB image of any size, the method uses Predefined Training Weights of VGG – 16(Visual Geometry Group) Architecture for the purpose of feature extraction and pre trained model has been used to detect the humans. We have also used Caffe-based face detector as deep learning framework for speed, expression and modularity.

4. PROPOSED SYSTEM:

The proposed system focuses on how to identify the person on image/video stream wearing face mask with the deep learning algorithm by using OpenCV, TensorFlow and Keras libraries. A web frame named Streamlit will be added with responsive features to implement Graphical User Interface.

ADVANTAGES: With the help of confidence score we will be able to give a better decision and a better accuracy. Reduces number of infections and transmission of viruses. Safe guard work-spaces and working environment.

DATASETS:

Dataset is necessary to train and test any kind of model. In our model we have used 1200 dataset where 600 are of people are wearing mask and other 600 people not wearing a mask. We trained the dataset and tested the dataset to give accurate results with a confidence score. As we are training and testing over 1500 + images normal CPU will not provide us better Efficiency for huge Epochs that is 50 and more.

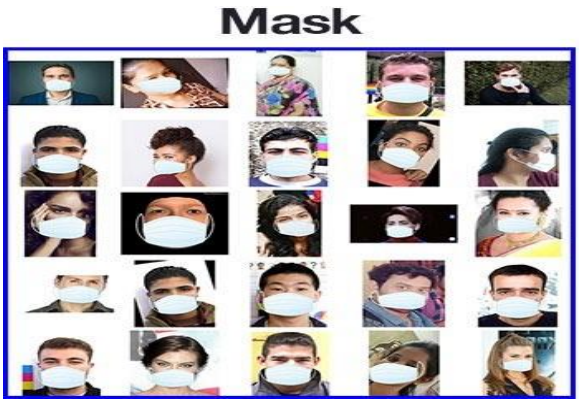

Fig 3(a): Datasets (With Mask)

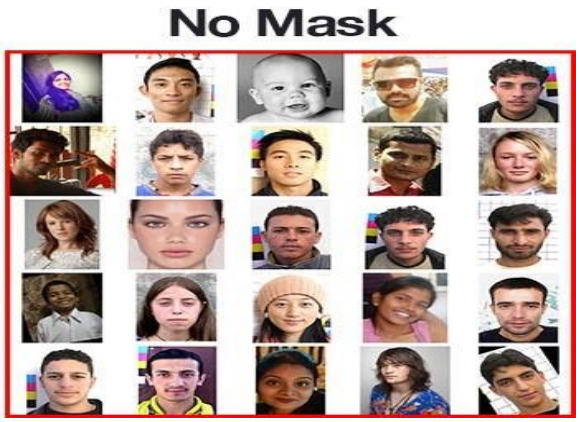

Fig 3(b): Datasets (Without Mask)

FLOW CHART:

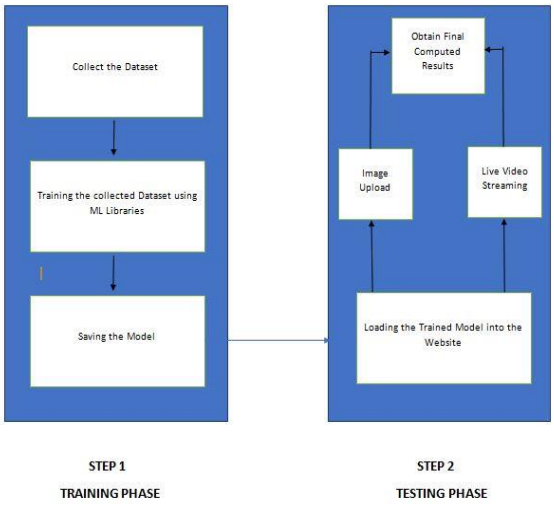

Fig 4: System Flow

ACCURACY: Accuracy is defined as the percentage of correct predictions for the test data. We are obtaining ~99% accuracy on our test set. Looking at the below Figure, we can see there are little signs of overfitting, with the validation loss lower than the training loss Given these results, we are hopeful that our model will generalize well to images outside our training and testing set.

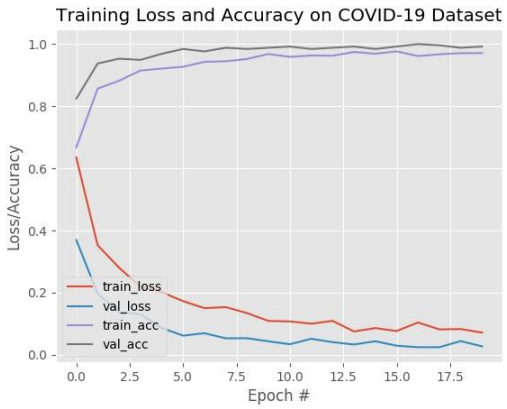

Fig 5: Accuracy on our Test Set

5. METHODOLOGY

Face Mask Detection of a person is wearing a mask or not by browsing of photos, live video stream and addition features like Voice Alert and covid status around the world by using streamlit as the interface gives an accurate result.

1.Streamlit: User interface Streamlit is used.

2. Image/Video input: Using StreamLit an user interface, browsing of images and live video stream can be done and checked if a person is wearing a mask or not with a confidence score. we are training the images with the image cropped into the format of (244,244,3) here (244,244) pixels and RGB index.

3. Validation: The system validates by displaying the confidence score and checks if the person is wearing a mask or not.

(i)Image Browsing: Browsing of images from the system and uploading an image where a person is wearing mask or not it in the streamlit. If there is a green dimensional bounding box with high confidence score then a person is wearing a mask and outputs animation of balloon. If there is a red dimensional bounding box with high confidence score then a person is not wearing a mask and gives an alert “Please wear a mask and protect yourself and your family from Covid-19“.

(ii)Live Stream Video: The streamlit takes laptop web camera and checks live if a person is wearing a mask or not. If there is a green dimensional bounding box with high confidence score then a person is wearing a mask. If there is a red dimensional bounding box with high confidence score then a person is not wearing a mask.

4. Voice Alert: This is voice speech where it gives information about

5. Covid status: This link will provide us status of covid situation in and around the like how many cases covid has been reported, displays the place with highest covid cases.

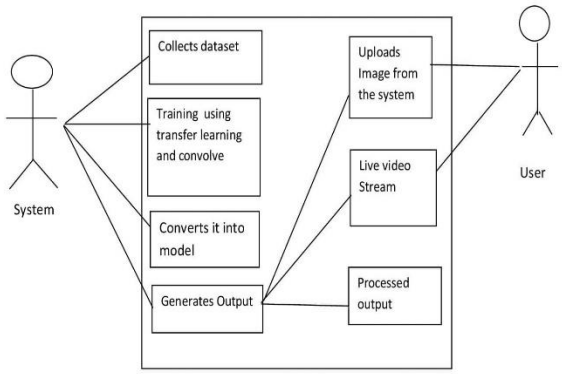

Fig 6: Class Diagram

6. MODULE

6.1 OPENCV

OpenCV is an open-source computer vision and AI programming library. OpenCV was worked to give a typical framework to computer vision applications and to quicken the utilization of machine insight in the business items. Being a BSD-authorized item, OpenCV makes it simple for organizations to use and change the code. The library has in excess of 2500 enhanced calculations, which incorporates an extensive arrangement of both work of art and best in class PC vision and AI calculations. These calculations can be utilized to distinguish and perceive faces, distinguish objects, arrange human activities in recordings, track camera developments, track moving items, extricate 3D models of articles, produce 3D point mists from sound system cameras, join pictures together to create a high goal picture of a whole scene, find comparative pictures from a picture information base, eliminate red eyes from pictures taken utilizing streak, follow eye developments, perceive view and set up markers to overlay it with enlarged reality, and so forth OpenCV has in excess of 47 thousand individuals of client network and assessed number of downloads surpassing 18 million. The library is utilized broadly in organizations, research gatherings and by legislative bodies. Alongside grounded organizations like Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda, Toyota that utilize the library, there are numerous new businesses, for example, Applied Minds, VideoSurf, and Zeitera, that utilize OpenCV. OpenCV's conveyed utilizes length the reach from sewing Streetview pictures together, identifying interruptions in

observation video in Israel, checking mine hardware in China, assisting robots with exploring and get objects at Willow Garage, location of pool suffocating mishaps in Europe, running intelligent workmanship in Spain and New York, checking runways for garbage in Turkey, reviewing names on items in manufacturing plants far and wide on to quick face identification in Japan. It has C++, Python, Java interfaces and supports Windows, Linux, and Mac OS. OpenCV inclines generally towards constant vision applications and exploits MMX and SSE directions when accessible. Full-included CUDA and OpenCL interfaces are in effect effectively grown at the present time. There are more than 500 calculations and around 10-fold the number of capacities that make or backing those calculations. OpenCV is composted locally in C++ and has a templated interface that works consistently with STL compartments.

6.2 TENSORFLOW

TensorFlow is a start to finish open source stage for AI. It has an extensive, adaptable environment of instruments, libraries, and network assets that allows specialists to push the best in class in ML and designers to effectively fabricate and send ML controlled applications. TensorFlow offers numerous degrees of deliberation so you can pick the correct one for your requirements. Assemble and train models by utilizing the significant level Keras API, which makes beginning with TensorFlow and ML simple. TensorFlow permits designers to make dataflow diagrams—structures that portray how information travels through a chart, or a progression of handling hubs. Every hub in the diagram speaks to a numerical activity, and every association or edge between hubs is a multidimensional information exhibit or tensor. TensorFlow gives the entirety of this to the software engineer via the Python language. Python is anything but difficult to learn and work with and gives helpful approaches to communicate how elevated level reflections can be coupled together. Hubs and tensors in TensorFlow are Python objects, and TensorFlow applications are themselves Python applications. The real number-related tasks, notwithstanding, are not acted in Python. The libraries of changes that are accessible through TensorFlow are composed as superior C++ pairs. Python just coordinates traffic between the pieces and gives significant level programming reflections to snare them together. TensorFlow applications can be a sudden spike in demand for almost any objective that is advantageous: a neighborhood machine, a bunch in the cloud, iOS and Android gadgets, CPUs or GPUs. In the event that you utilize Google's own cloud, you can run TensorFlow on Google's custom TensorFlow Processing Unit (TPU) silicon for additional speeding up. The

subsequent models made by TensorFlow, however, can be sent on most any gadget where they will be utilized to service expectations.

6.3 KERAS

Keras is an API intended for people, not machines. Keras follows best practices for diminishing psychological burden: it offers steady and straightforward APIs, it limits the number of client activities needed for regular use cases, and it gives clear and noteworthy mistake messages. It additionally has broad documentation and designer guides. Keras contains various executions of regularly utilized neural network building squares, for example, layers, goals, enactment capacities, streamlining agents, and a large group of apparatuses to make working with picture and text information simpler to rearrange the coding fundamentals for composing profound neural organization code. The code is facilitated on GitHub, and network uphold discussions incorporate the GitHub issues page and a Slack channel. Keras is a moderate Python library for profound discovery that can run on top of Theano or TensorFlow. It was created to make executing profound learning models as quick and simple as workable for exploration and development. It runs on python 2.7 or then again 3.5 and can consistently execute on GPUs and CPUs were given the hidden systems. It is delivered under the tolerant MIT permit

6.4 MOBILENET V2

MobileNetV2 expands upon the thoughts from MobileNetV1, utilizing profundity shrewd divisible convolution as effective structure blocks. Nonetheless, V2 acquaints two new highlights with the engineering:

1) Linear bottlenecks between the layers, and

2) Shortcut connections between the bottlenecks

MobileNetV2was picked as the calculation to fabricate a model that could be sent on a cell phone. A modified completely associated layer which contains four consecutive layers on top of the MobileNetV2 model was created.

6.5 CAFFE BASED FACE MASK DETECTION:

Caffe is a deep learning structure made with articulation, speed, and seclusion at the top of the priority list. It is created by Berkeley AI Research (BAIR) and by network supporters. Yangqing Jia made the venture during his PhD at UC Berkeley. Caffe is delivered under the BSD 2-Clause permit. Caffe depends on the Single Shot-Multibox Detector (SSD) and utilizes ResNet-10 engineering as its spine. It was presented post OpenCV 3.3 in its profound neural organization module. For general computer

vision issues, OpenCV's Caffe model of the DNN module is the best. It functions admirably with impediment, immediate head movements, and can distinguish side faces too. Additionally, it likewise gave the fastest fps among all.

6.6 STREAMLIT:

Streamlit is an open-source application system explicitly intended for ML engineers working with Python that makes it simple to make and share delightful, custom web applications for AI and information science. It additionally permits you to make a shocking looking application with a couple of lines of code. In only a couple of minutes, you can assemble and send incredible information applications. A couple of the upsides of utilizing Streamlit instruments like Dash and Flask:

It grasps Python scripting; No HTML information is required!

Less code is expected to make an excellent application No callbacks are required since gadgets are treated as factors. Information storing improves and accelerates calculation pipelines.

Fig 7: Streamlit

6.7 PYTHON 3.8

Python is an elevated level, universally useful and an extremely famous programming language. Python programming language (most recently Python 3) is being utilized in web advancement, Machine Learning applications, alongside all bleeding edge innovation in the Software Industry. Python Programming Language is very appropriate for Beginners, likewise for experienced software engineers with other programming dialects like C++ and Java.

7.CONCLUSION AND FUTURE ENHANCEMENTS

CONCLUSION:

[3] As the technology are blooming with emerging trends the availability so we have novel face mask detector which can possibly contribute to public healthcare. The architecture consists of MobileNet as the backbone and it can be used for high and low computation scenarios. In order to extract more robust features, we utilize transfer learning to adopt weights from a similar task face detection, which is trained on a very large dataset.

[4] We used tensor flow, keras, Opencv and CNN to detect whether people are wearing face masks or not. The models had been tested with images and real-time video streams using a webcam. The accuracy of

the model is achieved and the optimization of the model is a continuous process and we are building a highly accurate solution by tuning the hyper parameters. This specific model could be used as a use case for edge analytics.

FUTURE ENHANCEMENTS: In the midst of a pandemic caused by Covid-19 maintaining and Following the Guidelines is one of the major Issues. With the rise of covid-19 Virus across the Globe we have to take at most care by Wearing a Mask. With help of our project we can detect whether a person is wearing a Mask or Not with a Confidence Score. According to the research the ML models Developed will never get Deployed in Big Tech firms it has been estimated more than 85% with huge amounts of investment influx into these Niche Areas Ml projects are Exponentially Increasing Ever before. We can provide the Superpower to ML models by providing the IT Ops teams support which will lead to continuous Training, testing, managing, monitoring, deploying Machine Learning Models in Production and to govern their use in production environments. We will be solving one of the major problem which is being faced by Machine learning Models by Building an End-to-End fully automated model with the OPS which we can call as MLOPS [Mops].with the Mops we can automate the entire Process from the time of data collection, data preprocessing, building, testing like analysing metrics such as R2 Score, Precision, Recall, Accuracy and deploying Our Machine Learning Model . We can automate the process of training the model if we are not satisfied with the results, we obtained from the Machine learning model. We can Build such a Sophisticated Environment using some of the continuous monitoring Tool Like Jenkins, Gitlab and Bamboo etc. and wrapping up the entire dependencies From the point of setting up libraries to Deploying the Entire model using the Container Technology like Docker, Swarm, and podman etc. with all these tools in place we can build a complete end-to-end pipeline (CI/CD) which can speed up the entire process and improve the entire Machine Learning Model Development and Model Deployment Lifecycle. As the Buzzwords like AI , ML, Devops are on Move Companies are in the race to try their hand in this domain and make Money For any company Website is the first place to showcase their view Unlike the other sites Machine Learning Models Deployed Sites are more Valuable and profitable as it provides various amounts of insights for consumers which is very much crucial for any company. With this in mind will be managing our machine Learning model integrated website using smart portable and open-source tools like Kubernetes which helps to scale up and

down our Website as and when the Website Load increases or decreases periodically using Kubernetes Orchestration, by usage of Technique called Load balancing. Deploying Entire infrastructure in Cloud Storage like AWS is failure resilient and improves our Efficiency.

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MACHINE LEARNING FOR WEB VULNERABILITY: THE CASE OF CROSS-SITE REQUEST FORGERY

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Abstract **- Cross-Site Request Forgery (also known as XSRF or CSRF) is one of the oldest and simplest attacks on the Web, yet it is still effective on many websites and it can lead to severe consequences, such as economic losses and account takeovers. CSRF is an attack that tricks the victim into submitting a malicious request. It inherits the identity and privileges of the victim to perform an undesired function on the victim's behalf. For most sites, browser requests automatically include any credentials associated with the site, such as the user's session cookie, IP address, Windows domain credentials, and so forth. These attacks are possible because web browsers send some types of authentication tokens automatically with every request to a website. Web applications are particularly challenging to analyse, due to their diversity and the widespread adoption of custom programming practices. ML is thus very helpful for web application security: it can take advantage of manually labelled data to bring the human understanding of the web application semantics into automated analysis tools. In this we are going to analyze the data with different algorithms to analyze to compare the outcome.**

Keywords – Machine learning, cross-site request forgery, web security.

I. INTRODUCTION

Cross-Site Request Forgery (CSRF) is one of the simplest web attacks to understand, yet it has consistently been one of the top web security threats since its discovery in the early 2000s. In a CSRF attack, a malicious website forces the web browser to perform authenticated, security-sensitive operations at a target web application by means of cross-site requests, without any involvement of the browser's user. This can be done by using just standard HTML tags and JavaScript, making CSRF attempts trivial to perform and forcing security sensitive web developers to implement solutions to filter out malicious cross-site requests abusing authentication. Cross-Site Request Forgery (CSRF) is one of the top threats to web applications and has been continuously ranked in the OWASP Top Ten [1]. In a CSRF attack, the attacker makes a victim's web browser silently send a forged HTTP request to a vulnerable web site and cause an undesired state-changing action. The term victim refers to an honest user of the vulnerable web site.

Robust defences against CSRF are well-known [2], but still a significant number of modern web applications was shown to be vulnerable to this class of attacks [28], [34]. The main challenge to face when implementing protection against CSRF is that one has to strike a delicate balance between security and usability. As a matter of fact, the Web is built on top of cross-site requests, most of which are not malicious. Hence, web developers have to choose carefully which operations can only be made available to same-site requests without breaking the website functionality, and implement appropriate security checks on cross-site requests. It is thus easy to accidentally leave room for CSRF attacks, which motivated recent research on automated CSRF detection [28]. The research by White Hat claims that over sixty percent (60%) of the total web applications are exposed to multiple vulnerabilities which any attacker can take advantage of. These statistics are quite worrisome and it goes without saying that this rate must come down markedly [4]. Suitable and robust security policies should be implemented during development of any Web Application. Web Applications require more attention than normal computer applications because they are much more sensitive and highly prone to online attacks. A security loophole or a weakness in a Web Application, which a hacker can misuse to carry out an attack, is known as vulnerability [5]. Vulnerabilities are generally classified into two groups: Technical and Logical. One of the best known Web Application vulnerabilities is Cross Site Request Forgery (CSRF). The aim of this research is to analyse the different available tools for CSRF testing.

A. Example: Cross-Site Request Forgery (CSRF)

Cross-Site Request Forgery (CSRF) is a well-known web attack that forces a user into submitting unwanted, attacker-controlled HTTP requests towards a vulnerable web application in which she is currently authenticated. The key

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concept of CSRF is that the malicious requests are routed to the web application through the user's browser, hence they might be indistinguishable from intended benign requests which were actually authorized by the user.

A typical CSRF attack works as follows (Figure 1):

1) Alice logs into an honest yet vulnerable web application, e.g., her preferred social network. Session authentication is implemented through a session cookie that is automatically attached by the browser to any subsequent request towards the web application;

2) Alice opens another tab and visits an unrelated website, e.g., a newspaper website, which returns a web page including malicious advertisement;

3) the malicious advertisement sends a cross-site request to the social network using HTML or JavaScript, e.g., asking to "like" a given political party. Since the request includes Alice's cookies, it is processed in her authentication context at the social network. This way, the malicious advertisement can force Alice into putting a "like" to the desired political party, which might skew the result of online surveys.

Notice that CSRF does not require the attacker to intercept or modify user's requests and responses: it suffices that the victim visits the attacker's website, from which the attack is launched. Thus, CSRF vulnerabilities are exploitable by any malicious website on the Web.

Fig. 1. Cross-site request forgery (example)

I. Preventing CSRF

To prevent CSRF, web developers have to implement explicit protection mechanisms [7]. If adding extra user interaction does not affect usability too much, it is possible to force re-authentication or use one-time passwords / CAPTCHAs to prevent cross-site requests going through unnoticed. In many cases, however, automated prevention is preferred: the recently introduced Same Site cookie attribute can be used to prevent cookie attachment on cross-site requests, which solves the root cause of CSRF and is highly recommended for new web applications. Unfortunately, this defence is not yet widespread and existing web applications typically filter out cross-site request by using any of the following techniques:

1) checking the value of standard HTTP request headers such as Referrer and Origin, indicating the page originating the request;

2) checking the presence of custom HTTP request headers like X-Requested-With, which cannot be set from a cross-site position;

3) checking the presence of unpredictable anti-CSRF tokens, set by the server into sensitive forms.

A recent paper discusses the pros and cons of these different solutions [9]. However, all three options suffer from the same limitation: they require a careful and fine-grained placement of security checks. For example, tokens should be attached to all and only the security-sensitive HTTP requests, so as to ensure complete protection without harming the user experience. Using a token to protect a "like" button is useful to prevent the attack discussed above, yet having a token on the social network homepage is undesirable, because it might lead to rejecting legitimate cross-site requests, e.g., from clicks on the results of a search engine indexing the social network. In the end, finding the "optimal" placement of anti- CSRF defences is typically a daunting task for web developers. Modern web application development frameworks provide automated support for this, yet CSRF vulnerabilities are still routinely found even in top-ranked websites [8]. This motivates the need for effective CSRF detection tools. But how can we provide automated tool support for CSRF detection if we have no mechanized way to detect which HTTP requests are actually security-sensitive?

II. MACHINE LEARNING TO THE RESCUE

The CSRF example in the previous section shows that it is useful to enrich vulnerability detection tools with semantic information so as to minimize their number of false positives and false negatives. At the very least, one would desire a method to automatically classify HTTP requests as security sensitive or not to restrict the analysis to the former. However, this is particularly challenging to do on the Web, since HTTP requests have a relatively weak syntactic structure and custom programming practices abound. For example, there are many different plausible ways to implement a "like" button for some content identified by the unique string 3aa5bf, including:

1) a GET request to the page like .php with a single parameter id = 3aa5bf;

2) a GET request to the page manage .php with a parameter id = 3aa5bf and a parameter action = like;

3) a POST request to the page manages .php including a JSON object {id: 3aa5bf, action: upvote}.

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All these requests look semantically similar to experienced security testers, yet they are syntactically different and it might be hard to identify all the most common ways to encode the same information in the wild.

A. Supervised Learning

Luckily, Machine Learning (ML) provides effective tools to automate classification tasks. A classifier can be seen as a function f: X → Y mapping any object from the feature space X into a corresponding class from Y. The subfield of supervised learning studies effective techniques to automatically generate classifiers starting from a set of labelled data [8]. To fruitfully use supervised learning, one thus has to:

1) collect a set of objects of interest O, for example HTTP requests sent to representative web applications;

2) define the set of classes Y. For example, one could set Y = {+1, −1} to discriminate the security-sensitive requests (+1) from all the other ones (-1);

3) define the feature space X by manually identifying the salient aspects which look useful to assign the objects in O to their correct class in Y. For example, one could leverage the request length, the request method or the presence of selected keywords in the request body;

4) build a training set D of pairs (~x, y), where each ~x is the encoding in X of an object o ∈ O and y is its class.

Once this is done, supervised learning can automatically extract the best-performing classifier from a set of possible hypotheses H by estimating its performance on the training set D. As long as one has enough manually curated data in D, the performance of supervised learning can compete with or even outclass that of human experts [10], [11], [12].

I. MITCH: ML-BASED DETECTION OF CSRF

Mitch is the first tool for the black-box detection of CSRF vulnerabilities. Its design is based on the methodology presented in the previous section. Mitch is available online1 as a browser extension for Mozilla Firefox. We refer to our recent research paper for full details [14].

A. Overview

Mitch assumes the possession of two test accounts (say, Alice and Bob) at the website where the security testing is to be performed. This is used to simulate a scenario where the attacker (Alice) inspects sensitive HTTP requests in her session to force the forgery of such requests in the browser of the victim (Bob). Having two test accounts is crucial for the precision of the tool because if the forged requests contain some information which is bound to Alice's session, then CSRF against Bob may not be possible. For example, if a website defends against CSRF through the use of anti-CSRF tokens, then Alice's requests will be rejected in Bob's session. The use of two test accounts for CSRF detection has already been advocated in previous work [8] and is part of traditional manual testing strategies.

III. Methodology:

- Identification & Characterization of data.
- Converting the string data to numeric data for easier application of algorithms.
- Data normalization.
- Splitting the data into training and testing.
- Feature selection for further evaluation using different methods.
- Then applying the algorithms to the datasets to assist the problem of the dataset.
- Performing the evaluation/testing of the dataset.
- Comparing the results of the outcome of different methods.

Here we are applying some algorithms on the dataset, they are:

1. K-neighbour Classifier

The KNN is very simple and very effective machine learning algorithms. It is a non-parametric, lazy-learning algorithm, which means that there is no explicit training phase before classification.
The purpose behind its use is to use a database in which the data points are separated into several classes to predict the classification of a new sample point. The k-nearest neighbours' algorithm uses the entire dataset as the training set, rather than splitting the dataset into a training set and test set.
KNN can require a lot of memory or space to store all of the data, but only performs a calculation (or learn) when a prediction is needed, just in time. You can also update and curate your training instances over time to keep predictions accurate.

$$d(\mathbf{p}, \mathbf{q}) = d(\mathbf{q}, \mathbf{p}) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \cdots + (q_n - p_n)^2}$$

2. Random Forest Classifier

Random forest is a supervised learning algorithm. It can be used both for classification and regression. It is also the most flexible and easy to use algorithm. A forest is comprised of trees. It is said that the more trees it has, the more robust a forest is. Random forests create decision trees on randomly selected data samples, gets prediction from each tree and selects the best solution by means of voting. It also provides a pretty good indicator of the feature importance.

ISBN: 979-85-27243-61-1

A random forest is a classifier based on a family of classifiers $h(x|\Theta_1)$. . . . .,$h(\mathbf{x}|\Theta_K)$ based on a classification tree with parameters Θ_k randomly chosen from a model random vector Θ.

For the final classification f(**x**) (which combines the{ h_k (**x**)} classifiers), each tree casts a vote for the most popular class at input **x** , and the class with the x most votes wins.

Specifically given data D = $\{(\mathbf{x}_i,y_i)\}^n_{i=1}$: we train a family of classifiers h_k (**x**).

Each classifier $h_k(\mathbf{x}) \equiv h(\mathbf{x}|\Theta_k)$ is in our case a predictor of „

y = ± 1 =outcome associated with input.

3. SVC

Support vector machines [13] manage to avoid this difficulty by optimizing a bound on the generalization error in terms of quantities that do not depend on the dimension of the feature space [16], hence enabling good performance unaffected by the curse of dimensionality. In the present work, the C-library LIBSVM [15] was used. This library implements the one-against-one voting terminology to handle more than two classes.

Kernels: A typical applied kernel for the support vector classifier is the linear kernel, which is defined as
κ(x, x 0) = x T x 0 , hence an inner product between the input vectors. Another well-known kernel is the Gaussian kernel (or RBF-kernel) with width parameter σ defined s κ(x, x 0) = exp(− k x − x 0 k 2 /2σ 2). Using this kernel, support vector classifier is basically finding discriminating dimensions in an infinite feature space.

4. Linear SVC

The Linear Support Vector Classifier (SVC) method applies a linear kernel function to perform classification and it performs well with a large number of samples. If we compare it with the SVC model, the Linear SVC has additional parameters such as penalty normalization which applies 'L1' or 'L2' and loss function. The kernel method cannot be changed in linear SVC, because it is based on the kernel linear method.

5. Gradient Boost Algorithm

Gradient boosting is a greedy algorithm and can overfit a training dataset quickly. Gradient Boosting is a popular boosting algorithm. In gradient boosting, each predictor corrects its predecessor's error. In contrast to Adaboost, the weights of the training instances are not tweaked, instead, each predictor is trained using the residuad errors of predecessor as labels. One can arbitrarily specify both the loss function and the base-learner models on demand. In practice, given some specific loss function $\Psi(y, f)$ and/or a custom base-learner $h(x, \theta)$, the solution to the parameter estimates can be difficult to obtain. To deal with this, it was proposed to choose a new function $h(x, \theta_t)$ to be the most parallel to the negative gradient $\{g_t(x_i)\}^N_{i=1}$ along the observed data:

$$gt(x)=Ey[\partial\Psi(y,f(x))/\partial f(x)|x]_{f(x)=f^{t-1}(x)}$$

6. Decision Tree Classifier

Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.

In a Decision tree, there are two nodes, which are the Decision Node and Leaf Node. Decision nodes are used to make any decision and have multiple branches, whereas Leaf nodes are the output of those decisions and do not contain any further branches.

The decisions or the test are performed on the basis of features of the given dataset.

It is a graphical representation for getting all the possible solutions to a problem/decision based on given conditions.

7. Hybrid voting classifier

A Hybrid system is an intelligent system which is framed by combining at least two intelligent technologies like Fuzzy Logic, Neural networks, Genetic algorithm, reinforcement Learning, etc. The combination of different techniques in one computational model make these systems possess an extended range of capabilities. A Voting Classifier is a machine learning model that trains on an ensemble of numerous models and predicts an output (class) based on their highest probability of chosen class as the output. It simply aggregates the findings of each classifier passed into Voting Classifier and predicts the output class based on the highest majority of voting. The idea is instead of creating separate dedicated models and finding the accuracy for each them, we create a single model which trains by these models and predicts output based on their combined majority of voting for each output class.

IV. VIII. RELATED WORK

In the previous section, we discussed existing approaches to CSRF detection, i.e., tools designed to detect CSRF vulnerabilities in web applications. Here we report on additional related work on CSRF defences and machine learning for security. As to other serious threats to web session security, we refer to a recent survey on the topic [3].

ISBN: 979-85-27243-61-1

A. Cross-Site Request Forgery

Robust defences against CSRF were first proposed by Barth, Jackson and Mitchell in their seminal paper [6]. Their proposals still represent the state of the art to protect web applications against CSRF, which typically resort to tokenization and referrer checking to prevent such attacks. However, the research community proposed also a number of alternative solutions against CSRF, which did not find wide practical adoption. In particular, it is worth mentioning several browser-side defences like RequestRodeo [17], BEAP [18], and CsFire [22], [23], which share the idea of stripping session cookies from cross site requests to prevent CSRF. Other similar solutions instead involve the browser's user in the loop when suspicious cross site requests are detected [25]. These browser-side defences are useful to protect the victims of a CSRF attempt, but they cannot assist security-conscious web developers who want to identify potential room for CSRF in their web applications.

B. Machine Learning for Security

Machine learning has found a wide number of applications to computer security, for instance in intrusion detection systems [26], malware detectors [24], and spam filters [19]. In the context of web security, supervised learning techniques have been proposed to automatically detect cookies which are used for authentication purposes [20], [21]. This is useful to instruct the browser into applying stronger security policies on them, e.g., to prevent their improper disclosure.

Results

	Accuracy	**Algorithm**
0	0.960967	DecisionTreeClassifier
1	0.958527	KNeighborsClassifier
2	0.667332	SVC
3	0.591927	LinearSVC
4	0.962298	RandomForestClassifier
5	0.964515	GradientBoostingClassifier
6	0.962741	hybrid_voting_classifier

Fig.2 Accuracy of Algorithms .

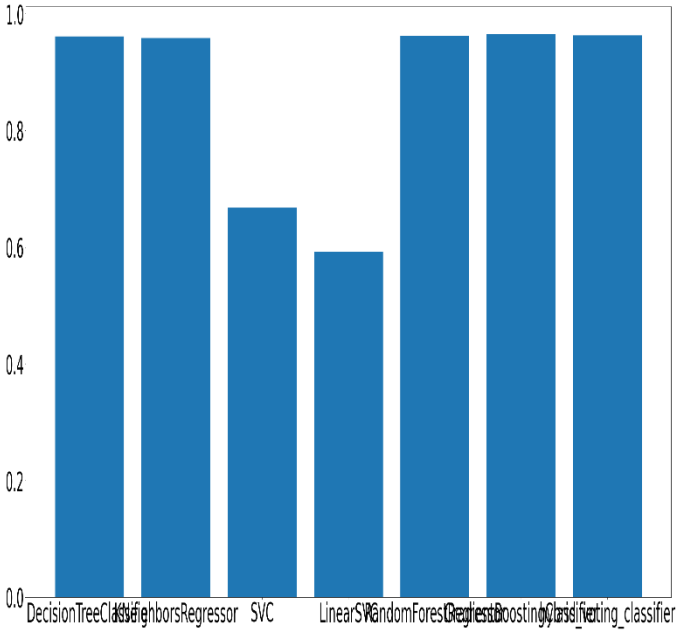

Fig.3 comparison using graph

V. RESULTS & DISCUSSIONS

We compared the classification results of Decision tree classifier, SVC, linear SVC, K-neighbors classifier, Random forest classifer, Gradient boosting classifier and hybrid_voting_classifier. The accuracy of the testing data was calculated. Then we compare those result to analyse the outcome of the data result. Performance test was carried out to see which algorithm is fast and less time taking and more accurate.

VI. CONCLUSIONS

1. The results strongly suggest that machine learning can aid in the detection of Cross Site Request Forgery. These attacks can be easily executed by the attackers by using straightforward techniques. A reliable mechanism for protecting a Web Application against these attacks is absolutely essential.
2. It can be concluded from the results that the proposed system can be effectively used for identifying the best algorithm to detect by seeing the accuracy.
3. It is time saving process for learning the patterns of attack.
4.It helps in understanding of where and when we need to use which algorithm.

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IOT Based Air Pollution & Sound Pollution Monitoring System

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Abstract:

Air and sound pollution are rapidly growing. This rapid growth is causing environmental challenges like climate change, malfunction, and pollution, which has affected the demand for efficient, low-cost, operationally adaptive, and intelligent systems for monitoring. In this research, smart sensor networks are a new research area that integrates various computer science, wireless communication, and electronics issues. The use of a wireless embedded computing system to monitor noise & air pollution levels in a specific region of interest is proposed in this research. Our solution comprises the IoT technology, which is the act of combining computer science plus electronics. The sensing devices are coupled to the embedded computing system to detect deviations from typical levels of parameters such as noise and air pollution. This approach can be used in any infrastructure context that requires constant monitoring, control, and behaviour analysis. The suggested model's working performance is assessed using a prototype implementation that includes an Arduino UNO board along with sensor devices & MATLAB with Arduino hardware support package. The implementation is evaluated for a few factors, such as noise, CO, radiation levels etc, in comparison to typical behaviour levels or supplied specifications, to ensure that pollution monitoring is controlled in order to make the environment smart.

Index terms *include IoT, Embedded Computing System, Arduino UNO, MATLAB Software, Smart Environment.*

I. INTRODUCTION

Air pollution is the introduction of biological molecules, particles, or other harmful elements into the atmosphere. It is a major source of infections, allergies, and other illnesses. in extreme cases, mortality in humans. It also damages other living things, including as animals and food crops, as well as the natural and manmade environments. They are also in charge of several types of respiration.Individuals who are exposed to these poisons or substances for an extended length of time are at risk. Carbon monoxide, for example, is very toxic to humans, since it may induce significant asphyxiation, headaches due to the carboxy-hemoglobin composition, and therefore death if left unprotected for an extended period of time. In 2014, the WHO estimated that 70 lakh people died. Air pollution kills people all around the world. The International Energy Agency (IEA) came close to matching this approximation as well. These chemicals are also to blame for a slew of environmental problems, including Acid rain, ozone layer depletion etc. Air pollution is on the rise as a result of a variety of human activities, and preventing it is critical.

Sensors for assessing air quality used to be large, bulky, and costly. Most air pollution sensors are now designed to detect the 5 most prevalent air pollutants like nitrous oxide, carbon monoxide, ozone, sulphur dioxide etc. Air pollution and quality monitoring are extremely important in today's society since they have a significant impact on health. The proposed air quality measuring sensor can detect & monitor the presence of air pollution in the surrounding area, as well as notify the people in the vicinity via a buzzer sound. It is suitable for both indoor and outdoor use. These sensors will become cheaper and more prevalent as a result of future technology advancements. cheap, portable air-quality monitors that individuals may wear to monitor local air quality.

Urban communities are beginning to emerge as a result of the strong concentration of big cities.resulting in high levels of noise from a variety of source such as human activity, transportation, building activities, and industry, causing irritation and health concerns among inhabitants. Professionals who capture and analyse noise data at site using a sound sensor do traditional noise measurements in metropolitan settings.

In the recent decade, there has been an increase in the quantity and diversity of methods for monitoring ambient noise that can assist in gaining greater insight into frequently complicated noise conditions in less time and with less effort. Custom built sensor network systems are meant to be compact, affordable, low power, and self-contained so that they may be distributed widely.monitoring in a wide area. With the popularization of IoT, this topic is becoming more and more relevant and aims to wide monitoring across a large region With the rise of the Internet of Things, this issue is becoming increasingly significant, with the goal of creating and constructing (WASNs – Wireless Acoustic Sensor Networks) to measure the amount of noise in city. In actuality, the IoT is founded on the connection of sensors and electrical device capable of providing low cost measuring alongside a developing infrastructure that allows for low-cost task observation. The numerous benefits of IoT-enabled monitoring and control capabilities have prompted a growing number of academics to look into novel Internet of things solutions for noise moniter and control in urban environment.

A low cost, self powered, wireless sensor device for continuous data collecting and display of noise & air level is created, based on prior scientific research.

II. LITERATURE SURVEY

[1]. Create an efficient air and sound pollution tracking system using the IoT.N. Komal Kumar2, K. Cornelius1, Sagar Pradhan3, Priyesh (2020) Members of the community will be able to control the level of pollution by using this app on their phones.The effective techniques to control the environment and an efficient, cost-effective equipped model are handed on several models in this article.This IoT approach has been proven in practise for controlling specific criteria. It also sent the actuators' criteria and data to the clouds. This IoT concept is beneficial to the community's well-being, and it is carried out by utilising such technological advances.

[2].Arushi Singh, Divya Pathak, Prachi Pandit, Shruti Patil, Prof. Priti. C. Golar, IoT-based Air and Sound Pollution Monitoring System in the year of March. It makes use of sound, gases, IoT, and sensors.The system identifies the presence of poisonous compounds in the air with air sensors and sends this data on a continual basis.In addition, the system continuously monitors and reports sound levels.It encourages the use of new technology while also emphasising the need of living a healthy lifestyle.

[3]. IoT-based air and sound pollution monitoring system Mr. Saurabh Surendran, Prof. M.P. Sardey, Ms. Sarika Deshmukh, Ms. Sarika Deshmukh, Ms. Sarika Deshmukh, Ms. Sarika Deshmukh in the year June 2017.Is a real-time monitoring device which analyzes levels of air and sound pollution in the environment.A hardware system is developed to monitor carbon monoxide, carbon dioxide, and smoke concentrations for this purpose. The system's output is digital, as a result of the sensor and processor's partnership. Sensor modules' data can be transmitted to another place over a network using Wi-Fi technology. The suggested system is intended to measure the amounts of pollution in various locations or sites.

[4].An IoT-based Air Pollution Monitoring System is being researched.Vijayakumar Sajjan, Pramod Sharma (2019) Both the xbee via zigbee and gps based air pollution observation framework and the wsn based air contamination checking framework utilize zigbee to transmit harmful data to the computer.In the wireless sensor system-based contamination testing framework, a bluetooth system is used, and the inquiry is completed using id3 calculation. Arduair's air quality monitoring system utilises a USB interface for data transfer, as well as ongoing chart plotting..

[5]. Air pollution monitoring and control system based on the IoT Aggarwal, Nipun Shekhar Shashi Shukla Raaj, Shukla Raaj, Shukla Raaj (2018) The planned system was created and put to the test. With the help of a hardware module installed at certain sites such as light posts, the suggested system measures the air pollution of a specific location. The suggested work used several sensors to collect real-time pollution information, which tracked percentages of gases such as ammonia, oxygen, and carbon monoxide**.**The programme projected the air quality based on these inputs. Despite the fact that there are numerous current systems, the proposed system offers a unique feature in that it transmits computed information for traffic management purposes when air quality is poor.

III. PROPOSED SYSTEM

The solution is made up of three layers: the Perception layer (Sensor layer), the Network layer, and the Application layer (Presentation layer), according to IoT architecture.

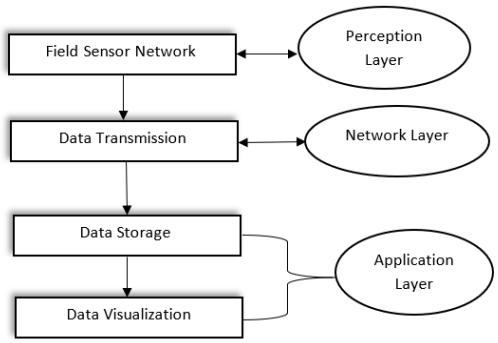

Fig 1: IOT Architecture Diagram

i. Perception layer architecture realisation:

The Field Sensor Network, based on a front-end acquisition device, is the main component of the Perception layer. Hardware basis for this sensor network incorporates an embedded microprocessor which is of low power with onboard sensors. We use an Arduino UNO microcontroller and a gas plus sound sensor to build a small node that collects and transmits a limited amount of data to a central controller that provides Internet access in the proposed work.

Two sensors are mainly used in our proposed system that includes the MQ135 Gas sensor and Sound sensor. MQ135 gas sensor for NH3, CO2, Benzene, Smoke, and other gases. The output will be an array of figures indicating the percentage of gases in the surrounding area measured in PPM. A sound sensor is also used to detect the level of noise in the environment. The output will be a series of numbers representing sound level in decibels.

ii. Network layer architecture realisation:

The major role of this layer is to transfer sensed data by connecting all of the sensors in the monitoring area to a central server and transmitting data experienced by sensors in real time to the data centre. The transmission system is designed to meet the needs of the service sector. Here a low-cost ESP8266 Wi-Fi module is used in suggested work. The ESP8266 contains a complete TCP/UDP stack. As a result, data is sent wirelessly from the basic node to Gateway in the form of TCP packets.

iii. Application layer architecture realisation:

The major purpose of this layer is to process and analyse air & sound pollutant data, evaluate their levels and anticipate how air quality and sound levels will change over time. The entire application layer involves evaluation of air quality and sound level, as well as anticipating such data from a functional standpoint.

The Application layer in this system consists of a Base Station (microcontroller) that handles data transmitted from nodes. We used Arduino IDE to create a TCP server over Arduino UNO to collect data. Using the WiFi module, the data will be sent to the ThinkSpeak cloud. The information can then be sent to the website.

IV. IMPLEMENTATION

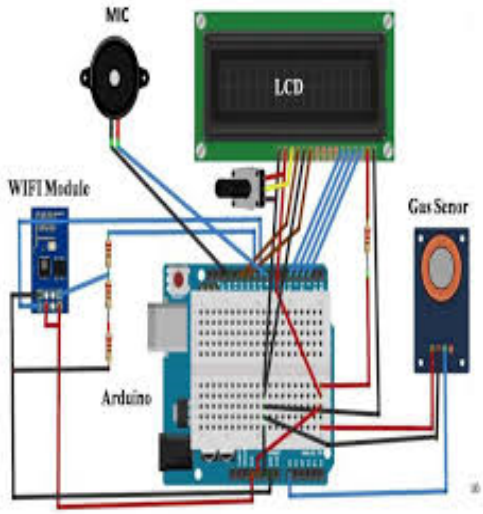

Fig 2: Implementation Design

To begin,we'll connect the ESP8266 to the Arduino.The ESP8266 runs on 3.3V, and if you supply it with 5V from the Arduino, it will not function properly and may be damaged. Connect the VCC and CH PD to the Arduino's 3.3V pin. When we connect the ESP8266 directly to the Arduino, the RX pin operates at 3.3V and will not communicate with the Arduino.As a result, we'll need to build a voltage divider to convert the 5V to 3.3V. As shown in the design, this can be accomplished by connecting three resistors in series. Through the resistors, connect the TX pin of the ESP8266 to Arduino pin 10 and the RX pin of the ESP8266 to Arduino pin 9.

Your projects are hooked up to the internet or Wi-Fi to use the ESP8266 Wi-Fi module. It's a low-cost device that boosts the power of your projects. It can interface with any microcontroller and is one of the most popular IoT gadgets. More information on using the ESP8266 with Arduino may be found here.

The MQ135 sensor will then be attached to the Arduino. Connect the sensor's VCC and ground pins to 5V and ground on the Arduino, and the sensor's Analog pin to A0 on the Arduino.

When the conditions are met, connect a buzzer to Arduino pin 8 and it will begin to sound.

Finally, we'll connect the LCD to the Arduino. The LCD's connectors are as follows:

- Pin no.1 (VEE) should be connected to the ground.
- Pin no.2 (VDD or VCC) should be connected to the 5V supply.
- Join pin no.3 (V0) to the 10K potentiometer's middle pin, and the other two ends of the potentiometer to the VCC and GND. The potentiometer adjusts the LCD's screen contrast..Potentiometers with values other than 10K can also be used.
- Join pin no.4 (RS) of the Arduino to pin no.12 of the board.
- Join Arduino's pin no.5 (Read/Write) to the ground. Since this pin is rarely used, we'll connect it to the ground.
- Join pin no.6 (E) of the Arduino to pin no.11 of the board. The RS and E pins serve as control pins for sending data and characters.

- The data pins on the following four pins are utilised to communicate with the Arduino.

  Connect pin no.11 (D4) to Arduino pin no.5.

  Connect pin no.12 (D5) to Arduino pin no.4.

  Connect pin no.13 (D6) to Arduino pin no.3.

  Connect pin no.14 (D7) to Arduino pin no.2.

- Through the 220 ohm resistor, connect pin no.15 to VCC. The brightness of the back light will be controlled by the resistor. Larger values will result in a considerably darker backlight.

- Pin 16 should be connected to the ground.

V. WORKING EXPLANATION

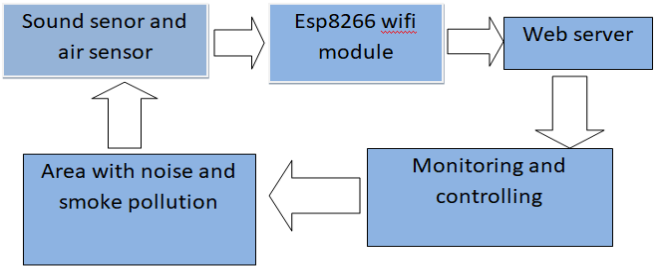

Fig 3: Block Diagram

The MQ135 sensor is suitable for our Air Quality Monitoring Project because it can detect NH3, NOx, alcohol, Benzene, smoke, CO2, and a number of other gases.It will detect gases and notify us with the pollution level in PPM once we attach it to an Arduino.The output of the MQ135 gas sensor is in the form of voltage levels, which we must convert to PPM.

When there was no gas in the surrounding, the sensor gave us a reading of 90,While air quality should not reach 1000 PPM, the safe threshold is 350 PPM.. Whenever it reach more then 1000 PPM, it causes headaches, tiredness, and stagnant, stale, stuffy air; if it reach 2000 PPM, it can induce elevated heart rate and a variety of other ailments.When the measurement is less than 1000 PPM, the LCD and website will indicate “Fresh Air.”

The buzzer will start beeping whenever the reading exceeds 1000 PPM, and the LCD and webpage will show "Poor Air, Open Windows." If it rises to 2000, the buzzer will continue to beep, and the LCD and website will indicate “Danger!” “Get some fresh air.”

VI. RESULTS

IoT technology is utilised in this system to monitor and check the amount of noise and air pollution We monitor a wide range of hazardous substances as well as high-intensity noise.That may result in air radiation, and we may use this model to monitor, control, and check the hazardous substances and their noise intensity in real time. Monitoring in real time allows us to take prompt action, such as displaying a warning on the LCD panel and uploading data to the cloud via IoT to avoid catastrophic catastrophes.

The module was installed in a specific position once the calibration operations yielded satisfactory results. The sensor was pre-programmed to give a value for the Leq calculated over a 10-minute period sample, and the observed values were tracked on the newly established ThingSpeak channel for 30 days. Figure 1 shows a graph. The graph in Fig(a) displays the obtained results for daily Leq values from the sensor, whereas the graph in Fig(b) depicts the acquired findings for daily Leq values from the sensor. shows the findings for Leq collected during an artificially chosen time period.During this time period, the sensor device produced the following measured data on the ThingSpeak platform,It was commonly observed that the position of the sensor offered a solid connection and effective data transfer.

Another feature of the ThingSpeak platform that may be mentioned is that it allows for a customizable way to showing results that are graphically representative This model is designed to be utilised by the general public and is meant to be readily modified and integrated into the "Smart city" idea. It also allows you to use MATLAB to process the measured data.for more comprehensive data analysis if that's what you require.

Fig. 6. On the ThingSpeak platform, visualisation of observed noise values: a) daily averaged noise level, b) hourly average noise level

Graph a: Noise level averaged over a 24-hour period.

Graph b: Noise level averaged over a 24-hour period.

VII. ACKNOWLEDGMENT

We would like to express our gratitude to our student team for their support and participation in the implementation of the work presented.

VIII. CONCLUSION

After gathering data from a variety of sensors, which have been strategically positioned in the area of interest, Once a proper connection with the server device is established, the web page offers information on the strength of sound as well as fluctuations in air pollutants levels in this specific location, wherever the embedded monitoring system is located. To do so, we'd like to place sensors around the environment to gather data and do analysis. Sensors are placed around the area, and data relayed over the internet triggers an alarm, alerting the individuals in the area.should become more conscious of the contaminants This allows us to bring the environment to life, allowing it to interact with other things over the network. It is fresh air if the air quality is less than 500 parts per million; it is bad air if the air quality is between 1000 and 2000 parts per million; it is dangerous if the air quality is greater than 2000 parts per million; and it is extremely polluted if the air quality is greater than 2000 parts per million. When we initially begin to experience air and noise pollution, the site where we place our air and sound is between 200 to 750 parts per million, which is called fresh air quality.

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SKIN CANCER DETECTION USING MACHINE LEARNING

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Abstract: *Out of the three basic types of skin cancer, namely, Basal Cell Carcinoma (BCC), Squamous Cell Carcinoma (SCC) and Melanoma, Melanoma is the most dangerous in which survival rate is very low. The necessity of early diagnosis of the skin cancer have been increased because of the rapid growth rate of Melanoma skin cancer, it's high treatment costs, and death rate. This cancer cells are detected manually and it takes time to cure in most of the cases. Early detection of Melanoma can potentially improve survival rate. This paper proposed an artificial skin cancer detection system using image processing and machine learning method. The features of the affected skin cells are extracted after the segmentation of the dermoscopic images using feature extraction technique. A deep learning-based method convolutional neural network classifier is used for the stratification of the extracted features. An accuracy of 89.5% and the training accuracy of 93.7% have been achieved after applying the publicly available data set [Kaggle ISCI].*

Keywords- Convolutional Neural Network (CNN), ImageSegmentation, Melanoma Skin Cancer.

I. INTRODUCTION

Skin is the outer most region of our body and it is likely to be exposed to the environment which may get in contact with dust, Pollution, micro-organisms and also to UV radiations. These may be the reasons for any kind of Skin diseases and also Skin related diseases are caused by instability in the genes this makes the skin diseases more complex. Melanoma. Maligna nt Melanoma is one of thedeadly and dangerous type cancers, even though it's found that only 4% of the population is affected with this, it holds for 75% of the death caused due to skin cancer[1]. Melanoma can be cured if its identified or diagnosed in early stages and the treatment can be provided early, but if melanoma is identified in the last stages, it is possible that Melanoma can spread across deeper into skin and also can affect other parts of the body, then it becomes very difficult to treat[2]. Melanoma is caused due to presence of Mela nocytes which are present with in the body.

Dermoscopy is a technique, that is used to exam the structure of skin. An observation-based detection technique can be used to detect. Melanoma using Dermoscopy images. The accuracy of the dermoscopy depends on the training of the dermatologist. The accuracy of Melanoma Detection can be 75%-85% even though the experts in skin use dermoscopy as a method for diagnosis. The diagnosis that is performed by the system will help to increase the speed and accuracy of the diagnosis. Computer will be able to extract some information, like asymmetry, color variation, texture features, these minute parameters may not be recognized by the human naked eyes.

The ABCD rule of dermoscopy for classifying melanoma or nonmelanoma. ABCD rule is the best rule of dermoscopy that is Asymmetry, Border irregularity, Colour, Diameter. Every parameter value will be utilized the prediction of skin cancer. Image acquisition, Image Pre-processing, Segmentation, Feature

Extraction and Classification these steps utilized the skin lesion is dangerous or generous. A lot of research has been carried out on the parameters for detecting and classifying the melanoma in an early stage so the patient can be given appropriate treatment Neural Network algorithm is utilized to detect the benign and malignant. This framework is based on learning the images that are captured with dermoscopic device to find out whether it is benign or malignant. Convolutional Neural Network (CNN) is a type of neural network which is used in signal and image processing. Convolutional Neural Network is also used in Recommender System. CNN is chosen because it gives high accuracy in image processing.

II. BACKGROUND

The diagnosis of the skin cancer is done by dermatologist where they can access the images of cancer patients and analyze the result whether the patient has cancerous cells or not. Because of having cancerous cells, dermatologist suggest it as malignant melanoma and benign on vice versa. The issue with this framework is, it sets aside a lot of time to process a ton of patients and furthermore it takes a great deal of labor to expand the rate of recognition which makes the cost go up[6]. The developing computerized system can automate this skin cancer detection process that will assist the dermatologists, and makes their works easier and faster. Different methods or techniques have been developed for years to make the skin cancer diagnosis.

Many researchers have been working on the ComputerVision approach for skin cancer detection. For segmentation of skin lesion in the input image, existing systems either use manual, semi-automatic or fully automatic border detection methods. The features to perform skin lesion segmentation used in various papers are: shape, colour, texture, and luminance[7]. Many border detection methods. Different image processing techniques have been used to extract such features, author has introduced an automated Global border-detection method in dermoscopy images based on colour-space analysis and global histo gram thresholding which exhibits high performance in detecting the border of melanoma lesions.

III. METHODOLOGY

For developing the system certain methodologies have been used. They are as follows: Dataset (Kaggle Hamset), Convolutional Neural Network, supervised learning algorithm, etc. Algorithm: In this experiment, supervised learning algorithm has been used for developing the system, because the inputted image defined is known.

Also, the data which is given to supervised learning algorithm are labelled, i.e . In depth, deep learning models used to find vast number of neurons. Deep learning algorithms learn more about the image as it goes through each neural network layer. For classifying Neural Network is used. Figure 1 represents layers of neural networks for feature extraction. The neural network is a framework formany machine learning algorithms. Neural networks consist of vector of weights (W) and the bias (B).

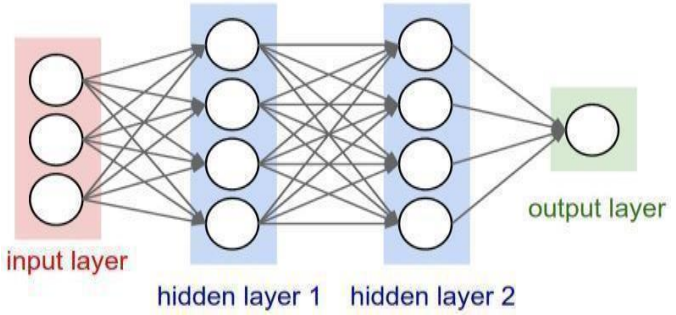

Figure 1: Three Layers of Neural Network

In deep learning, convolutional neural network (CNN) is a class of deep neural network mostly used for analysing visual images. It consists of an input layer and output layer as well as multiple hidden layers. Every layer is made up of group of neurons and each layer is fully connected to all neurons of its previous layer. The output layer is responsible for prediction of output. The convolutional layer takes an image as input, and produces a set of feature maps as output. The input image can contain multiple channels such as large brownish spot with darker speckles. A mole that changes in color, size or feel or that bleeds. A small lesion with an irregular border and portions that appear red, pink, white, blue or blue-black which means that the convolutional layer performs a mapping from 3D volume to another 3D volume. 3D volumes considered are width, height, depth. The CNN have two components:

1) Feature extraction part: features are detected when network performs a series of convolutional and pooling operation.
2) Classification part: extracted features are given to fully connected layer which acts as classifier.

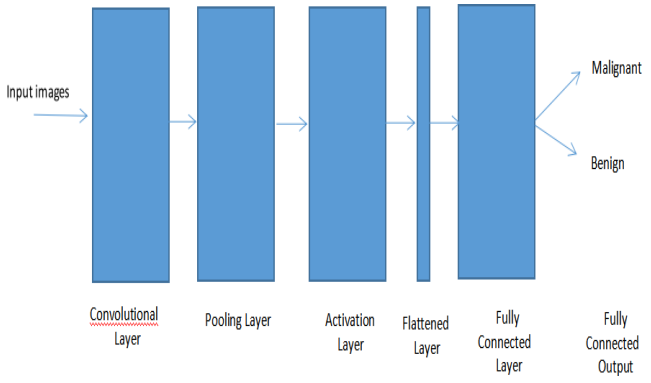

Figure 2: Convolutional Neural Network Layer

Figure 2 depicts that CNN consists of four layers: convolutional layer, activation layer, pooling layer and fully connected. Convolutional layer allows extracting visual features from an image in small amounts. Pooling is used to reduce the number of neurons from previous convolutional layer but maintaining the important information. Activation layer passes a value through a function which compresses values into range. Fully connected layer connects a neuron from one layer to every neuron in another layer. As CNN classifies each neuron in depth, so it provides more accuracy.

Library: Tensorflow is open-source software library which is created by Google. It gives developers to control each neuron known as a "node", so that the parameters can be adjusted to achieve desired performance. Tensorflow has many built-in lib raries for image classification. Tensorflow is responsible for creating an autograph which consists series of processing nodes. Each processing node in the graph represents an operation such as mathematical operation and connection or edge between nodes. With the help of python language Tensorflow provides programmer to perform these operations.

Dataset: A dataset is a collection of data. For performing action related to skin cancer images a dataset named Kaggle (ISIC) is used. The detailed information about the dataset is as follows: Number of categories: 2, Number of images:25,000.

Figure 3: Kaggle [ISCI]

Whenever a user will upload an input file on website, the image is temporarily stored in database. This input file is then feed to system and given to CNN where CNN is coupled with trained dataset. A CNN consists of various convolutional layers. Various alignments/features such as color, shape, entire image of skin are considered for classification to yield maximum accuracy. Each alignment is given through deep convocational network to extract features out from multiple layers of network. Then an unsupervised algorithm called deep learning using CNN is used to classify that image. Trained dataset consists of two parts trained result and test result. The dataset has to be retrained to achieve higher accuracy in identification using retrain.py in Google Collab. The training dataset is made using 50000 steps taking into consideration that higher the number of steps higher is its accuracy. The accuracy of training dataset is 93%. The testing dataset consists of nearly 1000 images with an accuracy of 80%. Further, dataset is validated with an accuracy of 75% to increase the performance of system.

IV.PROPOSED APPROACH

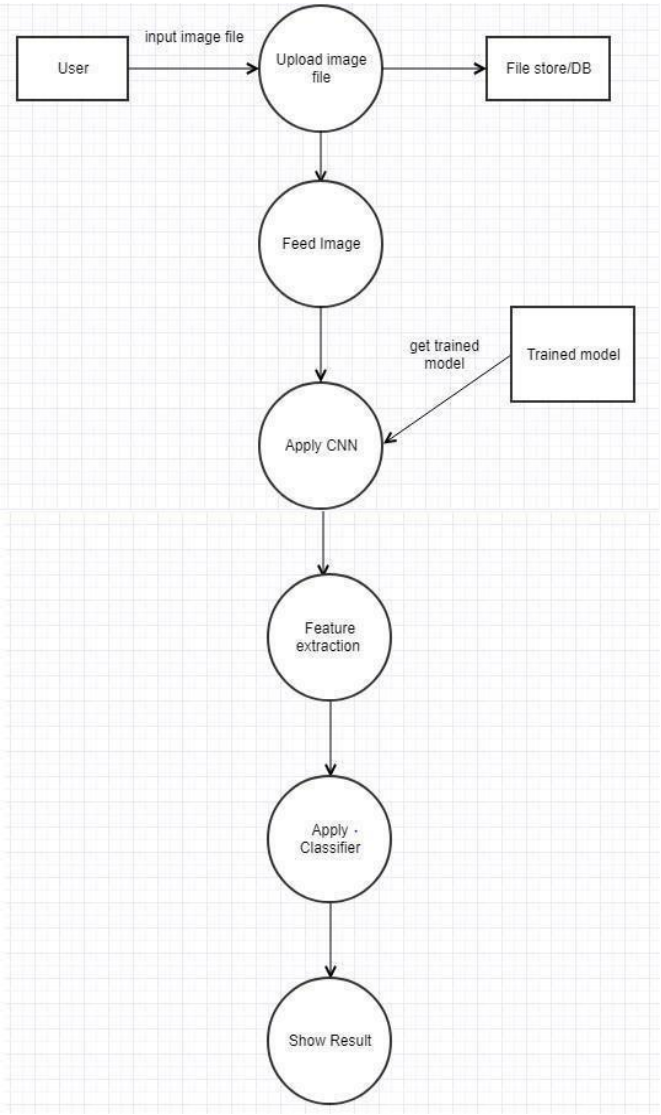

Figure 4: Flow of System

Further, a grayscale method is used to classify the image pixelby pixel. These features are then aggregated and forwarded to classifier. As shown in figure 4. Here, the input will be compared against the trained dataset to generate possible results. During classification, an autograph is generated which consist of nodes that ultimately forms a network. On basis of this network, a score sheet is generated and with the help of score sheet output will be produced.

V. EXPERIMENTAL ANALYSIS

The evaluation of the proposed approach for Skin cancer classification by considering color features and parameters such as size, shape, etc. of the skin cancer on the Kaggle [ISCI] dataset. This is an image dataset which includes 25,000 annotated images of skin cancer where each image is annotated with a rough segmentation, a bounding box, and binary attribute annotations. In this the t raining of dataset is done by using Google-Collab, which is a platform to train dataset by uploading the images from your local machine or from the Google drive.After training labelled dataset is ready for classifiers for image processing. There are probably average 200 sample images per species are included in dataset which are directly captured from dermoscope hence also include the other parameters in picture such as Dust, hairs, and other factors. Here skin cancer can identify in their any type of position as main focus is on the size, shape and color parameter. According to the nodes formed the autograph is generated which understandable by Tensorflow to classify the Image. This autograph is then taken by classifiers and image is compared with the pre t rained dataset images of Kaggle [ISCI]. Here a trial has made to implement 80% accuracy in result by training the Kaggle [ISCI].

For example, consider below Figure 5 as input image given to the system for classification of skin cancer. Let's see how it is being evaluated.

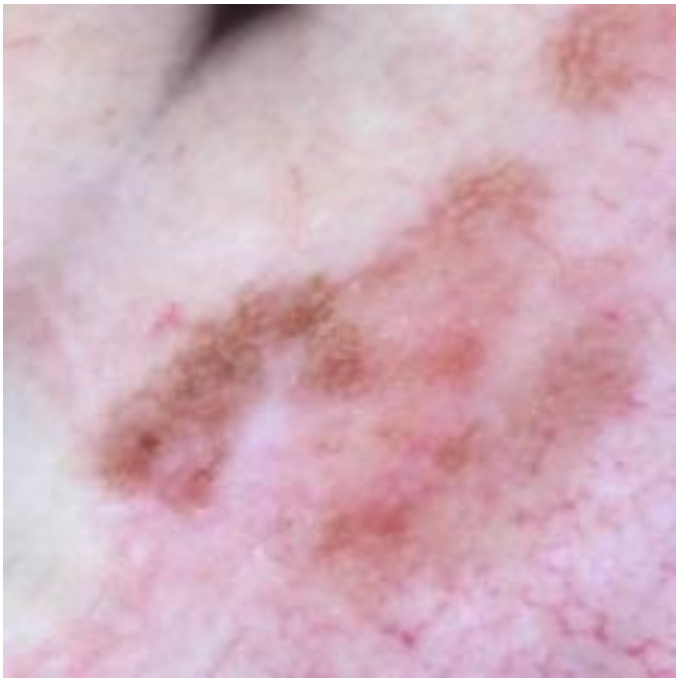

Figure 5: Input image

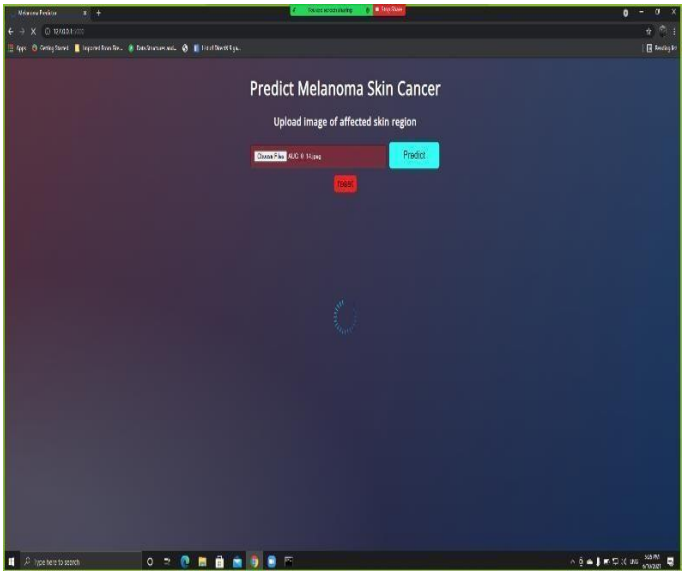

Figure 6: Image processing

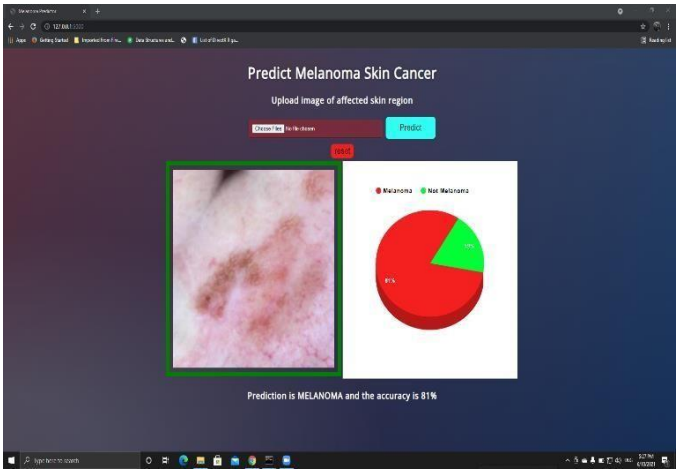

Figure 7: Displaying the results

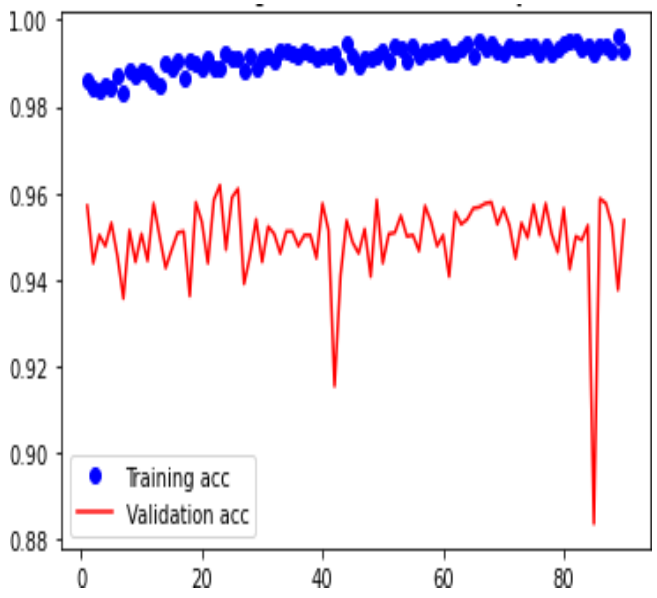

Figure 8: Training and validation Accuracy

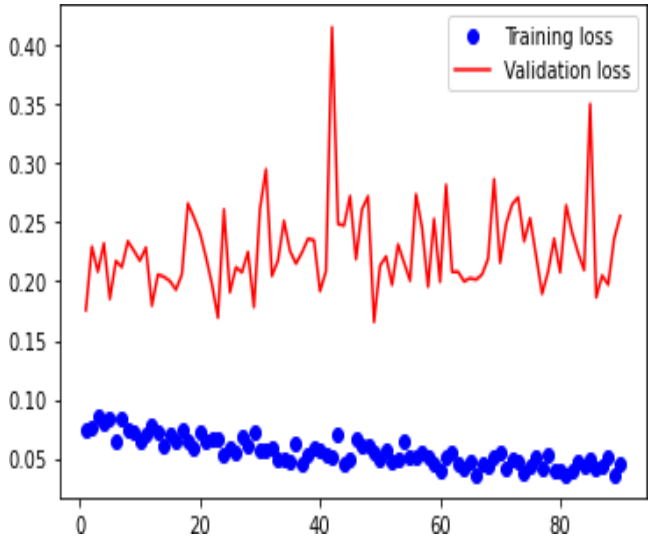

Figure 9: Training and validation Loss

VI. CONCLUSION

In this paper, a Convolutional Neural Networks based approach have been proposed for melanoma classification. A system is developed that can help patients and doctors to be able to detect or identify skin cancer classes whether it is benign or malignant. From the experimental and evaluation section, it can be said the model can be considered as a benchmark for skin cancer detection by assisting healthcare professionals. Figures 7, 8 9, 10 shows that by taking some random images any doctor can identify the accurate results but in traditional approach too much time are taken to detect the cases correctly.

VII. FUTURE SCOPE

1. The project can be deployed in hospitals so that it can be continuously checked and verified with the new datasets of the patients.
2. The accuracy can be increased by training the model with maximum number of datasets.
3. We can also use natural language processing in order to detect the cancer based on the patient's descriptions.
4. The project can also be implemented as a mobile application so that it can be accessed by a person in any location at any point of time.

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Computations in IoT-A Hope for Health Care System

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Abstract

One of the most notable technological results in Computer Science and Electronic engineering have been merged, Internet of Things (IOT). The term IOT refers to the network of physical objects that are embedded with sensors, hardware, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. In the last few years the impact of IOT in healthcare has been significantly increased .In healthcare domain to increase reliability, accuracy and productivity IOT is playing a crucial role. With the population increasement health issues are also rising and the necessity of technological solution is demanded. IOT redesigning modern health care with promising technological, economical and in social aspects . This is where IOT plays a big role.

Keywords – Internet of Things; Healthcare; issues; applications; computer science.

I. INTRODUCTION

In the progression of social protection monitoring system Internet of things has transformed into an authoritative segmented block. To enhance progressing remote sensing of the patient prosperity condition, to foresee essential conditions of the patient, and for improving individual fulfillment a powerful IoT therapeutic administrations system is used. Conventional strategies for giving security cannot be straight forwardly executed in IoT, as a result ,various models and correspondence stacks are included. As a feature of medicinal data frameworks that must guarantee different critical security necessities together with honesty, secrecy, accessibility, non-disavowal, confirmation, approval, and responsibility to verify therapeutic effect of data without influencing the proficiency of administrations and protection of patients' information by Data and communication technologies(ICTs) are conveyed. Worldwide maturing and the commonly

spreading of ceaseless sicknesses have transformed into a major concern in the current scenario[1]. Subsequently ,it is the responsibility of human services industry to create healthcare-related advanced systems and various administrations by using the important data and information and communication technology (ICT) and then implementing them in home-related issues[2]. This paper is based on two basic fundamentals: (1) continuous observing and dissecting imperative signs to early recognize or anticipate hazardous antagonistic health issues; and (2) then, checking whether they are implementing the recommended solutions[3]. In any case, with quickly maturing population, it has brought several difficulties in everybody's life. One audit assesses that about 25% of the grown-up populace do not hold fast to their endorsed medicine, which may prompt weakness results and expanded mortality . Poor drug adherence is a noteworthy issue for many people and human services suppliers. Among other fields, the leading technologies are using smart devices like radio frequency identification (RFID) tags and smart mobile technologies. Meanwhile, using the Internet of things (IoT), ICT was initiated with the twenty first century. How IoT innovation gives the likelihood for associating sensors, actuators, or different gadgets to the healthcare related framework and is considered as an empowering innovation to understand the vision of worldwide healthcare factors is the idea given by this review papper[4]. IoT broadens the Internet into our regular day-to-day existences by remotely connecting different healthcare devices, and will bring major changes in the manner we be have and cooperate with savvy gadgets. Also the paper focuses on the emerging technologies related with healthcare devices using Internet of things[5].

II. EXISTING TECHNIQUES

In Figure 1, the biographer depicts the total human services structure and figures a situation wherein patient's well-being is being recorded and crucial parameters like BP, ECG, diabetes, and body pressure are verified by convenient restorative gadgets. The information that is verified are put away and investigated for other procedures, put away information are taken from various sensors. For example, pressure sensors, diabetes sensors, ECG sensors, and so forth. Contingent upon study and total figures can check out patients from different areas and respond as indicated by their need. The patients can likewise convey through a video spilling by Web-based amid a crisis case just as support the spouting of interconnected framework with by and large interoperability for a microwave get to

(WiMAX), an Internet convention arrange and worldwide framework just as common doors and the entrance administration systems[6].

In Figure 2 the system tells about the crucial indications of various factors that are working with the support of the WBAN and RFID tags. The body of the patient is connected with different sensors with the support of the WBAN device. The Client's body is being attached with different types of sensors like WSN, medical sensors, etc. The signals triggers in such a way that the patient's information is recorded in

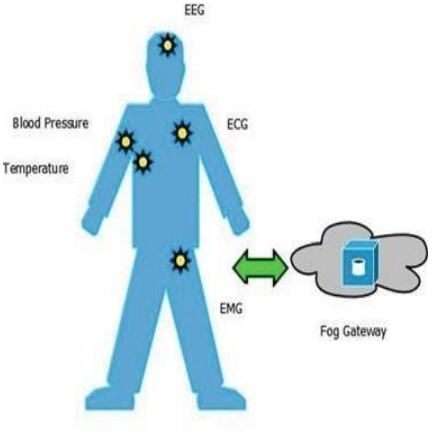

Figure 1 Remote monitoring personal healthcare system

a rapid way on a system[6]. The framework cannot guarantee the administration that is accommodated for 24 h that there would be a server issue.

The installed restorative gadget gets contributions from the client to coordinate the side effects with a pre-stacked indication document and endeavors to locate the coordinating malady for same. It performs tests recommended dependent on the pre-stacked side effect record to get the precise counterpart for the illness if the malady is not found by inspecting the side effects. In the event that the malady data is not discovered the framework includes the specialist with the given data, who will counsel the client, analyze the ailment and as needs be update the indication record and ailment document in the framework. The course server gets information and

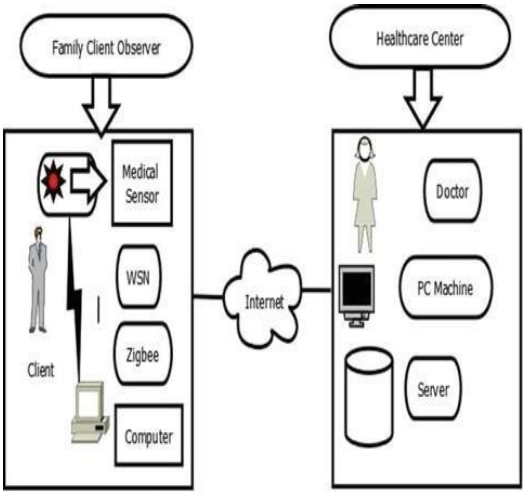

Figure 2 IoT healthcare architecture

changes over into agreed arrangement and stores it in cloud for later investigation by the doctors. The innovation imagines a remote healthcare

framework and for data social event, stockpiling and access every single records are watched for examination.

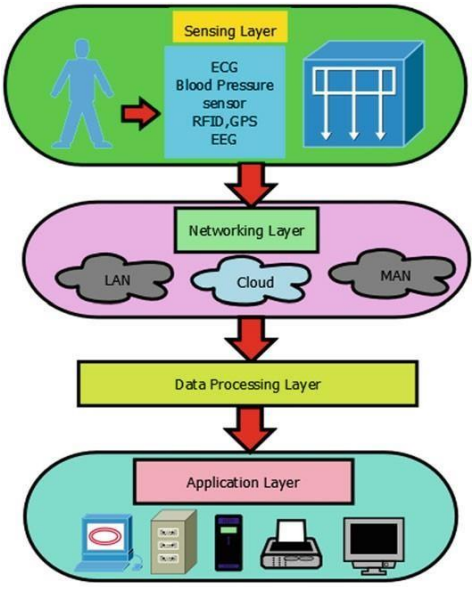

Figure 3 Layers of IoT healthcare system

Figure 3 shows various architectural layers of how the processing of data is being done in the healthcare systems. Each layer has its own specific functions performing various operations like data gathering, data transmitting, storing, etc.

III. RESULT AND DISCUSSION

This section deals with the comparison of well-known IoT-based healthcare techniques and based on those techniques, new IoT-based devices are being developed by the existing authors.

The most crucial step for developing any technique in the IoT-base environment is the data collection. Hence, a comparison chart is given below.

Table 1 shows the various parameters on which the researchers are working upon and further studies are going on the related fields. Various data collection techniques are discussed in the given Table 1 along with their advantages and disadvantages.

Table 1: Comparison of data collection techniques

publications	**Work done**	**Limitations**
Tekieh and Rashemi 2019 [7]	for research	No new techniqueis suggested through this literature
Shahin et al, 2019 [8]	Electronic health record It presents a casestudy to be implemented for practical applications	The specific environment is considered in which accuracy is an issue and can

		be further enhanced
Yanget al,2018 [10]	A Fast mechanism of data gathering is accomplished in this through. a proposed mechanism	Accuracy can be further improved
Mdaghri et al. 2018 [11]	Clinical decision supportsystem Data collection is done with accuracy	Missing values are not properly handled
Roy et al,2017 [16]	Correlation is used hence specific information about health care is gathered efficiently	Missing values are not considerd
Rao and Clarke, 2016 [17]	An open data set In this, graphical user interface(GUI) is used and hence better visualization	No missing values arethere

IV. CONCLUSION

Based on the discussed issues and comparative study which are perceived by any IoT system, it is still ought to be organized where the specialist on other region can analyze the consistency for patient's basic parameters through safe frameworks. A system is to be developed so as to give an all out security against different ambushes, with access control for IoT-based human administrations. In the last few years, the fast development of maturing populace has been a test to worldwide human services frameworks. Number of counter attempts have been dynamically made in experiencing an emergency healthcare system rebuilding through the advancement of medicinal assets and expanding the utilization of home human services. This paper basically tells about the various contributions of different authors and their respective works in the field of IoT. There are numerous research which is still going on in several fields related with the health care as there are many issues which have not been yet solved.

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HANDWRITTEN EQUATION SOLVER USING CNN

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Abstract **-Recently, deep learning and character recognition have drawn the attention of many researchers. Deep neural networks have state-of-the-art performance in solving many classifications and many recognition problems. The Optical Character Recognition (OCR) takes the optical image character as input and produces the corresponding character as output. It has a wide range of applications such as traffic surveillance, robotics, digitization of printed articles, etc. This Optical Character Recognition (OCR) can be implemented by using a Convolutional Neural Network (CNN), which is popular deep neural network architecture. The Convolutional Neural Network classifiers are capable of learning the important 2D features present in the images and classify them, the classification is performed by using the soft-max layer. In this article, we have presented Optical Character Recognition (OCR) by combining CNN and Error Correcting Output Code (ECOC) classifier. The CNN is used for feature extraction and the Error Correcting Output Code is used for classification. In order to find a suitable Convolutional Neural Network (CNN) for extracting features, which can be used in combination with ECOC classifier for recognition of handwritten characters accurately, several popular CNN classifiers have been explored. The Convolutional Neural Network CNN-ECOC Error-Correcting Output Code is trained and validated by using NIST handwritten character image dataset. The simulation result shows that Convolutional Neural Network CNN-ECOC Error-Correcting Output Code gives higher accuracy as compared to the traditional Convolutional Neural Network (CNN) classifier.**

Keywords –: convolutional neural networks; handwritten digit recognition; OCR

I. INTRODUCTION

In the current age of digitization, handwriting recognition plays an important role in information processing. A lot of information is available on paper, processing digital files is cheaper than processing traditional paper files.

The aim of the handwriting recognition and solution system is to convert handwritten characters into machine-readable formats and produce appropriate output. The main applications are vehicle license-plate recognition, postal letter-sorting services, Cheque truncation system (CTS) scanning and historical document preservation in archaeology departments, old documents automation in libraries and banks, mathematical equation solving apps, etc. All these areas deal with large databases and so they demand high recognition accuracy, lesser computational complexity, and consistent performance of the recognition system. It has suggested that deep neural architectures are more advantageous than shallow neural architectures. The deep learning field is evolving, and some of its variants are autoencoders, Convolutional Neural networks (CNNs), recurrent neural networks (RNNs), recursive neural networks, deep belief networks, and deep Boltzmann machines. Here, we introduce a convolutional neural network(CNN), which is a specific type of deep neural network having wide applications such as image classification, object recognition, recommendation systems, signal processing, natural language processing, computer vision, and face recognition. The ability to automatically detect the important features of an object(here an object can be an image, a handwritten character, etc.) without any human supervision or intervention makes them (CNNs) more efficient than their predecessors Multi-layer perceptron

II. LITERATURE SURVEY

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[1]The author discussed the processing result were able to take each characterofdifferent sizes and patternthe handwritingimageMedianfilters are effectively used to remove noise in image but had some disadvantages they are process of searching the region of the characters like (I) and (j) cannot be performed instantly.Classification using KNN has an Error rate of 14.61%. [2]The significant increase in number of pixels used in data input increasesthe accuracy of downsampled handwritten data.Larger the pixels higher is the accuracy, but had some disadvantages which include The significant increase in number of pixels used in data input increases the accuracy of down sampled handwritten data.Larger the pixels higher is the accuracy. [3]Going through such an ordeal for some simple and 'throw away' equations is not desirable. Going through such an ordeal for some simple and 'throw away' equations is not desirable. [4]The main reason is that a neural network can produce high-level features that are unique for any particular datasets. This allows it to produce. The main reason is that a neural network can produce high-level features that are unique for any particular datasets. This allows it to produce strong performance with fewer inputs from humanperformance with fewer inputs from humans. [5] This approach presents the best relationship for structural verification. Traditional parsing technique are not suitable for real time recognition. [6]SSD accompanied with three changes on size of input images, size of default boxes and architecture of SSD. This help our system detect and recognize small objects better than the original SSD. Similar symbols cause confusions, making SSD classify them incorrectly. [7]Every input from handwritingwill be processed in several phases, starts from preprocessing and feature extraction, Some classification Result in error. [8]A novel machine learning approach to recognize handwritten mathematical symbols achieving a 99.2% cross validation percentage accuracy on the Kaggle math symbol dataset with reduced symbols. Going through such an ordeal for some simple and 'throw away' equations is not desirable

III. MATERIALS & METHODS

A handwritten equation solver is designed to be a simple and efficient method to solve handwritten polynomial equations. It is able to predict and solve handwritten mathematical equations from the given image. The system is capable of solving expressions involving arithmetic operations (addition, subtraction, multiplication, division) and solve equations of any degree(linear, quadratic, cubic, and so on.

In working, a handwritten image is given as input to the machine, and this image is saved locally for further processing. The image is uploaded through a user interface developed using ReactJS. Here the user enters the images either by uploading or by using the sketchpad. The image is encoded to base64 format and sent to the REST-API as a POST request. The REST-API is implemented using Flask. The requested data is decoded and saved as an image locally and this image is sent to the backend where the equation is predicted and solved. The Backend has been implemented using Python, Tensorflow, and OpenCV. The backend can be seen as two separate modules Equation Prediction and Equation Solver.

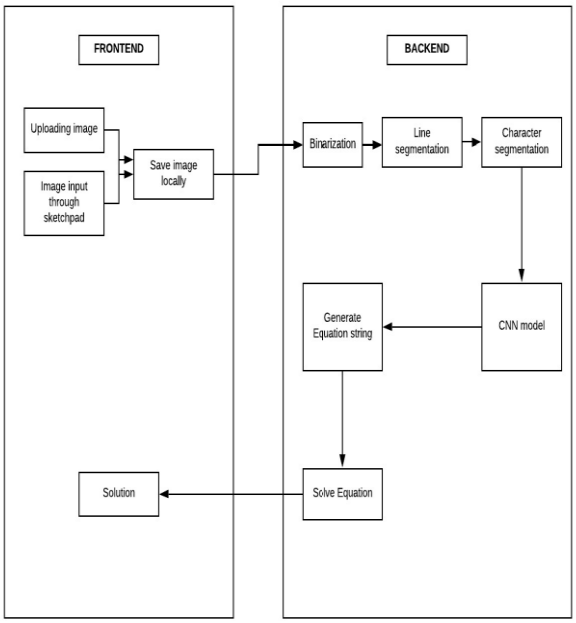

Fig.1 Architecture

The methodology of building an efficient equationrecognition and solver is as per the steps given below.

Methodology:

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- Image input by uploading or by writing equations on a sketch pad, which is sent as a POST request to the machine and is saved locally.
- Collected image undergoes feature extraction which involves three steps: Noise removal and Thresholding, Binarization, Character segmentation.
- Noise removal is done by cropping the unwanted part of the image and filtering out the image.
- Binarization is done by inverting the image and converting it to a binary image because contour extraction gives the best result when the object is black, and the surrounding is white.
- Character segmentation is achieved by resizing the imagemaximum area bounding rectangle to 28 by 28, then reshaping it to 784 by 1. So there will be 784-pixel values or features.
- Since the prediction of even a single character leads to incorrect results, simple replacements are performed on the given string to increase accuracy. These include Z ->2, G -> 6, B -> 8, D -> 0.
- After performing all the required actions on the inputimage it is fed to the Convolution Neural Network Model which accurately identifies each character.
- The output of this model is captured and necessary modifications are performed.
- Finally, a string of the equation is produced as an output of the model.
- A mathematical string such as '5+3' is evaluated using a custom-built function or the eval() function.

- If the equation contains '=', it is interpreted as the 2nd type, otherwise, it is interpreted as the 1st type.

2nd type of equation or polynomial equation is solved using the Sympy library, which is a python library for symbolic computation.

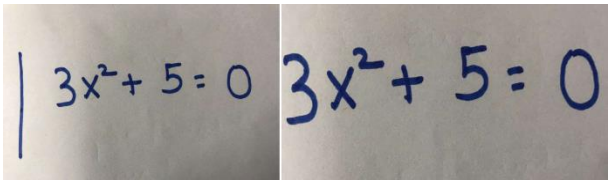

Fig.2 Noise removal and Thresholding

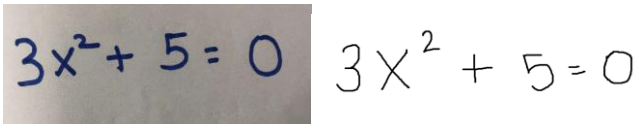

Fig.4 Binarization

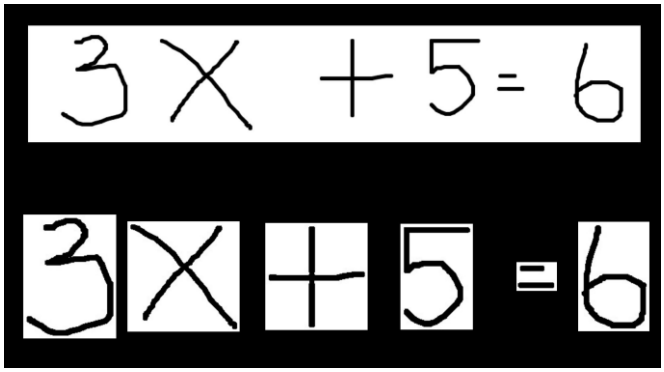

Fig.5 Character segmentation

IV. RESULTS & DISCUSSIONS

After training the network, we use more than 1000 test images for the recognition of the quadratics. We use images with one quadratics and polynomial expression. Firstly, we train the network after completing the training we apply each test image for recognition. For each of the quadratics recognition processes in the case of correct recognition, we will provide a command for finding a solution. The task was to solve equations in the following images. We pre-processed the dataset and equation generation was performed. After we extract equations in the images, then we solve equations.

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V. CONCLUSIONS

1. The Handwritten Equation Solver is used to recognize the equations which are written by hand and produce results accordingly.
2. The handwritten equation solver has also proven to be a good neural network architecture and application for the purpose of introducing and demonstrating neural networks to the general public.
3. The main goal is a purely educational one, a moderate recognition rate of 98.46% was reached on a test set.

FUTURE ENHANCEMENT

1. Implementing the system with a greater amount of resources to improve accuracy.
2. Using a computer with a better GPU would allow the system to recognize more number expressions.
3. Enhancing the code to solve more complex equations.
4. Further optimizing code to recognize the activity within a more complex background.
5. Other future enhancements can include the use of IoT-based smart devices.

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[5]Ray Genoe and Tahar Kechadi:A Real-time Recognition System for Handwritten Mathematics Structural Development

[6]Giang-Son TRAN,Than-SachLE,Chi-Kien HUYNH, Tan-Phuc PHAN:Handwritten Mathematical Expression Recognition Using Convolutional Neural Network

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Stock Market Prediction Using Machine Learning(ML)Algorithms

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KEYWORD

Stock Market Prediction; Machine Learning(ML); Algorithms; Linear Regression; Exponential Smoothing; Time Series Forecasting

ABSTRACT

Stocks are possibly the most popular financial instrument invented for building wealth and are the centerpiece of any investment portfolio. The advances in trading technology has opened up the markets so that nowadays nearly anybody can own stocks. From last few decades, there seen explosive increase in the average person's interest for stock market. In a financially explosive market, as the stock market, it is important to have a very accurate prediction of a future trend. Because of the financial crisis and recording profits, it is compulsory to have a secure prediction of the values of the stocks. Predicting a non-linear signal requires progressive algorithms of machine learning with help of Artificial Intelligence (AI).
In our research, we are going to use Machine Learning Algorithm specially focus on Linear Regression (LR), Three month Moving Average(3MMA), Exponential Smoothing (ES) and Time Series Forecasting using MS Excel as best statistical tool for graph and tabular representation of prediction results. We obtained data from Yahoo Finance for Amazon (AMZN) stock, AAPL stock and GOOGLE stock after implementation LR we successfully predicted stock market trend for next month and also measured accuracy according to measurements.

1. Introduction

Stock market is trading platform where different investors sale and purchase shares according to stock availability. Stock market ups and downs effects the profit of stakeholders. If market prices going up with available stock then stakeholders get profit with their purchased stocks. In other case, if market going down with available stock prices then stakeholders have to face losses. Buyers buy stocks with low prices and sell stocks at high prices and try to get huge profit. Similarly, sellers sell their products at high prices for profit purpose (Tae Kyun Lee *et al*, 2019). Stock market (SM) work as trusty platform among sellers and buyers. Advances in Artificial Intelligence (AI) supporting a lot in each field of life with its intelligent features. Several algorithms present in AI that performing their role in future predictions (Eunsuk Chong *et al*, 2017). Machine learning (ML) is a field of artificial intelligence (AI) that can be considered as we train machines with data and analysis future with test data. Machines can be trained on the basis of some standard that are called algorithms. Stock market predictions can be great beneficial to businessman. SMP provide future trend of stock prices on the basis of previous history (Bruno *et al*,2019). If stakeholders get future predictions then investment can lead him toward profit. Predictions can be 50% correct and 50% wrong as it is risk of business. Risks facing capability in business filed can

lead toward success. In any field of life, we take risks for success. Similarly, we rely on ML predictions about future prices of stock. In this chapter we would like to explain these ML algorithms with the help of their working methodologies and examples (Thomas Fischer *et al*, 2018). Before working on actual problem SMP, complete understanding of ML algorithms role in prediction is also necessary. That's why in this chapter we explained complete working scenario and problem definition (Bruno *et al*, 2019).Several Machine learning algorithms can be used for stock market prediction but in this research we used few algorithms like Linear regression (LR), Three Months Moving Average (3MMA) and Exponential Smoothing and if we further consider many other algorithms can also be used for Stock Market Prediction(SMP) (Bruno *et al*, 2019).

1.1. Data Analysis (DA) and Stock Prediction (SP)

Data analysis (DA) in machine learning (ML) is a process of applying technical skills (ML Algorithms) on historical data to obtain statistical as well as tabular results about predictions. It also considered as technical process of data illustration and evaluation. Two authors (Shamoo *et al*,2012; Resnik *et al* ,2013) explained about DA, according to their theory DA is process of distinguishing signals for decision making with statistical fluctuation of results. DA also included collection as well as analyzing process, it can be iterative according to problem statement. Several statistical techniques implemented in DA. Data scientists find patterns of entire data with special observations. Several types of quantitative as well as qualitative approaches as content analysis, history analysis, sentimental analysis and bibliographic analysis involved in DA (Tae Kyun Lee *et al*, 2019). DA study formulate predictions on the basis of historical data that can be present in form of notes, files, documents, tables, audio or video tapes. Accurate analysis of different research findings can lead to valid knowledge discovery. Inaccurate statistical presentation of data destroys the research findings of any scientist and guide wrong destinations to readers (Shepard, 2002) and public perceptions about research also influenced negatively (Bruno *et al*,2019). Integrity and accuracy are two main parts of statistical data analysis. In this research we used several data resources in form of datasets, research theories and financial resources of data presentation. Yahoo Finance, Quandle, Kaggle and several other similar platforms provided data that is used in stock market predictions. We obtained data from these platforms for different stock exchange companies and after applying ML algorithms we presented stocks predictions results statistically (Ben Moews *et al*, 2019).

1.2. Introduction to stock market

Stock market can be defined as combined platform of several markets and exchangers with regular process of buying and selling goods that shares issued publically (Comparison analysis performed at public platform). At this platform several situational financial performed for formal exchange process under defined rules and regulations (Hiransha *et al*, 2018). Multiple stocks trading places can be available at different place in a country where transections on stocks can be performed. There are two different terms used in stock market definition as stock exchange and stock market with consideration of formal trade assets. We can define stock market as, if someone is part of stock market will be considered as stock market trader, as he buy or sell his shares on one or different stocks (Ben Moews *et al*, 2019). Several stock exchange markets available at national as well as international level including Pakistan and world level biggest stock market i.e. New York Stock Exchange (NYSE), Chicago (CBOE) both of these are considered as national stock markets of USA (Tae Kyun Lee *et al*, 2019).

1.3. Introduction to stock market trend analysis

Trend is considered as direction of stock movement that is totally based on stock market ups and downs. Continues movement of stock in any direction upward or downward for specified duration or time period can be considered as trend. In stock market prediction trend analysis at current stage support a lot in future trend prediction (Thomas Fischer *et al*, 2018). Trend growing analysis for continues interval of time can be considered as future grow or continues down in trending market share prices can be supportive for future predictions as down. Stock market prediction always based on big amount of historical data analysis. Similarly trends also based on big data analysis results. Prediction about future trends in any stock market cannot be considered as 100% accurate. Trends presence in share market place provide predictions about trends in stock market. Gaining

in profit always based on trends, if investors move according to trend directions, they can be succeeded in their trade marketing (Bruno *et al*, 2019).

1.4. Problem Statement

Everyone want to be rich in his life with low efforts and great advantages. Similarly, we want to look in our future with inner most desire as we do not want to take risks or we want to decrease risk factor. Stock market is a place where selling and purchasing can provide future aims of life (Kang Zhang *et al*, 2019). Now the question is that how we can get advantages from stock market? Or what are the steps that can give us stocks market predictions before taking yourself in risk zoon (Yue-gang Song *et al*, 2018). How Artificial Intelligence with Machine learning algorithms can be supportive for future market trend predictions?

1.5. Stock Market Prediction (SMP)

If stock market trend predicted then we can avoid wastage of money. SMP is a process of predicting future on the base of past data. Prediction decreases the risk level to investors and increases the confidence level for investment. If they predicted goals before reach then they can avoid loss of money. All these consideration work as SMP. On the basis of historical data trends, we guess future trend that is called SMP(Changju Lee *et al*, 2019).

2. Material and Methods

AI is an intelligent field of latest research which is providing great help in solution of real time existing problems. AI supporting in each field of life as we use it in data processing in ATM machines, Bank accounts, Airways services, Reservation, X-RAYS, Auto door opening, recognition-based devices and weather forecasting. In other word we can say AI made our life easier and we can predict future. Earning money is major issue to face society and rick people considered as role models everywhere (Ben Moews *et al*, 2019). Stock market investments polices supported a lot in this process(Yue-gang Song *et al*, 2018). Stock market provide great benefits to intelligent investors but foolish investor's do not get much advantages form stock market. Why I said foolish? There is a big reason behind this, they invest in stock market without predicting future trend analysis of stocks ups/downs, that repel them in darky night. Some investors follow stock market predictions rules and enjoy great profits. Several tools support in stock market predictions as python, Java, Rstudio with R programming and Python programming as well (Wang Qili *et al*, 2018). Mostly predictions based on ML algorithms that are also used in these tools. Some famous prediction algorithms that are supported by several tools as well as programming languages are Regression (Linear, Logistic), K-Nearest Neighbor (KNN), Decision Tree (DT), Artificial Neural Network (ANN) and Simple Moving Average (SMA) with the help of Time Series Forecasting (TSF). In this research, we applied these ML algorithms on different stock datasets obtained for GOOGLE, FB, AMAZON and some other companies (Thomas Fischer *et al*, 2018). We predicted results by Rstudio and Excel sheets by using statistical as well as graphical presentation of results. After obtaining results by different predictors and ML techniques we performed comparison analysis to argue about best considerations. Several Machine learning algorithms can be used for stock market prediction but in this research we used few algorithms like Linear regression(LR), Three Months Moving Average(3MMA) and Exponential Smoothing and if we further consider many other algorithms can also be used for Stock Market Predic-tion(SMP).In Whole research we found Exponential Smoothing predictions results are best rather than Linear Regression(LR) and Three Months Moving Average(3MMA) (Bruno *et al*, 2019) .

2.1. Machine Learning (ML) algorithms Implementation for Stocks Prediction

We will implement machine learning algorithms on above explained datasets and we will also analyses the trends of data manipulation as combined analysis of GOOGLE, FB,AMAZON,AAPLE data. Mostly data is obtained from yahoo finance (FengmeiYang *et al*, 2019).

Table 1:. Amazon Data representation from Jan 2019 to July 2019

Date	Open	High	Low	Close	Volume
1/2/2019	1465.2	1553.36	1460.93	**1539.13**	7983100
1/3/2019	1520.01	1538	1497.11	**1500.28**	6975600
1/4/2019	1530	1594	1518.31	**1575.39**	9182600
1/7/2019	1602.31	1634.56	1589.19	**1629.51**	7993200
1/8/2019	1664.69	1676.61	1616.61	**1656.58**	8881400
1/9/2019	1652.98	1667.8	1641.4	**1659.42**	6348800
1/10/2019	1641.01	1663.25	1621.62	**1656.22**	6507700
1/11/2019	1640.55	1660.29	1636.22	**1640.56**	4686200
–	–	–	–	**–**	–
7/25/2019	2001	2001.2	1972.72	**1973.82**	4136500

2.1.1. AMAZON(AMZN) data analysis and Stock market predictions with Machine Learning (ML)

AMZN considered as huge stock market that attracts investors to buy/sell its shares and its becoming a trendy business market in the world.

2.1.2. AMZN Data Representation and data ranges

In this research we considered data from start of year as January 2019 to 25 July 2019 then we evaluated our approach with different prediction methodologies.

Amazon One Month Stock Data and Normalized Value

Table 2: July 2019 data for normalization (Amazon Yahoo Finance)

Date	*Open*	*High*	*Low*	*Close*	*Adj Close*	*Volume*	*Normalized*
7/26/2019	1942	1950.9	1924.51	1943.05	1943.05	4921900	0.96
7/25/2019	2001	2001.2	1972.72	1973.82	1973.82	4136500	0.98
7/24/2019	1969.3	2001.3	1965.87	2000.81	2000.81	2631300	0.99
7/23/2019	1995.99	1997.79	1973.13	1994.49	1994.49	2703500	0.99
7/22/2019	1971.14	1989	1958.26	1985.63	1985.63	2900000	0.98
7/19/2019	1991.21	1996	1962.23	1964.52	1964.52	3185600	0.97
7/18/2019	1980.01	1987.5	1951.55	1977.9	1977.9	3504300	0.98
7/16/2019	2010.58	2026.32	2001.22	2009.9	2009.9	2618200	0.99
7/12/2019	2008.27	2017	2003.87	2011	2011	2509300	1.00
7/11/2019	2025.62	2035.8	1995.3	2001.07	2001.07	4317800	0.99
7/10/2019	1996.51	2024.94	1995.4	2017.41	2017.41	4931900	1.00

Date	*Open*	*High*	*Low*	*Close*	*Adj Close*	*Volume*	*Normalized*
7/9/2019	1947.8	1990.01	1943.48	1988.3	1988.3	4345700	0.98
7/8/2019	1934.12	1956	1928.25	1952.32	1952.32	2883400	0.97
7/5/2019	1928.6	1945.9	1925.3	1942.91	1942.91	2628400	0.96
7/3/2019	1935.89	1941.59	1930.5	1939	1939	1690300	0.96
7/2/2019	1919.38	1934.79	1906.63	1934.31	1934.31	2645900	0.96
7/1/2019	1922.98	1929.82	1914.66	1922.19	1922.19	3203300	0.95

We obtained data from yahoo finance for AMZN stocks prediction. We applied normalization process on data and obtained values that are present in right corner of Table 2. Normalization is considered as ratio between close prices and maximum close prices. If we see the maximum close prices in Table 2 is 2020.99. We divided all close prices by maximum close price and obtained normalized column.

2.1.3. Graphical representation of Amazon trend analysis

Trends according to date can be checked about any product that is part of stock market. For this analysis we drawn graph between open/high/low/close prices. We can check how prices are moving day by day. Instead of complete study of data graph can give fully analytical view of market trends. Mark*et al*ways remain in changing process and statistical analysis give entire data outlook without any complexities.

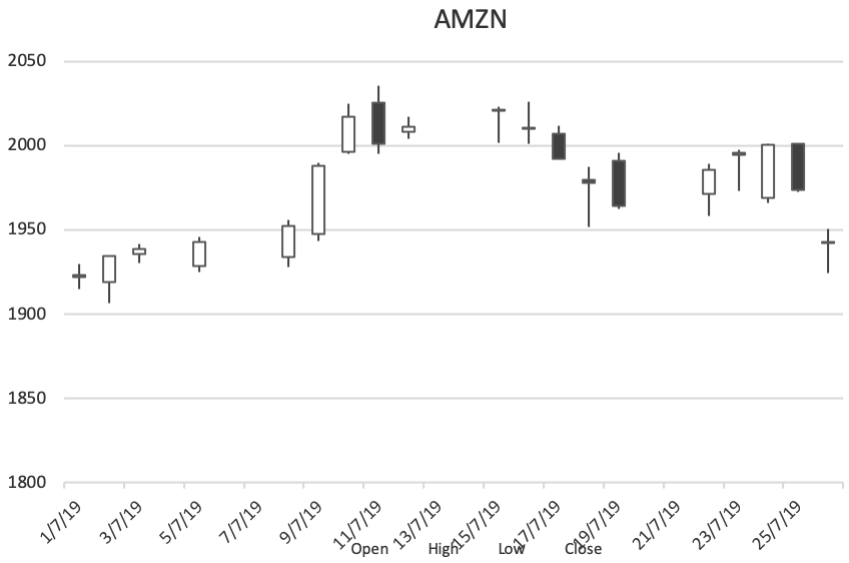

Figure 1: Graphical representation of AMZN Stock market trends.

Graph is representing a trend pattern where central dates of month showing high values. At start of month prices trend slow with central part of month it raises to high and at end of moth its showing medium rate of price changings Fig2.

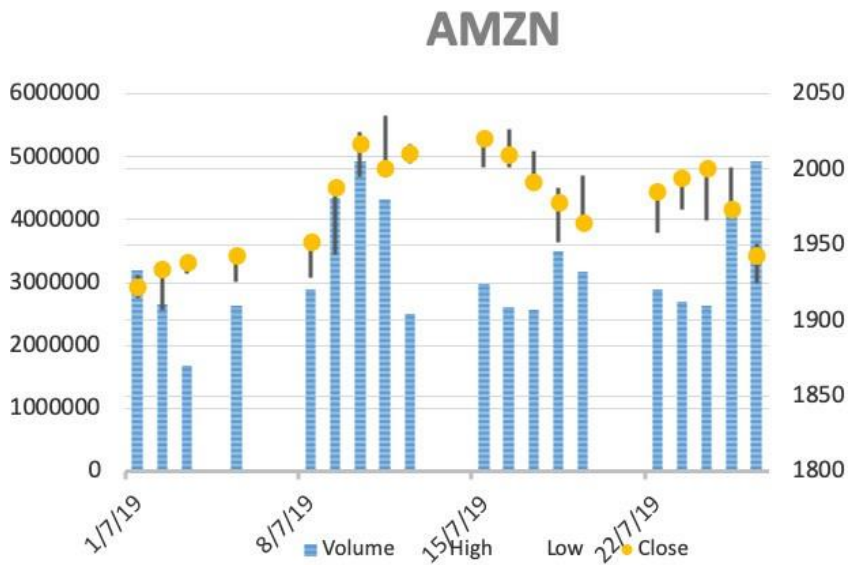

Figure 2: Amazon trend analysis graph with data adjustments.

2.2. Linear Regression (LR) introduction as ML algorithm

These algorithms can be understood easily and can be implemented easily. This algorithm runs into risky and over fitting environment easily. In some cases these algorithms are considered very much simple to solve complex problems. Linear regression runs under the relationship of two variables as one variable considered and dependent variable and other is considered as explanatory variable. A linear regression line has an equation of the form equation Y = a + bX, where X is the explanatory variable and Y is the dependent variable. The slope of the line is b, and a is the intercept (the value of y when x = 0) by (Vineet Maheshwari *et al* ,2019).

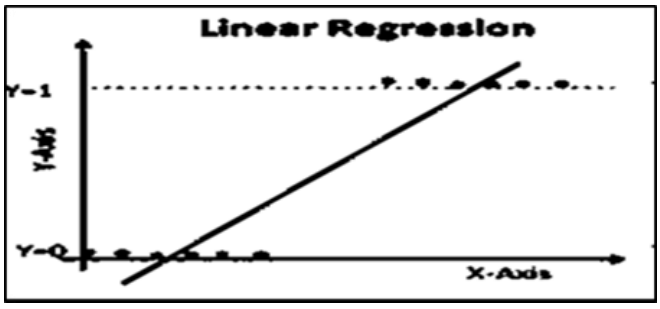

Figure 3: Linear regression/Logistic regression representation.

2.2.1. Linear Regression (LR) implementation for AMZN stock prediction

Linear regression is used for predictions with data that has numeric target variable. During prediction we use some variables as dependent variables and few considered as independent variables. In situation when there is one dependent and one independent variable, we prefer to use linear regression methodologies. Regression can be single variable or multi variable, it depends upon situation named as single variable or multi variable regression (FengmeiYang *et al*, 2019). Here in stock market prediction process, we have one date variable and one closing price variable. Closing price variable is our independent variable which also be considered as target variable. In this processing we will generate a prediction equation using liner regression method. We will generate prediction as **y=c+bx**, then we can say 'Y' is our predicted stock price and x is actual price.

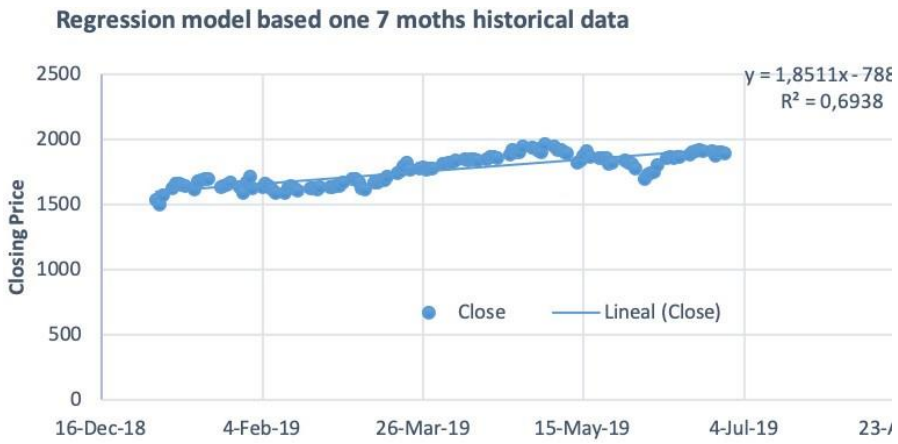

Figure 4: Regression Line for historical data of closing prices with respect to date.

In Fig4, linear regression line drawn between date and historical closing prices from Jan 2019 to July 2019. When we used linear regression graph in MS Excel it given us an equation, where 'Y' representing predicted value and 'X' represents actual value. By using this equation, we can predict future stock prices.

Linear Regression Equation $Y=1.8511X - 78860$ **Eq1**

$R^2 = 0.6938$

R^2 represents root mean square error that is considered as classification error, we can say 0.6% classification performed wrongly by linear regression and remaining working is correct and error free. In this processing data of closing prices from Jan 2019 to July 2019 used. We considered only date and closing prices for prediction. Equation 1 is our prediction with respect to actual values. By using this equation, we can predict next month closing prices that can be great beneficial to stockiest. Now let us consider predictions based on linear regression and generated data.

Table 3: Linear regression classification for stock market prediction

JULY	Actual Prices	Predicted Prices	ABS Error	Error^2	% Error
1-Jul-19	1922.19	1,934.96	12.77	163.12	0.66%
2-Jul-19	1934.31	1,936.81	2.50	6.26	0.13%
3-Jul-19	1939.00	1,938.66	0.34	0.11	0.02%
25-Jul-19	1973.82	1,979.39	5.57	31.00	0.28%
		Average=	**24.31**	**1065.03**	**1%**
			MAD	**MSE**	**MAPE**
		r-square=	0.6938		
		r=	-0.83295		

Now let's consider Table 3 for prediction explanation, In this table we considered July as our actual data. When we used this data there was only date and closing actual price columns were present. We used linear regression curve to obtain all other columns of table and predicted values. In this Table predicted values based on equation 1, we used MS Excel for the purpose of our statistical as well as linear regression prediction analysis.

2.2.2. Graphical representation of actual and predicted prices by line graph

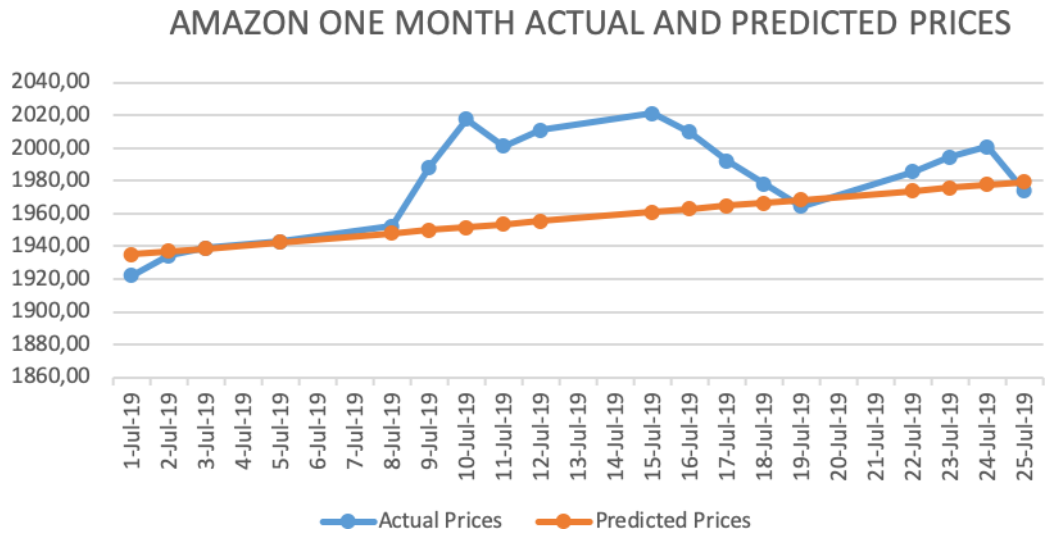

Figure 5: Line graph between actual and predicted prices with respect to date.

There can be different types of error present in our predictions that are explained by Table3.

- **Absolute Error:** If we want to calculate absolute error in our prediction we can perform calculations by predicted values-actual close prices. In MS Excel it can be calculated by following formula

ABS Error=*Fx=abs(forcast-actual)*

Similarly, we can calculate other types of errors in our predictions

- **Square Error:** It can be defined as sqare of absolute error=(ABS ERRR)^2
- **%age Error:** When absolute error is divided by actual close then we obtain percentage error

% Error=ABS Error/Actual Close price

- **Average absolute error=**Mean absolute deviation=**MAD**
- **Average square error=Mean of square error=MSE**
- **Average percentage error=Mean absolute %age error=MAPE**

As r-square is 0.6938, this represents root square value or it can be said as variability in closing prices of AMZN stock market.

- R-value is –ve squawroot of r-square=r= -0.8329

When size of data increases the accuracy of results also increases. Here we used only seven months data for predictions on the basis of regression equation. If we check only one-month data on the basis of linear regression, there will be large amount of variability and all types of error will increase.

2.2.3. Linear Regression based on One-month AMMZ Stock data

Here we used only June month data to draw linear regression curve, we can see all types of error values increases. We can say as SIMPLE size will be larger the prediction results will be accurate and vice versa.

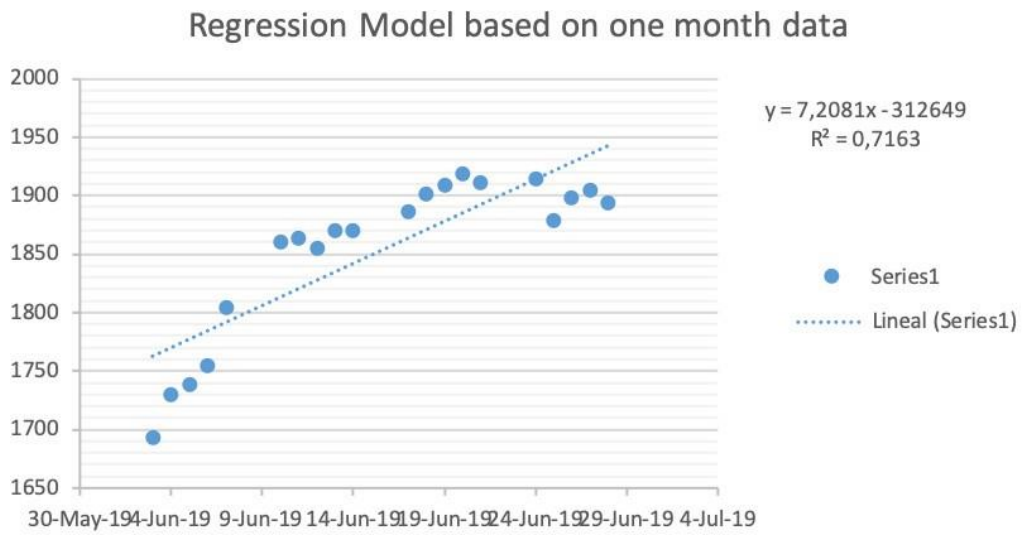

Figure 6: Regression equation generated on one month data as on JUNE.

Table 4: Predictions based on one-month regression line for AMZN Stock

JULY	Actual Prices	Predicted Prices	ABS Error	Error^2	% Error
1-Jul-19	1922.18994	1,962.94	40.75	1660.62	2.12%
2-Jul-19	1934.31006	1,970.15	35.84	1284.42	1.85%
3-Jul-19	1939	1,977.36	38.36	1471.25	1.98%
5-Jul-19	1942.91003	1,991.77	48.86	2387.60	2.51%
8-Jul-19	1952.31995	2,013.40	61.08	3730.46	3.13%
10-Jul-19	2017.41003	2,027.81	10.40	108.23	0.52%
15-Jul-19	2020.98999	2,063.85	42.86	1837.33	2.12%
16-Jul-19	2009.90002	2,071.06	61.16	3740.81	3.04%
17-Jul-19	1992.03003	2,078.27	86.24	7437.38	4.33%
18-Jul-19	1977.90002	2,085.48	107.58	11573.11	5.44%
19-Jul-19	1964.52002	2,092.69	128.17	16426.65	6.52%
22-Jul-19	1985.63001	2,114.31	128.68	16558.75	6.48%
23-Jul-19	1994.48999	2,121.52	127.03	16136.34	6.37%
24-Jul-19	2000.81006	2,128.73	127.92	16362.74	6.39%
25-Jul-19	1973.81995	2,135.94	162.12	26281.32	8.21%
		Average:	**72.47**	**7231.59**	**4%**
			MAD	**MSE**	**MAPE**
		r-square=	0.7163		
		r=	-0.84635		

Here we can compare the results of Table3 and Table4, the values of error percentage increases from 1% to 4% that is prove of our argument. In other words, we can say as SAMPLE size increases the chances of errors in predictions decreases.

If we want to improve accuracy in our predictions there are two more linear regression techniques that supportively work to decrease variability in actual and predicted values of closing prices. If we check Fig5, there is less symmetry between actual and predicted stock price line. The amount of variability in actual and predicted values of stock prices indicate accuracy of classifier. Let's decrease variability and increase accuracy by following methods.

2.2.4. Stocks prediction using 3-month average measurements (AMZN)

Table 5: AMZN stock prediction using 3-month average method

JULY	Actual Prices	Predicted Prices	ABS Error	Error^2	% Error
26-Jun-19	1897.83				
27-Jun-19	1904.28				
28-Jun-19	1893.63				
1-Jul-19	1922.19	1,898.58	23.61	557.43	1.23%
2-Jul-19	1934.31	1,906.70	27.61	762.32	1.43%
3-Jul-19	1939.00	1,916.71	22.29	496.84	1.15%
5-Jul-19	1942.91	1,931.83	11.08	122.69	0.57%
8-Jul-19	1952.32	1,938.74	13.58	184.41	0.70%
9-Jul-19	1988.30	1,944.74	43.56	1897.19	2.19%
10-Jul-19	2017.41	1,961.18	56.23	3162.19	2.79%
11-Jul-19	2001.07	1,986.01	15.06	226.80	0.75%
15-Jul-19	2020.99	2,009.83	11.16	124.62	0.55%
18-Jul-19	1977.90	2,007.64	29.74	884.47	1.50%
19-Jul-19	1964.52	1,993.28	28.76	826.95	1.46%
22-Jul-19	1985.63	1,978.15	7.48	55.95	0.38%
23-Jul-19	1994.49	1,976.02	18.47	341.26	0.93%
24-Jul-19	2000.81	1,981.55	19.26	371.08	0.96%
25-Jul-19	1973.82	1,993.64	19.82	392.97	1.00%
		Average	**21.08**	**609.22**	**1%**
			MAD	**MSE**	**MAPE**
		r-square=	0.6938		
		r=	-0.83295		

In this method we used previous three days average to predict next day price. If we compare Table3,4,5, It can be said the values of average absolute error decreases by 3-month average regression method. The value of MAE in Table3 was 24.31, in Table 4 was 74.47 but in Table5 it is 21.08 that represents less error chances by using 3-month average method. Below is graphical representation of actual vs predicted closing prices that can be considered better prediction.

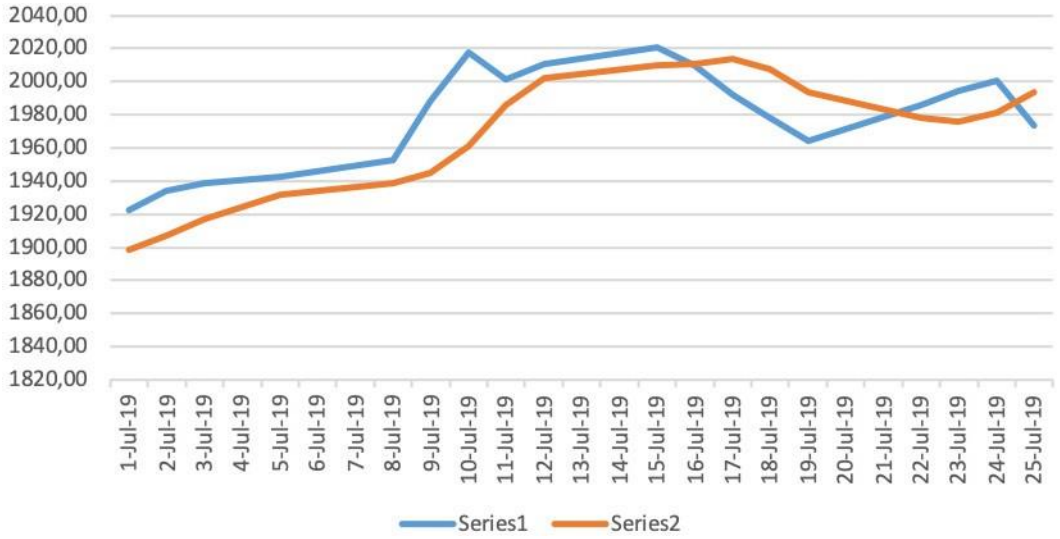

Figure 7: AMZN stock prediction using 3-month average method (Table 5).

Here in Fig7 blue line represents actual stock prices of AMZN products and orange line representing predicted closing prices of AMZN stocks. If we compare Fig 5 and Fig7 we can imagine about prediction accuracy.

2.2.6. AMZN-Stock prediction using Exponential Smoothing method

In this method we use an alpha value as alpha can be 0.4 or 0.8 then we consider first three close prices as seed values and from first three values central value considered as seed of prediction value, then we apply formula for prediction calculation.

Following formula work for exponential smoothing measurements
Prediction with exponential smoothing=

Exp smoothing=*previous forcast+alpha*(actual value-forcast value)*

For prediction test we change values according to need, first we put alpha=0.4 and check the values of error measures, then we place alpha=0.8 and the changings in errors measurements considered. Whole processing, we did in MS excel, let us consider data below for further explanation.

Table 6: AMZN stock prediction using exponential smoothing

	alpha=	0.8			
JULY	**Actual Prices**	**Predicted Prices**	**ABS Error**	**Error^2**	**% Error**
26-Jun-19	1897.83				
27-Jun-19	1904.28				
28-Jun-19	1893.63	1904.28			
1-Jul-19	1922.19	1,895.76	26.43	698.54	1.37%
2-Jul-19	1934.31	1,916.90	17.41	302.97	0.90%
17-Jul-19	1992.03	2,011.65	19.62	385.08	0.99%

	alpha=	0.8			
JULY	**Actual Prices**	**Predicted Prices**	**ABS Error**	**Error^2**	**% Error**
19-Jul-19	1964.52	1,981.51	16.99	288.69	0.86%
22-Jul-19	1985.63	1,967.92	17.71	313.71	0.89%
23-Jul-19	1994.49	1,982.09	12.40	153.82	0.62%
24-Jul-19	2000.81	1,992.01	8.80	77.45	0.44%
25-Jul-19	1973.82	1,999.05	25.23	636.55	1.28%
		Average	**16.62**	**363.83**	**1%**
			MAD	**MSE**	**MAPE**
		r-square=	0.6938		
		r=	-0.83295		

Here in Table 6, we can check accuracy improvements absolute error value decreases up to 16.62 that is less from all other methods. In short, we can say the prediction values by exponential smoothing is best in results. Error accordance decreases in this method and as the value of errors decreases the accuracy of predicted results can be considered best.

Figure 8: Exponential smoothing results for AMZN Stock prediction.

In this previous study we considered 3 different methods for stock prediction, firstly we considered linear regression and results were presented with 24.31 average absolute error, secondly we used only one month sample for linear regression equation then the value of average absolute error was 72.43,

Thirdly we used 3-month average regression methodology and obtained 21.08 average absolute error value, at last we used exponential smoothing measurements based on linear regression methodology and obtained 16.62 average absolute error values that was most significant results that were predicted on the basis of AMZN stock market data from yahoo finance market. At last we can say exponential smoothing proved its prediction best as the value of average absolute error was smallest than all others.

2.2.7. AMZN One-month prediction on the basis of linear regression equation

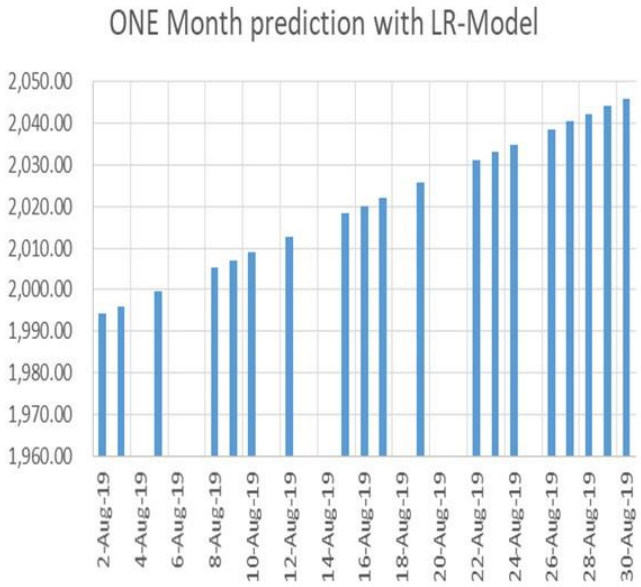

Figure 9: One-month prediction graph for AMZN Stocks.

After apply four different working methodologies we are able to predict next month prices of Amazon stock market, below is next month prediction as well as graphical representation of predicted prices. In linear regression equation we used seven months data as historical record and after generating equation we evaluated next month predictions.

Table 7: One-month prediction for AMZN Stock prices

August	Predictedcloseprice
2-Aug-19	1,994.20
3-Aug-19	1,996.05
5-Aug-19	1,999.75
8-Aug-19	2,005.30
9-Aug-19	2,007.15
12-Aug-19	2,012.71
16-Aug-19	2,020.11
17-Aug-19	2,021.96
19-Aug-19	2,025.67
22-Aug-19	2,031.22
23-Aug-19	2,033.07
24-Aug-19	2,034.92

August	Predictedcloseprice
26-Aug-19	2,038.62
27-Aug-19	2,040.47
28-Aug-19	2,042.33
29-Aug-19	2,044.18
30-Aug-19	2,046.03

From Figure 9, it is cleared that AMZN stock prices increasing day by day, that is why graph is presenting trending scenario. Prediction give estimation idea of future, by analyzing prediction results people can value their business.

2.3. Time Series Forecasting method for AAPL Stock Market Prediction

For time series forecasting method, we used AAPL Stock market data from Jan 2019 to July 2019. The data was obtained from yahoo finance and before stock market prediction measurements; we applied some preprocessing to organize data for better prediction results. We converted each month into three quarters, one quarter was ten days and total thirty days for each month become equal to 1,2,3 values. Now we can say for seven months there was considered 21 days or 21 quarters. For each quarter, we obtained average of ten working stock market days.

Now let us examine the AAPL data before and after preprocessing.

Table 8: General representation of AAPL data from yahoo finance

Date	Open	High	Low	Close	Adj Close	Volume
2-Jan-19	154.89	158.85	154.23	157.92	156.6424	37039700
3-Jan-19	143.98	145.72	142	142.19	141.0396	91312200
4-Jan-19	144.53	148.55	143.8	148.26	147.0605	58607100
7-Jan-19	148.7	148.83	145.9	147.93	146.7332	54777800
8-Jan-19	149.56	151.82	148.52	150.75	149.5304	41025300
9-Jan-19	151.29	154.53	149.63	153.31	152.0697	45099100
10-Jan-19	152.5	153.97	150.86	153.8	152.5557	35780700
11-Jan-19	152.88	153.7	151.51	152.29	151.0579	27023200
14-Jan-19	150.85	151.27	149.22	150	148.7864	32439200
15-Jan-19	150.27	153.39	150.05	153.07	151.8316	28710900
16-Jan-19	153.08	155.88	153	154.94	153.6865	30569700
17-Jan-19	153.08	155.88	153	154.94	153.6865	30569700
18-Jan-19	153.08	155.88	153	154.94	153.6865	30569700
19-Jan-19	153.08	155.88	153	154.94	153.6865	30569700
–	–	–	–	–	–	–
25-Jul-19	208.89	209.24	206.73	207.02	207.02	13909600
26-Jul-19	207.48	209.73	207.14	207.74	207.74	17601200

Only dates and closing prices of stock market AAPL product was our actual need to predict future, then we considered stock values as follow

Table 9: AAPL data before and after preprocessing

Used AAPL data for predictions Data before preprocessing	
Date	**Close**
2-Jan-19	157.92
3-Jan-19	142.19
4-Jan-19	148.26
7-Jan-19	147.93
8-Jan-19	150.75
9-Jan-19	153.31
10-Jan-19	153.8
11-Jan-19	152.29
14-Jan-19	150
15-Jan-19	153.07
16-Jan-19	154.94
–	–
–	–
25-Jul-19	207.02
26-Jul-19	207.74

Used AAPL data for predictions Data after preprocessing			
T	**Month**	**Quarter**	**Close Price**
1	January	1	150.59
2		2	153.83
3		3	157.54
4	February	1	171.26
5		2	170.67
6		3	173.43
7	March	1	174.38
8		2	184.26
9		3	189.83
10	April	1	196.69
11		2	200.55
12		3	204.86
13	May	1	205.44
14		2	187.72
15		3	178.63
16	Jun	1	183.90
17		2	195.69
18		3	198.40
19	July	1	202.49
20		2	203.77
21		3	207.90
22	August	1	
23		2	
24		3	

In Table 9, there is present on month as august without values that will be predicted after all type of time series forecasting process. As we divided each month into three quarters then the approach that need to be predict is august three quarters. We will perform different processing methods for the finding of different forecasting values. Before further processing let's consider graphical representation of data after preprocessing.

2.3.1. Graphical representation of data after preprocessing

Figure 10: Quarter based graphical data representation for AAPL data.

Now according to Fig 10 each month is represented by three dots and we can say it is one quarter. For further quarter consideration all data is present in Table 9. If we consider this graph there is no regularity in data some time it's going straight sometime its going up sometime its going down then we can say there is no presence of seasonality.

Seasonality can be considered when continuously data changing with a trend in each month. As we divided each month into three quarters with each quarter of ten days now let's consider moving average with MA(3). For each quarter value of MA can be considered as average of three quarters used in each month.

For first value the required result for MA can be predicted with average of 1,2,3=2nd value of the month, similarly we can find out all other patterns for whole data by using MS excel.

2.3.2. MA values for closing prices with AAPL stock data

Table 10: MA values for closing prices with AAPL stock data

T	**Month**	**Quarter**	**Close Price**	**MA(3)**
1	January	1	150.59	
2		2	153.83	153.99
3		3	157.54	160.88
4	February	1	171.26	166.49
5		2	170.67	171.79
6		3	173.43	172.83
7	March	1	174.38	177.36
8		2	184.26	182.82
9		3	189.83	190.26
10	April	1	196.69	195.69
11		2	200.55	200.70

T	Month	Quarter	Close Price	MA(3)
12		3	204.86	203.62
13	May	1	205.44	199.34
14		2	187.72	190.60
15		3	178.63	183.42
16	Jun	1	183.90	186.08
17		2	195.69	192.67
18		3	198.40	198.86
19	July	1	202.49	201.55
20		2	203.77	204.72
21		3	207.90	205.83
22	August	1		
23		2		
24		3		

In Table 10, MA is considered as central value of three quarters of a month. Now let us consider other terms for this data that completely represented in Table 11. Before the presentation of other terms we will consider there meanings and use in whole process.

Let us now consider central moving average of three quarters of a month with CMA(3). CMA is considered as center of two MA values for first moth and it can be said as central value of MA values in three quarters of a month.

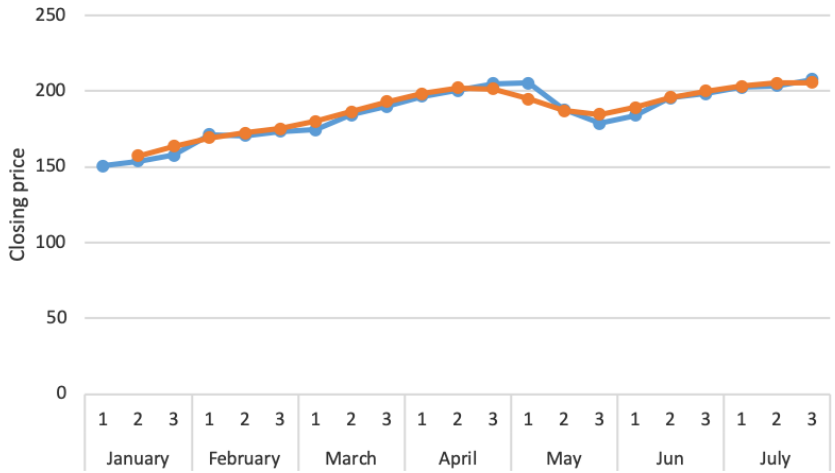

Figure 11: Line graph for actual closing and predicted central moving average (CMA).

In Fig 11, blue line representing actual closing prices and orange line representing predicted central moving average CMA(3) values that can be checked in Table 17.

Now for further accuracy and other parameters finding we will do more steps. Next step is called smoothing, for this purpose we need two variables one is called sessional component(S_t) and other is called irregular component(I_t) final result for smoothing can be considered by product of both of these variables(S_t I_t).

Smoothing= St It= actual closing price/CMA(3) **Eq3**

Let us consider **classical model for time series** that can be considered as

Actual Close Prices= Yt= St * It * Tt **Eq4**

Let us now consider full output by linear regression before further consideration of Time series forecasting. **Tt** can be obtained by addition of coefficients present in Table 16.1, and then multiplying with T values as serial number of stock market.

Table 11: Summary output linear regression

SUMMARY OUTPUT LINEAR REGRESSION						
Regression Statistics						
Multiple R				0.810585		
R Square				0.657048		
Adjusted R Square				0.637995		
Standard Error				9.829845		
Observations				20		
	df	*SS*	*MS*	*F*	*Significance F*	
Regression	1	3332.184	3332.184	34.48543		1.47E-05
Residual	18	1739.265	96.62585			
Total	19	5071.449				

Table 11.1: Time series forecasting summary with output results

	Coefficients	***Standard Error***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	162.6366	4.903824	1.36E-17	152.3341	172.93918	152.3341	172.9392
1	2.238482	0.381185	1.47E-05	1.437642	3.0393223	1.437642	3.039322

Seasonality and irregularity components tell about the distance closeness or away position from actual price line of graph. S_t in Table 17 is sessional component, let us consider its method of working. Now let us consider depersonalize values for data, this can be done actual prices $(Y_t)/S_t$ that is also necessary for stock values prediction. Now for forecasting we can obtain results of our predictions by dividing seasonality with T_t, that is considered our actual prediction obtained from whole process. Below is the obtained components table that is obtained by methodology for stock values prediction of AAPL stock for next month that is represented by yellow color.

Table 12: Time series forecasting with predicted stock prices for next month august

Month	**CMA(3)**	*S****	*S**	**DESEZ**	**T_t**	**Forecasting Predicted prices**
January			1.00	150.59	164.88	164.88
	157.43	0.98	0.99	155.38	167.11	165.44
	163.68	0.96	0.99	159.14	169.35	167.66

Month	CMA(3)	S▯▯	S▯	DESEZ	T_t	Forecasting Predicted prices
February	169.14	1.01	1.00	171.26	171.59	171.59
	172.31	0.99	0.99	172.39	173.83	172.09
	175.09	0.99	0.99	175.19	176.07	174.31
March	180.09	0.97	1.00	174.38	178.31	178.31
	184.75	0.97	0.99	180.43	196.21	194.25
Jun	189.37	0.97	1.00	183.90	198.45	198.45
	195.76	1.00	0.99	197.67	200.69	198.68
	200.21	0.99	0.99	200.40	202.93	200.90
July	203.13	1.00	1.00	202.49	205.17	205.17
	205.27	0.99	0.99	205.82	207.41	205.33
	205.83	1.01	0.99	210.00	209.64	207.55
August			1.00		211.88	211.88
			0.99		214.12	211.98
			0.99		216.36	214.20

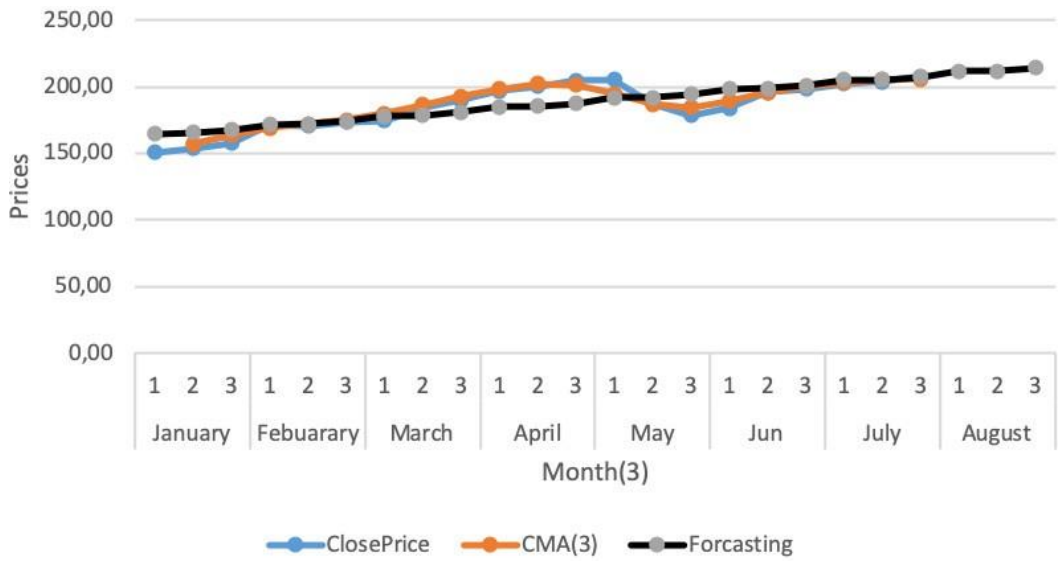

Figure 12: Graphical representation of actual and predicted stock prices for AAPL.

3. Conclusion

Stock market prediction is actual demand for beneficial business. Predictions always helpful to decrease risk factor in any business environment. Risk factor can be analyzed on the basis of historical data and previous business trends. This research based on several results and we used machine learning algorithm (ML) as Linear Regression (LR) with respect relations to business priority. Linear regression applied on different data sets that were obtained

from stock market place (Yahoo finance). Yahoo Finance ever considered as best market place for obtaining stock market data about any product. In our research we used Amazon (AMZN) and Apple (AAPL) datasets for our practical approaches. Before applying ML on datasets, we analyzed stock market trends for both products. Trend analysis also provide predictions about future business plan. In next step first we used AMZN dataset and after analysis of stock market trend we applied linear regression with the help of Excel statistical graphs. Secondly, we applied three month moving average(3MMA) method to predict stock market prices of AMZN products. Thirdly we applied exponential smoothing (ES) for predictions. After comparing all results, we obtained hypothesis that exponential smoothing prediction results given less error and greater accuracy and we considered it best stock market predictor with general trend analysis. Similarly, we applied these three methods on AAPL data and obtained results about predictions. After applying these methodologies, we capable to predict one-month forward stock market trend and we presented August prices as founded throughput. At end of previous chapter, we applied Time Series Forecasting methodology and predicted AAPL stock prices for next month. Time Series Forecasting method also introduced new ways for stock market trend analysis. At last we can say by applying this research methodology we are able to predict future stock market trends easily. Several Machine learning algorithms can be used for stock market prediction but in this research we used few algorithms like Linear regression(LR), Three Months Moving Average(3MMA) and Exponential Smoothing and if we further consider many other algorithms can also be used for Stock Market Prediction(SMP).In Whole research we found Exponential Smoothing predictions results are best rather than Linear Regression(LR) and Three Months Moving Average(3MMA).

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Gesture Recognition Based Virtual Mouse and Keyboard

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Abstract: The individual's enhanced regime is the outcome in modern-day technologies, individuals interests in reducing the human effort have created an interest in the area of gesture recognition based mechanism, computer vision has elevated the implementation of gesture recognition based systems to its apex, with meek programs of image-processing the system is able to outperform the expectations, communities are inculcating this vision in several features of day-to-day life, like Face-Recognition, Color-detection, Automatic-car, etc, The computer webcam will examine the image of various gestures performed by a person's hand according to the movement of gestures the Mouse or the cursor of the computer will move, even deliver right and left clicks using different gestures. Similarly, the keyboard functions may be used with some other distinct gesture, The coding is done on python using Anaconda platform, the sole hardware aspect of the project is a web-cam. Initially the Convex hull defects is generated and then by means of defect calculations an algorithm is generated and then mapping the mouse and keyboard functions with the defects takes place

Keywords: Convex Hull, Gesture recognition, Image Processing, Frame Extraction

I. INTRODUCTION

The Computer webcam is capturing the video of the person appearing in front of the webcam, there will be a small green box which will be generated in the middle of the screen. In that green box, the matter shown will be processed by the code and coordinated with it, if it matches then a red coloured border will be generated, which means the computer has recognized the object and then by moving the object the mouse cursor can be moved. This will not only help in the security of the computer but also help in generating a virtual computational experience. Here in the place of various objects, using hand gestures a single gesture will be moving the cursor, distinct gesture will be used for right click which will be dissimilar for left click, likewise with a simple gesture, we can do keyboard functions virtually that may have been done on some keyboard as a physical aspect. If the gesture differ than the expected trained gestures, the box will display an only green box when the known gesture is observed a red border will arise.

II. LITERATURE SURVEY

object recognition (classification), it was recognized that the human brain courses visual information in semantic space primarily, that is, extracting the semantically evocative structures such as line-segments, boundaries, shape and so on. [1] In computer vision it's still difficult to process visual information as humans do. Computers have to course visual data in data space formed by the vigorously detectable but less meaningful features such as colors, textures etc. Thus, the processing procedure in computers is relatively diverse from that in humans[1]. The approaches were done in which involved the impression of Image Processing and Image Acquisition. According to the study, the aim is to create a virtual mouse which can be primarily useful for saving manual work.

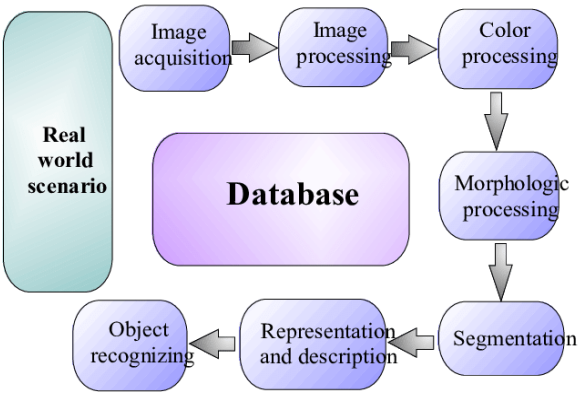
[2] Image base one time keyword is also a aspect these days to improve the safety of One Time Passwords it also includes machine learning algorithms for finding of image OTP's [2].

[3] Smart Image attendance grounded systems are also in use now a days which makes the attendance structure more fault free and quicker image processing tools and algorithm are used for student face detection[3].

In the field of medical science the use of machine learning and Artificial Intelligence is growing at an extraordinary pace image processing are used widely in various disease prediction. [4] hand gesture recognition method is developed using region growing segmentation and convex hull algorithm. The method can be applied for mouse control operations using hand gesture recognition[4] Region growing segmentation followed by morphological operations is applied to segment the

hand region alone from the background region. Then centre and radius of the palm region are calculated. The convex hull is computed and based on these.

BLOCK DIAGRAM



III PROPOSED SYSTEM

i. MOUSE

This Mouse uses a convex hull process for its working,

defects are captured or read, using the defects the functions of the mouse are mapped. The process of this image recognition process will solely focuses on defects and conditional statements, the convex hull takes the gap on the fingers as defects, so it can be used for multiple gestures and mapping commands. The following steps are as followed for the use of gesture recognition and its mouse functions:

- In the first step , the web cam will start and the video and what is present in front of the camera can be seen.
- In the next step the user has to keep their hand in the required border displayed on the screen.
- In this step the different hand gesture will be shown by the user, these gestures will not any kind of a gesture but those which have been trained to the computer from the beginning.
- If the gesture matches then a green colour border will be generated and can be moved by hand the mouse cursor will also move.
- There is total four different kind of gesture, one is used to move the cursor, another one is used to do the right click, another one is used for left click, and another gestures for scrolling up and down.
- When no hand is placed in bordered region a comment will show that there is no object placed
- The similar gestures may not match because sometime this is due to the reason that the user is not showing the gestures accurately or there may be a few noise which are affecting the inputs..
- The gestures count the defect using Convex Hull method and relates it with the object used for mapping

ii.KEYBOARD

We used this following procedure to type on virtual keyboard using our fingertips:

Step 1:Capturing all the real time video using computer's webcam.

Step 2:Processing the individual image frame from the captured video.

Step 3:Converting the image frames into HSV format.

Step 4:Creating a _filter which can create the mask for yellow color

Step 5:Draw contours from the mask. We will loop through all the contours and put a rectangle over it for object tracking.

Step 6:Find position of yellow colour object over the virtual keyboard.

Step 7:Print the character which is pointed by yellow coloured cap.

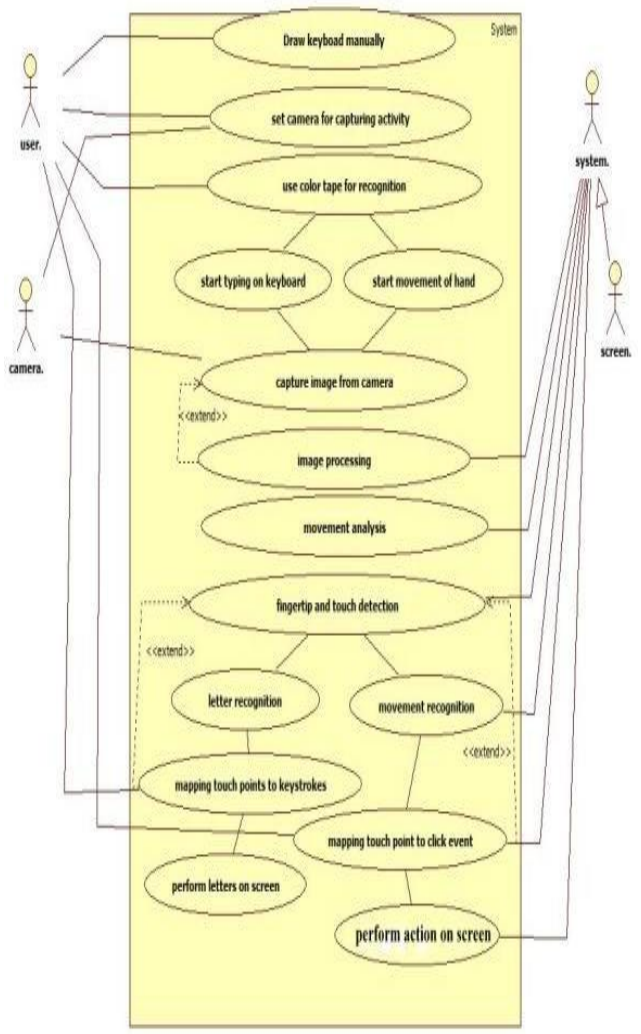
IV ADVANTAGES

- Gesture are easier in representation, makes the presentation attractive, quick expressing of message.
- Gestures are non-verbal communications.
- It can make information to be presented easily via audio, visual, or even through silent.
- People can easily interpret gesture of another person.
- Gestures are main mode of communication hearing impaired persons.

V DISADVANTAGES

- Gesture is difficult in understanding; information might get distorted.
- One cannot make long explanation or conversation through this gestures.
- It is one of informal types of communication, where it is not suited for official purposes..

USE CASE DIAGRAM



VI IMPLEMENTATION PLATFORM

We are employing software to accomplish this solution. The following are the tools that were employed to put this concept into action.

Hardware Requirements:
- System or laptop
- Web camera

Software Requirements:
- Open cv
- Imutils
- Python
- Json
- Pyautogui
- Numpy

A Web Camera A camera reader is an electrical device that reads images from a camera and prints them to a computer. Web cam is made up of a light source, a lens, and a light sensor that converts optical to electrical impulses. Furthermore, all Camera readers have decoder circuitry that analyses the picture data produced by the sensor and sends the content of the camera to the scanner's output port.

Open CV is commonly used for transmitting data in web applications (e.g., sending some data from the server to the client, so it can be displayed on a web page, or vice versa). Open cv is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using opencv, one can process images and videos to identify objects, faces, or even handwriting of a human.

Python It is a high-level, interpreted, interactive, and a interactive programming language. Object-oriented programming language This programming language is akind of It's written in a way that's easy to understand, with a lot of English keywords. Because of its writability, error minimization, and readability, this language supports a wide range of hardware platforms.

Numpy NumPy is a Python library. It is used to supports a large multi-dimensional arrays and matrices, along with a large collections of high-level mathematical functions to operate on these arrays. NumPy is open-source software and has many contributors

Imutils a series of convenience functions to make a basic image processing functions such as translation. rotation, resizing, skeletonization, and displaying Matplotlib images easier with OpenCV and both Python 2.7 and Python 3

Json JavaScript Object Notation is a standardized format commonly used to transfer data as text that can be sent over a network. Json is used by lots of APIs and Databases, and it's easy for both humans and machines to read. It represents objects as name/value pairs, just like a Python dictionary. It has a JSON module that will help converting the data structures to JSON strings. We use the import function to import the JSON module. This module will convert strings to Python datatypes, normally the JSON functions are used to read and write directly from JSON files. JSON is commonly used

for transmitting data in web applications (e.g., sending some data from the server to the client, so it can be displayed on a web page, or vice versa).

Pyautogui This library lets your Python scripts control the mouse and keyboard to automate interactions with other applications. The Application user interface is designed to be as simple. It works on Windows, macOS, and Linux, and runs on Python 2 and 3. Pyautogui is the Python module which can automate your GUI and programmatically control your keyboard and mouse.

VII IMPLEMENTATION

HARDWARE IMPLEMENTATION

In this project hardware usage is less. We use a personal computer or a laptop (intel i3/i5 2.4 Ghz)with ram 4/8 Gb. Webcam is used throughout the project for gesture recognition.

SOFTWARE IMPLEMENTATION

When it comes to software implementation, operating system is mandatory for every system to work .In the instant project we are using windows 10 as operating system, albeit, Windows Xp / windows 7 can be used. Python is used as programming language, to code the programme. Opencv library is used for hand gesture detection and recognition which is a Python library with free access. It can easily be installed on Anaconda using pip install command. Image processing toolbox is used for image processing.

VIII RESULT AND DECLARATION

1. The main aim was to design and develop a virtual mouse and keyboard that works using hand gesture recognition . Both the hardware and software were implemented well.
2. The proposed virtual mouse and keyboard would recognise meaningful gestures for cursor movement, right or left clicks and scrolling.
3. Reduce the hardware cost by substituting present day mouse and keyboard.

IX FUTURE ENHANCEMENTS

1. This paper is about virtual mouse and keyboard that works on hand gesture recognition . These works well with still background. It can be further improved in a way that it works well with dynamic background.
2. More accurate performance can be expected by increasing the number of cameras and capturing 3- D images. As the defects count will be accurate and eases the computer to read the image.
3. Improving gesture recognition to handle multiple windows, enlarging ,shrinking and closing of windows using multiple fingers and palm.
4. Voice recognition can also be implemented in the keyboard and detection of fingertip instead of color pointer.
5. On further enhancing, this system can find its application in architectural drawings, medical field, reducing workspace and in presentations.

X CONCLUSION

This paper is proposing a system that recognises hand gestures using which the virtual mouse and keyboard works . Defects are captured using the convex hull approach. The functions of the mouse are mapped using these defects. Hand position system is used for keyboard functioning. Where video records the hand position with virtual keyboard displayed on screen. Mouse functions like cursor movements, right and left clicks, drag and keyboard functions like printing alphabet etc are carried out. This system can be enhanced to find its applications in almost all fields. This system is more feasible and user-friendly.

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PRETERM BIRTH RISK DETECTION SYSTEM USING MACHINE LEARNING

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Abstract **- Recently,the number of preterm births is 15 million, and neonatal mortality rise as a result, as stated by the World Health Organisation. Despite the advent in technologies in the healthcare industry, anticipating preterm birth often plays an significant part in preventing complications. In this project we find some of the major factors correlated with pregnancy and then forecast premature birth by using three different algorithms for classification and regression, providing likelihood and potential causes for early birth based on inputs with an accuracy of 92.87 so that preventive measures can be taken to avoid the future causes.**

The paper proposes the application of a machine learning (ML) technique, named

support vector machine (SVM), for the recognition of patterns

in a pregnancy database. This approach has outperformed other ML methods, representing a valuable tool for smart decision support systems (DSSs) and For the performance assessment of the proposed model, this work uses the 10-fold cross-validation method. This ML- based technique obtained encouraging results with an accuracy of 0.921, a true positive (TP) rate of 0.939, a false positive (FP) rate of 0.268, and receiver operating characteristic (ROC) area of 0.785. These indicators show that this approach is an excellent pattern recognizer for pregnancy care. DSSs capable of enhancing the care provided to women who are at a risk of developing pregnancy-related problems. Thus, this work can contribute to improve the maternal and fetal health conditions, predicting preterm birth risk early.

Keywords—Computational intelligence; Machine learning; Sup- port vector machines; Medical conditions

I. INTRODUCTION

In Preterm birth refers to the birth of infants before completion of gestational period (below 37 weeks). The Gestational period being 40 weeks. One of the most challenging
circumstances in neonatology arise due to preterm birth and its complications.
Some of the causes which leads to preterm are – Shorter Cervix, Premature rupture of
membrane, multiple gestation, short stature and few more. The premature infants face
many risks like cerebral palsy, loss of sight and hearing.
Even though a lot of preventive measures have been implemented to deal with risks
related to preterm birth, the progress achieved in this field is confined.
Despite various measures taken, the health care system of India lacks to identify the
women with the risk of preterm labor. Hence it fails to provide the required care and
support for the proper development of premature babies.
The need to detect preterm births is to reduce the infant mortality rate, this can be done
by clinically detecting chances of preterm much before the labor and hence transforming
it into a normal birth. Various ways of detecting includes monitoring of breathing and
heart rate, ultrasound scans, checking of fluid index, Echocardiogram and blood tests.
Machine Learning enables more precise prediction of outcomes through programs. In
many applications machine learning is being used. The algorithms use recorded data as
input and predict the new output values. Here, to predict premature births, we use machine learning algorithms.

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II.LITERATURE SURVEY

1. "A Preterm Birth Risk Prediction System for Mobile Health Applications Based on the Support Vector Machine Algorithm". Support Vector Machine is an application of ML for recognization of pattern in pregnancy databases. It is a good method for mobile health application. For performance assistance, it uses 10 cross-validation. SVM is used to track fetal acidosis.Method:SupportVectorMachine(SVM). Accuracy:0.821.
2. "Applying Data Preprocessing Methods to Predict Premature Birth" One big use of this research centered on forecasting health results. Purpose of this work is to investigate whether pre-processing methods. When applied to datasets sees if there is an improvement in the prediction accuracy. BORN and PRAM datasets are used.
3. "Prediction of Preterm Pregnancies using Soft Computing techniques Neural Networks and Gradient Descent Optimizer"ANN is used to learn from the dataset.We used conditional logistic regression to estimate the likelihood of a pre-term arrival. The Softmax feature is used in the final layer of the neural network classifier to calculate the costs. Modelling of neural networks and gradient descent optimizer are used providing accuracy of 89.99.
4. "Level prediction of preterm birth using risk factor analysis and electrohysterogram signal classification"Predicting PTB by analyzing patient history with risk factors.Usually, electrohysterogram (EHG) is a clinical procedure that can be used.Preterm is detected through application of extraction features coupled with semi- supervised learning. Digital signal processing (DSP) is one of the innovative methods utilized by EHG to interpret and evaluate signals. Semi-Supervised Learning (SSL).
5. "Advanced artificial neural network classification for detecting preterm births using EHG records" Examination of electrical uterine signals from the abdominal surface may offer an unbiased and effective way to detect the initiation of premature delivery. Uses ML algorithm in conjunction with Electro hysterography signal processing.Seven different ANN is used to identify the records. Dataset of 300 records were used where 262 term were —TERM‖ and 38 were —PRETERM‖.Extracting characteristics from EHG signals is important for discovering particular spectral details. This is mostly concerned about specific and preterm deliveries.

III MATERIALS & METHODS

For a particular model tells us about what the system should perform. The requirements are developed depending on the various type of software and the users. These are usually described in a unique way that can be easily understood by system users. It helps to determine the output of that device or software for a particular given certain input value.

In working,It gives a brief idea of the working of different modules in the project is started with collection of dataset. The collected data is further sent for Data Preprocessing in order Now the processed dataset is used to train the classification algorithms being used. On the other hand, front end is created in order to provide an environment for the user to provide inputs and to display outputs. If any of the input boxes are not filled then a message is printed asking to enter those specific inputs and other inputs in form of radio buttons have default values set so if a user forgets to give a input the default value will be taken. When the data is entered into the frontend and submitted the data is stored in a dataset and then this dataset is pre-processed such that inputs can be transformed to a shape recognized by classification algorithms. Once the preprocessing is completed the values are sent to three different algorithms for prediction. The outputs from three different algorithms are further sent to a probability function. Here the probability of the given inputs leading to the preterm birth is being calculated.

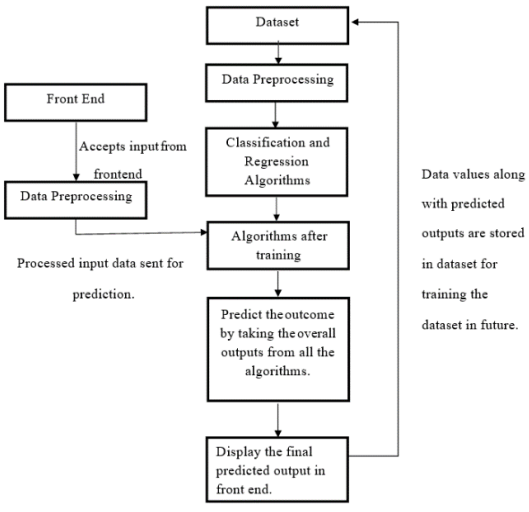

Fig.1 Architecture

The methodology of building an efficient equation recognition and solver is as per the steps given below.

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Methodology:

- Run the program.
- Give the required inputs for the text boxes ,an error message will be thrown if the input boxes are left empty.
- For radio buttons default values can also be taken as input.
- Submit the inputs.
- Once the inputs are submitted it will be sent to the backend where data preprocessing will be performed.
- Data will be processed in such a way that it is acceptable by all two algorithms.
- Output of this Model is captured and necessary modifications are performed.
- Finally a function will be called where all three algorithm processes the data and individual accuracy will be given.
- A probability function is called which takes the average probability from all three algorithms and output is printed on the output screen.
- The reasons which are causing preterm birth will also be printed on the output screen.
- Stop the program.
- Fig.2 Linear Regression is used to find the linear relationship between the label and the attribute. When the number of attributes which effect the label are more than one we make use of multiple linear regression. The plane which is considered for multiple linear regression is a hyperplane.
- Fig.3 Random forests is a collection or group learning method for classification , regression and other tasks, which function by building a multitude of decision trees during training and producing the classes in which individual trees are modeled (classifications) or mean predictions (returns).

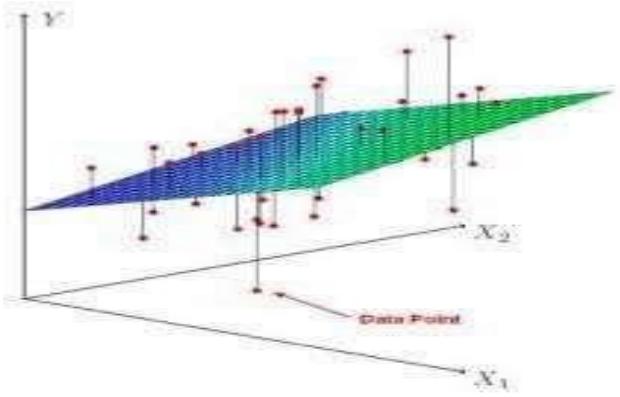

Fig.2 Multiple Linear Regression

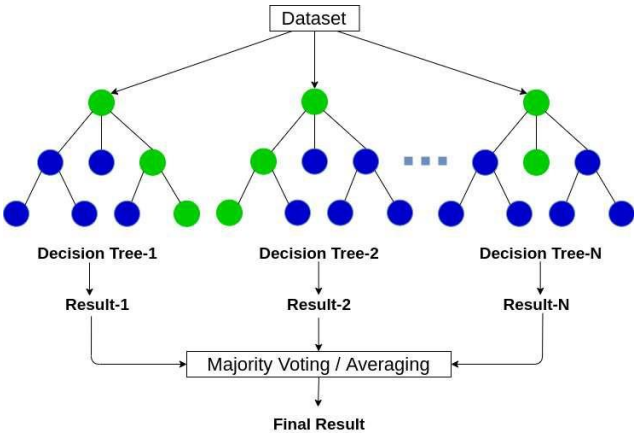

Fig.3 Random Forest

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IV. RESULTS & DISCUSSIONS

Tkinter is a standard python interface to GUI.the window with title and other widgets which are used to input the values of the patient. Once the values are entered ,we click on the submit button.

The submit button stores the values which are inputted in a csv file.

The output window is created by using Top level function.The various causes due to which the preterm birth is possible is displayed on the output window.

We have individually executed all the three algorithms – Random forest algorithm, and Multiple linear regression algorithm.

Below are the individual outputs of all three algorithms, it shows the expected outputs and the outputs which are predicted by the algorithms.

The probability value which is outputted by all the three algorithms tells us the possibility of the birth to be a preterm birth.

V. CONCLUSION

1.The Handwritten Equation Solver is used to recognize the equations which are written by hand and produce results accordingly.

2.The handwritten equation solver has also proven to be a good neural network architect=ture and application for the purpose of introducing and demonstrating neural networks to the generalpublic.

3.The main goal is purely educational one, a moderate recognition rate of 98.46% was reached on a test set.

FUTURE ENHANCEMENT

1. The present system predicts the probability of preterm birth by the data which is both textual and numerical
2. While further enhancing this system in future we can take image as inputs, in the sense the scanning reports of the mothers can be taken as input and image processing can be done to consider those scanning reports.
3. Can also update the system that the user will upload their scanned reports and the image will be processed internally and the output will be displayed.

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Blind Assistance System Using CNN

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***Abstract* - Globally, the spread of visual impairment is a highly sensitive subject. Independent travel is well acknowledged to pose substantial difficulties for such people, lowering their quality of life and jeopardising their safety. These include the inability to move completely independently and the ability to seek out and recognise items. For thorough reading of written texts, the visually impaired rely heavily on the Braille language. Until a decade ago, a blind person's sole means of assistance were sticks, guiding dogs, or the ability to move. Electronic technologies have been brought into the world of the blind in the last decade in order to make their life easier. The audio is delivered to the blind user via stereo headphones. We are developing a device with a USB camera that will capture real-time frames to overcome the travelling difficulty for the group of visually impaired people. The audio includes navigation assistance commands such as presence of obstacle, object of interest, clear path, other humans surrounding, doors nearby, and so on. CNN's forward-feedback neural network is employed to accomplish this. It provides a significant edge in object recognition due to its unique type of sharing local weights. The majority of it is made up of pooling, convolution, and fully connected layers. Object detection methods make the use of CNN. The output class will be identified using accuracy metrics. The object class will be translated to default voice notes, and voice-based outputs with distance units will be generated.**

I. INTRODUCTION

The field of computer vision is concerned with extracting, analysing, processing, and comprehending pictures. Object detection in videos is one of the most difficult challenges in computer vision. In films, object recognition entails recognising either static items such as landscapes or moving objects such as humans, animals, and other similar entities. Detecting objects is a very simple activity for humans. Humans can easily recognise an object that has been warped, translated, rotated, or partially obscured from view. Computer vision, on the other hand, remains a difficult task for researchers.

Video surveillance is now used in a wide range of applications, from traffic management control to security in enterprises and banks, as well as indoor and outdoor monitoring in homes. Surveillance films are popular not only because they offer a better viewing experience, but also because they have the ability to recognise certain objects or events from a distance of several metres. The world's estimated number of visually impaired persons is over 285 million, or roughly 20% of India's population. Visually handicapped persons, unlike normal sighted people, are unable to see or grasp their surroundings. They struggle with mobility and navigation on a regular basis, and they frequently have trouble acquiring and communicating information, especially when they are alone. They are primarily reliant on others to meet their fundamental daily requirements. As a result, their personal, social, and professional lives are all affected. As a result, we're interested in designing a system that will address the key issues faced by the blind, including the following features.

Object detection is a computer vision and image processing approach for locating semantic entities of a specific class in digital pictures and movies, such as people, buildings, and automobiles. Face detection, pedestrian detection, picture retrieval, and video surveillance are just a few of the domains where it can be used.

In most vision-related tasks, the underlying algorithm is object recognition. Deep learning-based methods, in which a deep neural network is created and subsequently trained, are used to handle any object recognition challenge. Unsupervised learning, in which the network is trained with unlabelled data, can be used to build deep neural networks, and it takes much less time. We use a convolutional neural network (CNN) and feature extraction in our object recognition approach, followed by a pooling step, and finally, a combined features vector is used to train the classifier. In our object recognition strategy, we use a convolutional neural network (CNN) and feature extraction, followed by a pooling step, and ultimately, a combined features vector to train the classifier.

So, the technological solution we've devised is an Integrated Machine Learning System that will recognise and classify Real Time Based Common Day-to-Day Things by pre-processing input photos in a pre-trained model and computing the distance between the objects discovered and the person. When he or she is very close to that particular object, the system will generate voice command feedbacks as cautions.

II. LITERATURE SURVEY

[1] CNN Based Auto-Assistance as a boon for directing Visually Impaired Person : 2019 by Samkit Shah, Jayraj Bandariya, Garima Jain, Mayur Ghevariya, Sarosh Dastoor :

Object categorization and detection is subject of the computer vision that is constantly being researched. It allows computers and computing devices to detect objects and do computations in the same way that human eyes do. When the new testing data is provided to ML algorithm, a prediction is formed based on the model, and the accurately predicted input data is analysed and deployed if it is found relevant. While, on the other hand, it is found that it is not relevant, it is retrained iteratively. Deep learning is subset of AI which mimics the human brain in terms of data management and pattern generation, which aids decision making. To carry out the task of machine learning, deep learning employs a hierarchical level of artificial neural networks.

The main purpose of this study is to create an object detection system that will help totally blind people manage their activities autonomously. The paper also compares object detection methods such as the Haar Cascade and the Convolutional Neural Network (CNN). The Haar Cascade classifier is a basic face identification technique that can be trained to detect various things, whereas the convolutional neural network is a deep learning approach that can be used to recognise objects. The custom dataset consists of 2300 photos divided into three classifications. This comparison is being carried out in order to determine whether CNN is a good algorithm for this system in terms of accuracy in a real-time setting.

[2] Video Content Analysis using Convolutional Neural Networks : 2018 by Inad Aljarrah, Duaa Mohammad :

We offer an intelligent video content analysis system that generates a searchable text file and summaries the video material using a pre-trained CNN model that improves the capability of analysing and searching video content in this research. Object categorization is used to analyse video surveillance footage. A convolutional neural network model is used to recognise and classify objects in the video. We are considering using Keyframes since they are important in video content analysis because they abstractly reflect the content of a video. Oxford's Visual Geometry Group built and trained VGGNet, a deep convolutional neural network for object detection (VGG). In ImageNet Large-Scale Visual Recognition Challenge (ILSVRC), the VGGNet achieves state-of-the-art accuracy in both localization and classification tasks, as well as the recognition of various datasets, thanks to this network architecture. We used the MatConvNet module in MATLAB to create a VGGNet 16 weight layer previously trained model for our project. VGGNet is used to analyse video keyframes in order to obtain searchable information about objects that appear in video and to determine the confidence scores for each occurrence. Because of its success, the proposed solution demonstrates that preserving keyframe content in a searchable text file will be the future of video searching.

[3] Real Time Object Identification Using Deep Convolutional Neural Networks : 2017 by Rajeswari Sujana S., Sudar Abisheck S., Tauseef Ahmed A., Sarath Chandran K.R :

When video is given as input, this study shows how to apply the notion of deep learning in conjunction with CNN to identify the items present. Even if the items are of varying sizes and shapes, the approach uses input video to produce an output containing a set of detected objects surrounded by boxes. Along with item identification, the convolutional neural network calculates a confidence score for each object. The Single Shot MultiBox Detector is the name of this approach (SSD). To improve computational speed, we are replacing the VGG Net with the Residual Networks in this project's architecture.

A convolutional neural network(CNN) is a multi-layer architectural extension of the feed forward artificial neural networks. To detect objects in real-time, we use a CNN based on the VGGnet architecture. To avoid output latency while preserving precision, we skip frames intelligently. To reduce computation cost, region proposal approaches are utilised to localise object regions and feed them to the CNN. The CNN searches the input region for recognised items and produces a label that is marked in real time. The clever frame skipping ensures that the recognised object is tracked smoothly while inside the frame.

[4] Moving Object detection in videos Using Principal Component Pursuit and Convolutional Neural Networks : 2017 by Enrique D. Tejada, Paul A. Rodriguez

In this paper, Robust PCA (RPCA, also known as Principal Component Pursuit, PCP) is used as a video background modelling pre-processing step before using Faster R-CNN model, which provides state-of-the-art classification accuracy and low response time for training and classification, to improve the efficiency of moving object detection and classification.

It is believed that such a pre-processing step, which separates moving items from the background, will reduce the number of regions to be examined in a given frame, improving classification time and lowering classification error for the video's dynamic objects. The computational results suggest that using the PCP approach as a pre-processing step for the moving object classification enhances classification accuracy by image-segmenting using the binary mask of sparse component. It is required to segment the regions to be categorised in order to appropriately classify items over the entire image. A new model has been presented recently where feature maps obtained in the convolutional layers of a detection CNN are shared with a new network approach called RPN(Region Proposal Network) to obtain these locations. Faster R-CNN is a unified system that provides state-of-the-art classification accuracy and a fast training and classification response time.

III. PROPOSED METHODOLOGY

The method for performing project summarization is described in this section. To meet given requirements, we used the process of defining the components, modules, interfaces, and data for the system. In the system we are proposing, the working is distributed among 4 modules. The 4 modules being,

1] Image Collection Module
2] Model Training Module
3] CNN Module
4] Text to Speech Module

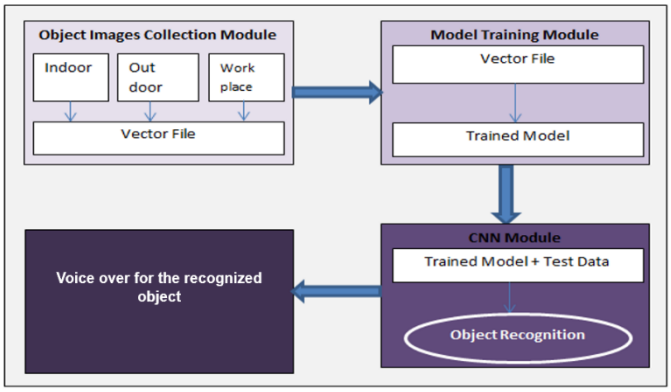


Figure 1. Architectural design of implementation

It is not only used for visualisation, describing, and documenting different parts of a system, but also for creating executable code of the software application, thus the summary can be classed based on information contents.

1] Image Collection Module

Data is the foundation of all data science endeavours. Depending on the project, datasets might be of any type. Data can take the form of music, video, text, graphics, and so on. A huge amount of data is necessary to develop a robust machine learning/deep learning model. We are frequently unable to locate the correct image dataset for a project. Searching for and downloading photos from the internet, as well as manually annotating them, takes a lot of time and effort. So, to prepare a custom image dataset, we use a python library bing_image_downloader. Bing Image Downloader is a Python package for creating a custom image dataset that may be used to train a variety of deep learning models. Python may be used to download a large number of photos from Bing.com. It is extremely quick because it uses an async URL. Scikit-image is a Python image processing package that interacts with NumPy arrays, which are a collection of image processing techniques. It has tools for image processing and computer vision that are simple and effective. Everyone can use it and it can be reused in a variety of situations. Submodules contain the majority of skimage's functionalities. NumPy arrays are used to represent images, such as 2-D arrays for grayscale 2-D images.

2] Model Training Module

In this module, we use a technique called train_test_split to assess the performance of a ML algorithm. Scikit-learn, sometimes known as sklearn, is a freely licenced Python machine learning library. Model selection is a technique for generating a blueprint for data analysis and then applying it to new data. sklearn.model_selection imports the train_test_split approach. A dataset is divided into two subgroups using this method. The initial subset utilised to make the model fit is the training dataset. The dataset's input element is fed to the model, which then makes predictions and compares them to the values predicted. The second subset isn't used to train the model; instead, the input element of the dataset is fed to the model, which then makes predictions and compares them to the values predicted. The second dataset is referred to as the test dataset. This is how we wish to use the model in practise. To put it in other way, we wish to fit it to existing data with known inputs and outputs, then generate predictions for future scenarios where the expected outcome or objective values are unknown. For the train-test strategy to be effective, we need a suitably large dataset.

3] CNN Module

Analogous to how a kid learns to recognise items, we must show an algorithm millions of photographs before it can generalise the input and generate predictions for the images it has never seen earlier. Computers see things in a different way than we do. In their world, only numbers exist. Pixels are numerical arrays with two dimensions that can be used to represent any image. However, just because animals view things differently than humans does not mean that we couldn't teach them to recognise patterns in the same manner that we can. All we have to do is look at an image from a new perspective.

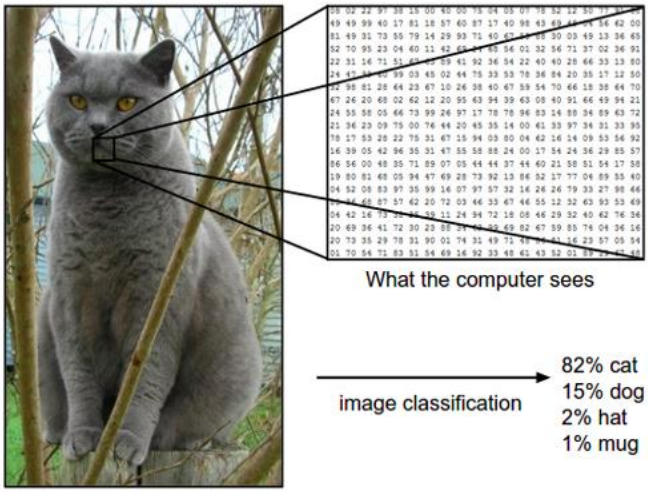


Figure 2. How a computer sees an image

To train an algorithm how to recognise things in photographs, we use a type of Artificial Neural Network known as Convolutional Neural Network (CNN). Convolution is one of the most significant operations in the network, hence the name. Convolutional Neural Networks get their inspiration from the brain. A CNN is a Deep Learning system that takes an input image and assigns relevance (learnable biases and weights) to various objects/aspects in the image, as well as differentiate between them. The purpose of Convolution Operation is to extract high-level properties such as edges from the i/p image. ConvNets don't have to be limited to just one Convolutional Layer. Traditionally, the first ConvLayer is in charge of capturing Low-Level data such as edges, colour, gradient direction, and so on. The design changes to the High-Level properties as well with the addition of layers, giving us a network that understands the photographs in the dataset in the same manner that we do. The operation yields two types of results: one in which the convolved feature's dimensionality is reduced when compared to the input, and another in which the dimensionality is raised or unchanged. The Pooling layer, just like the Convolutional Layer, is responsible for reducing the spatial size of the Convolved Feature. The computer power needed to process data is

reduced as a result of dimensionality reduction. Max Pooling also acts as a Noise Suppressant. It removes all noisy activations while also performing de-noising and dimensionality reduction.

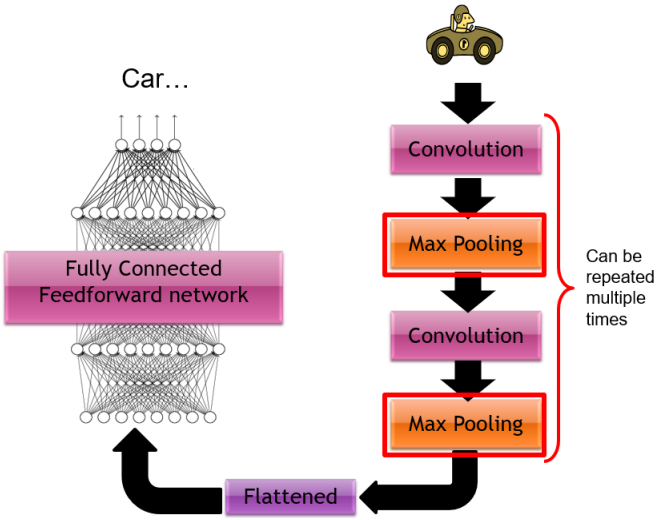


Figure 3. Working of CNN Module

4] Text to Speech Module

TTS (text-to-speech) technology allows you to hear computer text read aloud. It can convert text to audio on PCs, smartphones, and tablets. Additionally, any sort of text file can be read aloud, including Pages documents, Word, and online web pages. TTS can assist children who have difficulty reading, here for the blind. To convert text to speech, a variety of methods and programmes are available. There are various APIs for converting text to speech in Python. One of these APIs is the Google's Text-to-Speech, also known as the gTTS API. gTTS is a simple utility that translates text into audio, which may then be saved as an mp3 file. English, Hindi, French, Tamil, German, and many other languages are supported via the gTTS API. The speech can be given at either of the two audio speeds available: rapid or slow.

There are three parameters used in this module:

1] text (string)

2] lang (string, optional)

3] slow (bool, optional)

Python allows us to communicate with the computer. It will speak the written words in English if given a text string. Text To Speech is the name of this procedure (TTS). The language in which the text should be read (IETF language tag). The default language is English. Slowly reads the text. False is the default value. The image will be outputted to the user as speech from the CNN module, which will have a file name.

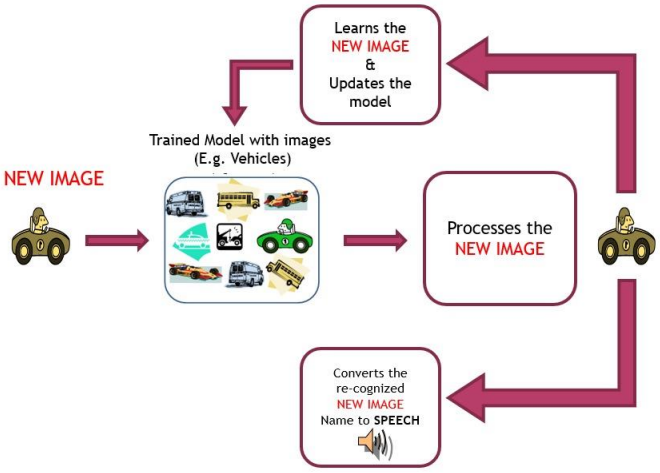
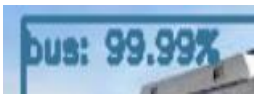


Figure 4. Approach

IV. RESULT

Plain image

Detected image



Confidence score

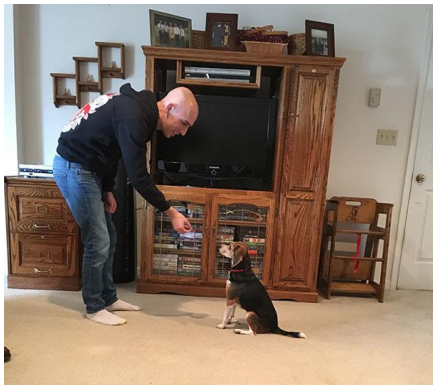
Figure 5. Output

In the field of image processing, object recognition has always been a hot topic. Our project takes an image as input, computes the

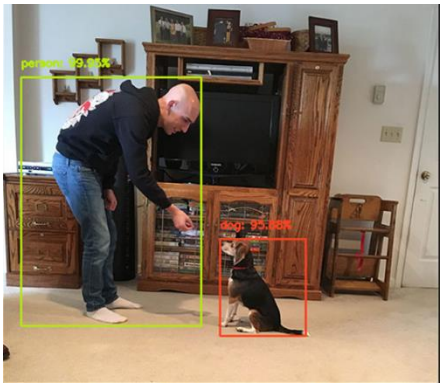
confidence value for each object in the frame, and outputs the object surrounded by boxes, as well as the object's identification and confidence value. The recognised objects are contained in a box in the CNN paradigm. This box represents the object's position in the frame as well as the overall area it takes up within the image. This box is also accompanied by a label that represents what the identified object is, or to put it another way, it classifies the object and assigns it a confidence score, which is essentially how confident the neural network is in its classification. Using Convolutional Neural Networks, we are capable of detecting objects on an image. With this in mind, we prioritised a number of objects that a visually impaired person might encounter on a daily basis.

As a result, we take the data of the items that we are interested in and discard the other data that has been spotted. When it comes across humans, animals, or a crowd, this algorithm recognises them. For each of the labels detected in the image, this application generates audio output. The software will pause until all of the identified labels have been output as audio.

Depending on the type of object detected, the audio output can be changed. If a person is detected, the CNN model will assign a label or classification, followed by a confidence score, such as “person 83.22 percent.” We can give an audio output like "There is a person ahead" by looking at the label in front of us. A visually impaired individual will be more aware of their surroundings as a result of this information.



A Person and a dog as input image



The Detected image

Figure 6. Output

V. CONCLUSION

With the help of a friendly device and an item detecting system, blind people will be able to navigate around in unfamiliar indoor and outdoor situations. Different object detection methods are examined in this project in order to detect many items at the same time. When recognising several objects at the same time for real-time applications, CNN provides more accurate results. CNN has a higher cognitive capacity than any other method and has an efficiency of 80-90 percent.

CNN gives far better accurate results when recognising multiple objects at once for real-time applications. A gadget with text-to-speech conversion is used to transmit information. Visually impaired people can employ CNN and aural clues to help them perceive and locate objects in their surrounding environment. The field of computer vision is really vast, and the technology is still in its infancy. CNN and audio cues are used in the technology to help vision impaired persons perceive and locate objects in their surrounding environment. Computer vision is a vast field, and this device is still in its early stages of development.

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PREDICTING DEEP SOLAR SYSTEM COVERAGE USING MACHINE LEARNING

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Abstract: In the current project we are provided with a subset of a database DeepSolar which keeps track all the solar installation. Our task here is to predict the solar power system coverage of a tile (represented by rows) given various features present in the dataset. We have used six different types of supervised algorithms which are very prominent in the machine learning world. We have confined our analysis on "Logistic Regression", "Random Forest", and "Support vector machine". Before we started our analysis, we did the required data preparation. Which is explained in the below report. Apart from this all the method has been explained in detail. Based on the accuracy we have concluded on the best method. Also, all the methods have been replicated 100 times for better results using hold-out method. At the end of the report we have summarized the conclusion and the results.

INTRODUCTION

In the current project we worked on the dataset "data_project_deepsolar" which is the subset of the DeepSolar database, a solar installation database for the US, built by extracting information from the satellite images. The database can be employed to relate key environmental, weather, and socioeconomic factors with adoption of solar photovoltaics energy production. Each row in the dataset provided to us "data_project_deepsolar.csv" is a tile of interest, that is an area corresponding to a detected solar power system, constituted by a set of solar panels on top of a building or at a single location such as solar farm. For each system, a collection of features records social, economic, environmental, geographical, and meteorological aspects of the tile (area) in which the system has been detected. The target variable is "solar_system_count". This variable is a binary variable indicating the coverage of the solar power systems in each tile. The variable takes outcome low if the tile has a low number of solar power systems (less than or equal to 10), while it takes outcome high if the tile has a large number of solar power systems (more than 10). Our task is to use various supervised classification methods to predict the solar power system coverage of a tile given the collection of predictor features. We are to use different range of methods and we need to find best model to classify the given dataset.

METHODOLOGY

Supervised learning: Predict the target variable using a function of the input variables. This function will also enable us to predict the outcome variable values corresponding to new input data. Supervised learning problems can be further grouped into regression and classification problems.

• Classification: A classification problem is when the output variable is a category, such as "red" or "blue" or "disease" and "no disease".

• Regression: A regression problem is when the output variable is a real value, such as "dollars" or "weight".

Methods used by us for our interpretations:

➢Logistic Regression

➢Random Forest

➢Support vector machine

Data Preparation: Before we start with the data analysis, we do the data preparation. We start by checking the dimensions of the dataset and look for any NA values present in the dataset. The initial dataset 20736 tiles and 81 different features. We remove all the highly correlated variables from the dataset to get only

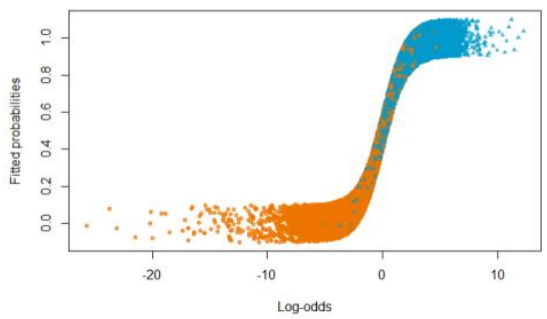
the required features for our analysis hence we are down with 56 features. We have then scaled the dataset. Two of the categorical variables i.e. "voting_2016_dem_win" and "voting_2012_dem_win" whose values are either true or false has being converted to 1's and 0's where 1 has been indicated as true and 0 has been indicated as false. We then have split the dataset into train, validation, and test sets. We split the dataset into the ratio of 85% and 15% into training/validation and testing. Further we split training/validation into 80% as training and 20% as validation. After the through data preparation we start with our analysis.

LOGISTIC REGRESSION

• Model a binary/categorical target variable given a set of input variables. The focus is in modelling the probability of an outcome of the target variable given the set of covariates.

• Perform classification, that is predict the class-label of input observations.

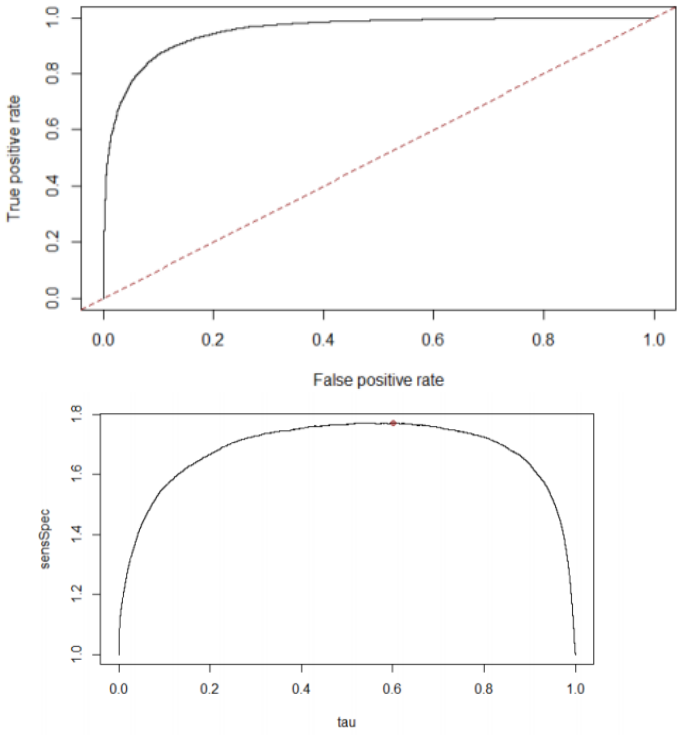
• Predict if email is spam or not, predict if tumour is benignant or malignant, predict credit risk level (low, medium, high), etc. The main function for fitting a logistic regression model with binary response variable is glm. Note that this function is used more generally to fit generalized linear models and to estimate a logistic regression we need to set the argument family = "binomial". We construct confidence intervals for the estimated coefficients, both on original and log-odds scale. To get the preliminary feeling of how the model is performing, we have plotted the log-odds versus the estimated probabilities, colouring the points according to the actual outcome of the response variable. The function jitter is used to add some random noise to aid the visualization. The below graph is the plot of log odds vs fitted probability. We can clearly visualize the sigmoid curve distinguished between 0 (low) and 1 (high). Also, from the confusion matrix, we see that 5221 times 0 has been accurately predicted and 841 times it has been incorrectly predicted. 7275 times 1 has been predicted correctly and 763 times zero has been predicted incorrectly.



pred	0	1
0	5221	841
1	763	7275

We have also plotted ROC curve. From the below curve we see that ROC is pushed to the top left corner indication of a good separation. Also, the almost 89% of the area is covered under the curve again a good indication of the discrimination.

In the below graph we get the best or an optimal tua value which is close to 0.6 indicated by the orange dot at the peak.

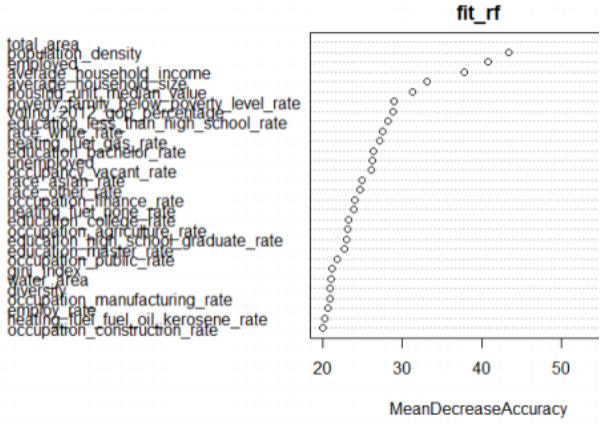


The model accuracy of the validation dataset is around 89.4% while the accuracy on the test data is around 87.20%. Classification based on the best tau value: False positive is 5425, False negative is 637, True positive is 7044 and True negative is 994.

pred	0	1
0	5425	637
1	994	7044

RANDOM FOREST

Random forests extend bagging by considering random splits, and this to further make trees more diverse. We use randomForest package via the function with same name. We fit random forest on training and validate on the validation set. We fit the model using random forest method and we plot a graph "varImpPlot". varImpPlot: Function varImpPlot can be used to plot the variables ranked accordingly to their assessed importance; argument type = 1 specifies that the importance should be measured in terms of mean decrease in accuracy. From the below plot we can see that there are nearly 30 important variables in our current dataset.



From the confussion matrix we can see that high has been predicted correctly 7447 times while 591 times it has been predicted incorrectly with a class error of 7.3%. Low has been predicted correctly 5279 times and 783 times it has been predicted incorrectly with class error of 13.11%.

High low Class.error high 7447 591 0.07352575 low 783 5279 0.13116529

	HIGH	LOW	Class.error
HIGH	7447	591	0.07352575
LOW	783	5279	0.13116529

The test and validation accuracy is around 90.8% and 91.06% repectively.

SUPPORT VECTOR MACHINE

Support vector machines (SVM) are another very popular method for classification. In their most basic form, support vector machines are another type of "linear" classifier. So, they are very similar to logistic regression analysis. When used in conjunction with kernels, support vector machines can account for non-linear structure. But the same is true of logistic regression and many other linear classifiers. We have fit the model using svm and have computed the testing and validation accuracy. The validation accuracy is nearly equal to 90.8% and the testing accuracy is around 90.3%.

We have tabulated all the accuracy results within a table displayed below:

METHOD	ACCURACY
Logistic Regression	89.4%
Random Forest	91.06%
Support Vector Machine	90.08%

From all the above process we can see that the model with highest accuracy is of the model constructed using Random forest with an accuracy of 91.06%. To get better accuracy we have replicated all the above models 100 times using the hold-out method. After the replication we can see the best method among all the above for classification is Random Forest with an average accuracy of nearly 90%.0.

PROPOSED APPROCH

In the proposed system, we will use the random forest algorithm to predict the dataset based on the most accurate level compared to the previously used algorithms. Here we will use principal component analysis to constraint the NA values and execute the dataset using random forest model, henceforth random forest is the most flexible , easy to use machine learning algorithm that produces, even without hyperparameter tuning, a great result most of the time. It is also one of the most used algorithm, because of its simplicity and diversity. i.e, it can be used for both classification and regression tasks.

TOOLS USED

Anaconda Navigator : Anaconda is a free and opensource distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. Jupyter Notebook IDE: Jupyter Notebook is an open sourced web-based application which allows you to create and share documents containing live code, equations, visualizations, and narrative text. The IDE also includes data cleaning and transformation, numerical simulation, statistical modeling, data visualization, and many others

Dataset: for this project we have used the dataset from public domain(kaggle.com)

CONCLUSION

When performing 3 different methods to predict the solar power system coverage of a tile (represented by rows) given various features present in the dataset we see that the accuracy of most of the methods are nearly equal to 90% that is almost all the methods can perform the prediction task accurately 90% of times. Amongst all the methods Random forest has exceedingly performed better with an accuracy of 91.06%.

Why Random forest?

➢ Random forest is a flexible, easy to use machine learning algorithm that produces, even without hyper-parameter tuning, a great result most of the time. It is also one of the most used algorithms, because of its simplicity and diversity i.e. it can be used for both classification and regression tasks.

➢ One of the biggest problems in machine learning is overfitting, but most of the time this won't happen thanks to the random forest classifier. If there are enough trees in the forest, the classifier won't overfit the model.

➢Random forest is a great algorithm to train early in the model development process, to see how it performs. Its simplicity makes building a "bad" random forest a tough proposition.

➢The algorithm is also a great choice for anyone who needs to develop a model quickly. On top of that, it provides a pretty good indicator of the importance it assigns to your features.

➢Random forests are also very hard to beat performance wise. Of course, you can probably always find a model that can perform better, like a neural network for example, but these usually take more time to develop, though they can handle a lot of different feature types, like binary, categorical and numerical.

➢Overall, random forest is a (mostly) fast, simple and flexible tool. We have accomplished the assigned task successfully i.e. for the given dataset Random Forest methods can predict the solar power system coverage of a tile given the collection of predictor features in a better way having a model accuracy of nearly equal to 91.06%.

FUTURE ENHANCEMENT

There are aspects to be considered to improve the results. One thing is to implement In the current project i.e predicting deep soler power system coverage we have used random forest algorithm that has shown the accuracy approximately around 91.06% but in future version we can use other machine learning algorithm such as SVM, Logistic regression..etc can be used to show more accuracy.

Even in the algorithm that we have used ie random forest, for the given dataset we have shown the accuracy level upto 91.60% but it the future using

various ways the accuracy level can be increased to some more extent.

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Touchless Human Computer Interaction for Kiosk Machines

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Abstract – *A real-time algorithm to detect eye blinks in a video sequence from a standard camera is proposed. Recent landmark detectors, trained on in-the-wild datasets exhibit excellent robustness against a head orientation with respect to a camera, varying illumination and facial expressions. We show that the landmarks are detected precisely enough to reliably estimate the level of the eye opening. The proposed algorithm therefore estimates the landmark positions, extracts a single scalar quantity – eye aspect ratio (EAR) – characterizing the eye opening in each frame. Finally, an SVM classifier detects eye blinks as a pattern of EAR values in a short temporal window. The simple algorithm outperforms the state-of-the-art results on two standard datasets.*

1. INTRODUCTION

Interactive public kiosks are now so widely used viz. Banking (ATMs), Airport (Check-in), Government (e-Governance), Retail (Product Catalogue), Healthcare (Appointment),Schools(Attendance),Corporate(Registration), Events (Info) and the list goes on. While businesses move towards kiosks to better service delivery, touch-free interaction of all public devices has become an imperative to mitigate the spread of ubiquitous Corona virus.Gesture or Speech Navigation might seem to address the above, but such devices are resource constrained to analyze such inputs. Have you noticed your mobile voice assistant, be it Siri or GAssist, gives up when mobile goes offline? Your voice-enabled car infotainment system fails to respond, while you drive remote roads. Even a conventional computer won't be able to run multiple AI models concurrently. Ain't it nice to do it all on your device itself ? Imagine a bed-side assistant device which can take visual or voice cues from bedridden patients. This is possible with the advent of Intel OpenVINO. It enables and accelerates deep learning inference from the edge, by doing hardware- conscious optimizations. OpenVINO supports CPU, iGPU, VPU, FPGA and GNAs. If you wannaget your hands wet, a Raspberry Pi along with Intel Movidius NCS 2 would be your best bet to toy with.

In this Project, we will try to build a Human-Computer Interaction (HCI) module which intelligently orchestrates 5 concurrently-run AI models, one feeding onto another.

AI models for face detection, head pose estimation, facial landmarks computation and angle of gaze estimation identify gesture control inputs and trigger mapped actions.

A child thread is deployed to run offline speech recognition, which communicates with the parent process to give parallel control commands based on user utterance, to assist and augment gesture control.

2. SENSORS/MODULES USED

A. Raspberry pi board B

The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins, allowing you to control electronic components for physical computing and explore the Internet of Things (IoT).

Figure 1. Raspberry pi board B

B. Raspberry pi camera 5mp

The Raspberry Pi Camera Board plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image, or 1080p HD video recording at 30fps! The module attaches to Raspberry Pi, by way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed especially for interfacing to cameras.

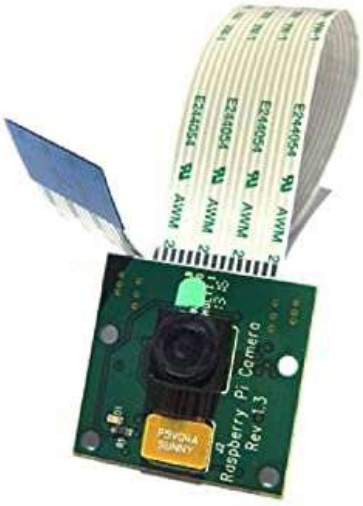

Figure 2. Raspberry pi camera 5mp

C. Intel movidius neural compute stick

In order to develop deep learning inference applications at the edge, we can use Intel's energy-efficient and low-cost Movidius USB stick**!** The Movidius Neural Compute Stick (NCS) is produced by **Intel** and can be run without an Internet connection. The Movidius NCS' compute capability comes from its Myriad 2 VPU (Vision Processing Unit). It's an easy-to-use kit that allows you to design and implement applications such as classification and object recognition on physical products.

Figure 3. Intel movidius neural compute stick

3. METHODOLOGY

In this project Touchless Human-Computer Interaction which intelligently orchestrates 5 concurrently-run AI models, one feeding onto another. AI models for face detection, head pose estimation, facial landmarks computation and angle of gaze estimation identify gesture control inputs and trigger mapped actions. A child thread is deployed to run offline speech recognition, which communicates with the parent process to give parallel control commands based on user utterance, to assist and augment gesture control.

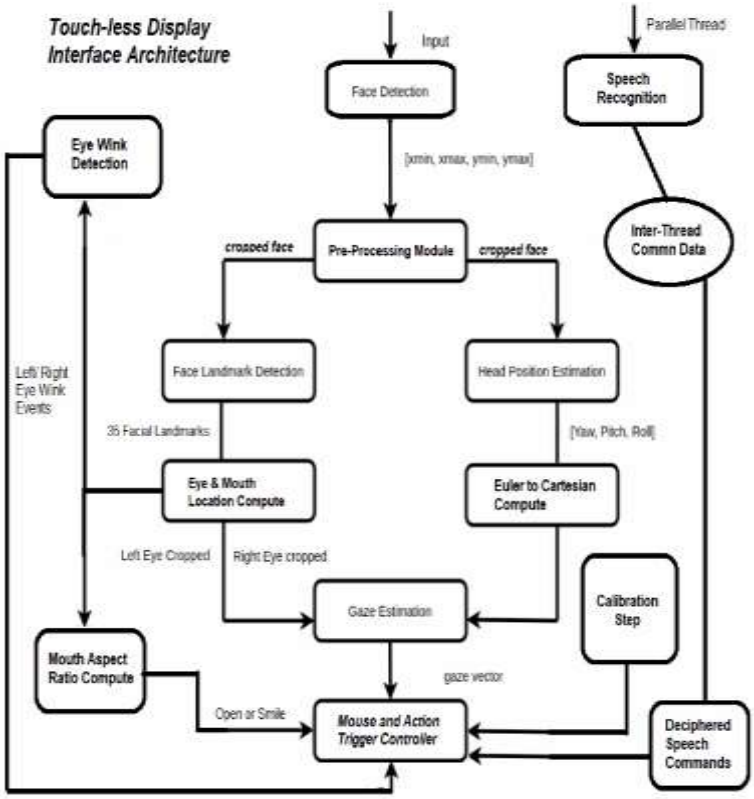

Figure 4. System Architecture

Control Modes

There are **4 control modes** defined in the system, to determine the mode of user input. We can switch between control modes using gestures.**Control Mode 0: No Control** Gesture and Sound Navigation is turned off

- **Control Mode 1: Gaze Angle Control**
  Mouse moves along with angle of eye gaze (faster)
- **Control Mode 2: Head Pose Control**
  Mouse moves with changing head orientation (slower)
- **Control Mode 3: Sound Control**
  Mouse slides in 4 directions and type based on user utterance

Gesture	Action
Yawn	Left Click
Looking Up	Right Click
Right Wink	Increment Control Mode
Left Wink	Unassigned
Smile	Unassigned
Vocal 'Up'	Move Mouse 30 pixels up
Vocal 'Down'	Move Mouse 30 pixels down
Vocal 'Left'	Move Mouse 30 pixels left
Vocal 'Right'	Move Mouse 30 pixels right
Vocal: Alphabets	Type the alphabet
Vocal: Numerals	Conver to number and type

6. Gestures and Actions

4. EXPERIMENTAL ANALYSIS

In Four Pre-trained OpenVINO models are executed on the input video stream, one feeding onto another, to detect a) Face Location b) Head Pose c) Facial Landmarks and d) Gaze Angles

A. Face Detection :

A pruned MobileNet backbone with efficient depth-wise convolutions is used. The model outputs (x, y) coordinates of the face in the image, which is fed as input to steps (b) and (c)

B. Head Pose Estimation:

The model outputs Yaw, Pitch and Roll angles of head, taking face image as input from step (a)

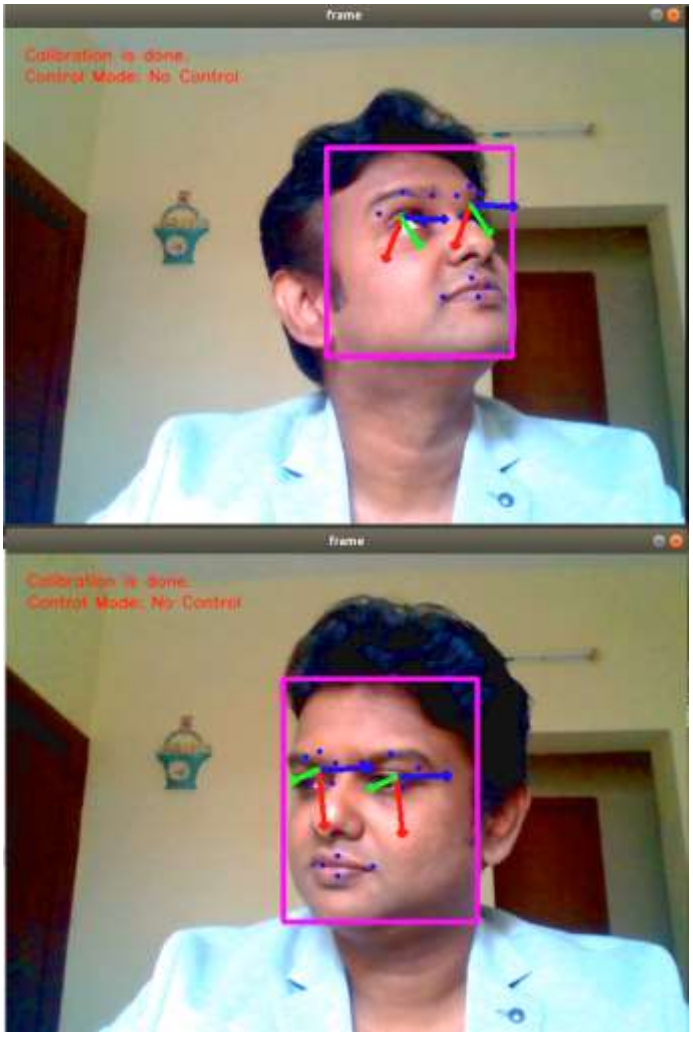

Figure 7.Face Detection

C. Facial Landmarks:

A custom CNN used to estimate 35 facial landmarks**.**This model takes cropped face image from step (a) as input and computes facial landmarks, as above. Such a detailed map is required to identify facial gestures, though it is double as heavy in compute demand (0.042 vs 0.021 GFlops), compared to the Landmark Regression model, which gives just 5 facial landmarks.

Figure 8.Facial Landmarks

D.Gaze Estimation

The network takes 3 inputs: left eye image, right eye image, and three head pose angles — (yaw, pitch, and roll) — and outputs 3-D gaze vector in Cartesian coordinate system.

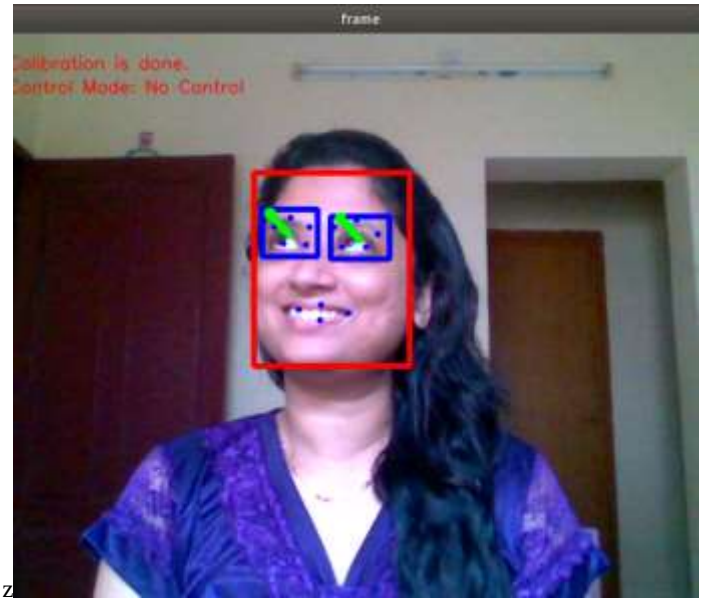

Figure 9.Gaze Detection

5. CONCLUSIONS

The project demonstrates the capability of Intel OpenVINO to handle multiple Edge AI models in sequence and in parallel. Many control inputs are also sourced to demonstrate the flexibility. But to deploy a custom solution you can choose controls, as you deem fit.For instance, Gaze control may be ideal for big screen while head pose control for laptop screen. Either way, Sound Control can help to accept custom form entries or vocal commands. Gesture-action mapping can also be modified. Yet the point you can drive home is the possibility to chain multiple hardware optimized AI models on the Edge, coupled with efficient numerical computing to solve interesting problems.

6. FUTURESCOPE

The We see a limitation that a fixed blink duration for all subjects was assumed, although everyone's blink lasts differently. The results could be improved by an adaptive approach. Another limitation is in the eye opening estimate. While EAR is estimated from a 2D image, it is fairly insensitive to a head orientation, but may lose discriminability for out of plane rotations. A solution might be to define the EAR in 3D. There are landmark detectors that estimate a 3D pose (position and orientation) of a 3D model of landmarks,

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Cricket Game Predictive Analytics Using KNN Algorithm

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Abstract- *The objective of cricket game predictive analytics project is to predict the match winner of a cricket game. Cricket world cup is one of the more popular cricket world tournaments, and its financial is increasing each season, its viewership has increased markedly and the betting market for cricket is also growing significantly every year. With cricket being a very dynamic game, bettors and bookies are incentivized to bet on the match results because it is a game that changes ball-by-ball. However, a team changes its composition depending on the match conditions, venue, and opponent team, etc. In this project a model has been proposed which takes into account the varying strengths of the individual players and reflects the changes in player combinations overtime. The relative team strength between the competing teams forms a distinctive feature for predicting the winner. This project investigates machine learning technology to deal with the problem of predicting cricket match results based on historical match data of the league matches. More importantly, machine learning technique K-Nearest Neighbor (KNN) has been adopted to generate the required result. Selected machine learning techniques were applied on both feature sets to determine a predictive model.*

I. INTRODUCTION

The Statistical modelling has been used in sports over decades and has contributed significantly to success on the field. Cricket is one of the most popular team sports in the world, second only to soccer. Various natural factors affecting the game, enormous media coverage, and a huge betting market provide strong incentives to model the game from various perspectives. However, the complex rules governing the game, the ability of players and their performances on a given day, and various other natural parameters play an integral role in shaping the course of a cricket match. The new measure for batsmen takes into account the quality of each bowler he is facing and the new measure for bowlers considers the quality of each batsman he is bowling to. The aggregate of individual performance of a batsman against each bowler is the total performance index of the batsman. Similarly, the aggregate of individual performance of a bowler against each batsman is the total performance index of the bowler. However, run rate is considered as the only criteria for calculating the final score. But there are other factors too which may affect the final score like number of wickets fallen, the venue and the batting team itself. In this project, a method has been proposed in which the final score can be predicted of the first innings and the second innings. The K-nearest Neighbhor algorithm (KNN) is a non-parametric method used for classification and regression. K-Nearest Neighbhor algorithm is implemented to predict the match scores.

II. LITERATURE SURVEY

The previous proposed models were based on few or all of the features related to any cricket were manual partially. This study describes accuracy of different machine learning algorithms used to predict the winner of an cricket match is given along with its Precision, Recall and F-Measure. Analyzing sports and showing it to the viewers in terms of simplified tables and graphs also has been popular and results in increasing revenue for the sports industry. It first gives us the ball-to-ball information of every match ever played in the match from datasets, like the batsman, bowler, runs, wicket, and more, on each ball of the match. The second dataset gives us the summary of each match, which includes the teams playing, the winner, the winner of the toss, and more, for every match played in the game. Various attributes of a match are used to analyze what affects the result of a cricket match. With the help of a number of features, the outcome of a cricket match is also predicted.

In engineering static features the following operations were performed to extract information from the available data: - countries column was used to generate information about the two teams playing the match, a feature to mark the matches that were played in the world cups was created to allow the learners to capture any information regarding the effects of a world cup match, date column was used to generate features regarding the day of week, month and year; although it is easy to comprehend that year may not be informational to the learner, but could be used for exploratory data analysis, ground details was used to create location, country and city features for the match being played at.

This study reports a comparative analysis of the predictions generated by 2 different supervised classification models which was performed for the same input dataset. The proposed approaches are better than the statistical approach as unlike statistics which uses mathematical equations to formalize the relationships between variables. These approaches require no prior assumptions regarding the data variables and their underlying relationships. During training phase, data needs to be fed in and the algorithm after processing the data discovers patterns and finally makes predictions for freshly generating data. More precisely, some form of gradient descent is actually used to train the dataset, and such gradient values are also computed. It explains the approach which has been taken into account for the proposed analysis. It also deals with the comparative analysis of both the classifiers used and presents the other related works in this domain.

This paper reports importance of comparative analysis of performance measure of supervised learning techniques, analyzing all the factors which strive to affect the final outcome of the game of cricket. It gives analysis of different athletic abilities and performances which is crucial for predicting actual performance in the field. Athletic performance is affected by many factors in different sports, and it is not easy to estimate which factors are most important and decisive. These factors largely do not show any linear relation with actual performance and performance is a complex composition of many factors. Determination of these factors can help coaches clearly see the strengths and weaknesses of their athletes and establish their training programs according to the personal needs of the athletes. It predicts athlete performance in six skills and to assist coaches with the efficient selection of athletes in games, determines the factors that affect the considered skills and assist trainers in focusing on significant factors to improve athlete performance of particular skills.

This study reports implementation of ML model to determine the optimal model for the considered skills and perform a comparative evaluation using different metrics and to consider multiple performance skills of athletes for the prediction.. Finally, significant factors influencing predicted performance were determined by retraining the superior model. This study describes the selection of the right players for each match plays a significant role in a team's victory. An accurate prediction based on how many runs a batsman is likely to score and how many wickets a bowler is likely to take in a match will help the team management select best players for each match. In this paper, modeled version of batting and bowling datasets based on players' stats and characteristics are done. They analyze different characteristics and the statistics of the players to select the best playing 11 for each match. Each batsman contributes by scoring maximum runs possible and each bowler contributes by taking maximum wickets. The problems are targeted as classification problems where number of runs and number of wickets are classified in different ranges. It uses knn algorithm for modelling. Some other features that affect players' performance such as weather or the nature of the wicket could not be included in this study due to unavailability of data. Results of knn were surprising as it achieved an accuracy of just 81.45% for predicting winner.

III. PROPOSED METHODOLOGY

In this section, the approach of modelling the model is presented. We have used extractive document summarization approach in which the important step is to identify summary worthy sentences from the source document and at the same time reducing the redundancy from the original text so that the final summary generated is relevant to the users. In text summarization there are three parts: 1) Data Pre-Processing 2) Building the model 3) Getting results of matches. The system architectural design is presented in figure 1 where kNN algorithm is applied on the final synthetic datasets. kNN is applied with k value. The algorithm is implemented successfully and predicted scores of each innings are resulted and these values are rounded to the nearest numeric number.

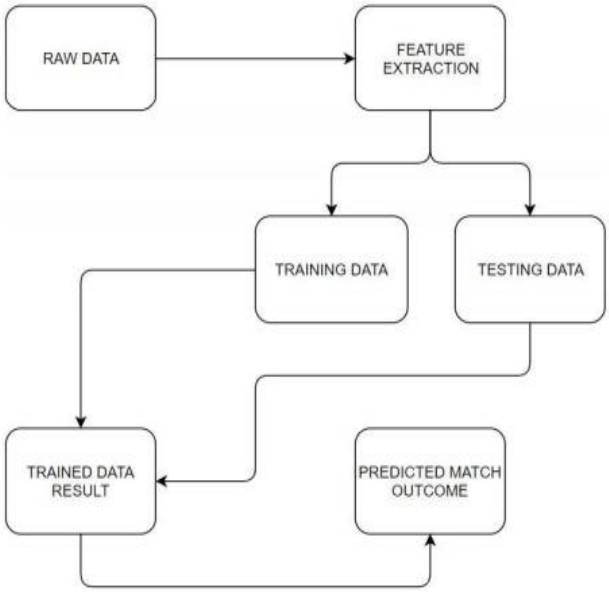

Figure 1. System Architectural design of extractive document summarization system.

The probabilistic model works by calculating the probability of winning of one team against the other team.

Model prepares a matrix of probabilities of winning of each team against every other team and uses the same matrix to predict future instances. The model was built using python math library and pandas.

1. Pre-Processing

Data pre-processing is one of the most important step in any natural language processing system and it should be performed before carrying out any other tasks on the dataset. This section discusses the steps taken to tidy the data and convert it to a format suitable for analysis. All the column names were checked for inconsistency and suitably handled to maintain consistency. All the observations with unwanted results, such as abandoned matches, conceded matches, cancelled matches, walkovers etc. were dropped. Unnecessary columns such as the one indicating row number and the one providing link text were dropped. The links were used during data collection to fetch game play details and were not required any further. Data types of the columns were converted to the required data types, since the information was retrieved by web scrapping hence all the columns were stored as object types. There were outliers in the data set, but were left untransformed because they are natural outliers.

Data files are in csv format. Data pre-processing was performed using pandas python library. Files stored in the local file system was read through pandas read csv() function and after pre-processing, was stored back using to csv() function. Other pandas functions such as drop() to drop columns, astype() to change data types of the column, data frame apply(), etc. were used as needed. Data files are loaded to variable tournament by usage of pandas library to read all data records. Result data file is loaded to result variable. read_csv() can read any .csv file and manipulate it. It is important to have a consistent and a proper dataset to have quality results. In our system of extractive document summarization, there are three tasks in this step.

2. Building the model

In this step, all the segmented sentences are made to go through test that checks the features related to it. k-NN stands for k Nearest Neighbors. It is a supervised classification algorithm that work by classifying unlabelled observations by assigning them the class label of most similar observations or the nearest neighbors. Despite the simplicity of the idea behind the learner, the nearest neighbor classifiers perform competitively in comparison to some of the other more complex classifiers. The finding of this paper corroborates the same. k-NN is a lazy learner. It does not build models explicitly. This makes for a fast training phase but slow classification phase. k-NN algorithm utilizes nearest neighbour approach for classification. It takes a set of examples classified into several categories; the training set as input, and classifies the unlabelled instances of the test set into one of those categories. For each instance of the test set, k-NN works by identifying k records in the training data that are ”nearest” to the particular test instance. The unlabelled test instance is then assigned the class of majority of the k nearest neighbours. Distance between two data points can be calculated by using either Euclidean, Hamming, Manhattan, Minkowski, Jaccard, Mahalanobis, etc. distances.

Euclidean distance is the most commonly used distance metric among the others. Chomboon in their research conclude that Hamming and Jaccard distances give lower accuracy and are affected by ratio of members in each class while other distances show similar accuracy. Hence, this paper uses Euclidean distance. Matplotlib and seaborn are used for data visualisation. Scikit learn library used for building model using K Nearest Neighbor algorithm. Scikit learn library imports libraries train_test_split and KNeighborsClassifier. The dataset has been portioned separately into training and testing sets based on random selection. Initially all the values are normalized to contain the same range 0 to 1. Then the sampling of training and testing takes place. 90% of the dataset is used for training and 10% is used for testing.

3. Getting results of the matches

The summation of all feature values of a sentences gives its sentence score. Since, the range of scores can be varying, data normalization is done using min-max normalization to bring the scores in a range of 0 to 1. Following formula is used: classifier.fit(x_train, y_train) evaluate how classifier performs on training set. Value of K is decided and applied in the code itself. Prediction of all league matches is done by function named Predict. Main prediction is based on ranking and venue.

Accuracy gives the percentage of correct predictions made by the classifier. Precision and recall scores are calculated using true values and predicted values, hence first the confusion matrix was calculated, and then precision and recall scores were calculated. However, precision and recall alone are not very informative, they may fail to detect a poorly performing classifier from classifiers that perform well. Hence, we also used f1score, which is the harmonic mean of the precision and recall scores, thus penalizing any classifier with imbalanced recall or precision scores. Although the research concentrates solely on the test playing nations,

since the model is generic it can be fitted to handle matches for every nation. The model is robust enough to account for underlying strength difference of the teams, if non-test playing nations are included.

IV. CONCLUSION

One of the vital applications in sports that require good predictive accuracy is match result prediction. Traditionally, the results of the matches are predicted using mathematical and statistical models that are often verified by a domain expert. More accurate ML models for sport prediction are being used these days. Comparative analysis of performance measure by supervised learning techniques, analyzing all the factors which strive to affect the final outcome of the game of cricket and design & development of a desktop application which can be used to predict the chances of winning, using input attributes are observed. The prediction of the players' performance in cricket matches by analyzing their characteristics and stats using supervised machine learning techniques and comparative analysis of the predictions generated by different supervised classification models was performed for the same input dataset. In training phase, data needs to be fed in and the algorithm after processing the data discovers patterns and finally makes predictions for freshly generating data.

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IoT Based System for Monitoring and Controlling Air Pollution

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Abstract – *The level of pollution has increased with times by lot of factors like the increase in population, increased vehicle use, industrialisation and urbanisation which results in harmful effects on human being by directly affecting health of population exposed to it. With an ever increasing number of industrial units and transport vehicles, the problem of air pollution is becoming severe by each passing day. Therefore, it has become important to keep the air pollution levels under check especially in urban areas. IoT Based system for monitoring and controlling Air Pollution in which monitor the Air Quality at any Industry over a web server using sensors when the air quality goes down across a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the cloud and as well as on Things Speak so that we can handle and monitor it easily. After gathered the information about air quality, this information is bought under notice by tweeting through the authorized account and sending to the Air Pollution Control Officer or to the owner of Industry through mail and message in order to take strict action.*

***Key Words*: Pollution,Air Quality, Cloud, Internet ofThings,ThingSpeak,Sensors**

1. INTRODUCTION

Internet of things (IOT) is a type of computing which incorporates the use of the world wide web and internet onto normal day to day machines to enhance the usage of devices. These devices transfer information collected through the sensors and sends it to an online repository to reduce as much as human intervention as possible [1]. Today, we are using this Internet of Things to monitor and control the air pollution. One can have an idea of the quality of the air them and can take necessary measures if required.

It is necessary to measure air quality and keep it under control for a better future and healthy life for everyone. Due to flexibility and low cost Internet of things (IoT) is getting popular [2]. With the urbanisation and with the increase in the vehicles on road the atmospheric conditions have considerably affected. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma[3].

Monitoring gives measurements of air pollutant and sound pollution concentrations, which can then be analysed interpreted and presented. This information can be applicable in many ways. Analysis of monitoring data allows us to assess how bad air pollution is form day to day[4].. Monitor the Air quality at any Industry using Sensors. Gathered the information about Air quality is send to the Air pollution control units head and the owner of industry through mail and message ,when the air quality goes down beyond a certain level. The air pollution monitoring system overcomes the highly-polluted areas which is a major issue.

2. SENSORS/MODULESUSED

A. MQ-2 Gas Sensor

Gas Sensor(MQ2) module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke, or Propane. Due to its high sensitivity and fast response time, a measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by the potentiometer.
Features :
Wide detecting scope.
Stable and long lifetime
Fast response and High sensitivity

Figure1.MQ-2 Gas Sensor

B. MQ-135 Gas Sensor

Air quality sensor for detecting a wide range of gases, including NH3, NOx, alcohol, benzene, smoke, and CO2. Ideal for use in office or factory. MQ135 gas sensor has a high sensitivity to Ammonia, Sulfide, and Benze steam, also sensitive to smoke and other harmful gases. It is at low cost and particularly suitable for Air quality monitoring applications.

Figure 2 .MQ135 Air QualitySensor

C. LM-135 Temperature Sensor

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies.

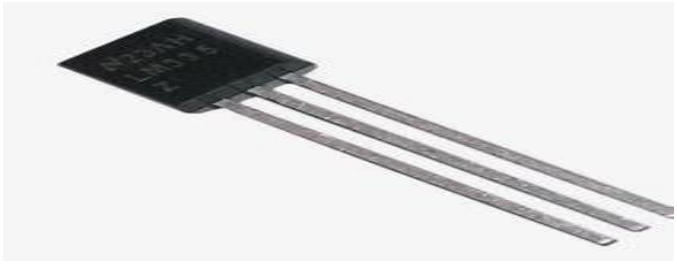

Figure3.LM_135 Temperature Sensor

D. ESP8266 Wifi Module

ESP8266 is a complete and self-contained Wi-Fi network solutions that can carry software applications, or through Another application processor uninstall all Wi-Fi networking capabilities. ESP8266 when the device is mounted and as the only application of the application processor, the flash memory can be started directly from an external Move. Built-in cache memory will help improve system performance and reduce memory requirements. Another situation is when wireless Internet access assume the task of Wi-Fi adapter, you can add it to any microcontroller-based design, the connection is simple, just by SPI / SDIO interface or central processor AHB bridge interface. Processing and storage capacity on ESP8266 powerful piece, it can be integrated via GPIO ports sensors and other applications specific equipment to achieve the lowest early in the development and operation of at least occupy system resources.

Figure 4.Wifi Module ESP8266

E. Arduino uno

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Figure 5. Aurdino Uno

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

3. METHODOLOGY

In this project we use Arduino based method which uses sensor devices for data, Wi-Fi module is used for connection to server, arduino for data processing and alert to user via user interface.

IOT Based Air Pollution Monitoring System employs to monitor the Air Quality with the help of highly sensitive and fast gas sensors over a webserver using internet , a twitter alert message wil be sent when the air quality goes down beyond a threshold (safe) level, means when accumulation of hazardous gases present in the air like CO2, smoke, benzene, NH3, NOx .

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A temperature sensor is employed to monitor the temperature of a specific area. This system can be installed easily on roadsides and anywhere where required.The real time data of air quality.

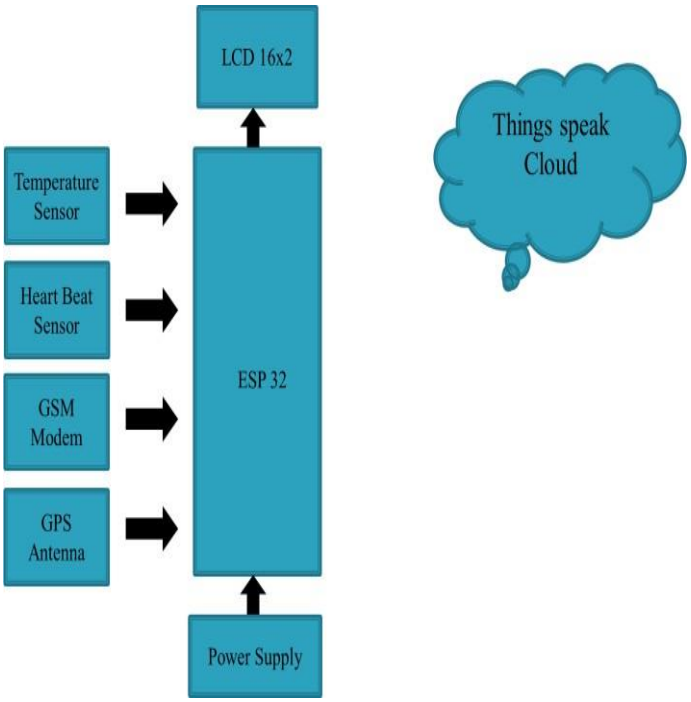

Figure 6. SystemArchitecture

The basic methodology of this system is that all of the sensors will be connected to Arduino uno all the data from the different sensors are gathered on the ThingSpeak cloud network and if the temperature is more than the threshold value set then a twitter alert message will be sent.

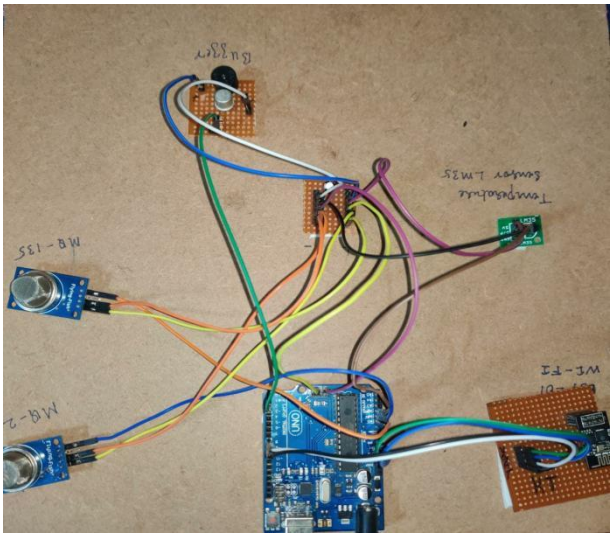

Figure7. Proposed System

Figure 7 represents the prototype of the proposed system. At First The Sensors are connected to arduino-uno and then the sensors collect the data from the Surrounding/Environment based on the message various graphs are made in things speak. The flow charts below tells us the methodology of proposed system.

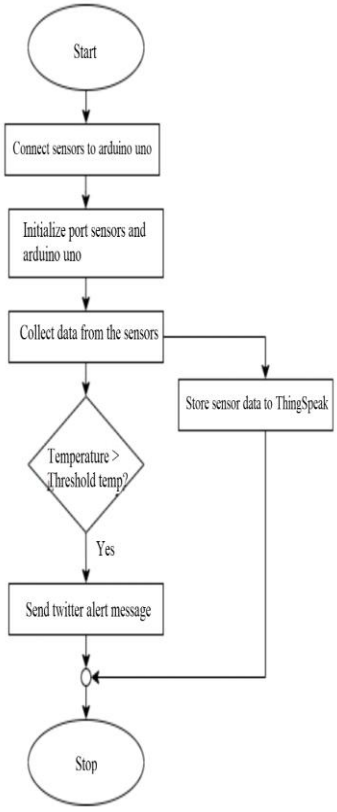

Figure 8. Flow of data in System

4. EXPERIMENTALRESULTS

In order to check the quality of the air there are various things which should be measured , For example various gaseous particles like H2,CH4,LPG,Smoke,NH3 ,CO2 etc and also the Temperature , So for that we have different sensors which are MQ2,MQ135 and LM135 sensor.

A. Monitoring Gaseous Particle using MQ135 :

MQ 135 sensor continuously measures Differnt gases like CO,Ammonia,Smoke etc in the Surrounding and plots a graph as shown in Figure 9 , and its range of detection is between 10-300ppm.

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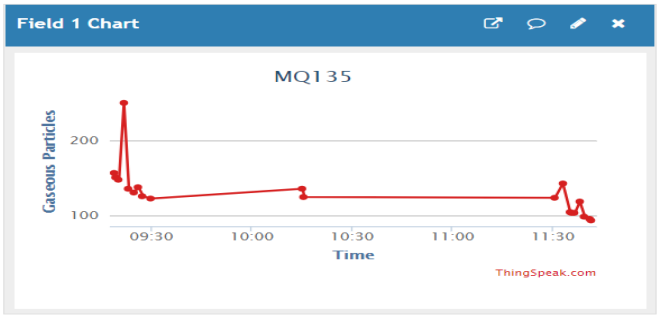

Figure 9. MQ-135Monitoring

B. Monitoring Gaseous Particle using MQ2:

MQ 2 sensor continuously measures Different gases like H2,CH4,CO etc in the Surrounding and plots a graph as shown in Figure 10, and its range of detection is between 10-300ppm.

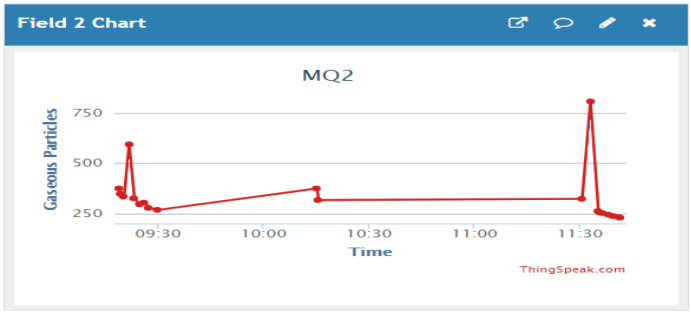

Figure11. MQ-2Monitoring

C. TemperatureMonitoring:

LM-35 sensor continuously measures temperature of the cattle and plots a graph as shown in Figure 12.The temperature sensor plays an important role since the SMS notification is sent based on the threshold temperature itself.

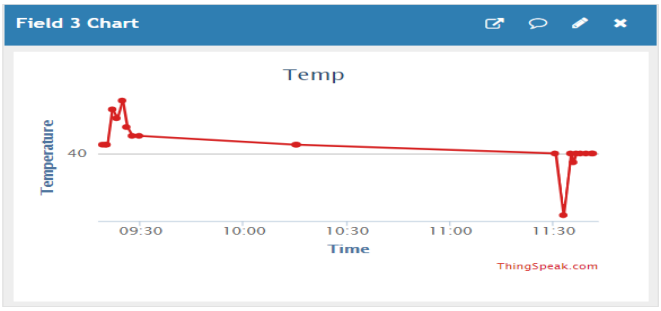

Figure12.TemperatureMonitoring

D. Twitter Alert

The Twitter alert is sent based on the Gaseous Particles and temperature recorded by the sensor if it exceeds the threshold of 250ppm and temperature of 40°C. Figure 13 shows the Twitter Notification when a Tweet is being sent provided there is proper Network Connection.

5. CONCLUSION

The IoT based applications used in the proposed system is a step taken to monitor the pollution in the environment. The authorized users can control and monitor the environmental pollution using ThingSpeak Cloud platform. The system is affordable and compact which makes it very easy to port the system into remote places. The data collected in the cloud can be accessed by the users to get the complete data in real time

6. FUTURESCOPE

The system can be improved by connecting different regions to a single cloud system. Air filters can be used in areas with high levels of air pollutions to reduce the level of pollution. Since we are in a pandemic, many research institutes are developing biosensors that can be used to detect SARS-Cov-2 in air. Once the biosensors are commercially available it can be integrated into the model. Prediction models can be implemented using Machine Learning.

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Home Security and maintenance system using Raspberry pi.

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Abstract- Security is becoming one of the important aspects in today's life, especially in home security. With so many burglary events taking place in our surrounding these days, we want our houses to be protected when we are away from them. Home security systems enable us to monitor our residence from a remote location. Through the system a person can watch all the activities taking place at his home from his remote location. The present home surveillance systems are still lacking in many aspects especially in terms of performance and cost. As everyone expects to have an effective security system without any flaws in it, in order to make this happen we proposed our project using Raspberry pi where we will be able to provide a cost effective and user-friendly system. Whenever the intrusion takes place image will be captured and it'll be stored in SD card which will be further sent to the owner, and it can be used as an evidence for next process.

I INTRODUCTION

As we come across many reports about the security issues that has been noticed frequently about the residence or some other places. We lack in many ways to keep our house safe and secure and then get worried for facing burglary events. Thus, to get rid of these things we must use technologies which are available to keep the house safe and much more secure. As people are always busy in their own work, they always travel from one place to another, where they'll not be able to take care of their houses and if something unusual happens in their absence, they'll not be in a position to stop it. To solve these problems, an effective and high-performance security system is needed where that should be able to help the person in avoiding any unusual activities that has taken place.

This surveillance system can help them by providing a feature where he or she can keep an eye on their residence from their location and can take the necessary actions if needed. This system has special features like detection and identification of events that occurs. But the security system which are available in market are costlier and it's hard to implement on each and everyone's house.

Thus, we have taken a step ahead to provide a cost-effective system for the user's where anyone can adapt it without any hesitation.

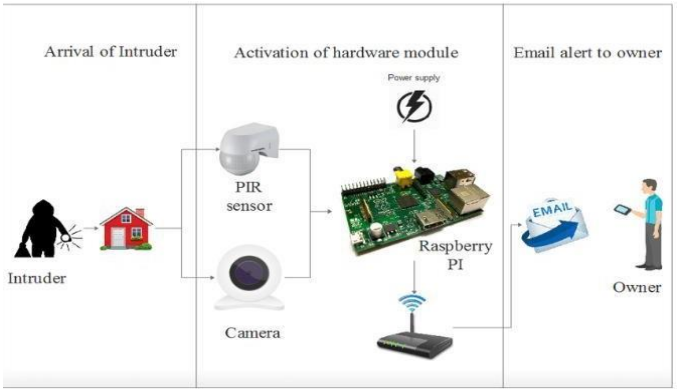

Fig.1 System overview

II LITERATURE SURVEY

M.S.Obaidat et al [1] developed a home security system using Pyro electric infrared (PIR) module and raspberry pi. By using raspberry pi, the delay that occurred during sending email alerts were minimized. Here, the camera is used to click pictures of the house and sends it back to the raspberry pi module which is further sent to the owner of the house as an email. It uses IMAP (Internet message get to convention) to send the emails. For this, Raspberry pi must be connected to the Internet through the WIFI module.
So, whenever the owner is away from home, he/she gets the alarm of any theft happening at their place and they can take appropriate actions like informing the local police about the theft

Aparicio Carranza et al [2] introduced a security system with a feature of live streaming. This system makes use of raspberry pi. A Raspberry pi is a thirty five dollar, credit card sized computer which can be used for various activities like creating spreadsheets ,browsing the internet, playing HD videos etc. Here it is used to build an efficient security system with less installation cost. Whenever the system detects any motion, Pi-cam captures the image and saved it. Then the image is emailed as an attachment to the owner. The owner's email ID will be inserted into the python

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script which does the functions above. The owner can also start live streaming using the pi camera through which he/she can monitor the house anytime and every time. Using the above-mentioned components an efficient and cost-effective security system is built here.

Aman Sharma et al [3] introduced a smart security system for home and banks using Zigbee technology. Zigbee is high level communication protocol which is used to connect many devices there by creating a personal area network. In this system, all the sensor devices, microcontroller (ATMEGA168 microcontroller), and Relays are connected using the Zigbee network. This system uses components like SIM900A GSM module, cameras, and motion detection sensors. When a person tries to enter the house or a bank, sensor detects the motion. The system then asks the person for a door key and password. If both are correct, then the device allows the person inside by unlocking the door. If any one of them gets wrong, then the system barres the person's entry and sends an alert email to the concerned person using the GSM module. By using the Zigbee network this paper was able to provide a cost effective and flexible security system.

Akash V Bhatkule et al [4] this paper implements a surveillance system that captures the image of the intruder and sends an alert message to the user. An alarm is turned on by the raspberry Pi on detection of the gas leakage, smoke formed by fire.
The User must manually activate all the alarm system while leaving the house.

Prof. G. R. Gidveer et al [5] In this method motion detection software is used with Raspberry Pi and a camera to detect intrusion and the camera and saves that image and sends it to portable device for streaming. An email alert is generated using a phyton script. The paper claims to be cost-effective and claims to provide security efficiently.

III PROPOSED SYSTEM

The proposed Home security system is designed to improve efficiency, security and flexibility. This method detects any movement made by the intruder using PIR sensors. The sensors are fixed at various locations of the home.
The sensor sends the value to the raspberry pi, if the value received by the PIR sensor is high the raspberry pi enables the camera. Images are captured and are sent back to raspberry pi; The system then generates an email that contains an attachment of images captured during motion detection and sends it to the owner. Once the owner receives the alert email sent by the system, he confirms intrusion and activates the smart lock to all the doors and windows of the house.

We use an application called blynk to activate smart lock, it is a smartphone-controlled, internet-connected deadbolt actuator that is operated by a Raspberry Pi. The application to lock the door can be used on multiple phones, and can also notify the user when someone locks/unlocks the door. A high torque, metal gear servo is used to attach the deadbolt to the door. Thus, our project ensures safety of ones residence.

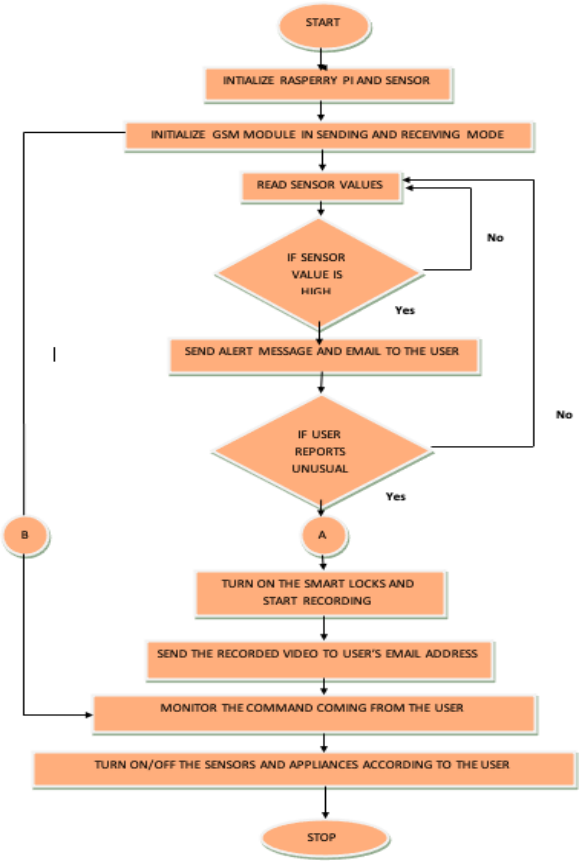

Fig.2 Activity diagram of the system

IV EXPERIMENTAL ANALYSIS

A. Hardware Components

Raspberry pi: Raspberry pi a credit card-sized computer it may be small and cheap but can-do powerful things by learning how to control it and there's a growing list of projects and achievements on record. The PI has gone into space control.

Fig.3 Raspberry pi

Pi Camera: The Raspberry Pi foundation has released a total of three cameras including the very recent Raspberry Pi high-quality camera, in addition, there are a number of different cameras you can get from different manufacturers that are suitable for use with the Raspberry Pi

Fig.3 Pi Camera

PIR Sensor: A Passive Infrared sensor is a pyro electric sensor which generates energy when exposed to heat. That is, whenever a human body or an animal get in the range of the sensor, it will detect the movement because the object body emits heat energy in the form of infrared radiations. Hence the name Passive Infrared Sensor.

Fig.4 PIR Sensor

Servo Motor: Servo motor applications are most commonly used in closed-loop systems and are comprised of several parts namely a control circuit, servo motor, shaft, amplifier, and either an encoder or resolver, where precise position control commonly found in industrial and commercial applications.

Fig.5 MG995 servo motor

B. Software Component

Raspbian OS: The Raspberry Pi OS is an operating system for Raspberry Pi. This opening system is highly optimized and it runs over all the Raspberry Pi except the Raspberry Pi Pico microcontroller. This system looks similar to many other desktops like Microsoft Windows and mac OS.

Blynk: Blynk is a software which is designed for Internet of things, it is used to control all the hardware components remotely. It displays the data of the sensors and also stores the data and can perform various actions remotely. The software has 2 major components like Blynk application, server and libraries.

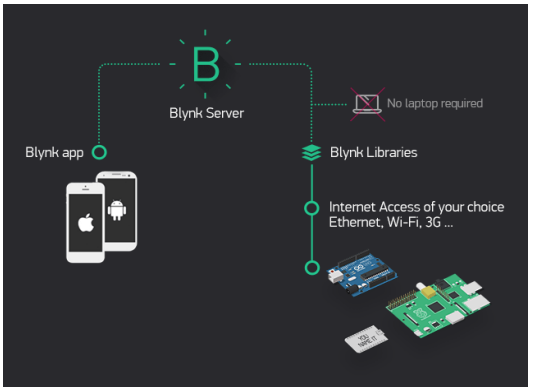

Fig.6 Blynk Application

V RESULTS

The System is implemented successfully and whenever the intrusion takes place , the motion sensors detect and captures all the images accordingly and store them in a document where it can be used as a reference document for evidence during any other process .

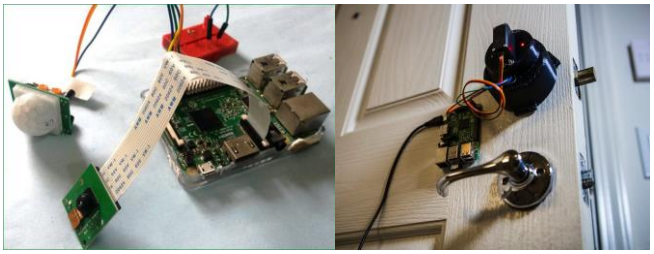

Fig.7 System Setup

After capturing the videos or images, it'll be sent to the user through email as mentioned below.

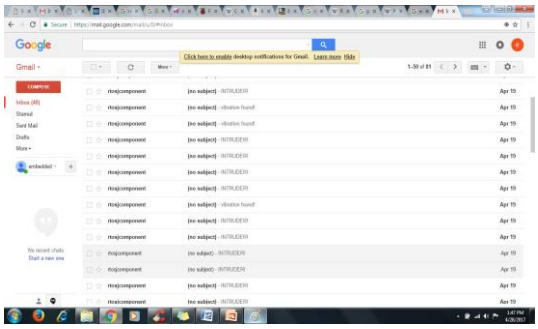

Fig.8 Mail notification to user

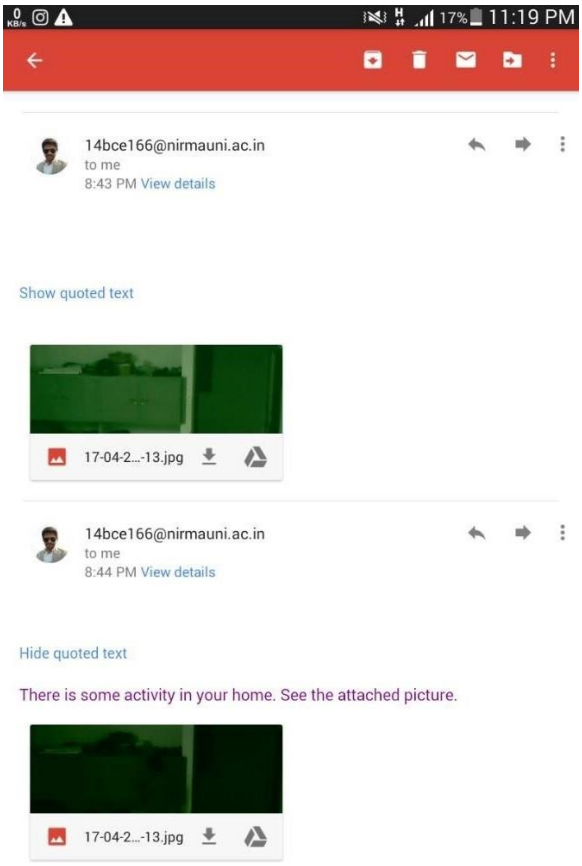

Fig.9 Captured images sent to owner

After reviewing the mail sent by the system if the user identifies that as an intrusion ,then he can take necessary actions from his remote place by accessing the installed system through his smartphone. He locks and unlocks the door as per requirement. Thus, by doing this he or she can secure his or her residence.

VI CONCLUSION

Home security system has been designed in such a way that it can help the user and fulfill all his needs with respect to the security of his residence. This system can be used in different places of work and environments. For example, if a person is working in any industry, he must be aware of his working place and the activities that are happened in their absence.

Another scenario where this can be made used is in bank lockers for spying and at storage houses. Raspberry pi helps in opening up a new chapter when it comes to technology. Not only in the size of the component but also in its capabilities. Security has been a greater issue in the present world so in order to solve such problems we have designed our system in such a way that the owner of the house will be able to handle the situation at his fingertips. The platform which has been used is raspberry pi where it is cost-effective, highly capable, and fast processing. The code is generated using Python and all these codes are executed on Raspberry pi. The main goal of any system is to provide a portable, eco-friendly and affordable product to the user. This application can be further implemented for different environments and more features can be added so that it makes the system more capable of handling all the scenarios it undergoes. New technologies like Artificial Intelligence can also be used in order to make it a smart security system and to avoid burglary events.

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Green Cloud Computing-Birth of a New Era

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ABSTRACT:

Cloud computing has revolutionized the way large data is stored and handled by the virtualization of servers and data centres to make them more efficient. *Cloud computing provides computing power and resources as a service to users across the globe. This scheme was introduced as a means to an end for customers worldwide, providing high performance at a cheaper cost when compared to dedicated high-performance computing machines.* ***However, these IT resources consume huge amounts of power and energy, ultimately becoming a vital source of CO2 emission. This has brought upon the need for Green Cloud Computing to make IT resources both energy efficient and operating at a low cost. In order to reach optimal solutions for green cloud computing, the power efficiency of the Cloud needs to be thoroughly analysed.*** *Cloud computing itself is a much greener alternative to individual data centres with lesser number of servers being used and cloud data centres being far more efficient than those of traditional thereby reducing the carbon impact.*

Keywords: Green cloud computing, Cloud Computing, energy efficiency, CO2 emission, Clustering, Data Virtualization, Proportional Computing.

1. INTRODUCTION:

Cloud computing is a nascent technology that encourages productivity by enabling institutions to outsource different Information Technology services such as data storage services, computational services, and Enterprise Resource Planning services. The successful adoption of cloud computing depends on the efficiency of utility computing, the scalability of the processes, and the scope of IT outsourcing. It was reported by MacAfee, the antivirus company, that the transmission of the trillions of spam e-mails received everyday needs as much electricity as needed to power two million homes in the Unites States. This produces greenhouse gas emissions equivalent to that generated by three million cars. The increasing demand for environment-friendly operations and business procedures has seen a number of innovations that focus on the development of technologies that provide services that not only boost the performance but also ensures the environmental sustainability. The development and adoption of green cloud computing help in the reduction of institutional carbon footprint and improve the image and public profile of the organization. Therefore, from the economic point of view, most of the consumers who are concerned with the conservation and management of natural resources would want to associate themselves with products that preserve the environment. This would allow the individuals to act as brand ambassadors of such products, thereby boosting the sales and profitability of the company.

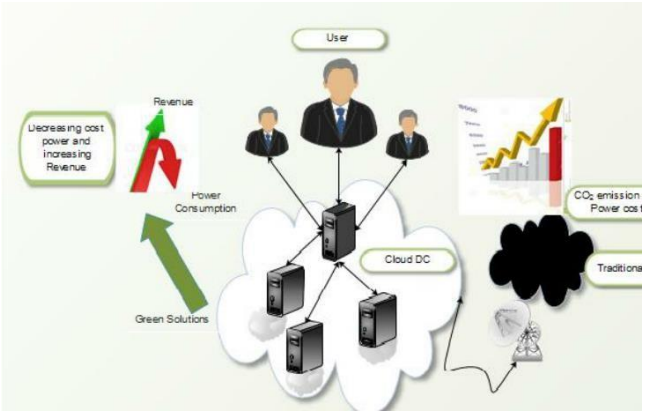

Figure 1 : Cloud and Environment

It is clear from Figure1 that in cloud scenario power consumption is very high with high carbon emission whereas at the same time in green cloud this is very less as compared to traditional cloud. Green clouds avoid power wastage and this is the reason for adoption of this technology by IT companies like Google, Microsoft, Yahoo!, etc. According to a survey done in the year 2007 IT industries contribute to 2% of the total carbon emission every year. European Union (EU) is also of the view that severe reductions of the order of 15%-30% is required to maintain the global temperature and stop it from increasing drastically before 2020[1]. An energy consumption policy is an essential approach to be considered in any organization. The lack of knowledge on how to adopt standards, and also metrics, leads many data centres managers to a puzzle on how to measure energy efficiency from their environments[2]. In other words, in many cases, managers do not know how to calculate their configurations energy efficiency. In order to use standard metrics, we adopt concepts published in researches which take into consideration costs related to bit transmission from different type of users in a cloud configuration, and then indicate an appropriated configuration[3]. Heating is other important element which should be taken into the account of energy consumption in a cloud configuration, where it is related to infrastructure temperature maintained, because of machines of the environment. On other words, it is reported in commercial literature that the heating created by the machines from a cloud configuration can represent a cost between 2 and 5 million, considering a standard data centre. Therefore, an optimized infrastructure can reduce costs related to the OPEX.

2. EXISTING APPROACHES

Contributions to carbon green cloud architecture which points on the third-party concept, consist of two types of directories named as green offer and carbon emission. These directories help us to provide and utilize the Green services from users and providers both. The services of the providers are registered in the “Green offer Directory”. The Green Broker accessed these services and organized it according to the price, time and the service that offer least CO2 emission[4]. The Carbon Emission Directory keeps and stores the data which contains the information of energy and cooling efficiency of cloud services and data centres. The green broker used the up-to-date information about services. Whenever the user request for the services, it contacts with the Green Broker. The Green Broker uses these directories and chooses the green offer and energy efficiency information and allocates the services to the private cloud. And finally give the result to the users. This directory idea is beautifully used, proposing a new architecture called as integrated

green Cloud architecture (IGCA) shown in Figure 2. It smartly includes client oriented in the Cloud Middleware that verifies the cloud computing is better than the local computing with QoS and budget.

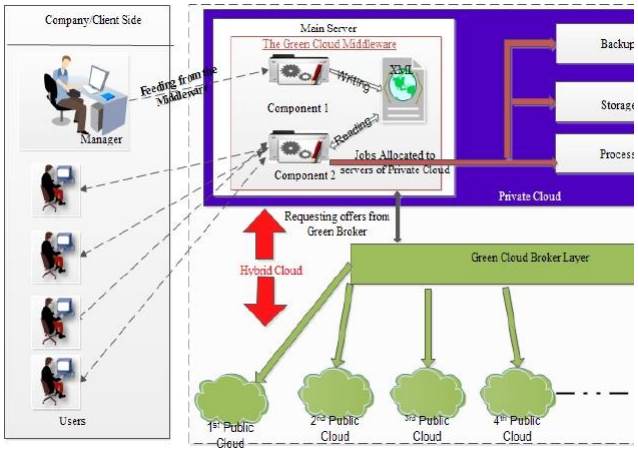

Figure 2 : Cloud and Environment

This architecture has two elements; one is the client and second is the server side. In the client side the manager and the users are present, which deals with the execution destination of the job and in the server side includes the green cloud middleware, green broker and sub servers like processing servers, storage servers, etc. The directory concept is used in the green broker layer of IGCA for organizing all the information of the public cloud and provides the best green service to the user[6]. The green cloud middleware has two components. The manager is the main head that deals with one component and stores all the information of the middleware. The usage of the user's PC, the servers present on the private clouds all the information. The frequencies of each sever like high, medium and low. The energy usage, storage capacity and other information also exist in the component of middleware.

When the manager got request from the client. The request is dividing into jobs and distributed among the users meanwhile they also stores the information about job into the component. The carbon emission and energy used for the execution of job on the private cloud by servers, on the public cloud by using green broker or on the client's PC is calculated and show to the users. The best green offer is selected by the manager by taking into consideration the security level of the job also. When the decision is making out by the manager then this information is store in the XML file for future usage.

The second component is accessed by all the users for reading the XML file. This file stocks all the information of the execution of job. The locations of the jobs are registered in the file and according to the addresses, they will execute. If the job entry is not in the file then the job will be executed either on the PC of the client or in the private cloud. The execution of job is takes place in three places. First if the job is executed LOCALLY (on the requester side) then this information is stored in the client side so next time when the request arrives it will not get through will middleware. If the job is executed in the private cloud the location as well as the server name is fetched from the file. Or if it is in public cloud, we will take help from the green broker to know the most excellent green decision for the execution of the job. The middleware know all the information about the three places. Energy used by the workers working in the company is also calculated by the middleware for taking further decisions.

The processing speed, energy consumption, bandwidth or others factors are responsible for deciding the best location for the execution of the job. By considering all the factors the middleware will compute and judge the place from the three places. The IGCA provides the balance in the job execution and provide the security and quality of service to the clients. The manager divides the task and top quality green solution by considering all the places (public, private, local host). making. But at the same time the manager is the weakest point in this architecture as it is the central point of failure, as if the manager fails everything in the architecture collapses.

3. RESULT AND DISCUSSION

Many researchers /authors had taken lot of efforts to find out better solution using green cloud computing to save global environment. The table illustrates total 11 papers of current decade (year 2014 to 2019), which includes what are objectives/focused points of author and what they had concluded.

Many scientists and researchers have put lot of effort to save our planet by proposing Green computing. The Table 1 shows the comparison of various researches in Green cloud computing.

Table 1: Comparison of researches done in Green cloud computing

Year of year	Highlight of the work	Limitations
publication		
Vertika Bansal 2019 [10]	Gives a view about green computing by surveying numerous papers on green cloud computing.	It is a theoretical approach
2017 [12]	Focuses on current and future trends in green computing and issues related to that	It is theoretical approach
Muhammad salam 2016 [13]	Focus is on the Critical success factors for developers of green computing software	Obtaining the Critical success factors is difficult
Ibtehaj 2016 [14]	Focus is on different metrics for green cloud computing	Have not implemented
Tribid Debbarma 2015 [2]	Focuses on how to reduce harmful gases produced as an effect of electronic toxic waste.	Needs to implement robustly
Peter H Shuttleworth 2016 [16]	Analysis was done by surveying different metrics for green computing.	Lack of implementation
Shivam Singh 2015[17]	Focuses on Green Cloud computing Framework for managing energy efficiently.	Implementation needs more improvement.
Amlan Deep Borah 2015 [18]	Focus is on CO2 emissions which are causing hazards and if unchecked may lead to fatal Carbon monoxide. They have specified that green cloud computing is the need of the day.	It is still in nascent development stage
Bharti Wadhwa	Focus is on power consumption by ICT tools. It showcases	It is just in design stage and

2015 [19]	how power consumption can be reduced using Green cloud computing'	yet to be implemented
Jacob John 2014 [21]	Focus is on energy saving in data centers with the help of Green computing.	Yet to be fully implemented

4. CONCLUSION:

The purpose of this review is to emphasize the necessity of altering current cloud computing methods to achieve green cloud computing for the objective of reducing greenhouse emission gasses, conserving power, and reducing cost. There are multiple ways to achieve that; some of which are scheduling to reach optimal utilization, virtualizing to attain minimal cost and hardware usage, and proportional computing for maximum productivity. Other general approaches include generating electricity using renewable energy, cluster computing, and managing power consumption. Despite the advantages of green cloud computing, it still encounters challenges of security and the need for connectivity. The search for new cloud computing methods continue to prevail the world of data centers. Methods not mentioned in this review include algorithmic approaches that utilize resources more efficiently causing less power consumption and increased productivity.

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HUMAN AGE AND GENDER DETECTION USING CONVOLUTION NEURAL NETWORK

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Abstract:

Automatic Age and Gender Classification has become relevant to an increasing amount of applications, particularly since the rise of social platforms and social media. Nevertheless, performance of existing methods on real-world images is still significantly lacking, especially when compared to the tremendous leaps in performance recently reported for the related task of face recognition. In this paper we show that by learning representations through the use of deep- convolutional neural networks (CNN), a significant increase in performance can be obtained on these tasks. To this end, we propose a simple convolutional net architecture that can be used even when the amount of learning data is limited. We evaluate our method on the recent Adience benchmark for age and gender estimation and show it to dramatically outperform current state-of-the-art methods.

Keywords : Classification, real-world images, Adience benchmark, convolutional net

I. INTRODUCTION

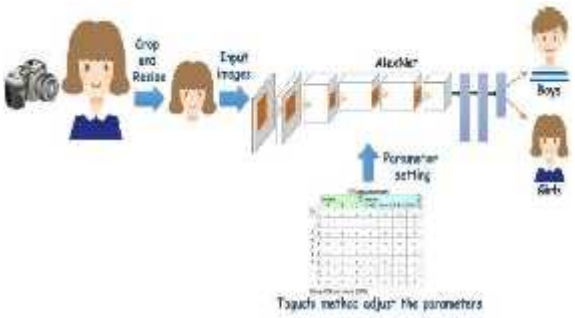
Age and gender play fundamental roles in social interactions. Languages reserve different salutations and grammar rules for men or women, and very often different vocabularies are used when addressing elders compared to young people. Despite the basic roles these attributes play in our day-to-day lives, the ability to automatically estimate them accurately and reliably from face images is still far from meeting the needs of commercial applications. This is particularly perplexing when considering recent claims to super-human capabilities in the related task of face recognition.

Past approaches to estimating or classifying these attributes from face images have relied on differences in facial feature dimensions or “tailored” face descriptors. Most have employed classification schemes designed particularly for age or gender estimation tasks, including and others.

Few of these past methods were designed to handle the many challenges of unconstrained imaging conditions. Moreover,

the machine learning methods employed by these systems did not fully exploit the massive numbers of image examples and data available through the Internet in order to improve classification capabilities. In this paper we attempt to close the gap between automatic face recognition capabilities and those of age and gender estimation methods. To this end, we follow the successful example laid down by recent face recognition systems: Face recognition techniques described in the last few years have shown that tremendous progress can be made by the use of deep convolutional neural networks. We demonstrate similar gains with a simple network architecture, designed by considering the rather limited availability of accurate age and gender labels in existing face data sets.

We proposed a set of motion features we show it to be effective, and which provide the basis for current ongoing work to combine



appearance and motion features.

Figure 1: Image Processing

The figure 1 represents the process of detecting the bird from image. The image is getting upload first then from that image the various alignments will be considered such as head, body, color, beak and entire image. Further, each alignment is given through deep convocational network to extract features out from multiple layers of network. After that representation of the image will get consider. Then on the basis of it the classifying result will get generated (i.e. features are aggregated to transfer it to classifier) and the bird species will get found.

II. METHODOLOGY

For developing the system certain methodologies have been used. They are as follows: Dataset(Adiences) Deep Convolutional Neural Network, Unsupervised learning algorithm, etc.

A. Algorithm:

In this experiment, unsupervised learning algorithm has been used for developing the system, because the inputted image defined is not known. Also, the data which is given to unsupervised learning algorithm are not labeled, i.e. only the input variables(X) are given with no corresponding output variables. In unsupervised learning, algorithms discover interesting structures in the data themselves. In detail, clustering is used for dividing the data into several groups[4].

In depth, deep learning models used to find vast number of neurons. Deep learning

algorithms learn more about the image as it goes through each neural network layer. For classifying **Neural Network** is used. Figure 2 represents layers of neural networks for feature extraction. The neural network is a framework for many machine learning algorithms.

Neural networks consist of vector of weights (W) and the bias (B).

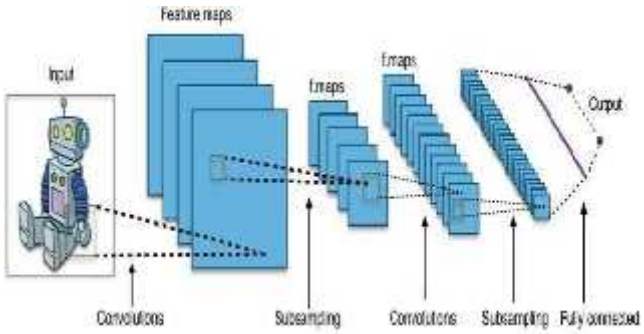


Figure 2: CNN Layers

In deep learning, convolutional neural network (CNN) is a class of deep neural network mostly used for analyzing visual images. It consists of an input layer and output layer as well as multiple hidden layers. Every layer is made up of group of neurons and each layer is fully connected to all neurons of its previous layer. The output layer is responsible for prediction of output. The convolutional layer takes an image as input, and produces a set of feature maps as output [2]. The input image can contain multiple channels such as color, wings, eyes, beak of birds which means that the convolutional layer perform a mapping from 3D volume to another 3D volume. 3D volumes considered are **width, height, depth.** The CNN has two components:

- Feature extraction part: features are detected when network performs a series of convolutional and pooling operation.
- Classification part: extracted features are given to fully connected layer which acts as classifier.

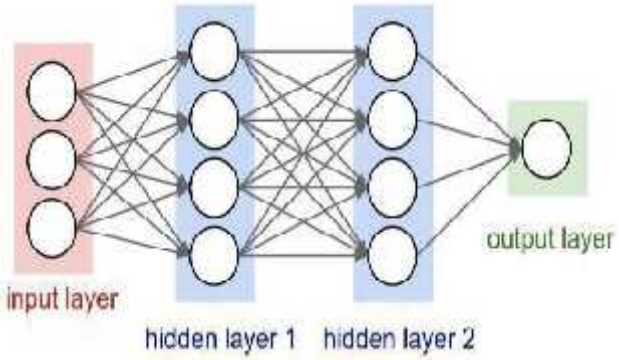


Figure 3: Convolutional Neural Network Layers

CNN consists of four layers: convolutional layer, activation layer, pooling layer and fully connected. Convolutional layer allows extracting visual features from an image in small amounts. Pooling is used toreduce the number of neurons from previous convolutional layer but maintaining the important information. Activation layer passes a value through a function which compresses values into range. Fully

connected layer connects a neuron from one layer to every neuron in another layer. As CNN classifies each neuron in depth, so it provides moreaccuracy.

B. Technologies used:

Image Processing: Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too.

OpenCV: OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the- art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize

scenery and establish markers to overlay it with augmented reality, etc. OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions whenavailable.

C. Tools used:

Anaconda Navigator : Anaconda is a free and open- source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. Jupyter Notebook IDE: Jupyter Notebook is an open sourced web-based application which allows you to create and share documents containing live code, equations, visualizations, and narrative text. The IDE also includes data cleaning and transformation, numerical simulation, statistical modeling, data visualization, and many others.

Dataset:

For this project, we'll use the Adience dataset; the dataset is available in the public domain. This dataset serves as a benchmark for face photos and is inclusive of various real-world imaging conditions like noise, lighting, pose, and appearance. The images have been collected from Flickr albums and

distributed under the Creative Commons (CC) license. It has a total of 26,580 photos of 2,284 subjects in eight age ranges (as mentioned above) and is about 1GB in size. The models we will use have been trained on this dataset.PROPOSEDAPPROACH

The below figure no. 5 represents the actual flow of the proposed system. To develop such system a trained dataset is required to classify an image. Trained dataset consists of two parts trained result and test result. The dataset has to be retrained to achieve higher accuracy in identification using retrain.py in GoogleCollab.

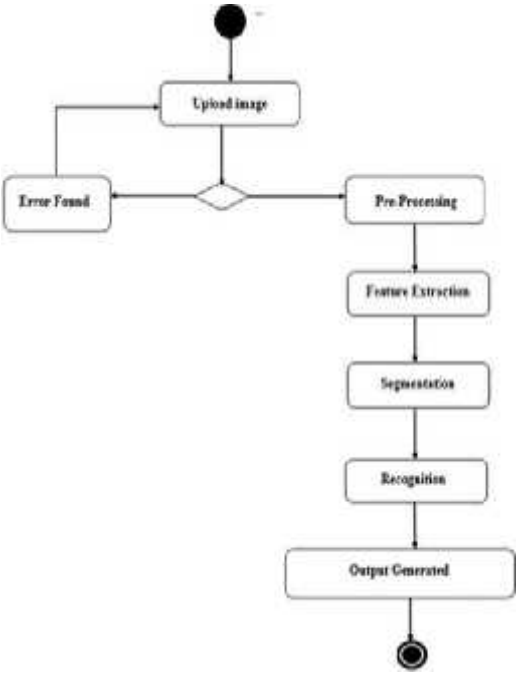


Figure 4: Flow of the System

Here we are convolution neural networks algorithm(CNN).A Convolutional Neural Network is a deep neural network (DNN) widely used for the purposes of frame recognition and processing and NLP. CNN has input and output layers, and multiple hidden layers, many of which are convolution. In a way, CNNs are regularized multilayer perceptrons. The convolutional neural network for this python project has 3 convolutional layers: Convolutional layer, pooling layer. It has 2 fully connected layers 1. A first fully connected layer that receives the output of the third convolutional layer and contains 512 neurons 2. A second fully connected layer that receives the 512- dimensional output of the first fully connected layer and again contains 512 neurons 3. A third, fully connected layer which maps to the final classes for age or gender. When given a frame/video, the CNN algorithm first detects for faces in each frame. Classify into Male/Female : Once it finds faces in the frame, the features of the faces are extracted, and the gender is determined using second layerofCNN.•Classifyintooneofthe8ageranges

In the third layer of CNN, the age of the faces is determined and falls under either of the 8 ageranges[(0 – 2), (4 – 6), (8 – 12), (15 – 20), (25 – 32), (38 – 43), (48 – 53), (60 –100)] .

Put the results on the frame and displayit : the result is displayed on the frame containing the age range and gender using OpenCV. The resulting frame consists of a square box around the faceswith the estimated gender and age.

III. EXPERIMENTALANALYSIS

In this paper we tested our method on the recently proposed Adience Face benchmark for age and gender classification. The Adience Faces benchmark contains automatically uploaded Flickr images. As the images were automatically uploaded without prior filtering, they depict challenging in-the- wild settings and vary in facial expression, head pose occlusions, lighting conditions, image quality etc. Moreover, some of the images are of very low quality or contain extreme motion blur.

For example, consider Figure 5 as input image given to the system

Figure 5: Input image

The system generates following output ,When you give the figure 6.

Figure 6:Result

Whenever you give input like figure 7 the system will automatically display, face not detected.

Figure 7: Input image

eventually leads to misclassification. Sometime the model confused the prediction of age when the uploaded image images shared similar properties. This project has given us great pleasure in creating a concept that can be used for good purposes and health in real life. Through developing this project further, camera footage for safety purposes can be used for real-time age prediction. We tend to believe this project extends an excellent deal of scope because the purpose meets. In life analysis and observance, this idea is often enforced privately traps to keep up the record of life movement.

IV. CONCLUSION

Age and gender are important demographic attributes for many potential face-based applications, for instance access control or Forensics. The present study investigated a technique to find the age and gender of human being. The proposed model can

predict the uploaded image of a face with 100% accuracy. But due to the subtle visual similarities between and among the human beings, the model sometime lacks the interspecific comparisons among the human and user. System can be implemented using cloud which can store large amount of data for comparison.

V. FUTURE ENHANCEMENT

For future works, upon changing the dataset the same model can be trained to predict emotion, ethnicity etc. Create an android/iOS app instead of website which will be more convenient to CREATE and provide high computing power for processing (in case of Neural Networks). Deeper CNN architecture and more robust image processing algorithm is required for exact age estimation.

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Dementia Patient Fall Detection and Location Tracker

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Abstract –*Dementia is the loss of cognitive functioning. This effects the person's daily life and activities such as the ability to think, remember and reason. Alzheimer's disease, the most common form of dementia, is progressive and slowly destroys the brain limiting functionality. It is estimated that over 10 million cases of Dementia is reported in India every year. Dementia can cause hindrance in the patient's day to day life and can be fatal if the patient is all alone. These days' smart phones are a necessity , all over the world everyone is now connected. During the last decade, mobile phones have been witnessing many improvements in their computing power, memory size, and the number of sensors embedded in the device (e.g. GPS, accelerometer, gyroscope). Our project is mainly focusing on assisting dementia patient in their day to day life activity, tracking them regularly and giving their location update to their emergency contact. The objective of the application is to sign up Dementia patients and to allow them to freely go out. The application will ask them random questions to make sure they are not experiencing memory loss. If the application detects a fall/patient not answering the asked question, an email is sent to the patient's emergency contact. The project aims at creating a safe travel experience for patients who have dementia. Not tracking a person who has dementia can lead to accidents and sometimes even result in death of the patient. Implementation of a technology which can accurately detect whether a dementia patient is in trouble is a must. The application should be able to detect if the patient has fallen down or if they are experiencing any memory loss.*

Key Words*: *Dementia, Global Positioning system, Accelerometer, Gyroscope

1. INTRODUCTION

Dementia occurs as a set of related symptoms when the brain is damaged by disease. The symptoms involve progressive impairments to memory, thinking, and behavior, that affect the ability to perform everyday activities. Other common symptoms include emotional problems, difficulties with language, and decreased motivation. Dementia is not a disorder of consciousness, and consciousness is not usually affected . A diagnosis of dementia requires a change from a person's usual mental functioning, and a greater cognitive decline than that due to normal aging. Several diseases, and injuries to the brain such as a stroke can give rise to dementia which all have a significant effect on relationships and caregivers. Flutter engine, written primarily in C++, provides low-level rendering support using Google's graphics library. Additionally, it interfaces with platform-specific SDKs such as those provided by Android and IOS. The Flutter Engine is a portable runtime for hosting Flutter applications. It implements Flutter's core libraries, including animation and graphics, file and network I/O, accessibility support, plug in architecture, and a Dart runtime and compile tool chain. Most developers interact with Flutter via the Flutter Framework, which provides a reactive framework and a set of platform, layout, and foundation widgets. Firebase is a toolset to "build, improve, and grow your app", and the tools it gives you cover a large portion of the services that developers would normally have to build themselves, but don't really want to build, because they'd rather be focusing on the app experience itself. This includes things like analytics, authentication, databases, configuration, file storage, push messaging, and the list goes on. The services are hosted in the cloud, and scale with little to no effort on the part of the developer. Sensors Most Android-powered devices have an accelerometer, and many now include a gyroscope. The availability of the software-based sensors is more variable because they often rely on one or more hardware sensors to derive their data. Depending on the device, these software-based sensors can derive their data either from the accelerometer and magnetometer or from the gyroscope. Motion sensors are useful for monitoring device movement, such as tilt, shake, rotation, or swing. The movement is usually a reflection of direct user input (for example, a user steering a car in a game or a user controlling a ball in a game), but it can also be a reflection of the physical environment in which the device is sitting (for example, moving with you while you drive your car)

2. SENSORS/MODULES USED

A. Global Positioning System

GPS sensor is present in most of the smartphones It can be used to detect the current location of the device with varying intensity. The intensity can either be accurate or fine course. We used the GPS sensor to get the exact co-ordinate i.e. latitude and longitude of the patient's phone. We then use the latitude and longitude values in the Google maps query to send it to the emergency contact

The emergency contact can then open up google maps to see the current location of his/her device.

B. Accelerometer

Smartphones have sensors to detect the axis and position of the device. We make use of the accelerometer sensor to get the values of the x,y,z axis of the phone's position. We then compute a threshold value with an equation to get the exact position of the phone in three dimensional space .We then continuously listen to this threshold value and when it becomes less than 2, we come to the conclusion that the phone has fallen when it becomes less than 2

C. Device Camera

Device camera is used for the web RTC feature. It is used on both the patient and the caretaker device. When a fall/memory loss is detected and the patient fails to answer the questions, a live video broadcast starts and the device camera is used.

3. METHODOLOGY

For developing the system certain methodologies have been used. They are as follows: Sensors(GPS, Accelerometer, Gyroscope),
Firebase ML Text Vision Kit,
UI development, etc.

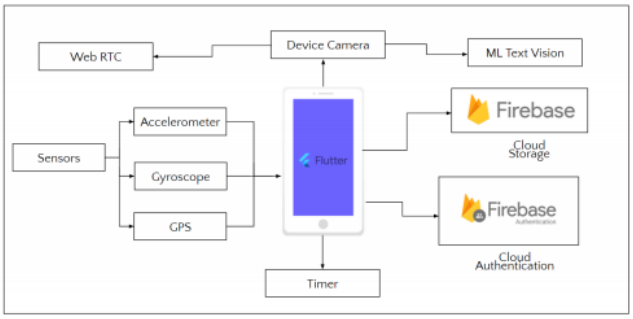

Figure 1. System Architecture

Algorithm:

The functionality of the system can be broadly classified into two ways.

1. Fall Detection with Email Notifier and Live Broadcast
2. Safe Travel
3.Prescription Scanner

1. The Fall Detection module is designed in such a way that it uses the smartphone sensors i.e , the Accelerometer and Gyroscope to calculate the positional value of the device in the three dimensional space.

To detect fall we are using algorithm which is based on threshold. This is most classical approach to fall detection. The accuracy of fall detection is high as compare to other algorithms. Basically we have X, Y, Z axis orientation. And our algorithm is based on three axis acceleration; Acceleration in X-axis, Y-axis, Z-axis are represented by Bx, By and Bz respectively. And equation is represented by,
Bsum = Square Root of ($Bx^2 + By^2 + Bz^2$)
We need to fix some threshold value and by comparing this threshold values we are analysing fall detection. After a fall has been detected, the system requests for a security PIN to the patient to confirm if they are in trouble. If the patient fails to answer this PIN in a certain amount of time, the application launches a background service that requests the GPS location of the device. After the co-ordinates has been determined, the application again launches a SMTP server request in the background and generated a pre-defined mail format by retrieving the emergency contact of the patient. The email is sent to the caretaker along with the Google Maps link to get the real-time location of the patient device. All these steps are asynchronous and happens at the same time. A live broadcast feed of the patient camera is also started in the events of a fall or memory loss which can then be seen by the caretaker from a different app.

2. Safe Travel extend the features of Fall Detection module and adds some extra layer to it. A patient can start a safe travel mode where the system will continuously monitor their movement as well as the memory efficiency at regular interval of times. Since, Dementia is related to cognitive dysfunction, the application asks a quiz at regular interval to make sure that the patient is not experiencing any brain fog/memory loss. In events of any fall detection or memory loss during the safe travel mode, the same functionality of the Fall Detection module takes place i.e, Email notification to the caretaker alongside the live broadcast of the patient camera.

3. The Prescription Scanner module is designed utilizing the Google Firebase ML Kit feature, namely the Text Vision. This module uses the device camera to analyse an image and identify medicines which are related to Dementia or have some quantity assigned to it. A list of Dementia related medicines is stored in the code base and the ML Algorithm compares each text in the block of line and if a match is found the medicine is stored and highlighted in a red frame. Furthermore, if some medicine which is not related to Dementia but has a quantity mentioned to it can also be identified by matching the "MG" field in the image.

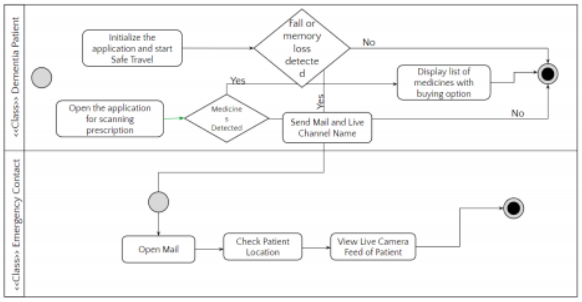

Figure 2. Activity Diagram

4.EXPERIMENTAL RESULTS

A. Fall Detection with Email Notifier and Live Broadcast

1. Fall Detection

The fall detection is the major feature of the application and it was extensively tested in order to make sure the application is able to detect when a phone or person has fallen. The application should take the user to the Fall Detected Page once a fall has been detected. The accuracy of the fall detection is around 80%.

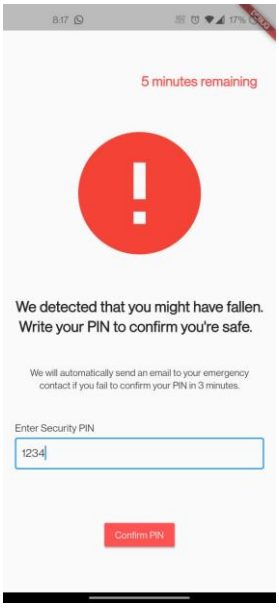

Figure 3. Fall Detection

2. Email Notifier

Mail received by emergency contact when patient in trouble

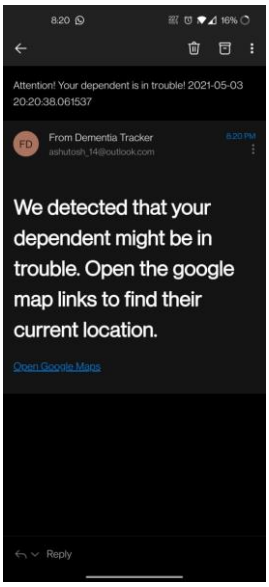

Figure 4. Email Notifier

Live Location of Patient on Google Maps

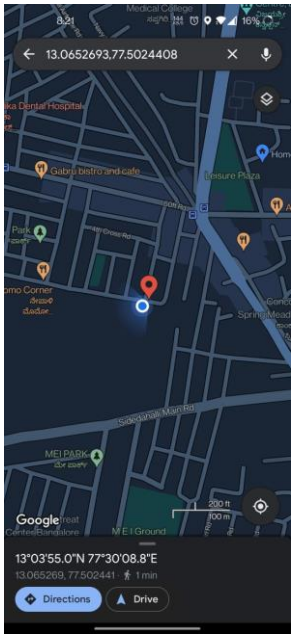

Figure 5. Live Broadcast

3. Live Broadcast

Whenever a free fall is detected, the automatic live streaming feature gets into action. A screen pops up which includes the window of the emergency contact as well as the user on the other end who is at risk. This feature of live streaming uses Agora WebRTC. Channels are created whenever there is a fall detection or the user is at risk. The channel information must be entered by the emergency contact for the live streaming to start immediately.

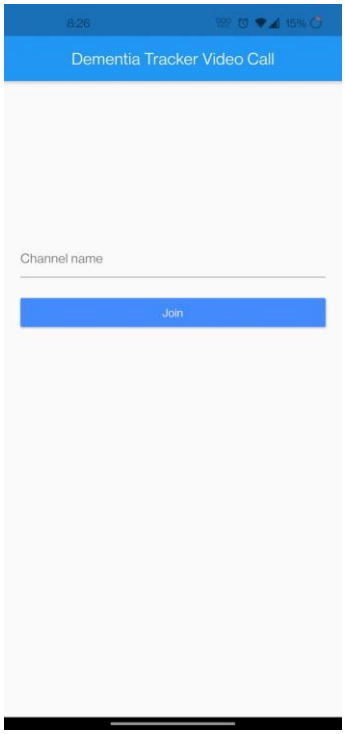

Figure 6. Care Taker Video Call

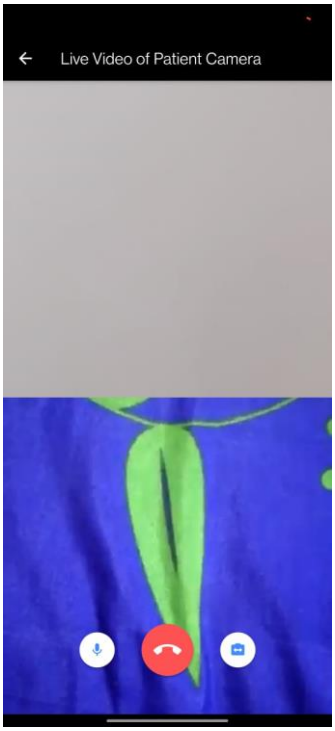

Figure 7. Live Broadcast Of Patient

B. Safe Travel

Safe Travel extend the features of Fall Detection module and adds some extra layer to it. A patient can start a safe travel mode where the system will continuously monitor their movement as well as the memory efficiency at regular interval of times.

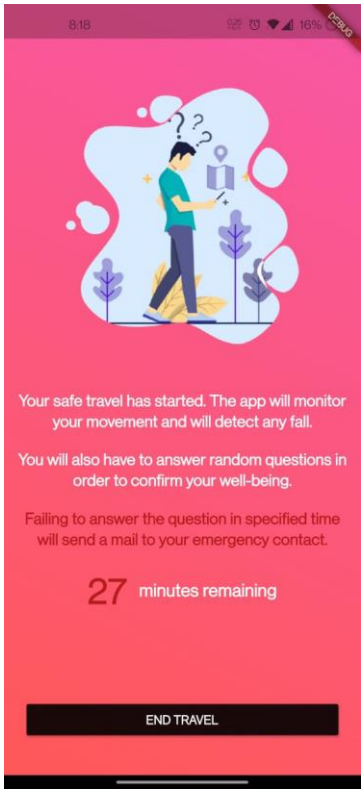

Figure 8. Safe Travel

Dementia is related to cognitive dysfunction, the application asks a quiz at regular interval to make sure that the patient is not experiencing any brain fog/memory loss.

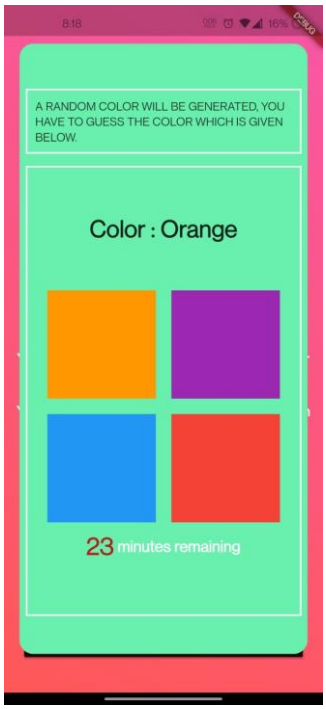

Figure 9. Brain Fog Quiz

C. Prescription Scanner

When the medicines in the prescription has been identified, the application should create frames for the user to make it visually appealing as to what medicines have been identified and selected. The application should also present the Buy Now button in front of every medicine identified. The user can then click on any button and it will take them to the NetMeds webpage from where they can buy the selected medicine.

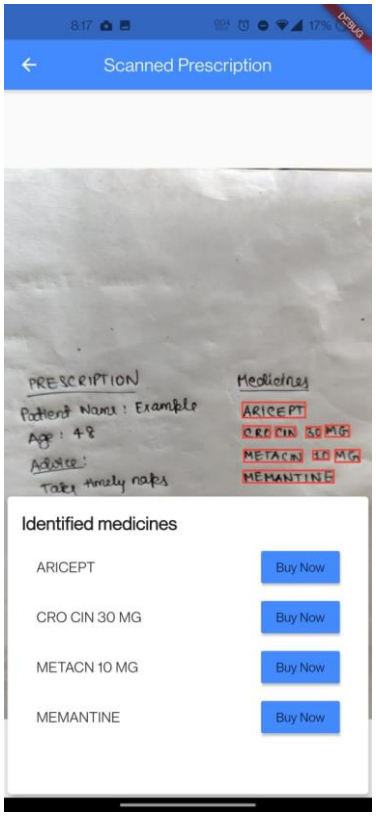

Figure 10. Prescription Scanner

5.CONCLUSIONS

Dementia is a serious cognitive disorder which is far common in today's population, it may occur in any stage but most commonly found in old aged people.The number of people living with dementia and Alzheimer's disease is expected to rise to 70.6 million by 2030 and 135.5 million by 2050. Since there are a limited number of options for treating dementia, such trackers come into play in order to reduce the problems faced by a dementia patient. The development of such applications has changed the way the elderly receive round-the clock care while living at home. The changing technology does offer comfort for care-givers and autonomy to the elderly. The users not carrying his or her phone with them at times or the phone not having enough charge can be a problem. Such tracking applications require multiple users to actively monitor the app and follow up accordingly.

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Autonomous Car Simulation using CARLA

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Abstract—

The Autonomous Car is currently 20 million dollars capital. It is expected a growth of 63.1% in the next 10 years. We developed a real-world autonomous vehicle (AV) using the CARLA open source simulator. The research and development is inspired by companies like Zoox, Witricity, Tesla Autopilot, Zscalar and Cruise for reference and inspiration. We have implemented a very realistic driving environment which involves 3D modelling of pedestrians, traffic and environmental conditions.

The simulator uses state estimation and location in an autonomous car using sensors, GNSS and IMUs. It implements Unscented Kalman Filter to locate a car using CARLA simulator data.

This will enable the main tasks of perception in autonomous driving are dynamic and static object detection, as well as examine common methods of computer vision for perception. Methods such as object detection, visual odometry, and tracking, and semantic segmentation are used in the estimation of the drivable surface.

The research implements key planning tasks in autonomous car, which includes mission planning, behavioral planning and local planning. It also implements map development and uses algorithms to execute and design, smooth and optimum trajectories and velocity profiles for safe navigation around obstacles while respecting traffic laws. Numerous hierarchical motion planners are used to navigate through a variety of scenarios in the CARLA simulator, which includes avoiding a vehicle parked in your lane, following a vehicle which is moving in front of it and safely navigating in an intersection.

I. Introduction

An autonomous car is a vehicle that implements a combination of cameras, sensors, radars, ultrasounds and Computer Vision (CV), to travel between start and destinations without the need for any human interference.

In the past five years, autonomous driving has gone from "perhaps possible" to "now commercially available on the market" and has become a reality.

Autonomous driving can open the door to future systems where computers take control of the art of driving.

In recent years, the automotive industry has made great strides towards a future free of human drivers. Researchers are currently working to overcome the technological, policy and social challenges posed by the spread of autonomous vehicles. These vehicles must be secure, reliable and economical. The use of machine learning technologies and the creation of coordination mechanisms could contribute to these objectives.

The global market for autonomous cars is segmented according to application of the car, vehicle type, product type, technological components (both hardware and software) and geography.

This paper provides a way to apply machine learning to the implementation of automated driving capabilities in a vehicle. It uses computer vision, that trains the onboard computer to understand and interact with the visual world. Using digital images and videos from cameras and deep learning models, machines can precisely classify and identify the objects and respond to what they sense.

This can be performed in a controlled environment using a simulator such as CARLA.

II. CARLA Simulator

CARLA is one open-source simulator for autonomous vehicle driving research. CARLA is engineered from scratch to support development, validate and train autonomous driving systems. In addition to the code and open-source protocols, CARLA also provides open digital assets such as urban layouts, vehicles, buildings and pedestrians which have been created for simulation and can be freely used. The developed simulation platform supports flexibility in the specification of sensor suites and environmental conditions. Some of them are illustrated in Fig 1 given below.

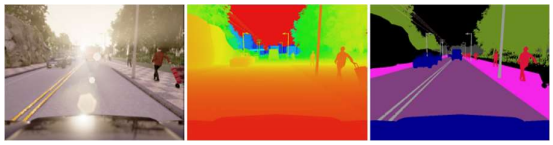

Fig 1: These are the views from camera which is converted to semantic view using computer vision to classify objects in the environment and identify safe drivable area for traveling.

CARLA is engineered for flexibility and realism in rendering physical simulation. It is implemented as an open-source layer on Unreal Engine 4 (UE4), permitting future expansions by the community. This Unreal Engine delivers state-of-the-art rendering quality, realistic physics, core NPC logic and an interoperable plug-in ecosystem. The engine is freely available for non-commercial use. CARLA simulates a dynamic world and offers a simple interface between the world and an agent which interacts with the world. In order to support this function, CARLA is designed as a client-server system, where the server is responsible for running the simulation and rendering the scene. The CARLA's client API is built using Python. It is mainly responsible for the interaction between the server and the autonomous agent through sockets. The client sends commands and meta-commands to the server and then receives sensor readings in return. Commands control the vehicle that include steering, braking, and acceleration.

III. Proposed Methodology

The proposed system includes the major tasks of autonomous driving planning, consisting of local planning, behaviour planning and mission planning. The system is trained to find the shortest route through the road network using Unscented kalman filter, Dijikstra's and A* algorithm. It uses finite state machines to identify and plan safe behaviours to design optimal, secure and smooth trajectories and speed profiles for safe navigation in the environment while respecting traffic rules. It creates maps of occupancy grid map of static elements in the surrounding and learns how to handle them for effective crash control. The system will construct a fully autonomous driving planning solution, to take you from one place to another while behaving like a typical driver by maintaining the vehicle safety at all times. This includes implementing a hierarchical motion planner to navigate through series of real life simulated scenarios of CARLA simulator, like following a lead vehicle, avoiding a parked vehicle in the lane, safely navigate in an intersection, entering and leaving a roundabout, passing slower vehicles. It is trained for real-world randomness and is robust to environmental changes.

The basic architecture of the implemented autonomous system can be decomposed into six standard modules. They are

- Environment Perception
- Environment Mapping
- Motion Planning
- Sensor Fusion
- Controller
- System Supervisor

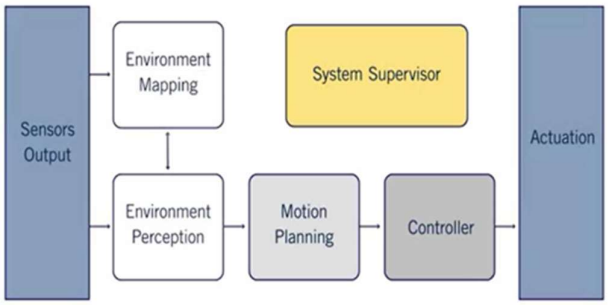

Fig 2: Basic architecture of the autonomous driving software system.

These modules explains about how the system receives the inputs, how computations are made based on these and what outputs they generate. Let us discuss these modules more in detail.

A. Environment Perception and Mapping

The raw sensor measurement is passed to two modules (environment mapping and perception) to understand the environment around the car.

Environment perception involves identification of vehicles in space and then classify the elements in the environment for the driving.

Environment mapping involves mapping the objects around the autonomous vehicle for wide range of uses for example avoiding collision.

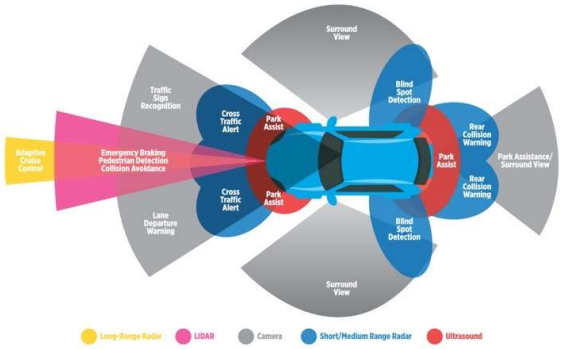

Fig 3: Sensor positioning in the autonomous vehicle and its functions.

These are the sensor data we have taken into consideration.

- Global Navigation Satellite Systems (GNSS) – GNSS is a catch-all term for a satellite system that can be used to pinpoint a receiver's position anywhere in the world. To compute a GPS position fix in the Earth-centred frame, the receiver of GNSS uses the speed of light to calculate distances to each satellite based on time of signal arrival. A GNSS works through trilateration via pseudo ranging from at least 4 satellites.
- Inertial measurement Unit - An IMU is typically composed of

  Gyroscopes – It is a spinning disc that maintains a specific orientation relative to inertial space, providing an orientation reference. They measure angular rotation rates about three separate axes.

  Accelerometers - They measure the acceleration relative to free-fall - this is also called the proper acceleration or specific force. They measure accelerations along three orthogonal axes.
- LIDAR- LIDAR emits laser light and measures distance using the time-of-flight equation. The device scans are stored as points that can be manipulated using common spatial operations like rotation, translation, scaling to identify position and movement of objects. The Iterative Closest Point (ICP) algorithm is used by LIDAR for localizing the autonomous car. As Fig 4 the device scatters laser beams in all the directions to identify boundaries. The module uses dynamic Lidar positioned overhead of car.

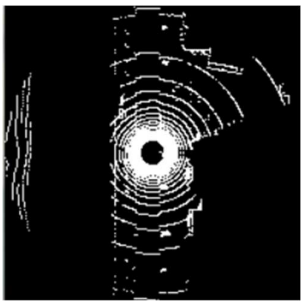

Fig 4: Lidar processed output

- RADAR – Radar has been used for decades to compute the velocity, range and angle of objects. On the road, radar is playing a vital role of driving, which constitute in the development of autonomous car. The Frequency-Modulated Continuous Wave (FMCW) radar system is used to detect the range and velocity of targets through stretch processing.
- Ultrasound Sensor - Ultrasonic sensors was initially introduced to vehicles as sensors of parking assistance systems. Ultrasonic sensors detect obstacles by transmitting and receiving ultrasound, a frequency is beyond the upper limit of human hearing at 20 kHz. To measure the distance from an object, the ultrasonic sensor transmits ultrasonic pulses, and measures the time taken for reception of reflected pulses. Distance between the nearest obstacle is calculated based on the propagation time of the received echoes.
- Camera - The cameras provide images that AI-based Deep-Learning programs can analyse with a high level of precision. The cameras use visual data received from the optics in the lens to the computer vision software for more-in-depth analysis. With the implementation of neural networks and computer vision algorithms, objects can be identified to provide the car's information as it drives. This allows the car to slow down when traffic is on, avoid collisions, make safe lane changes, and even read the traffic signs on the roads or highways.

  Cameras are used for computing visual depth perception which are done using stereo algorithms. The cameras used are set to generate images of ratio 720px X 1280px which is sent as input for computer vision programs for object identification and perception.

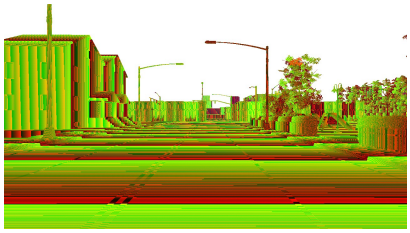

Fig 5.1: RGBD camera depth raw input.

The process of incremental estimation of the vehicle posture by examining the changes induced by motion on the images of its onboard cameras generating visual odometry for car.

Semantic segmentation of the image can be carried out with the aim of labelling each pixel of an image with a corresponding class of what is represented. As we make predictions for each pixel of the image, this task is often called dense prediction.

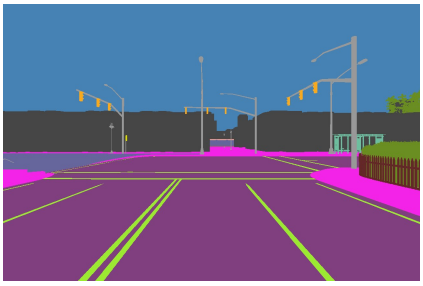

Fig 5.2: Semantic Segmentation of the environment.

B. Motion Planning

Motion planning for autonomous vehicles has been developed and greatly improved in the past years. Most fully autonomous vehicles have their own motion planning to directly control a desired trajectory that builds both the desired trajectory and velocity.

Motion planning can be broken into hierarchy of sub problems.

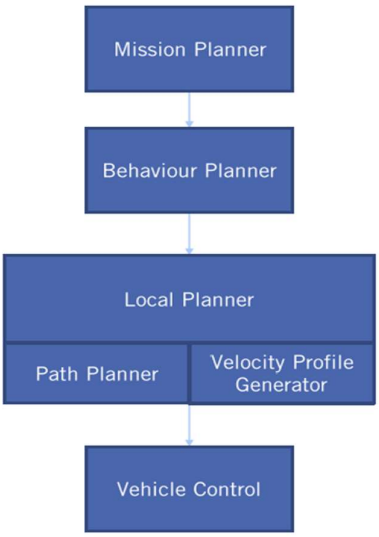

Fig 6: Hierarchy of motion planning sub problems.

- Mission planner is the highest level planner. It focuses on the mission which is to navigate to destination at the map level. It can be solved with graph based methods (Dijkstra's, A*).
- Behavioural planner decides when it is safe to proceed. It takes pedestrians, vehicles, cyclists into consideration. It also looks at regulatory elements such as traffic lights and stop signs.
- Local Planning generates feasible, collision-free paths and comfortable velocity profiles. This profile is then fed to the controller which makes the necessary adjustments accordingly.

C. Sensor Fusion

Sensor fusion is the process of blending sensor data with information from many sensors. Sensor fusing plays a vital role in planning. It collects data from all the sensors simultaneously and fuses it to generate a more precise

perspective of the environment with the assistance of an occupancy grid map and simultaneous localization and mapping (SLAM).

The sensor fusion can be classified into three major steps as follows.

- Data analysis: Data from the sensors come at a delayed time and the frequency would be different which has to be processed and merged. The algorithm combines several heterogeneous sources of sensory data to attain more precise and synthetic readings.
- Feature Level: The features express information calculated on board by each sensor. These features are then sent to the fusion node to feed the fusion algorithms. This process generates smaller information spaces for the data level fusion, which is preferable in terms of computational load.
- Decision Level: The decision level is the procedure for selecting a hypothesis from a set of hypotheses generated by individual decisions of several sensors. It is the highest level of abstraction and uses information that was formerly been developed through preliminary data or at the level of the processing function. The main job of decision level fusion is to use a meta-level classifier while data from the nodes are preprocessed by extracting certain features to identify the environment with greater precision and overcome hardware faults like sensor damage of foggy weather where camera visibility is low.

D. Controller

This module tracks and determines the best steering angle, gear settings, throttle pedal position and brake pedal position to accurately follow the planned path. It consists of

- Model Reference Point – This involves building a dynamic model of a car using kinematic bicycle model as a starting point and converting it to a standard state space representation.
- Longitudinal Control – For Longitudinal control Feedforward and feedback controllers are used together. Feedforward controller provides predictive response, non-zero offset. Feedback controller corrects the response compensating for the disturbances and errors in the model.
  The output of the feedforward and the feedback control blocks the throttling and the braking signals to accelerate or decelerate the vehicle to keep the vehicle velocity close to the reference velocity.

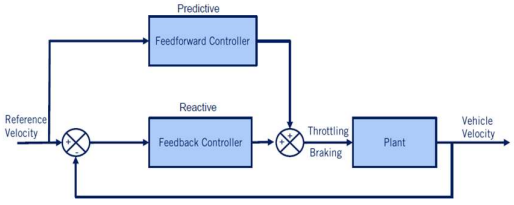

Fig 7.1: Structure of longitudinal control.

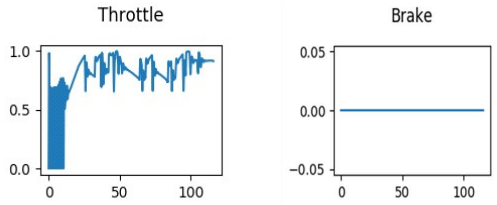

Fig 7.2: Graph indicating throttle and brake output.

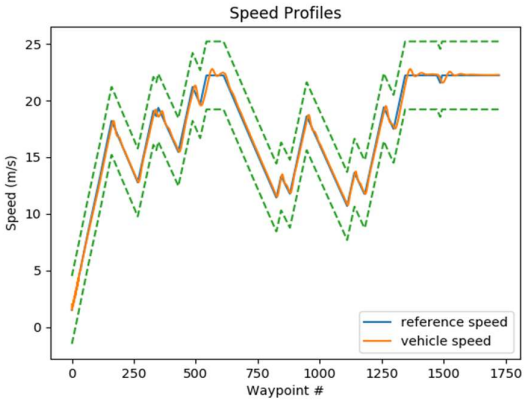

Fig 7.3: Graph indicating achieved vehicle speed against reference speeds.

- Lateral Control – The model predictive control (MPC) approach is enforced for controlling the active front steering system of the autonomous vehicle. At each time step, a trajectory is calculated over a finite horizon, and the MPC controller computes the updated steering angle in order to follow the trajectory.
  The conversion of the tire forces into steering commands is performed through the use of the MPC block. The resulting low-level control is executed by the vehicle's steering and throttle controls. The feedback loop is then closed using the applicable actuation signals. The MPC is a low-level controller that uses the tire forces as a low-level control unit inside the feedback loop. The vehicle's control system is then optimized to implement the appropriate steering and throttle commands.

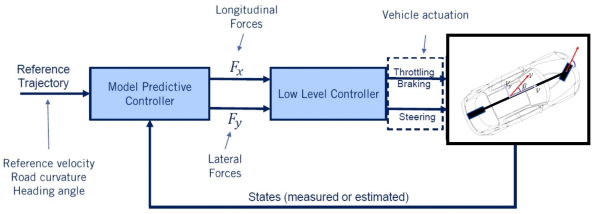

Fig 8.1: MPC structure for lateral control.

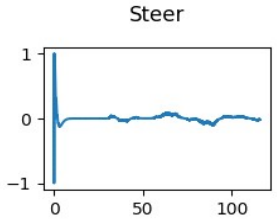

Fig 8.2: Graph indicating the steering angle set at the position of the car.

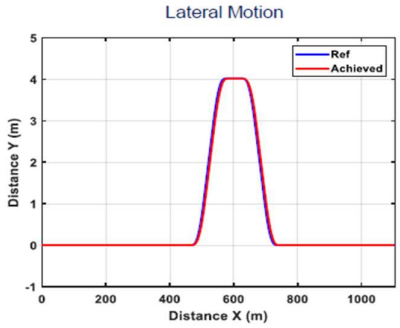

Fig 8.3: Graph indicating achieved lateral motion against reference lateral motion.

E. System Supervisor

The system supervisor monitors all parts of the software stack and hardware outputs to ensure that all systems are working as intended. It is also responsible to report any issues within the system.

IV. Conclusion

The Autonomous vehicle remains one of the hottest topics in the field of research. This paper introduces the basic principle of autonomous car based on algorithms.

This paper tells about the implementation details of development of maps, and use algorithms for safe navigation around obstacles while respecting traffic laws.

In practical applications, these simulations can be applied in real world which removes human interactions with the vehicles.

We can apply this in real world with minimal training of real world environment.

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Security Protocol for Transmitting data in Wireless Sensor Networks

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Abstract

Wireless sensor network is a trend that is growing faster in a decade or so. The data integrity of the WSN's is the critical part of data transmission. The transmission is based on the request of the nodes in return to the advertisement of the data from a source sensor node. Many algorithms are proposed for the integrity of the request (REQ) made by sensor nodes in order to protect the request. we propose an algorithm for giving security for data. The data which is sent back to a sensor node in return to the request made by sensor node has to be integrated by some method to ensure data privacy. Here we make use of a well-known RSA cryptographic algorithm to encrypt data. This provides an integrity constraint for the data .

Keywords - WSN, security, DATA, RSA, cryptograph.

1. Introduction

A wireless sensor network (WSN) is a collection of small nodes for monitoring environmental conditions and storing the obtained data in a central place. They're also known as highly diffused networks of small, insignificant wireless nodes that are grouped in large numbers. WSNs consist of sensor nodes with a radio range and energy consumption and works to achieve a very specific functionality [3].

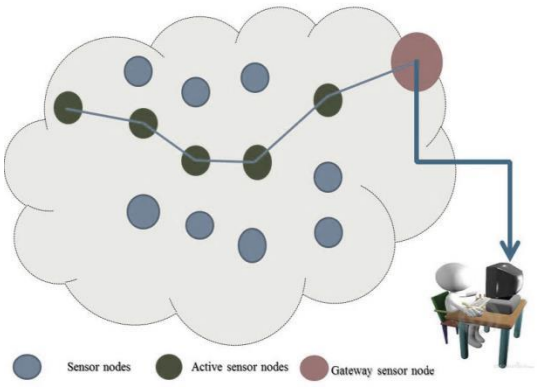

Fig. 1 Typical WSN Architecture

Each sensor node in the fig. 1 has an internal architecture which consists of central processing unit, power unit, sensor unit and communication unit. These small nodes have very low energy consumption, radio ranges and processing power. The important characteristics of WSN are Power consumption constraints, Mobility of nodes, Ease of use, heterogeneity of nodes. The major concern in WSN is power conservation because of their unique power sources they use.

The concept of sink nodes improves the remote access to sensor data that allow them to connect to other networks. When a sensor node shares their inspection and processes these inspections to store the useful, significant information with in them. These inspections can be accessed from sink nodes to examine and control situation by afar.

Sensor network is an autonomous node and has no central control acting on them. There transaction is mainly based on the current information that node has, it's computing ability, goal and resources. In other words, the

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collection of sensor networks refers to distributed processing ad hoc networks providing high-quality detail about the situation and ease of access.

Several hurdles need to be overcome in order to gain reality. Major hurdles in WSN are energy consumption, computational power, communication and resources available to the sensors in the networks[4].

1.1. Working architecture of WSN

WSN nodes are distributed in an area of sensor networks. These nodes are capable of holding data and also forward the data to different nodes and also end users. The data forward to the end users is by multi-hop infrastructure.

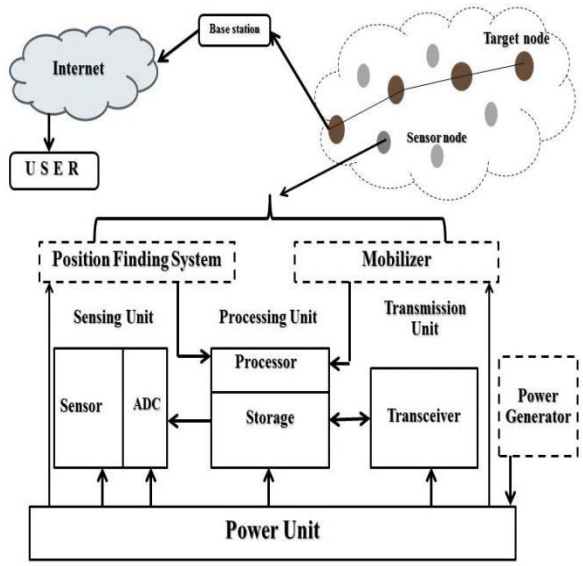

Fig. 2 components of sensor nodes and scatter nodes

This protocol has a stack which combines the capacity and routing perception, combines data with networking protocol and communicates through wireless medium. In the application layer the applications are assembled subject on the sensing job. The task of the transport layer is to keep trajectory of the data .

Security Attacks

- Spoofed, altered, or replayed routing information
- Selective forwarding
- Sinkhole attacks
- Sybil attacks
- Wormholes
- HELLO flood attacks
- Acknowledgement spoofing

A. Spoofed, altered, or replayed routing information

Rivals may generate routing loops, interest or prevent network load, widen or shorten source routes, issue fake error signals, block the network, increase end-to-end inactivity, and so on by spoofing, manipulating, or replaying routing facts. [5]

B. Selective forwarding

When the hacker is clearly included on the track of a data flow, indiscriminate advancing assaults are active. A rival hearing a flow travelling via adjacent nodes, on the other hand, might be able to compete with discriminating forwarding by blocking or crashing each forwarded packet of interest[5].

C. Sinkhole attacks

This work by using a negotiating node appear particularly appealing to nearby nodes who respect the routing mechanism. For example, a challenger could take off or rerun an announcement for a base station route with high elevation quality. Some protocols may attempt to check route quality via end-to-end acknowledgements that include information.[5]

D. Sybil attacks

A single node in a Sybil assault provides many attributes to other nodes in the network. This attack may suggest that fault-tolerant configurations less successful[5].

E. Wormholes Attacks

In a wormhole attack, an opponent sends communications from one area of the network across a low-reliability link to a different

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portion of the network, where they are repeated.

F. HELLO flood attacks

Some WSN routing methods need nodes to publicize themselves to their neighbors by sending hello messages. Accepting such a message requires the node to be within radio range of the sender. However, this notion may be incorrect in some instances; a laptop-class attacker sending overwhelming or other material with sufficient broadcast authority could satisfy this need. [5]

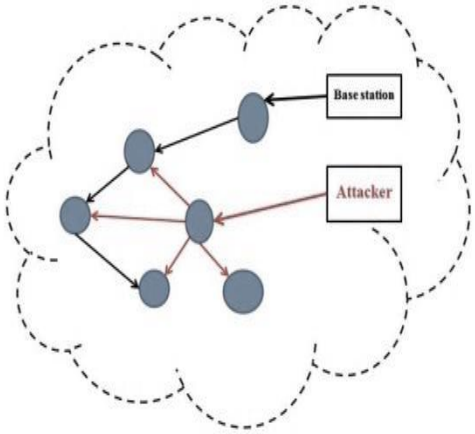

Fig. 3 HELLO flood attack, attacker has more power than base station. [2]

G. Acknowledgement spoofing

Embedded or categorized link layer acknowledgements are used by many sensor network routing techniques. An opponent can intercept link layer acknowledgments for "overheard" packets addressed to neighboring nodes due to the inherent transmission medium[5].

2. Routing protocols supported by WSN

They are classified into three routing protocol as shown in Fig. 4. [1]

A. Flat Routing:

SPIN, ACQUIRE, RR, MCFA, CADR, GBR, IDSQ, DD, COUGAR, EAR.

B. Hierarchical Routing:

LEACH, MECN, SOP, HPAR, and VGA, TTDD, PEGASIS, TEEN & APTEEN,

C. Location Based Routing:

MFR, DIR, GEDIR, GOAFR, GAF and GEAR.

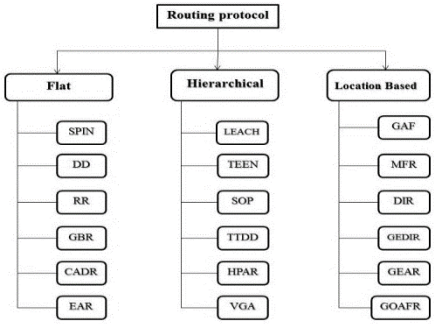

Fig. 4 classification of routing protocol

2.1. SPIN

Sensor Protocol for Information via Negotiation (SPIN) is projected to increase saturating protocols.

SPIN has three types of messages, they are:

- **ADV Message:**
  A node advertises to all the nodes in the network to notify that it has data to send.
- **REQ Message:**
  A node requests the node which has the given the advertisement that it has data with it.
- **DATA Message:**
  This message contains the actual message that is requested by a node.

The SPIN family is designed keeping two aspects in view. First, to efficaciously activate and to reserve energy, sensor applications essential to reverse with each other roughly that exists in the node and the data they statically essential to achieve. Exchange of sensor data for network procedure is expensive. Second, to lengthen the functioning period of

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the arrangement the nodes in the network must witness and amend to deviations made by their energy possessions.

2.1.1. Metadata

The SPIN protocol, which is a negotiation-based distribution protocol suitable for WSN, employs the concept of metadata.
Sensors employ meta-data to label the data they collect in a concise and complete manner[4].

2.1.2. The SPIN family

The spin family is been classified into four protocols as listed below:

- SPIN-PP
- SPIN-EC
- SPIN-BC
- SPIN-RL

A. SPIN-PP

It's a three-stage process, similar to the SPIN protocol, with a. ADV, b. REQ, and c. DATA. It is possible for nodes A and B to interconnect completely without eavesdropping by other nodes in this case[6].

Diagrammatically SPIN-PP is as shown below:

- Node A advertises (ADV) that it has data with it, to all other nodes.
- If any node (B) needs the data it sends request (REQ) to node A.
- Upon receiving request from other node (B), node A sends DATA to the requested node (B).

Now node B is capable of advertising it has DATA with it, to all other nodes. Other nodes now can request (REQ) and revive DATA from B. It is diagrammatically shown below:

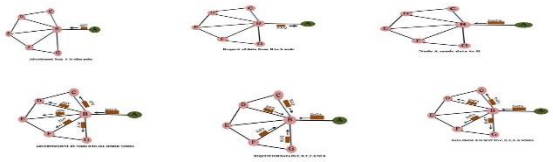

Fig. 5 DATA transaction in SPIN-PP

SPIN-EC

This is a straightforward energy-saving strategy. SPINEC is a variation of SPIN-PP that uses less energy. When an SPIN-EC node detects that its energy level is approaching a low-energy threshold, it adapts by lowering its protocol participation. In general, a node will only participate in one phase of the process. [4].It is as shown in fig. 6.

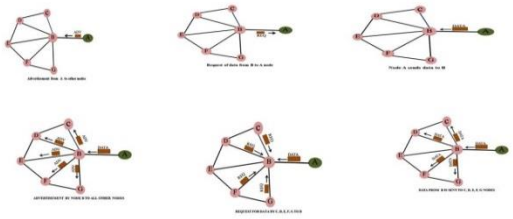

Fig. 6 the SPIN-EC

B. SPIN-BC

In broadcast communication, the SPIN protocol is utilised. SPIN-BC for broadcast networks improves on SPIN-PP by relying solely on low-cost . This means that all messages are delivered to the broadcast address, which is then processed by all nodes within the sender's

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transmission[1].

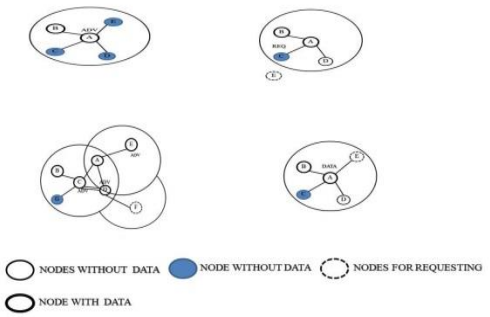

Fig. 7 the SPIN-BC Protocol

C. SPIN-RL

SPIN-RL is a type of SPIN-BC that can be trusted. Even if the network is unable to detect packets or communication is excessive, it can broadcast data effectively via a broadcast network. To achieve consistency, the SPIN-RL protocol incorporates two modifications to the SPIN-BC protocol. To begin, each SPIN-RL node maintains track of which announcements it receives from which nodes, and if it does not receive the data in a timely manner, it notifies the other nodes. [4].

2.2. Modified SPIN

The fascinating aspects is that energy feeding is dependent not only on sensing data, but also on moving and receiving data to and from neighbour nodes. So, if we can manage the number of data messages sent and received. A WSN network is seen in Figure 6.

During the event occurrence the entire network is divided into portions A and B. Section A's sensor nodes and section B's sensor are on opposite sides. Sensor nodes in section A do not need to waste energy getting or sending data after accepting data from the event node.

The current SPIN protocols, on the other hand, do not allow for such discriminating transmission. As a result, a new protocol known as modified SPIN or M-SPIN has been developed. Alarm monitoring applications, for example, require quick and consistent responses. [4].

M-SPIN has 3 phases:

- Distance discovery
- Negotiation
- Data transmission

In this step, we calculate the distance between each node in the network and the sink nodes in hops. Nodes with advanced hop relevance are located far from the sink node. For sending real data, arbitration is done on the basis of hop distance. After that, data is transferred. In our upcoming article, we'll go through each of these phases in detail. [4].

2.2.1. Distance discovery

MSPIN's distance detection phase. From sink nodes, the hop distance is calculated. Initially, the sink node transmits the packet. The term "type" refers to the several types of communications that can be sent. The transfer node's id is node Id, while the hop distance from the sink node is hop. The value of hop is initially set to one. This information is stored when a sensor node receives the packet [4].

2.2.2. Negotiation

An ADV message is sent from the source node. Each nearby node verifies if it has previously established broadcast data when it receives an ADV message. If the getting node's hop distance (own hop) is shorter than the hop distance specified in the ADV message (rcev hop), i.e. own hop rcev hop, the getting nodes send a REQ message to the sending node for any existing data. The transfer node then uses the DATA message to send the real data to the demanding node. As soon as a node receives data, whether from its own application or from another source, it becomes a node. It also uses the setCurrent function to determine which data is currently in its memory. When an ADV message is established, each receiving node uses the function chkHistory to examine its record to see if it has already seen that data. It also uses setDesired to specify the DATA packet it is looking for. The function getCurrent

ISBN: 979-85-27243-61-1

is used by the source nodes that receive the REQ. [4]

2.2.3. Data Transmission

Broadcast phase is identical to that of the SPIN-BC. Data is provided to the demanding node as soon as the source node acknowledges the demand. The Negotiation phase resumes if the demanding nodes are transitional nodes other than the sink node. As a result, the central nodes send ADV for data with a corrected hop distance . The hop distance f is modified by the transfer nodes. [4]

2.3. SSPIN

SPIN is a protocol of negotiation-based information spreading. It is the best protocol, but do not provide security measures. For this purpose, we have a protocol known as SSPIN . This protocol improves the security in the SPIN protocol.

- **ADV Stage**:

When a node has a data it advertises the other nodes that it has a data. All the other nodes will receive the advertisement from the source node which has data with it. ADV is the message sent to all other nodes. The ADV message format is as shown below:

$$(ADV, l_s, meta, n, (l_1, l_2, l_3.....), (MAC_1, MAC_2, MAC_3...))$$

Where ADV is message identifier, l_s is identifier of the initiator S, meta is application specified meta-data, n is random integer, (l_1, l_2, l_3) are identifiers list of S neighbors, (MAC_1, MAC_2, MAC_3…) is MAC list.

- **REQ Stage:**

After receiving the advisement from the source node, the other nodes are now able to send request to source node that it needs the data associated with it. The request message is named as REQ. the message format is as below:

$$(REQ, l_d, n, MAC_{req})$$

Where REQ is message identifier, l_d message sender for D's identifier and n is an integer equals to the one in ADV message, MAC_{req} is pare-wise key generated between S and D.

- **DATA Stage**

Once the source receives the request (REQ) from the other source nodes which have requested for data. It verifies the ADV messages sent to other node and verifies whether the data request is received from a node to which it had sent the advertisement. If the request is received by the node which had advisement sent from source then it will send the data to the requested node. The data is named as DATA message. The format for DATA is as below:

$$(DATA, D, E_{nc}(S||n||data))$$

Where DATA is message identifier, Enc (S||n||data) is the encrypted content, data is actual data.

The proprieties of S-SPIN are listed below:

- If two nodes n_i and n_j neighbors to each other then, n_i and n_j can be directly connected or can be connected by adversarial relay.
- If the node n_j is a honest node than upon receiving the advertisement from node n_i it will send a request (REQ) to the source node.

3. Proposed System

The system we proposed earlier provides the best and efficient way to provide security for the REQ made by the sensor nodes for the data from other nodes. This security is based on the properties mentioned in the previous section.
But the security for the data that is being sent back to the requested sensor nodes is not provided. This is the major drawback of SSPIN

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protocol. In addition to the REQ, DATA is also important and should reach the specified sensor nodes. This is the main challenge of the data transmission in WSN's. In this paper we propose an encryption algorithm for providing security in data transmission in WSN's.

In this paper we make use of the one of the popular algorithms known as RSA algorithm for encrypting the data in the WSN's. this will provide the security for data transmission and also an efficient way to encrypt the important data in transmission. For encryption, we employ the Asymmetric RSA technique in this work.

Data encryption existed before the computer was invented. Diplomats, hobbyists, and, most notably, military have contributed to the evolution of this art, which entails distorting data such that only the intended recipient can decode it. A cryptographic algorithm can be set as a function in this way.

Encryption also operates in the fields of integrity of authentication and is described below:

• *Confidentiality*: ensuring that only the sender and receiver have the ability to understand the message being exchanged.

• *Integrity*: Ability to check if a message was altered during transmission.

• *Authentication*: Medium to prove the identity of an individual communication

Classes of cryptographic algorithms

Based on the encryption key generation cryptographic algorithms are classified as: symmetric or asymmetric.

Symmetric Key Algorithm.

Secret key or symmetric encryption Cryptography is the encryption and decryption of data using only a single key. However, in order to be effective, you'll need a secure communication channel with the ability to alter a cryptographic key.

Through the encryption technique and key k, the text is encrypted, and X and Y become the message. The message Y is delivered to the receiver, who decrypts it with the key k before turning it back on in the text X. Figure 3 also shows that the key k is transmitted through a secure channel, which means that if a potential attacker obtains it, he or she can simply read the original text.

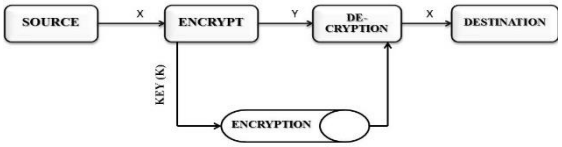

Fig. 8 SYMMETRIC CRYPTOGRAPHY

Asymmetric Key Algorithm

Asymmetric cryptography, often known as public key cryptography, has resulted in a paradigm shift. Instead of permutation and substitution, public key methods use mathematical functions. Apart from that, the most crucial distinction is that public key cryptography is asymmetric, involving the use of two distinct keys, as opposed to symmetric encryption, which employs just one. The usage of two keys has significant implications for security, key distribution, and authentication. Asymmetric encryption's main differentiating feature is that it enables secure communication between persons without requiring the previous parties to share a single cryptographic secret.

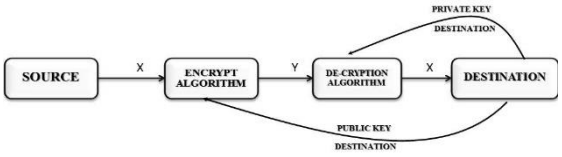

Fig. 9 Asymmetric cryptography

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4. Methodology and Algorithms

Here in this paper we make use of an asymmetric RSA algorithm to provide security for the data in the wireless sensor networks. By this proposed system we are able to encrypt the data that is sent from a source node to destination node. This will reduce the risk to be bared by the user and organization while transmitting data in WSN's.

The RSA algorithm is explained below:

We provided a method to create a public key cryptosystem whose security is based on the difficulty of factoring big prime integers in the RSA introduction article. It is feasible to encrypt data and create digital signatures using this method. It was so effective that it is now the most widely used public key algorithm in the world. The encryption mechanism is RSA-based, and the signature is digitally signed.

$m^{ed} \equiv m(\mathrm{mod} n)$.

for m integer. The encryption and decryption schemes are presented in Algorithms 1 and 2. The decryption works because $c^d \equiv (m^e)^d \equiv m(\mathrm{mod} n)$.

The safety lies in the difficulty of computing a clear text m from a ciphertext $cm^e \mathrm{mod} n$ and the public parameters n (e).

***RSA Encryption Algorithm*:**

- Input: RSA public key (n, e), Plain text m ∈ [0, n-1]
- Output: Cipher text c
- begin
    - Compute c = m^e mod n 2. Return c.
- End

This algorithm will provide the encryption for the data to be transmitted between source and destination nodes. Here n is a constant, e is the key used to encrypt the data to be sent. C is the chipertext of the original data to be sent, computed by **m^e mod n 2.**

RSA Decryption Algorithm:

- Input: Public key (n, e), Private key d, Cipher text c
- Output: Plain text m
- begin
    - Compute m = c^d mod n
    - Return m.
- End

This algorithm will provide the Decryption for the data to be transmitted between source and destination nodes. Here n is a constant, e is the key used to encrypt the data to be sent, d is the decryption key used to get the plain text out of chipertext. C is the chipertext of the original data to be sent computed by **c^d mod n.** m is the plain text obtained and is the data which was transmitted by the source sensor node.

5. Conclusion

We looked at a variety of data-centric protocols utilized in Wireless Sensor Networks in this paper. The SPIN protocol family has overcome the constraints of classical protocols. SPIN is a WSN protocol that is low on energy. There is also M-SPIN, which is a modified variant of the original SPIN protocol. It saves energy by not transmitting signals when it's not necessary. We also found SSPIN protocol which provides the security for the REQ made by the sensor nodes to avoid the duplicate copy of REQ. However there are some limitations of SSPIN protocol. It does not provide any security measures for the DATA that has to be transmitted between the source sensor node and the requested sensor nodes. We propose a new algorithm to encrypt the data sent by source sensor and decrypt algorithm for getting the data at receiver side. We use the efficient RSA algorithm for encrypting the data. For the future work we can consider the security issues with more abstract cryptographic techniques.

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Corona virus: A Disease Pattern Study dependent on Semantic-Web Approach utilizing Description Logic

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***Abstract*— Description good judgment elucidates statement the use of the methodology of reasoning. Description logic blended with semantics forms the valuable Description good judgment ontology. Numerous researches have depicted semantics of Description common sense, the use of concepts and roles.** Here the **disease pattern with admire to pandemic COVID-19 is studied. The proposed system examines ambitions to deliver semantically wealthy that means to the disease sample of COVID-19. The outbreak of Coronavirus has deeply ruined all forms of human pursuit. The principle goal of our paper is to make use of description logic Ontology and the semantic web-primarily based approach to put off ambivalence developed around spread of COVID-19. Semantics combined with Description common sense, therefore serves the reason of offering which means to words, in order that the interpretation is correctly performed. In this paper, proper reasoning is furnished to statistics in order that they can be depended on without any further doubt or notion.**

Keywords — Ontology, Semantic Web Engineering, COVID-19, Description Logic.

I. INTRODUCTION

Semantics vindicate and govern policies to store the facts and manipulate it as and whilst required. It is imparting the suitable meaning in order that it's far properly understood, without any hassle. This is confirmed with the contemporary pandemic of COVID-19 disorder sample. Semantics validate and govern guidelines to keep the statistics and manipulate it as and while required. It is imparted appropriate that means so that's why properly understood, without any trouble. This is confirmed With the present day pandemic of COVID-19 disease sample. This paper, the case examine of COVID-19 is taken as far defined the use of Description good judgment (DL)[1] and semantic net-primarily based technique. Primary aim is to offer a reasonable method to the ailment sample of COVID-19, Using DL standards and position utilization [2]. DL [3] uses reasoning to understand, remedy, diagnosis and different extra records regarding the family and form of virus.

The data to be had is within the form of herbal language this is translated into axioms in order to create an ontological version primarily based on novel.

DL version the dating between different entities. Entities are categorized into three categories: individual names, roles, and ideas. Names function constants, they may be used to portray a single people. Roles represent the relationship among individuals and ideas alternatively, depict a large set of individuals.

Ontology [four] defines representational entities, where the domain of knowledge gets modeled. Inducement behind this ontology examine is to deepen the research the usage of DL [five] which presents more insightful structure of the hassle. DL allows in breaking inferences which can be used for powerful choice making. addition, DL ontology is responsible for logically deducing information to collect records from them and check the particular consistencies. DL ontology is nothing however axioms which might be real in line with the given situation and state of affairs.

Axioms are classified into three categories: axioms [6], axioms [7] and axioms. or axioms are meant for representing the named people, their ideas, and their courting with one another. E.g. Brother (name: Bharath) or terminological axioms are meant for representing the concept relationships. E.g. Brother ó Sibling i.e. brother belonging to the subset of set siblings. or relational axioms are casted off to constitute the different residences assigned to roles. Taking example, where is a of that means every individual defined with also can be properly described with the aid of. The paper is organized as: segment II explains Description ,the term's simple which means after which is going on, to provide an explanation for illustration of DL and inconsistency visible in DL. The segment III and IV deals with the proposed COVID Ontology and it's modeling. V states the realization and future enhancement of the paper, followed by means of references.

II. DESCRIPTION LOGIC

DL formal notions are used for the purpose of reasoning [8] and illustration. Two or more relational statements are being merged, to offer upward push to a illustration. Illustration for this reason shaped, describes specific form of concept like conjunction [nine], negation [10], disjunction [eleven].

The know-how base of description common sense, is given by means of = (S, T) where, S represents set of statement-based statements for example the (Mammal (Bat)) and T is the terminological axioms that is (Mammal). Are few examples of statements and their equivalent DL representations.

x COVID-19 or corona virus, the lethal pandemic inflicting disorder has placed mankind at its unsafe spot. Corona virus ≡ COVID-19 (1)

Deadly Pandemic Causing Disease ≡ DPCD (2) Factors Responsible For Mankind At unsafe Spot ≡VS (three) COVID-19ó DPCD (4) COVID- 19ó VS (5) COVID-19DPCD VS (6) COVID-19

Additionally recognized by using the name corona virus, is showcased in axiom (1), with the equity signal depicting that each the terms on left- hand facet and proper-hand facet are equal. COVID-19 belongs to the group of deadly pandemics inflicting sicknesses.

That is depicted via subset representation with respect to axiom (4). It is also a member to the magnificence of things accountable for inclining the mankind to the tough situation. This is represented via subset representation in axiom (five). In the Combination of axiom (four) and axiom (five), we found that COVID-19 is an intersection of two things that is the lethal Pandemic causing sickness and the second is the factors accountable for mankind at a unguarded spot as per the axiom (6). x A small fragment of coronavirus, is similar to the one, found in Pangolins and bats. Coronavirus therefore seems like the bat virus [12] and the pangolin virus [thirteen]. Fragment of Batvirus ≡ BV (7) Fragment of Pangolin virus ≡ PV (8) BV Fragment of Coronavirus (nine) Fragment of Coronavirus
(10) (BVPV Fragment of Other viruses)ó Corona virus (eleven) A small fragment of bat virus is determined to be identical as corona virus, portrayed as a subset of corona virus in axiom (9).

A minor fragment of pangolin virus and the minor fragment of corona virus are discovered to be the similar one dealt as a subset notation in an axiom (10). By the combination of axiom we can infer that the corona virus has been originated from the fragments of bat virus [14], pangolin virus and other types of viruses. x SARS-COV-2, the well known factor for the cause of the fatal ailment found in bats. Each SARS [15] and COVID19 outbreak was from the bat species. SARS-COV-2 ó a component of causing corona virus (12)

Starting place or start point of SARS ≡ OOS (13) starting place or start point of COVID-19 ≡ OOC (14) Root of the Origin from or start point of Bat species (15)
OOC ó OriginFromBatSpecies (sixteen)(OOCOOS) OriginFromBatSpecies (17) SARS-COV-2 is a subset of factors imposing corona virus, as per the axiom (12).

Starting place of SARS and COVID-19 is a subset of bat species, depicted in axiom (15)and axiom(16) one at a time ,and mixed to form the axiom(17). x COVID-19 or corona virus, the well-known lethal pandemic inflicting ailment has positioned mankind at a prone spot. Corona virus ≡ COVID-19 (1) Deadly Pandemic Causing Disease ≡ DPCD (2)FactorsResponsible ForMankindAtVulnerable Spot ≡ VS (three) COVID-19ó DPCD (four) COVID-19ó VS (five) COVID-19DPCD
VS (6) COVID-19 additionally termed through the call corona virus, is showcased in axiom (1), with the equity signal denoting that the terms on left-hand side and right-hand facet are same.

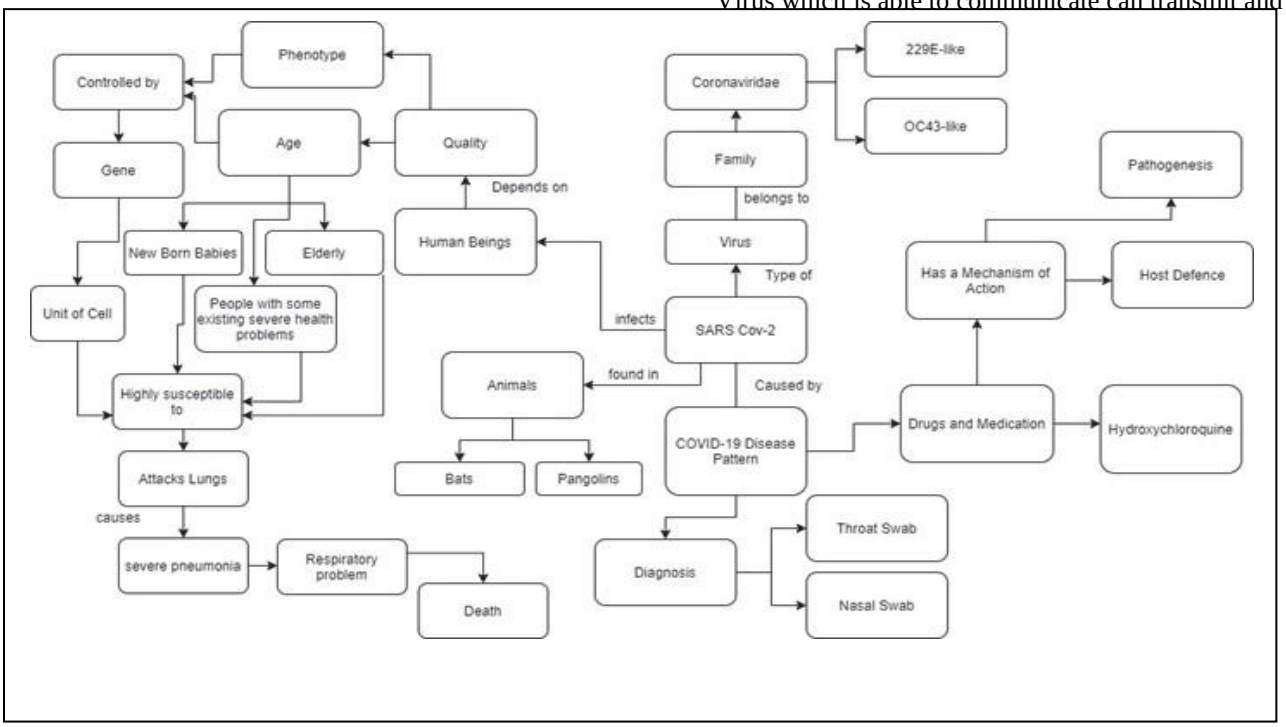
COVID-19 belongs to the group of lethal pandemics inflicting diseases. this is told via subset illustration in axiom (four). It also belongs to the elegance of factors liable for putting mankind at a unsafe or hard state of affairs. This is dealt through subset representation in axiom (five). Combining axiom (four) and axiom (5), we discover that COVID-19 is an intersection of the two that is the deadly Pandemic inflicting ailment and factors responsible for mankind at a prone spot as proven in axiom (6). x A small fragment of coronavirus, fits with the one, discovered in Pangolins and the bats. Coronavirus as a consequence seems like each bat virus [12] and pangolin virus [thirteen]. Fragment of Batvirus ≡ BV (7). (BVPVFragment of Other viruses) Corona virus (eleven) A small fragment of bat virus is pointed out to be the same as corona virus, represented as a subset of corona virus in axiom (9). A small fragment of pangolin virus is likewise found to be matching with the fragment of corona virus, represented as a Subset notation as in axiom (10). Combination of each of these axioms, we found out that Corona virus is originated from fragments of bat virus [14], pangolin virus and different viruses. x SARS-COV-2, the acknowledged component of inflicting the deadly Ailment is found in bats. Both SARS [15] and COVID19 are originated from bat species SARS-COV-2
Which is responsible for causing coronavirus (12) origin of SARS ≡ OOS (thirteen) starting place of COVID-19 ≡ OOC(14) OOS ó OriginFromBatspecies(15)OOC ó OriginFromBatSpecies (sixteen)
(OOCOOS) OriginFromBatSpecies(17) SARS-COV-2 is a subset of factors which are responsible for causing corona virus, as per axiom (12). beginning of SARS and COVID-19 is a subset of bat species, dealt separately via axiom (15) and axiom (sixteen) and mixed to shape axiom (17) become incomprehensible when there is a contradiction with respect to the statements used in their illustration, with respect to the logical statements belonging to disjoint units [16], having nothing in commonplace . Incoherent Ontology
Contamination Diseases ≡ CD (18) CD (19) ¬ CD (20) COVID-19 following the incoherent assets which belongs to both disjoint units. This makes it an announcement [17] good judgment. The identical instance of COVID-19 is blanketed in both the sets which don't have anything in common. Reasoning with respect to the above Ontology CD (21) Virus ≡ V (22) bacteria ≡ B (23) Fungi ≡ F (24) Parasites ≡ P (25) CD illnesses (VBPF) (26)27( ) the above axioms deduce to be a the PV (eight) BV Fragment of Corona virus(nine) and fragment of corona virus(10).

subset of sicknesses from axiom (21) and (26) as per the reasoning. Axiom (20) on the other hand suggests to be outdoor the set of diseases. This suggests incoherent ontology because the axioms turned out to be the means of falling of indisjoint sets.

B. Inconsistent Axiom Ontology SARS-CoV-2: Family Of Virus (28) SARS-CoV-2: Family Of Bacteria (29) Family Of Virus Family Of Bacteria (30) SARS-CoV-2 [18] is determined to be of each, Family Of Virus and Family Of Bacteria. axiom (26) states about the virus and to be disjoint with each other.

III.PROPOSED COVID ONTOLOGY

An ontology for the ailment pattern [21] of the spread of novel is being proposed i.e., as a result of SARS Cov-2, a sort of virus which belongs to the family of the human fall under these two classes: 229E-like (which might be secluded in human embryonic cultures) andOC43- like (which might be within the brain of mice).so that you can treat the virus the supply and the sample should be recognized in which it became infected Virus which is able to communicate can transmit and infect



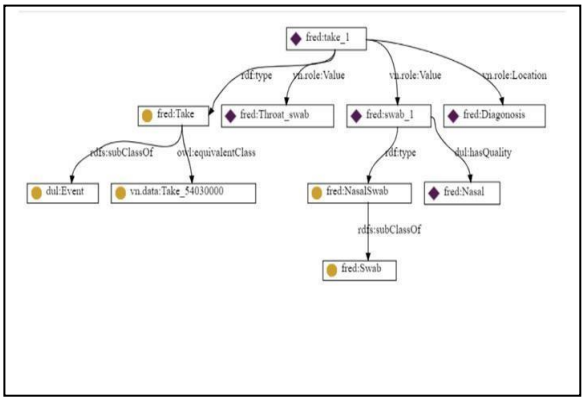
This leads to the inconsistent and risky axioms Few styles which prompt pair of inconsistent and incoherent are shown underneath: x unmarried is Solitude (SIL) example: . SIL1: X . Y (31) SIL2: X . Z (32) SIL3: Y¬Z (33) X is related to the position (given through r) to Y and Z. right here, Z makes use of axiom (32) and is disjoint with B. example: SIL1: Antibiotics . FamilyOfVirus (34) SIL2: Antibiotics . FamilyOfBacteria (35) SIL3: FamilyOfVirus ¬ FamilyOfBacteria (36) x Singular existence SE example: SE1: X . Y (37) SE2: X. Z (38) SE3: Y ¬Z (39) Axiom SE2 portrays the existential restrict contradicting with standard limit [19] represented through SE1 Concepts gift conflicting nature: SE1: Antibiotics. Family Of Virus (40) SE2: Antibiotics . Family Of Bacteria (41) SE3: Family Of Virus ¬ Family Of Bacteria ().Axioms (40) and (41) represents inconsistent and incoherent behavior of SE1 and SE2. Reasoner [20] equipment alerts regulations to be distinct and unstable.

number of the conspicious symptoms starts initially with the moderate fever, sneezing and coughing leads to the trouble in breathing. So far it is difficult to distinguish it from different viruses so a right remedies and prognosis process is being followed which incorporates taking a pattern of nasal and throat swab that is similarly tested with a number of care in laboratories, like age and people affected by other sicknesses are at greater risk with respect to this virus. , they need greater care and attention. In people,this virus in extreme cases can input the lungs inflicting pneumonia [23] which makes it tough for the human to breathe as it has been discovered beneath [24] that the following virus affects respiration cells and organs within the body. may be no vaccine to be had as of now, but the use of [25] and pills used in antiviral remedy can be useful to deal with the sufferers stricken by this lethal virus

IV.MODELLING THE DIAGNOSIS OFCOVID-19

Nasal swab [26]. The amassed records within the shape of natural language is further modeled [27] to an ontology. The specific ideas and relationships may be studied by way of examining fig 2 in which the primary frame whirls around the instance take1 having two values i.e., throat and nasal swab. The equal description common sense of the equal is given under : Takeó dul: event take1: Take swab1: NasalSwab dul:has Quality (swab1,Nasal) vn.role:region(take1,diagnosis) vn. Position : fee(take1,Throat Swab, Nasal Swab) further, we can model the relaxation of the standards of the proposed ontology on COVID-19 and devise its equivalent description logics.

The fig 1, above specifies the proposed COVID -19 disorder sample ontology, may be modeled for its analysis with the aid of taking throat swab.



V.CONCLUSION AND FUTURE SCOPE

Description common sense [28] and Semantic Ontology had been aptly defined and described in the paper. The properly defined semantic approach helps us to comprehend the sickness pattern of COVID-19 easily. Ontological axioms [29] used for depiction or portraying, have been granted a fulfilling formal definition to the model. COVID-19 as a domain is explicitly described in this paper. DL [30] has effectively supplied the axioms and ontology version in brief right from the origin till the entire development of COVID-19.

The proposed disorder pattern has been converted to assign it an ontological version that means the capabilities of the proposed ontological version collectively speaks about the sole purpose of creating the treatment simpler by viewing it as the attitude of reasoning in semantics. In this paper the focal point is on modeling and providing the practical functions of COVID- 19 ontology.

The destiny plan includes constructing a technique to confirm the consistencies in ontology- based totally feature-model [31]. The paper may be prolonged to formally verify the configuration and integration of various functions and concepts present in the version. In addition, it might be also prolonged for evaluation of the version by incorporating ontology and describes the motives of conflicts produced by using any shape of inconsistency if raised through the reasoning tool [32].

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Secure and optimal performance for data in cloud by fragmentation

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Abstract- Nowadays data is being outsourced to some third party the way it's carried out in cloud computing which is giving rise to many security concerns. In cloud there is risk of attack by some other user's and nodes due to which there might be data compromise. Hence there is requirement of huge security concern in order to secure the data on cloud. But still whatever the security plan is applied, it should consider optimizing the data retrieving time. Splitting and multiplication of data on cloud for secure optimal performance is proposed to achieve the optimization in performance and security concerns in the cloud. In the proposed method file is divided into units of data and the fragmented data in the cloud nodes is replicated. Only one unit of specific data file is stored in every nodes which ensures that even if there is any attack then attacker will not come to know any meaningful data. To avoid in helping the attacker in guessing the nodes location storing the chunk of data, these are dispersed with some distance by means of graph T-coloring. This proposed method is not dependent on any of the old cryptographic techniques for securing the data hence it is cost effective. It's shown that the probability to trace and find out the attacker node which stores the unit of data in one file is minimum. The proposed method working performance is compared with other schemes. There was an observation of high level security and little performance overhead

Keywords- DROPS, Replication, Drops methodology

I. INTRODUCTION

Cloud computing gives the information, software and computation of a user to distant services. Cloud computing includes system hardware and application software resources as third-party managed services produced accessible on the Internet. Typically, these services provide advanced server software and high-end network access. The cloud computing is one of the most trending technologies for growing software industries and also public organization using the cloud services as platform. Presently roles-based access control (DROPS) models is very popular model in the business system area. Also in the model have major is security issues when access to the cloud server. A typical model is (DRPOS) uses to guidance monitor running on the information server to implement authorization. Otherwise the server in cloud is out of control the business domain. to developing an efficient data security mechanisms for the cloud-associated enterprises system has more challenges First things is in cloud storages is encryption operation is major techniques to used to store information with securely .the cloud security alliance suggesting that brilliant methods of improvising information protection are keeping data in the form of cipher text. And also typical encryption method. Such as public key-encryption and identity based encryption can care to maintain the information integrity, then unauthorized person cannot access the information is encryption in the next proposed as internally access policy and have capable to authorize any client associated on the access policy, confidentiality and access control could be achieves information its self o them then we have a strong believe on un trusted cloud servers. It's the one important type of providing protections model, id associated to as self-contained data protection here the authors says it's not only decreases the dependences on the cloud servers

The rest of this article is structured as follows: Section II describes Literature survey. Section III briefly reviews the proposed system. Section IV summarize the results. Section V conclusion.

II. LITERATURE REVIEW

[2]Juel etal. introduced a methedology to makesure the integrity, originality and availability of information in acloud. By the Iris file system, the transfer of information to the cloud is performed. The gateway is created and utilized in the company that ensures the resilience and reality of the information using a Merkletree. The files denies, M.A.C address, and version numbers are kept at different phases of the tree. The amount of data loss in case of tempering as a result of interference by virtual machines cannot be minimised. [3] G. Kappes, A Hatzieleftheriou, and S.V. Anastasiadis. To obtainable the unrealistic and multi-subscribers associated problems for storing of data in the cloud by using the shared storage and authorization. The Dike authorization architecture is used which combine the concept of controlling the localaccess and name space segregation of occupant. [5] D. Zississ and DLekkas, [5] presented supplying security services in the cloud utilizing a trusted third party. The level of belief in the data integrity, authentication and confidentiality of information increases by using the public key infrastructure and the interaction between the parties. The certification authorities manage the generation of keys. At the userlevel, the use of character evidence of devices, such as smart cards was suggested to store the keys. [6] D. Borus, D. Kliazovichs, F. Granellis, P. Bouvrys, and A. Y. Zomayas, proposed data replication of energy-efficient in

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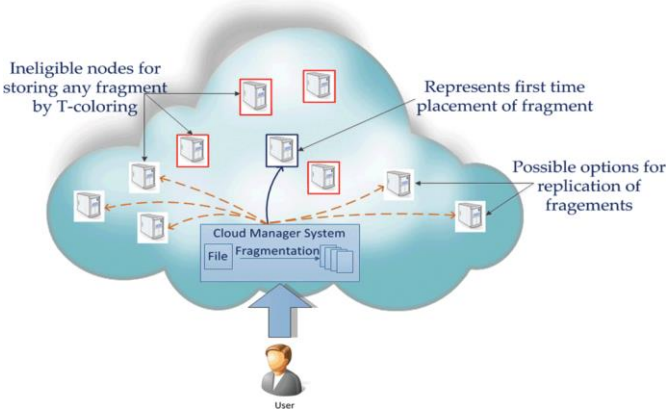
cloudcomputing data centers. A central database, positioned in the huge area networks, give entire data needed for cloud application. In order to speedup the access and lower inactivity, individual data center manages a localdatabase, known as datacenterdatabase. From the central database, it is used to duplicate the most commonly used data items. Each rackhosts have at leastone server efficient of running local racklevel-database, which is used for replication of data from the datacenterdatabase.

III METHODOLOGY

A. *Proposed System*

The main objective of problem statement is maintenance of complete positives of the current system, overcoming few disadvantages are stated earlier. Contract out information to third party organizational controls, is done in cloud computing, increase safety problems. The information might be loss because of compromise node other client and nodes in the cloud. so, greater-level safety procedures are necessary of the data protecting in the cloud. on the other hand, the working protection strategy must alsoo consider the optimize the data recovery time. Only the traditional cryptography is used for data security which needs more storage on the clouds. The cryptographic less nature of the proposed method helps in greater performance of the required functions on the data. The evaluation of the network can be done using the training dataset. Similarly evaluation of the model on a test or validation set also be done. We proposed a security scheme of cloud storage methodology that cooperatively dealing with the securities and performance in conditions of recovery times. The file of information was fragmented, and those are distributed all over numerous nodes. The T-coloring graph is used to separate the nodes. The fragmentation and distribution of nodes make sure that no meaningful data was available some time adversary in case of winning attacks. Unique piece of a file is stored in each node on the cloud. The methodology performance is comparing with complete replication techniques. The simulation outcome showed that the synchronized attention on the safety and performance outcome in improved of protection stage of information accompany by a minor performance. Presently with this methodology, a end-user can upload the files to cloud, downloads the files, updates the contents, and upload it again. Here implements self updates techniques that can observe and auto only its required fragment. Introduce new methodology that jointly deals with the security and performance problem. The future system makes sure those winning attackers, no correct information is exposed to the intruder. We do not depend on present cryptographic technique for information safety. The proposed scheme of no cryptographic methods makes it speeder to perform the needed operations on the information. We make sure a regulated replication of the file fragments, to improve security every fragment is replicated only once.



B. *Implementation*

In the environment of cloud, a file in entirety, stared at a node leads to a point of failure. The nodes might be at risk due to data confidentiality or data integrity on a successful attacks on a node. In another situation can happen both the situation of interference faults. The performance in the form of recovery time can be improved by using replication condition. though, the multiple copies increases with the replication within the cloud. Thus, the probability of target of attacks may be increase due to the node holding the files. A large-scale system is necessarily need for security and replication, such that cloud, both are developed to give essential services to the end-user. Both safety and replication must be evenhanded so In this methodology, we proposed single node should not storing the complete files. The this approach divides the files into fragment and does the replication by using the cloud. The fragments are dispersed such that no node holds additional added a distinct chunks of data in the cloud, so that node does not leak important information even in the successful attack.

The splitting and multiplication methodology uses standard replication for security in which all the fragment is replicated atmost once in cloud and stored. Although, the correct and control replication will not increase the retrieval time to the level of full-size replication, it considerably developed the security. In this methodology, end-user sending information file to cloud server. The manager of cloud system performs the following steps on getting the file: (i) Fragmentation, (ii) First phase of nodes is selected and saves single fragment on each of the chosen node, and (iii) Second phase of nodes are selected for replication of chunks. The cloud manager maintains the placement of fragment and is thought to be a secure place. The division threshold of the file which contains data is specified to be generated by the owner of the file.

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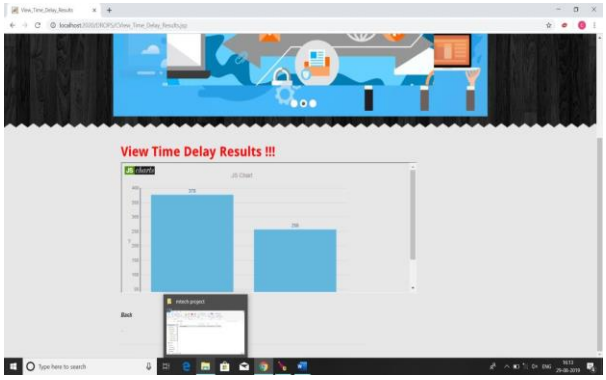
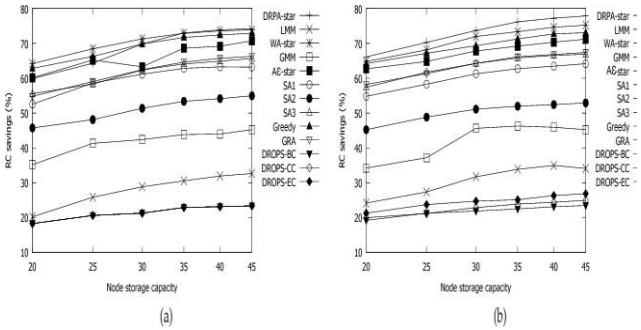
He/she can identify the division rate in terms of fraction or the numeral and size of variety of fragment.

IV RESULTS





V CONCLUSION

To proposed the splitting methodology, a cloud storage scheme of security that deals with the security and performance in the form of fetching time. The file was divided into chunks, and the chunks are dispersed across number of nodes on the cloud. T-coloring graph is used to separate the nodes on the cloud. The fragmentation and replication ensure that no correct information is disclosed in the successful attack by the attacker. Nodes are not there in cloud can store multiple unique fragments of the same file. The performance of this method are comparing with other replication ideas. The output of the simulation exposed the parallel consideration of the security and performance got, in greater security level of the information. Here we used MAC address to divide the file into fragments. Presently with the splitting and mutliplication methodology, a end-user must downloading the files, updating the things, and uploading it back. It is calculated to build up an motorized updates mechanism that can recognizing and updating the necessary chunks only. The get an opportunity to works on the fields research on downloading, changing, and file uploading.

The scope of this project; To divides the file into chunks and replicate the chunks of information in excess of the nodes in cloud. Every nodes stores only a individual chunk of a information file that guarantee that even in case of a victorious attacks, no significant information is revealed to the intruder.

Here we are using only limited number of nodes and further for the enhancement we can use a greater number of nodes. Also, we can enhance the automatic update the fragments and the data.

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FRAMEWORK FOR STOCK PRICE PROJECTION BASED ON PHIOLOGICAL SIMILARITY GATHERING.

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Abstract- Forecasting quotation prices through traditional information is a upcoming research topic. Quotation price is said to be a typical time series. Recurrent neural network (RNN), long short-term memory (LSTM), and gated recurrent units (GRU) techniques are basically adopted to tackle this kind of information. However, recent related studies have axis on the analysis of isolated stocks, thus giving no importance to the connection between same type of stocks in the total stock trade. This paper proposes a clustering method for mining same type of stocks, which is a combination of morphological similarity distance (MSD) and kmeans clustering. Subsequently, Hierarchical Temporal Memory (HTM), an online studying model, is used to grasp patterns from same type of stocks and make forecast at last, denoted as C-HTM. The experiments on the amount foreseeing show that 1) contrast with HTM which has not listed out same type of stock patterns, C-HTM has good foreseeing perfection, 2) in terms of short-term prediction, the performance of C-HTM is excellent compared to the traditional models.

Keywords- ***Machine learning, kmeans, philplogical similarity distance, hierarchical temporal memory, quotation prediction.***

I. INTRODUCTION

The non-random walk hypothesis and the systematic market hypothesis states that traditional quotation information are of prominent commercial value and that the learning of old prices can be used to project new prices [1]–[3]. And also, an encouraging quotation prediction model has been proven to bring reliable benefits to the one who invest and many marketing agencies. Although the stock price prediction job is attractive to researchers, it is still examined to be a exciting problem because the quotation information is real-time, high-noise and nonlinear. Hence, most of the researchers use numerous methods to accomplish a improved accuracy [4]–[7]. Machine learning models have shown more talented predictions than old statistical models such as Autoregressive Integrated Moving Average (ARIMA), a time-series prediction model which exploits alterations. Nabipour et al. [8] evaluated the concert of artificial neural networks (ANNs), recurrent neural network (RNN), long short-term memory (LSTM) and six tree-based models(decision tree, bagging, random forest, adaboost, gradient boosting, and xgboost). The outcomes illustrates that LSTM was the highest executor when compared with other systems. Chen and Zhou [9] employed a genetic algorithm (GA) for feature selection, for improving the perfomance of LSTM. Though, based on our technical knowledge, there is slight research work that gives the information about the issue of relationship between many stocks. Gathering all the older jobs done till now, it shows that their replicas are subjected to overfitting or underfitting, which means that the constraints has to be changed very often. Henceforth, the discussed concepts are very much important for the typical model: 1) Since the information has real-time nature of quotation data, the model can study always and does not need extreme parameter alterations. 2) The model is delicate to input, thus it can study the potential patterns. 3) The model has great robustness and fault tolerance mechanism to adjust to the high-noise information atmosphere. To address the two issues, the technique proposed in this paper is that by means of a clustering technique based on kmeans to discover same type of stocks in the quotation market, which utilizes morphological similarity distance (MSD) as a degree of resemblance, denoted as K-MSD. The MSD has been confirmed to be further appropriate for estimating the resemblance of time series [10]. On top of that, we use Hierarchical Temporal Memory (HTM) model, a biologically-unnatural theory of cleverness originally described in [11], to same stock patterns. HTM afterwards clustering, is considered as C-HTM, has good decision percentage. Moreover, in small range decision, the efficiency of C-HTM is good compared to three baseline models. Important donation of this task is

concluded in the following• the task is to execute KMSD clustering algorithm, to mining same stocks in the full stock market. • HTM model, an online learning model, to seek potential stock patterns on good clusters, which promising performance on short-term stock price prediction tasks.

II. LITERATURE SURVEY

Many researches on stock price prediction recently are found in plenty. Introduce part of the past works. Nowadays research, clustering algorithms are largely used in stock price prediction task [12]–[14]. Xu et al. [12] proposed a hybrid two-stage stock forecasting method on basis of clustering and ensemble learning. In this process, kmeans is applied for cluster various methods factors which effects stock price. Li and Wu [13] use hierarchical clustering algorithms to group stock time series windows into various groups, develop stock price predictions utilizing market styles. Nakagawa et al. [14] showed a k-medoids clustering with Indexing dynamic time warping (IDTW) to find amount varying patterns helpful for prediction. In [15], Kumari et al. support CUDA parallel computing framework to accelerate clustering operations. In addition, many models specifically dealing with stock data have been proposed. Hoseinzade and Haratizadeh [16] trained a convolutional neural network (CNN) model which provides a 3D tensor to combine and line up different group of variables as input data. An elman neural network (ENN) model effectively used by grey wolf optimization (GWO) algorithm promotes stock predictive progress on work identifying closing price for one day prior, given by Chandar et al. in [17]. Pang et al. [18] utilize embedded layer and the automatic encoder, correspondingly, to vectorize information of LSTM. Outcome presents LSTM with embedded layer is good. Presently, some studies concentrates on identifying the effect of stock commonly on model. The model learning the pattern of same stocks through large robustness and more generalization, since stock price is effected by unguessable parameters. So, the paper provides the HTM model on same stocks which are grouped by KMSD to increase the prediction precisely.

III EXISTING SYSTEM

In this part, technique used in the paper is mentioned, KMSD clustering, HTM, baseline models and evaluation measures for clustering and prediction. A. KMEANS WITH MORPHOLOGICAL SIMILARITY DISTANCE Kmeans [19] is a clustering algorithm in machine learning work. Providing n samples of time series (x1, x, . . . , xn), in which every sample is a d-dimensional real vector, kmeans clustering goal to divide n samples into k(≤ N) sets S = (S1, S2, . . . , Si). Secondly, its aim is to identify the cluster Si that proves formula: arg min S X k i=1 X x∈Si f (x, µi) (1) where µi is the mean value of all series in Si , the function f is the similarity between sample x and µ. MSD as the common measure, so f can be denoted as : f (x, µi) = ED × (2 − ASD SAD) = vuuut X d j=1 (xj − µij) 2×(2 − | Pd j=1 (x − µi)| Pd j=1 |x − µi |) (2) in which ED is Euclidean distance, ASD is the absolute sum of the difference, and SAD is Manhattan distance. B. HIERARCHICAL TEMPORAL MEMORY In this part, we have done small abstract to HTMTo beginners unaware of HTM, see the literature [20], [21]. 1) HTM STRUCTURE HTM is an unsupervised machine learning technology that provides techinque of neocortex of the mammalian (mainly human) brain, proposed by [11] intailly. Framework for abstract HTM model with two level is shown in Figure 1. A typical HTM model is a hierarchical structure. Each level is comprised of fewer items considered as regions, while each level in a hierarchical structure may consists of multiple regions. Generally, levels are more then less number of regions in the model. Moreover, every region comprised of columns of numerous neurons.

Design of neuron is the pyramidal cells in the brain. It is a multipolar neuron that involves three categories of dendrites: proximal dendrites, which obtains feedforward input information; terminal dendrites, which obtains contextual information; apical dendrites, which receives feedback. 2) HTM WORKFLOW depicted in diagram 2, the HTM workflow importantly provides four parts: encoding, spatial pooling, temporal pooling and classifier prediction. In the beginning the encoder [22] converts input into sparse distributed representations (SDRs), data structure comprised of binary, count of 1's smaller than 0's. SDRs is fundamental for the robustness of the model. Then, the spatial pooling algorithm [23] and the temporal pooling algorithm combine same patterns and distribute time groups, correspondingly. At the end, the prediction outcome of the model is provided by the classifier. 3) SPARSE DISTRIBUTED REPRESENTATION when neural network is considered , sparsity terms proved to increase prediction accuracy in [24]–[26]. As sparse data representation in HTM, SDRs specifies the robustness of noise and sensitivity to input. An SDR consists of many binary bits where 1 shows comparatively active neuron and a 0 shows comparatively inactive neuron. Moreover, count of 1s less than 0s, so we deduct SDRs is sparse. SDR is identified as important part of HTM. C. The SDR has thousands of binary bits, 1 indicates a somewhat active neuron and a 0 indicates a quite inactive neuron. The number of 1 is much lesser than 0, hence we imagine SDRs is a sparse. In universal SDR is measured to be the important

concept of HTM. C. BASELINE MODELS In this paper, we use RNN [27], LSTM [28] and GRU [29] as baseline models. As a class of neural network, Because of its internal memory RNN is broadly used in dealing out variable-length time series. In adding up, LSTM and GRU are variants of RNN, which prevent the gradient vanishing problem [30] and prove to be more appropriate for dealing out long time series. In the trial, we use the common sliding window method to instruct the baseline models. Figure 3 is an example indicating how to use previous 7 days to calculate the future 1 days.

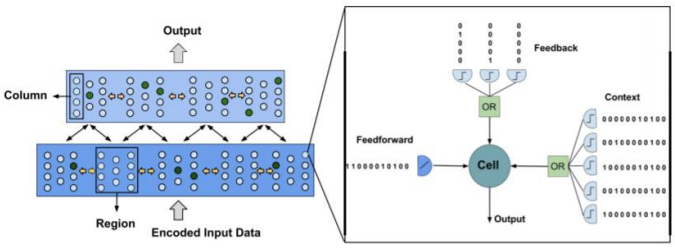
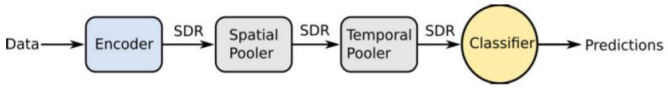


Figure 1: Existing system text mining flowchart



IV PROPOSED WORK

V EVALUATION METRICS

1) CLUSTERING METRIC Silhouette is an assessment technique of clustering effect, proposed by [31]. Its assessment is a calculation of how similar a sample is to its own cluster (cohesion) when compared to various clusters (separation), which ranges from −1 to +1. A sample is well coordinated to its own cluster and poorly matched to neighboring clusters can be done by high value. The calculation method of the Silhouette of sample i is as follows: s(i) = □ □□ □□ 1 − a(i)/b(i), if a(i) < b(i) 0, if a(i) = b(i) b(i)/a(i) − 1, if a(i) > b(i) where a(i) is the mean distance between i and all other samples in the same cluster, b(i) is the smallest mean distance of i to all samples in any other cluster. The Assumption all samples have been clustered via KMSD clustering into k clusters. The cluster can said as a better cluster if the standard Silhouette of a cluster is more than or equal to the average Silhouette of all samples,.

VI CONCLUSION & FUTURE ENHANCEMENT

Prediction of stock prices based up on historical data is considered an beautiful and challenging task. In this context, we first employ KMSD clustering to find similar type of stocks. By similar stock dataset, HTM is obtained. The experiment values shows that KMSD clustering can progress the accuracy of HTM significantly and show-term stock price prediction can be achieved from HTM after clustering. Further work can be improve the prediction accuracy and simplification of the model by devising an algorithms which can take account of more variables to discover similar stocks.

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An Efficient Underwater WSN as Distributed Database Network implementing for Structured Distributed Storage and extractions

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***Abstract*- Before the vast organization of submerged WSN turns into a reality, the test to be met is proficient blunder recuperation in vicinity of high fault likelihood, prolong proliferation postpones and low audio data transfer capacity. The network implementing is a predicting solution to computation potentiality of underwater sensor nodes and broadcast type of acoustic channels. An methodical underwater sensor network as a distributed database and implementing network for structured distributed storage and extractions.**

Distributed storage system gives solid entry to information via excess open out over exclusively temperamental nodes. Application situations incorporate data centers, shared capacity frameworks, and capacity in wireless networks. Putting away information utilizing an eradication code, in parts spread crosswise over hubs, requires less excess than straightforward replication for the same level of dependability. Then again, since pieces must be intermittently supplanted as hubs fall flat, a key inquiry is the way to create encoded parts in a disseminated manner while exchanging as meager information as would be prudent over the network. We present an idea of recovering codes, which permit another node to download *function* of the put away information from the surviving nodes.

***Keywords*- Underwater Sensor Network; Distributed Storage System; Network Coding;**

1. INTRODUCTION

More than 70% of the surface of the earth is secured by water. In spite of years of exploration, numerous discriminating submerged applications, for example, oceanographic information accumulation, contamination checking, strategic reconnaissance applications, remain truly constrained. The investigations of [2–6] overview major limitations, potential applications, difficulties and future exploration headings in submerged situations. They call attention to the perfect channel to amphibian applicative is submerged sensor system (UWSN) [4]. Be that as it may, the qualities of UWSNs, for example, low data transmission, long engendering postponements and high blunder likelihood, are altogether unique in relation to those in physical sensor network.

The reason for distributed storage systems is to store information dependably over drawn out stretches of time utilizing conveyed gathering of capacity noess which may be independently inconsistent. Applications include capacity within substantial server farms as well as shared stockpiling frameworks, for example, Ocean Store [7], Total Recall [8], and DHash++ [9], those utilization nodes over Internet for circulated document stockpiling. In wireless sensor network, getting solid stockpiling over problematic bits may be attractive for vigorous information recuperation [10], particularly within cataclysmic situations [11].

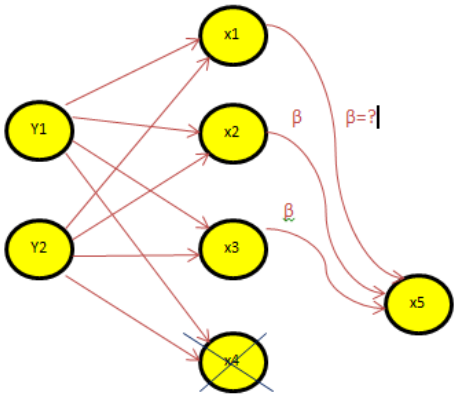

Fig. 1. The repair problem: Node x5 generates fragments as x1, x2…x3 when node x4 fails.

Within every one of these situations, guaranteeing unwavering quality requires presentation of excess. Most straightforward type of excess is replication, which is received within numerous down to earth stockpiling frameworks. As a speculation of replication, deletion coding offers better stockpiling productivity. For example, we can partition a record of size M into k pieces, each of size M/k, encode them into n coded pieces utilizing a (n, k) most extreme separation distinct (MDS) code as well as store them at n nodes. At that point, first document can be recuperated from any arrangement of k coded pieces.

This execution is ideal as far as redundancy–reliability tradeoff within light of fact that k pieces, each of size M/k, gives base information to recuperating the record, which is of sizeM. A few outlines [8], [4], [5] use eradication codes rather than replication. For specific cases, eradication coding can

accomplish requests of size higher unwavering quality for the same excess variable contrasted with replication; see, e.g., [9]

Notwithstanding, an inconvenience emerges: Within distributed storage systems, excess must be consistently invigorated as nodes fizzle or leaves framework, which includes extensive information exchanges over network. This issue is best represented within straightforward illustration of Fig. 1: an information item is partitioned in two pieces y1, y2 (say, each of size 1Mb) and these encoded into four sections x1, . . . x4 of same size, with property that any two out of four can be utilized to recoup first y1, y2. Presently expect that stockpiling node x4 falls flat as well as another node x5, newcomer, needs to correspond with existing nodes make another encoded parcel, such that any two out of x1, x2, x3, x5 suffice to recuperate. Obviously, if newcomer can download any two encoded parts (say from x1, x2), reproduction of entire information article is conceivable as well as after that another encoded section can be produced. This, be that as it may, requires correspondence of 2Mb within system to create eradication encoded section of size 1Mb at x5. When all is said within done, if an object of sizeMis separated within k introductory sections, repair data transfer capacity with this methodology is M bits to create a part of size M/k. interestingly, if replication is utilized rather, another copy might just be duplicated from whatever other existing node, bringing about no transmission capacity overhead. It was ordinarily trusted that this k-figure overhead repair data transmission is an unavoidable overhead that accompanies the advantages of coding. In fact, all known coding developments oblige access to first information item to produce encoded sections.

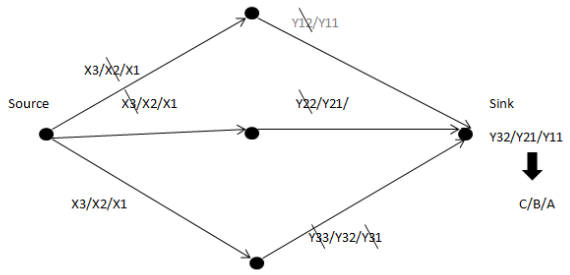

Fig. 2: Using Network Coding

Fig. 2 demonstrates advantages of network coding utilizing a straightforward illustration. Fig. 2 delineates outcome when utilizing network coding. A source produces packets A, B as well as C, encodes these packets into X1, X2 and X3, as well as after that sends them to a sink.1 these packets will reach transfers R1, R2 and R3 at same time within light of show property of acoustic channel. Transfer R1 gets packets X1 and X3 effectively as well as encodes them into packets Y11 and Y12. Essentially, hand-off R2 encodes its approaching packets into packets Y21; Y22, as well as transfer R3 encodes it's approaching packets into Y31; Y32; Y33. Transfers then forward encoded packets to sink. Sink gets three encoded packets Y11, Y21, and Y32. At that point when utilizing a legitimate network coding plan, sink can recuperate three unique packets with high likelihood.

2. LITERATURE SURVEY:

Because of disadvantages of ARQ-based and FEC-based plans, specialists have proposed different plans to enhance heartiness of sensor network [12, 13, and 14]. One plan is multi-way sending [12,13], which utilizes excess packets through different ways to enhance packet conveyance proportion. In any case, as we have found in Fig. 2, multi-way sending alone is not adequate on grounds that copied packets, which will be disposed of specifically, expend vitality yet don't give any creative data. Another plan [14] utilizes various virtual sinks to give lapse flexibility: a source advances packets to different virtual sinks utilizing acoustic correspondence, then virtual sinks forward packets to last destination utilizing high-transfer speed remote radio correspondence. This plan obliges a specific conveyance base. Our plan applies to single sink building design as well as uses a communitarian coding plan to completely use alarm assets within UWSNs.

We apply network coding to UWSNs for solid information exchange as well as exhibit that coupling network coding as well as numerous ways enhances information conveyance proportion as well as gives high vitality effectiveness. Lucani et al. propose a network coding construct technique that depends within light of certain affirmation of beforehand transmitted packets to enhance power utilization execution within UWSNs [19]. They consider a linked transfer system as well as spotlight over time towards finish transmissions of a given number of packets. In this paper, we concentrate on productive slip recuperation utilizing network coding as a part of UWSNs as for packet conveyance proportion as well as vitality utilization.

Various late studies have composed and assessed expansive scale, shared appropriated stockpiling frameworks. Repetition administration methodologies for such frameworks have been assessed in among these contrasted replication as well as deletion codes within transmission capacity unwavering quality tradeoff space. The examination of Weather spoon as well as Kubiatowicz [9] demonstrated that eradication codes could lessen data transfer capacity use by a request of greatness contrasted as well as replication. Bhagwan et al. [4] arrived at a comparative decision within a reenactment of Total Recall stockpiling framework.

Rodrigues as well as Liskov [10] propose an answer for repair issue that we call Hybrid system: one uncommon stockpiling node keeps up one full copy notwithstanding different erasure coded parts. Node putting away imitation can create new parts and send them towards newcomers, consequently exchanging justM/k bytes for another piece. In any case, keeping up an additional reproduction on one node weakens data transfer capacity productivity of eradication codes as well as entangles framework outline. Case within point, if imitation is lost, new

parts can't be made until it is restored. Creators demonstrate that within high-beat situations, deletion codes give a huge stockpiling advantages yet transmission capacity expense is too high to be within any way commonsense for a P2P disseminated capacity framework, utilizing Hybrid technique. In low-beat situations, decrease within data transfer capacity is insignificant. In moderate-beat situations, there is some advantage. These conclusions were in view of an explanatory model expanded with parameters evaluated from hints of genuine frameworks. Contrasted as well as [9], [10] utilized a much littler estimation of k (7 rather than 32) as well as Hybrid technique to address code recovery issue.

3. ANALYSIS

A: Information Flow Graph

Data stream chart is a coordinated non-cyclic diagram comprising of three sorts of nodes: a solitary information source S, stockpiling nodes xi in, xi out as well as information authorities DCi. Single node S relates towards wellspring of first information. Capacity node i within framework is spoken towards by a stockpiling data node xi within as well as a stockpiling yield node xi out; these two nodes are joined by a coordinated edge xi within! xi out with limit equivalent towards measure of information put away at node i. See Figure 3 for an outline. Given the dynamic way of the stockpiling frameworks that we consider, data stream diagram likewise develops within time. At any given time, every vertex within chart is dynamic or latent, contingent upon whether it is accessible within system. At the beginning time, just source node S is dynamic; it then contacts an introductory arrangement of capacity nodes, and interfaces with their inputs (xin) with coordinated edges of interminable limit. Starting here onwards, first source node S gets to be and stays dormant. At whenever step, at first picked stockpiling nodes turn out to be presently dynamic; they speak to a conveyed deletion code, comparing to fancied relentless condition of framework. On off chance that another node j joins framework, it must be associated with dynamic nodes. In the event that newcomer j decides towards interface with dynamic stockpiling node i, then we include a guided edge from xi out to xj within, with limit equivalent towards measure of information that newcomer downloads from node i. Note that by as well as large it is feasible for nodes towards download more information than they store, as within case of the eradication code. On the off chance that a node leaves framework, it gets to be dormant. At long last, an information gatherer DC is a node that relates to a solicitation towards recreate information. Information gatherers unite with subsets of dynamic nodes through edges with boundless limit. An essential idea connected with data stream chart is that of least cuts: A cut within diagram G between source S as well as an altered information authority node DC is a subset C of edges such that, there is no way beginning from S to DC that does not have one or more edges in C. The base cut is cut within middle of S and DC within which aggregate whole of edge capacities is littlest

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4. EVALUATION

We assess execution of different error recovery plans utilizing reproduction as a part of an extensive variety of settings.

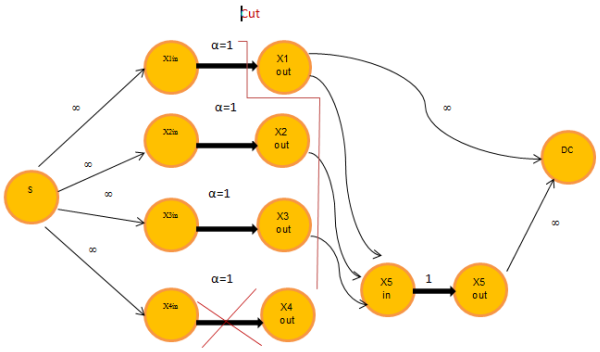

Fig.3. Illustration of the information flow graph G

one another. We next depict these two test systems as well as recreation setting. A while later, we detail assessment results. Our emphasis is on multi-way based plans as our investigation has demonstrated that solitary way based plans are not suitable for UWSNs. In this area, we contrast recovering codes as well as other excess administration plans within connection of circulated stockpiling frameworks. We take after assessment approach of [10], which comprises of a basic systematic model whose parameters are acquired from hints of node accessibility measured within a few genuine appropriated frameworks. We started talk of node motion as well as the destinations significant towards circulated stockpiling frameworks, to be specific unwavering quality; data transfer capacity, as well as plate space. We present model as well as evaluation practical qualities for its parameters. Area IV-D contains quantitative aftereffects of our assessment. We examine subjective tradeoffs between recovering codes as well as different methodologies as well as how our outcomes change finish of [10] that eradication codes give restricted pragmatic advantage.

Labels	Descriptions
R1,R2,R3	Transfers
X1,X2,X3	Forwarded packets
Y1,Y2,Y3	Encoded packets
β	Min. amount of info. Need to be communicated

Table 1: Labels and Descriptions.

We have actualized simulator like Matlab. Matlab-based simulator is more straightforward as well as more adaptable. Matlab-based simulator mimics an improved domain: it uses brought together packet booking as well as sending towards maintain a strategic distance from packet impacts; it expect

same measure of time towards transmit a packet from a node to every one of its neighbors; as well as it just considers vitality utilization amid packet transmission as well as uses quantity of transmissions to speak to measure of vitality utilization.

5. PERFORMANCE EVALUATION

5.1 Network simulation

We have implicated two simulators, one constructed by using Matlab and the other constructed on top of ns2. These two simulators are complementary to each other: the Matlab-based simulator is simplest manner and more elastic, while the ns2-based simulator simulates a more practical underwater environment. We next narrate these two simulators in fact.

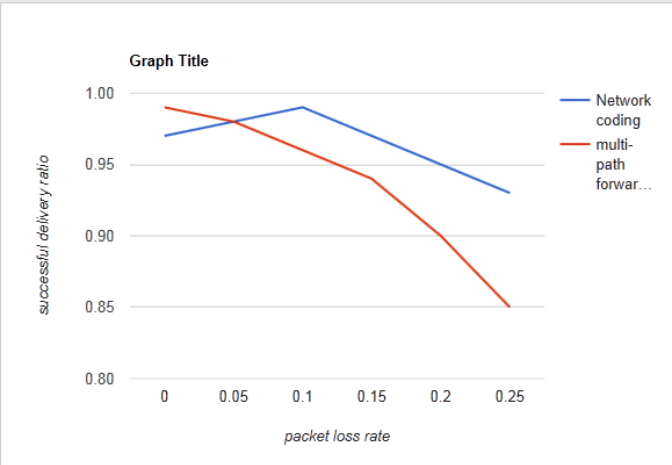

Fig 5: Successful Delivery Ratio.

Fig. 5 plots the successful delivery ratio for network coding and multiple-path forwarding. The 95% certainty interims are from 25 runs. For low bundle misfortune rather (beneath 0.1), multiple-way sending accomplishes a marginally higher fruitful conveyance proportion than system coding; for high misfortune rates, system coding accomplishes a fundamentally higher effective proportion than multiple-way sending. The motivation behind why multiple-way sending beats system coding under low misfortune rates is as per the following. At the point when the parcel misfortune rate is low, multi-way sending gives adequate measure of excess to mistake recuperation, and subsequently accomplishes a high fruitful recuperation proportion. In system coding, a hub sits tight for an era of bundles and afterward sends them consecutive. This prompts more bursty parcel transmissions. In addition, system coding recoups and sends more packets.

Performance Metrics: following table2 describes that proposed system exposes in some performance parameterized wise is enough better than the existing system. Proposed system has been measured in different performance metrics among those some of have been listed in table2.

Parameters	Overcome
Availability	Distributed storage systems provide reliable access to data through redundancy spread over individually unreliable nodes.
Reliability	Storing data using an erasure code, in fragments spread across nodes, requires less redundancy than simple replication for the same level of reliability
Recovery	Recovery can be achieved using simplest form of redundancy. i.e. replication.

Table2.List of performance Metrics

6. CONCLUSION AND FUTURE WORK

In this paper, we propose an effective underwater WSN as Distributed Database and employed network coding for efficient distributed storage and extractions. As forth coming work, we are seeking after in the accompanying bearings: Eq. (1) utilizing system coding as a part of multichannel applications in UWSNs, e.g., charge circulation or programming redesign from a source to every single other hub, which need rich coordinative among the various beneficiaries and also the hand-off hubs, Eq. (2) applying system coding for data gathering in UWSNs, in which one vital issue is era administration to keep away from extensive overhead of coding vectors.

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Aadhaar Identity Processing using Integrated Model

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Abstract-*In India with the population of 1.39 billion a Unique Identification i.e. AADHAAR Identification is a major project. This ID is common for personal and Business usage. In 2009 Government of India by Ministry of Electronic & Information Technology established UIDAI(Unique Identification Authority of India). An Integrated approach to secure Aadhaar Identity using Block chain Technology and Convolution Neural Networks. Model is being proposed using Distributed Ledger Technology(DLT) of Block chain Technology(BT) comprised of 3 phases, In first phase Biometric data and Demographic data of AADHAR is used and data reduction is done. In second phase Convolution Neural Networks(CNN)of Deep Learning with ReLU model to secure biometric data from data cloning and face verification. In 3rd phase Block chain Technology(BT) using Distributed Ledger Technology(DLT) is added to have more security to the proposed model. Thus the Security in Aadhaar Identity can be achieved.*

Index Terms— Blockchain, Distributed Ledger Technology(DLT), Convolution Neural Networks(CNN), UIDAI(Unique Identification Authority of India)

1.0 Introduction to Aadhaar Identification

The need for Official Identification emerged with the Digital era. For the Financial services, Banking Systems, Social benefits, Online Transactions, Healthcare, Education etc. needed Citizen Identification. In 2009 Government of India established a statutory body called UIDAI. A Unique Identification of 12 Digit Number with collection of biometric and demographic data was given to every citizen of India. Aadhaar number always with a 2-9 digits it is not by binary digits and it's a random digits which is not fraudulent , thefting of data and better privacy.[2]

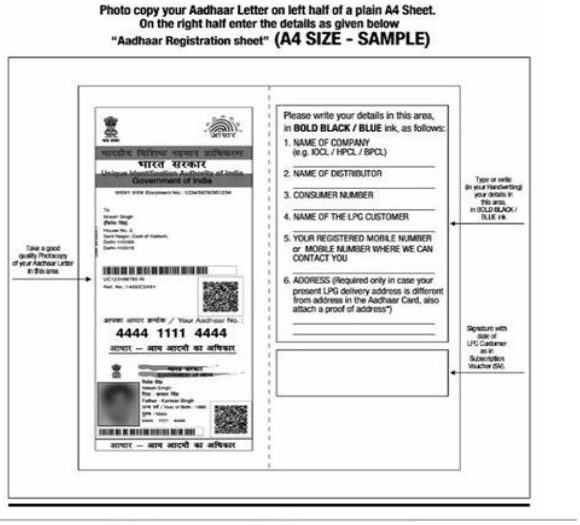
The UIDAI with collaboration of Government of India uses CIDR (Central Identities Data Repository) to issue Aadhaar number to every resident of India. Its robust in pattern Identification and can be authenticated in nearby Trusted Parties deployed by Government. Verification and card issue is postal facilitated. The Letter format comprised of Name, Age, Gender, Address and details to validate document. The mock up copy of Aadhaar card [2] as shown in Fig 1.1

An Aadhaar survey has started in year 2009 till march 2017, with a budget spent on making UIDAI project is approximately 87.939 crore(US $ of 1.4 Billion). [2]

Aadhaar Id Identification method is proposed by the author [1] using supervised learning of Extreme Learning Process and Decentralized application of alternative multiplier path of ADMM.

1.1 How the Blockchain works?

The term Blockchain first coined from a paper "Bitcoin: A peer to peer electronic cash system" published by a scholar or a group aliased as "Satoshi Nakamoto" at the end of 2008.[8] who is a introducer of Bitcoin Crypto currency to the world.



Source:Internet

Fig 1.1. Aadhaar Card Mock up

A Blockchain Technology (BT) is a contemporary approach of Decentralised database System contradictory to the centralized data architecture as CIDR which is governed by Authenticated Agency of India. BT has a DLT to share data or Transaction of currency among all the participants in the Blockchain.

Every transaction in public ledger is subjected to consensus by all the participants in the system of blockchain. The data are permanent and immutable in nature. Each transaction data is updated through verification process so data loss is ruled out.

Bitcoin and Ethereum are the most popular Incentives of blockchain Technology. The important characteristics of blockchain technology are distributed consensus and anonymity.

Keyless Security Infrastructure (KSI) is a feature that helps to overcome the limitations of Public key Infrastructure which is compromised in Securing the Transaction. This is one of the major concepts of Blockchain. KSI uses cryptographic hash function i.e., SHA-256 Hash Algorithm used in Blockchain, security and

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availability of blocks are verified and updated when each node is introduced.[4]

Fig.2 shows the Model of Blockchain [4] which has owner signature to every hash key which is Private and verified the document for signature i.e. sent to next node/ block, this is repeated process and links of block chains appended at end.

Transaction 1 Transaction 2

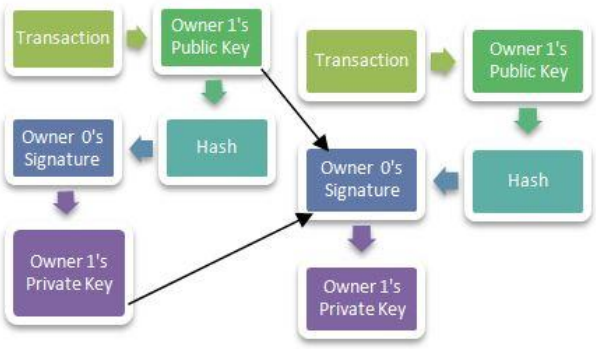

Fig 1.2: Structure of blockchain

1.2 Convolution of Neural Networks (CNN)

Convolution neural networks is a core Artificial Intelligence Technology and Machine Learning(ML). The Deep Learning (DL) has structured way of representative learning.

Franck Rosenblatt considered being notable for his works in Deep Learning. In 1958 The perceptron written by Frank Rosenblatt was first published. 3 major Architectures of DL are Supervised, Semi-Supervised, Unsupervised Learning. Deep Neural Networks(DNN) and Artificial Neural Networks(ANN) are coagulation of Neural Networks. Deep Network has recurrent and convolution neural networks(CNN). Computer Vision , Speech recognition, Natural language Processing (NLP), Machine Translation, Medical Image Analysis are the application fields of neural network.

An unbound layer of numbers of unbounded size shows the depth of deep learning with many hidden layers. As the human neurons have structural analysis, the CNN has generative models like Deep Boltzman machine, deep belief networks. Alex Krizhevsky used computer vision for ImageNet competition . error record from 26% to 15%,one of the major improvement in 2012. K means clustering, bagging, and Deep Learning (DL) algorithms are widely used in Machine Learning(ML). Deep Learning algorithms such as Convolution Neural Network (CNN), Long short-term memory (LSTM) can be used to check for the security breaches in Blockchain.[6]

2.0 Literature Survey

India Chain is a central government's project by NITI Aayog, Use cases and prototypes of the blockchain technology is calibrated through this project. Creating a protocol using national infrastructure for problems using blockchain is challenging. Identity and incentive platform is major role play.

India as blockchain hub: Is the Promotion and Work propagation in BT. Gartner, the research and advisory firm consists of the 5 elements of the true Blockchain: distribution, encryption, immutability , tokenization and decentralization. Blockchain participants are find local connections apart and are connected on a network is defined as distribution, and no single entity controls are achieved in decentralization showing all nodes follow the rules to be clustered. [6]

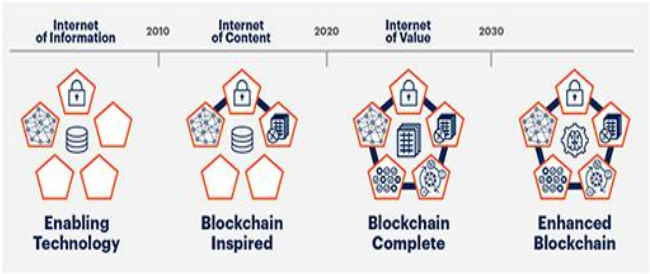

Fig 2.1. Blockchain Spectrum by Granter

Fig 2.1 shows that Gartner Blockchain Spectrum has 3 Phases i) Blockchain-inspired solutions ii) Blockchain-complete solutions iii) Enhanced-blockchain solutions. In the 'Ease of Doing Business' rankings, released annually by the World Bank, India, specifically, has not fared well in indicators to measure the efficiency and Performance of processes to gain trust. While India has settled in the phenomenal progress and has acquired 79 positions since 2015 to 63rd in the 2020 position[7].[8]

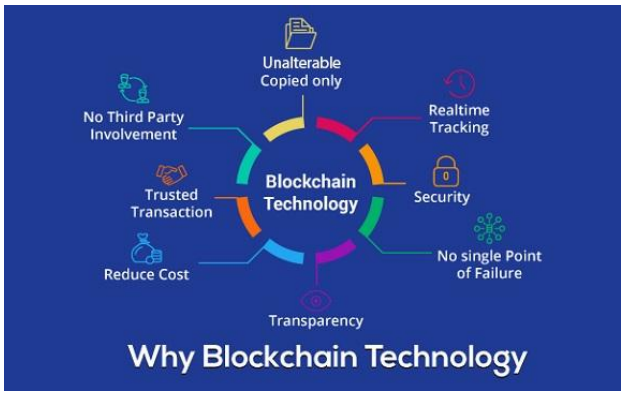

Fig 2.2 Internet of Value

Source: businesstimes.co.zw

2.1 Security Threat of Aadhaar ID.

i. Privacy Concern for Individual:

The biometric data record of each AADHAAR ID having 12 digits Numerical. Government mandated Id information is linked with users of all banks, voter ID, PAN card. If this very private information of these users is used for any unintended legal purpose, The Security threat is for sure. Each Id risks the information can be leaked.

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ii. Centralization Power Problems:

Centralized data collection in CIDR of Aadhaar or Unique Identification Scheme is managed and operated by Supreme Authority of Nation. As the centralization of power can be manipulated and used for Anti Social Networking Purpose

iii. Misuse of Aadhaar in Bank Transactions:

All bank accounts need to be linked with Aadhaar, which will be used in the processing of ATM, as well as in Credit and Debit Cards. This bit will give the access to reach and trace financial transaction of the masses in the country.

Thus the Distributed Ledger Technology (DTL) of Blockchain comes into the picture. The database of the blockchain can be treated as list of transaction among peer nodes of Distributed Ledger. However, instead of maintaining the records in a table, it groups the records into a block in a ledger.

Each new block is chained to a previous block with the use of cryptographic hash; hence the name Blockchain is created. The ledger can be shared with all nodes within the network where it can be verified and validated as well. This provides an audit trail for reliable verification. As larger blockchains require more resources, processing speed is also adversely affected as more time is required to verify and approve transactions. This would be major disadvantage of securing Unique Identification such as Aadhar ID.

The process of generating a block and validating it is called “Consensus” which is invoked by all the participants in the chain. There is an inhibited advantage of blockchain technology **-** its immutability. Once a transaction is recorded and propagated to the network, it becomes permanently stored on the blockchain and can be accessed subsequently for verification. [2][10]

2.2 Existing Works on BC and CNN.

2.2.1 Smart contracts of Block Chain

- Smart contracts, by using digital signatures, could considerably improve the whole process.
- Verification and Validation of Block a small set of code with High Level Language and added that contract to that particular Node.
- Security of data is ensured using blockchain technology, smart contracts can be programmed to directly send the data for building machine learning models.
- This means that this fusion of machine learning and blockchain technology can be a game-changer for numerous other technologies.
- Similarly, industries like finance and insurance have a lot to gain from this amalgamation because together they can be used in designing tools for identification and prevention of fraud.
- Using machine learning, supply chain solutions can be improved and billions of dollars can be saved every year by reducing theft and wastage.[16]

The figure 2.3 illustrates such a combo (GAN-FD architecture), where the generator is founded on LSTM, which applies to predict Yt+1. The discriminator is based on CNN for the purpose of estimating the probability of whether a sequence is real (Y) or being predicted (Y).

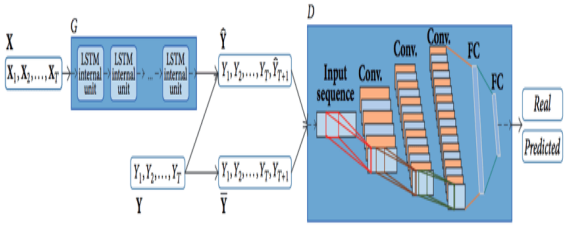

Fig 2.3: GAN with LSTM and CNN

The paper [14] shows that the generative Adversial Network (GAN) has a single Image dehazing algorithm based on feature pyramid network(FPN). FPN is end to end image dehazing method, avoiding the physical model dependency. The results of this work shows that algorithm is obtaining satisfactory results in terms of spped and quality.

The Ethereum crypto currency is invented by Vitalik Buterin. Ethereum solved the major problem of double spending(Spending the same coin twice) in the mainstream bitcoin. This promising technology using Distributed network platform to enable secure Blockchain-based financial and business transactions. However, many identified bugs and vulnerabilities in smart contracts have led to serious financial losses, which raises serious concerns about smart contract security. Significantly required to better maintenance of smart contract code and ensure its high reliability. In this research paper [14] we propose an automated deep learning based approach to learn structural code embeddings of smart contracts in Solidity, which is useful for clone detection, bug detection and verification of smart contracts.[14]

Since Blockchain and CNN are considered as two of the most promising and powerful technologies, there are some research work on ML and BC on various applications as well.

3.0 Proposed System

In 2009 Government of India using AADHAAR ID facing many issues so related to Aadhaar card ID data set for Image maintenance. An Integrated approach to secure Aadhaar Id data using Block chain Technology and Convolution Neural Networks.

Model is being proposed in Distributed Ledger Technology(DLT) of Block chain(BC) having 3 phases, In first phase Biometric data and Demographic data of AADHAR is used and data reduction is done in second

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phase Convolution Neural Networks(CNN) ReLU model to secure biometric data from cloning and face verification and in 3rd phase BT using Distributed Ledger Technology(DLT) is provided more security to the proposed model. Using this Hybrid model Security of Aadhaar ID can be achieved.

Proposed system a concept of integrating BT shows the DLT (Ledgers have report keeping mechanism) of Blockchain in Decentralized system and CNN takes Image datasets of every user of Aadhaar holder Aadhaar authentication can authenticated by themselves using the system. At a high level, authentication can be using Demographics data and/or Biometric (FP/Iris/Face) data, and/or OTP. Face authentication is currently not supported. So provides security by using Maxpool, Flattening , Hidden layer with 3 filters to check for the image detection &verification. Dense classifiers and convolution 2D for ReLU Conv Nets can achieve more security of biometric data in AAdhaar.

Using a Private Blockchain for organizations can give more stable, immutable and secure data in DLT. Integration BT and CNN for more security of Bank data, PAN card Details which are linked through AADHAAR ID. The Biometric data with CNN-ReLU model can also detect data cloning and face verification which is discussed in section 3.1 of the paper. Convolution and batch normalization layers are usually followed by a nonlinear activation function such as a rectified linear unit (ReLU), specified by a ReLU layer. A ReLU layer performs a threshold operation to each element, where any input value less than zero is set to zero. Fig 3.1 shows the Integrated Hybrid Model.

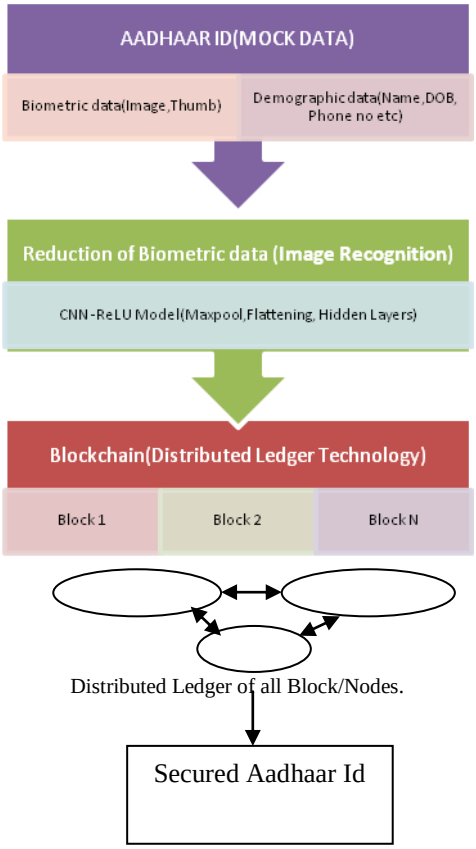

Fig 3.1 Hybrid Integrated Model.

3.1 Practical Implementation of Convolutional Neural Network(CNN)

3.1.1 Image Recognition

A Convolution Neural Network (CNN) that can detect various objects in images. Implementation of Deep Learning model to recognize a cat or a dog in a collection of images. However, using different set of images we can detect anything using CNN Models simply changing the pictures in the input folder. Dataset sample: The dataset contains 10k images of cats and dogs.

Initial step-up is to import Keras Library functions and packages for building the CNN Model. Then first and foremost to import sequential model for Initialization. Second is Convolution2D packages used to make first step using convolution layers. Likely working on 2D images using convolution2D Image format. Convolution3D for video format for recognizing images of video frames. Further steps like maxpooling, flattening and filters in hidden layer of CNN is used with Rectified Linear Unit Model to show sample coding steps as shown below. At last dense package is used to add fully connected layer.[18]

```
# importing the keras Libraries and package
from keras.models import Sequential
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
from keras.layers import Dense
```

```
# initializing the Convolutional Neural Network
classifier = Sequential()
```

```
# Step 1: Convolution
classifier.add(Convolution2D(32, 3, 3, input_shape = (64, 64, 3), activation = 'relu'))
```

```
# step 2: Max Pooling
classifier.add(MaxPooling2D(pool_size = (2,2)))
```

```
# adding a second convolution layer
classifier.add(Convolution2D(32, 3, 3, activation = 'relu'))
classifier.add(MaxPooling2D(pool_size = (2,2)))
```

```
# step 3: Flattening
classifier.add(Flatten())
```

```
# Step 4: Full Connection
classifier.add(Dense(output_dim = 128, activation = 'relu'))    # hidden layer
classifier.add(Dense(output_dim = 1, activation = 'sigmoid'))   # output layer
```

```
# on the basis of training predict img
train_set.class_indices
```

```
{'cats': 0, 'dogs': 1}
```

(Images Source: Medium.com) Coding samples of how CNN –ReLU model.

Thus the CNN Model fits in Actual Image Prediction.

With a blockchain ledger for independent verification of datasets and models used (hash values).The research paper proposed [18] documentation of classification thresholds, and performance results potentially leverage of AI algorithms, rather than using independent contracted research

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algorithms. Blockchain provides facility to test AI models. Data sets and hash values validated on blockchain. Blockchain potentially be compatible with the collaborative training cycle in a federated learning approach too. The blockchain ledger have detailed record of data i.e. who accesses it, at what time, and with which algorithm to ensure secure data use and to allow Monitoring behaviour, activities, or information for the purpose of information gathering, influencing, managing or directing.

The author in paper[19] proposed Aadhaar ID Clone/Duplicate Identification of facial image in one of the classes defined by all person IDs, included in a facial image database. Face verification is a binary problem, where the objective is to distinguish one class (called positive class) defined by the ID of the person of interest from the rest of the world (called negative class got through the IDs of all other persons, not included in the facial image DB). An illustration of the face recognition and face verification problems is shown in Fig 3.1 [19]

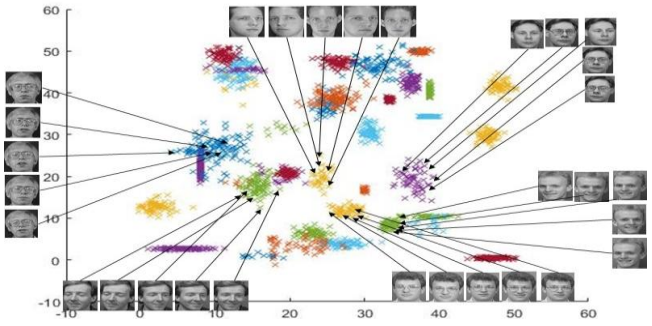

Fig 3.1 Illustration of face recognition and face verification problems.

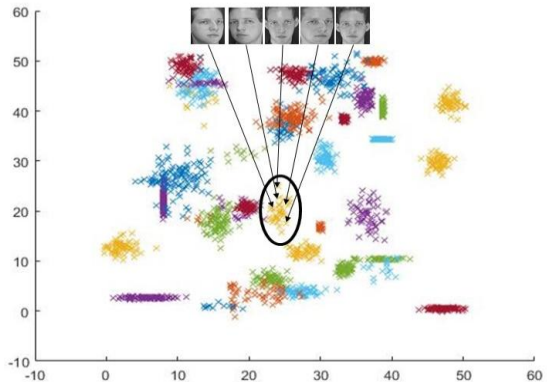

Fig 3.2. Face recognition for Depicted Person

Source:Reference Paper [19]

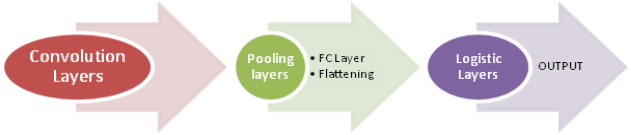

Fig. 3.3 Model building blocks of CNN

Face verification is a binary problem, where given a new facial image the answer is whether the image depicts the ID of interest or not. Here we show the 2-D representations of the facial vectors in ORL dataset. Fig 3.1 & 3.2 sourced by Neural Class-Specific Regression for face verification [19]

CONCLUSION

The proposed review work on introducing a integrated model using Blockchain and CNN in securing Biometric Data set of AADHAAR Id as well the security system of face recognition , data cloning using the ReLU model of CNN. The distinguishing features of the presented technique can be that method utilizes the layer normalization at the initial layer and it provides a method to leads to a better performance rate. ReLU model can be employed for the purpose of detecting images Cloning and Verification. By this we can achieve faster Data Transaction and Security of Image in large Blockchains of Distributed Ledger.

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Visual cryptography for color Images and its implementation

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Keywords: Visual cryptography**,** Stenography, Encryption, Decryption, Resolution.

Abstract: ***Nowadays, Information Security is an imprortant issue. There are several conventional techniques which provide Information Security like cryptography and Steganography. Visual Cryptography is different from both conventional techniques. Visual Cryptography deals with providing security for images. Here, Security is provided by dividing the image in to several numbers of shares. Each individual shares wont reveal any information about original image. User can get back the original image by superimposing all the shares. So, the person having access to all the shares can only get back the original image. Visual Cryptography Scheme (VCS) uses combinatorial techniques to encode confidential written materials.***

In this paper we are taking more consideration implementation of visual cryptography, it establishes a progressive mechanism to share color images at multiple resolutions. We extract shares from each resolution layer to construct a hierarchical structure; the images of different resolutions can then be restored by stacking the different shared images together. So this technique enables flexible decryption.

1 Introduction

Visual Cryptography is a confidential sharing scheme which allows visual information like pictures, text etc to be encrypted in such a way that the decryption can be performed by humans without the need of computers. Visual Cryptography is an encryption technique that doesn't require complicated computations to decrypt a message. The cipher text and the key consist of transparencies. When properly stacked these transparencies reveal the plaintext. Visual Cryptography Scheme (VCS) uses combinatorial techniques to encode confidential written materials. The strategy is to transfer the text material into an image and encode this image into n shadow images. The decoding only requires only selecting some subset of these n images, making transparencies of them, and stacking them on top of each other. Traditional confidential sharing schemes like shamir scheme use polynomial interpolation to decrypt the confidential, whereas the decryption of visual cryptography does not require any computations at all. Moni Naor and Adi Shamir first pioneered the visual cryptographic technique in the 1994. In visual cryptography the confidential is an image, and user shares are black and white images printed on transparencies. To decrypt the confidential one should superimpose a number of transparencies. Thus the decryption is realized by human visualization systems rather than computations. The fundamental idea before visual cryptography is utilize of superimposed images to display the confidential. seaparate image can be traeted as a cipher, and the equivalent image may be considered as a key. It can also be treated as a graphical form of one time pad.

Confidential sharing is one type of key establishment protocols. Here the Trusted Authority (TA) divides the confidential into pieces and distributes the pieces to different users. These pieces are called Shares. Shares contain partial information about the confidential. However, shares are constructed in such a way that although the confidential can be reconstructed by combining a number of shares, simply examining individual user‟s share will not reveal the confidential information at all. Thistechnique incorporates a share control scheme called Threshold Schemes. In a (t, n)– threshold scheme, Combining of t shares will be able to compute the confidential, coalition of (t-1) shares or less should not reveal any confidential information at all [1].

In this confidential sharing threshold schemes use polynomial interpolation to decrypt the confidential. In visual cryptography the confidential is an image and user shares are black and white pictures. These pictures are usually printed on transparencies and superimposing these transparencies will be able to reveal the confidential image. The visual cryptography shares the same security condition as other confidential sharing schemes: in a (t, n)– threshold scheme, superimposing t shares or transparencies, the confidential image will be revealed; stacking up (t-1) shares or less should not reveal any information about the confidential image at all. However, their decryption process is different. The decryption of visual cryptography only needs superimposing a stack of transparencies. Thus it uses human visualization rather than computation for decryption. This is the major advantage of visual cryptography over other confidential sharing schemes The visual cryptography thus allows a fast visual sharing of graphic objects in a secure way without the need of any reconstruction device, which is used to decrypt

the confidential image. If all the shares are given reconstruction of the image is easy, but if one of them is missing then it is not possible to reveal the confidential information.

Literature survey & related work

The concept of cryptography is not new. It was introduced in 1900 BC at the time of Egyptians: a scribe made use of deviated hieroglyphics in an inscription. Julius Ceaser used a simple shifting to characters back in 50 BC. Like visual cryptography, cryptography also played a vital role to transmit confidential messages in the two world wars. In present day communication and transactions, cryptography plays a vital role. Electronic commerce makes extensive use of cryptography to exchange transaction information, like credit card data. Cryptography is also used in digital cash, smart cards, digital signatures, cellular phones, automated teller machines (ATM), cable television, etc.

2 Visual Cryptography

In this project a two-in-one visual cryptography scheme that not only shares an image of moderate confidentiality between two noisy transparencies, but also hides in these two transparencies a more confidential text file describing the image. None of the transparencies alone can reveal anything about the image or text. Later, people can view the image by simply stacking the two transparencies; on the other hand, after certain simple computations, the more confidential text data can also be extracted. This project also introduces an alternative version in which the decoding of both the image and text requires no computer. Visual cryptography (invented by Naor & Shamir in 1994) is a method for securely encrypting messages in such a way that the recipient won't need a computer to decrypt them. The underlying cipher is essentially the one time pad; so the system is unbreakable in the information theoretical sense. Formally, goal is to divide some data D (e.g., the safe combination) into n pieces $D_1,\ldots, D_n$ in such a way that:
(1) Knowledge of any k or more Di pieces makes D easily computable.
(2) Knowledge of any k−1 or fewer Di pieces leaves D completely undetermined this scheme is called (k, n) threshold scheme.

If k = n then all participants are required to reconstruct the confidential.Naor and Shamir proposed several types of Visual Cryptographic schemes: 2-out-of-2 scheme, in which two slides are required to reconstruct the confidential data, while none of these two slides have any information on the confidential data. E.g.:-On-time pad: Here the confidential binary string k = k1k2k3…kn can be shared as {x=x1x2…xn; y=y1y2…yn}, where xi is random and yi=ki XOR xi. n-out-of-n schemes, in which n slides are required to reconstruct the confidential data, while subset of up to n-1 slides have no information on the confidential data. K-out-of-n schemes, in which any subset of k slides can be used to reconstruct the confidential data by fitting them together, while any subset of up to k-1 slides do not have any information on the confidential data [2, 3].

3 Basic idea involved in visual cryptography

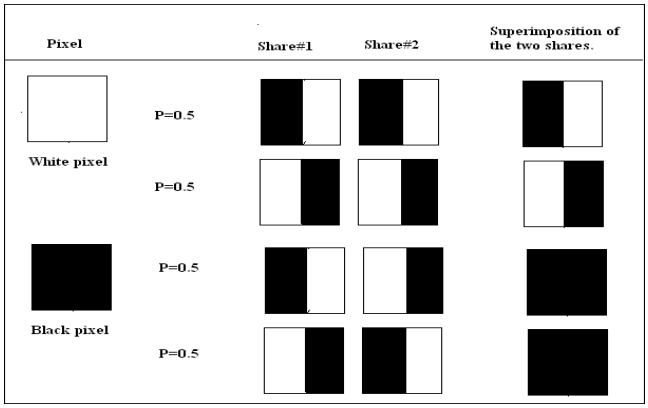

Fig 1: An Example of (2, 2) visual threshold scheme

An image is made up of a number of small parts called pixels. These pixels can either be black or white pixels. Suppose if a black pixel on position x of one user share, superimposing this share with any number of other people‟s shares still ends up with a black pixel on position x. This indicates that there is a black pixel on position x in the confidential image. If this happens then the security condition of the scheme is compromised, since partial deatils about the confidential image is known. To solve this, the basic idea is to spliteach pixel in the confidential image into some sub pixels, and making the resulting image corresponding to this pixel area contain more black sub pixels than white pixels. As long as the gray level of a black pixel is darker compared to gray level of a white pixel, the image should be recognizable.

The above Fig.1 shows an example for (2, 2)-threshold visual cryptography scheme. Here each pixel is seperated into two sub pixels. Each pixel in the confidential image is split into two sub pixels in user shares. There are both two ways to encrypt the black or white Pixels, each with equal probability. Assume the first user‟s share, to encrypt a white pixel there are two ways either two sub pixels with “black and white” or two sub pixels “white and black; similarly, to encrypt black pixel, user can either choose encoding it with “black and white” sub pixels or “white and black” sub pixels. The combination of “black and white” or “white and black” sub pixels does not reveal whether the original image is black or white. This implies that viewing the primary user‟s share; User cannot conjecture the color about the original pixel. The same argument applies to the second user‟s share. This shows that looking independently at each user‟s share; User cannot obtain any confidential. On the

Different side, if user shares 1 and 2 are combined, a black pixel in the confidential image is encoded into two black sub pixels; a white pixel in the confidential image is turned into two sub pixels with “black and white” or “white and black” coloron them. Since the gray level of a black pixel is darker than the gray level of a white pixel, thus the image is recognizable, but the resulting image size gets doubled. What is more, have fifty percent loss of contrast of white pixels here.

The Layout of VCS

Prior to produce few beneficial features of VCS, user wants to establish the notation. Let M be a n × m binary matrix. For X
€{1, . . . , n}, let M[X] represent mvector produced by taking the rows corresponding to the indices in X; thereby M[X] represent the |X|×m matrix generated fromM by taking only the rows analogous to the indices in X. If X = {r}, then rather than using M [{r}] to represent the row r of M, will use the compress notation M[r]. For any binary vector V, with w (V) represent the number of zeroes in V (i.e., the”complement” of the Hamming weight). By abusing of notation, given two matrices A and B having the same number of rows, with A \ B =; Represent the fact that the same column does not appear in both matrices. In this case, the matrices A and B are referred as non-redundant matrices. Finally, with A||B represent the matrix obtained by concatenating the matrices A and B. User restricts attention to (ΓQual, ΓForb, m)-VCS realized by non-redundant basis matrices S0 and S1. In this case, if the access structure is not an (n, n) - threshold access structures, reduces to w(S0X) = w(S1X) = m, for any X 2 ΓQual\Γ0. Will also prove that the matrix S = S0||S1 has to contain some predefined sub-matrices. The columns of such sub-matrices are referred to as “unavoidable patterns”.In practice, use m x n matrix A [i, j] to record the colors of sub pixels. n is the number of users and each pixel is split into m sub pixels. If the ith sub pixel in user j‟s confidential share is black, then A [i, j] =1, otherwise, let a [I, j] =0. The superimposing operation can be representd as the OR operation of all the columns of A. The following basis matrices S0 and S1 realize a VCS for Γ0.

$$S^0 = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix} \qquad S^1 = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}.$$

The unavoidable patterns

$$\begin{bmatrix} 0 & 1 \\ 0 & 1 \\ 1 & 0 \\ 1 & 0 \end{bmatrix}$$

Belongs to S0; while, the unavoidable pattern

$$\begin{bmatrix} 1 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

Belongs to S1; In this scheme, m = 3 and α (m) = 1/3.

Properties

Some of the useful properties of Shamir‟s threshold scheme are:
Perfect: information theoretic security.
Ideal: the size of each piece does not exceed the size of the original data.
Extendable: when k is kept fixed, Di pieces can be dynamically added or deleted (e.g., when scientists are fired or suddenly died) without affecting the other pieces.Security can be easily enhanced without changing the confidential, but by changing the polynomial occasionally (keeping the same free term) and constructing new shares to the participants. Flexible: in organizations where hierarchy is important, user can supply each participant different number of pieces according to his importance inside the organization. For instance, the president can unlock the safe by himself, whereas 3 confidentialaries are required together to unlock it [2].

The requirements should use non-technical terms and diagrams easily comprehendible by everyone. It should avoid terms and complex diagrams that expertise in certain areas. The functional requirements for the application, Visual Cryptography, are ability to operate the system with no prior training and consultation of any help files i.e. it should be possible to use the program successfully to accomplish a task in the first run. Ability to encrypt gif images. Ability to reveal the exact data or image from these shares. Ability to operate the application over different hardware and software platforms. Ability to choose custom images to encrypt.

4 Design of visual cryptography

4. 1 Steps in visual cryptography

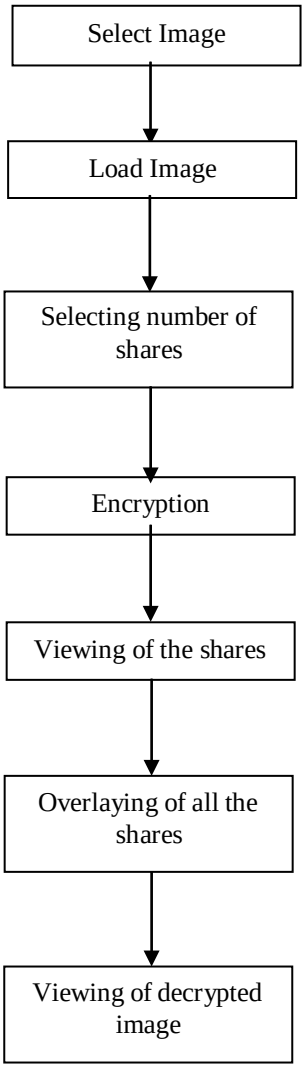

Fig 2: Steps in extended visual cryptography

Fig.2 depicts how extended visual cryptography will work. First the image has to be selected and then loaded into the memory. Select the appropriate encryption scheme based on the image selected. After the encryption, the encrypted shares will be obtained. To decrypt the image, the qualified number of encrypted shares should be overlaid each other. After decryption the original image will be obtained [3].

Encryption

To start off simple lets imagine that user just want to encrypt a single pixel into a (2, 2)-threshold scheme. The confidentialpixel is either black or white, and by white really meantransparent. But user want to encode it into two shares sothat when the shares are overlaid they form either a blackimage or a „gray" image, which is half-white and half-blacksince user can"t reconstruct a white pixel exactly. Each ofthe shares user creates under this scheme will be expandedto four sub pixels. If the original pixel were black we"dcreate the first share white on one side and black on theother and the second share would have white and blackpixels in the opposite positions of the first. If the originalpixel were white we"d create both shares to be white in onespot and black in the other. This way, when we overlay theshares for the black pixel, the white pixels are covered andthe resulting image is black like the original pixel. And whenuser overlay the shares for the white pixel the white pixelsare not covered up so user get an image that is half-whiteand half-black, which user know means the original pixelwas white. This is how user visualizes the scheme, but in thecomputer one uses a data structure to represent the scheme. Encryption can be done in different methods.

1. Pixel Extension Method
2. Performing XOR operation

4.2.1 Pixel extension method

This is most efficient and also popular method. Here every pixel of the picture is divided into different sub pixels. The number of sub pixels to be made is chosen on users wish. There are different types in pixel extension method. The following concisely explains each of the pixel extension methods the user may select. The names chosen are may be not preferably illustrative, but probably the descriptions of each scheme will help to control this:

Random basis column: This technique builds part with proportions similar to the confidential image. This is how it works: for each pixel in the confidential image it erratically selects one column from the suitable basis matrix and encrypts the pixel onto share *i* according to value of row *i* in the column it randomly selected. By eliminating the other columns not all data is retained and the confidential image will not be as sharp when it is reconstructed. However, as long as the image is not too small and the scheme is not to complex, the confidential image should still be easy to see when qualified setsof shares are combined.

Pixel Sampling: This technique builds part with proportions that are nearly similar to the confidential image, though usually a little bit distinct. It works by creating the

sub pixel extension a square and choosing one pixel from each square of equal size to the sub pixel extension on the confidential image and encoding just that pixel (and none others inthe square) so that its sub pixel extension takes up the space of the square where that one pixel was selected from. I know this is not a clear explanation. It's simpler for me to picture in my mind than to explain it in words. Anyhow, the consequence is identical to that of the earliest scheme: there is a loss of detail when the confidential image is rebuilt but considering the picture is not too small and the scheme is not too complex this distribution method is still powerful.

Square subpixel extension : This technique produces shares with the same height/width ratio as the confidential image by replicating the subpixel extension , *m*, over *m* times for each SI pixel on each share, producing the net subpixel extension (essentially) a square. This plan of action maintains the detail of the confidential image when it is rebuilt, nevertheless there is always a loss of variance. The only obstacle is that the shares can get huge for compound VCS's

Decryption

The decryption is done by collecting all the shares and overlaying all the shares. The share can be accessed in different ways: i.e. either all of the shares could be used to decrypt or only restricted or qualified set can be used to decrypt. The different access structures are:

- *(2,2)-threshold VCS:* This is a elementary threshold scheme that takes a confidential image and encrypts it into two shares that disclose the confidential image when they are overspread. No auxiliary data is needed to generate this kind of access structure.
- *(2,n)-threshold VCS*: This strategy encrypts the confidential image into *n* shares such that when any two (or more) of the shares are overspread the confidential image is disclosed. The user will be prompted for *n*, the number of participants.
- *(n,n)-threshold VCS*: This strategy encrypts the confidential image into *n* shares such that only when all *n* of the shares are combined will the confidential image be revealed. The user will be prompted for *n*, the number of participants.
- *(k,n)-threshold VCS:* strategy encrypts the confidential image into *n* shares such that when any group of at least *k* shares are overlaid the confidential image willbe revealed. The user will be prompted for *k*, the threshold, and *n*, the number of participants.
- *General Access Structure*: This scheme encrypts the confidential image into *n* shares such that the confidential image is only revealed when a group of shares that is a superset to a *minimal qualified set of participants* are combined. A *qualified* set of participants is any group that reconstructs the confidential image by overlaying their shares. A *forbidden* set ofparticipants is any group that cannot reconstruct the confidential image by overlaying their shares.

Every set of participants is either a qualified set or a forbidden set. A *minimal qualified set of participants* is any set of participants that is qualified but has no qualified proper subset (i.e. if any participant is removed from the set, it becomes a forbidden set). For this scheme, the user will first be prompted for *n*, the number of participants, and will then be asked to select all of the minimal qualified sets of participants for the desired scheme from a list box.

5 Implementation

Load image

Here, GIF Image files are selected using Jfilechoser and load the selected image into the Jpanel.

Mode of encryption

Here, image is encrypted into the number of shares. And also implementing threshold scheme. In this project, it has been implemented for both black and white and color GIF images. Have done for different modes like:

- 2 out of 2 for black and white images
- 2 out of 3 for black and white images
- 3 out of 3 for black and white images
- 2 out of 2 for color images

Save operation

Here in this project user can save the transparencies individually or all transparencies created can be saved.

Zoom operation

To use this option first users have to click on any transparency using the left button then click on zoom option. Here the transparency can be viewed in double size. User can examine sub pixels accurately by applying zoom on the transparency.

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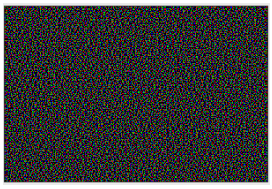
Overlaying of transparencies

Here one can decrypt the image by overlapping all the transparencies. We have used radio buttons to choose each transparency. According to the mode of operation selected, overlap the created transparencies. If considering less than the specified transparencies image cannot be revealed.

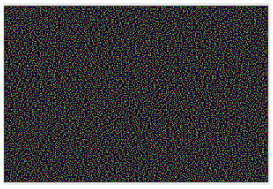
6 Results

2-out-of-2 Color VC Scheme

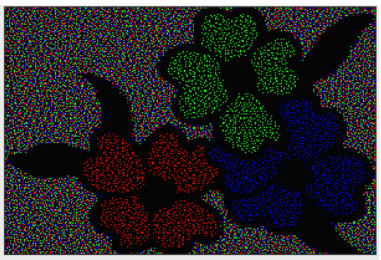
Original Image



Share1



Share2



Decrypted Image

Snapshot 1: Depicting 2-out-of-2 Visual Cryptography scheme for color image

Snapshot.1 shows that 2 out of 2 shares for a color image. When both the shares are overlapped the original image is obtained.

7 Conclusion

The project "Visual Cryptography" is an encryption technique where user is encrypting confidential images and decryption can be done by human visualization without the need of computers. Here user is dividing image into a number of shares where each share contains a part of the image. To decrypt, all specified transparencies are necessary. This technique is used in several fields like verifiable receipts in electronic voting, bank customer Identification, and sharing confidential documents. Considering the current trends and the developments the future might offer, this is a secure system with a promising bright future in the coming networking era.

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Security challenges and issues in Iot:A Survey

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Abstract: *The Internet of Things (IoT) is current trending technology which plays an important role in connecting the unconnected things and variety of objects into a network to provide services with its constrained nature. As the nature and the components used in IOT is multidisciplinary which has introduced new security challenges. Incorporating security features like authentication, confidentiality, encryption, authorization, network and application based security for devices and the threats involved in IoT is challenging. The main problem in IoT devices is the performance parameter which make it difficult to apply on the already available security method Due to the heterogeneity of devices used in Iot ,and limited resources and ,bandwidth the devices supports only lightweight algorithms. In this paper a survey on variety of attacks, threats on the IoT system and different types of attack or intrusion detection methods.*

Keywords: IoT security,Vulnerabilities ,attacks,Intrusion

I. INTRODUCTION

IoT is a emerging area that is currently booming with a wide applications. IoT[2] is a system of connecting sensors, devices, , physical objects, controllers, actuators, and digital machines and internet that is used for collecting and exchanging data with other devices without requiring human or interaction of human.

IoT is growing rapidly from few years and it is been used in different areas such as cities, healthcare ,houses, roads etc.IOT growth has made as future technology for the upcoming years. The devices used in IOT has sensors which is used to collect data and the data collected is transferred through internet for controlling and monitoring .Data aggregated from real time application is used to take the right decision about the device. The data received through internet has to be converted to the form which is easily understood by the human. By this user's knowledge about the devices will be known.

The architecture of Internet of things as shown in the below figure is based on three layers:

- Physical/perception Layer: In this layer sensors are used which is used to collect data and turn into useful information.
- Network Layer: In this layer the data are collected and aggregated from different sensors is converted to form of data processing.
- Application Layer: In this layer it provides services to the request from the users.

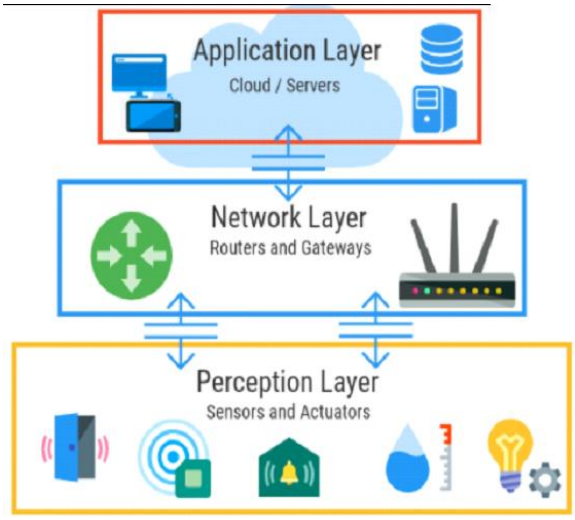

Figure 1:IOT Architecture

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Internet of things systems contain multidisciplinary arrangements which makes it complex .Due to heterogeneous nature of IOT devices ,leads to many attacks and threats. Hence implementing security in such system is challenging.

The requirement for security can be satisfied by including the entire concepts of security at every layer. Iot system usually work in disregarded environment which paves the way for attacker or intruder to access the devices physically. Normally devices in the Iot system gets connected in wireless medium which allows the intruder to get the confidential or sensitive information from the channel where it gets communicated by secretly listening over the conversation.

Due to the constrained nature like limited power ,computing capability of Iot devices system are more prone to attacks and cannot sustain the complex behavior .As the important objective in IoT is to connect everyone, anyone and anytime more threats, vulnerabilities and attack surfaces are created.

The threats are a process which exploits weakness in the system and creates negative impact on IoT sytem .Threats is classified into two types passive and active threats. Example for passive threat is eavesdropping and DoS attack, Sybil attack is best example for active threats. Threats or attacks can create problems in meeting requirements of security such as authentication, authorization,data intergrity.

The main purpose is to summarize the different types of attacks, vulnerabilities in IOT and survey on different methods used in detections of different attacks and threats.

II. CHALLENGES IN IOT

There are certain significant challenges and problems that the IOT[2] is currently facing. As devices can be connected everywhere and anywhere the most challenging is on scalability and availability for communication between the devices.

In IoT large numbers of sensors are connected, where Data generated from Iot system are of huge and need to be analysed to extract valuable data. Data can be of personal ,industry ,environment, enterprise related. Hence securing the data from theft or make it confidential is also biggest challenge. The biggest challenge in IoT system is to provide security. Security also plays an important role in data transmission.

The challenges related to Iot are summarized as follows:

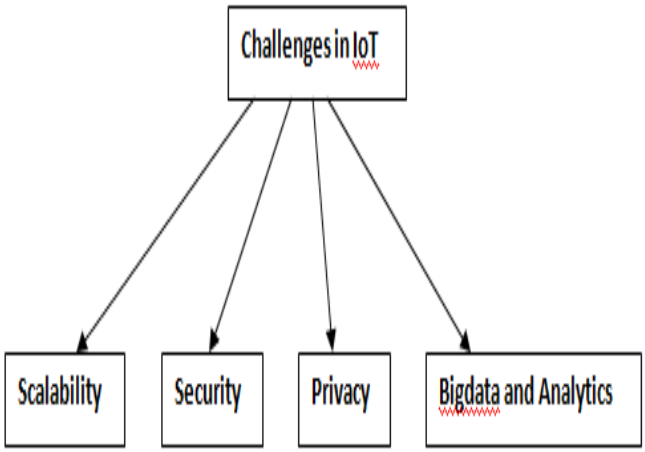

Figure 2:Challenges in IoT

Data Privacy: Data transmissitted from different devices should be secured. Achieving data security is achallenging task.During data transmission it is necessary to hide the data from the different attacks over the internet.Traffic generated by the Iot device [1]is also increasing due to more usage of these devices. Data security can be of three types:

- System security
- Application security.
- Network security

System security deals with various challenges for design of security models or frameworks and protocols followed to maintain the overall network security .

Application security deals with Iot application issues of security as per the requirementsNetwork security works on securing the network communication of various devices in IoT.

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III THREATS AND ATTACK SURFACE IN IOT.

Threats in Iot[2] is categorized as physical threats and cyber threats. Further Cyber threats are classified as active or passive.

A threat which is performed by eavesdropping through communicating channels or through network is termed as passive threat. An attacker collect information by tracking the sensor or through sensor holders.

Active threats are skillful in modifying the configuaration controlling communication and service denial. Some kind of attack include disruption of services, modifications and intervening the sequence.

Physical threats[3] mainly deals with physical destruction. In this type of threat attacker will not have technical knowledge and capacity to do cyber attacks. Here the attacker have the capacity to destroy physical objects , related Iot components which leads to service termination.

A Attack surface: Attack surfaces in IoT[2] is classified as physical layer surface ,network surface services, cloud layer service, web and application layer interface.

The physical devices used in the IoT have constraints on resources and contain sensitive information, which enables the attacker to create attack surface .An Iot system is connected using both wired and wireless ,where the wireless network create vulnerabilities and are prone to large attack.The protocols used for transporting data in IoT is TCP/IP .The usage of such protocol allows to connect many millions of objects and creates more vulnerabilities and attacks such as malware, intrusions, viruses ,hacking, replay attack and identitiy theft.

B Security issues at IoT layers.

Every layers in IoT is prone to many attacks.[1]

Layers in IOT	Types of attack
Perception /sensor layer	Malicious code injection attack ,False data injection attack, side channel, attack, Eavesdropping and interference, Sleep deprivation attack and Booting vulnerabilities.
Network layer	Phishing site attack, Access attack, DDOS/DOS attack, data transit attacks, unlawful attacks
Middleware	Flooding attack in cloud, Cloud Malware injection,signature wrapping attack,SQL injection attack,Man in the middle attack.
Application	Data theft attacks, Access control attacks, service interruption attack, illegal intervention attacks, DDOS attacks, Malicious code injection attacks, Reprogram attacks.

IV RELATED WORK

A Security mechanism in IOT

In this survey many attack detection frameworks are proposed to incorporate security in the IoT network.Hernandez-Ramos proposed a IoT Architecture reference framework which provide security and privacy in IoT .This can be used in smart homes and smart buildings to secure the data by authorizing the IoT nodes. The framework mainly uses the concept of security key to identify and authenticate the Iot devices.

Due to the limited resources and constrained nature of IOT devices ,only light weight algorithms can be used to provide security. Zhang proposed an algorithm to prevent DoS (Denial of service) attack. In this work nodes are divided into working normal node, legitimate node, illegitimate node and monitoring node.Dos attack is also addressed in this work

The proposed work focused on secure RPL routing against Rank attacks .A parent node selection[10] method using trust based threshold scheme is uses to obtain security against rank attacks.In this work attacker node is identified during selection of parent and different attack such as rank attacks are prevented .Limitation of this approach is attacks like Sybil and black hole is not detected .

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Trust(PROTECT) based mechanism[4] is proposed to provide enhanced security to defend against Sybil attack and rank attack.This mechanism provides security by maintaining routing secure with the help of trustworthy nodes. Sybil attack and rank attack leads to destruction situation in the Iot network.Nodes trustworthiness is evaluated with the parameters used in identifying the attack.The main advantage of this proposed scheme is by comparing the proposed methods performance with the secure trust protocol performance with respect to accuracy detection , consumption of energy and throughput.

B Security using machine learning approaches

Machine learning approaches are used to identify and detect the intrusion and anomalies in the Iot network .Many security frameworks are proposed using machine learning approaches .

Liu and L.T. Yang[5] proposed a framework for detecting Off and On attack with the help of malicious node in the network for industrial IoT . By this it is understood that On and Off attack in the IoT network could be easily attacked by a attacker node either in active or passive state.more, Light probing route method is proposed for calculating the trust estimation of each node and to identify the anomalies in the network.

Anthi[6] proposed intrusion detection system called Pulse for IoT. This model makes use of machine learning methodology supervised learning algorithm and rule based approach .Both combined approaches provide flexible model to predict the abnormal or malicious behavior in the network.It has found that this approach learns the network behavior of the IoT and identify network probing and DoS attack .

Diro and Chilamkurtial. [7] proposed distributed attack detection scheme for detection of attack using deep learning methods.In this method focus is to detect different types of attack and anamolies in the network. The proposed system proved that accuracy obtained is of 98.27% for identification of attack

K- nearest neighbor[8] method is one of the popular and efficient mechanism for detection of intrusions.. K-nearest algorithm is used as classification algorithm for classifying traffic of the network with detection of high accuracy in identifying malicious behaviour. KNN algorithm takes the data classifies the sample on vote basis of its nearest neighbours; . The algorithm decides the unknown data samples based on majority voting of its neighbors which are near.

Pajouh [9]proposed a framework for detection of intrusion on the basis of 2 layer dimension reduction and two tier classification modules. This framework is used to find find the malicious activities or anomalies. Linear discriminate analysis and component analysis is used. This model was also designed to identify malicious activities such as User to Root (U2R) and Remote to Local (R2L) attacks. For dimension reduction, component analysis and linear discriminate analysis have been used. NSL-KDD dataset was used to carry out the whole experiment. For detecting suspicious behaviors with the two-tier classification

Decision tree based[11] method uses aconcept of decision tree to build a prediction model to learn data from training samples by exhibiting it as leaves and branches.Decision tree needs huge storage due to its build nature.In this model is trained priorly to predict the new class sample.In this work intrusion detection method is proposed and it also identifies suspicious traffic.

Anomaly-based network intrusion[12] detection method is sued to detect intrusion in network and safeguard against varieties of malicious attacks and abnormalities. Machine learning algorithm are used to detect and identify anomalies on the dataset of network intrusion. The experimental result showed that accuracy of 99% is achieved with higher efficiency.

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V. CONCLUSION

The main focus of this survey paper is on security issues of IoT specifically on the threats, attacks types on each layer The survey paper reviewed about the different anomaly and intrusion detection methods.Using machine learning approach higher accuracy of attack and malicious activity discussion.

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[12] Zhipeng Liu, Niraj Thapa, Addison Shaver, KaushikRoy, Xiaohong Yuan, Sajad Khorsandroo Anomaly Detection on loT Network Intrusion Using Machine Learning.

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Wi-Fi Technology Enabled Home Automation for Smart Living

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Abstract:

This project work revolves around making a home automation framework model with an idea being the capacity to bolt/open an access to home through technology. The framework comprises of a focal gadget, a worker and an Android application. The need of headway for remote operation, there are few associations are presented like Global System for Mobile (GSM) correspondence, Wireless-Fidelity (Wi-Fi) and Bluetooth [1]. Every one of the association has their own remarkable determinations and applications. Among the four mainstream remote associations that regularly executed in Home Automation System (HAS) project, Wi-Fi is being picked with its appropriate capacity. The abilities of Wi-Fi are all that anyone could need to be carried out in the plan. Additionally, the greater part of the current PC/scratch pad or Smartphone accompany worked in Wi-Fi connector. The proposed approach in a way decrease the expense of this framework. This task includes the plan of home mechanization and security framework utilizing Raspberry Pi and Arduino, a credit estimated PC. Raspberry Pi gives the highlights of a smaller than normal PC, extra with its General-Purpose Input Output (GPIO) pins where different parts and gadgets can be associated. GPIO registers of Raspberry Pi are utilized for the yield purposes. This task plans a plug extension that can be handily associated with GPIO Pins of the Raspberry Pi. The home apparatuses are associated with the info/yield ports of Raspberry Pi alongside the plug extension and their status is passed to the Raspberry Pi. The android running OS in any telephone associated with an organization can get to the situation with the home machines through an application. It presents the plan and execution of mechanization framework that can screen and control home machines through android telephone or tablet.

Keywords: Appliances, Prototype, HAS, GPIO, Android, Consumer electronics.

I. Introduction

The "Home Automation" [2][3] idea has raised in the recent years with the advent of technology. The expressions "Keen Home", "Wise Home" followed and has been utilized to present the idea of systems administration apparatuses and gadgets in the home. HAS addresses an incredible examination opportunity in making new fields in designing, and Computing. HAS incorporates unified control of lighting, machines, security locks of entryways and entryways and different frameworks, to give improved solace, energy proficiency and security framework [8]. HAS turning out to be mainstream these days and enter rapidly in this growing business sector. Nonetheless, end clients, particularly the crippled and old because of their intricacy and cost, don't generally acknowledge these frameworks. Because of the progression of remote innovation, there are a few diverse of associations are presented like Global System For Mobile Communication (GSM), Wireless Fidelity (Wi-Fi), and Bluetooth. Every one of the association has their own interesting details and applications. Among the four well known remote associations that regularly executed in HAS project, Wi-Fi is being picked with its reasonable capacity. The capacities of WI-FI are all that could possibly be needed to be executed in the plan. Additionally, the greater part of the current PC/journal or Smartphone accompany worked in Wi-Fi connector.

It will by implication lessen the expense of this framework. This task covers the plan of home mechanization and security framework by utilizing Raspberry Pi and Arduino, a credit estimated PC. Raspberry Pi gives the highlights of a small PC, extra with its General-Purpose Input/Output (GPIO) pins where different parts and gadgets can be associated. GPIO registers of raspberry pi are utilized for the yield purposes. The work have planned a plug extension that can be effectively associated with GPIO Pins of the Raspberry Pi. The home machines are associated with the information/yield ports of Raspberry Pi alongside the plug extension and their status is passed to the Raspberry Pi. The Android running Operating System (OS) in any telephone associated with an organization can get to the situation with the home apparatuses by means of an application. It presents the plan and Smart Home Automation Using Wi-Fi Technology execution of mechanization framework that can screen and control home apparatuses through android telephone or tablet.

II. Background Study (Literature)

In Bluetooth [1] based home mechanization framework the home apparatuses are associated with the Arduino Bluetooth (BT) board at input yield ports utilizing transfer. The program of Arduino BT board depends on undeniable level intelligent C language of microcontrollers; the association is made through Bluetooth. The secret key security is given so that approved client is permitted to get to the machines. The Bluetooth association is set up between Arduino BT board and telephone for remote correspondence. Python script is utilized and it can introduce on any of the Symbian OS climate which is convenient.

To screen and control of the home apparatuses, the framework is planned and executed utilizing Zigbee [7]. The gadget execution is record and store by network facilitators. For this the Wi-Fi network is utilized, which utilizes the four-switch port standard remote Asymmetric computerized Subscriber Line (ADSL) current switch. The organization Service Set Identifier (SSID) and security Wi-Fi boundary are preconfigured. The directive for security reason first interaction by the virtual home calculation and when it is proclaimed safe it is re-scrambled and forward to the genuine organization gadget of the home. Over Zigbee organization, Zigbee regulator sent messages as far as possible. The well-being and security of all messages that are received by the virtual home calculation to decrease the cost of the framework and the rudeness of separate establishment of the framework Zigbee [7] correspondence is useful.

III. Methodology

The user has to register through the App and after successful registration, user has to login. Once the user logs in, user have to connect to Wi-Fi network node mcu via Android devices. Then the firebase connections and the permissions to user will be handled by the admin. Different kinds of sensors are needed to obtain physical condition of temperature sensor which detects the temperature value, gas sensor detects smoke and for avoiding fire outbreak of cooking gas have been used. This information is gained by using micro-controller. The user can control all the devices through the App. User can also add new devices to App. The user can add any number of rooms to app according to the availability. Admin can view all the data stored in the firebase. Each end-user has the specific access permissions likely to add the devices & add rooms etc. User friendliness is another peculiarity of this system. Messages are displayed in the message boxes to make the system user friendly.

IV. Implementation

The implementation involves the following procedure:
In the Home Automation System, client's necessities of turning on/off a light or changing the volume of a music player can't be fulfilled until the worker is combined with the equipment to play out the real activities. For

this reason, the project interfaces various miniature regulators, transfers, sensor, organizing strategies and correspondence gear with the worker as portrayed in figure 1.

The equipment execution isn't just about interfacing the wires and the parts together; it shapes the premise of numerous client case and framework prerequisites. It requires appropriate and exact planning that is done while remembering the clients prerequisites as well as the parts of the framework execution. These are going from the frameworks power-execution proportion, cost of execution, framework convenience, framework dependability and framework adaptability. There is a moderate level of programming associated with building up the equipment to run the accessories with which it is connected.

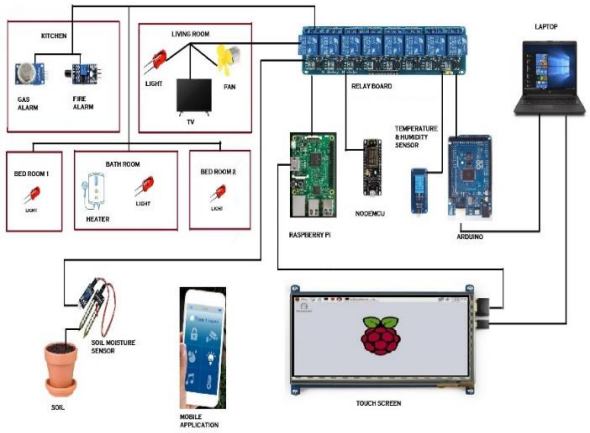

Figure 1: Architecture of the System.

The project demands necessary experimental set up which is reasonable and well within the reach for smart living. The significant advancement in consumer electronics items that demands and recommends the people in the society to elevate themselves for smart living. The home need electronic gadgets which are associated with advanced technology that influence the people in the society for efficient utilization. The result observed in the application developed can run on a smart phone shown in figure 2.

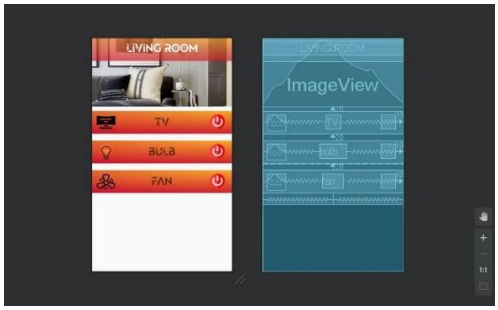

Figure 2: Living room switch control screen.

V. Conclusion

As the use of technology increases from last two decades, this wireless network becomes very popular to provide better life. The main effort of these innovations is to provide low-cost home automation devices such that it becomes affordable for large number of populations. A novel architecture for a home automation system is proposed and implemented, using the relatively latest communication technology. The platforms are Free Open-Source Software. The overall implementation cost is low and can be easily configured. This project implements smart home ideas interfacing it with the kit and making Home to perform automated Operations which help people to easily monitor home appliances without any learning. The use of available technology for the purpose of home automation makes the life of common man more comfortable. People in the society can lead the life in a smart way for better living. This work provides simplicity, flexibility, reliability, and a low-cost system that is within the reach to middle-class families too.

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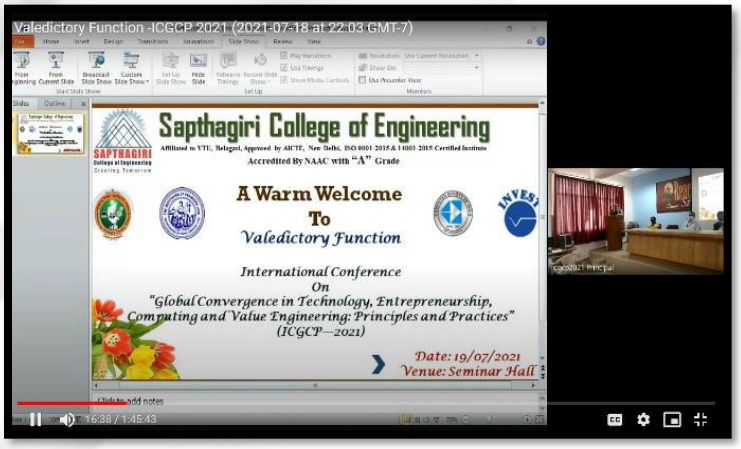

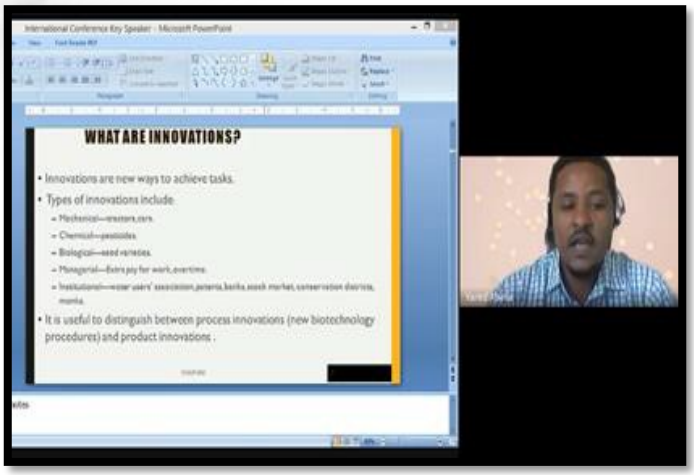

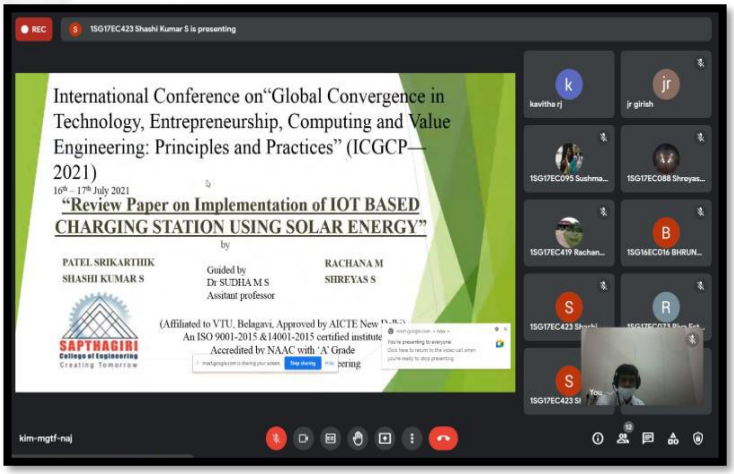

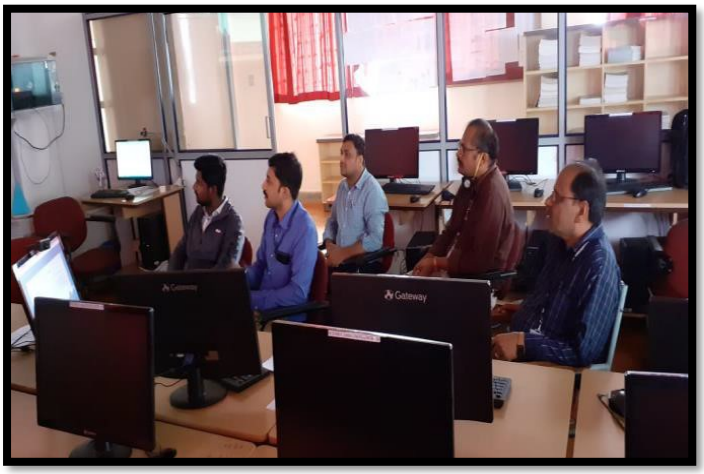

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