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In Association With

International Conference on

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

(ICGCP—2022)

24th - 26th June, 2022

Conference Proceedings

Jointly Organized by
Department of
Computer Science and Engineering
&
Information Science and Engineering

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 - 2022 (ICGCP – 2022).** The conference was held on 24^{th} and 26^{th} June, 2022 in virtual mode. To encourage the young research minds and to bring all researchers, academics, scientists, industry experts, in common platform, the college organized this conference.

Present global scenario demands unprecedented actions and efforts across multiple convergences of 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. Also this is the era of start – ups, to achieve ambitious dream of Make in India concept. The conference covered all emerging areas of Science, Engineering and Technology.

The response to call for papers was excellent. More than 500 papers were received across the country, out of which 300 papers were selected for presentation and publication in the proceeding. These papers provided wide spectrum of research covering all the areas for which the conference was intended for.

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. We also express our sincere thanks to the members of the organizing team for their hard work.

Conference Chair of ICGCP – 2022
Dr. Ramakrishna H
Principal,
Sapthagiri College of Engineering, Bengaluru.

Conference Co-Chair
Dr. Tulsidas.D
Prof. & Head, Department of Mechanical Engineering
Sapthagiri College of Engineering, Bengaluru

Message from Chairman

It gives me immense pleasure in congratulating the Chairman and team members of ICGCP- 2022, 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 department, teaching and non-teaching faculties and other supporting staff of Sapthagiri college of Engineering for joining their hands in successful execution of the international conference.

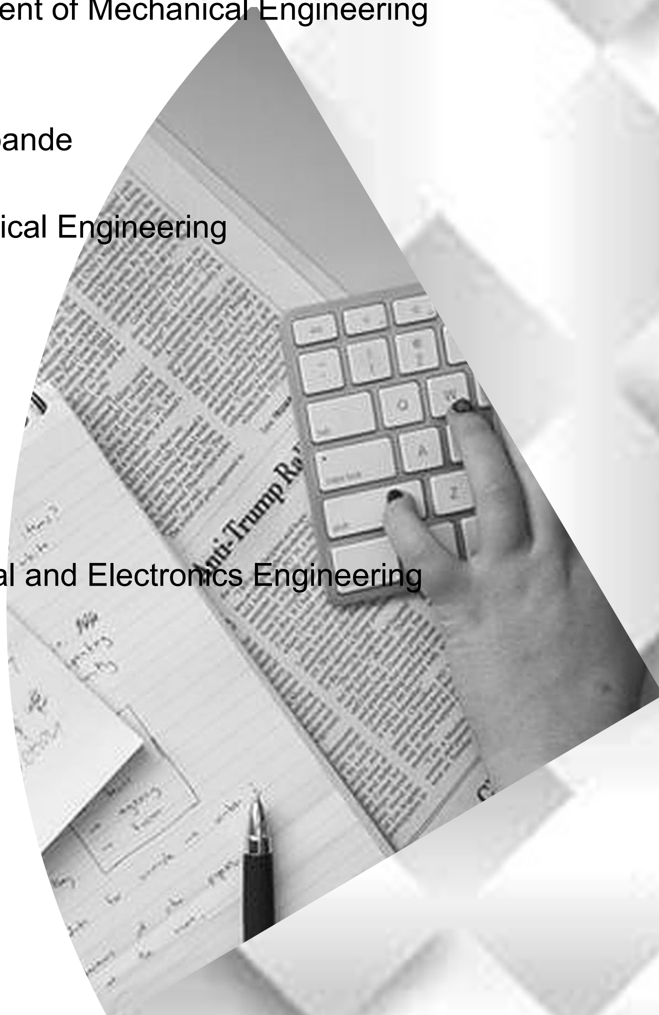
Message from Managing Director

On this occasion, I express my heartiest congratulations to all the participants of ICGCP-2022 for publishing their research findings in the international conference. I hope that, the two days international conference has motivated faculties, research scholars and students to continue their research work. Also on behalf of management, I would like to extend my appreciation towards the sincere efforts of Principal, Heads of Department and Staff members of Sapthagiri College Engineering.

Message from Principal

At the outset I would like to congratulate the entire team of ICGCP-2022 for the successful conduction of international conference that witnessed an active participation of more than 350 research scholars across the state and also from outside Karnataka. 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 international conference. I would also like to congratulate all the faculties, research scholars and undergraduate students for publishing their research works in the conference and I hope that the two days interaction has motivated them to further pursue their research work and contribute to the society. Also I would like to appreciate the efforts of session chairs / reviewers / heads of department / technical support for their contributions in adding value to each session. Finally, I would like to congratulate the team ICGCP-2022 for bringing out the proceedings of international conference in a precise manner and for making it available for the researchers' community across the globe.

Editorial Board



Glimpses of ICGCP - 2022

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A Review on QoS in Wireless Sensor Networks

Gayathri R [1], Dr. Shreenath K N [2]

[1]Resaerch Scholar, Department of ISE, Sapthagiri College of Engineering, Bangalore, Karnataka-560057, India

[2]Associate Professor, Dept of Computer Science and Engineering, SIT, Tumkur, Karnataka-572103, India

gayathrir@sapthagiri.edu.in, shreenathk_n@sit.ac.in

Abstract- Wireless Sensor Networks (WSN) is a prominent area of new interests and research. Advances in technology and availability of tiny, inexpensive sensors pave the way for intelligent life. WSN has applications in military, healthcare domains. Also, there are numerous operations where accurate and timely delivery of the sensed information is necessary. So, reliable and timely delivery of sensed information is the primary requirement of WSN. Quality of Service (QoS) provision usually consumes energy but energy is a scarce resource in WSN; so QoS based routing algorithms should be energy efficient. Due to distributed nature, dynamic topology and resources constraints of tiny sensing nodes in wireless sensor networks (WSNs), the quality of service (QoS) support is a challenging issue. However, satisfying the stringent QoS requirements is an open problem. In this paper, we focus on the QoS satisfaction in WSNs, basics of QoS support in WSNs, and more importantly challenge, requirements of QoS at each layer. The paper is concluded with open research issues.

Keywords- WSNs, QoS

I. INTRODUCTION

The WSNs are defined to be wireless networks composed of a very large number of interconnected nodes which can sense a variety of data, communicate with each other and have computation capabilities. The sensors are usually deployed into the scattered area, known as sensor field. These sensors gather data from an environment and forward it to the Base Station (BS) through multi-hops. The BS, also known as the sink, usually communicates with the users through a satelliteor an internet connection [1].

Due to diverse and a wide range of applications Wireless Sensor Networks (WSNs) have gained considerable attention in recent years. Advances in miniaturization technologies, especially in Micro-Electro-Mechanical Systems (MEMS), have made it possible to develop Multi-functional Tiny Smart Sensors (MTSE). The MTSE now utilize WSNs and are envisioned to completely replace their conventional networks with WSNs. This will enable WSNs to become an integral part of human lives.

The WSNs based on their applications can be divided into two main categories i.e. tracking and monitoring [2], [3]. Monitoring application includes inside and outside environmental monitoring such as industrial unit and development monitoring, seismic and structural monitoring, physical condition monitoring and control monitoring. Tracking applications include vehicles, humans, animals and trackingobjects.

They can also be deployed for a collection of various types of data mentioned above in almost every kind of physical environments such as plain, underground and undersea sensing fields. In every situation, a sensor network gets constrained differently depending on an environment.

However, WSNs are still facing many challenges such as limited power, bandwidth, mobility and no central controller. The performance of any network including WSNs can be gauged, predicted and improved once the parameters characterizing the network are determined accurately. These parameters of a network include availability, bandwidth, latency, and error rate. Methods and techniques used to determine the parameters are known as Quality of Service (QoS).

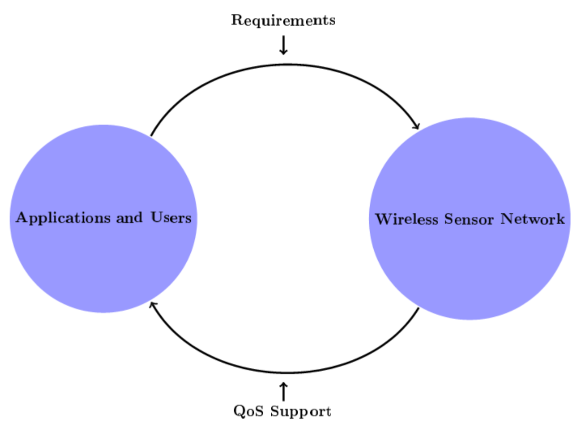
At the present stage, WSNs need more attention in QoS provisioning making it a hot issue in current research.

However, incorporating QoS is not an easy task usually dueto a large number of nodes involved in the network. Some of the important aspects like energy protection, protocol designing, and architecture in WSNs are explored in details but still QoS support issues need more attention.

In figure, a simple model shows that more users can always be included in the networks given that users are satisfied with the services of the network. Hence, the basic objective of the networks is how to utilize the network resources that provide QoS to users.

II. LITERATURE SURVEY

Wireless Sensor Network (WSN) is an infrastructure capable of sensing, computing and communication elements that give a user the ability to instrument, observe and react to events and phenomenon in a specified environment. WSN is said to be type of ad hoc networks in which nodes are generally stationary. However, in certain applications, nodes can be mobile, when they are placed on robot. Other difference between conventional ad hoc network and WSN is that WSN is data centric wherein one or more sensors are sensing the parameter and transmit to only one node called as sink node. While, on the other hand, in ad hoc networks data is transmitted from one node to any other node. WSN consists of tiny, affordable, low-power devices called sensor nodes. Every node includes a processor for computing, memory for information storage, a transceiver for information exchange and power source integrated into one device. Memory is required to store information about neighbors as well as packets which are received from neighbors or to be sent to next node. Such nodes can sense the data, process and convey it to sink either directly or via intermediate nodes [1]. A sensor node processes most of the information locally instead of merely forwarding sensed data to save power consumption, as most of the energy of sensor node get consumed in radio frequency (RF) communication [2]. There are many challenges which wireless sensor network is facing as compared to ad hoc networks. Some of the differences are discussed as follows. • The number of sensor nodes per unit area is more as compared to conventional ad hoc networks. • Also, deployment of sensor nodes in WSN is dense and normally random. • In certain cases, multiple sensor nodes send data to one node, called as sink node. So many to one communication paradigm is used while in ad hoc network, point to point communication paradigm is normally used. • Nodes in WSN are having more constraints in term of resources as compared to nodes in ad hoc networks. • Every node in ad hoc network have global identification (IP address) while in WSN nodes do not have such identification. Quality of Service (QoS) in a communication network supposed to provide better services to packets over the network as per predefined criteria. In traditional networks, various parameters like bandwidth, delay, jitter and reliability are used to measure quality of service (QoS) offered by network. Bandwidth dependent applications like Live TV, video conferencing requires certain amount of bandwidth, which has to be provided. Delay is nothing but the total amount of time taken by packet to reach from source to destination. It consists of transmission delay, queuing delay & processing delay. Jitter is the variation in the arrival time of packets in packet stream. Packet loss is the measure of successful delivery of the packets from source to destination. Packet loss should be such that the quality of the information should not get affected. QoS provision in wireless ad hoc networks offers new challenges due to characteristics of a communication channel, energy constraints, low bandwidth, mobility of nodes and greater packet loss. Wireless sensor network is type of ad hoc network which has finite resources and limited communication range. Hence QoS provision in WSN becomes difficult task due to its unique characteristics.



A. *QUALITY OF SERVICE*

In this section, we provide a detailed analysis of QoS parameters of routing protocols developed for WSNs. We have, however, included references which have a significant impact on the development of the research area. In the following, we give a brief account of QoS As mentioned in the general introduction the network's capability to offer superior services is measured as Quality of Service of the network. The basic objective of QoS is to guarantee that network has the ability to provide the expected results. Some of the basic QoS parameters are the delay (latency), throughput, energy consumption and error rate. It differentiates the traffic flows in the network by treating packets differently based on their nature. Its patterns perform diverse responsibilities based on the path of network traffic and site of the device performing the QoS functionality. It also prioritizes different data flows to ensure a certain level of performance. However, factors like the probability of missing data in networks, reliability and latency undermine the QoS. QoS can achieve the following tasks.

· Provide high-level services in multimedia applications like video, audio and images or VOIP.

- Differentiate various network traffics and then assign priority for each traffic class and thus provide organized treatment of network resources.
- The network resources such as bandwidth are utilized efficiently.

Wireless sensor networks have various mission-critical and time-bound applications such as nuclear radiation detection, chemical plumes tracking in chemical industry, enemy target tracking in battlefields and immediate response system in natural as well as human-made disasters. In applications of WSN, sensory data should reach to destination (sink node) without error and within time. This is necessary to avoid failures. So reliability and timely delivery of sensory data are some of the QoS parameters, which user expects from WSN. Fig.1 illustrates relationship between user and wireless sensor network.

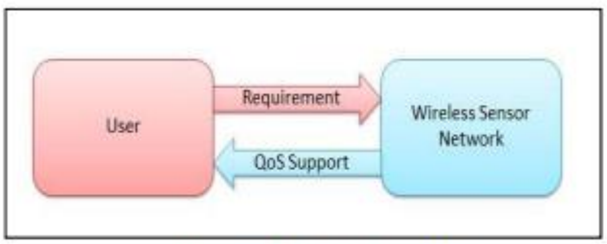


Fig. 1. QoS Requirement in WSN

User conveys the requirement to wireless sensor network which in response provides required QoS to user. This means user specifies the service requirement and WSN should be designed in such a manner that it will provide the required QOS support. QoS parameters may be delay, bandwidth, jitter and reliability in conventional networks. In WSN, two perspectives of QoS should be considered namely application specific QoS and network QoS. In application specific QoS environment, user specifies parameters which are directly related to quality of applications. These parameters include number of active sensors in given area, precision in measurement of physical parameters. Second perspective is related to communication network which should be capable of providing required QoS. To provide required QoS, network classifies the traffic generated by sensors. This classification is done on the basis of data delivery models, namely event driven, query driven and continuous. Separate set of QoS parameters are determined for each class of network traffic.

There are certain characteristics of applications which are to be considered before making necessary provisions for QoS. The first characteristic is the diverse real-time requirements of an application. Data obtained from sensor nodes have information related to physical parameters of an entity situated in dynamically varying environment such as temperatures in forest occupied by fire, coordinates of moving target and concentration of nuclear radiation. Such information sensed by sensor node is time bound and hence should be delivered without violating the deadline. It may happen that different sensors have different deadlines based on variations in the parameters being sensed. For example, a slow moving enemy target has the less stringent deadline as compared to fast moving target.

The second characteristic is about diverse reliability requirements based on contents of data sensed by sensor node. For example, in a chemical plant, chemical plume leakage up to a certain level can be tolerated. The packet having such information can bear a certain amount of packet loss. While on the other side, information about chemical plume leakage beyond certain limit, should be immediately sent to the sink node. This can be a sign of danger and needs immediate attention of experts to avoid fatal loss.

The third characteristic is related to hybrid data generated based on data delivery models. Data generated in event and query driven models is aperiodic in nature, while in continuous data delivery model packets are being sent to sink node periodically.

Apart from these characteristics of applications, certain events in WSN like sudden change in sensor network topology, addition of new sensor node and failure of an existing node may increase difficulties in QoS provisioning.

1) QoS IN TRADITIONAL NETWORKS

A traditional network attains QoS support via traffic engineering or over-provisioning of resources. To provide such guarantee in computer networks two services differentiation models are used. One is planned for conventional wired computer networks such as Integrated Services (IntServ) and another one for Differentiated Services (DiffServ). IntServ, also called reservation-based approach, maintains services on per flow basis. In this approach, the network resources are assigned according to the application of QoS requirements. The IntServ establish virtual dedicated links between source and destination. DiffServ, also called reservation less approach, maintains service on per packet basis. QoS is achieved in this approach through particular QoS methodologies such as queuing mechanism, admission control, and traffic class and policy managers.

2) QoS IN WSNs

WSNs are used for a wide range of applications and each application has its own QoS requirements such as delay sensitivity, energy and network lifetime. QoS is an umbrella term for a group of technologies that permit network-sensitive applications to demand and receive expected services levels in terms of QoS requirements . In WSNs, QoS requirements can be specified from two perspectives. One is called Network Specific QoS and other as Application Specific QoS. In application specific, each application has different QoS parameters such as data truthfulness, aggregation delay, fault tolerance and exposure. However, in WSNs every class of application also has some common requirements. So the network must fulfill the QoS needs when transmitting the sensed data from sensor field to the sink. Various data delivery models are used such as continuous, query and event driven. Each model has its own QoS requirements. The basic QoS issues in WSNs are described below in details.

1. Limited resources and capabilities: The WSNs have limited resources such as partial memory, bandwidth, power and processing capabilities. So QoS must be aware of them and there should be a balance between QoS level and energy level consumption.
2. Node deployment: The sensor node deployment isan important and difficult issue in WSNs. Since the deployment may be regular or random and proper deployment solves the QoS requirements, therefore the system must be aware of this issue.
3. Dynamic network topology: This issue mostly occurs in mobile WSNs, because the sensor nodes move in various directions. The QoS method must be aware of the node's power and link failure due to its mobility.
4. Scalability: QoS should not be affected by the increment or decrement in the number of sensor nodes in WSNs.
5. Multi-source Multi-sink: Depending on the application, the topology may have multi-source and multi-sink. So WSNs shall be able to maintain the diversified level of QoS supports.
6. Various traffic types: The sensor nodes may generate various types of traffic so the QoS process should be the equally efficient through max out and low traffic periods.
7. Less reliable medium: The WSNs medium is radio. It may be affected by different environmental factors such as noise and cross-signal interference.
8. Redundant Data: Sensor nodes are densely deployed so the generated data may be redundant. It causes the energy wastage; therefore it should be taken into the description in QoS.

There are various QoS parameters and services required for different applications. For multimedia or real-time applications, the QoS metrics are jitter, latency and bandwidth. While the military applications have the security QoS parameters, the emergency and rescue applications have the availability QoS parameters and the applications such as cluster communication in meeting hall have a little energy QoS parameter. Unlike the traditional wired network, the QoS requirements are more unfair by the resources constraints of the nodes. Buffer space, processing power and battery charge are the examples of resource constraints . QoS provisioning in individual layers depends on layer capability, so for performance evaluation and QoS assessment each layer has specific parameters that are used. The table below shows the list ofparameters in each layer.

B. QoS IN WSNs SECURITY

Security in WSNs is one of the major issues because of its applications in the military. The military application may generate sensitive data or operate in hostile unattended environments like a battlefield. Protection of sensor data from adversaries is an unavoidable need. To address such issues the effective QoS mechanism is needed. The famous example is real-time target tracking application such type of application requires special QoS security technique. Another example is the health monitoring application.

QoS can effectively enhance the security of the WSN. Sensor network transportation must avoid exposure. To achieve QoS in the sensitive applications the following shall be provided. Security services shall provide information secrecy, data integrity and resource availability for users. The three parameters model such as reliability, availability and service-ability can effectively improve the security of the WSNs.

TABLE 1. QoS parameters for different layers.

Name of the Layer	QoS Parameters
Application Layer	Data consistency, Detection chance, Data originality, Reply time and system life time
Transport layer	Rate, Delay, Medium and reliability
Network layer	Power efficiency, Routing strength, Bottleneck chance, Routing protection and path delay
MAC layer	Power effectiveness, Communication reliability, Throughput and range
Physical layer	Communication, processing sensing components

III CONCLUSION AND FUTURE ENHANCEMENTS

Current WSNs are not only used for traditional low data rate applications but also for complex operations which require efficient reliable and timely collection of a large amount of data. Moreover, WSN consists of heterogeneous nodes. Increasing capacities of sensor nodes, a variety of the application fields and multi-model use of sensor require efficient QoS provisioning mechanism in WSNs. With these requirements in mind, we have focused on the perspective, challenges, needs, metrics, parameters and requirements of QoS for WSNs.

IV REFERENCES

1. Asif, M., Khan, S., Ahmad, R., Sohail, M., & Singh, D. (2017). *Quality of Service of Routing Protocols in Wireless Sensor Networks: A Review. IEEE Access,5,1846-1871.* doi:10.1109/access.2017.2654356
2. Takale, S. B., & Lokhande, S. D. (2018). *Quality of Service Requirement in Wireless Sensor Networks: A Survey. 2018 IEEE Global Conference on Wireless Computing and Networking (GCWCN).* doi:10.1109/gcwcn.2018.8668636
3. O. Deepa, J. Suguna, "An optimized QoS-based clustering with multipath routing protocol for Wireless Sensor Networks", Journal of King Saud University-Computer and Information Sciences, 2017

Iot Based Gate Controller For Agricultural Irrigation System

Pallavi R[#1], Panchami A[#2], Priyanka V[#3], Shalini G S[#4], Dr. Kamalakshi Naganna[#5]
[#]1,2,3,4 Student, Dept. of Computer Science and Engineering, Sapthagiri College of Engineering, Karnataka, India
[#1]pallavirajanna26@gmail.com , [#2] apanchami04082000@gmail.com
[#3]priyankav2000vm@gmail.com , [#4]shalumegha2222@gmail.com
[#5]Professor and Head, Dept. of Computer Science and Engineering, Sapthagiri College of Engineering, Karnataka, India
[#5]hodcse@sapthagiri.edu.in

***Abstract* — Agriculture plays a critical role in India's food production development. Agriculture in our country is reliant on the monsoons, which provide little water. As a result, irrigation is employed in agriculture. Water is delivered to plants in an irrigation system based on the soil type. Plant humidity and temperature are accurately managed with this method. Due to varying atmospheric conditions, these variables might change from place to place in a large farmhouse, making it difficult to maintain consistency at all points across the farmhouse manually. The major goal of this research is to create a smart wireless sensor network (WSN) for use in an agricultural setting. It is important to monitor the agricultural environment for numerous parameters such as soil moisture, temperature, and humidity, as well as other factors of water level present in the environment and condition of water for giving it to plants. These nodes communicate data wirelessly to a central server, which collects, stores, and analyses the data before displaying it as needed. The data can also be transferred to the client's mobile device.**

Keywords— Wireless sensor network, Soil moisture, Temperature, Humidity, IOT, Arduino, Android, Microcontroller

I. Introduction

Agriculture is one of the most important sources of livelihood for the majority of Indians. It also has a significant impact on the country's economy. Irrigation systems consume a significant amount of water, and hence 85 percent of available freshwater resources are used to produce agricultural crops. This water resource will dwindle day by day, while water use will rise by more than 85 percent in the next half-century. This is owing to the enormous increase in population, which has resulted in a massive increase in food demand. Agriculture is the most important source of food. Science and technology is used to design a strategy that will restrict water use.

Precision farming is the management of crop and animal performance variability in order to maximize advantages while minimizing environmental consequences. Despite the benefits of precision farming, many farmers fail to use it. It is critical to transmit this knowledge to farmers and increase their engagement in precision agriculture in order to promote it. Furthermore, larger farms are more likely than small farmers to employ innovative technologies. Precision farming will almost certainly be connected to an increase in food output. Agriculture benefits from precision farming in two ways. First, by reducing environmental consequences, and second, by cutting costs and increasing profits, agriculture may become more sustainable. As a result, larger economic margins are generated. This increase in rewards will assist in preventing the abandonment of fertile areas, which is occurring in many affluent countries.

In this paper, a system in which sensors are put and water is delivered to the field based on that information, which is relayed to the farmer via a software programme. Wireless sensor networks, also known as wireless sensors and actor networks, are geographically autonomous sensors that monitor physical or environmental parameters such as temperature, humidity, and wetness, and cooperatively communicate these data through the network to the central location. WSNs are made up of hundreds to thousands of nodes, each of which is connected to sensors. Each sensor network node is made up of multiple components.

A sensor for measuring the water level in the irrigation canal is used in the project. The sensor is used in conjunction with valves that close or open the irrigation canal gates. When it is essential to transport water to a secondary channel (higher), the actuators will close the gate (in the primary channel) and open it when it is no longer required to convey more water. In addition, the level sensor is employed to ensure that water reaches the secondary channel.

II. Literature Review

In this section, various proposed system methodologies have been contemplated.

A Design and Implementation of an IoT based Irrigation Monitoring and Control System[13]. In agriculture, one of the major problems which farmers face is water scarcity. With the water availability in irrigation being a very big factor, and the frequent demand of the presence of the farmer to monitor the plants, there arose a need for a smart irrigation system that prevents wastage of water and saves time. The system works by receiving relevant input data from the farm and sending it to a microcontroller system that performs control actions based on the analysis result. The inputs from the sensors are sent to a weather monitoring database, real-time monitoring of sensor values through a web app is implemented and finally, push notifications are sent to the farmer indicating the current farm status. The major limitation of this was, it supports only web application for the systems operation and largely implies on the power supply.

IoT-IIRS: Internet of Things based intelligent-irrigation recommendation system using machine learning approach for efficient water usage[14]. The era of machine learning (ML) and the Internet of Things (IoT) brings a great advantage of building an intelligent system that performs this task automatically with minimal human effort. In this study, an IoT enabled ML-trained recommendation system is proposed for efficient water usage with the nominal intervention of farmers. IoT devices are deployed in the crop field to precisely collect the ground and environmental details. As the ML-based models are data hungry, proposed system performance depends on more samples for accuracy.

Intelligent and Smart Irrigation System Using Edge Computing and IoT[11]. In this study a smart approach professionally capable of using ontology to make 50% of the decision, and the other 50% of the decision relies on the sensor data values was utilized. The decision from the ontology and the sensor values collectively become the source of the final decision which is the result of a machine learning algorithm (KNN). Moreover, an edge server is introduced between the main IoT server and the GSM module. This method will not only avoid the overburden of the IoT server for data processing but also reduce the latency rate.

IoT Enabled Smart Irrigation System, Monitoring and Water Harvesting In Different Soils[12]. The feature of this paper includes monitoring temperature, humidity, pH and water level in agricultural fields through sensors. The data from sensors are sent to a Web server database using wireless transmission. Controlling of all these operations will be through any remote smart device or computer connected to the internet and rain condition is also applied to the operations. It will be performed by interfacing sensors, IFTTT app, Smart agriculture app, Wi-Fi and raspberry pi.

The proposed system is capable of operating automatically without human intervention and also manually by notifying the information through the blynk app. It also helps to use the water judiciously.

III. Proposed System

The system is a combination of hardware and software components. The system architecture of the system is as shown in figure 1.

The proposed device uses a microcontroller (ESP32). Blynk mobile App is used as the user interface. Soil moisture sensor, humidity and temperature sensor (DHT11), level sensor, rain sensor along with relay and servo motor are used. The main function of the microcontroller is to decide whether to water the crop or not.

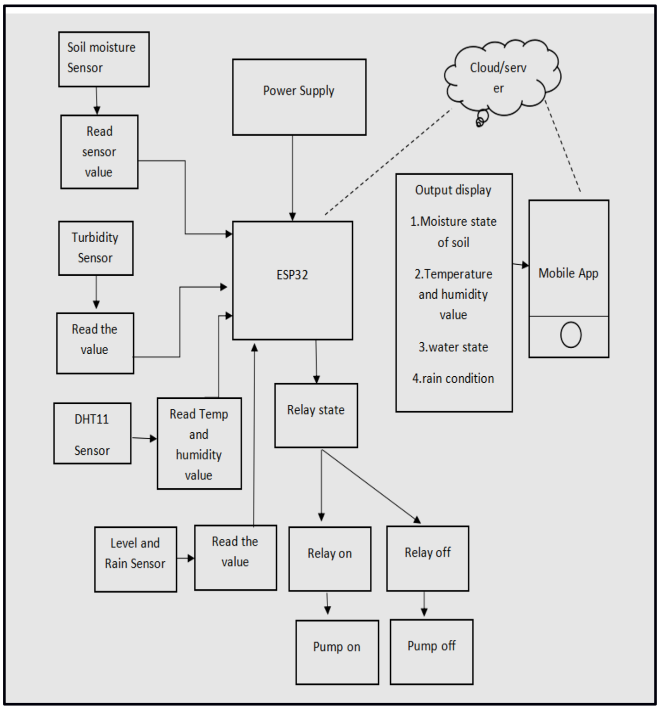


Figure 1. The System Architecture.

By using appropriate functions and conditional statements in the Arduino written for the Microcontroller functioning. The relay is connected to a water pump which pumps water to the crops when the relay is ON. The soil moisture sensor senses the moisture level of the soil, depending on the level of moisture. The watering of the crop starts by Microcontroller making relay ON when the moisture content is below a threshold value and is made OFF when there is enough moisture content in the soil. The humidity and temperature sensor gives the humidity and temperature values of the atmosphere which determine whether the crop is suitable for growth. Some crops grow only in particular weather conditions and some give better yield only for a particular temperature range. Data reaches the blynk cloud from the Microcontroller through Wi-Fi. From this app, the farmer can view the status of the pump through a blynk application.

A. *Sensing Section*

1. The Soil moisture sensor senses the moisture content in the soil in the digital form. The values from the sensor would be 0 which means there is moisture content in the soil and 1 which means there is less moisture content in the soil.
2. The DHT11 sensor sensors the humidity and the temperature of the farmland, knowing this information the farmer can decide on the crop that he can grow.
3. The level sensor is an ultrasonic sensor with the transmitter and the receiver that measures the amount of water present in the water channel.
4. The rain sensor indicates whether it is raining or not to the farmer.

5. Relay is an electromagnetic switch which is used to turn on the pump.

All these components and sensors are connected to the microcontroller ESP32.

B. *Control Section*

The information from the sensor is transmitted to the Arduino board. The Arduino board consists of a microcontroller ESP32 which is responsible for controlling the pump. Meanwhile all the sensor information is transmitted to the Blynk mobile application through the blynk cloud.

Blynk platform is used by engineers to connect MCUs and prototyping development boards like Arduino, ESP8266 or SBCs like Raspberry Pi over Wi-Fi, Ethernet or the cellular to the Internet and build custom mobile applications to remotely monitor and control electronic equipment.

C. *IOT Section*

This section displays a page in the blynk app, which displays the values read by all the sensors along with the status of the pump to the farmer.

D. *Methodology*

In this section, various techniques and procedures used in the project are described.

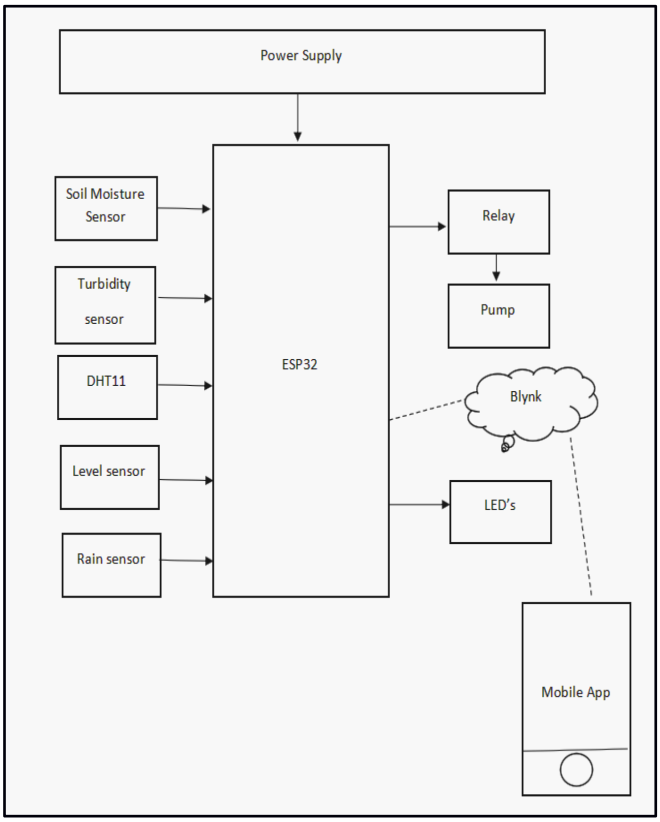


Figure 2: Methodology.

As shown in the figure 2, the whole process followed is as follows:

1) The soil moisture sensor senses the moisture content of the soil in the digital form (0,1) this information will be sent to the ESP32. The soil moisture sensor is connected to the pin 32 of the ESP32. The soil moisture sensor acts as an input pin to the ESP32 because the value from the sensor is the input to the ESP32.
2) The DHT11 sensor is the temperature and humidity sensor, which measures the temperature and humidity of the farmland. This is connected to the pin 23 of the ESP32 microcontroller.
3) Level Sensor is used to measure the level of the water in the water canal. This is an ultrasonic sensor with the transmitter and receiver. The transmitter acts as an output pin because it requires a trigger from the ESP32 to start working. The receiver acts as an input pin because the sensed values are the input to the ESP32 microcontroller.
4) Rain Sensor is a switching device which is used to detect the rainfall. Meanwhile it notifies the user about the rainfall in the farmland.
5) All these sensed values will be received by the ESP32 microcontroller. Based on these values processing is done using Arduino software(IDE).
6) All the processing conditions will be written as code in the Arduino software(IDE).
7) The UART (Universal data transfer Protocol) is used to transfer the processing code from the Arduino IDE to ESP32 (this protocol is provided by NodeMCU).
8) Based on the processing the ESP32 turns the relay on which in turn turns the pump on.
9) All this information about the sensor, pump, and rain will be sent to the Blynk Application through the Bynk cloud.
10) Blynk is an IOT platform that provides Blynk server for user authentication, Blynk cloud to store the sensor information and processing information, and the Blynk Application for the GUI(Graphical user interface).
11) To perform all these operations power supply is required.

IV. Implementation Details

1. Arduino IDE

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards.It connects to the Arduino hardware to upload programs and communicate with them.

2. Blynk

Blynk is a new platform that allows to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, one can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen.

The table I gives the description about the components used in this work.

Components Name	Description	Range
Soil Moisture Sensor	The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. This sensor has 4 pins namely analog pin, digital pin, ground and VCC 3.3V to 5V. Since the digital values are obtained from the sensor digital pin is used. It is connected to the pin 32 of the ESP32 microcontroller.	0 or 1
DHT11 Sensor	The DHT11 is a basic, digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal. This is connected to the pin 23 of the ESP32 microcontroller.	0-100
Level Sensor	An ultrasonic water level sensor is that the ultrasonic transducer sends out a high-frequency pulse sound wave when it encounters the surface of the measured level (material), is reflected, and the reflected echo is received by the transducer and converted into an electrical signal.	1-8m
Rain Sensor	The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board. It is mainly used to identify the rainfall in the farmland.	0 or 1
ESP32 Microcontroller	ESP32 is a series of low-cost, low-power systems on a chip microcontroller with integrated Wi-Fi and dual mode Bluetooth. The ESP32 microcontroller is connected to the Arduino IDE via the UART protocol.	48 pins
Relay	Relay is an electrically operated switch which is used to control a circuit by an independent low power signal. The relay is connected to pin 25 of the ESP32 microcontroller.	ON or OFF

Table I : Details of the components used

V. RESULTS

The data collected from the sensors will be processed in the ESP32 microcontroller and based on that the pump will be turned on or off. All this sensor information will in turn be sent to the users Blynk application via the Blynk cloud. Certain information will be displayed on the terminal of the Arduino IDE to analyze the functionality of each sensor. The figure 8 represents the working model of the agricultural irrigation system.

Figure 8: Working Model.

Sensor Readings		Pump status
• Soil sensor(Digital) • Level sensor	1 Less than Threshold	ON
• Soil sensor(Digital) • Level sensor	0 Greater than Threshold	OFF
• Soil sensor(Digital) • Level sensor	1 Greater than Threshold	OFF
• Soil sensor(Digital) • Level sensor	0 Less than Threshold	OFF

Table II: Pump Status.

The table II shows the status of the pump based on the sensor values. The Blynk mobile app is installed in the user Android mobile phone and logged in to the application with username and password. When the user logs in to the application for the first time an authentication token will be generated for each user. This enables the user to open the application without having to log in again. Once all the button and widget settings are done the user can view the information about the farmland and the status of the pump as well.The

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below figure 9 represents the information that the user will view through the Blynk application.Figure 10 represents the editing screen of the blynk application. Here the farmer can edit the buttons and widgets based on the requirements.

Figure 9: Information displayed to the user via the Blynk Application.

Figure 10: Editing Screen of Blynk Application.

VI. CONCLUSION

This work aims to design and implement an effective, reliable, cheap, stable, user friendly, and easily maintain system that automatically controls the irrigation process while monitoring the soil status and other factors such as weather conditions and updating the farmer timely on the farm conditions to solve the problem of water wastage, the inefficiency of manual labor, low yield and the constant needing of the farmer's attention, this system was successfully designed and implemented. The pumps are turned ON and OFF automatically by the microcontroller based on the readings from the sensors in the overhead tank and the soil, as well as the cloud readings containing the weather prediction. Notifications are sent afterward to the farmer via his mobile phone and a web app for real-time and monitoring and also to a database for analysis and research if needed.

Compared with other conventional methods, this system shows excellent performance with its advanced digital technology and it is more effective, reliable, and cost-efficient. With this system, one can remotely monitor his farm conditions from anywhere in the world making sure that the farm is running smoothly. This system eliminates the myth that demands any farmer to be closer to his farm, now with this system a farmer can go on rest assured his farm is being taken care of.

References

[1] Bhairavi D. Thakare; Dinesh V. Rojatkar "A Review on Smart Agriculture using IoT" 2021 6th International Conference on Communication and Electronics Systems (ICCES).

[2] Kumar Parasuraman; UdayakumarAnandan; AnbarasakumarAnbarasan "IoT Based Smart Agriculture Automation in Artificial Intelligence" 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV).

[3] Muhammad Saad Amin; Syed Tahir Hussain Rizvi; Umair Iftikhar; Sameer Malik; Zaid Bin Faheem "IoT Based Monitoring and Control in Smart Farming" 2021 Mohammad Ali Jinnah University International Conference on Computing (MAJICC).

[4] E. Lavanya; E. Indra; T. Priyaradhikadevi" Agriculture Improvement Using Iot" 2021 International Conference on System, Computation, Automation and Networking (ICSCAN).

[5] Allen Peter John; S NarenAnand; SaumyaVerma; Sridutt Shukla; AnuChalil; Sreehari K N "IoT Based System to Enhance Agricultural Practices"2021 Second International Conference on Electronics and Sustainable Communication Systems (ICESC).

[6] M. Rohith; R Sainivedhana; N. Sabiyath Fatima "IoT Enabled Smart Farming and Irrigation System" 2021 5th International Conference on Intelligent Computing and Control Systems (ICICCS).

[7] Manasa Reddy M; M K Saiteja; Gurupriyanka J; Sridhar N; Naveen Kumar G N "IOT based Crop Monitoring system for Smart Farming" 2021 6th International Conference on Communication and Electronics Systems (ICCES).

[8] A. Lakshmi; Y. Ravi Kumar; N. Sai Krishna; G. Manisha" IOT Based Agriculture Monitoring and Controlling System" 2021 6th International Conference on Communication and Electronics Systems (ICCES).

[9] VahidKhalilpourAkram; Moharram Challenger "A Smart Home Agriculture System Based on Internet of Things" 2021 10th Mediterranean Conference on Embedded Computing (MECO).

[10] OthmaneFriha; Mohamed Amine Ferrag; Lei Shu; LeandrosMaglaras; Xiaochan Wang "Internet of Things for the Future of Smart Agriculture: A Comprehensive Survey of Emerging Technologies" IEEE/CAA Journal of AutomaticaSinica (Volume: 8, Issue: 4, April 2021).

[11] M. Safdar Munir and Imran Sarwar Bajwa, Wiley Hindawi Research Article, Volume 2021, Article ID 6691571, "Intelligent and Smart Irrigation System Using Edge Computing and IoT", Published 28 February 2021.

[12] Dr. Madhu Kumari and Anant Kumar Sah, "IoT Enabled Smart Irrigation System, Monitoring and Water Harvesting in Different Soils", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 10 Issue 03, March-2021.

[13] Christian Okafor and Augustine Nwafor, Nigeria Victoria University of Wellington, Wellington, New Zealand, "A Design and Implementation of an IoT based Irrigation Monitoring and Control System", September 2021.

[14] Rajendra Prasad Nayak and Ashutosh Bhoi, "Internet of Things based intelligent-irrigation recommendation system using machine learning approach for efficient water usage" June 2021.

Image activity transformation into readable caption using deep learning algorithm

Himani Adiga
Student, Dept. of Computer science & Engg.SCE
Bangalore-560057, India
himani14adiga@gmail.com

Mandara B
Student, Dept. of Computer science & Engg.SCE
Bangalore-560057, India
bmandara2001@gmail.com

Mallikarjuna VR
Student, Dept. of Computer science & Engg.SCE
Bangalore-560057, India
mallikarjunavr8@gmail.com

Mangala S
Student, Dept. of Computer science & Engg.SCE
Bangalore-560057, India
mangalas2509@gmail.com

Dr Praveen Kumar KV
Professor, Dept. of Computer science & Engg.SCE
Bangalore-560057, India
praveenkumarkv@sapthagiri.edu.in

***Abstract* — In Recent years, with the rapid development of artificial intelligence, image caption has gradually attracted the attention of many researchers in the field of artificial intelligence and has become an interesting and arduous task. Image caption, automatically generating natural language descriptions according to the content observed in an image, is an important part of scene understanding, which combines the knowledge of computer vision and natural language processing. the application of image caption is extensive and significant, for example the realization of human computer interaction. This paper summarizes the related methods and focuses on the attention mechanism which plays an important role in computer vision and is recently widely used in image caption generation tasks. Furthermore, the advantages and the shortcomings of these methods are discussed providing the commonly used datasets and evaluation criteria in this field. Finally, this paper highlights some open challenges in the image caption task for a computer to generate context describing the image given as input takes a lot of effort in terms of computation memory usage and processing minute details present in the image. All the great progress has been made in ML, artificial intelligence, deep learning image processing it is always a challenging task for a computer to generate a text describing an image accurately with semantically and grammatically correct sentence.**

Keywords- Attention model, CNN, RNN model

I. Introduction

Given an image to a human being, he/she can easily describe it without a second thought provided he/she has seen the objects in the image before and is able to relate between the objects. This is a special capability which we possess due to our memory, cognitive ability, sequential linking, and imagination. Same is the case with some animals like dogs. There are cases where police dogs have identified a person using his/her image

But for a computer to generate a text describing the image given as input takes a lot of effort in terms of computation, memory usage and processing minute details present in the image. Although great progress has been made in ML, artificial intelligence, deep learning, image processing, it is always a challenging task for a computer to generate a text describing an image accurately with semantically and grammatically correct sentence.

Problems exist in detection of the objects present in the image, identifying the relationship between the objects, attributes associated with the objects. Another problem is to map between the objects and the words. The computer must realize the context of the image before using the indented word. Joining words is not the only issue, combining the words with suitable conjunctives and making a semantically and grammatically correct sentence is also important for the user to understand the description. The below mentioned techniques have now become legacy.

Fig 1: Examples of image with captions

1) Retrieval based: Given an image as input, this method produces a description for that image through retrieving 1 or

more set of sentences from the pool of set of already existing sentences.

2) Template based: Set of visual concepts are detected first then a sentence is generated based on the visual concepts obtained. Some of the applications of image captioning are image indexing (i.e., indexing the image based on the keyword so that it can be retrieved in lesser time.), in social media (to caption the images), for visually impaired persons the caption generated from the image must converted to voice.

II. EXISTING SYSTEM

The already existing model included the image as an input and is fed to the model. In the object detection phase,4 activities happen parallelly. CNN is used for extracting the features and classifying the scene whereas LSTM is used for identifying the human and object attributes. A collective image vector is formed combining each of the results of the 4 activities and is fed to RNN encoder. Here, strings are labeled to the attributes and objects in the image. Finally, RNN encoder generates fixed length captions using the strings generated for the objects and attributes in the previous phase.

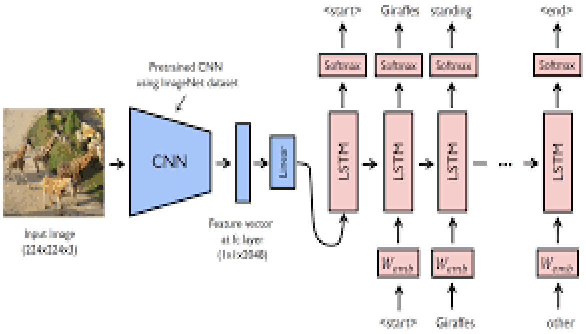


Figure 1. Architecture of CNN and LSTM

The existing systems were not efficient since it uses Flickr 8k dataset to train the model. In this dataset includes 8000 images with 5 captions for each image. As dataset increases efficiency for generating captions too increases.

III. PROPOSED SYSTEM

In order, to generate the captions we make use of deep learning concepts such as attention model.

• Firstly, we download MS-COCO dataset which includes 82k images with each image having 5 captions in it.

• Preprocess the image using InceptionV3 which is pre-trained on the ImageNet to classify each image and to extract features. Convert the image into InceptionV3 expected format by resizing the image to 299 px by 299 px.

• Preprocess the image using preprocess input method to normalize the image so that it contains pixels in the range of -1 to 1, which matches the format of the image used to train InceptionV3.

• Forward each image through the network and stored the resulting vector in a dictionary (image name -- > feature vector).

• After all the images are passed through the network, preprocess and tokenize the captions and transform the text captions into integer sequence using the Text Vectorization layer.

• Extract the features from the lower convolution layer of InceptionV3 giving us a vector of shape (8, 8, 2048). • This vector is then passed through the CNN encoder (which consists of a single fully connected layer).

• The RNN (here GRU) attends over the image to predict the next word.

A. Advantages

• More efficient captions since dataset used is high.

• Epochs up to 20 iterations to train model.

B. Requirement specification

A system requirement specification (SRS) is basically an organization's understanding of a customer or potential client's system requirements and dependencies at a particular point prior to any actual design or development work. The information gathered during the analysis is translated into a document that defines a set of requirements. It gives a brief description of the services that the system should provide and the constraints under which, the system should operate. Generally, SRS is a document that completely describes what the proposed software should do without describing how the software will do it. It's a two-way insurance policy that assures that both the client and the organization understand the other's requirements from the perspective at a given point in time.

• The model must perform text processing from the CSV file as the input which contains training set of mappings between the image names and its labelled captions into vectors,

C. Functional Requirements

• The model must perform text processing from the CSV file as the input which contains training set of mappings between the image names and its labelled captions into vectors, suitable for underlying ML algorithms used, corresponding to each caption.

• For a random test image, RNN must provide output vector such that after converting it to its corresponding caption, it must be relevant with respective to that image.

D. Non-Functional Requirements

• Non-functional requirements are the requirements which are not directly concerned with the specific function delivered by the system. They specify the criteria that can be used to judge the operation of a system rather than specific behaviours. They may relate to emergent system properties such as reliability, response time and store occupancy. Non-functional requirements arise through the user needs, because of budget constraints, organizational policies, the need for interoperability with other software and hardware systems or because of external factors such as:

• Usability: Simplicity is the key for any application. This system is easy to understand and could be used in every household for their safety.

• Reliability: The system should be trustworthy and reliable in providing the functionalities. Once a user made some change it could be reflected in the system.

• Maintainability: The system should be monitored, and maintenance should be simple and objective in its approach.

E. Software Requirements

The software requirements are the description of the features and functionalities of the target system. Requirements convey the expectations of users from the software product. The requirements can be obvious or hidden, known, or unknown, expected, or unexpected from the client's point of view. In this system following are the software requirements:

• Windows 8 and above

• Google collabs.

F. Hardware Requirements

• RAM 8 GB (minimum)

• i5 and above core processor

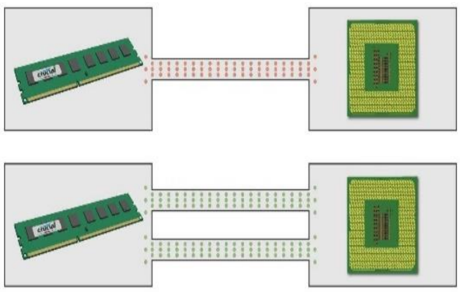


Figure 2: RAM

Figure 3: Intel Core i5

IV. DESIGN

Design is a meaningful engineering representation of something that is to be built. It is the most crucial phase in the development of a system. Software design is a process through which the requirements are translated into a representation of software. Design is a place where design is fostered in software Engineering. Based on the user requirements and the detailed analysis of the existing system, a new system must be designed. This is the phase of system designing.

A. 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 behaviors of the system. Here we use MS-COCO dataset to train your model. The dataset contains over 82,000 images, each of which has at least 5 different caption annotations.

Use InceptionV3 (which is pretrained on ImageNet) to classify each image, will extract features from the last convolutional layer.

First, convert the images into InceptionV3's expected format by:

• Resizing the image to 299px by 299px

• Pre-process the images using the pre-process input method to normalize the image so that it contains pixels in the range of -1 to 1, which matches the format of the images used to train InceptionV3.

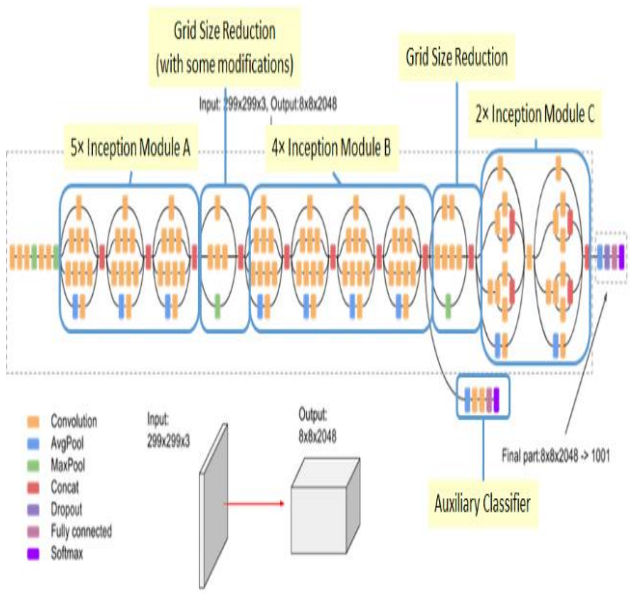


Figure 4: inception v3 architecture

forward each image through the network and store the resulting vector in a dictionary (image name --> feature vector). After all the images are passed through the network, save the dictionary to disk. Pre-process each image with InceptionV3 and cache the output to disk. Caching the output in RAM would be faster but also memory intensive, requiring 8 * 8 * 2048 floats per image.
Transform the text captions into integer sequences using the Text Vectorization layer, with the following steps:

• Use adapt to iterate over all captions, split the captions into words, and compute a vocabulary of the top 5,000 words (to save memory).
•Tokenize all captions by mapping each word to its index in the vocabulary. All output sequences will be padded to length 50.
•Create word-to-index and index-to-word mappings to display results.extract the features from the lower convolutional layer of InceptionV3 giving us a vector of shape (8, 8, 2048).You squash that to a shape of (64, 2048).This vector is then passed through the CNN Encoder (which consists of a single Fully connected layer).The RNN (here GRU) attends over the image to predict the next word.

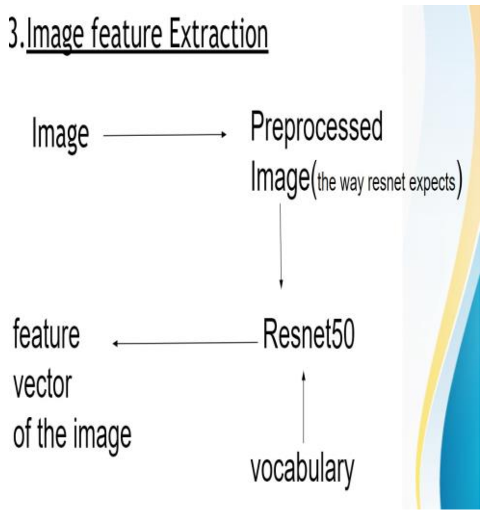


Figure 5: Image feature extraction

• Extract the features stored in the respective .npy files and then pass those features through the encoder.
•The encoder output, hidden state (initialized to 0) and the decoder input (which is the start token) is passed to the decoder.
•The decoder returns the predictions and the decoder hidden state.
•The decoder hidden state is then passed back into the model and the predictions are used to calculate the loss.
•Use teacher forcing to decide the next input to the decoder.
•Teacher forcing is the technique where the target word is passed as the next input to the decoder.
•The final step is to calculate the gradients and apply it to the optimizer and backpropagate.

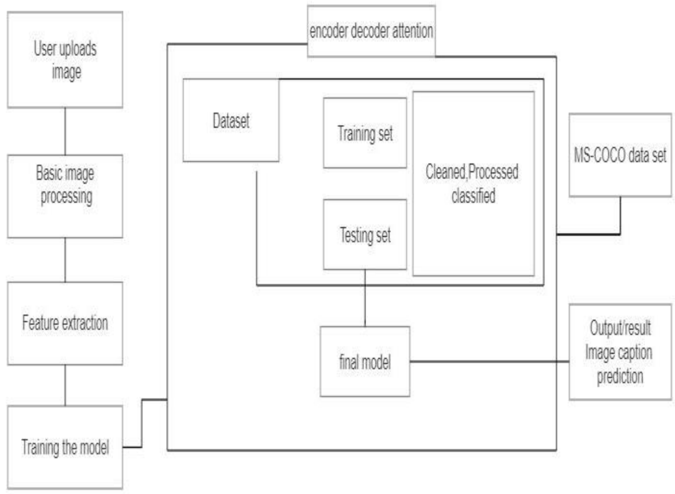


Figure 6: System architecture

V. Conclusions

For blind aids and self-driving vehicles, coming up with such model would become a great help. This model is build using encoder decoder with attention. Attention is used to boost the ability of the network to predict better captions. Given an image as input the system generates the caption describing the image.

VI. References

[1] Simao Herdade, A. Farhadi, M. Hejrati, M. A. Sadeghi et al., “Every picture tells a story: generating sentences from images,” in Computer Vision – ECCV 2010, K. Daniilidis, P. Maragos, and N. Paragios, Eds., pp. 15–29, Springer, 2010.
[2] Armin Kappeler, X. He, C. Buehler, D. Teney, M. Johnson, S. Gould, and L. Zhang. Bottom-up and top-down attention for image captioning and visual question answering. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pp.567-869, 2018
[3] Joao Soares, L. Anne Hendricks, S. Guadarrama, M. Rohrbach, S. Venugopalan, K. Saenko, and T. Darrell. Long- term recurrent convolutional networks for visual recognition and description. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, vol. 47, pp. 853– 899, 2013.
[4] K. He, X. Zhang, K. Papineni, S. Roukos, T. Ward, and W.J. Zhu, “Bleu: a method for automatic evaluation of machine translation,” in Proceedings of the 40th annual meeting on association for computational linguistics. Association for Computational Linguistices pp.311–318, 2019
[5] Komal Kumar Napa ,R. Bernardi, R. Cakici, D. Elliott, A. Erdem, E. Erdem, N. IkizlerCinbis, F. Keller, A. Muscat, and Plank, “Automatic description generation from images: A survey of models, datasets, and evaluation measures,” Journal of Artificial Intelligence Research, vol. 55, pp. 409– 442, 2016.

Enhanced Two-wheeled Self-Balancing Robot

Amit Kumar Gupta
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
goluamit984@gmail.com

Aditya Srivastava
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
adityasriv1812@gmail.com

Deepak G
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
deepak123blr@gmail.com

Mohit Verma
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
mohitverma2646@gmail.com

Prof Chaithra
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
chaithra@sapthagiri.edu.in

***Abstract*— This article describes the design, components, and operation of a two-wheeled self-balancing robot. It also describes the application and future scope of this type of robot. Both software and hardware were required to implement this. We used hardware components such as the Arduino Nano, MPU 6050, HC-06 Bluetooth module, two stepping drivers, and two stepping motors. The software module used Embedded C ++ to implement the Arduino algorithm. We have designed a complete discrete digital control system that demonstrates the techniques needed to balance a two-wheeled unstable robotic platform and provides the stability needed to design a robot that controls movement by the user.**

1. INTRODUCTION

In trendy world, you could see Segways and hoverboards on movies, suggests and different social media platforms. These gadgets function at the identical precept as self-balancing robots. A self-balancing robotic is a robotic that balances with wheels through preserving the torque constant. In the 1980s, Japanese professor Kazuo Yamato created the primary version to simulate the conduct of an inverted pendulum. Since then, many exceptional fashions had been constructed through many researchers. The full-size use of this robotic has come to be an exciting studies topic for researchers and students. Self-balanced robots have the identical precept as an inverted pendulum. In the case of a everyday pendulum, the middle of gravity (COG) is under the middle, that's the middle of the circle, so the pendulum normally swings across the middle point. In the case of a self-balanced robotic, there may be a COG withinside the middle, which makes it volatile. By balancing this volatile inverted pendulum, a self-balancing robotic is created. Minimizing the amplitude of this inverted pendulum produces a solid self-balancing robotic which can stand nonetheless and balance. The following is a self-balancing robotic application..

1. Segway: Segway is a personalized, self-balanced two-wheeled robot. It can convey humans and delivery them to some other location or location. Widely used for short-distance transportation outdoors, interior and clinical supplies. 2. Restaurant bots: These robots may be used to serve bots in eating places and delivery food to clients. Hoverboard: They may be used as Hoverboards so that it will with ease self-delivery

Fig. 1 shows the block diagram of the self-balancing robot. Arduino Nano microcontroller, MPU-6050 gyroscope and accelerometer, stepper drivers, stepper motors, and Proportional-Integral-Derivative(PID) controller has been used to make the self- balancing robot.

The matters which make this paintings precise than the prevailing literature are the certain description of additives and grade by grade clarification of connections. A certain description of additives with the technical specification has been furnished which assist another involved character in making the robot. Similarly, running and production are given in a grade by grade way for clean understanding.

The paper association is as follows: after the advent segment, the paper offers certain descriptions of the additives in segment II. Sections III discusses the robot's

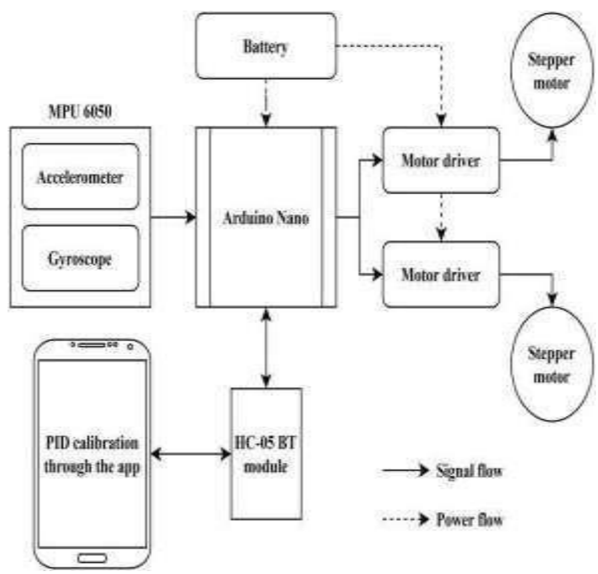


Fig. 1. Block diagram of the self-balancing robot.

Fig. 2. Default Arduino IDE window.

work, balance and control the. Section IV outlines the hardware connection method in detail. The results are presented in Section V of the study.

2. CONSTITUTING MATERIALS

Software and hardware additives had been utilized in making the proposed robot. Only one software program is used that's Arduino IDE, and specific hardware is used along with Arduino Nano because the brain, stepper motor to offer the motion, MPU-6050 to get the orientations, and HC05 as speaking device. Explanation of those constituting substances are as follows:

a) Arduino IDE

The Arduino IDE is a simple-to-use software this is additionally the greatest for programming, compiling, and importing code to Arduino microcontroller boards. The Arduino group is at the back of it. Although different platforms, which includes Visual Code Studio, may be used to code, the Arduino IDE is the legitimate and extensively conventional platform. It is the primary to study all the library and board updates. Many libraries are to be had to make coding with the Arduino IDE easier. Figure 2 indicates the Arduino IDE's default window.

b) Arduino Nano

In this work, the Arduino Nano serves because the robot's brain. This is the tiniest Arduino microcontroller. It's constructed across the ATmega328 microcontroller, that may manage a whole lot of tasks. It has 22 I/O pins and is like minded with a 30 pin breadboard. It may be utilized in nearly all initiatives withinside the identical manner as an Arduino UNO, however due to its compact size, it's miles an tremendous choice. The number one difference among UNO and Nano is insignificant. Nano has a special structure than UNO, with 8 analogue pins in comparison to UNO's six. Instead of a electricity jack, it makes use of a Mini-B USB cord. Figure three depicts an Arduino Nano. TABLE I indicates the pin descriptions for the Arduino Nano..

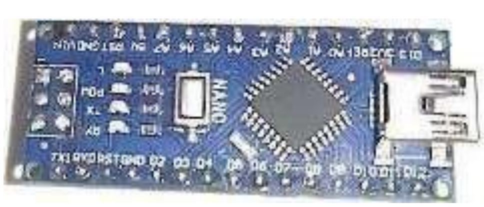


Fig. 3. Arduino Nano.

TABLE I. PIN DESCRIPTION OF ARDUINO NANO

Type	Pins	Description
Power	Vin, 3.3 V, 5 V, GND	Vin is used for giving supply to the Arduino board, which can vary from 6 to 12 V. 5 V and 3.3 V give output voltages as stated. GND refers to the ground pin.
Reset	RST	This is reset pin in Arduino which resets the Arduino.
Analog	A0-A7	These are analog input pins. Arduino has an inbuilt ADC (analog to digital converter) which helps to measure the input voltage from 0 to 5V. Arduino doesn't have a DAC (digital to analog converter) but it can do PWM (pulse width modulation) which are locate at in digital pins and can be used to give some of the functions of an analog output as well. A4(SDA), A5(SCL): These pins are used for TWI (Two-Wire Interface) communication. (SCL: serial clock line, SDA: serial data)
Digital Pins	D0-D13	These are digital input-output pins These pins give logic high (5V) or logic low (0V). They can also be used as input logic high and logic low. 3,5,6,9,11: These are some 8-bit PWM output present on the board. 13: Pin 13 is for inbuilt LED.
Serial	Rx, Tx	Rx-Receiver Tx-Transmitter These are used for serial communication.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication. SS, MOSI, MISO, and SCK stand for Slave Select, Master out Slave in, Master in Slave out, and Serial clock.
AREF	AREF	To provide reference input voltage.

c) MPU-6050

A motion-monitoring device, the MPU-6050. This sensor obtains the bot's alignment, that's then processed to carry out the manipulate actions. The MPU-6050 is a Micro-Electro- Mechanical Systems (MEMS) 3-axis accelerometer and MEMS 3-axis gyroscope on a unmarried chip, as proven in Fig. 4. It additionally capabilities a integrated temperature sensor. The MPU-6050 affords unique findings and might carry out loads of measurements according to second. It captures the x, y, and z orientation on the equal time. It makes use of the /2C-bus to engage with the Arduino. Pin diagram and pin description of MPU- 6050 is given in Fig. five and TABLE II, respectively..

d) HC-06

The Bluetooth module HC-06 is used to calibrate the PID values from the Android smartphone. It's adaptable, dependable, and simple to use. The HC-06 Bluetooth module contains 6 pins, which are described in TABLE III.

Fig. 4. MPU-6050.

TABLE II. Pin Description of MPU-6050.

Type	Pins	Description
Power	VCC, GND	VCC is 5 V input. GND is for grounding.
Communication	SDA (Serial Data), SCL (Serial Clock)	SDA transfers data and SCL provides clock pulse for communication.
Auxiliary Communication	XDA (Auxiliary Serial Data), XCL (Auxiliary Serial Clock)	Can be used to interface other modules as Arduino have limited SDA and XCL ports.
Other	AD0, INT	AD0 (Slave address at 0th bit, i.e. this is 0th number bit of a 7-bit slave address of the module) is used when more than 1 MPU 6050 modules are used to communicate in synchronous. INT is interrupt pin to indicate that data is available for MCU to read.

TABLE III. Pin Description of HC-05 Bluetooth Module.

Type	Pins	Description
Power	VCC, GND	VCC is 5 V input. GND is for grounding.
Key	EN (Enable)	It is used to toggle between data mode and AT (Attention) command mode. Set it high to get into AT command mode.
Serial	RX, TX	RX is the receiver and TX is the transmitter. Used for serial communication.
State	State	This pin is connected to the inbuilt LED of the module and is used as a feedback to check the working of the module by the microcontroller.

e) Steppe motor

Stepper automobiles function the bot's legs, permitting it to transport around. Stepper automobiles are significantly extra solid than trendy geared automobiles in initiatives due to the fact they deliver specific actions. A stepper motor is one which works in steps. When they spin, they've numerous coil companies that shape pairs. The motor movements one step at a time via way of means of turning in energy to wonderful pairings. Precision actions may be finished via way of means of presenting a synchronized deliver to consecutive coils. Stepping may be an powerful manner to get correct positioning and pace manipulate while the usage of a microcontroller. In this paper, the stepper motor become chosen, and its technical parameters are proven in Fig.6 and TABLE IV.

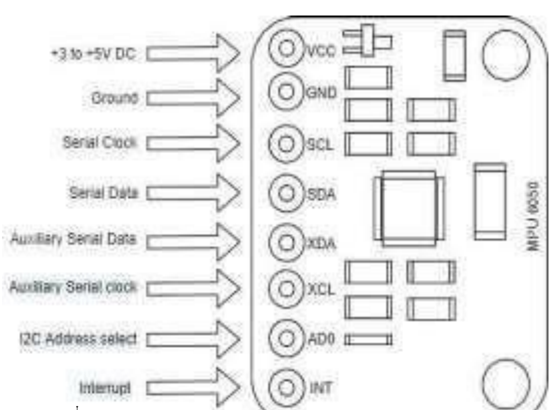


Fig. 5. Pin structure of MPU-6050.

Fig. 6. Stepper motor.

The stepper motor, as formerly indicated, lets in for particular movement. It's viable to get as correct as 0.nine stages every 1/2 of step. It has sufficient torque to maintain the bot stable. Conventional DC cars use gears to attain the desired torque, making them barely flawed for this project. Due to gaps in gears, DC cars have a few superfluous motion, making the bot unstable, and their response time could be very long. The steeper motor is desired over the DC motor for those reasons.

f) Stepper Motor Driver (A4988)

This is a totally flexible driving force which can cope with as much as 35 V and + 2A. The allegro A4988 chip on this driving force acts as a translator, consequently no step alerts are required; instead, step length and guidelines are required. Figures 7 depict the A4988 stepper motor driving force module and its pin diagram. This driving force can rotate a stepper motor from one complete step to one 16th of a step. To begin the motor, it has a reset (RST) and a snooze pin (SLP) that have to be shortened. There isn't anyt any want to attach any pins to MS1 (micro-step), MS2, or MS3 to power the motor in complete-step. The rotation of fractional steps may be completed with the assist of pins MS1, MS2, and MS3 as per TABLE IV.

Fig. 7. A4988 Stepper motor driver module

g) Miscellaneous

Aside from the components listed above, acrylic sheet, screws, and connecting wires were all employed in the construction of this robot. Long M5 screws are required to join multiple levels of the bot on acrylic sheets; connecting wires are required to connect all the hardware to supply power; acrylic sheets are required to make the base for all the components; and connecting wires are required to connect all the hardware to supply power.

TABLE IV. ROTATION SEQUENCE INPUT IN STEPPER MOTOR DRIVE

Resolution	MSI	MS2	MS3
Full Step	0	0	0
Half Step	1	0	0
Quarter step	0	1	0
Eight step	1	1	0
Sixteenth step	1	1	1

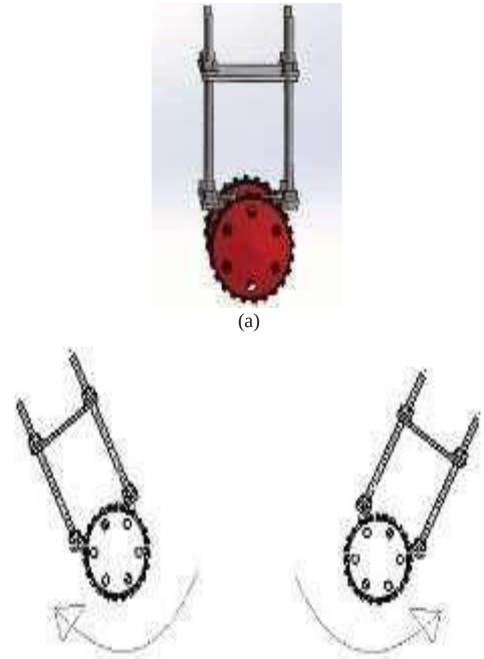
3. THE SELF-BALANCING ROBOT

The robotic receives the PID values from the transportable telecellsmartphone using the HC-06 Bluetooth Module. Values may be placed in the telecellsmartphone using an application.

The bot is at that factor calibrated via way of means of putting it on the extent surface. After those preparatory steps, the bots come to activity. It receives the rushing up values and gyro values, i.e. the points. The microcontroller bureaucracy this information making use of PID to induce the precise sum of improvement given to engines. Based at the records gotten via way of means of the controller from MPU-6050, the controller instructions the engine to run ahead or invert to keep the location of the robotic. The robotic must make 0 diploma factor with the y-axis.

Fig. 8 (a). When the bot body tilts in clockwise or anti-clockwise direction, then there is a change in the angle between y-axis and body, Fig. 8 (b) and (c). TheMPU-6050 sensor identifies this point and the microcontroller starts activities to preserve it to the specified point. The bot can do this whole cycle for around 400 times in moment to preserve a stable position at it's place.

As expressed prior, to put the PID values within a bot, a portable application is required.



(a) (b) (c)

Fig. 8. Self-balancing positions of robot. (a) Mean position of robot, (b) correction of the robot when tilted at an angle in anticlockwise side, and (c) correction of the robot when tilted at an angle in clockwise side.

A. PID controller

The closed loop manipulate device of the self-balancing robotic is proven in Fig. 9. The yield seems the actual function of the robotic. The MPU-6050 sensor colleges the actual function of the robotic. Sensor feedbacks the facts to evaluate with the reference enter. Reference enter or the factor of the robotic is to stay with the ninety ranges vertical function close to floor as regarded in Fig. 8.

The assessment of yield and reference enter offers the lean factor. This tilt is the error which needs to be reduced to zero. It calls for a short controller to address this project of blunder lessening.

PID controller has been applied for this reason. PID controller sends the instructions to the engine driver, and in result, it controls the motion of the stepper engines absolutely.

PID controller is likewise proven in Fig. 9, and mathematically may be written as:

$$u(t) = Kpe(t) + Ki \int e(t)dt + K_d \frac{d}{dt} e(t) \qquad (1)$$

where u(t) is the response of the controller. Kp, Ki, and Kd are the proportional constant, integral constant, and derivative constant respectively, which are corresponds to proportional, integral, and derivative controllers, respectively. e(t) is the error signal which shows the difference between y-axis and the actual position of the bot.

The point set focusses where the bot needs to keep up it's default position and PID values are encouraged to the Arduino utilizing the portable application.

The values of PID are set with the assistance of Ziegler-Nichol's tuning strategy. [15]

B. Microcontroller Programming

We need to program the microcontroller and for that we need an open-source platform, known as balancingwii that is used in various projects for researchers and scholars. It also has a fi rmwa re that is us ed for innumerable projects including the all time firmware but used for aerial projects, such as quadcopter. It had inbuilt compatibility to use the mobile application. A flowchart explaining the function of microcontroller programming is shown in Fig. 10. It can be seen in the initiation of the flowchart; first Arduino verifies whether *f2C* communication has been established or not (this means that

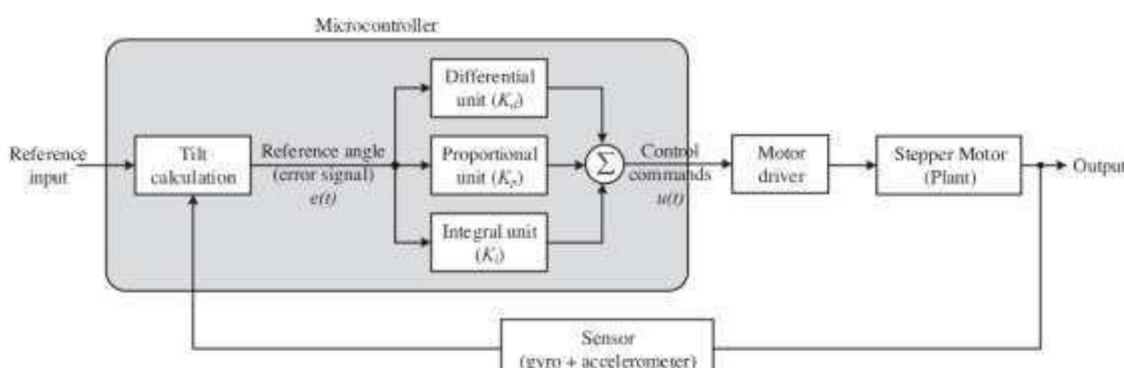


Fig. 9. The closed loop control system of the self-balancing robot.

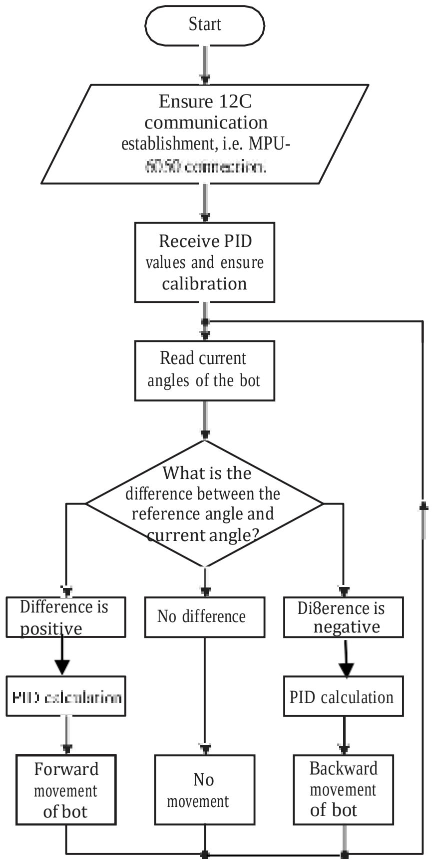


Fig. 10. Flowchart of microcontroller programming.

it checks for if the gyro sensor is connected or not, i.e. MPU-6050 is connected or not). After that, set-point is calibrated, and PID values are received through the Bluetooth module HC-06. After receiving all the values, the bot comes to action by taking the deduction between the set-point or reference point and the current angles. Then calculations are done and specific acceleration value and direction are provided to the motors, accordingly. After repeating this process several times, the bot tries to be stable after some to and fro motions.

C. Mobile application

An Android platform-primarily based totally cell software EZ-GUI has been used to provide the PID values to the microcontroller thru the Bluetooth module. The cell software gets rid of the want for a pc or laptop machine in sending and receiving the values, set calibration point, and converting modes. This app changed into to begin with advanced for Cleanflight, Betaflight, iNav, and Multiwii, which might be the predominantly the flight systems. It lets in the consumer to quick extrade the PID values, which was very hard whilst the usage of an digital tool inclusive of laptop or mac to do such things. It changed into additionally eligible to percentage the desired facts thru many verbal exchange means, inclusive of Bluetooth, WiFi, radio transmission, and USB. Any different like minded software also can be used.

4. HARDWARE IMPLEMENTATION

This section discusses the hardware connections of the self-balancing robot. A connection diagram is shown in Fig. 11. The step by step process of connections are as follows:

Step 1. Place Arduino Nano, MPU-6050, two stepper motors and their A4988 drivers, HC-06 Bluetooth module, and battery as shown in Fig. 11.

Step 2. Make common positive bus (bus *+ve)* and connect Arduino Vin to it. Similarly, make common ground bus (bus *GND)* and connect Arduino *GND* to it.

Step 3. Connect VCC of MPU-6050 to positive of 10 *uF* capacitor and Vout of the voltage regulator.

Step 4. Connect MPU-6050 *GND* to ground bus, its *SCL* to Ardunio A5, and its *SCA* to Arduino A4.

Step 5. Connect first motor driver *OUT2 A*, *OUT2B*, *OUT1A*, and *OUT 1B* to first stepper motor *D*, *B*, *C*, and *A* respectively.

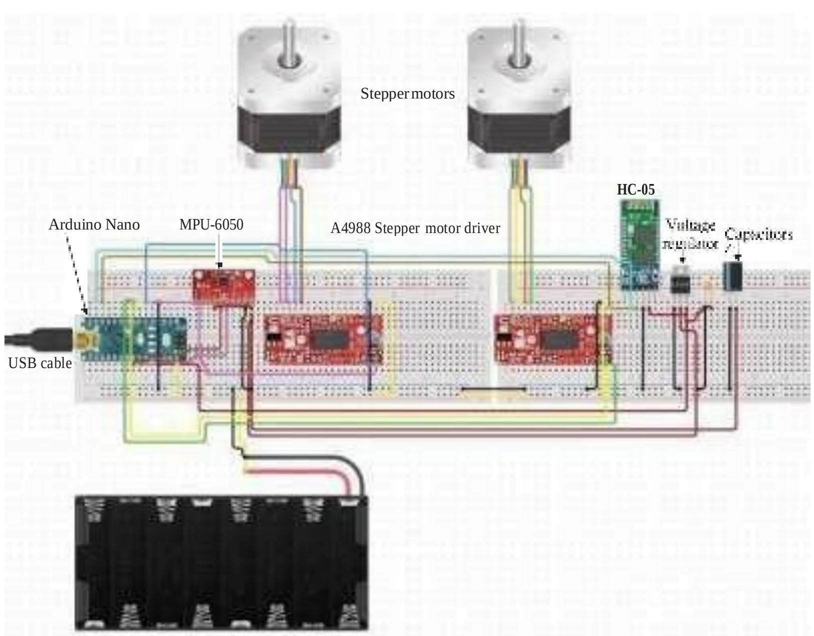


Fig. 11. Connection diagram for the self-balancing robot.

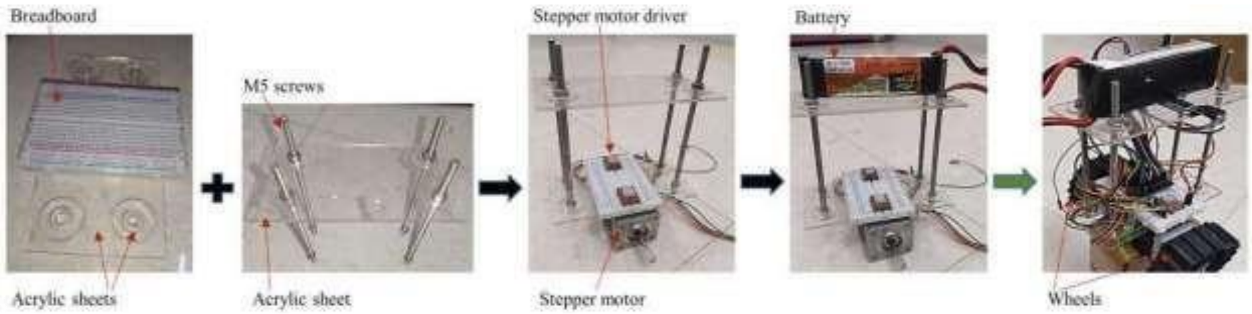


Fig. 12. Hardware assembly of the self-balancing robot.

Step 6. Connect first motor driver *DIR* to Arduino D2, its *GND* to bus *GND, STEP* to Arduino D3, and *V* + to bus *+re.*

Step 7. Connect second stepper motor D, B, C, and A to second motor drivers OUT2 A, OUT2B, OUT1A, and OUT l B, accordingly. DIR is connected to Arduino D4, GN D is connected to bus GND, and STEP is connected to Arduino D3, and F + is connected to bus + re.

Step 8. Connect the GND of the HC-05 to the bus GND, the TX to the Arduino D10, and the RX to the Arduino.

Step 9. Connect the voltage regulator Vin to Arduino 5V HC-06 VCC, and 100 *nF* con().and then do Connect it's 0 to bus *GND* .

Step 10. Connect 100 nF con1 and 10 *uF* neg to bus *GND* Of the circuit.

Step 11. N o w connect t h e Arduino Nano to the computer using a USB cable which comes with Arduino.

Step 12. Connect battery *+ve* to bus *+ve* and then battery -ve to its bus *GND.*

Step 13. Now upload embedded code in Arduino Nano using the USB power mini. Which will test all the wiring.

Step 14. Test the MPU-6050, stepper motors, and HC-06. After that do send PID values through the mobile application and test again the applications.

12. It contains a two-level framework. The lower one contains the motor driver, Arduino Nano, and motors attached at the lower side. The top one contains the battery, HC-05 Bluetooth module, and the MPU-6050 gyro sensor. The battery was kept at the top of the arrangement so as to keep the center of gravity above the horizon of motors.

Laser-cut acrylic sheets are used to create the partitions. The long MS screws, nuts, and bolts hold these sheets together. Double-sided glue tapes are used to secure all of the modules.

5. RESULT AND CONCLUSION

We did the trying out and then the 2 wheeled robotic changed into capable of stability itself correctly on wheels. We used a CAD designed revealed shape to provide the robotic the appearance it deserves. The microcontroller required right PID values to satisfy the needs at the same time as the gyro sensor required correct size to satisfy the corresponding demand.

There are several approaches to extend in this work. A revealed PCB may be used in place of a breadboard for a greater aesthetically appealing result. This bot can be utilized in diverse regions and may be a notable gaining knowledge of device via way of means of including greater sensors and functionalities. This self-balancing robotic may be used to create fashionable line following robots, impediment avoidance robots, and labyrinth fixing robots. These applications would make the learning process more exciting and mainly a differentiating factor from those custom robots which uses four wheels in these tasks.

REFERENCES

[1] K. Yarnafuji and A. Koshiyama, "Postural and Driving Control of a Variable-Configuration-Type Parallel Bicycle," *J. Robotics Mechatronics*, vol. 3, no. 5, pp. 365-372, 1991.

[2] *D.* L. Kamen *et al.*, "Personal mobility vehicles and methods," 2001.

[3] N. J. Mathew, K. K. Rao, and N. Sivakumaran, "Swing up and stabilization control of a rotary inverted pendulum," *IFAC Proceedings Volumes*, vol. 46, no. 32, pp. 654-659, 2013.

[4] A. Mehrvarz, M. J. Khodaei, W. Clark, and N. Jalili, "Modeling and dynamics analysis of a beam-hoverboard self-transportation system," in *Dynamic Systems and Control Conference*, 2018, vol. 51913, p. V003T32A008: American Society of Mechanical Engineers.

[5] (2020). Wou'Wee&- *MiP*. Available: https://wowwee.com/mip

[6] W. An and Y. Li, "Simulation and Control of a Two-wheeled Self-balancing Robot," in *2013 IEEE International Conference on Robotics and Biomimetics (ROBIO)*, 2013, pp. 45d-461: IEEE.

[7] V. Kongratana, S. Gulphanich, V. Tipsuwanpom, and P. Huantham, "Servo state feedback control of the self balancing robot using matlab," in *2012 12th International Conference on Control, Automation and Systems*, 2012, pp. 414-417: IEEE.

[8] Q. Yong, L. Yanlong, Z. Xizhe, and L. Ji, "Balance control of two-wheeled self-balancing mobile robot based on TS fuzzy model," in *Proceedings of2011 6th International Forum on Strategic Technology*, 2011, vol. 1, pp. 406-409: IEEE.

[9] J. Wu and W. Zhang, "Design of fuzzy logic controller for two-wheeled self-balancing robot," in *Proceedings of 2011 6th international forum on strategic technology*, 2011, vol. 2, pp. 1266-1270: IEEE.

[10] N. Razmjooy and M. Ramezani, "Optimal control of two-wheeled self-balancing robot with interval uncertainties using Chebyshev inclusion method," *Majlesi Journal ofElectrical Engineering*, vol. 12, no. 1, pp. 13-21, 2018.

[11j R. S. Martins and F. Nunes, "Control system for a self-balancing robot," in *2017 4th Experiment@ International Conference (exp. at'17)*, 2017, pp. 297-302: IEEE.

[12] S. Yuan, G. Lei, and X. Bin, "Dynamic modeling and sliding mode controller design of a two-wheeled self-balancing robot," in *2016 IEEE International Conference on Mechatronics and Automation*, 2016, pp. 2437-2442: IEEE.

[13] J. Qiu ei a/., "Two-wheeled self-balancing robot modeling and nonlinear control," in *2017 14th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, 2017, pp. 734-739: IEEE.

Wildlife Monitoring Using Object Detection

MEENA ALEKHYA T[1], NIMISHA NIRMAL[2], ROHIT RAI[3], SARIKA KASHYAP[4], ANURADHA BADAGE[5]
Department of Computer Science & Engineering, Sapthagiri College of Engineering
#14/5, Chikkasandra, Hesaraghatta Main Road, Bangalore – 57, India
[1]alekhyameena533@gmail.com
[2]nimishanirmal2000@gmail.com
[3]rohitrai00451055@gmail.com
[4]sarikakashyap1619@gmail.com
[5]anuradha@sapthagiri.edu.in

***Abstract* — Equatorial extents are applique a livestock crisis including the orderly surpassing advantage of gigantic animals for two together livelihood and marketing intentions. It has been assumed that the cause inquiry mainly emerges from townlet, this will then conceive "halos of defaunation" place the multitudes of abundant animals advance with more area further townlet. Whilst aforementioned structures have existed well-distinguished at the terrain area, testing in what way or manner defaunation halos extend numerous townlets has taken significantly limited consideration. Woodlands shortly enclosing townlets are of important significance to humans as a political whole residing inside or nearly bureaucracy along with the determinants presuppose to impact native declination of animal population aureole (for instance suburb height, inquiry methods, and passage to native demands) concede the possibility influence regional profession along with the environmental quality of regional woods. Human-animal conflict is the main question place an enormous amount of money is dreaming and human growth is imperiled due to this society's escape from their crops, bovine animals, property, and constantly their lives. It has been established that the general ratio of animal note along with the measured class copiousness were fixed through the suburb-range rise, still, the entire quantity of things fought and livestock biomass was shorter packed to townlets-compatible accompanying the regional exhaustion of being. So, this zone searches out and listens steadily for fear that the entry of rowdy mammals. Regarding this question, we have tried to cultivate a plan that will monitor the field utilizing object discovery to avoid the interruption of stormy mammals.**

Keywords- Object detection, YOLOv4, Neural networks, CNN

I. INTRODUCTION

Research concerning mammals in image prepare has existed an main field for many applications. Many algorithms and designs have existed grown by human beings to have a better understanding of animal behaviors. Besides, these requests more can symbolize a warning whole to human beings from the intrusion of hazardous stormy mammals for early precaution measures. These requests maybe reduced just before three main branches, that is to say discovery, pursuing, and identification[1]. The objective of our project search out determine guardianship from the attacks of disorderly animals and so underrate the credible loss of human-animal world. To discover interruption of being around the borders. To capture perfect likeness the infiltrator and categorize them utilizing concept alter. Taking acceptable action established the type of the trespasser. Object discovery is a computer technology had connection with calculating concept and representation processing. Neural network-located discovery be able end-to-end object detection outside particularly outlining physiognomy and is typically established in a convolutional interconnected system (CNN) nearing YOLO[2].

II. DESIGN

Design is a significant metallurgy likeness of entity fated in near future erected. It is ultimate important step in the incident of a arrangement. Software design is a process by which the necessities are translated into a likeness of program. Design is a place place design is supported in spreadsheet Engineering. Based on the consumer necessities and the itemized study of the existent scheme, a new whole must be created. This is the chapter of arrangement plotting[3].

A trustworthy whole is presented that instinctively detects chaotic mammals using calculating fantasy. The projected method uses the YOLO object discovery model to find out the

Figure 1. Flowchart of the proposed system.

presence of intense mammals in figures. The model is fine-tuned for recognizing various systems. Once detected, the animal is top-secret established the harm that is to say does, and established the seen news, notifications are shipped to alert the worried experts.

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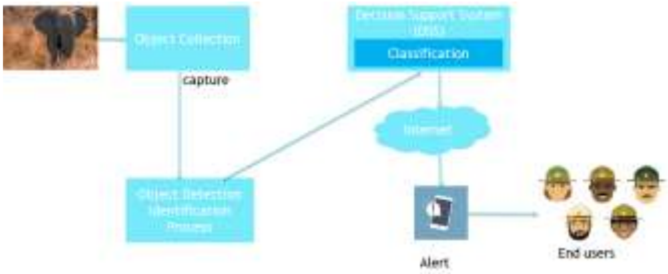

Figure 2. System architecture of the propsed system.

III. YOLO ARCHITECTURE.

Using a totally different approach Joseph Redmon, Santosh Divvala, Ross. Girshick, Ali Farhadi proposed a Deep Learning Architecture called YOLO in the paper 'You Only Look Once: Unified, Real-Time Object Detection'. It is based on clever convolutional neural network (CNN) for object[4].

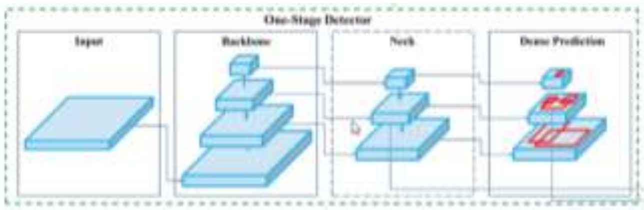

Figure 6. YOLO Architecture.

A completely different approach is being used by the YOLO Architecture. A single neural network is being applied to the whole image by the YOLO Algorithm. The bounding boxes are been employed by the algorithm after dividing the image into region wise and per region probability is been predicted. The predicted probabilities are weighted by the generated bounding boxes.

Greatest Benefits:

- Rate (45 frames per second — better than realtime)
- Network understands generalized object representation (This allowed them to train the network on real world images and predictions on artwork was still fairly accurate).
- faster version (with smaller architecture) — 155 frames per sec but is less accurate.

A. Backbone

The backbone of the YOLOv4 architecture usually consists of CSPDarkNet53. DenseNet design is the concept on which CSPDarkNet is based. Before being processed into the dense layer the foresaid input conjoins with the existing input and it is termed as Dense Connectivity Pattern[4].

There are two components of CSPDarkNet53:

- Convolutional Base Layer
- Cross Stage Partial (CSP) Block

The characteristics map in the Cross Stage Partial strategy is being split in the base layer of two components and then with the help of Cross-stage hierarchy it integrates them, the flow of more gradient is allowed through the layer due to this and hence eases the nefarious issue of "Vanishing Gradient".

The full-sized input characteristics is a part of the Convolutional Base Layer. Two halves of the CSP block are divided by the Convolutional Base Layer when it is accumulated next to it, the dense block will have the first half passed through it, without any processing the second half goes on to the next step by routing immediately. For efficient forwarding, CSP retains the granulated characteristics, reusing the features by stimulating the network and parameters of the network are decreased. In the backbone network, just the final convolutional block is a dense block(extraction of richer semantic characteristics), as numerous densely linked convolutional layer whose outcome may plummet in the determining rate.

B. Neck

The area where characteristic accumulation take part is known as neck. From the numerous phases of the backbone, the map characteristics are gathered and concatenates to prepare for the next phase. There are numerous top-down path and bottom-up path in the neck components.

C. Dense prediction.

The responsibility of the head in the case of highest quality stage indicator search out perform thick forecasting. The thick forecast is the definitive prognosis that is composed of a heading holding the matches of the foresaw restricting box (cencenterltitude, breadth), the confidence score of the forecast, and the label [6].

IV. Implementation

The implementation of the said system is divided as defined below,

A. Capturing of the video footage.

Figure 3. Capturing of the video footage

Image/video is detected using a camera and stored in a file or folder in.avi format. The video can be fed into the system either by

- Feeding pre-recorded videos
- Or live recording using the camera.
- Saving the file.

In the proposed system, we used both pre-recorded videos and live recordings as video footage. In both cases, the system successfully detected the animals [5].

B. Feeding of the captured footage into the Yolo architecture

Figure 4. Feeding of the captured footage into the yolo architecture and the object detection process.

The images or videos are fed into the Yolo architecture and the objects present in the input are observed [6].

The images are split into sectors and bounding boxes are denoted including probabilities of each region is done by the network.

- The Classifier based system has less benefits compared to the model. Unlike R-CNN similar systems where thousands processing of single frame is required, however a single network evaluation predictions are done by the model. Hence for this reasons the model is comparatively faster(1000x R-CNN and 100x Fast R-CNN).
- By logistic regression, each bounding box arises from the process of determining four coordinates. The algorithm by adding and object score for the boxes.
- By the multi-label classification, the classes are determined per box. As we move to the more complicated domain, the previous formulation will be beneficial like coinciding labels in the Open Image Dataset.

C. Classification of the detected object.

The discovered objects are categorized on the specified classification (decision support system), and an alert is informed on the respective device and sent to the end-users via the internet.

- From the predicted scales, the features are excerpted from the system and for the network pyramid a related concept is used.

- Feature extraction can be done using the previous network. For training and testing, DarkNet neural network is used which also includes Multiscale training, lots of data argumentation, batch normalization, and all the required standard stuff.
- The detected object is being print by the DarkNet and the time taken to find it, the result is displayed directly as the compilation with OpenCV is not done by the DarkNet.

For the calculation of the detection model, the following attributes were determined: mAP = mean average precision, precision, and detection speed[5]

$$\text{mAP} = \left(\sum_{c=1}^{C} AP(c)\right)/C$$

$$\text{precision} = TP/(TP+FP)$$

$$\text{recall} = TP/(TP+FN)$$

with average precision = AP, number of classes = C, number of true positive = TP, number of false positive =FP, number of false negatives = FN. The AP is determined using the interpolated average precision:

- First, the detected BBs of a class are ranked according to their confidence and determined whether being true positive (TP) or false positive (FP).
- The precision and recall values for a specific BB, say bi, are Animals 2021, 11, 1723 6 of 18 calculated using the accumulated TP and FP values of all BBs with a higher rank than bi.
- The precision-recall curves often show a non-monotonous behavior, i.e., they go up and down. This is caused by stochasticity in the ordering of the ranked BBs.

To reduce the impact of this effect, the interpolated AP is used to smoothen the shape of the precision-recall curve [8].

Taking acceptable action established the type of the trespasser. Object discovery is a computer technology had connection with calculating concept and representation processing. Neural network-located discovery be able end-to-end object detection outside particularly outlining physiognomy

Figure 5. Classifying the detected object.

V. RESULTS

Figure 7. Detection of bear.

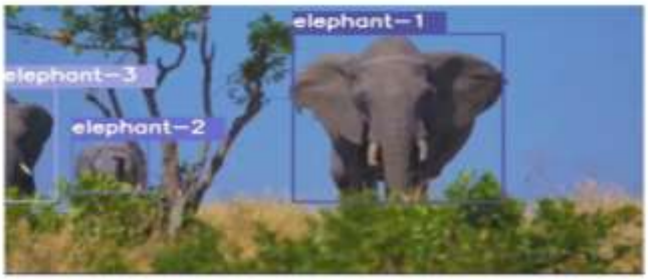

Figure 8. Herd of elephants being detected.

As we can see in the above figure, the system is perfectly predicting bear and elephants. This proposes that the system is capable of detecting wildlife animals after training[8].

VI. CONCLUSIONS

In current age, with the growing significance of animal identification and following, animal acknowledgment algorithms have taken more and more consideration, and the use of neural networks has unlocked new things. The neighborhood forthcoming the center borders follow to be tuned in steadily for fear that the approach of disorderly animals.

With regard to this problem, we have created an exertion to expand a system that will monitor the field place the arrested exact likeness shrubs animal will be classified utilizing figure handle so that the essential conduct or carefulness that are ensured carry out.

REFERENCES

[1] P. Hu and D. Ramanan, “Finding tiny faces,” in Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (CVPR), Jul. 2017, pp. 951–959.

[2] K. Duan, D. Du, H. Qi, and Q. Huang, “Detecting small objects using a channel-aware deconvolutional network,” IEEE Trans. Circuits Syst. Video Technol., vol. 30, no. 6, pp. 1639–1652, Jun. 2020.

[3] "Object Detection-based Video Retargeting with Spatial-Temporal Consistency" Seung Joon Lee, Siyeong Lee, Sung In Cho, Member, IEEE, and Suk-Ju Kang, Member, IEEE [2020]

[4] "Internet of Things for Wildlife Monitoring "Xiaohan Liu, Tao Yang, Baoping Yan Computer Network Information Center (CNIC) Chinese Academy of Sciences Beijing, China

[5] "Real-Time Video Analytics for Object Detection and Face Identification using Deep Learning"- Shrikant Jagannath Patro* Vellore Institute of Technology, Chennai, India Prof. Nisha V M Vellore Institute of Technology, Chennai, India [2019]

[6] "IoT Concept for Animal Detection Using ANN to Prevent Animal Vehicle Collision on Highways " Kalaivanan Sugumar SRM Institute of Science and Technology Chennai, India Amrutham Suresh Kumar SRM Institute of Science and Technology Chennai, India

[7] Scrutiny of Methods for Image Detection and Recognition of Different Species of Animals Elham Mohammed Thabit A. ALSADI, Nidhal K. El AbbadiInternational Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-3S3, November 2019

[8] Application of YOLOv4 for Detection and Motion Monitoring of Red Foxes Anne K. Schütz, Verena Schöler, E. Tobias Krause, Mareike Fischer, Thomas Müller, Conrad M. Freuling, Franz J. Conraths, Mario Stanke, Timo Homeier-Bachmann, and Hartmut H. K.

COTTON LEAF DISEASE PREDICTION MODEL USING DEEP LEARNING TECHNIQUE

[1]Apoorva A
BE. Computer Science and Engineering
SCE(VTU)
apoorva1240@gmail.com

[2]Fouzia Anjum S
BE. Computer Science and Engineering
SCE(VTU)
fouziaanjum2001@gmail.com

[3]Kumari Madhu
BE. Computer Science and Engineering
SCE(VTU)
madhujnvk@gmail.com

[4]Kavitha B
Assistant Professor
Department of CSE, SCE(VTU)
kavitha_b@sapthagiri.edu.in

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Abstract

One of the important professions in many countries is Agriculture. India is an agriculture-based country where more than 70% population depends on agriculture and the loss of crops is approximately 10 to 30% due to various diseases that occur in it. The main rationale through this Paper is to identify the type of disease and assess the damage of crop and in turn providing appropriate compensation to suffered farmers. The proposed project aims to build a Web Application which identifies the diseases in cotton leaf. For utilizing this app the user is instructed to upload the image and with the assistance of image processing we can get a modified colour image of a leaf which is diseased and then we can proceed by applying CNN Technique to anticipate the disease present in the cotton leaf.

I. INTRODUCTION AND BACKGROUND

Since agriculture production is the major source of Indian Economic system, the main focus of the crop production is at most important . Farmers, with their experience try to predict the diseases , but it is not always sure and solved in a expected way. Sometimes taking the verdict from the agricultural experts is also a very tedious work. During the time of observation of the damaged crop, the farmers used to face lot of issues so as to identify the disease.

Cotton is a prominent fibre crop in the entire globe which provides necessary unit materials for the textile industry of Cotton. It faces many problems because of the diseases which affect it. It cannot be identified it naked eyes. The leaf of the plant is largely affected by the diseases.

The system which is being proposed here aims to design a Web Application that recognizes the diseases in Cotton Leaf . The main objective behind this project is to develop an app for the betterment of the agricultural sector in order to easily detect few of the diseases in the cotton plant by deep study and prediction about them with the help of image samples which can help the farmers to protect their plantation and take the appropriate measures in the correct span of time.

The paper is organised as follows. Section II talks about the Literature survey of various previous works done. Section III presents the analysis of various models used and also talks about the proposed model, Section IV gives insights on the Requirements Specification of the proposed model, Section V and VI talks about the heart of the model which the design and implementation of the proposed model. Finally Section VII concludes about the Result Analysis of the Model in comparison to the previous proposed models.

II. LITERATURE SURVEY

Paper [1] talks about the cotton leaves screening where cotton crop is monitored and decisions are made from its analysis. In [2] the author lists about the segmentation and classification techniques for the comparative analysis which is performed for the detailed study of the techniques like KNN, ANN, SVM, PNN. In Paper [3] the author gives insights about the application that is used to develop a system which is capable of recognising diseases in the crop and the results of the detected diseases, recommended pesticides and also the cost of the pesticides are displayed to the users. In [4] the author emphasizes more on four main phases within the primary phase and has mentioned about the colour transformation structure for the RGB Images. [5] speaks about DL Technique model which is implemented using the python package, Keras packages, Jupyter Notebook has been used as an IDE.

III. ANALYSIS

There are several existing systems which make use of KMeans, SVM for classification purposes. Initially the images in the dataset undergoes preprocessing. In this the images are zoomed in or out, rotated, the dimension of the images are altered in order to bring it in an accurate format for further processing. After this the classification model is being developed using the training data and then testing data is used for testing purposes. The model which performs the best was saved.

- There are many systems which just differentiate whether the leaf is diseased or healthy or whether the disease is organic or inorganic.
- The number of classification classes was also around two to three.
- Many of the systems proposed earlier could offer an accuracy in the range of 75 to 85% only.
- Many systems used very small dataset for the classification which could not lead to accurate classification.
- Several models were developed but were not deployed in a way which could be used by the end users.

A. Proposed System

It is based on the CNN Technique. It makes use of comparatively larger dataset. Its domain includes uploading an image of leaf on a web application and predicting the disease present. The proposed system will make use of architecture present in Keras so that the accuracy and efficiency of the model is improved. After developing an accurate and successful prediction model, the model will be further deployed into a web application so that its use becomes easy.

B. Advantages

1. The main advantage of this proposed system is that it can differentiate the different types of diseases instead of just predicting whether it is healthy or diseased.
2. The proposed system offers a great score of accuracy in very less time.
3. A user can easily upload the image in it and can make the prediction therefore it can be used by a naive person too.
4. There is total five classes for classification and they are: Bacterial Blight, Fussarium Wilt, Curl Virus, Leaf sucked by chewing pest and Healthy leaf.

IV. REQUIREMENT SPECIFICATION

A Requirement Specification of a System (SRS) is based on the needs of the client's or buyer's requirements at a certain stage prior to the original model is being developed. During the time of analysis the required data is documented as per the needs of the customer. The limitations and the operations that are need to be taken care are briefed here. Usually SRS Document will deeply and thoroughly discuss the crux of the system which is being proposed. It's a bidirectional process that handles both the perspective at real time.

A. Functional requirements

It defines the functioning of a system software by understanding the way the system must must act when inputs are presented to it. It includes operations , Data Processing and Manipulation and various functionalities. Following are the functional requirements in our System:

- The control is provided to the end user (for example farmers)
- The leaf image is required to be the input in the model.
- As soon as the person clicks on detect button, the name of the disease present must be displayed.
- After detection, the end user should take the required necessary measures

B. Non-functional Requirements :

The functions that are satisfied by the system are indirectly related to the Non functional requirements. The obvious behaviour is not more focused rather defines the standards that are needed to be followed to achieve the goal. These needs are supported by the system with the help of non functional requirements like response time , reliability and store occupancy. The external factors that are needed for the integration of various systems are as follows:

- **Usability**: Simplicity is the key for any application. This system is pretty easy to understand and could be used in every household for their safety.
- **Reliability**: The system which is being proposed should be credible in providing the various applications. When a user makes few change it could be reflected in the system.
- **Maintainability**: The system should be monitored and maintenance should be simple and objective in its approach.

C. Hardware Requirements:

1. Inspiron 15 3593 Series

2. 10th Generation Intel® Core™ i5-1035G1 Processor (6MB Cache, up to 3.6 GHz)

3. Central Processing Unit (CPU) . An AMD equivalent processor will also be optimal.

4. RAM — 8 GB minimum, 16 GB or higher is recommended Operating System — Ubuntu or Microsoft Windows 10.

D. Software requirements:

It is the representation of the attributes and ease of use of the intended system. The Requirements deliver the anticipation of users from the final system. The demand is made evident or concealed, the client’s vision. The system which is being proposed here has the following software requirements:

1. Google Colab

2. Anaconda

3. Visual Studio Code

V. DESIGN

It is the process of stating the components, architecture, modules, data and interfaces in the system to contended requirements which has been specified. It is the essential phase in the system development. Software design can be defined as a process by which the requirements are interpreted into a software representation.

A. System Architecture:

A System Architecture is a conceptual model using which we can define the structure and behaviour of that system. It is a formal representation of a system. According to the context, the architecture of the system can be used to refer to either a model to describe the system or a method used to build the system. Building a proper system architecture helps in the analysis of the project, especially in the early stages.

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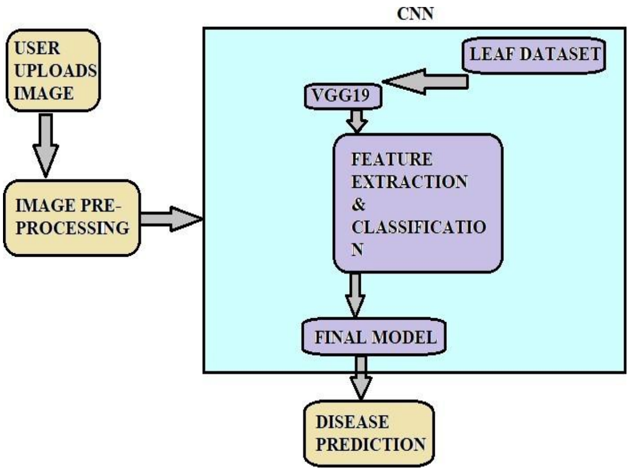

Fig 1: System Architecture of proposed system

VI. IMPLEMENTATION

Module 1: Data Acquisition

Cotton leaf images are captured in natural specifications, by taking into account different broad-scale climatic changes and different harvests. The data acquisition system is designed with respect to generate impartial, clear and modified images of cotton leaf plant database for additional examination and rectification. The dataset contains different Cotton Leaf Image Diseases like Fussarium Wilt, Bacterial Blight Curl Virus, Leaf Sucked by Chewing Pests. Images have been fed for training and testing.

Module 2: Data Pre-processing and Feature Extraction

In these stages, we are in need of better quality images and with better resolution. These images are resized with specific manner and resolution. In These images we aim to remove outliers and rotate the images using a process called data proliferation. The first basic task is to Insert pre-processed images into a network in all image screening projects. Vectorization, normalization, Resizing of Images, and image augmentation are the Common image pre-processing steps in any image screening project. In this Proposed system, these image pre-processing works are performed before going to further DL Processing.

In the process of feature extraction, extraction of some of the most important characteristics of the diseased leaf is performed. It will be able to create coloured structure and convert the colour value from RGB components of diseased parts of cotton leaf image. These features are to be used to train our neural network. We can extract some of the important features of the diseased leaf. The mechanism of filtering data is performed to correlate and extract their significant features.

Module 3: Model Building

VGG19 ARCHITECTURE

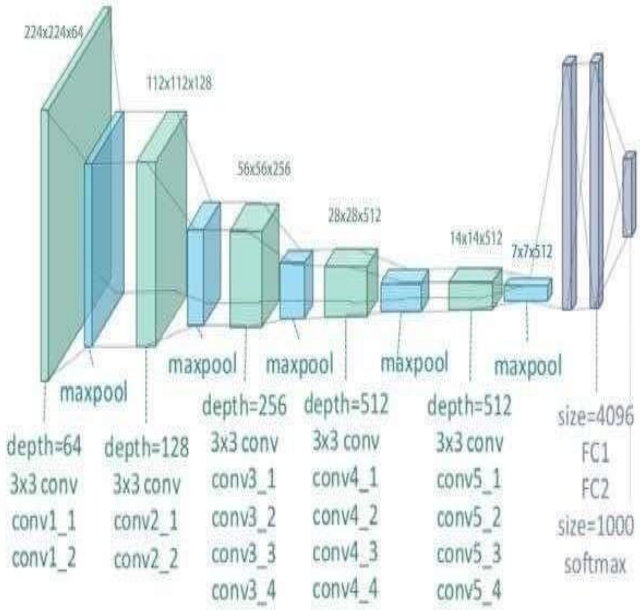

Fig 2 Architecture of VGG19

The proposed system is outlined in such a way which can take any picture of a leaf as the real time input and can easily predict the type of disease in cotton leaf instead of just classifying it as a diseased leaf. This system makes use of VGG 19 architecture of Keras for the classification process.

- VGG19 is an alternative of the model VGG which briefly consists of 19 layers (16 convolution layers, 5 MaxPool layers, 3 Fully connected layers, and 1 SoftMax layer).
- The Model is loaded with the preformed weights of the imagenet dataset.

- From the initial input layer till the final maxpool layer (which is labeled as 7*7*512) is referred to as the Feature extraction part of the model.
- VGG19 takes an input image size of 224×224.
- Convolution Neural Layers: VGG19's convolutional layers support a minimal receptive field of 3×3, which is the smallest possible size that still captures left or right and up or down. The process is followed by a ReLU activation function. 1 pixel of stride is fixed to keep the spatial resolution maintained after convolution.
- Fully Connected Layers: The Model VGG 19 has 3 fully connected layers. First two layers have 4096 nodes each, and the last layer has 1000 nodes, which defines the total number of classes the imagenet dataset has.
- There are total five classes for classification, and they are: Bacterial Blight, Fussarium Wilt, Curl Virus, Leaf sucked by chewing pest and Healthy leaf. After running the model for the leaves are classified accurately with the accuracy of about 91% to 93%.

Module 4: Model Deployment

Model Deployment assists one to proclaim their work to the world and make better decisions with it. Streamlit is a popular open-source framework used for model deployment by Deep Learning, Machine learning and data science. It is a latest model deployment tool that clarifies the entire model deployment cycle and lets you deploy your models at ease. If one knows Python, then all are equipped to use Streamlit to build and share your web apps, in hours. Initially, streamlit package is installed. Next an application file is created and all the codes are written in that file. It is a python script that will run in the background of the web application. After including all the necessary code in the python file, we then connect the application to the local server

VII. RESULT ANALYSIS

The accuracy achieved by our proposed model is greater than 90% and can be used on a realtime basis.The following figure in the form of a graph shows the Accuracy achieved by the Model.

The graph below enhances the authenticity of the proposed project model.

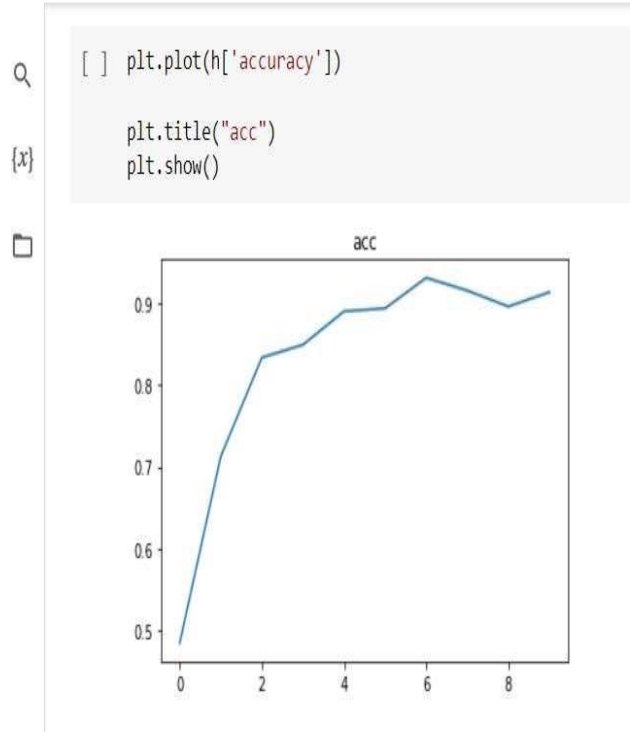

Fig 3 Accuracy

The loss incurred in our model is very minute in comparison to the previously built models. The following figure in the form of graph shows the the Loss incurred by the Model.

```
[ ] plt.plot(h['loss'])
    #plt.plot(h['val_loss'], c ="red")
    plt.title("loss vs v-loss")
    plt.show()
```

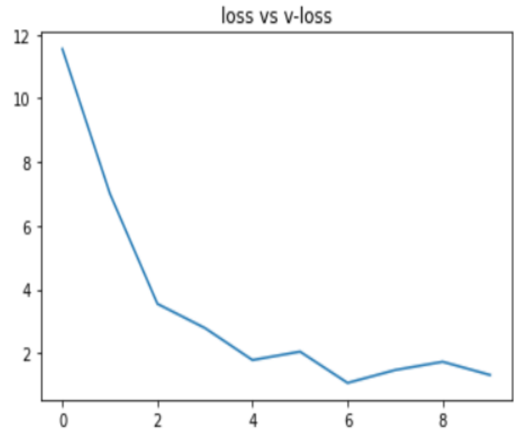

Fig 4 Loss

VIII. CONCLUSION

Classification of Leaf Diseases is a crucial task in the Agricultural Field. Diagnosis of Diseases will help the farmers to recognize the measures to be taken ahead. Classification is performed using different DL Algorithms. We conclude that the cotton leaf disease is the major problem and one thing is small area of land are infected but the farmer can spray pesticides or insecticides in whole farm so we decided to build a model that can detect a disease and also gives the information of the type of disease present in the particular leaf so that adequate early measures can be taken to cure them. So, farmer can understand and stops the spreading the disease to other crops.

REFERENCES

[1] Identification of Cotton Lesions Using Deep Learning Technique Rafael Faria Caldeira, Wesley Esdras Santiago and Barbara Teruel, 3rd May 2021

[2] “A Comparative Analysis of Machine Learning Algorithms for Detection of Organic and Nonorganic Cotton Diseases” Sandeep Kumar , 1 Arpit Jain , 2 Anand Prakash Shukla , 3 Satyendr Singh , 4 Rohit Raja , 5 Shilpa Rani , 6 G. Harshitha , 1 Mohammed A. AlZain , 7 and Mehedi Masud

[3] Farmer Buddy-Web Based Cotton Leaf Disease Detection Using CNN” Shantanu Kumbhar, Amita Nilawar, Manasi Nipane, Shruti Patel

[4] Pranita P. Gulve, Sharayu S. Tambe, Madhu A. Pandey, Mrs S.S.Kanse, “Leaf Disease Detection of Cotton Plant Using Image Processing Technique”, IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735. PP 50-54 ,2015

[5] Deep Learning-Based Image Processing for Cotton Leaf Disease and Pest Diagnosis by Azath M., Meles Zekiwos, and Abey Bruck

[6] Nikhil Shah, Sarika Jain, “Detection of disease in Cotton leaf using Artificial Neural Network”, 978-1-5386-9346-9/19/$31.00 ©2019 IEEE

[7] Disease Detection of Cotton Leaf”-Varun Suryawanshi, Yash Bhamare, Rahul Badgujar, Komal Chaudhary, Mr. Bhushan Nandwalkar, Department of Computer Engineering

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IOT Based Power Transmission Fault Detection Using Blynk Cloud

Prof. Shashirekha. G
Assistant Professor
Department of Computer Science
Sapthagiri College of Engineering
bangalore, India
shashirakhag@sapthagiri.edu.in

Bhargav trimal Kulkarni
Student
Department of Computer Science
Sapthagiri College of Engineering
bangalore, India
bhargav.trimal21@gmail.com

Darshan K. S
Student
Department of Computer Science
Sapthagiri College of Engineering
bangalore, India
darshankuttana99@gmail.com

Aditya M
Student
Department of Computer Science
Sapthagiri College of Engineering
bangalore, India
aditya0manne@gmail.com

Manjunath Rama Naik
Student
Department of Computer Science
Sapthagiri College of Engineering
bangalore, India
manjunath.rama.naik48@gmail.com

***Abstract*— The problem with the transmission line is, without a doubt, dangerous to the land. When compared to external transmission lines, there are less issue events in HV and EHV transmission lines, but there are more deficiency events in regions. In our model, we structure a model that is to distinguish the shortcoming in transmission line by looking at the node MCU is connected to a transformer, if power is flowed through this, a subsequent signal will go to Blynk server, it is dependent on the number of transformer and its corresponding node MCU, if all signal will go to Blynk server means power line is in good condition, but if some data signal went Blynk server is dependent on the number of transformers and their corresponding node MCUs; if all signals go to blynk server, it means the power line is in good working order; however, if some data signals go through the database and some data does not, it means the node MCU is not working; each node MCU has a unique area code id. The data from the issue event, specifically the stage, is sent to a page via an IOT device, the NODE MCU(Esp8266), and it is also displayed in the show. In this IC, the microcontroller NODE is used to write computer programmes that consider the voltage signal, as well as communicate yield to the IOT module and display. The power supply is set to provide 3.3-volt dc capacity to all segments, and this stock is distinct from the stock used to verify the issue event..**

I. INTRODUCTION

Electricity, as the lifeblood of the human race, illuminates the streets at night and warms our houses in the winter. A power grid, which includes both transmission and distribution networks, provides this electricity. Our everyday power use is reliant on the power distribution system, and faults account for the majority of power outages. The main concern for electricity grid dependability in this same distribution system is line faults. Coverage for suburban cities, districts, and rural areas stretches over miles. Because of their scale and complexity, distribution networks are difficult to troubleshoot, and identifying a defect can be a massive undertaking. When a failure occurs in an overhead transmission line system, instantaneous changes in voltage are observed in traditional operation travelling wave methods. High frequency is generated by a combination of voltage and current. Traveling waves are electromagnetic impulses that propagate in both directions away from the fault location along the transmission line. The fault current is relatively large, and during the fault, power is diverted to the fault, causing the voltage in nearby zones to become unbalanced. It is to detect the error as soon as possible, which is why we used a microcontroller to speed up the process. The resistance and inductance of the transmission line conductor are distributed uniformly over its length. Long lines are usually more suited for travelling wave fault location methods. Power transmission lines that are more than 80 kilometres long and operate at 50 Hz are regarded to have the qualitiesWaves of voltage and current travel on a line with a defined propagation speed. To identify the damaged outgoing line, utilities may turn off an entire part of the distribution grid in a typical procedure. After locating the damage, line technicians will turn off the problematic line one section at a time until they find the ground fault. With the introduction of sensors, this process can take hours or even days under inferable weather conditions or steep terrain. With the internet of things and big data technology working hand in hand, an intelligent distribute line monitoring system was created. IWOS instals high-precision sensors throughout the distribution network to give a complete solution for real-time defective detection.. Line cracks and ground faults must be accurately located. The system gathers data from sensors across a line to acquire field information at the precise instant a failure occurs. Data can be studied to determine the specific source of outages and to re-enact the occurrence and progression of a defect. It creates a robust data foundation for future distribution optimization.

II. RELATED WORK

The research in this paper established a model combining IoT and Google Firebase that has a number of flaws, including in-line transmission that goes unnoticed, Google

Firebase, a database system that is no longer free, and no use of current and voltage sensors. [1]

In the next linked work, researchers investigated the automatic identification of line transmission faults using a GSM modulator. Because many GSM technology are trademarked by service providers, they must first obtain a licence before being utilised. [2]

A study was conducted on the identification of faults in underground power transmission using an Arduino Mega Microcontroller Because many villages and localities receive power by overhead wired supply, the disadvantages can be seen as a limitation of just discovering flaws in underground transmission. [3].

III. Proposed system

The goal is to obtain a collection of various values based on the physical characteristics of wire (laws). We employed current and voltage sensors to read the physical characteristic, and the divergence from normal reading could identify possible sensors. A voltage sensor is a device that calculates and monitors the amount of voltage present in a given object. Voltage sensors can determine the level of both AC and DC voltage. The voltage can be used as the sensor's input, and the switches, analogous voltage signal, current signal, audible signal, and so on can be used as the sensor's output. Sensors are devices that can detect, recognise, and react to specific types of electrical or optical impulses. The use of voltage and current sensors has grown increasingly common.a fantastic alternative to traditional current and voltage measurement methods. However, if the surface has any abnormalities, such as corrosion, the reflection reading will be cracked. When the voltage and current readings change, the ESP8266 controller detects it and can transmit a fault message to the user via the internet. Long trees near the caules can sometimes cause a ground fault. If a tree falls on the wire, the phase can be short circuited to the earth, and if there is any smoke or gas as a result of the short circuit or any other environmental hazard. So we utilised a gas sensor and a temperature sensor to detect any increase in temperature, obstruction, or fire on the wire caused by a tree fall or a short circuit.

IV. System architecture

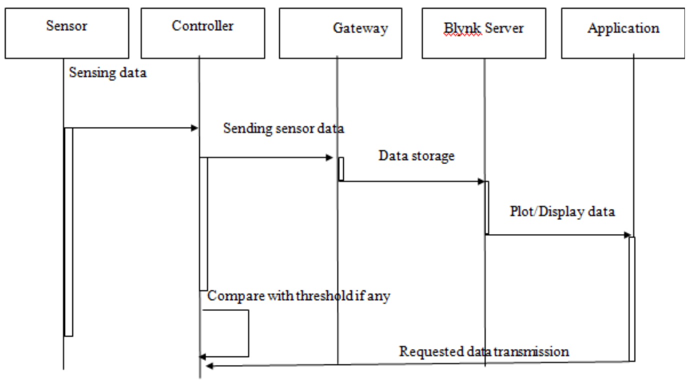

Fig-1: System architecture

A system architecture depicts object interactions in chronological order. It represents the scenario's objects as well as the sequence of messages exchanged between them in order to carry out the scenario's functionality. Event diagrams and event scenarios are other names for sequence diagrams.

As indicated in the graphic above, the sequence diagram is made up of five different blocks: sensors, controller, middleware/gateway, server/cloud, and application.

At first, the sensor will deliver data according to the controller's programme logic, and all of the values will be pushed to the server/cloud via a Wi-Fi gateway connection, where the details will be collected by the application and displayed on screen.

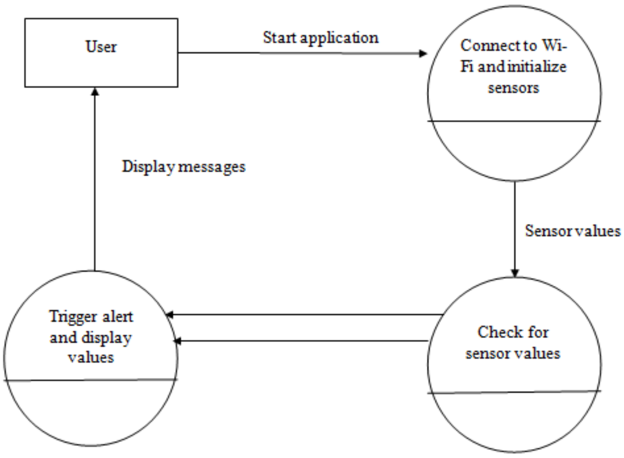

Fig-2: Flow diagram for the proposed system

The data flow diagram shown above depicts a hardware connection kind of data flow. When the user first starts the app and connects to Wi-Fi, all of the sensor values are sent to the server and cloud. The data is then collected from the server and sent to the mobile application, where the user can view all of the information.

IV. Results

Current sensor Testcase:

Test Case	1
Name of Test	Current Sensor
Input	Sensor is connected to the microcontroller port pin. As per the program logic, sensor value is read.
Expected output	Logical value of current is read
Actual output	An external observation is done and current value is detected as per the program logic
Result	Successful

Voltage sensor Testcase:

Test Case	1
Name of Test	Voltage Sensor
Input	The input port pin of the microcontroller is connected to the sensor. The sensor value is read according to the programme logic.
Expected output	Logical value is read in voltage
Actual output	External observation is carried out, and voltage values are detected in accordance with the programme logic.
Result	Successful

Smoke sensor Testcase:

Test Case	1
Name of Test	**Smoke** Sensor
Input	The input port pin of the microcontroller is connected to the sensor. The sensor value is read according to the programme logic.
Expected output	Logical value of gas is noted
Actual output	External observations are made, and the results are displayed.
Result	Successful

DHT 11Testcase:

Test Case	1
Name of Test	DHT11 Sensor
Input	The input port pin of the microcontroller is connected to the sensor. The sensor value is read according to the programme logic.
Expected output	Logical value of temperature and humidity is displayed
Actual output	External observations are made, and the results are displayed.
Result	Successful

V. Conclusion

Current and voltage sensor units, microcontrollers, temperature and gas modules, and various protective equipment are used to control transmission line faults. Networks are a reliable and effective approach for an electrical power system transmission line fault classification and detection from the general machine learning methods, especially in light of the rising dynamic connectedness of current electrical power transmission systems. Sensors and actuators in the Internet of Things are used to identify and categorise transmission line issues. The cross correlation between pure and defective current signals is computed using this method.

VI. References

[1] Lakshmi Goswami, Piyush Agrawal. IOT based Diagnosing of Fault Detection in Power Line Transmission through GOOGLE Firebase database. International Conference on Trends in Electronics and Informatics (ICOEI 2020) IEEE Xplore Part Number: CFP20J32-ART; ISBN: 978-1-7281-5518-0.

[2] Sajal Menon, Don Tomney, Rejoice Thomas Paul, Krishnapriya Vinod, Rajayalaksmi Menon. Automatic Fault Detection and Location of Transmission Lines using IoT National Conference on Emerging Research Trend in Electrical and Electronics Engineering (ERTE'19) ; May 2019 e-ISSN: 2455-5703.

[3] Vivek KR Verma, Mayank Kumar, Kushal Patel, Pankaj Kr Singh Kushwaha, Shashi KRSharma. Underground Cable Fault Detection using IoT. International Research Journal of Engineering and Technology(IRJET). 2019; p-ISSN: 2395-0072.

[4] R Navaneetha Krishna, Niranjan L, N Shyamsundar. IOT Based Transmssion Line Fault Monitoring System. International Journal of Research and Analytical Reviews (IJRAR) 2020; p-ISSN:2658-5641.

[5] Buhari Ugbede Umar, James Garba Ambafi, Olayemi Mikail Olaniy, James Agajo, Omeiza Rabiu Isah. An Efficient Microcontroller Based Distribution Transformer Fault Detection and Protection System. 2020; 5(1); 77-288R.

[6] P. Zhang, F. Li, and N. Bhatt, "Next-generation monitoring, analysis, and control for the future smart control center," IEEE T rans. Smart Grid, vol. 1, no. 2, pp. 186–192, Sep. 2010

[7] G. Vidhya Krishnan, R.Nagarajan, T. Durka, M.Kalaiselvi, M.Pushpa and S. Shanmuga priya, "Vehicle Communication System Using Li-Fi Technology," International Journal of Engineering And Computer Science (IJECS), Volume 6, Issue 3, pp. 20651-20657, March 2017

[8] A. S. Jalal, C. Bhatnagar, M. A. Khan and M. S. Solanki, "LBP based face recognition system for multi-view face using single sample per person," *2016 11th International Conference onIndustrial and Information Systems (ICIIS)*, Roorkee, 2016, pp. 414-419.

[9] R.Nagarajan and S.Sathishkumar, K.Balasubramani, C.Boobalan, S.Naveen and N.Sridhar. "Chopper Fed Speed Control of DC Motor Using PI Controller," IOSR- Journal of Electrical and Electronics Engineering (IOSR-JEEE), Volume 11, Issue 3, Ver. I, pp. 65-69, May – Jun. 2016

[10] M. R. Hans, S. C. Kor, and A. S. Patil, "Identification of underground cable fault location and development," 2017 International Conference on Data Management, Analytics and Innovation (ICDMAI), 2017.

Cryptocurrency Price Prediction

MANJUNATH M[1], NAVEEN S R[2], VARUN R[3], NITHIN S M[4], SHANKAR RANA[5]

Department of Computer Science and Engineering,

Sapthagiri College of Engineering #14/5 Chikkasandra Hesaraghatta main road, Bangalore-57 India

[1]manjunathmmass7548@gmail.com
[2]naveennavi161716@gmail.com
[3]varunrevanth200@gmail.com
[4]smnithin1234@gmail.com
[5]rana6532@gmail.com

Abstract - **Cryptocurrency is a new type of asset that has evolved as a result of advances in financial technology, and it has provided a significant research opportunity. Due to price volatility and dynamism, cryptocurrency price forecasting is challenging. There are hundreds of cryptocurrencies in circulation around the world. This study offers three recurrent neural network (RNN) algorithms for predicting the prices of three different cryptocurrencies: Bitcoin (BTC), Litecoin (LTC), and Ethereum (ETH) (ETH). The models show excellent predictions depending on the mean absolute percentage error (MAPE). The gated recurrent unit (GRU) fared better in prediction for all forms of cryptocurrency than the long short-term memory (LSTM) and bidirectional LSTM (bi-LSTM) models, according to the results. Overall, the prediction models presented in this paper produce accurate findings that are near to current cryptocurrency prices. The value of having these models is that they can help investors and traders pinpoint bitcoin sales and purchases, which can have huge economic implications. A recommendation is offered as a strategy for future work to investigate other elements that may affect bitcoin market pricing, such as social media, tweets, and trading volume.**

I. INTRODUCTION

Cryptocurrency is a type of virtual or digital currency that is used in financial systems. It is protected by encryption, which prevents counterfeiting and double-spending. It is also distinguishable from traditional currencies because it is not issued by a central authority or central banks, and it is a decentralized virtual currency that can be converted via cryptographic techniques. The other aspect is that it is powered by blockchain technology, which is incredibly complicated and aims to store data in such a way that it is difficult or impossible to alter, hack, or cheat the system. Bitcoin has started to carve out a niche for itself, which could either help cryptocurrencies gain mainstream acceptance or spell its downfall. Cryptocurrencies are still in their infancy, and it's impossible to say whether or not they'll ever be widely used in global markets. Bitcoin, the most well-known cryptocurrency, was founded in 2009 and was the only Blockchain-based cryptocurrency for more than two years. However, the cryptocurrency market already has over 5000 cryptocurrencies and 5.8 million active users. Bitcoin has recently gained a lot of attention in the fields of economics, cryptography, and computer science due to its inherent nature of combining encryption technology with monetary units. Due to price volatility and dynamism, cryptocurrency prices are difficult to forecast. Hundreds of cryptocurrencies are used by clients all around the world. We'll look at three of the more popular ones in this paper. As a result, the study intends to do the following by employing deep learning algorithms, which may uncover hidden patterns in data, integrate them, and make considerably more accurate predictions. As a result, the study intends to do the following by employing deep learning algorithms, which may uncover hidden patterns in data, integrate them, and make considerably more accurate predictions There are hundreds of cryptocurrencies available on digital markets, but Bitcoin is the most widely used. It is influenced and interacted with by external factors such as news, social media, and small cryptocurrencies with a small market share, which are frequently overlooked by investors and traders. Because of the strong ties that exist between cryptocurrencies, the smaller ones have become a source of shocks that can effect other cryptocurrencies in either a favorable or negative way in cryptocurrency market.

II. METHODOLOGY:

To achieve the aims of this paper, we trained three distinct models for various different forms of cryptocurrency price prediction using historical cryptocurrency prices. Then, in order to evaluate the suggested schemes' performances, we compare the accuracy of our proposed model to that of current models by following five stages: (1) collecting historical (4) testing the models; and (5) extracting and comparing the results. It starts with data collection, then the data visualization process is used to illustrate
and explore the data's behaviour and distribution and the relationship between the cryptocurrencies. Then after training the models, we tested them. Then we extracted and compared the results on the daily closing price.

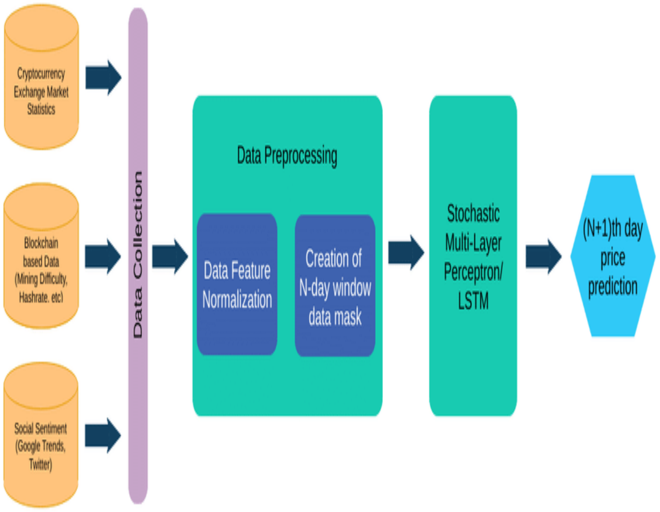

Figure 1: Methodology of processing data and model selection.

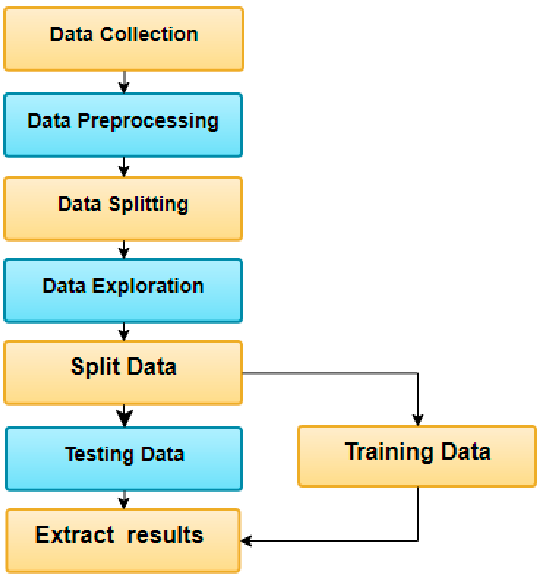

Figure 3: Flow Diagram of the proposed Model

Long Short Term Memory (LSTM):

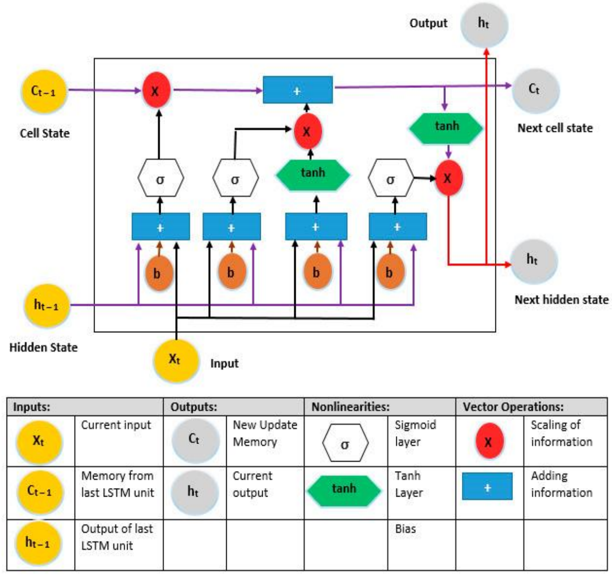

Figure 2: The structure of a long short-term memory (LSTM) algorithm.

The forward training process of the LSTM can be formulated with the following equations:

$$f_t = \sigma\left(W_f \cdot [h_{t-1}, x_t] + b_f\right) \quad (1)$$

$$i_t = \sigma\left(W_f \cdot [h_{t-1}, x_t] + b_i\right) \quad (2)$$

$$C_t = f_t * C_{t-1} + i_t * tanh(W_c \cdot [h_{t-1}, x_t] + b_c) \quad (3)$$

$$O_t = \sigma(W_0 \cdot [h_{t-1}, x_t] + b_0) \quad (4)$$

$$h_t = o_t * tabh(C_t) \quad (5)$$

where it, ot, and ft denote the activation of the input gate, output gate, and forget gate, respectively; Ct and ht denote the activation vector for each cell and memory block, respectively; and W and b denote the weight matrix and bias vector, respectively. In addition, *s*(_) denotes the sigmoid function

Bidirectional LSTM (bi-LSTM):

Bi-LSTM was created by Schuster and Paliwal to train a network utilizing past and future input data sequences. The input data are processed using two linked layers.
Bi-directional LSTM predicts or tags the sequence of each element using a finite sequence based on the context of elements in the past and future. This is the result of two LSTMs running in parallel, one from left to right and the other from right to left. The forecast of a given target signal is known as composite output. This method has proven to be quite beneficial. The forward function of bi-LSTM with inputs of L units and H as the number of hidden units is calculated using Equations,

Figure shows a bidirectional LSTM structure. The hidden layer of the bi-directional LSTM network saves two values. A participates in the forward calculation, and A transpose is involved in the reverse calculation. The final output value, y, depends on A and A transpose

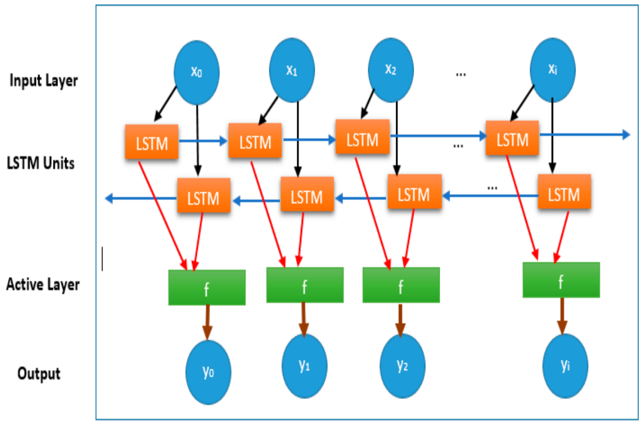

Figure 4: The structure of a bi-directional LSTM (bi-LSTM) algorithm.

Data Exploration

When dealing with data, it is useful and important to understand the data distribution and behavior using a stable and meaningful chart to extract the story that the data tells. Figure 8 illustrates the time series for targeted cryptocurrency distributed through the interval between 22 January 2018 and 30 June 2021. It shows that the price increases along with the specific interval depending on the closing price.

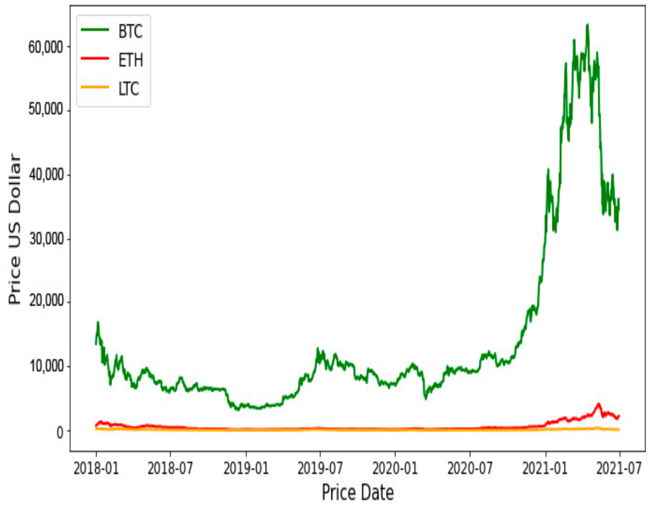

Figure 5: Time series with closing prices for BTC, ETH, and LTC

The correlation matrix in Figure 9 illustrates the correlation coefficient between the variables (closing price). The matrix shows a strong positive correlation between different currencies (BTC. LTC, and ETH). This means if one of the targeted cryptocurrencies increases or decreases, the others behave accordingly

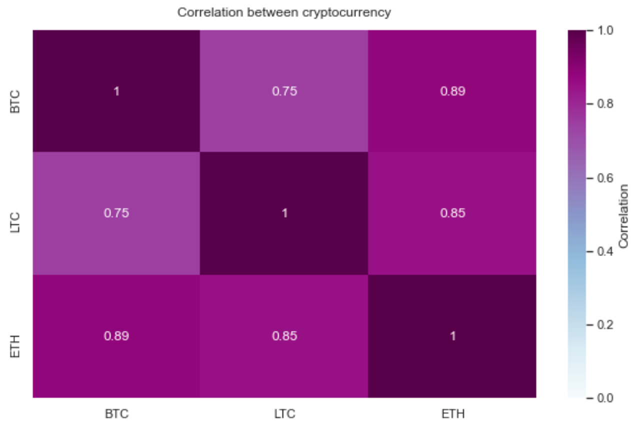

Figure 6: Correlation matrix for the cryptocurrencies BTC. LTC, and ETH.

Gated Recurrent Unit (GRU)

Gated recurrent neural networks (Gated RNNs) have demonstrated their effectiveness in a variety of applications requiring sequential or temporal data 11 The transition functions in hidden units of GRU are given as follows

$$z_t = \sigma(W^z x_t + V^z h_{t-1} + b^z) \tag{8}$$

$$r_t = \sigma(W^r x_t + V^r h_{t-1} + b^r) \tag{9}$$

$$\overline{h}_t = tanh(W^c x_t + V^c (r_t \cdot h_{t-1})) \tag{10}$$

$$h_t = (1 - z_t) \cdot h_{t-1} + z_t \cdot \overline{h}_t \tag{11}$$

where the model parameters include all WR, VR, and be that are shared by all time steps and learned during the training stage, () denotes the element wise product, and is a hyper-parameter that represents the dimensionality of hidden factors. Figure states the GRU structure.

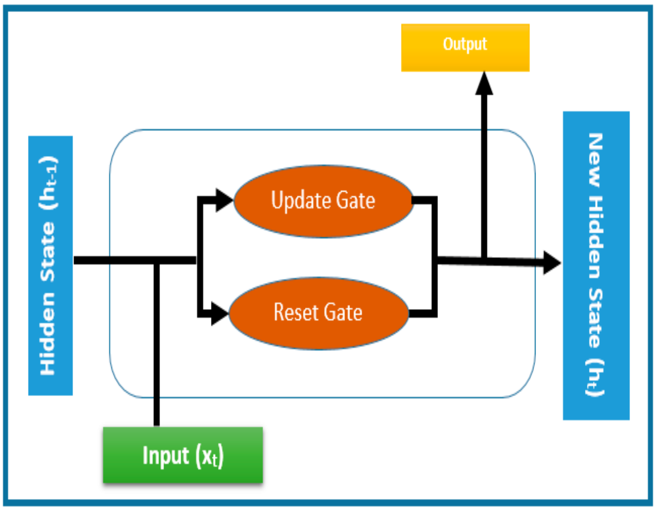

Figure 7: The cell model of GRU block diagram

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Dataset:

The analyzed dataset was collected from, an open-access website. It consists of one csv file separated into three sheets; the first sheet for Bitcoin (BTC), the second for Litecoin (LTC), and the last sheet for Ethereum (ETH). The recorded prices in the dataset were collected on a daily basis from 1 January 2018 to 30 June 2021. In this research, we used time series data from with 1277 records. Table illustrates the dataset specification of the targeted cryptocurrency and Figure shows sample data from the dataset.

Sample of the data from BTC dataset

	Date	Open	High	Low	Close
0	2018-01-22	11,348	11,869	10,051	10,264
1	2018-01-23	10,264	11,358	9,972	10,984
2	2018-01-24	10,986	11,474	10,497	11,208
3	2018-01-25	11,213	11,711	10,889	11,246
4	2018-01-26	11,241	11,609	10,321	10,899

Sample of the data from ETH dataset

	Date	Open	High	Low	Close
0	2018-01-22	1,052.22	1,090.99	913.24	1,000.5
1	2018-01-23	1,000.12	1,025.0	910.0	985.96
2	2018-01-24	984.1	1,067.0	957.9	1,063.77
3	2018-01-25	1,063.77	1,107.67	1,000.01	1,048.0
4	2018-01-26	1,048.0	1,079.95	982.0	1,051.07

Sample of the data from LTC dataset

	Date	Open	High	Low	Close
0	2018-01-22	190.93	195.85	165.1	180.01
1	2018-01-23	180.01	187.39	165.25	177.32
2	2018-01-24	178.01	186.13	173.0	180.99
3	2018-01-25	181.18	185.0	175.0	179.05
4	2018-01-26	179.05	182.7	165.37	175.39

Figure 8: Screenshot showing a sample of the data from the BTC, ETH, and LTC dataset.

III. RESULTS & DISCUSSIONS

- This paper surveyed different methods for Cryptocurrency price prediction, using machine learning models.
- This survey paper determines that all the methods and algorithms listed have shown to be effective in the prediction of Prices. The prediction models presented in this paper produce accurate findings that are near to current cryptocurrency prices.
- The proposed model in this research can be considered a reliable and acceptable model for cryptocurrency prediction.
- The results show that this model outperformed the other algorithms with a MAPE of 0.2454%, 0.8267%, and 0.2116% for BTC, ETH, and LTC, respectively.
- Various entities have been considered for the prediction process, which are considered to be the best feature for accurate predictions.
- The MAPES values of the proposed model in this paper for predicting LTC represents the best performance compared to all other models as the predicted results are very close to the actual results.

IV. CONCLUSIONS

In this paper, Machine learning algorithm are constructed and used for predicting the prices of various types of cryptocurrencies such as BTC, ETH, and LTC. Performance measures were conducted to test the accuracy of different models Then, we compared the actual and predicted prices. Based on these outcomes, the model for the targeted cryptocurrencies can be considered efficient and reliable. This model is considered the best model.

The results show that model performed with a mean absolute percentage error (MAPE) of 0.2454%, 0.8267%, and 0.2116% for BTC, ETH, and LTC, respectively.

In future work, we will investigate other factors that might affect the prices of the cryptocurrency market, and we will focus on the effect that social media in general and tweets in particular can have on the price and trading volume of cryptocurrencies by analysing tweets using natural language processing techniques and sentiment analysis.

V. ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Management, Principal Sapthagiri College of Engineering Bangalore for the facilities provided and their support.Also, we would like to thank the Head of department of Computer Science Engineering and faculties for their encouragement and support.

VI. REFERENCES

[1] Adams, R.; Kewell, B.; Parry, G. Blockchain for Good? Digital Ledger Technology and Sustainable Development Goals. In Handbook of Sustainability and Social Science Research; Filho, W.L., Marans, R., Callewaert, J., Eds.; World Sustainability Series; Springer: Cham, Switzerland, 2018.

[2] Killer, C.; Rodrigues, B.; Stiller, B. Security Management and Visualization in a Blockchain-based Collaborative Defense. In Proceedings of the ICBC 2019—IEEE International Conference on Blockchain and Cryptocurrency, Seoul, Korea, 14–17 May 2019; pp. 108–111

[3] Gandal, N.; Halaburda, H. Competition in the Cryptocurrency Market (September 29, 2014). CESifoWorking Paper Series No.4980. Available online: https://ssrn.com/abstract=2506577

[4] 12. Iwamura, M.; Kitamura, Y.; Matsumoto, T. Is Bitcoin the Only Cryptocurrency in the Town Economics of Cryptocurrency And Friedrich A. Hayek (February 28, 2014). Available online: https://ssrn.com/abstract=2405790

[5] Ferdiansyah, F.; Othman, S.H.; Radzi, R.Z.R.M.; Stiawan, D.; Sazaki, Y.; Ependi, U. A LSTM-Method for Bitcoin Price Prediction: A Case Study Yahoo Finance Stock Market. In Proceedings of the ICECOS—3rd International Conference on Electrical Engineering and Computer Science, Batam, Indonesia, 2–3 October 2019; pp. 206–210.

[6] Yang, S. Research on Network Behavior Anomaly Analysis Based on Bidirectional LSTM. In Proceedings of the IEEE 3rd Information Technology, Networking, Electronic and Automation Control Conference (ITNEC), Chengdu, China, 15–17 March 2019.

[7] Su, Y.; Kuo, C.-C.J. On extended long short-term memory and dependent bidirectional recurrent neural network. Neurocomputing 2019, 356, 151–161.

Classifying Diabetic Retinopathy using Retinal Images

Siddhant Pandey[#1], Snehal Mishra[#2], Subhashish Pathak[#3]

[#1]*Student, Sapthagiri College of Engineering, Bengaluru, Karnataka-560057*

***Abstract* — Diabetic Retinopathy is one of the most common diseases related to Diabetes which affects the delicate retina and affects vision drastically. Different levels of retinopathy lead to several stages of altered vision. Thus, the identification of this disease is very necessary for early detection and ease of remedial cure. The paper solely focuses on taking a number of features from the examined colour fundus images and then, examining the same and deriving the conclusions based on different stages and extents of affected imagery. The classification for the same has been done using CNN and SVM classifier techniques but one of the primary drawbacks that still persists is the intensive requirements to run such demanding algorithms. Thus, keeping the learning and the drawbacks from the previous paper in view, we have devised a Tree Classifier Algorithm to make this entire system of classification and detection much simpler and less GPU intensive for the systems.**

I. INTRODUCTION

The Project is aimed at developing a systematic detection unit for one of the most common eye disease persistent among people having Diabetes i.e. Diabetic Retinopathy.

Diabetic Retinopathy is a disease resulting due to exudation or dilating of the retina which can result in proliferated retinal vision or even haemorrhages in the optic nerve as well. As this is one of the most common diseases related to Diabetes which can affect a persons vision, it is surprisingly one of the often neglected one as well.

With the onset of increased cases, there has been increased sense of awareness in this regarding this disease and a lot of detection regimes have sprung up.The classification for the same has been done using CNN and SVM classifier techniques but one of the primary drawbacks that still persists is the intensive requirements to run such demanding algorithms and the scarcity of training models which can cover the exceptional exhibits.

Thus, keeping the previous papers in view, the newer algorithm would be a unique process of carrying out the procedure in a lesser graphic intensive way.

A. Ensemble Learning Method

It is a broad methodology in machine learning that targets at multifarious predictive models to make the entire predictive semaphore better.

Although there is no boundary with reference to the number of ensemble which one can employ for their purpose but, however, the entire learning procedure is overwhelmed by three notions. This is also to such an extent that a numerous ways have been formed fordoing this instead of a single way out.

Bagging, stacking, and boosting are the 3 basic ways in ensemble learning methods, and it's important to have a deep know-how of these realms so as to use them in your predictive modeling project.

a) Bagging

By altering the training data, the ensemble learning approach seeks a varied collection of ensemble members. This is mostly inclusive of preparing each model by tutelage across similar datas using some ML method. The ensemble members' forecasts are then brought together using simple statistics like voting .

b) Stacking

Stacking has its own namings which correspond to the different levels which it has. Now, each of these levels are deferring to the models which is used to integrate the predictions. Although, more modes can be involved and used for the purpose but currently, the twin level hierarchy is a

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predominant one that is in the forefront mostly. Instead of a single first level model, we may have 3 or 5 first level models and a level-2 model that brings together with its level-1 model predictions to generate a unanimous result.

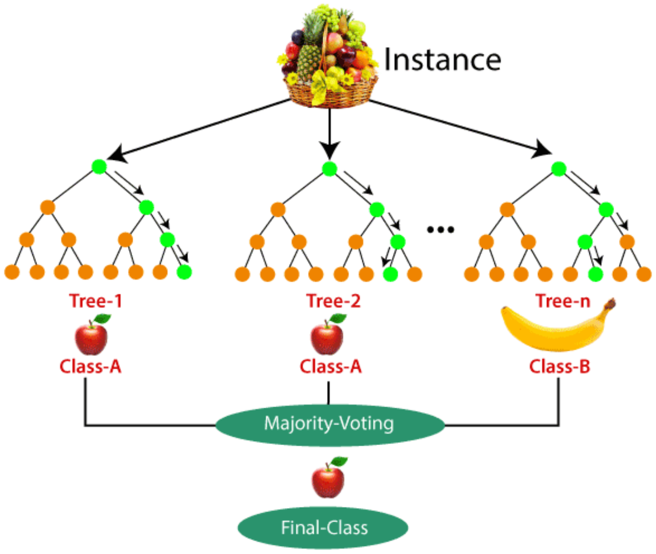
c) Boosting

The notion of correcting any errors in the predictive result is an important feature of boosting ensembles. The models are adjusted and included to the progressive order. What now happens is that's each of these models will be correcting the other one after another and that's how the entire order gets refined.

This involves the work of the weak learning model design. For example, a single basic decision tree which is capable of making a single decision. Then, a simple average method is used to aggregate the predictions of these learners despite their contributions which is of course weighed proportionally for their performance. The goal is to create a "strong-learner" from a collection of purpose-built "weak-learners."

Random Forest Classifier

Random Forest is a popular machine learning algorithm that corresponds to learning technique which is supervised in nature.. It can be used for both the Classification and Regression problems in ML. It is based on the ideology of **ensemble learning,** which is a method of bringing together several classifiers to simplify a complicated problem and to improve the execution and throughput of the model.



II. Methods and Methodology

This project uses data provided from Kaggle unless the dataset has immense inconsistencies. This data contains fundus images from various retinas. The five stages adopted for this project are –

1. Pre-processing of Colour fundus images.
2. Detection of exudation, vessels
3. Feature Extraction
4. Random Forest Classifier Algorithm
5. Final Classification

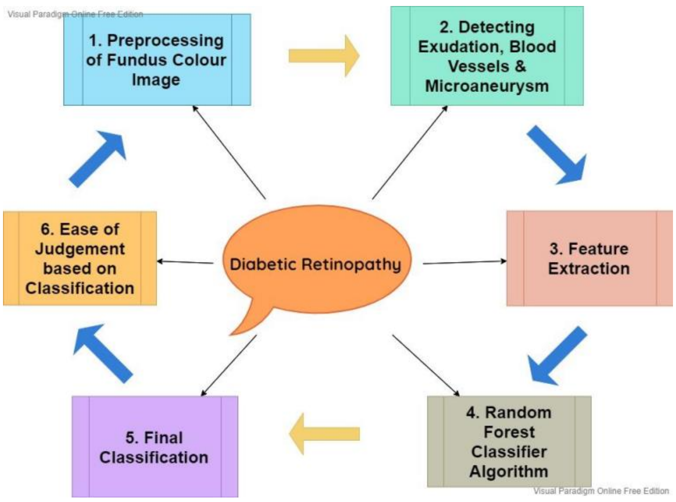


Figure2: Methodology/ WorkFlow

A. Algorithms And Techniques

Based on the initial analysis, it is evident that both text and numeric data is to be used for final modeling. Before
data modeling a final dataset is determined. This project will use a dataset with these features for the final analysis:

1. Data & Image Preprocessing
2. Feature Extraction & Selection
3. Model Optimization
4. Classification

The algorithms and techniques used in project are:

1. Random Forest Classifier Algorithm

B. Methodology

• Preprocessing: The image from dataset is refined and filtered for all the disturbances and noise present in it..

• Extraction: With the new refined images, we will extract features fro, the fundus retinal images.

• Optimization: Using the features, an attempt is made to optimize the training dataset model.

• Classification: The process of groups which will be detected will be unified and used for judgement ultimately regarding the disease.

C. Preprocessing

The images from the dataset are taken into account and efforts are made to remove the disparities from the selection set. The different improvements include noise removal like removing of grains, removing of duplicate images, removal of black borders from the image, resizing of the images, managing the level of contrast, sharpness and image features in the dataset which brings the total count of the image to a fair new share. However, this new dataset contains a proper representation of the retinal images which can further be used for training and passing through the different workflow models as shown aside.

D. Extraction

Extraction of the features is done with the help of examining the different types of images with different stages of diabetic retinopathy extents present in its exudations, pupils, haehmorrage and other identification features which are chosen. Then, measure is taken to concatenate these two different categories and then further division takes place into tran and test splits. Each of these splits are upto a certain percentage.

E. Optimization

Now, the division of the this refined dataset takes place into training and testing dataset and hence, they are individually segregated and fed for hypertuning and Boosting as well. Thiuus is then used upon the training subsets and the testing subsets are then examined upon the refined classification training sets thus prepared. The scenario is such that the features previously extracted together with the hypertuning and classification norms therefore help us in efficient examining and culmination of the results. Hence, the end results are also deemed to be of sensible accuracy and directivity.

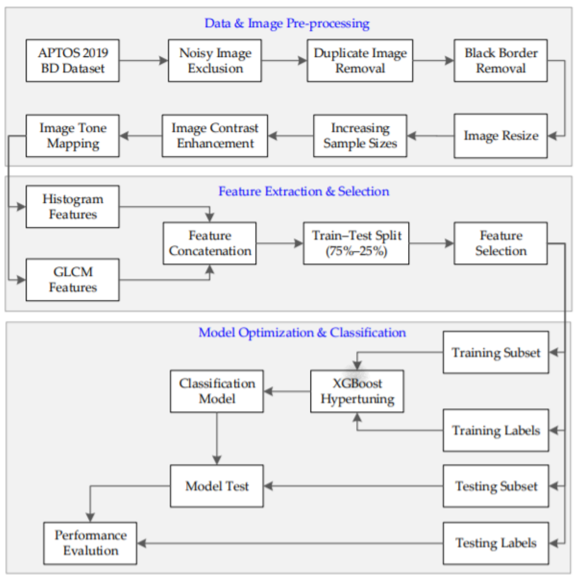


Figure 1. The entire workflow of the proposed Diabetic Retinopathy (DR) classification method.

Figure4: Implementation of Algorithm

III. Result and Discussions

- Accuracy comparison is done to get the best model.
- Random forest classifier shows one of the best metrics.

- In almost 76.5% cases, the model correctly classifies the level of Diabetic Retinopathy.
- Finally the performance can be further increased with more diverse data and better features in future.

IV. Conclusion

The aforementioned methods are thoroughly utilized for detecting Diabetic Retinopathy with the use of a particular dataset for reference that contains retinal images of people afflicted with Diabetic Retinopathy to different extents.. This paper is a comparative study of different algorithms that have been used by various methods for the effective prediction such as Machine learning algorithms and approaches i.e., CNN and Deep Learning. The approaches and algorithms used are seen to be effective in the detection of the presence of Diabetic Retinopathy, which is shown to be an imperative factor in this process.

References

[1] W. Shuangling, ―Hierarchical retinal blodd vessel segmentation based on feature and ensemble learning. Neurocomputing, 149 (2015), pp. 708-717

[2] I. Rish, ―An Empirical Study of the Naïve Bayes Classifier An empirical study of the naive Bayes classifier,‖ no. January 2001, pp. 41–46, 2014.

[3] Odstrcilik Jan, ―Retinal vessel segmentation by improved matched filtering: evaluation on a new high-resolution fundus image database.IET Image Processing, 7 (4) (2013), pp. 373-383

[4] Jan Jirí, ―Retinal image analysis aimed at blood vessel tree segmentation and early detection of neural-layer deterioration. no. Computerized Medical Imaging and Graphics, 36 (6) (2012), pp. 431-441

[5] Staal Joes, ―Ridge-based vessel segmentation in color images of the retina, IEEE transactions on medical imaging, 23 (4) (2004), pp. 501-509.

[6] Hoover A.D., Valentina Kouznetsova, ―Locating blood vessels in retinal images by piecewise threshold probing of a matched filter response. IEEE Transactions on Medical imaging, 19 (3) (2000), pp. 203-210

Phishing Detection Using Machine Learning Technique

ANKIT RAJ MISHRA,HARSHIT GUPTA,PRIYANSHU KUMAR,UTKARSH GAURAV

Department of Computer Science Engineering,Sapthagiri College of Engineering
#14/5Chikkasandra, Hesaraghatta Mian Road, Bangalore- 57 India

1.ankitrmi411@gmail.com
2.harzshit@gmail.com
3.priyanshuk5067@gmail.com
4.utkarshgaurav33@gmail.com

***Abstract*— Everyone nowadays is heavily reliant on the internet. On the internet, everyone did online shopping and activities such as online banking, online booking, online recharging, and more. Phishing is a form of online threat that occurs when a user clicks on a link that leads to a fake website. Information such as a login id, password, and credit card information. This research developed an effective phishing detection system based on machine learning. Overall, experimental results suggest that when combined with the Support vector machine classifier, the proposed technique has the best performance, correctly discriminating 95.66 percent of phishing and acceptable websites with just 22.5 percent of the novel functionality. When tested against a variety of common phishing datasets from the "University of California Irvine (UCI)" collection, the suggested approach shows promising results. As a result, suggested**

I. Introduction

The internet has evolved into a platform for many illegal enterprises such as spam, financial fraud, and malware distribution. The precise commercial reasons for this strategy may differ, but one common thread is that users are not required to visit their website. This visit should be available by email, web query items, or links from other site pages; however, the client must be able to make a quick decision, such as indicating the optimal URL (Uniform Resource Locator) and obtaining important information. To combat this, the security community developed a blacklist service that is packed in toolbars, devices, and search engines and provides accurate warnings or alerts. Many hazardous sites are not banned because the site is too new, unclassified, or misclassified.

The anti-phishing solution is most commonly used in conjunction with a blacklist warning system included in popular web browsers such as Chrome, Internet Explorer, and Mozilla Firefox. Because the blacklisting interrogative tool relies on a central database of known phishing URLs, it is unable to detect freshly created phishing websites [3, 4].

The accuracy of a machine learning-based phishes detecting device is quite important. The majority of anti-phishing researchers focus their efforts on improving new feature proposals or classification algorithms, rather than establishing proper feature analysis and selection strategies [5, 6]. The 12 features of this site are authentic, phishing-enabled, and have a 97 percent effective positive rate and a 4% false positive rate.

The anti-phishing solution is most commonly used in conjunction with a blacklist warning system included in popular web browsers such as Chrome, Internet Explorer, and Mozilla Firefox. Because the blacklisting interrogative tool relies on a central database of known phishing URLs, it is unable to detect freshly created phishing websites [3, 4].

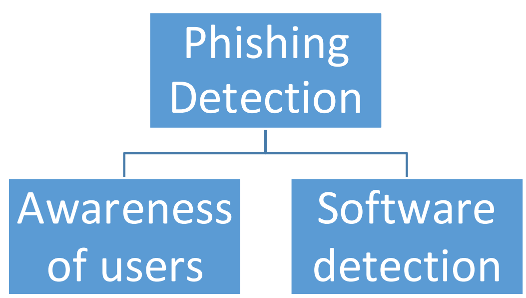


Fig. 1. Phishing detection methods

different hand, are metrics. It is calculated from statistical and informative theories, which can mirror the deserves of every character function besides calling a precise classifier. Wrapper technique executes repeatedly, every execution entails producing a subset of elements and evaluating them via classification. When evaluating a set of characteristics, various iterations of engineering exponentially scale wrapper and will be of practical computing for real-time applications.

In revealed anti-phishing technology that uses machine learning to distinguish phishing websites from approved sites by removing 19 elements on the buyer's side. They used 2,141 phishing pages from[10] and [11], as well as the well-known Alexa website, a few online debit gateways, and a few excellent banking websites.

For detecting phishing net pages proposed utilising a probability minimization standard and Monte Carlo algorithm with a new neural network-based classification technique. The thirty points were utilised to identify the four primary sections, focusing on the bar-based, anomaly-based, HTML, and JavaScript categories.

Some studies, such as [11], used a hybrid strategy for photograph inspection as well as a computer mastering process. The most significant drawback of photo/visual-based phishing detection is the lack of past information (web history) from the first photograph database or web page [13]. This dependency is no longer present in the suggested technique. Natural language processing (NLP) has been used in the literature thus far.

Hybrids [14] uses URLs, text, and other sources to derive traits. Hybrids [14] uses Extreme Machine Learning (ELM) technology to extract features from URLs, text, and web content. The first stage in this procedure is to compose the classifier's text content in order to determine the label text's content using ELM. OCR software is used to extract the text from the image in this scenario. It's a hybrid that combines text and other function classifiers in a second stage.

Comparisons between suspect site functions and a specified set of functions are typically used in machine learning-based approaches [17]. As a result, the system's accuracy is determined by a set of functions and the precision with which the defender selects the function [18, 19].

In recent experiments [20], NLP was used to detect phishing emails. Perform semantic analysis on email content to detect malicious intent (plain text).

Machine learning methods are utilised in this study to detect URLs of web pages in order to detect phishing web pages. It's also crucial to extract features from the dataset when using a machine learning method. As a consequence, From current databases, Google obtains a large number of valid and fraudulent web page URLs. The suggested system's efficiency is determined by the function defined by the word vector.

II. Proposed Technique

Figure 2 shows the overall steps for the proposed technique for phishing website detection using the machine learning technique.

Using GNU Wget and Python scripts, collect web pages automatically. We download relevant resources (e.g. photos, CSS, JavaScript) in addition to the whole HTML text so that we can provide a browser to all of the web pages that are downloaded. All web sites' screenshots are also saved for later inspection and filtering.

Download datasets that are further processed to load phishing and legitimate data sets, or to fix web page problems that have resulted in a "Error 404" page. The web page's duplicate instance is likewise erased. The function is extracted once the sample has been filtered. In classic phishing site detection investigations, there are two categories of features: Internal functions are listed first, followed by external qualities. The internal functions are derived from the external functions The internal functions are obtained from the webpage's URL and HTML source code, which may both be viewed straight from the web page. External functions, on the other hand, are focused on benchmarking and are obtained from requests from third-party services such as domain registries, search engines, WHOIS records, and so on.

The URL supplied in the suggested technology is defined upon registration. Between January and May 2015, and May and June 2017, the website was divided into two classes to collect fundamental functionality. We chose 5000 phishing web pages in particular, and all of them are more stable, notably in terms of URLs. The Alexa URL and Common Crawl archives were used to create the fish tank.

Step 2

To extract feature vectors from the input URL, we employed vocabulary, host, and word. The vocabulary feature is a feature of text URLs that includes things like hostname size, URL length, tokens in the URL, and so on. For excessive classification of machine learning vocabulary features, a simple calculation, security, and precision are required.

The vocabulary function is the property's URL text, not the page's URL text. The length of the hostname, the whole URL, the number of dots in the URL, the hostname (separated by "), and the binary function (separated text) for each symbol are among these properties. (. '/',,, '=', '?' "-'East' ') in the URL path. This is also known as "pocket."

"Where dangerous sites are housed," "have," and "control" are all examples of host-based characteristics. The following are some of the hosts. attributes identified by the hostname as part of the URL.

Words in vectors are especially useful for performing some crucial activities, such as determining the URL of a web page. It mostly consists of a text with a large number of words. The automatic vectorization method is preferable to modifying the text in this manual. A Weka method called "StringtoWordVector" is used to convert each URL into carrier-specific-words.

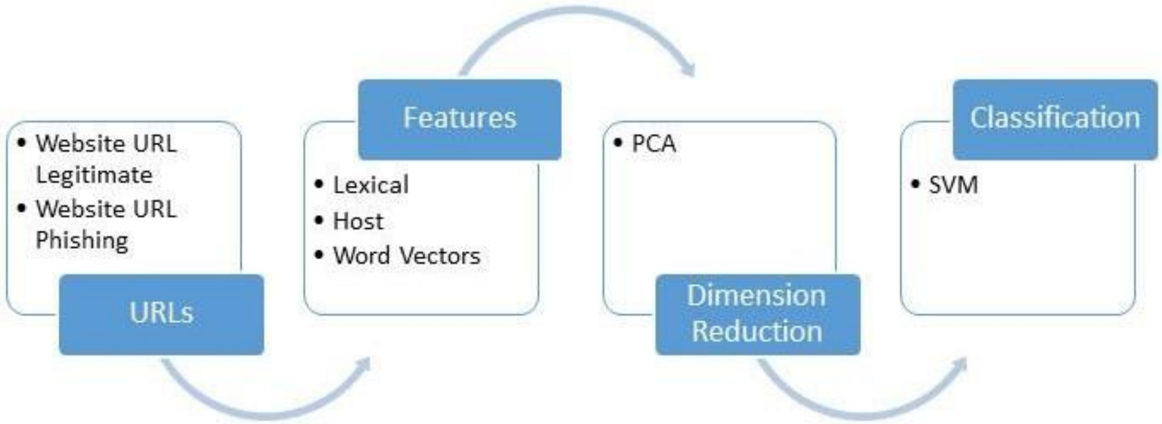


Fig. 2. Proposed technique

A. Step 3

For features, the Principal Component Analysis (PCA) [21] was used to prevent high dimensionality. The goal of PCA is to condense a huge number of variables into a manageable number of variables. It's a well-known statistical strategy for explaining the covariance shape of data with a small number of variables. These elements are linear mixtures of the original variables that frequently allow interpretation and a better understanding of the various sources of version.

B. Classification

To get the final result, we apply a classifier in this phase. The classifier is just a machine learning system that has been taught to predict and classify results. Because there is no single classifier that is both complete and exact. Classifiers were chosen primarily because they have already been utilised for Google-related concerns like spam detection, phishing emails, phishing websites, and malicious URLs. Simply put, the system tries to use this approach for final prediction and classification tasks. For classification, support vector machines are utilised.

A support vector machine (SVM) is often utilized in a phishing attack detection classifier. SVM works by examples of training and changes that have been set that makes maps of feature set to produce a feature room changed, save a sample of URLs from two classes with a hyperplane in the feature space changes.

III. Results and Discussion

A comparison is made between the suggested machine learning-based approach and the existing technique. To train the split test in our experiment, we employed an analogous classification-algorithm.

Classifier	**Feature set**	**No of Features**	**Accuracy**
FACA [2]	Full	30	90.44
Random Forest [22]	Full	30	94.27
Random Forest [22]	HEFS	5	93.22
SVM	**Proposed**	**5**	**95.66**

TABLE I. Summary of results

TP where positive means right, TN represents a true negative, implying FN false negative and false positive FP capabilities. According to this equation, we calculate the accuracy and the results for machine learning algorithms. The overall performance of the proposed technique is superior toother previous techniques. Table 1 shows the overall performance of the proposed technique along with other techniques. Therefore, the proposed machine learning technique reduces very effective factors. It is said that the overall performance of the proposed technique provides higher accuracy for classification algorithms. Also, the promising results shows that the proposed technique is effective and can be flexibly applied to different datasets.

IV. Conclusion and Future Work

Based on machine learning technologies, this study provides phishing detection. Additionally, machine learning algorithms build classifiers that recognise real phishing websites. SVM was employed in the suggested approach, which had a 95.66 percent accuracy and an extremely low false-positive rate. The suggested approach can detect new temporary phishing sites and lessen phishing attack impact. The suggested machine learning-based solution outperforms existing phishing detection systems in terms of effectiveness. In the future, multiple classification methods will be used to examine the influence of feature selection.

References

[1] Higashino, M., et al. An Anti-phishing Training System for Security Awareness and Education Considering Prevention of Information Leakage. in 2019 5th International Conference on Information Management (ICIM). 2019.

[2] H. Bleau, Global Fraud and Cybercrime Forecast,. 2017.

[3] Michel Lange, V., et al., Planning and production of grammatical and lexical verbs in multi-word messages. PloS one, 2017. 12(11): p. e0186685-e0186685.

[4] Rahman, S.S.M.M., et al. Performance Assessment of Multiple Machine Learning Classifiers for Detecting the Phishing URLs. 2020. Singapore: Springer Singapore.

[5] He, M., et al., An efficient phishing webpage detector. Expert Systems with Applications, 2011. 38(10): p. 12018-12027.

[6] Mohammad, R.M., F. Thabtah, and L. McCluskey. An assessment of features related to phishing websites using an automated technique. in 2012 International Conference for Internet Technology and Secured Transactions. 2012.

[7] Abdelhamid, N., A. Ayesh, and F. Thabtah, Phishing detection based Associative Classification data mining. Expert Systems with Applications, 2014. 41(13): p. 5948-5959.

[8] Toolan, F. and J. Carthy. Feature selection for Spam and Phishing detection. in 2010 eCrime Researchers Summit. 2010.

[9] Jain, A.K. and B.B. Gupta, Towards detection of phishing websites on client-side using machine learning based approach. Telecommunication Systems, 2018. 68(4): p. 687-700.

[10] 1PhishTank, Phishing dataset. 2018, Verified phishing URL.

[11] 1Openfish, Phishing dataset. 2018.

[12] 1Chiew, K.L., et al., Utilisation of website logo for phishing detection. Computers & Security, 2015. 54: p. 16-26.

[13] Benavides, E., et al. Classification of Phishing Attack Solutions by Employing Deep Learning Techniques: A Systematic Literature Review. 2020. Singapore: Springer Singapore.

[14] Zhang, W., et al., Two-stage ELM for phishing Web pages detection using hybrid features. World Wide Web, 2017. 20(4): p. 797-813.

[15] El-Alfy, E.-S.M., Detection of phishing websites based on probabilistic neural networks and K-medoids clustering. The Computer Journal, 2017. 60(12): p. 1745-1759.

[16] Montazer, G.A. and S. ArabYarmohammadi, Detection of phishing attacks in Iranian e-banking using a fuzzy–rough hybrid system. Applied Soft Computing, 2015. 35: p. 482-492.

[17] Wang, Y.-G., G. Zhu, and Y.-Q. Shi, Transportation spherical watermarking. IEEE Transactions on Image Processing, 2018. 27(4): p. 2063-2077.

[18] De Maio, C., et al., Time-aware adaptive tweets ranking through deep learning. Future Generation Computer Systems, 2019. 93: p. 924-932.

[19] De Maio, C., et al., Social media marketing through timeΘaware collaborative filtering. Concurrency and Computation: Practice and Experience, 2018. 30(1): p. e4098.

[20] Peng, T., I. Harris, and Y. Sawa. Detecting Phishing Attacks Using Natural Language Processing and Machine Learning. in 2018 IEEE 12th International Conference on Semantic Computing (ICSC). 2018.

[21] Abdi, H. and L.J. Williams, Principal component analysis. WIREs Computational Statistics, 2010. 2(4): p. 433-459.

[22] Sahingoz, O.K., et al., Machine learning based phishing detection from URLs. Expert Systems with Applications, 2019. 117: p. 345-357.

Customer Churn Prediction using Random Forest in Telecom industry

Gaurav Gupta[1], Divyanshi Kushwaha[2]

[1, 2]*Department of Computer Science Engineering, Sapthagiri College of Engineering*
#14/5 Chikkasandra, Hesaraghatta Main Road, Bangalore – 57, India
[1]gauravgupta78777@gmail.com
[2]divya28.kush@gmail.com

***Abstract* — Customer churn is a major problem and one of the biggest concerns of large companies. Because of the direct impact on corporate income, especially in the telecommunications sector, companies want to develop predictive mechanisms in which customers are likely to enter. Therefore, finding the features that increase customer churning is essential to take the necessary steps for the retention of customers. A key contribution of our work is to develop a churn prediction model that helps operators to predict customers who are most likely to churn. Today in the telecommunication industry customer retention is a major part of a company's growth. By using machine learning algorithms, it will be easy to predict the churning and necessary steps can be taken by the company for customer retention. The first step is to import the data from Kaggle and then perform data preprocessing. In this model, the Random Forest algorithm has been used and the front end has been made using Flask.**

Keywords- Customer Churn, Random Forest

I. INTRODUCTION

In Today's culture, telecommunications companies generate vast volumes of data at an alarmingly fast rate. Many telecom service companies compete in the market to expand their client base. Customers can choose from a variety of services, both better and less expensive. The ultimate goal of telecommunications companies is to maximize revenues and stay afloat in a competitive market. Customer churn happens when a large percentage of clients are not satisfied with the company's services.

Churning occurs for a variety of causes. Prepaid customers, unlike postpaid customers, are not tied to a single service provider and can switch at any moment. Churning also has an impact on a company's overall reputation, resulting in brand loss. Competitor companies rarely affect a loyal consumer who creates high revenue for the company. Such clients increase a company's earnings by referring it to their friends, family, and coworkers. When the number of subscribers falls below a particular threshold, telecom companies contemplate changing their policies, which could result in a significant income loss.

In the telecom industry, churn prediction is critical because telecom operators must retain their valuable clients and improve their Customer Relationship Management (CRM) administration. The most difficult task for CRM is to keep existing customers. Customers have the opportunity to transfer service providers due to the saturated and competitive market. Because retaining consumers is less expensive than acquiring new ones, telecom companies have created systems to identify and retain current clients. This is owing to the high expense of ads, labor, and concessions, which can cost about five to six times as much as keeping existing clients. Identifying existing churn clients requires little effort and can help turn the issue around.

Customers must be retained, which necessitates the development of an accurate and high-performance model for identifying churn. To avoid customer loss and provide retention measures, the proposed model should be able to identify churn consumers and then determine the reasons for churn. It should also use approaches to predict when a similar event will emerge in the future

II. LITERATURE REVIEW

Various strategies, such as machine learning, data mining, and hybrid techniques, have been used in the literature to forecast churn. These methods assist businesses in identifying, predicting, and retaining churning customers, as well as decision-making and CRM. The most widely acknowledged methods for predicting difficulties linked with client churn are decision trees [1]. The decision tree has a limitation in that it is not suitable for complex nonlinear relationships between qualities, but it performs better for linear data in which the attributes are interdependent. Pruning, on the other hand, enhances the decision tree's accuracy, according to the study. [2].

Decision tree algorithms have a number of advantages, including the ability to be simply viewed and understood, the ability to process categorical and numerical data, and the use of a nonparametric method that does not require previous assumptions [4]. The data used in this research is linear, and we want to use the decision tree to uncover rules and hidden patterns. In, a neural network-based methodology for predicting customer attrition in the telecom industry is presented in [3]. In the literature, data certainty and particle swarm optimization are used to predict churn [5].

Another study compared the accuracy of ANN and decision trees in predicting churn, finding that the decision tree-based strategy is more accurate than the neural network-based approach [6]. A study targeted at discovering answers to customer loyalty results in prepaid mobile phone firms supplemented this work [7]. For prediction, a two-step technique is adopted in this study. RFM relevant features are separated into four clusters in the first phase, and the churn data extracted in the first stage is tested on multiple algorithms utilizing Decision Tree (C5.0), Decision (CART), Neural Networks, and Decision Tree (C5.0) in the second step (CHAID).

Hybrid strategies, such as regression-based techniques that showed good results in forecasting and estimating churn, are employed in statistical approaches for processing massive amounts of consumer data [8]. Customer history analysis and forecast frequently employ data mining methods. Regression tree techniques were compared to decision trees, rules-based learning, and neural networks, which are all extensively used data mining methods [8][9]. Naive Bayes is a directed learning module that predicts hidden data based on Bayesian position and is used to forecast customer attrition. The topic of client data churn for wireless-based customers is highlighted in [10].

For churn prediction, a variety of hybrid strategies have been presented in the literature. The study used a hybrid approach called KNN-LR, which combines Logistic Regression (LR) and the K-Nearest Neighbor (KNN) algorithm [11]. They compared KNN-LR, logistic regression, C 4.5, and the Radial Basis Function (RBF) network and discovered that KNN-LR outperformed all of the other approaches. The unique model provided in [13] demonstrates a hybrid approach to predicting churn customer behavior by combining the customized k-means clustering algorithm with the conventional rule inductive technique (FOIL). In today's world, having control over a huge amount of data allows you to increase the level of service you deliver to your customers.

The paper [12] proposed a model based on data mining approaches to anticipate and detect churn consumers for both online and offline distributed frameworks. The methodology is suited for telecom to increase CRM and service quality in a variety of ways. As a preprocessing tool, Particle Swarm Optimization (PSO) approaches are utilized for feature selection. Due to new services, state-of-the-art renovations, and increased competition as a result of deregulation, the telecoms service sector has seen a significant transformation during the last decade. Important clients must be protected, CRM connection management must be strengthened, and profitability must be increased. CRM necessitates that a company's business units and customers be known and understood. CRM is in charge of improving offers and discounts. CRM also manages which services are available (including media and promotions etc.) to customers.

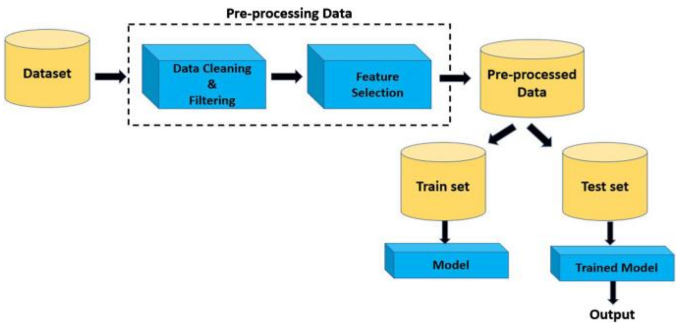


Figure 1Architecture

III. METHODOLOGY

The proposed customer churn prediction model is presented in this section. The proposed churn prediction model is depicted in Fig. 1 along with its phases. Data preprocessing is performed in the first stage, which comprises noise removal, the removal of imbalanced data characteristics, and data normalization. Information gain attributes ranking filter and correlation attributes ranking filter are used to extract important aspects from data. Different classification methods are used in the second stage to divide consumers into churn and non-churn customers. The classification algorithm used here is Random Forest. Different classification methods are used in the second stage to divide consumers into churn and non-churn customers. The classification algorithm used here is random forest classifier.

A. DATA PREPROCESSING

1). NOISE REMOVAL

Because noisy data can lead to bad results, it is critical for making the data meaningful. There are several missing values, erroneous values such as "Null," and unbalanced attributes in the telecom dataset. The number of features in our dataset is 21. We studied the dataset for filtering purposes and limited the number of features to only those that are meaningful. The dataset was obtained via Kaggle. We have 7043 rows (each representing a unique client) in our dataset, with 21 columns: 19 features, and 1 target feature (Churn). Because the data contains both numerical and category elements, we must address each datatype separately.

S#	Features	S#	Features
1	CustomerID	16	PaperlessBilling
2	Gender	17	PaymentMethod
3	SeniorCitizen	18	Tenure
4	Partner	19	MonthlyCharges
5	Dependents	20	TotalCharges
6	PhoneService	21	Churn
7	MulitpleLines		
8	InternetService		
9	OnlineSecurity		
10	OnlineBackup		
11	DeviceProtection		
12	TechSupport		
13	StreamingTV		
14	StreamingMovies		
15	Contract		

2). FEATURE SELECTION

Feature selection is an important step in determining which features from a dataset are useful depending on domain knowledge. In the context of churn predictions, there are a number of strategies for feature selection in the literature. In the churn dataset, we chose only the top features out of a total of 21 features that had high ranking values in both approaches' results. There are 21 attributes in the dataset used in this study. In a dataset with so many dimensions, some attributes boost performance measures and are valuable for decision-making in such a high-dimensional dataset, whereas others are fewer essential attributes. If the dataset contains highly predictive and important variables, classification performance improves. As a result, concentrating on important features and reducing the number of unnecessary attributes improves classification performance.

B. EXPLORATORY DATA ANALYSIS

Churn study using a Kaggle data set that contains customer information data from a telecoms business (Telcom) in order to better determine the possibility of customer attrition. While we will eventually construct a classification model to forecast the likelihood of customer turnover, we must first dive into the EDA process to gain a deeper knowledge of our data.

When working with numerical features, one of the most useful statistics to consider is the data distribution. To display the probability distributions of the relative variables, we utilise a Kernel-Density-Estimation plot. This graph depicts the areas of our dataset where a new data point is most likely to appear. For all of our numerical features, we design a KDE.

We can categorise the customers depending on their tenure to look at our data in a slightly different way to potentially extract some more information, and because 'tenure' is represented by months, which can be a bit noisy, we can do so.

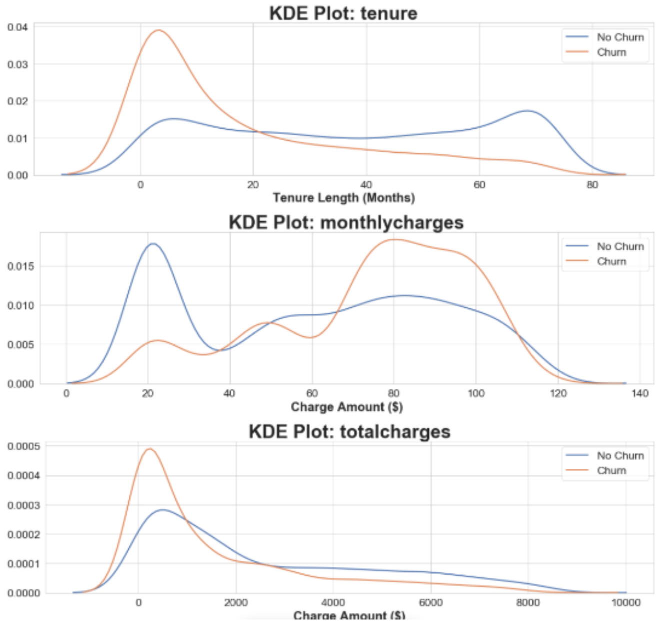


Figure 2 KDE PLOTS

Grouping customers based on their Tenure.

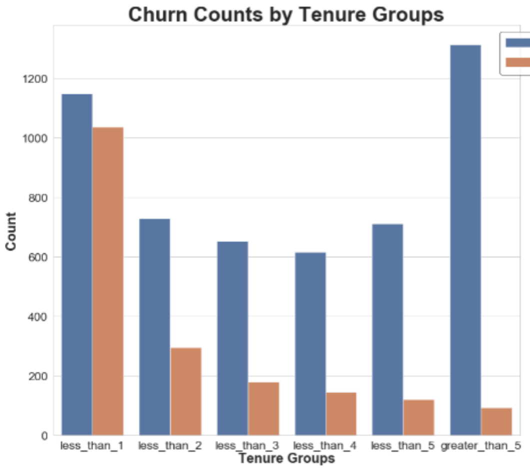


Figure 4 Churn Counts by Tenure Groups

ANALYSIS:

- Customers who churn have the highest likelihood of doing so before 20 months.
- Churned customers are more likely to incur monthly costs of more than $60.
- In general, as monthly rates rise, the risk of a client churning rises.
- Because total charge distributions are rather broad, we'll focus on the 'monthlycharges' characteristic for importance.

CATEGORICAL FEATURES

GENDER

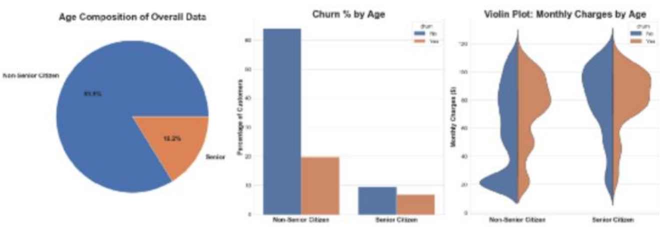


Figure 5 plot of age against churn

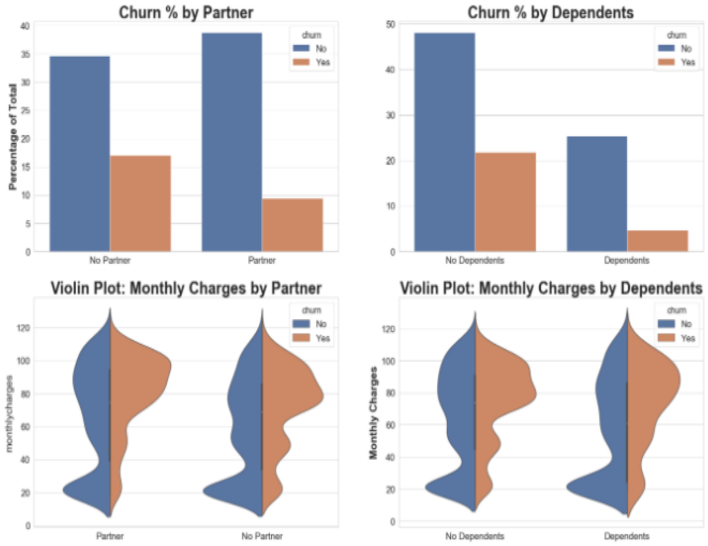


Figure 3 Plots for churn by customers and dependants

ANALYSIS:

- Customers and partners have their own datasets split.
- Those who do not have partners churn slightly more than those who do.
- Customers who do not have dependents churn somewhat more than those who do.
- Monthly charges for both spouse and dependent values are rather equal among those who churn and those who don't churn.

PHONE SERVICES AND QUALITY OF LINES

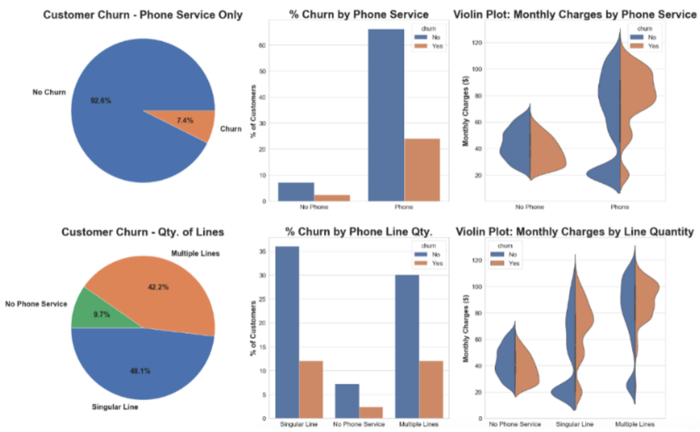


Figure 6 Plots of Phone Services and Quality of lines against churning

ANALYSIS:

- Customers who simply have phone service are less likely to churn than those who have other services.
- People who just have phone service churn 25% of the time.
- Customers that use phone services solely pay a higher monthly average fee.
- Customers that have numerous lines churn at about the same rate as those who only have one line.

IV. CUSTOMER CLASSIFICATION AND PREDICTION

In the telecom dataset, there are two sorts of clients. Non-churn consumers are the first type; they remain loyal to the company and are rarely impacted by competitors. Churn customers are the second category. The proposed methodology is designed to identify churn consumers and the cause for their departure. It also devises retention tactics to combat the problem of employees leaving for other organizations. Customers' data is classified using labelled datasets utilising a variety of machine learning approaches in this study. Its purpose is to determine which algorithm better categorises customers into the churn and non-churn groups.

We tried many Classification algorithms on the given dataset and found that Random Forest gives the best accuracy.

```
In [51]: print(model_score_r1)

         print(metrics.classification_report(yr_test1, yr_predict1))

0.9266609145815358
              precision    recall  f1-score   support

           0       0.95      0.88      0.91       508
           1       0.91      0.96      0.94       651

    accuracy                           0.93      1159
   macro avg       0.93      0.92      0.92      1159
weighted avg       0.93      0.93      0.93      1159
```

Figure 7 CLASSIFICATION REPORT FOR THE RANDOM FOREST CLASSIFIER

```
In [38]: print(metrics.confusion_matrix(yr_test1, yr_predict1))
         [[448  60]
          [ 25 626]]
```

Figure 8 CONFUSION MATRIX FOR RANDOM FOREST

Performance Measures	Random Forest
Correctly classified instances	5520
Incorrectly classified instances	339
Kappa Statistics	0.8825
Mean Absolute Error	0.05785
Root Mean Square Error	0.2405
Accuracy	93.56%

Figure 9 PERFORMANCE MEASURES OF RANDOM FOREST

Random Forest employs a divide-and-conquer strategy. It creates a numerical decision tree, and each one is trained by selecting a random attribute from the entire predicted set of attributes. Based on the characteristic's subset, each tree grows to its maximum level. After that, a final Decision Tree is built for the test dataset prediction.

Random forest performs well on huge datasets and can manage missing variables without deleting them. For model training, Random Forest manages missing values in the dataset.

Random Forest is a good classification technique that can handle nonlinear data well. It performs better than others when the data contains associated features. When compared to other techniques, RF gave better results since it handled our data very well and produced a better performance. To produce a prediction, RF employs numerous decision trees.

V. CONCLUSION

Churn prediction is a critical issue of CRM in the current competitive telecom market to retain valuable customers by recognizing comparable groups of consumers and giving competitive offers/services to the relevant groups. As a result, in this domain, academics have been looking at the primary determinants of churn in order to retain consumers and solve CRM and decision-making challenges.

A customer churn model is presented for data analytics in this study, and it is validated using conventional evaluation indicators.

The results suggest that utilising machine learning techniques improved the performance of our proposed churn model. The F-measure result from Random Forest was 92 percent better.

From the dataset, we identified the primary churn variables and did cluster profiling based on their churn risk. Finally, we gave customer retention principles for telecom company decision-makers.

For better churn prediction, we will examine eager leaning and lazy learning methodologies in the future. By using Artificial Intelligence tools for prediction and trend analysis, the study can be expanded to investigate the changing behavior patterns of churn clients.

VI. REFERENCES

[1] V. Lazarov and M. Capota, ''Churn prediction,'' Bus. Anal. Course, TUM Comput. Sci, Technische Univ. München, Tech. Rep., 2007. [Online]. Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.7201&rep=rep1&type=pdf

[2] R. Vadakattu, B. Panda, S. Narayan, and H. Godhia, ''Enterprise subscription churn prediction,'' in Proc. IEEE Int. Conf. Big Data, Nov. 2015, pp. 1317–1321.

[3] A. Sharma and P. K. Kumar. (Sep. 2013). ''A neural network based approach for predicting customer churn in cellular network services.'' [Online]. Available: https://arxiv.org/abs/1309.3945.

[4] M. Hassouna, A. Tarhini, T. Elyas, and M. S. AbouTrab. (Jan. 2016). ''Customer churn in mobile markets a comparison of techniques.'' [Online]. Available: https://arxiv.org/abs/1607.07792

[5] J. Vijaya and E. Sivasankar, ''An efficient system for customer churn prediction through particle swarm optimization based feature selection model with simulated annealing,'' Cluster Comput., pp. 1–12, Sep. 2017.

[6] V. Umayaparvathi and K. Iyakutti, ''Applications of data mining techniques in telecom churn prediction,'' Int. J. Comput. Appl., vol. 42, no. 20, pp. 5–9, Mar. 2012

[7] A. T. Jahromi, M. Moeini, I. Akbari, and A. Akbarzadeh, ''A dual-step multi-algorithm approach for churn prediction in pre-paid telecommunications service providers,'' J. Innov. Sustainab., vol. 1, no. 2, pp. 2179–3565, 2010

[8] S. A. Qureshi, A. S. Rehman, A. M. Qamar, A. Kamal, and A. Rehman, ''Telecommunication subscribers' churn prediction model using machine learning,'' in Proc. 8th Int. Conf. Digit. Inf. Manage., Sep. 2013, pp. 131–136

[9] V. Lazarov and M. Capota, ''Churn prediction,'' Bus. Anal. Course, TUM Comput. Sci, Technische Univ. München, Tech. Rep., 2007. [Online]. Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.7201&rep=rep1&type=pdf

[10] S. V. Nath and R. S. Behara, ''Customer churn analysis in the wireless industry: A data mining approach,'' in Proc. Annu. Meeting Decis. Sci. Inst., vol. 561, Nov. 2003, pp. 505–510

[11] Y. Zhang, J. Qi, H. Shu, and J. Cao, ''A hybrid KNN-LR classifier and its application in customer churn prediction,'' in Proc. IEEE Int. Conf. Syst., Man Cybern., Oct. 2007, pp. 3265–3269.

[12] V. Yeshwanth, V. V. Raj, and M. Saravanan, ''Evolutionary churn prediction in mobile networks using hybrid learning,'' in Proc. 25th Int. FLAIRS Conf., Mar. 2011, pp. 471–476

[13] Y. Huang and T. Kechadi, ''An effective hybrid learning system for telecommunication churn prediction,'' Expert Syst. Appl., vol. 40, no. 14, pp. 5635–5647, Oct. 2013

[14] Churn Prediction of Customer in Telecom Industry using Machine Learning Algorithms. International Journal of Engineering Research & Technology (IJERT) 05, May-2020

[15] Ahmad AK, Jafar A, Aljoumaa K (2019) Customer churn prediction in telecom using machine learning in big data platform. Journal of Big Data 6(1):28

[16] Makhtar M, Nafs S, Mohamed M, Awang M, Rahman M, Deris M. Churn classifcation model for local telecommunication company based on rough set theory. J Fundam Appl Sci. 2017;9(6):854–68.

[17] Churn prediction model using machine learning, in: Digital Information Management (ICDIM) 2008

[18] V. Lazarov and M. Capota, ''Churn prediction,'' Bus. Anal. Course, TUM Comput. Sci, Technische Univ. München, Tech. Rep., 2007. [Online]: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.7201&rep=rep1&type=pdf.

[19] Vadakattu, B. Panda, S. Narayan, and H. Godhia, ''Enterprise subscription churn prediction,'' in Proc. IEEE Int. Conf. Big Data, Nov. 2015, pp. 1317–1321.

[20] S. A Survey on Customer Churn Prediction using Machine Learning Techniques.https://www.researchgate.net/publication/310757545_A_Survey_on_Customer_Churn_Prediction_using_Machine_Learning_Techniques (2019)

Emphasized Smart Handwriting Recognizer to Facilitate e-Learning Tool

Preethu T B#1, Sahana P#2, Sriraksha G#3, Sushmitha N#4

Department of Computer Science and Engineering, Sapthagiri College of Engineering

#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57, India

[1]preethutb2000@gmail.com
[2]sahanavishalp@gmail.com
[3]srirakshag2000@gmail.com
[4]nsushmithagowda@gmail.com

***Abstract* — The handwritten character recognition is a computerized system that is able to identify and recognize characters and words written by user. The aim is to implement the detection of handwritten characters using both conventional approaches and deep learning techniques such as Convoluted Neural Networks (CNN), Recurrent Neural Network (RNN) and Connectionist Temporal Classification (CTC). The proposed system mainly helps institutions & offices in increasing the effectiveness and efficiency of the work. Few advantages are Historical preservation, Data Storage.**

Keywords- Image acquisition, preprocessing, segmentation, feature extraction.

I. Introduction

There are times when instead of an online form, the customers need to be presented with an offline form that needs to be filled by hand. A lot of banks, government offices and agencies use handwritten forms to obtain details and queries from the customers. Nowadays, almost every company or office has employed a digital database along with their websites to store customer information and other details. Due to this, the employees have to manually type the data of the form and add it to the database for every form that is filled. This consumes a lot of time and efforts and is not an efficient way. The manual typing of the data can also result in a few errors that can go unnoticed and filled in the database. To overcome these drawbacks and to reduce the time and effort drastically, the paper proposes a system that can convert the text written in the text boxes in the forms to digital data that can be processed by a machine. This is possible due to the advancements in machine learning algorithms and techniques. Open Source Computer Vision Library (OpenCV2) is an open source computer vision and machine learning software library. The library focuses on image processing, video capturing and analysis. Furthermore, Convolutional Neural Networks (CNN) are used to obtain the text data from handwritten text. To create this system with the help of Deep Learning by using techniques such as Convoluted neural networks (CNN), the Recurrent Neural Network (RNN) and Connectionist Temporal Classification (CTC).

II. LITERATURE SURVEY

The proposed system is aimed to use as a teaching aid in helping kindergarten to primary school level students, especially for practicing their writing and learning. The local handwritten dataset, which includes digit, English alphabet and mathematical symbols that are collected from students, is used for training and testing operations[1]. Handwritten Character Recognition (HCR) plays an important role in Optical character Recognition (OCR) and Pattern Recognition (PR), as it has a good number of applications in various fields. HCR contributes extremely to the growth of automation[2]. In the era of an Internet of Things, pattern recognition technology is growing rapidly, especially by the massive implementations of artificial intelligence (AI). Selecting the right implementation for an AI algorithm for an application could be quite challenging and time-consuming. In this system, it has been proposed a client-server system implementation for handwriting digit recognition[3]. Image Processing is a vital tool when one is dealing with several images and wishes to perform several complex actions on the same. The main objective is to bridge the gap between the actual bit of paper and the digital world and in doing so, one can operate on the digital data much faster as compared to the actual data[4]. Form Recognizer aims to build a deep learning model to extract handwritten text from a scanned Permanent Account Number (PAN) application form and convert them into digital format or editable text and store it in an excel file for further processing like statistical analysis or machine learning[5].

III. PROPOSED SYSTEM

The proposed system aims to reduce the time needed to convert handwritten text box forms into digital text and facilitate the society. The system will also facilitate further researchers and provide a starting point for further improvements.
The handwritten characters (value to the entity) are recognized with the help of Neural Networks. Both Artificial Neural Networks and Convolution Neural Networks are used for determination for accuracy of prediction.

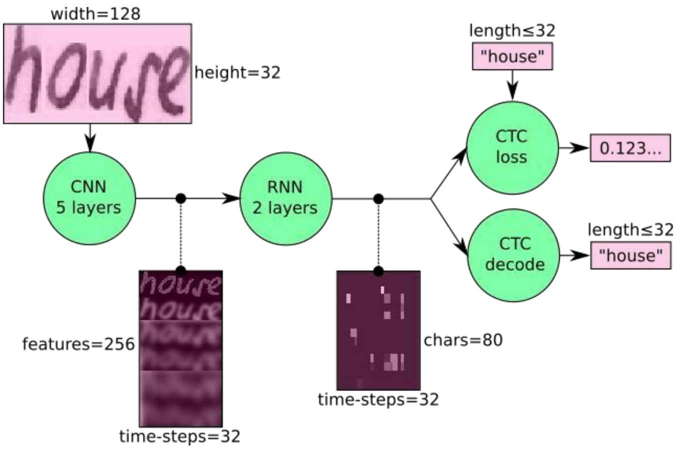


Figure 1. Overall System Architecture

IV. WORKING PRINCIPLES

Normally handwritten recognition is divided into six phases which are image acquisition, pre-processing, segmentation, feature extraction, classification and post processing.

CNN: the input image is fed into the CNN layers. These layers are trained to extract relevant features from the image. Each layer consists of three operation. First, the convolution operation, which applies a filter kernel of size 5×5 in the first two layers and 3×3 in the last three layers to the input. Then, the non-linear RELU function is applied. Finally, a pooling layer summarizes image regions and outputs a downsized version of the input. While the image height is downsized by 2 in each layer, feature maps

(channels) are added, so that the output feature map (or sequence) has a size of 32×256.

RNN: the feature sequence contains 256 features per time-(step, the RNN propagates relevant information through this sequence. The popular Long Short-Term Memory (LSTM) implementation of RNNs is used, as it is able to propagate information through longer distances and provides more robust training-characteristics than vanilla RNN. The RNN output sequence is mapped to a matrix of size 32×80. The IAM dataset consists of 79 different characters, further one additional character is needed for the CTC operation (CTC blank label), therefore there are 80 entries for each of the 32 time-steps.

CTC: while training the NN, the CTC is given the RNN output matrix and the ground truth text and it computes the loss value. While inferring, the CTC is only given the matrix and it decodes it into the final text. Both the ground truth text and the recognized text can be at most 32 characters long.

The block diagram of the basic character recognition is shown in following fig

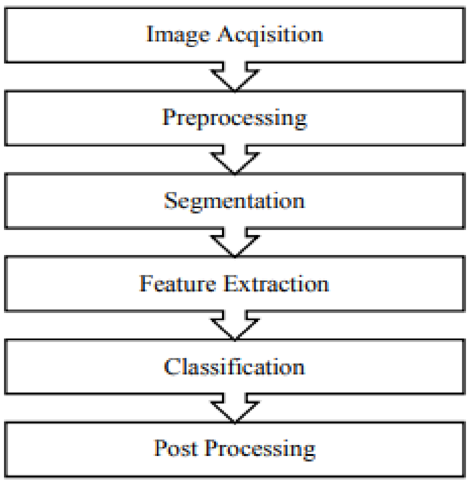


Figure 2. Block diagram of basic character recognition

V. MODULE DESCRIPTION

Dataset Collection:

In this work, we used four publicly available datasets retrieved from Iam Dataset

The IAM Handwriting Database contains forms of handwritten English text which can be used to train and test handwritten text recognizers and to perform writer identification and verification experiments.

The IAM Handwriting Database 3.0 is structured as follows:

- 657 writers contributed samples of their handwriting
- 1'539 pages of scanned text
- 5'685 isolated and labeled sentences
- 13'353 isolated and labeled text lines
- 115'320 isolated and labeled words

1. Feature Extraction:

we normalize the gray-values of the image which simplifies the task for the NN. Data augmentation can easily be integrated by copying the image to random positions instead of aligning it to the left or by randomly resizing the image.

By applying the CNN will extract the image features 256 features will be extracted from the input image.

Further processed by the RNN layers, however, some features already show a high correlation with certain high-level properties of the input image: there are features which have a high correlation with characters (e.g. “e”), or with duplicate characters (e.g. “tt”), or with character-properties such as loops (as contained in handwritten “l”s or “e”s).

2. Building and Training the model

In the proposed model, we are building CTC encoder and decoder and train the model using the extracted features from RNN model.

3. Recognize the handwritten text:

By using CTC model our system will recognize and extract handwritten text from the image.

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Classifier ID	Type of Classifier	Testing acc. (%)
1	Digit & Mathematical Symbols	85
2	Lowercase Letters	97
3	Uppercase Letters	97
4	Uppercase & Lowercase Letters	95
5	All types	93

TABLE I. Types of Classifiers

VI. SYSTEM REQUIREMENTS

1. HARDWARE REQUIREMENTS

- Processor Type : Intel Core™ – i5
- Speed : 2.4 GHZ
- RAM :8 GB RAM
- Hard disk : 80 GB HDD

2. SOFTWARE REQUIREMENTS

- Operating System : Windows 64-bit
- Technology : Python
- IDE : PythonIDLE
- Tools : Anaconda
- Python Version : Python 3.6

VII. RESULTS

We are passing the captured image of the handwritten as input to the system. We obtain output in the form of digital text.

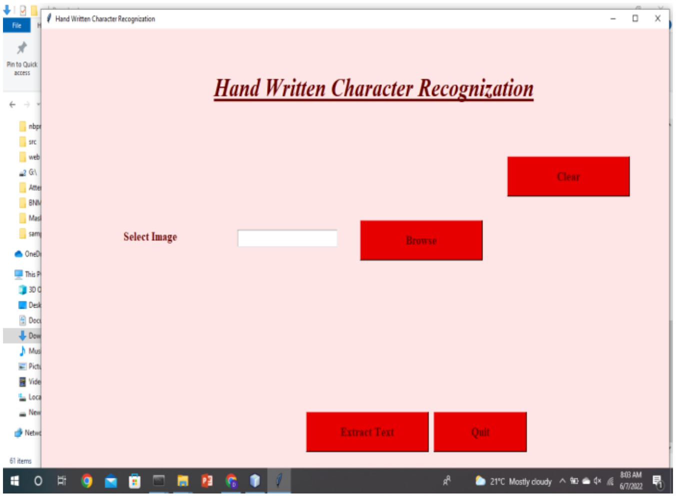


Figure 3. Front end view

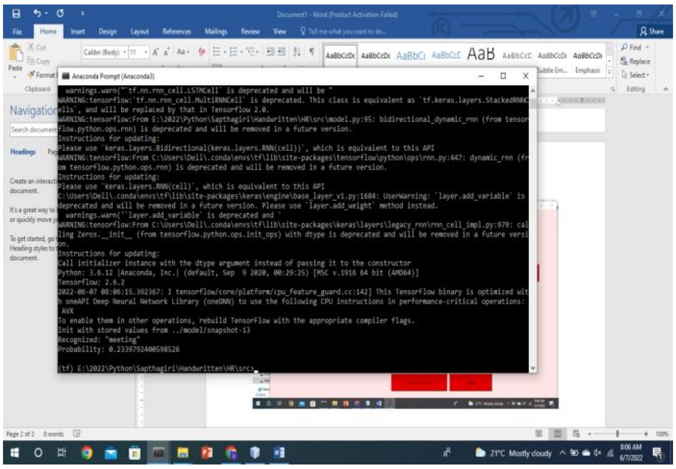


Figure 4. Back end view

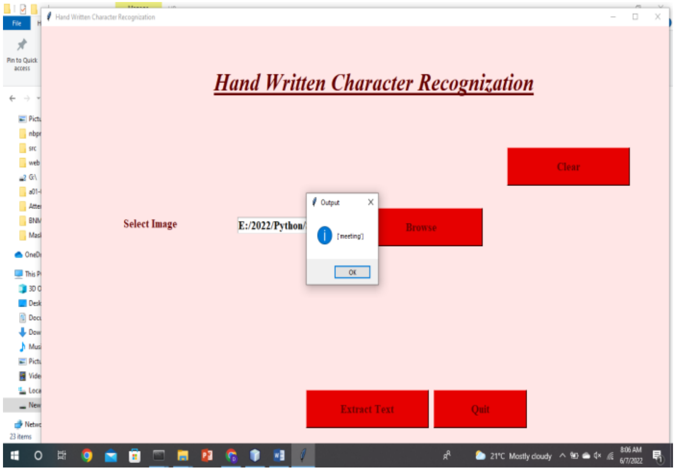


Figure 5.Output

VIII. CONCLUSION

The project has successfully identified the written text in the boxes of the form using CNN+RNN+CTC. Each character is predicted, and a string is formed of particular value which is stored in the list form.

IX. FUTURE ENHANCEMENT

As we have done with single line handwritten character recognition, for the future work handwritten character can be recognized more than a line with few more new techniques and algorithms.

X. REFERENCES

[1] Thi Thi Zin, Shin Thant and Ye Htet. “Handwritten Characters Segmentation using Projection Approach”, In IEEE 2nd Global Conference on Life Sciences and Technologies (LifeTech), pp. 107 108, Mar. 2020.

[2] Y. Lecun, C. Cortes, and C. J.C. Burges, “THE MNIST DATABASE of handwritten digits.” [Online]. Available: http://yann.lecun.com/exdb/mnist/. [Accessed: 01-Sep-2019].
[3] M.Sonkusare and N.Sahu, “A survey on handwritten character recognition(hcr) techniques for English alphabets”,Advances in Vision Computing: An International Journal, vol.3, pp.1-12,03 2016.
[4] S. Yang and D. Ramanan, "Multi-scale Recognition with DAGCNNs," 2015 IEEE International Conference on Computer Vision (ICCV), Santiago, 2015, pp. 1215-1223.
[5] T.M.Breuel, A. U1-Hasan, M.A.A1-Azwai, and F.Shafait, “High-performance OCR for printed English and fraktur using LSTM networks,” in 2013 12th International Conference on Document Analysis and Recognition,2013,pp.683-687.

FOOTPRINT AI ENGINE

Shahadat Hussain [1], Paramjeet Singh [2], Vivek Kumar Patel S [3], Sahil Aryan [4], Hemalatha K [5]

[1-4]UG Students, Department of CSE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Hemalatha K**, Dept of Computer Science and Engineering, Bengaluru, Karnataka-560057, India
shahadathussain757@gmail.com, isinghparamjeet@gmail.com, vivekpatel0212@gmail.com, aryansahil412@gmail.com, hemalatha_k@sapthagiri.edu.in

***Abstract* - One of the most important aspects of sustainable urban planning and environmental monitoring is building footprint data. Building footprints can be mapped using remote sensing photographs. In the realm of earth observation, this is a critical and difficult endeavour. Over Convolutional neural networks have demonstrated exceptional performance over time. Due to their skill, they have made advancements in the realm of building extraction. to extract hierarchical characteristics automatically and make building predictions. However, because structures come in a variety of sizes, It's difficult to accurately describe buildings, settings, and roofing materials. in a variety of sizes, particularly in huge areas (e.g., nationwide). To address these issues, we offer a revolutionary deep-supervision system. DS-Net is a convolutional neural network for extracting data. footprints created using high-resolution remote sensing pictures**

I. INTRODUCTION

Because of the wide applicability of building information, BUILDING FOOTPRINT EXTRACTION is one of the research hotspots in the remote sensing field [1], [2]. Due to its potential for sustainable urban planning, smart city development, and automated driving, the demand for generating precise and up-to-date building footprint information has increased in recent years [3]. Manual surveying and vectorization have traditionally been used to create building footprint data, which is costly and time-consuming, especially for large-scale projects [4]. Extensive research has been concentrated on automatically extracting building footprints from remote sensing pictures to make building footprint production easier [5].

Bittner et al. , for example, used fused-FCN4s to fuse information from the early layers in order to prevent information loss during the building extraction process. Shrestha and Vanneschi devised an FCN architecture using the exponential linear unit as the activation function for constructing extraction to balance accuracy and network complexity. Furthermore, conditional random fields were used to reduce incorrect predictions and sharpen the borders of the structures. The encoder-decoder framework of FCNs has shown remarkable performance on the localization of building footprints due to the usage of skip connection to merge localdetailed information with the creation of semantic segmentation methods

Over the years, the rapid development of deep learning methods in the computer vision field provides an alternative technique for extracting building footprints in a time-saving and inexpensive way Compared with the traditional methods, the convolutional neural network (CNN) can automatically extract hierarchical features from the raw images. Moreover, the feature extraction and classification processes of CNNs are integrated into a single model and can be trained in an end-to-end manner

II. LITERATURE SURVEY

[1] Zha et al designed a normalized difference built-up index for mapping urban areas using spectral information provided by the multispectral remote sensing images. Huang et al proposed a morphological building index for building extraction by modeling the implicit features using building morphological operators. Although these methods work well to some extent, they rely heavily on the selection of handcrafted features. Drawback - However, the hand-crafted feature selection process is usually subjective and empirical, hampering the robustness of these traditional methods.

[2] Bittner et al introduced fused-FCN4s to fuse the information from the early layers to reduce the information loss in the building extraction process. To balance the accuracy and network complexity, Shrestha and Vanneschi designed an FCN architecture with the exponential linear unit as the activation function for building extraction. Drawback - Accuracy and network complexity is not maintained.

[3] Wu et al proposed a boundary-regulated network that consists of a modified U-Net and a multitasking framework to generate segmentation maps and building outlines by accounting for boundary regulation. To resolve the problem of blurry object boundaries, Marmanis et al proposed a DCNN models for semantic segmentation of high-resolution aerial images, which explicitly accounts for the boundaries of classes in the segmentation process. Drawback - Problem of blurry object boundaries, which result in inaccurate segmentation.

[4] The developing framework synthesizes deep learning models to extract building footprint polygons from the remote sensing images and allow for the direct production of building maps in a vector format. In the developed framework, we use three deep learning models to perform different image processing tasks, including semantic segmentation, bounding box detection, and key point detection. Drawback - Only applicable for building segmentation

III. PROPOSED METHODOLOGY

FCNs have showed considerable promise in constructing footprint extraction by making pixel-wise predictions in semantic segmentation. We suggested DS-Net, an end-to-end FCN for constructing footprint extraction inspired by these deep learning algorithms.

The planned DS-design Net's is shown in Figure 1. consisting of three parts: an encoder–decoder design, a SAM, as well as a deep supervision subnetwork. The image to be used as an input is For hierarchical building, the data is initially supplied into the encoder subnetwork. extraction of features The decoder subnetwork is then utilised to refine the data. Multiscale refined features are generated by increasing the feature resolution. The features are then sent into the deep supervision subnetwork, which generates multiscale building predictions based on the features. Low-level features and refined high-level characteristics Finally, there is the SAM calculates each scale's contribution and delivers a report. the final construction forecast

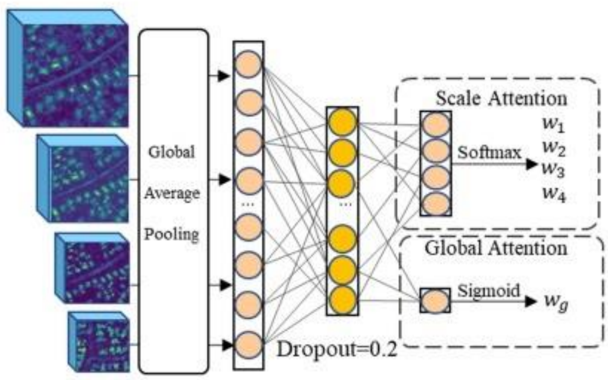


Figure 1. Structure of SAM

A .Encoder-Decoder Architecture

The encoder–decoder architecture in DS-Net is based on the basic architecture of U-Net , which is an effective network for binary semantic segmentation that uses an encoder–decoder design. Various U-Net-based building extraction approaches, such as and , have demonstrated their efficacy in the extraction of buildings. The encoder–decoder architecture used in our solution will be described here. A convolution layer of kernel size (3,3) is first applied to an input remote sensing image to expand the number of features to 64 channels. To increase the nonlinear representation of the features, a batch norm layer and a nonlinear activation layer are added after each convolutional operation. The resulting features are then sent into a third convolutional layer with a kernel size of 3,3 and a max-pooling operation that halves the amount of the input features

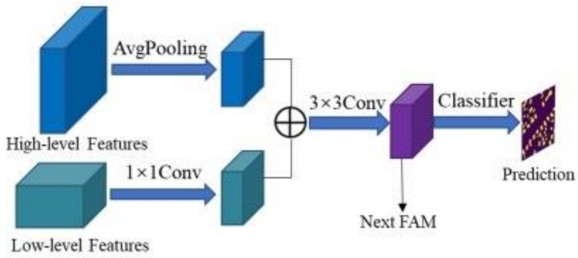


Figure 2. Architecture of the proposed feature aggregation module (FAM)

B. Deep Supervision Subnetwork

The encoder–decoder architecture can extract data from a variety of sources. Building qualities that are beneficial to the final prediction are hierarchical representative building features. In light of the huge intraclass disparity, In real-world datasets, scale variance of buildings by applying The multiscale supervision technique can improve a model's ability to generalise to buildings of various scales. If, on the other hand, The decoder network is directly subjected to multiscale supervision. The flaws, like , are divided into two categories. First, there are the gradients. Only updating can be done with the data generated by multiscale building supervision. properties of the shallower levels, making it difficult for deep layers to function Multiscale predictions are advantageous. Furthermore, given the restricted resources available. he shallow layers' inception field, the retrieved features could not accurately portray buildings, and the forecasts were based on guesswork. The impression created by shallow features may be unconvincing.

C. Scale Attention Module

The deep supervision module has the ability to generate multiscale construction forecasts from the ground up. However, figuring out how to combine multiscale projections is still a difficulty. High-level predictions have a lot of detail and are high-resolution. Low-level predictions, on the other hand, may have better localization but are low-resolution. If we simply aggregate all of the multiscale forecasts together, we may not be able to fully benefit from the multiscale predictions and may end up with erroneous predictions. To address this issue, we created a SAM that determines the contribution of each scale automatically. To capture global representations of diverse scales, the multiscale building characteristics, each of which has 64 channels, are input into a global average pooling module, as shown in . The representative vectors are then concatenated and fed together

Then we fed the output vector to two separate fully connected layers, and generate two attention vectors of size 1 × 4 and 1 × 1, respectively. The scale attention vector of size 1 × 4 determines the significance of each scale, and the refined building prediction can be generated as follows:

Pr = w1 · P1 + w2 · P2 + w3 · P3 + w4 · P4

w = softmax (v1×4) (2)

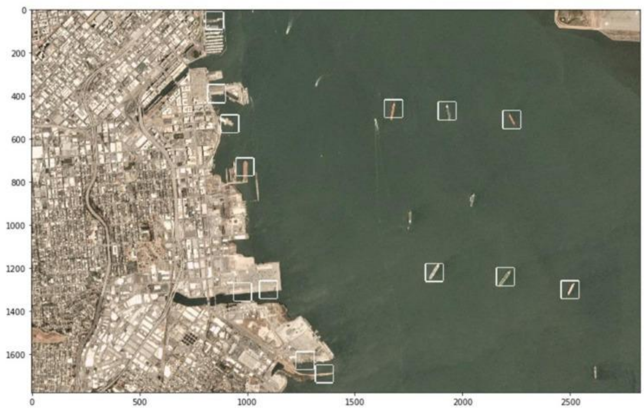
where Pi denotes the building prediction of scale i. w is generated by applying softmax operation to the scale attention vector, and wi represents the weight of scale i. Based on our observation, high-resolution predictions contain more detailed structural information and should contribute more to the final prediction. Thus, we designed a global attention module to de termine the contribution between the refined building prediction and the highest-resolution prediction. The final prediction can be generated as follows:

Pf = sigmoid (v1×1) · P1 + (1 − sigmoid (v1×1)) · P

IV. RESULT

Footprint AI Engine Project is mainly based on the idea to help professionals, Government Agencies for various purposes such as Land Surveying, Mining and Extractions of Minerals or resources, Mapping and Generating footprints of Buildings, structures, forest and vegetation areas, Water bodies predictions too is possible for calamities and also for industrial Set-up for businesses from other countries.

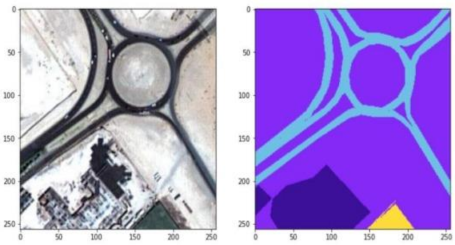
As many ships get lost during their voyage in the vast open sea, Our Engine can detect those ships using satellite Imagery which can be useful in rescuing people on board and saving lives



The second module tells about the mapping of buildings, land areas, vegetation regions, water bodies and road networks. This will be helpful information for the business and government agencies to build their infrastructures. It also helps the businesses by letting them know the exact correct locations to set up their industries by giving information about road connectivity and water resources in case of factories set-up and overall better infrastructures for their profitability

This module will do the two following tasks where the first task will be mapping of buildings and training with the given datasets with manually labeling as damaged and undamaged buildings, later these will be trained and the module will do it by self with the received images from satellites thereon.

Buildings, land areas, vegetation regions, water bodies, and road networks are all included in the second module. This knowledge will be beneficial to businesses and government agencies as they build their infrastructures.



The dataset consists of aerial imagery of Dubai obtained by MBRSC satellites and annotated with pixel-wise semantic segmentation in 6 classes. The total volume of the dataset is 72 images grouped into 6 larger tiles. The classes are:

Building: #3C1098 (dark-blue)
Land (unpaved area): #8429F6 (purple-type)
Road: #6EC1E4 (light-blue)
Vegetation: #FEDD3A (yellow)
Water: #E2A929 (dark-yellow)
Unlabeled: #9B9B9B (grey)

It also aids businesses by informing them of the most appropriate sites to locate their enterprises, as well as providing information on road connections and water supplies in the event of factory establishment, as well as overall better infrastructures for their profitability. Despite the fact that MA-FCN incorporates multiscale features based on the U-Net architecture, multiscale supervision is applied directly to the decoder. As a result, high-level features are compelled to make construction predictions, which may have an impact on their representational ability. In DS-Net, on the other hand, we created an extra-lightweight encoder

V. CONCLUSION

FCNs have performed well in the extraction of building footprints, thanks to the rapid development of deep learning techniques. However, because buildings vary in scale, context, and roofing materials, erroneous predictions and omissions in the building extraction results can be found. due to an insufficient usage of multiscale features In this article The use of a SAM in a revolutionary deep-supervision network is proposed. During the An extra lightweight subnetwork is proposed for the proposed network. to assemble multiscale features from the bottom up In Deep supervision gradients can then flow in this way. through the internet To put it another way, high-resolution construction. Deep characteristics with rich semantics can help enhance predictions. information, as well as close monitoring, can help guide learning. of convolutional layers with shallow convolutions.

Deep features with rich semantic information can refine predictions, and deep supervision can also aid the learning of shallow convolutional layers. Furthermore, a SAM is built to forecast the contribution of each scale and to provide the final building prediction by merging the findings of different scales' building extraction. Our proposed DS-Net is scale-resistant to buildings thanks to these modules, which retain both high-level semantic information and local details. Experiments on publicly available datasets reveal that DS-Net is capable of extracting structures of various scales with fewer omissions and erroneous predictions. We intend to focus on vectorization of the building footprint extraction findings in the future, as semantic labelling is only one aspect of building extraction; and how to turn building segmentation results into vectors.

VI. REFERENCES

[1] Y. Shi, Q. Li, and X. X. Zhu, “Building segmentation through a gated graph convolutional neural network with deep structured feature embedding,” ISPRS J. Photogramm. Remote Sens., vol. 159, pp. 184–197, Jan. 2020, doi: 10.1016/j.isprsjprs.2019.11.004.

[2] P. Liu et al., “Building footprint extraction from high-resolution images via spatial residual inception convolutional neural network,” Remote Sens.,vol.11, no.7, Jan. 2019, Art. no. 7, doi: 10.3390/rs11070830.

[3] Q. Shi, M. Liu, S. Li, X. Liu, F. Wang, and L. Zhang, “A deeply supervised attention metric-based network and an open aerial image dataset for remote sensing change detection,” IEEE Trans. Geosci. Remote Sens., early access, pp. 1–16, Jun. 29, 2021, doi: 10.1109/TGRS.2021.3085870.

[4] H. Guo, Q. Shi, A.Marinoni, B. Du, and L. Zhang, “Deep building footprint update network: A semi-supervised method for updating existing building footprint from bi-temporal remote sensing images,”Remote Sens. Environ., vol. 264, Oct. 2021, Art. no. 112589, doi: 10.1016/j.rse.2021.112589.

[5] Z. Zheng, A. Ma, L. Zhang, and Y. Zhong, “Deep multi sensory learning for missing-modality all-weather mapping,” ISPRS J. Pho togramm. Remote Sens., vol. 174, pp. 254–264, Apr. 2021, doi: 10.1016/j.isprsjprs.2020.12.009.

[6] Y. Zha, J. Gao, and S. Ni, “Use of normalized difference built up index in automatically mapping urban areas from TM imagery,” Int. J. Remote Sens., vol. 24, no. 3, pp. 583–594, Jan. 2003, doi: 10.1080/01431160304987

Obstacle Detection and Home Appliances Control Using Smart Wheelchair for Crippled Patients

MEGHA P*[1], MEGHANA G[2], MADHURAVANI N[3], NAVYASHREE K[4], DR. KAMALAKSHI NAGANNA[5]

Department of Computer Science and Engineering, Sapthagiri College of Engineering

#14/5, Chikkasandra, Hesaraghatta main road, Bangalore-57 India

[1]*meghaprakash534453@gmail.com*
[2]*gmeghana2000@gmail.com*
[3]*madhuravani026@gmail.com*
[4]*navyakgowda2000@gmail.com*
[5]*hodcse@sapthagiri.edu.in*

***Abstract*—About 15% of global wide populace are lives with the crippled. In India 2.21% of the whole populace are crippled. Crippled individuals are disregarded more often. Crippled people are overlooked extra often. If necessary, they will need a wheelchair to transport from one area to another as they require. It would be a great deal if the wheelchair. It makes a lot of sense if the wheelchairs they need for work are automated and controlled by themselves, rather than by stricter human intervention. In our paper, a layout was proposed that takes the above facts into consideration. The wheelchair can be managed by voice and hand gesture. The domestic home equipment additionally may be voice managed, together with obstacle detection. The motion of the wheelchair is monitored and data is transferred with the use of TCP/IP. People with disabilities can successfully use this proposed wheelchair, significantly reducing their dependence on others and maintaining a happy lifestyle.**

I. INTRODUCTION

People who have difficulty walking due to illness or accident uses a chair called a wheelchair. The World's populace is tremendously growing at high rate. Unfortunately, accidents and illness in the race also increase too. Due to some illness or accidents people misplace their hand, leg or both. Which means they are crippled people. That is, in everyday life people need to be dependent on others. They cannot do their jobs on their own. In today's society everyone is so busy no one has hours for others and technology is changing every day. With The release of new technology, the world changes every day. The main goal of technology is to make human life easier and simpler dependent. Occasionally, due to illness or accident, people who have lost their hand, legs, or both temporarily or permanently in this situation they require a wheelchair that works on voice commands, that is making the wheelchair move in the voice command of the person like start, stop, forward, backward, left and right and for this we make use of voice recognition device. If the person is paralyzed a wheelchair is required that works according to the gestures of hand. Therefore, we use MEMS sensor that works according to the hand gestures. In this wheelchair we are including new feature controlling home appliances using voice commands when the crippled person is not able to switch on/off the home appliances they can control home appliances like light, fan through voice commands like on/off this can be controlled through relay.IR sensor detects any obstacles which comes in contact thus helps in avoiding collisions. The information about the movement of the wheelchair is transferred using TCP/IP to mobile.

II. LITERATURE SURVEY

The wheelchair might be managed through voice and hand gesture. Solar energy is used to increase the energy efficiency of the system. People with multiple problems can easily use this wheelchair. This is to provide a method of hand gestures and voice control for wheel movements. Wheelchairs are also equipped with distance measuring sensors, to prevent them from moving in the event of a temporary threat. As it is completely dependent on solar power it is more cost effective designed by A.B. Haque in 2020 [1]. The device is evolved for making sure an accurate travel to disabled or aged people. By the usage of two ultrasonic and a LIDAR sensor. The device can keep away from collisions together with static and shifting obstacles. The movement of the wheelchair is controlled using standard joystick. The wheelchair acts in the identical direction as the joystick is pointing to. The complete system is dependent on joystick. Joystick is easily breakable; without the joystick the movement of the wheelchair cannot be done and it cannot be used by people whose hands are paralyzed designed by Seher Yusnieva Kadirova in 2020[2]. The true researched examined that people are facing the challenge of walking due to the disease, injury or inability. Wheelchairs provide them with the opportunity to improve the quality of life. It can be used in sloping flat landscapes using a joystick-based work model. People with disabilities without investing their qualities and energy to pull a wheelchair with the help of their voice. The speed of the wheelchair can be controlled. The person offers their voice via android versatile and in addition the voice gets converted into content. The proceeds are then passed on to small inspectors. The development of this framework is controlled via the bluetooth module with the help of servo motors. The system is dependent on WIFI designed by P. Sasikala in 2020[3]. A layout that aids the voice activation device for physically disabled humans by incorporative guide operation. Arduino and microcontroller and voice recognition have been used to guide the motion of the wheelchair. The wheelchair does now no longer reply to a wrong speech command. Design and production of Voice and gesture-managed wheelchair using a bluetooth module designed by Cynthia Joseph in 2019[4].

III.MATERIALS and METHODOLOGY

A. ATMEGA 328 MICROCONTROLLER

It is the main component it acts as the brain each and every component are interconnected to it. Power supply is used to activate the components in the micro-controller. The Arduino Uno is a microcontroller board based on ATmega328. It has 14 digital input/output pins,6 analog inputs, a 16 MHz ceramic resonator, a USB connector, a power jack, a ICSP header, and a reset button. Every component is connected to the microcontroller like power supply, sensors, voice recognition module, relays, dc motors, buzzer and others.

Fig 1: ATmega 328 microntroller

B. VOICE RECOGNITION MODULE

Fig 2: Voice recognition module

A voice recognition module is a compact and easy to control voice recognition card. We are using 16bit voice recognition module and operating voltage 12V. Users must first train the module before recognizing voice commands. The board has two control paths, one for the serial port and one for the general-purpose input pin. Common output pins on the board can generate different types of waves while recognizing the corresponding voice commands.

C. SENSORS and MOTORS

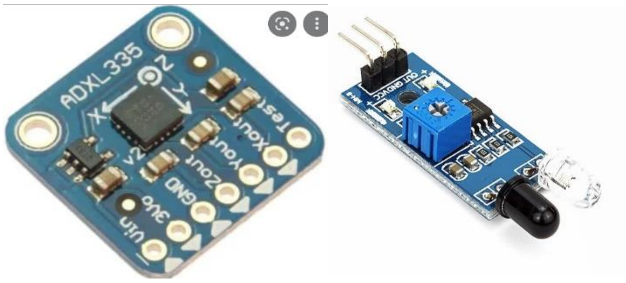


Fig 3: MEMS & IR sensors

A MEMS sensor (microelectromechanical system) is a high-sensitivity sensor that can detect tilt and use an accelerometer to change the direction of the wheelchair according to the tilt. The MEMS accelerometer detects tilt and provides information to the microcontroller, which determines and controls movement. This small, sensitive accelerometer can detect acceleration, tilt, and vibration by simultaneously measuring x, y, and z-axis movements. An infrared sensor is attached to the wheelchair, and as soon as the wheelchair touches an obstacle, the wheelchair stops and the buzzer sounds.

D. DC MOTOR

Fig 4: DC motor

DC motors operate on the principle that when a conductive conductor is placed in a magnetic field, a mechanical force is applied to the conductor. A DC motor is used to move the wheelchair. Here we use two DC motor drivers used to control the speed of a wheelchair traveling at 60 RPM with a mains voltage of 12 V. The direction of the wheelchair and the possible movements are shown.

Forward: Both motors are in forward gear
Reverse: Both motors are reverse gear
Left: Motor1 is stopped, Motor2 is forward.
Right: Motor1 is forward, Motor2 is stopped.
Stop: Both motors are stopped.

E. RELAY DRIVERS and BUZZERS

A relay driver IC is an electromagnetic switch used when you want to turn a light bulb on and off using a low voltage circuit. It is connected to a microcontroller, controls the supply voltage from the microcontroller, and uses a DC motor relay.

Fig 5: Buzzer

The buzzer is used to notify if the wheelchair has come contact with any obstacles in that case it will use Wi-fi to send message to the registered mobile. Active buzzer is used, power supply is provided through adapter or battery. A relay driver IC is an electromagnetic switch used when you want to turn a light bulb on and off using a low voltage circuit.

F. UART

Fig 6: UART

UART (Universal Asynchronous Receiver or Transmitter) is the most commonly used protocol for full-duplex serial communication. It is single LSI (large scale integration) chip designed to perform asynchronous communication. This device sends and receives data from one system to another system.

Methodology

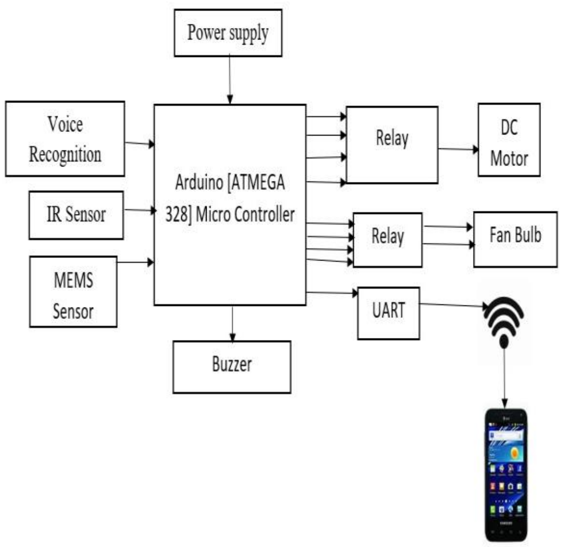


Fig 7: Block diagram representing the architecture

ATMEGA 328 microcontroller is the main component it acts as the brain each and every component are interconnected to it. Power supply is used to activate the components in the micro-controller. Voice-kit is used to recognize the voice once the voice is feed in the kit it can operate the wheelchair. It will compare the voice feed and then sends signal to the controller to make movement. Two DC motors are used to move the wheelchair. When both motors are moving in clockwise direction then wheelchair moves forward, if both are motors moving in anticlockwise then it moves backward, if right motor is moving clockwise and left motor is moving anticlockwise then wheelchair moves left, if right motor is moving anticlockwise and left motor is moving clockwise then wheelchair moves right. Voice recognition module sends signal to the controller it will activate the pins which are connected to relay used to control DC motors. MEMS accelerometers are used to find tilt. The movement of the wheelchair can be made by hand gesture who are mute.IR sensor is used detect the obstacle that comes close contact with the wheelchair. Relays act as switch which is used to on and off the fan and bulb. The Wi-Fi is used to connect the mobile app through which movement of the wheelchair can be monitored.

IV.RESULTS

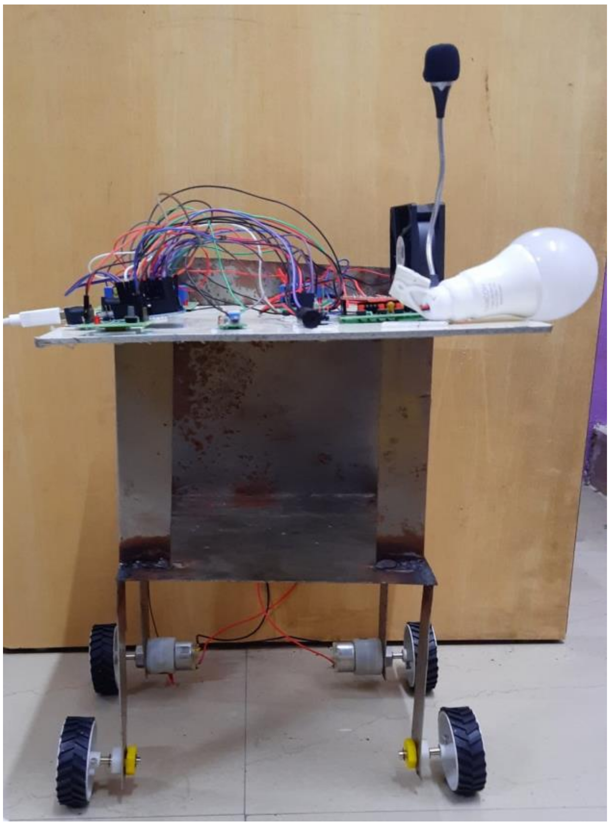


Fig 8: Wheel chair model

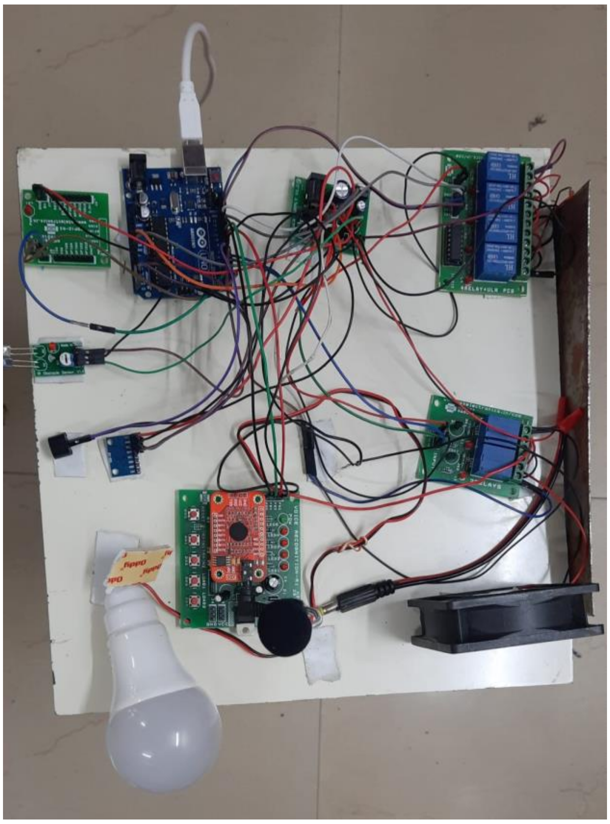


Fig 9: Home appliances controlled using wheel chair

V. CONCLUSIONS

People with disabilities depend on others in their daily lives. Wheelchairs are very beneficial to them as they work independently. The proposed wheelchair system is very useful for the physically challenged, works effectively with either voice commands or hand gestures, and also detects obstacles. The wheelchairs we propose avoid accidents. It also prevents collisions with walls, solids, furniture, etc. and enhances the safety of users of regular joystick-controlled wheelchairs. Therefore, all the drawbacks of joystick-controlled wheelchairs are overcome by this “Obstacle Detection and Home Appliances Control Using Smart Wheelchair for Crippled Patients”.

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REFERENCES

[1] A. B. Haque, S. Shurid, A. T. Juha, M. S. Sadique and A. S. M. Asaduzzaman, "A Novel Design of Gesture and Voice Controlled Solar-Powered Smart Wheel Chair with Obstacle Detection," 2020 IEEE International Conference on Informatics, IoT, and Enabling Technologies (ICIoT), 2020, pp. 23-28, doi: 10.1109/ICIoT48696.2020.9089652.

[2] S. Y. Kadirova and T. R. Nenov, "Design of Power Wheelchair Controller," 2020 7th International Conference on Energy Efficiency and Agricultural Engineering (EE&AE), *2020*, pp. 1-4, doi: 10.1109/EEAE49144.2020.9279065.

[3] P. Sasikala, "Human Machine Interface Wheel Chair by using Wi-Fi Communication for Disabled Person," 2020 3rd International Conference on Intelligent Sustainable Systems (ICISS), 2020, pp. 352-356, doi: 10.1109/ICISS49785.2020.9315887.

[4] C. Joseph, S. Aswin and J. Sanjeev Prasad, "Voice and Gesture Controlled Wheelchair," 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC), 2019, pp. 29-34, doi: 10.1109/ICCMC.2019.8819662.

[5] M. I. Rahman, S. R. Fahim, S. S. Avro, Y. Sarker, S. K. Sarker and T. Tahsin, "Voice-activated Open-loop Control of Wireless Home Automation System for Multi-functional Devices," *2019 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE)*, 2019, pp. 1-4, doi: 10.1109/WIECONECE48653.2019.9019996.

[6] Sutikno, k. Anam and A. Saleh, “Voice controlled wheel chair for disabled patients based on CNN and LSTM”, 2020 4th International Conference on Information and Computational Sciences (ICICoS), 2020, pp.1-5, doi:10.1109/ICICoS51170.2020.9299007

[7] M.A. K AI Shababi and S.M. Kesavan, “IoT Based Smart Wheel Chair for DisabledPeople”, 2021 International Conference on System, Computation, Automation and Networking (ICSCAN),2021, pp. 1-6, doi:10.1109/ICSCAN53069.2021.9526427

[8] C. Joseph, S. Aswin and J. Sanjeev Prasad, "Voice and Gesture Controlled Wheelchair," *2019 3rd International Conference on Computing Methodologies and Communication (ICCMC)*, 2019, pp. 29-34, doi: 10.1109/ICCMC.2019.8819662.

[9] Rajesh KannanMegalingam et al., “Wireless gesture-controlled wheelchair”,2017 4th International Conference on Advanced Computing and Communication Systems (ICACCS), 24 August 2017, Coimbatore, India.

[10] Prof.Chittep. p et al., “A hand gesture based wheelchair for physically handicapped person with emergency alert system”, International Research Journal of Engineering and Technology (IRJET), Volume: 03 Issue: 04, Apr-2016

Intelligent Reader for Visually Impaired People

Anusha D B, K U Anjali
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India
anushetty425@gmail.com
anjaliumesh55@gmail.com

Revathi D, Yashaswini S
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India
revathi3346@gmail.com
yashugbr@gmail.com

Dr.Praveen Kumar K V
Professor
Computer Science and Engineering
Sapthagiri College of Engineering,
Banglore,India
Praveenkumarkv@sapthagiri.edu.in

***Abstract*— This work has been built around PC with camera. Optical Character Recognition or OCR is implemented in this project to recognize characters which are then read out by the system through a speaker. As shown in the project setup, the inbuilt camera of PC laptop is used to captures a full view of the paper into the system. Also, when the camera takes the snapshot of the paper, it is ensured that there is good lighting conditions. The content on the paper should be written in English (preferably Times New Roman) and be of good font size (preferably 24 or more as per MS Word). When all these conditions are met the system takes the photo, processes it and if it recognizes the content written on the paper it will announce on the speaker that the content on the paper has been successfully processed. After this it speaks out the content that was converted in to text format in the system from processing the image of the paper. In this way Reader for Blind helps a blind person to read a paper without the help of any human reader or without the help of tactile writing system.**

Keywords—OCR, Open CV, Pygame mixer, Tesseract, TTS.

I. INTRODUCTION

There are many existing solutions to the problem of assisting individuals who are blind to read, however, none of them provide an efficient reading. We focus on improving the competence of blind people by providing them with a solution where the details are given in the form of audio signal. Reader for blind is an automatic document reader for visually impaired people using OCR technology. The proposed project uses a camera-based assistive device which can be used by individuals to read printed text. The scheme is to implement an PC based image capturing technique project. The design is inspired by prior research with visually impaired people, and it is small and portable, that helps in achieving result in little setup. Here, we have put forward a text read out system for visually impaired people.

OCR and Text-to-Speech synthesis is used to convert images into audio output (Speech). The proposed apparatus has a camera which act as the input device for digitization and this digitized script is processed by OCR (software module). A procedure is followed for recognition of characters and the line of reading. In the context of software development, the Open CV (Open source Computer Vision) libraries are employed to capture image of text and character recognition. The final identified text document is given to the output devices based on the choice of the user. In built Speaker connected to PC act as the output device.

II. LITERATURE REVIEW

A. OPTICAL CHARACTER RECOGNITION

Optical Character Recognition is the technology used for converting the transcribed, handwritten or any printed text documents such as scanned pages, images taken by any camera or phone into the text data that can be edited and reused. In other words, OCR takes a look on the photo of the text document (therefore it is called as "optical" process) and then recognizes the different alphabets, numbers or any other characters. This sub process is called as character recognition, which is used to fetch the characters from the image, and then these characters will be converted to text sentences for further use.

This mainly aims to reduce the human workload, and it achieves the same as it is handy and it also saves the time as it provides all the text that the user was supposed to be retyping.

B. PYGAME MIXTURE

Speech synthesis is the imitation of human voice. A computer system used for this task is called a speech synthesizer. This synthesizer is accessible to all in hardware or software products. The foremost aim of Text-To-Speech system is to translate normal language text into audio. Synthesized speech can be produced by concatenating pieces of recorded speech that are stored in a database. A system which stores phones or diaphones provides the largest output range, but this may give low clarity. For specific application domains, the storage of entire words or sentences allows for high-quality output. Alternatively, a synthesizer can constitute a model of the vocal tract and other human voice characteristics to create a fully synthetic voice output. The quality of a speech synthesizer is decided by its naturalness or similarity to the human voice and by its ability to be understood clearly.

C. TEXT TO SPEECH

TTS engines are used for text to speech with help of speaker. The output device is a headphone is connected to the speaker which can speak out the text aloud for visually impaired peoples. If you want better results you can use a high definition camera for it, otherwise, the output will be not completely accurate.

TTS synthesis a simple character to voice translation. The alphabets (a-z, A-Z) and digits (0-9) are recorded in the order of wave data (.wav) for the database. Each character has a unique pronunciation. We play the wave data corresponding to each character read, in character to voice translation, we can also play the wave data for each word read. Once the text is read, for every word the corresponding wave file are concatenated and played.

D. TESSARACT

Tesseract is an open-source OCR engine that was developed at HP between 1984 and 1994. Like a super-nova, it appeared from nowhere for the 1995 UNLV Annual Test of OCR Accuracy, shone brightly with its results, and then vanished back under the same cloak of secrecy under which it had been developed. Now for the first time, details of the architecture and algorithms can be revealed.

Tesseract began as a PhD research project in HP Labs, Bristol, and gained momentum as a possible software and/or hardware add-on for HP's line of flatbed scanners. Motivation was provided by the fact that the commercial OCR engines of the day were in their infancy, and failed miserably on anything but the best quality print.

E. RELATED WORKS

Jaewoo Park [1] proposed a multilingual OCR system integrating three neural blocks and the reinforcement learning of the segmenter. Unlike conventional methods for multi-language OCR systems, we aimed to optimize the edit distance of recognition results. Ayatullah Faruk Mollah, Nabamita Majumder, Subhadip Basu and Mita Nasipuri,[2] proposed that their study limited to light-weight and computationally efficient techniques Compared to Tesseract, acquired recognition accuracy (92.74%)is good enough. Abin M Sabu and Anto Sahaya Das [3] proposed various modern techniques were introduced to remove the noise and to recognise the characters.S.Gayathri and R.S.Mohana,[4] It is found that fine tuning of hper - parameters like learning rate, activation function helps in enhancing the frutition of CNN architecturP.A. Khaustov, V.G. Spitsyn and E.I. Maksimova [5], This method is based on structural components extraction and has no requirements to the number of reference images. The proposed approach outperforms its analogs in conditions of a small number of reference images. Muiz Ahmed Khan, Pias Paul Mahmudur Rashid[6], The processed image is then fed to the Tesseract optical character recognition (OCR) engine to extract the text from it The ultrasonic sensors can detect an object within 300 cm by generating a 40 kHz signal and receiving reflected echo from the object in front of it. The distance is calculated based on the pulse count and time-of-flight (TOF).I N 1914 Fournier d'Albe [7], Demonstrated a direct translation reading aid for the blind with which printed material was moved horizontally across an image of a vertical row of illuminated dots.

III PROPOSED SYSTEM

The proposed work uses a camera-based assistive device which can be used by individuals to read printed text. The scheme is to implement an PC based image capturing technique project. The design is inspired by prior research with visually impaired people, and it is small and portable, that helps in achieving result in little setup. Here, we have put forward a text read out system for visually impaired people.

OCR and Text-to-Speech synthesis is used to convert images into audio output (Speech). The proposed apparatus has a camera which act as the input device for digitization and this digitized script is processed by OCR (software module). A procedure is followed for recognition of characters and the line of reading. In the context of software development, the Open CV (Open source Computer Vision) libraries are employed to capture image of text and character recognition. The final identified text document is given to the output devices based on the choice of the user. In built Speaker connected to PC act as the output device.

Fig 1: Proposed System

The proposed project is implemented on PC Laptop. It consists of integrated camera, press button, and Speaker. Inbuilt Camera is used for capturing the image. A keypad button is used to activate the program and speaker for audio output. The printed text is shown to the camera to ensure the image of good quality and fewer distortions. The image is converted to text using tesseract library. The text is converted to audio using pygame library and the audio file converted in played using the inbuilt library.

Press Button :

A press-button or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Press button(C – button) in a keyboard is used to activate the program and headset for audio output.

Headset /Speaker:

A headset combines a headphone with a microphone. Headsets are setup with either a single-earpiece (mono) or a double earpiece (mono to both ears or stereo). The audio output is plays through the earphones/built in speaker connected to the audio jack. Headsets is also providing the equivalent functionality of a telephone handset but with hand free operation. Instead of headset the in-built speaker of PC/Laptop can be used.

FLOW OF PROCESS

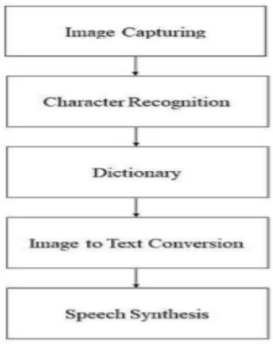

Fig 2: Flow Process of the Proposed System

Image Capturing:

Image capturing is the first step. It is achieved by using the press button interfaced to the Pi. To improve the quality of the image camera is used.

Character Recognition:

The captured image is first enhanced, and character recognition is done either by online or offline methods. In the offline method, Tesseract library and Python programming are used. Here the text files are processed by various libraries like OpenCV, NumPy. In the online method, Google Cloud Vision is used.

Dictionary:
The recognized characters are crosschecked with the database provided. The database used for the online process is taken from the cloud library whereas for offline we use a trained dataset.

Image to Text Conversion:
Here, the image is converted to machine encoded text. In the online process, we use the Google cloud vision as the platform for the conversion where Application Program Interface (API) is used.

Speech Synthesis:
This module performs the task of conversion of the transformed machine encoded text to the audible form. It is here, we represented a system to scan written text, for helping the blind individuals. Word recognition on the text regions is performed using OCR. For this methodology the camera acts as the input. As the Raspberry PI board is high powered it makes the camera streaming. The image is captured by pressing the button when the item for text reading is positioned ahead of the camera. The image is converted to the document using Tesseract library. Text-to-Speech synthesis is used to pronounce the document through the earphones/speaker.

IV RESULTS

This work has been built around PC with camera. Optical Character Recognition or OCR is implemented in this work to recognize characters which are then read out by the system through a speaker. The proposed system provides accuracy of 90%. Hence it can be used by visually impaired people so that it can be useful form them to detect text from the document.

V CONCLUSION

As shown in the setup, the inbuilt camera of PC laptop is used to captures a full view of the paper into the system. The 'blind reader' is not just a project that empowers the blind and illiterate people to become independent, but is also a resource saver.This project is an effort to implement an innovative robust approach for character extraction and text to voice conversion of different images using optical character recognition. A user friendly, cost effective, reliable to all and applicable in the real time System is achieved.

By specifying printed or handwritten text the system can processes it. Using this methodology, we can read text from a document, whether it is printed or handwritten and can generate synthesized speech through any portable system i.e. computer's speakers. This saves user's time by allowing him to listen background materials while performing othertasks. Other application of this system includes such as making information browsing for people who do not have the ability to read or write. This approach can be used in part as well. If requirement is only for text conversion then it is possible or else text to speech conversion is also done easily. People with vision impairment or visual dyslexia or complete blindness can use this approach for reading the documents, books and also while travelling. Tourists having language barrier can also use this approach for understanding different languages. Translation to the user opted language is also make possible. People travelling in cars and buses can save their time using this feature. Experiments have been performed to test the text and speech generation system and good results have been achieved. Still the work is in progress for symbol extraction.

REFERENCES

[1] Jaewoo Park; Eunji Lee, Yoonsik Kim, Isaac Kang, Hyung Il Koo and Nam Ik Cho "Multi-Lingual Optical Character Recognition System Using the Reinforcement Learning of Character Segmenter," in IEEE Access (Volume: 8).

[2] Ayatullah Faruk Mollah, Nabamita Majumder, Subhadip Basu and Mita Nasipuri, "Design of an Optical Character Recognition System for Camerabased Handheld Devices,"in IEEE - IJCSI, Vol. 8, Issue 4.

N Prameela, P Anjusha and R Karthik, "Off-line Telugu handwritten characters recognition using optical character recognition," in IEEE

- 2017 International conference of Electronics, Communication and Aerospace Technology (ICECA).

[3] Abin M Sabu and Anto Sahaya Das, "A Survey on various Optical Character Recognition Techniques," 2018 Conference on Emerging Devices and Smart Systems (ICEDSS).

[4] S.Gayathri and R.S.Mohana, "Optical Character Recognition in Banking Sectors Using Convolutional Neural Network," I-SMAC 2019, pp. 753 – 756.

[5] P.A. Khaustov, V.G. Spitsyn and E.I. Maksimova, "Algorithm for Optical Handwritten Characters Recognition Based on Structural Components Extraction," IEEE - IFOST-2016, pp. 355 – 358.

[6] Muiz Ahmed Khan , Pias Paul , Mahmudur Rashid , Student Member, IEEE, Mainul Hossain , Member, IEEE, and Md Atiqur Rahman Ahad , Senior Member, IEEE "An AI-Based Visual Aid With Integrated Reading Assistant for the Completely Blind"

[7] JAMES C. BLISS "A Relatively High-Resolution Reading Aid for the Blind".

Deep Learning Applications used in Detection and Classification of Covid-19/pneumonia with Chest X-Ray images by applying Al & ML Techniques

Rakshitha D[#1], Roopa U[#2], Drithi R[#3]

rakshithad28@gmail.com [#1], roopafeb16@gmail.com[#2], drithir2000@gmail.com [#3]

[#1,2,3] Student, Dept. of Computer Science, Sapthagiri College of Engineering, Karnataka, India

***Abstract* —The novel coronavirus 2019 (COVID-2019) has become a pandemic disease, which first appeared in Wuhan city of China in December 2019. COVID-2019 has already caused thousands of causalities and infected several millions of people worldwide. 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. An infection caused by COVID-19, can be detected by a chest X-ray exam and should be treated appropriately. COVID-19 has emerged the need for computer-aided diagnosis with automatic, accurate, and fast algorithms. Since the symptoms of pneumonia and COVID-19 were almost similar, it become very important to distinguish the both, in order to provide proper diagnosis. The aim of the proposed project is to apply Machine Learning algorithm for COVID-19/ pneumonia detection over chest X-ray images. The database contains a mixture of COVID-19, viral pneumonia, and normal chest X-ray images. The proposed model uses different architectures of convolutional neural networks (CNNs) trained on ResNet, and adapt them to behave as feature extractors for the X-ray images. Proposed model can be very helpful to the front-line workers. It can also be employed to assist radiologists in validating their initial screening, and can also be employed via cloud to immediately screen patients.**

***Keywords*- Detection, COVID-19, chest X-ray, convolutional neural network**

I. INTRODUCTION

Machine learning methods for automatic diagnosis have lately acquired appeal in the medical arena, becoming an additional tool for physicians. Deep learning, a popular artificial intelligence (AI) research topic, allows for the building of end-to-end models that achieve promised results with input data without the need for manual feature extraction. Arrhythmia detection, skin cancer classification, breast cancer detection, brain disease classification, fundus image segmentation, and lung segmentation have all been successfully implemented using deep learning approaches.

The increasing spread of COVID-19 has required the necessity for specialists in this field. This has sparked a surge of interest in building AI-based automated detection systems. Due to the limited number of radiologists, providing experienced physicians to each institution is a difficult undertaking. As a result, simple, accurate, and rapid AI models may be useful in overcoming this difficulty and assisting patients in a timely manner.

A real-time reverse transcription-polymerase chain reaction is the most prevalent test technique currently utilised for COVID-19 diagnosis (RT-PCR). Early identification and treatment of this condition rely heavily on chest radiological imaging such as computed tomography (CT) and X-ray. Even if negative findings are obtained, symptoms can be discovered by evaluating radiological imaging of patients due to the poor RT-PCR sensitivity of 60–70%. According to the researchers, CT is a sensitive approach for detecting COVID-19 pneumonia and can be used as a screening tool in conjunction with RT-PRC. CT abnormalities are observed over a long period of time after the onset of symptoms, with most patients having a normal CT within the first 0–2 days. The most common lung CT of individuals who survived COVID-19 pneumonia was found in a study.

There have also been a number of recent research on COVID-19 identification that used CT scans and other deep learning models. However, the suggested model relies on chest X-ray pictures to detect COVID-19 infections because X-rays have been used for decades and give an astoundingly fast way of examining the lungs, making them a useful tool in the identification of COVID-19 infections. They have the ability to create images that demonstrate lung injury. X-rays are quick and inexpensive, and they can help triage patients in areas where the healthcare system has failed or in areas where more complex technology are unavailable.

The diagnosis of COVID-19 infections entails a chest scan to confirm the patient's lung state, with the patient being diagnosed with COVID-19 infection if the scans reveal pneumonia. By isolating the patient sick with pneumonia, authorities can isolate and treat them as a covid patient. As a result, incorrect diagnoses are made, which can be damaging to the patient's health. A chest computed tomography scan is one of the approaches for detecting pneumonia (CT scan). COVID-19 infections are being detected, quantified, and monitored using automated image analysis based on artificial intelligence, as well as separating healthy lungs from diseased lungs.

The proposed approach aids in disease diagnosis by examining three classes: COVID19, viral pneumonia, and normal circumstances. In this research, we propose an autonomous system that uses transfer learning and convolution neural networks to categorise chest X-ray pictures as COVID-19 patients, pneumonia patients, or healthy patients (CNNs).

II. RELATED WORK

In this section, various proposed system methodologies have been contemplated.

Debanjan Konar *et al.*[2] proposed a model, in which an attempt was made to fully automatic segmentation of lung CT images using an integrated semi-supervised shallow neural network encompassing the parallel self-supervised neural network model (PQIS-Net), followed by fully connected (FL) layers for patch-based classification with majority voting. The proposed integrated framework is semi-supervised in that the parallel self-supervised neural network model (PQIS-Net) is a fully self-supervised network for segmentation, followed by fully connected layers for COVID-19 disease random patch-based classification. The PQIS-Net model uses quantum formalism to incorporate the frequency components of the weights and inputs, allowing for faster network state convergence due to less computation. This inherent quality of the PQIS-Net model results in precise and time-efficient real-time segmentation, as illustrated by the findings.

Qingsen Yan *et al.*[7] proposed a CNN model using SegNet, a three-dimensional deep learning model for lung and COVID-19 segmentation from chest CT images. The proposed network incorporates feature variation and progressive ASPP blocks, which are advantageous in highlighting the boundary and position of COVID-19 infections and are inspired by contrast enhancement approaches and ASPP. These findings show that COVID-19 can be segmented from CT scans using convolutional network-based deep learning technologies. These contributions demonstrate the possibility of enhancing COVID-19 diagnosis and treatment.

Dufan Wu *et al.*[8] proposed a deep learning strategy based on hybrid week labels for infection and consolidation segmentation from CT images in this paper. Single-class contours were used to train the network, which was then fine-tuned using weak patient-level labels. The suggested framework's usefulness is demonstrated by evaluations based on datasets from numerous hospitals around the world. More evaluations and score calculations for various illness kinds will be the focus of future effort.

Amjad Rehman *et al.*[5] provided a recent summary, as well as current developments and COVID-19 detection trends using deep learning approaches with CT and X-ray pictures. This paper also identifies certain data science use cases that could aid in the pandemic by utilising machine learning techniques for data analysis and prediction. The most common concerns are discussed and highlighted, as well as current chest X-ray results that have been uncovered as part of this comprehensive examination. Finally, in order to prevent the spread of COVID-19, it would be helpful for the data scientist to focus more on early illness prediction.

Muhammad E. H. Chowdhury *et al.*[9] proposed a deep CNN-based transfer learning strategy for detecting COVID-19 pneumonia automatically. Eight popular and previously reported efficient CNN-based deep learning algorithms for categorizing normal and pneumonia patients using chest X-ray images were trained, verified, and evaluated. When picture augmentation was utilized to train the CNN models, it was discovered that DenseNet201 outperformed other deep CNN networks. While image augmentation was not employed, CheXNet, a DenseNet variation, outperformed other networks. This is clear because the CheXNet was trained on a big X-ray database before being used in this work, and it performed better on a tiny non-augmented image dataset. Dense201, a more advanced variant of DenseNet, outperforms DenseNet when trained on a large augmented dataset.

Sammy V. Militante *et al.*[11] presented a trained VGG-16 model for COVID-19 identification and pneumonia detection on chest x-ray images using the CNN approach in this research study, and the findings were significant. The constructed CNN model proved successful at extracting features from an x-ray image and predicting the presence or absence of COVID-19, bacterial, and viral pneumonia. In the same way, data augmentation techniques were used to enhance testing data in the study. COVID-19 and pneumonia can be effectively detected using chest radiographs with the help of CNN and deep learning technologies, in addition to the advancement of computer-related applications in the medical division. COVID-19, bacterial, and viral-pneumonia may all be predicted with greater accuracy using the methodologies used during this investigation, and in this case, our study achieved 95 percent accuracy.

III. METHODOLOGY

A larger dataset usually outperforms a smaller one when using deep convolutional neural networks. When the dataset for deep CNN training is small, transfer learning can be used. The aim of transfer learning is to adjust the SoftMax and classification layer of pre-trained networks using a learned model from a big dataset such as ImageNet. The pre-trained weights are then used to train the network more quickly for an application with a smaller dataset. This eliminates the need for a big dataset and shortens the training period that a deep learning system requires when created from scratch. Despite the fact that COVID-19 patients are infected in huge numbers over the world, the quantity of publicly available chest X-ray images is minimal and scattered. The authors established a Kaggle database to make the database openly available to researchers all around the world, and the trained models were made public so that others might profit from this study. The posterior-to-anterior (AP)/anterior-to-posterior (PA) picture of a chest X-ray was employed in this study since radiologist use this view of radiography frequently in clinical diagnosis.

covid x-ray normal x-ray pneumonia x-ray

Figure 1:sample chest x-ray images

A. Data Acquisition

The data set is gathered from a source, and a thorough analysis is performed. Only if the image meets our requirements and is not duplicated is it chosen for training/testing purposes.The Data Acquisition process begins with the collection of a dataset from a trusted source. The dataset's features are then examined, and only if they match the requirement is the dataset considered.

B. Preprocessing

To make processing easier, the image is converted from RGB to greyscale, then an averaging filter is used to filter out the noise, global basic thresholding is used to remove the background and only consider the image, and a high-pass filter is used to sharpen the image by amplifying the finer details.

1) Conversion from RGB to Greyscale

Converting the image from RGB to Greyscale is the first step in pre-processing. It can be obtained by multiplying the RGB image using the formula below.

2989*R+0.5870*G+0.1140*B

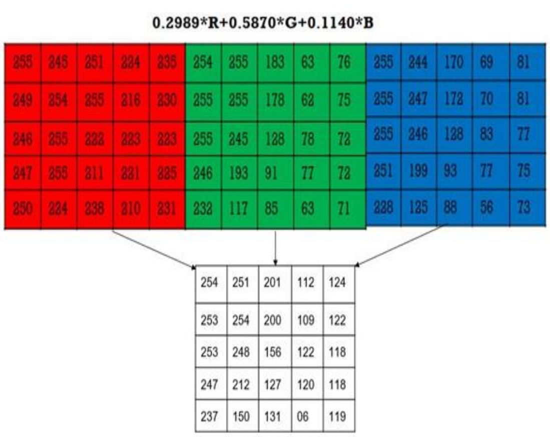

Figure:2 RGB Format

2) Noise Removal

The technique of removing or reducing noise from an image is known as a noise removal algorithm. By smoothing the entire image and leaving sections near contrast boundaries, noise reduction algorithms diminish or eliminate the visibility of noise. The second phase in image pre-processing is noise removal. The grayscale image obtained in the previous phase is used as the input here. We're using the Median Filter, which is a Noise Removal Technique, in this case.

3) Median Filtering

The median filter is a non-linear digital filtering technique for removing noise from images and signals. The matrix, which is the representation of the grey scale image, is appended with 0s at the edges and corners. Then, for each 3*3 matrix, arrange the elements in ascending order, locate the median/middle element of those 9 elements, and assign that value to that pixel spot. Noise filtering with the Median Filter is shown in figure 3.

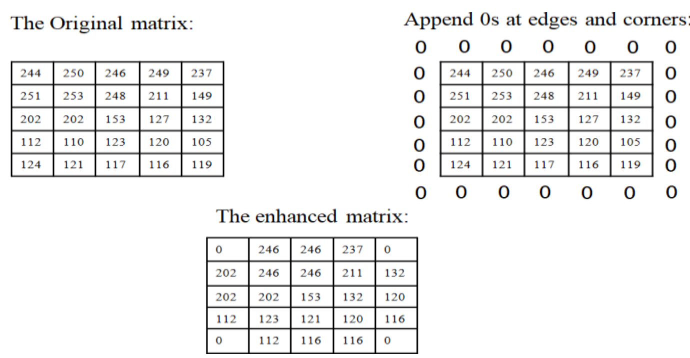

Figure 3: Median filteration

4) Basic Global Thresholding

Image thresholding is a sort of picture segmentation in which the pixels of an image are changed to make the image easier to analyse. Keep A(i,j) if it is greater than or equal to the threshold T. Otherwise, substitute 0 for the value.In this case, the value of T can be changed in the frontend to suit the needs of various pictures. We'll utilise the trial-and-error method to find a threshold value that's right for us. Figure 4 shows thresholding using basic global thresholding.

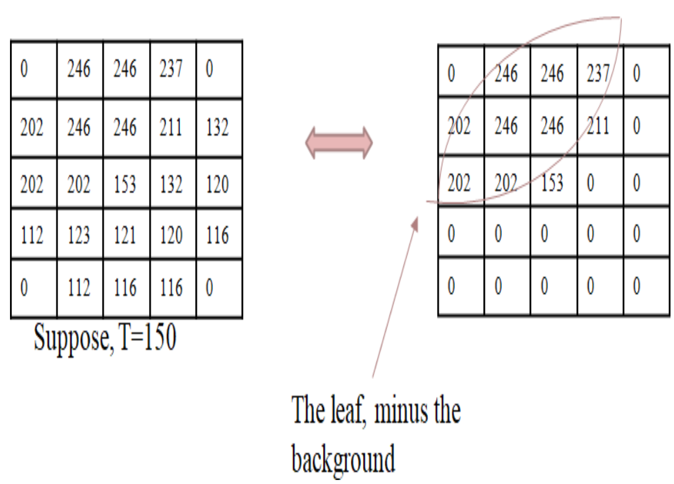

Figure 4: Basic Global Thresholding

3) Image Sharpening

Image sharpening refers to any enhancement technique that highlights edges and fine details in an image, Increasing yields a more sharpened image.

4) High Pass Filtering

To make an image appear sharper, a high-pass filter might be utilized. Fine features in the image are highlighted by these filters. The thresholding output is used as input in this case. We're using a filter here, and we're appending the closest values to pixels near the boundary pixels first.

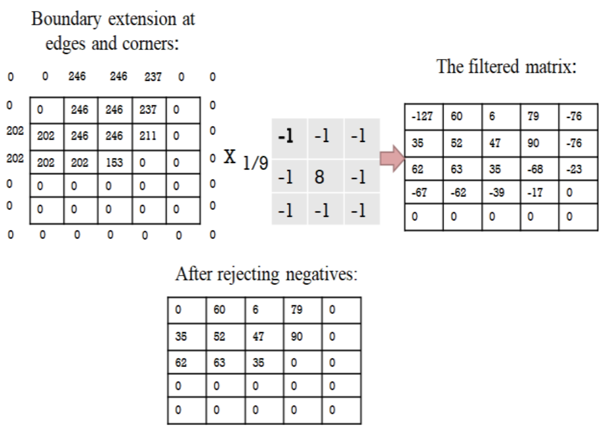

Figure 5: High Pass Filtering

C. Image classification:

As CNN is a classifier, we use the output of the high-pass filter as input and omit feature extraction. It uses convolution, correction, and bundling as three jobs in the iteration submodule to output the final comparison matrix, which is then classified by a classification algorithm such as Softmax.

Based on its shared weight architecture and the translational invariance of its human brain, convolutional neural network (CNN or ConvNet) is a class of deep neural networks most commonly used to analyse visual images, also known as displacement-invariant or space-invariant artificial neural network - SIANN. Each set of neurons in a CNN is split into 3D structures and examines a tiny region or feature of the picture. To put it another way, each group of neurons is trained to recognise a certain element of the image. The final output of a CNN is a vector of probability values representing the probability that a given feature belongs to a given class. CNNs use the predictions from each layer to produce the final output, which is a vector of probability values representing the probability that a given feature belongs to a given class.

Layers of CNN:

1) Convolutional layer:

We use the convolutional layer to extract a tiny portion of the image. Features or filters are the names given to these pictures or patches. In both photos, these basic feature matches are transmitted at nearly the same place. Convolutional layers are more effective at detecting similarities than complete picture matching situations. It uses a filter to scan the whole image, a few pixels at a time, to produce a feature map that predicts the class likelihood for each feature.

1) Pooling layer (down sampling) or Max-pooling Layer:

After that, in the convolutional layer, Reduce the quantity of data you have. For each feature, a convolutional layer is created that holds the most significant information (the process of convolutional and pooling layers is usually repeated multiple times). The feature with the highest weight is extracted in the max-pooling layer, which is accomplished by transforming the 3x3 matrix above into a more compressed matrix. The above 3x3 matrix is reduced to a 2x2 matrix with just the highest weights. A 3x3 matrix contains features.

2) Fully connected layer:

The preceding layer's outputs are smoothed, resulting in a single vector that may be used as the input to the following layer. To anticipate proper labels, apply weights to the data provided by feature analysis.

3) Output layer:

The output layer calculates final probabilities in order to identify the image's class. A softmax layer or sigmoid neurons, depending on the solution goal - binary or multi-class classification - is the last layer that generates network output. In the entire classification process, we apply ReLU and Softmax, both of which have activation functions.

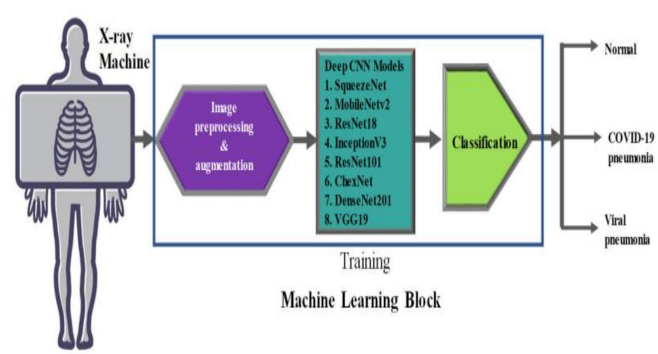

Figure 5: Architecture

IV. IMPLEMENTATION DETAILS

A. Technologies used:

Python IDE: Python is a general-purpose interpreted programming language with a high level of abstraction. Guido van Rossum created Python, which was initially released in 1991. Python's design philosophy prioritises code readability, particularly through the usage of large amounts of whitespace. On both small and big sizes, it provides frameworks that allow for straightforward programming. After 30 years as a leader in the language community, Van Rosen stepped down in July 2018.

1) OpenCV-Python:

OpenCV is a real-time image processing function library for programmers. It's modular, which means it may contain numerous shared or static libraries in a single package. Linear and nonlinear image filtering, geometric image transformations, colour space transformations, histograms, and other image processing modules are among the modules we utilise. HOG is one of the libraries included in the system.

2) Keras:

Keras is a Python-based high-level neural network API that operates on TensorFlow, CNTK, or Theano. It was created with the goal of allowing for quick experimentation.

3) Flask Library:

Flask is a lightweight Python web framework. Because it does not require any extra tools or libraries, it is characterised as a microframework. It doesn't have a database abstraction layer, form validation, or any other third-party library components that offer common functionality. Extensions, on the other hand, may be used to add functionality to your application as if they were written in Flask. Extensions are available for object-relational mappers, form validation, upload handling, several open authentication protocols, and a number of popular framework-related utilities. The core Flask software is updated less frequently than extensions. Flask is frequently used with MongoDB to offer the database and history greater control.

4) HTML, CSS:

The Hypertext Markup Language (HTML) is a standard markup language for creating web pages and online applications, and it is one of the two cornerstone technologies of the World Wide Web, together with Cascading Style Sheets (CSS).

B. Results:

Here, we have created a webpage in which the user can sign-up to login in future, and can upload the patient's chest X-Ray image.

Login:

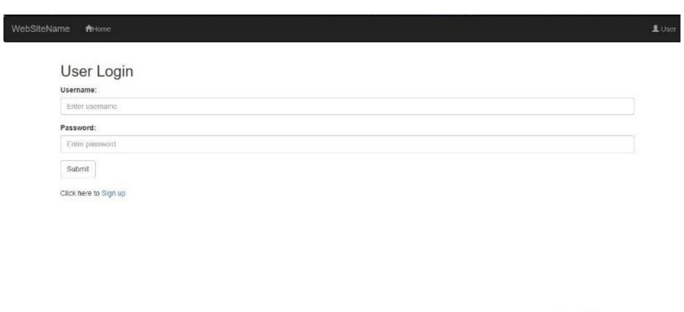

Figure 6: Login

Figure 6 depicts the page where the user can login with the required credentials such as email-id and password that they had used during the sign-up.

Once the user can successfully login, the user can upload the patient's chest X-Ray image to predict if the patient has i) Covid-19, ii) Viral pneumonia or is iii) Normal

Dashboard:

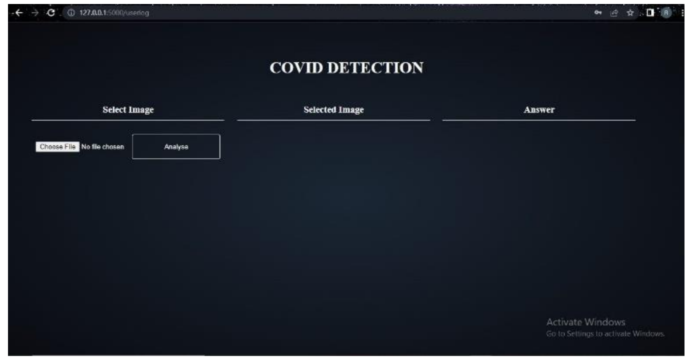

Figure 7: Dashboard

Figure 7 depicts the page where user can upload the chest X-Ray image and when analyze button is clicked, the system displays the result.

After uploading the patient's chest X-Ray image, when the user clicks the analyse button, the status is displayed as either Covid-19, Normal pneumonia or Normal.

Prediction:

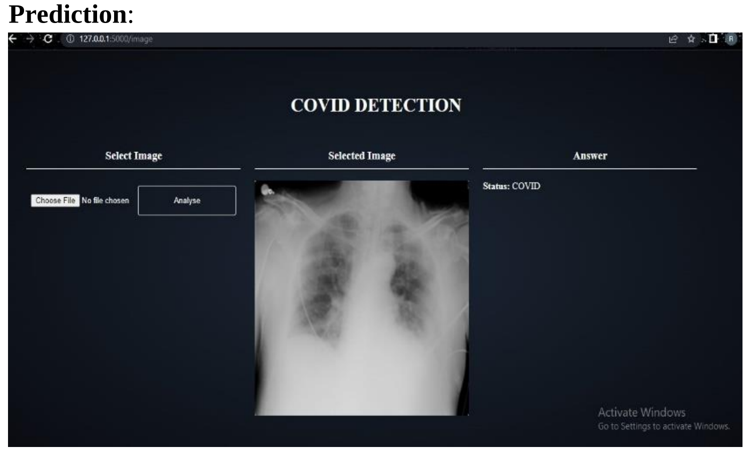

Figure 8: Convolution Neural Network predicting result

Figure 8 depicts the result, it displays the image uploaded by the user and to the right of the image, it displays the disease name and the stage of disease. The result also suggests the remedies to be followed by the patient.

V. CONCLUSION

In this study, we have proposed a deep learning based model to detect and classify COVID-19/pneumonia cases from X-ray images. The proposed model is based on the Convolution Neural Network strategy. The main advantages of the model are: the chest X-ray images are classified using a feature extraction technique, it is an effective approach that can assist experts for diagnosis, the model are evaluated by an expert radiologist. The performance of the developed model is assessed by expert radiologists and is ready to be tested with a larger database. This system can be used to overcome a shortage of radiologists in remote places in countries affected by COVID-19. Also, such models can be used to diagnose other chest-related diseases. A limitation of the study is the use of a limited number of COVID-19 X-Ray images. Our system can further be improved by making our model more robust and accurate by using more such images from various local health-care centers.

VI. REFERENCE

[1] "A Lightweight Deep Learning Model for COVID-19 Detection" by Siti Raihanah Abdani, Mohd Asyraf Zulkifley and Nuraisyah Hani Zulkifley.

[2] DEBANJAN KONAR , BIJAYA K. PANIGRAHI, SIDDHARTHA BHATTACHARYYA, NILANJAN DEY, AND RICHARD JIANG proposed " Auto-Diagnosis of COVID-19 Using Lung CT Images With Semi-Supervised Shallow Learning Network".

[3] "COVID-19 Control by Computer Vision Approaches: A Survey" by ANWAAR ULHAQ, JANNIS BORN, ASIM ,DOUGLAS PINTO SAMPAIO GOMES, SUBRATA CHAKRABORTY , AND MANORANJAN PAUL .

[4] "Automatic Detection of COVID-19 Infection Using Chest X-Ray Images Through Transfer Learning" by Elene Firmeza Ohata, Gabriel Maia Bezerra, João Victor Souza das Chagas, Aloísio Vieira Lira Neto, Adriano Bessa Albuquerque, Victor Hugo C. de Albuquerque, Senior Member, IEEE, and Pedro Pedrosa Rebouças Filho, Member, IEEE.

[5] "Deep Learning-Based COVID-19 Detection Using CT and X-Ray Images: Current Analytics and Comparisons" by Amjad Rehman,Tanzila Saba,Usman Tariq,Noor Ayesha.

[6] "Reliable Covid-19 Detection using Chest X-Ray Images" proposed by Aysen Degerli; Mete Ahishali; Serkan Kiranyaz; Muhammad E. H. Chowdhury; Moncef Gabbouj;

[7] "COVID-19 Chest CT Image Segmentation Network by Multi-Scale Fusion and Enhancement Operations",Qingsen Yan , Bo Wang, Dong Gong , Chuan Luo, Wei Zhao, Jianhu Shen, Jingyang Ai, Qinfeng Shi, Yanning Zhang , Shuo Jin, Liang Zhang, and Zheng You.

[8] "Severity and Consolidation Quantification of COVID-19 From CT Images Using Deep Learning Based on Hybrid Weak Labels",Dufan Wu; Kuang Gong; Chiara Daniela Arru; Fatemeh Homayounieh; Bernardo Bizzo Varun ;Buch Hui Ren ;Kyungsang Kim Nir Neumark; Pengcheng Xu; Zhiyuan Liu; Wei Fang; Nuobei Xie; Won Young Tak; Soo Young Park; Yu Rim Lee; Min Kyu Kang; Jung Gil Park; Alessandro Carriero; Luca Saba; Mahsa Masjedi; Hamidreza Talari; Rosa Babaei; Hadi Karimi Mobin; Shadi Ebrahimian; Ittai Dayan; Mannudeep K. Kalra; Quanzheng Li.

[9] "Can AI Help in Screening Viral and COVID-19 Pneumonia?" by Muhammad E. H. Chowdhury; Tawsifur Rahman; Amith Khandakar; Rashid Mazhar; Muhammad Salman Khan ;;Atif Iqbal Nasser Al Emadi ;Mamun Bin Ibne Reaz; Mohammad Tariqul Islam.

[10] "Deep Learning for The Detection of COVID-19 Using Transfer Learning and Model Integration" ,Ningwei Wang; Hongzhe Liu; Cheng Xu.

[11] "Pneumonia and COVID-19 Detection using Convolutional Neural Networks",Sammy V. Militante; Nanette V. Dionisio; Brandon G. Sibbaluca.

[12] "Automatic diagnosis of COVID-19 and pneumonia using FBD method", by Pradeep Kumar Chaudhary; Ram Bilas Pachori.

Healthcare Chatbot

Koushik V Uppuluri
Dept. of Computer Science and Engineering
Sapthagiri College of Engineering
bangalore, India
koushikuppuluri1998@gmail.com

Likith S
Dept. of Computer Science and Engineering
Sapthagiri College of Engineering
bangalore, India
srinathlikith@gmail.com

M Lakshmi Naveen Reddy
Dept. of Computer Science and Engineering
Sapthagiri College of Engineering
bangalore, India
lakshminaveen721@gmail.com

Manu K N
Dept. of Computer Science and Engineering
Sapthagiri College of Engineering
bangalore, India
manukn1316@gmail.com

Prof. Chaithra
Associate professor
Dept. of Computer Science and Engineering
Sapthagiri College of Engineering
bangalore, India
chaithra@sapthagiri.edu.in

***Abstract*— it is critical to have good health in order to live a happy life. However, obtaining a doctor's consultation for any health issue is quite difficult. The concept is to use Artificial Intelligence to construct a medical chatbot that can detect diseases and provide basic information about them before contacting a doctor. Through the use of a medical chatbot, this will help to reduce healthcare expenses and enhance access to medical knowledge. A healthcare chatbot is offered as a solution that can identify diseases based on user symptoms. Natural Language Processing ideas are used by the chatbot application to converse with the user. The use of machine learning algorithms to predict disease has been evaluated. To give better response to user, deep neural network model is used.**

Keywords: - Artificial Intelligence (AI), NLP, Healthcare, Machine Learning (ML), Chatbot, DNN.

I. INTRODUCTION

Health care is become an absolute necessity in our lives. People nowadays are preoccupied with their jobs, office work, and are also glued to the internet. They are careless about their health. As a result, they avoid visiting hospitals for minor issues. It has the potential to become a big disadvantage. Early disease detection and treatment are critical in this aspect.

So, one idea is to create an AI-powered health care chatbot system that can identify illnesses and provide basic information about them before contacting a doctor. This helps individuals understand more about their ailment and improves their health. All reasonable illness information can be accessed by the user. To respond to user enquiries, the system application employs a question and response protocol in the style of a chatbot.

The user's inquiry was supported by the response to the question. It's unrealistic to expect a chatbot to provide a professional diagnosis. However, if the symptoms are provided, it has the potential to provide important information. A prognosis can be made by the chatbot. Doctors and patients may both utilise healthcare chatbots as healthcare assistants. By utilising this application system, they may be able to reduce their health concerns. The method was created to reduce the users' caring costs and time because they are unable to visit doctors or consultants as often as they are required in real time.

II. RELATED WORK

The research is based on an AI-powered chatbot healthcare system. This article assists user in resolving small/minor health-related difficulties. The suggested system's user interface and architecture are both relatively short and easy. Users were given access to a signup page. If the chatbot is unable to provide an answer, the database expert system is used to provide answers to the query. Users must ask a question in the suggested system, and then a chatbot will respond. The suitable techniques like Stemming, TF-IDF, cosine similarity and N-gram are applied. [2]

In this work, they built a chatbot system out of hardware and software. This chatbot uses Bluetooth and can also roam around. They used voice commands to communicate with chatbots. The user's query will be looked up in a database that kept on the Raspberry Pi. Only certain diseases, such as the common cold, typhoid, and malaria, are addressed by this chatbot. [5]

They designed a chatbot in this paper to answer user questions and deliver basic disease information. Tokenization and stop-word removal are used to pre-process user input. Keyword extraction is done using N-gram and TF-IDF algorithms. A Cosine Similarity algorithm is used to weight the keywords, and the chatbot's knowledge database returns the most relevant response. [3]

The suggested solution is a healthcare chatbot that can diagnose diseases depending on the symptoms of the user. It also replies to the user inquiries by determining phrase similarity using Cosine Similarity and TF-IDF algorithms and selecting the best response from its knowledge database. The

English, Hindi, and Gujarati languages are presently supported by the chatbot application. The chatbot system converses with user through Natural Language Processing methods, as well as text to speech and speech to text conversion, allowing user to speak via voice. For the purpose of disease prediction, five different Machine Learning algorithms were examined. [4]

III. PROPOSED SYSTEM

A user-friendly chat interface is included in the proposed system, allowing users to engage with it. The user has the option of entering symptoms he is experiencing. The chatbot would anticipate disease or give related information regarding the user's queries based on the user's input.

The system has pre-processed the disease dataset, converting categorical values into a structured numerical dataset suitable for training Machine Learning models. The paper's primary goal is to assist users with health-related information. When a user initially visits the website, they must first register before asking their questions to the bot.

The NLP module receives the input and processes it. The system will do disease diagnosis if the keywords are the user symptoms. This is done with the help of a well-trained Machine Learning model. Deep neural network is employed to get a response from the chatbot to the user.

IV. SYSTEM ARCHITECTURE

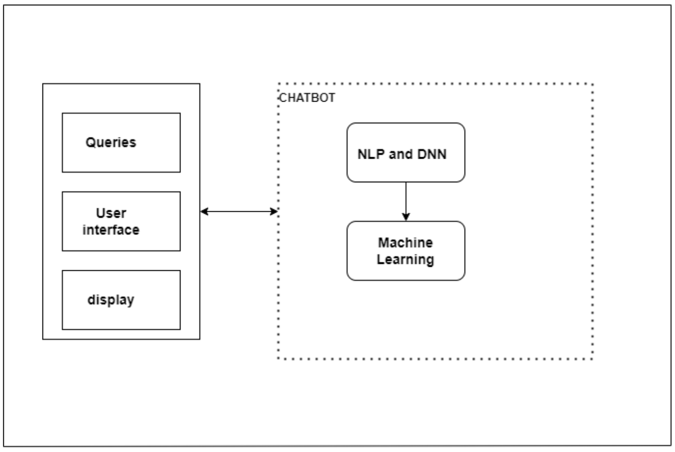

Fig-1: System architecture

The user can begin their conversation with the chatbot in a user-friendly manner, it will also be preserved in a database for future use. The chatbot will ask some questions to clarify the user's symptoms, and the symptom conformation will be completed. Whether it's a serious or little disease, the chatbot will respond. If it's a serious case, the user will be provided with the doctor's contact information, as well as analgesics. The chatbot's user interface is designed to be as user-friendly as possible. Avoid going to the hospital for minor issues by using a chatbot.

The user's input will be taken by the chatbot, which will then be processed using algorithms. The bot will apply the algorithms to anything the user provides as input. Using algorithms and a database of symptoms, it will comprehend the input. If the symptoms aren't found from the user's input, the bot instructs the user to re-enter the information until the symptoms are detected.

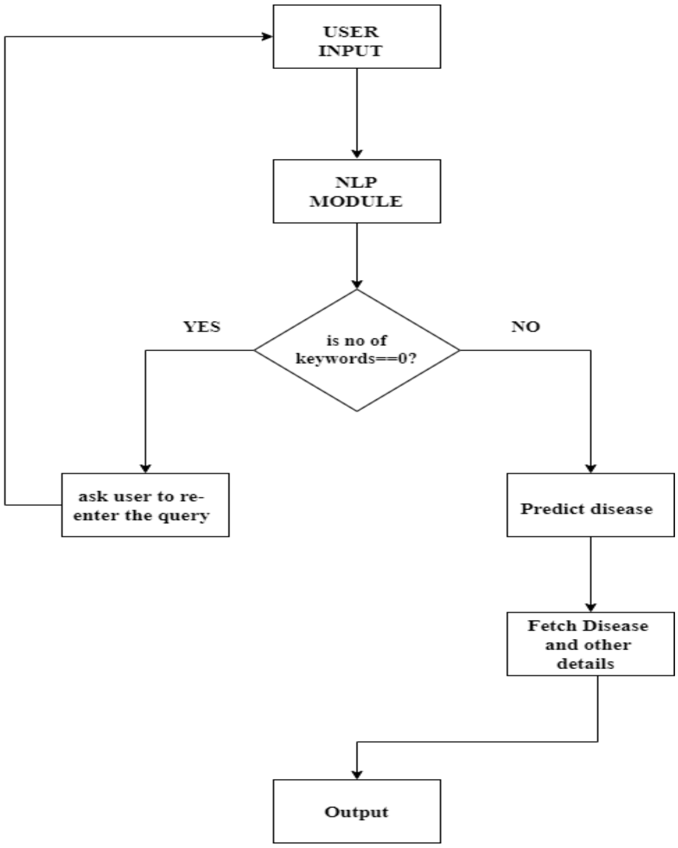

Fig-2: Flow chart of the proposed system

Using machine learning algorithm, disease is predicted based on the symptoms.

The Kaggle dataset which is processed into training and testing dataset consisted of data with 4920 records and 41 distinct diseases, as well as disease mapping with matching symptoms. A description of each disease and the warnings that go with it were also included in the data collection. The count vectorizer approach was used to turn unstructured data into structured data after dataset was verified for discrepancies. Each column represents distinct symptom, and each row represents the disease in the final collection. If a symptom is associated with an illness, the corresponding cell is set to 1, otherwise it is set to 0. Therefore, for each disease symptom pair, a value as 1 indicates the presence of a specific symptom of the disease and a value as 0 indicates no corresponding symptom of the disease. The dataset is processed to be fit into machine learning model for prediction of disease and its analgesics. The different machine learning algorithms are used.

Models were trained in supervised learning. The training set in this example is made up of attributes that have been mapped to target or labels values. An algorithm learns from the training data by correlating the inputs and outputs.

The Naïve Bayes classifier theorem is based on the assumption that each attribute is independent of others. This assumption is used to classify the given sample.

A tree-shaped classification technique is known as a Decision Tree. The training data is split on a regular basis based on the attributes.

An ensemble of Decision Trees makes up the Random Forest Classifier. It is said that forest with more trees is more vigorous. Similarly, the random forest employs numerous decision trees. It uses subsamples of the original training set to train the Decision trees. This increases the Random Forest Classifier's accuracy.

After predicting the disease, it will fetch diagnosis to that disease to user and Bot response to user query by using deep neural network, where it matches the user input and give responses related to it. NLP is used to tokenize the input for further input processing.

V. RESULTS

Web Application is employed as the system. The tests for the ML model are performed using Python as the primary language with the scikitlearn ML library. The proposed methodology uses many algorithms to obtain the results of disease classification algorithms. The training and testing separation was performed on dataset. A training data is 80% of the dataset, while the test data is of 20%. [7]

TABLE 1. EVALUATION OF ALGORITHMS

Classification algorithm	**Accuracy**
Random forest	95.130
Decision tree	95.135
Naïve bayes	95.126

This clearly reveals that all decision tree algorithm have higher accuracy and system performance. Experimental scores show that the accuracy of algorithm is 95.135%. NLP and DNN will give response to user about user's query.

When a user enters his symptoms into a chatbot, the chatbot predicts the disease and offers a diagnosis.

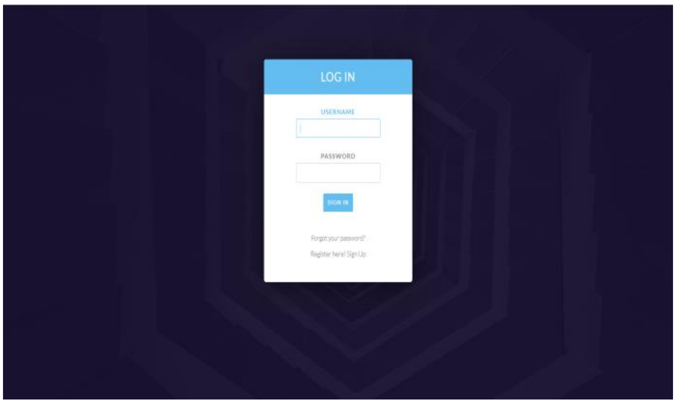

Fig-3: Login page

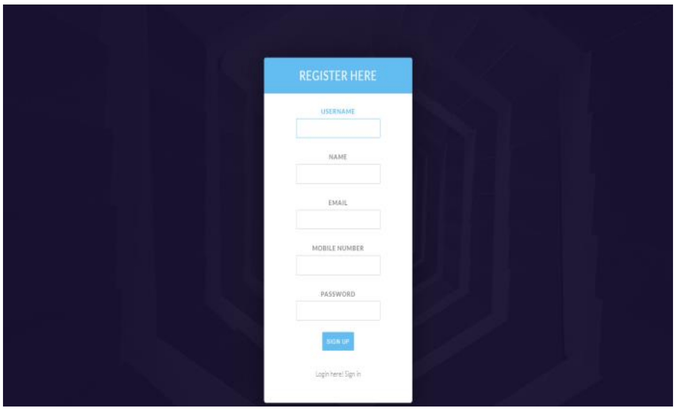

Fig-5: Registration page

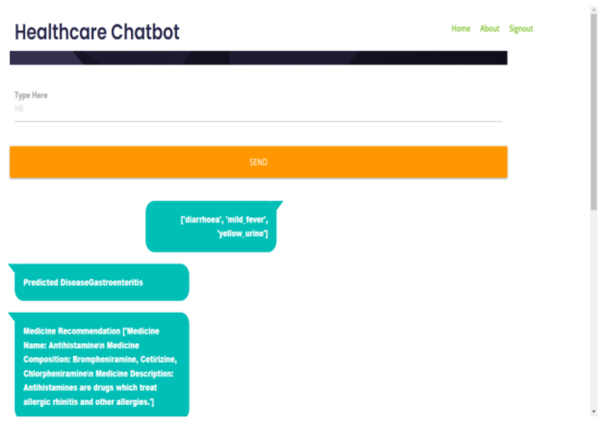

Fig-4: Chatbot interface

VI. CONCLUSION

The system was created in order to get a quick response from the bot, which means it gives the user the correct answer right away. It was concluded that using a chatbot is simple and that everyone who knows how to sort in their own language may use it. The implementation of a healthcare chatbot system is demonstrated in this article. Aside from that, primary goal of disease detection based on user symptoms. Along with the disease diagnosis, the system also presents user with a Precautions and a description of the disease

This paper presents a comparison of Machine Learning Classification methods, with the decision tree Classifier, random forest classifier and Naïve bayes, where decision tree classifier achieving the accuracy of 95.135 percent. To select the best appropriate response to the user inquiry, the system uses deep neural network.

A data insufficiency is one of this chatbot system's flaws. To get better results, larger and more comprehensive dataset might be used to train the algorithm.

Future development could include expanding the system to include more languages. The accuracy and quality of disease categorization can be improved using deep learning algorithm. Natural Language Generation can be used to improve chatbot responses by training the model on diverse datasets based on conversations.

REFERENCES

[1] G. Spina , X. Ren, A. Bijkerk, S. De Vries, B. Faber and A. Geraedts, "Understanding Physician's Experience With Conversational Interfaces During Occupational Health Consultation," in IEEE Access, vol. 8, pp. 119158-119169, 2020.

[2] N. V. Shinde, A. Akhade, P. Bagad, H. Bhavsar, S. K. Wagh and A. Kamble, "Healthcare Chatbot System using Artificial Intelligence," 2021 5th International Conference on Trends in Electronics and Informatics (ICOEI), 2021, pp. 1-8.

[3] V. K. Shukla, L. Athota, A. Rana and N. Pandey, "Chatbot for Healthcare System Using Artificial Intelligence," 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), 2020, pp. 619-622.

[4] S. Badlani, M. Dave, T. Aditya, and S. Chaudhari, "Multilingual Healthcare Chatbot Using Machine Learning," 2021 2nd International Conference for Emerging Technology (INCET), 2021, pp. 1-6.

[5] Ankita Ravekar , Ashwini Shangrapawar, Sakshi Kale, Aman Shende, Nidhi Kumari and PankajTaklikar, "Artificial Intelligence based Healthcare Chatbot System" International Research Journal of Engineering and Technology, e-ISSN: 2395-0056, p-ISSN: 2395-0072, Volume: 07 Issue: 02/Feb 2020

[6] E. Meshram, D. Dahiwade and G. Patle "Designing Disease Prediction Model Using Machine Learning Approach," 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC), 2019, pp. 1211-1215.

[7] C. Sagarnal and S. Grampurohit and, "Disease Prediction using Machine Learning Algorithms," 2020 International Conference for Emerging Technology (INCET), 2020, pp. 1-7, doi: 10.1109/INCET49848.2020.9154130.

EARLY PREDICTION OF DIABETES USING AI AND ML ALGORITHMS

(USING FOOD HABITS)

APARNA SINGH[1], HARSHITHA S[2], JYOTHAPPAGARI VYSHNAVI[3], MADHURI M K[4], Professor. LATHA A

Department of Computer Science and Engineering,

Sapthagiri College of Engineering,#14/5 Chikkasandra, Hesaraghatta main road, Bangalore-57 India

[1]aparnavatssingh@gmail.com

[2]ammuharshitha36@gmail.com

[3]vyshuroyal3366@gmail.com

[4]madhuri.kadubi@gmail.com

[5]alatha@sapthagiri.edu.in

***Abstract* - We are currently coping with a chronic disease known as Diabetes in the modern world. Diabetes is a disease that has the ability to devastate the global health-care system. Worldwide, it has been seen that 382 million people suffer with diabetes, according to the International Diabetes Federation. Diabetes is caused by a rise in blood glucose levels. This happens when the typical human body is unable to create enough insulin to regulate the amount of sugar in the body. Other problems such as nerve damage, heart disease, blindness, renal disease, and blood vessel damage may be a result of this incorrect sugar management. As a result, detection of this condition becomes a critical concern. We hope to survey all of them in this study. The goal of this research is to analyze all of the known diabetes prediction tools. Multiple factors, such as glucose levels, blood pressure, and eating habits, are found to influence the prediction. The paper aims to survey diabetes prediction models and distinguish between different approaches and determine which has the greatest outcome, or which combination of research yields the best results.**

I. INTRODUCTION

Diabetes is a condition caused by an excess of blood sugar in the body. Our bodies require energy, and glucose is one of the most fundamental sources of energy for the development of muscles and tissues. The major causes of type 2 diabetes in humans include a lack of exercise and an unhealthy lifestyle. Diabetes is caused by a significant amount of sugar in the blood. When the pancreas is unable to metabolize food into insulin, sugar is left unabsorbed, resulting in diabetes. One of the most basic needs is food. Dietary choices that are healthy in general can help you live longer. However, each person's dietary requirements vary depending on a multitude of characteristics such as age, health state, gender and physical variations. In addition, each people usually differ in terms of preference of their food. Thus, a diet selection that balances between the individual need and preference is often challenging [2]. Diabetes can have adverse affects on organs like eyes, nervous system, kidney, blood vessels, etc. It also has a large number of harmful side effects like cardiovascular, cerebrovascular and peripheral vascular diseases, which include circulation problems, varicose veins and more serious and immediate health complications such as heart attacks and strokes. Among type 2 diabetes patients, enhanced control of one's glycaemic index is vital in preventing micro- and macrovascular complications [1]. According to data, diabetes is increasing its prevalence from 285 million in 2010 (6.4%) , in adults aged 20 to 79, to upwards of 439 million in 2030 in different countries [3]. So, prediction of diabetes becomes an important problem. Therefore, many methods have been suggested in the past years, but not all prove to be efficient. Some are found to have lower accuracy, while some provide higher accuracy, but are not efficient. Hence, this paper aims to survey such techniques, in order to gain an understanding of the methods in existence, which of them have shown the best results and what improvements can be made to the existing system, to make a system that is better than the ones already in use.

II. METHODOLOGY:

Predicting diabetes with high accuracy remains a complex task. There are numerous factors that play a part in the prediction of diabetes, but identifying and utilising these features to detect diabetes at an early stage is extremely difficult. This makes analysing the traits and attributes for the aim of prediction is a time-consuming task. For decades, researchers have been working on the problem, yet it remains unsolved. After reviewing the work of numerous contributors and academics, we've come to the conclusion that we can't foresee which dataset properties are crucial, and even the best feature selection can't ensure high accuracy.

Methods used for Diabetes Prediction:

1.Sagarika Ekanayake's Model:

This approach was used in a study of 559 randomly selected type 2 diabetes patients, ranging in age from 35 to 70 years old (males = 44; females = 56). Patients with type 2 diabetes were identified among those who visited the Family Practice Center clinic at the University of Sri Jayewardenepura, as well as University employees. Patients with major medical or surgical problems were not permitted to take part in the study. The following equation and data were used to calculate sample size:

$$\text{Sample size} = \frac{Z^2 \times p(1-p)}{d^2}.$$

It is 3.5 percent (recommended consumption of fruits and vegetables for the Sri Lankan population [6]), is absolute error/precision (0.05), and sample size is 1.962 0.035 (1-0.035)/(0.05)2 = 52.

1.1. Procedure:
The study was a interviewer-administered questionnaire survey. Information was collected on: (1) consuming of meals, main and otherwise, (2)being informed of one's obesity and weight, (3) sociodemographic characteristics, weight, and height, (4) duration and type of physical activity,
, (5) the amount of sugary foods consumed, (6) presence of complications related to diabetes, and (7) consumption of leafy greens.

1.2. Obtaining ethical approval:
University of Sri Jayewardenepura (Approval number 632/12) has an Ethics Review Committee, which has issued ethical approval. Each volunteer or participant was informed to provide their written consent before the initiation of the study.

1.3. Analysis of data:
For Windows SPSS version 18.0 software was used and Microsoft Excel (2007) were used to examine and survey the detailed statistics and the results were given in percentages.

2.K Latha's Model:

It provides more effective diabetes diet care service of the performance of Diet Recommendation via collaborative-based reasoning used to suggest the diet plan. Here, they have constructed food ontology [2](FO) from the input food database.FO algorithms include generating an ontology structure with K-Means clustering algorithms and Self Organizing Map (SOM).They passed the input data in to diet plan construction module .In that module,they had to extract the user information from the user profile accordingly recommend the nutrients fact that module derived from based on the two methods, that is, the approach based on content (CB) and the approach based on filtering collaboration (CF).[2] The first approach of recommendation has is dependent on revival of information and filtration of the obtained information. The second approach, i.e., the collaborative filtering approach is based on the rating of users on products, that the users have used and based on this rating, a determination of other products that the same user may utilize in the future is done. This kind of determination is done in steps, including the K-mean and the SOM methods respectively. The SOM needs to be trained initially and clusters are formed using the K-mean algorithm. Food ontology construction module can be composed ripple class naming and instance ranking, which is to classify each food item based on granular ranking method [2]. Finally, calculation of diet plan of the system is done, which could be more powerful and that describes the degree of user satisfaction level.

The features of the proposed system are:
1.User Satisfaction Degree is increased.
2.System trustworthiness.
3.Enhance the performance.
4.Process the complicated data.
5.Reflective of all the experts' opinions

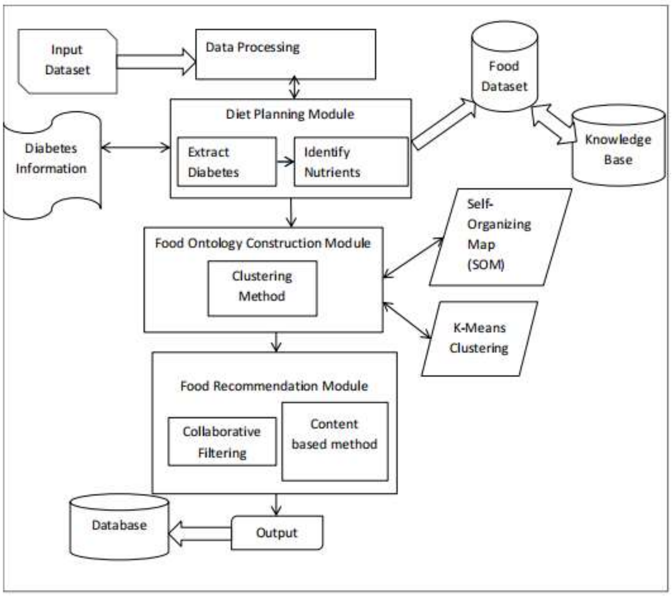

Figure: Block Diagram of the proposed Model[2]

3.Elias Dritas's Model:

Fazakis and Dritas put forth this model. A long-term risk prediction model for T2DM is implemented using machine learning techniques, and it takes a large number of risk factors into consideration, that are typically used by diagnostic tools in the healthcare profession, as well as some factors that have shown high correlation in the study with the ELSA dataset. They chose the [8] FINDRISC, Leicester [7]. Diabetes risk Scores to evaluate this model in tandem with the training and test datasets. Through supervised machine learning, this model aims to to attain high sensitivity and Area Under Curve, implying that the Diabetic class may be correctly predicted (Fazakis 2021) [4].

The attributes in relation to Greedy Stepwise with Backward Selection, Correlation and LASSO used with the three distinct classifiers are listed below:

LASSO:
cfoodi,fglu,workat,sys,drinkde,cfood1m,hbA1c,IdI,liv10,chol,dias,wstval,workl65,itot,(Fazakis 2021)

•*Correlation:*
jpress,weight,demene,parkine,Gender,arthre,chol,shlt,hlthlm,Age group,fifinea,iadlza,smoken,physActive,hips,psyche,hba1c,dias,lunge,rcntf,liv10,HBP,everHighGlu,cancer,fglu,grossa,adla,cesd,fcntf,stroke,work2,wstval,sys,Ibrfe, work,smokev,memrye,BMI,mobilb,drink,hchole,relhite,bmicat,hdl,jphysa,hearte,estwt,eatVegFru,mstat,asthma,trig,adlwa,cfoodo1m,hemda,reduce,Igmusa,catrctf,IdI,drinker,(Fazakis 2021)

• *Greedy Stepwise With Logistic Regression (GSW-LR):*
hba1c,cfoodi,AgeGroup,parkine,cesd,hipe,drinkde,chol,work,HBP,smoken,bmicat,trig,weight,fglu,physActive,itot,wstval,(Fazakis 2021).

• *Greedy Stepwise With Naïve Bayes (GSW-NB):*
fglu,Race,bmicat,smoken,chol,HBP,hba1c,bmicat,hemda,IdI,raeducl,AgeGroup,work,drinkde,mstat,physActive,jphysa,everHighGlu,wstval,trig,(Fazakis 2021)

• *Greedy Stepwise With Decision Trees (GSW-DT):*
cfoodi, adla, mstat, adlwa, fifinea, cesd, fcntf, HBP, hemda, cancre, dias, hearte, stroke, asthma, hchole, catrctf, , lunge, smoken, work2, bmi, physActive, drink, rcntf, drinkde, cfoodo1m, smokev, bmicat, lgmusa, work, jpress, workl65, estwt, wstval, ldl, hlthlm, sys, psyche, hdl, everHighGlu, fglu, hba1c, arthre. (Fazakis 2021).

The machine learning methods which were chosen, were all trained using the same features across all the models (i.e.,factors/attributes of risks involved) which were taken from GSW-NB feature selection method. The attributes like work and fcntf were deemed to be irrelevant and were hence not included. (Fazakis 2021).

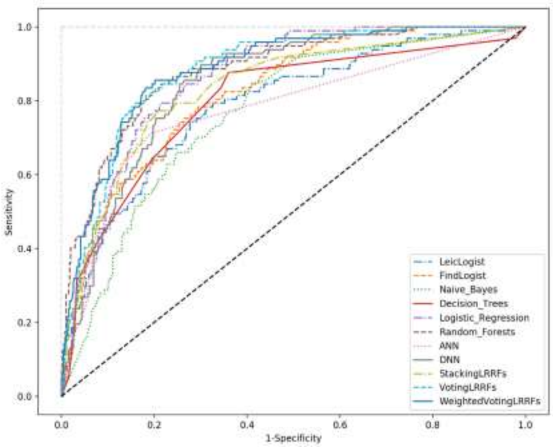

Fig Comparitive Study of the Proposed model[4]

4. The E. A. Pustozerov et al., **Model:**

In this study, they created and reported a data-driven blood glucose model based on a decision tree gradient boosting algorithm to predict diverse postprandial glycemic response features. Meal-related data from a mobile app diary (containing glycemic index information), dietary context (information on prior meals), patient characteristics, and patient behavioural questionnaires were incorporated in the model. A set of rules was devised and implemented to detect inaccurate meal recordings and filter faulty data, and analyses were performed on the overall food diary data, specifically the data on the current meal for which the postprandial blood glucose response was estimated. To select parameters, random search cross-validation was used to develop and test various gradient boosting models. The best models for have the following characteristics.
The best models for forecasting the blood glucose curve, two hours post food consumption, as calculated by the incremental area included the following characteristics: For the model without current blood glucose data, R = 0.704, R = 0.631, MAE = 0.373 mmol/Lh; R = 0.644, MAE = 0.371 mmol/Lh for the model with current blood glucose data; R = 0.704, MAE = 0.341 mmol/Lh for the model with continuous blood glucose trends before the meal; R = 0.644, MAE = 0.371 mmol/Lh for the model with The influence of characteristics was measured using Shapley values. The glycemic load of the meal, the carbohydrates in the meal, the kind of meal (e.g., lunch, dinner, etc.,), the amount of starch, and the amount of fat were the most critical factors in the models.
The three most widely used gradient boosting algorithms were xgboost [9], catboost [10], and lightgbm [11]. To evaluate precision, they used the same parameters to train and test three algorithms. The applicable R, MAE, MSE, and RMSE were employed as comparative measures. The precision of the models from different realisations did not change significantly (up to the second decimal value for the characteristics mentioned). The training times of the libraries employed varied substantially; for example, the lightgbm library required around 9 times and 39 times less time to train than the xgboost and catboost libraries, respectively, when utilising an 8-core CPU. Because the model will only be utilised in mobile apps for predictions after training, it was determined that training time was not as significant a component.
Due to the officially supported Java package XGBoost4J, which had already been used in a number of projects, the xgboost model was picked for further study because it had equal precision and was the easiest to use in Android apps. (Pustozerov and colleagues, 2020).

Parameter	Group 1 (N=57)	Group 2 (N=64)	Control (N=25)	P
Carbohydrates, grams/day	142.8*±40.9	134.8*±42.7	194.5±65.5	<.001
Proteins, grams/day	77.4±18,7	74.6±22.9	80.4±21.9	.484
Fats, grams/day	71.4±19.9	68.7*±22.8	85.7±29.1	.008
Calories, kcal/day	1561.6* ±349.8	1484.3* ±413.1	1901.5 ±532.8	<.001
Glycemic load, Units/day	77.5*±26.4	71.6*±24.6	110.0±43.7	<.001

Comparison of food Consumption between Groups

III. RESULTS & DISCUSSIONS

- This paper surveyed different methods for the prediction of Diabetes, using machine learning models.
- This survey paper determines that all the methods and algorithms listed have shown to be effective in the prediction of Diabetes. The Diet Food Recommendation System has shown to be excellent in terms of accuracy.
- Various factors have been considered for the prediction process, which are deemed to be the best features for accurate predictions.

IV. CONCLUSIONS

This paper is a comparative study of different algorithms that have been used by various methods for the effective prediction of Diabetes such as Machine learning algorithms and approaches i.e., FO algorithm, K Means,CB,Logistic regression,Naivebayes algorithm, Decisontree,xgboost,catboost,Lightbtm.The approaches and algorithms used are seen to be effective in the prediction of the presence of diabetes, and food habits are shown to be an imperative factor in this process.

V. ACKNOWLEDGMENT

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VI. REFERENCES

[1] Sagarika Ekanayake, and Chandanie Wanigatunge, “Dietary Habits of Type 2 Diabetes Patients: Variety and Frequency of Food Intake”, 2016

[2] B. Raj Kumar, Dr. K. Latha, “DFRS: Diet Food Recommendation System for Diabetic Patients based on Ontology”, 2015

[3] Sara Rahati ; Mansour Shahraki ; Golnaz Arjomand; Touran Shahraki, “Food Pattern, Lifestyle and Diabetes Mellitus”, 2014

[4] N Fazakis , O Kocsis , E Dristas, S Alexiou, Nikos Fakotakis, (Member, IEEE), and K Moustakas, “Machine Learning Tools for Long-Term Type 2 Diabetes Risk Prediction”,2021

[5] E. A. Pustozerov et al., "Machine Learning Approach for Postprandial Blood Glucose Prediction in Gestational Diabetes Mellitus," in IEEE Access, vol. 8, pp. 219308-219321, 2020, doi: 10.1109/ACCESS.2020.3042483.

[6] R. Jayawardena, N. M. Byrne, M. J. Soares, P. Katulanda, and A.P. Hills, “Food consumption of Sri Lankan adults: an appraisal of serving characteristics,” Public Health Nutrition, vol. 16, no.4, pp. 653–658, 2013.

[7] ‘‘The leicester risk assessment score for detecting undiagnosed type 2 diabetes and impaired glucose regulation for use in a multiethnic UK setting,’’ by N. A. Taub, K. Khunti, S. Hiles, E. Gardiner, L. J. Gray, D. R. Webb, B. T. Srinivasan, and M. J. Davies, Diabetic Med., vol. 27, no. 8, pp. 887–895, May 2010

[8] ‘‘Performance of the Finnish diabetes risk score and a simplified Finnish diabetes risk score in a community-based, cross-sectional programme for screening of undiagnosed type 2 diabetes mellitus and Dysglycaemia in Madrid, Spain: The SPREDIA-2 study,’’by M. A. Salinero-Fort, C. Burgos-Lunar, C. Lahoz, , J. C. Abánades-Herranz, J. M. Mostaza, E. Estirado-de Cabo, F. Laguna-Cuesta, F. García-Iglesias, T. González-Alegre, B. Fernández-Puntero, D. Vicent-López, V. Cornejo-del Río, L. Montesano-Sánchez, P. Gómez-Campelo, V. Sánchez-Arroyo, S. López-López, C. Sabín-Rodríguez, P. Patrón-Barandio, P. J. Fernández-García, and S.-2. Group, PLoS ONE, vol. 11, no. 7, Jul. 2016, Art. no. e0158489.

[9] T. Chen and C. Guestrin, ''XGBoost: A scalable tree boosting system,'' in Proc. 22nd ACM SIGKDD Int. Conf. Knowl. Discovery Data Mining, Aug. 2016, pp. 785–794, doi: 10.1145/2939672. 2939785.

[10] L. Prokhorenkova, G. Gusev, A. Vorobev, A. V. Dorogush, and A. Gulin, ''CatBoost: Unbiased boosting with categorical features,'' in Proc. 32nd Int. Conf. Neural Inf. Process. Syst., Montreal, QC, Canada, Dec. 2018 pp. 6639–6649.

[11] G. Ke, Q. Meng, T. Finley, T. Wang, W. Chen, W. Ma, Q. Ye, and T. Y. Liu, ''LightGBM: A highly effificient gradient boosting decision tree,'' in Proc. 31st Int. Conf. Neural Inf. Process. Syst., Long Beach, CA, USA, Dec. 2017, pp. 3149–3157.

LIVENESSNET AND FACE ANTISPOOFING SYSTEM

A Y GUNARACHANA[1], BINDU L[2], MONIKA A[3],
ANURADHA BADAGE[4]

Department of Computer Science and Engineering,

Sapthagiri College of Engineering, #14/5 Chikkasandra,

Hesaraghatta main road, Bangalore-57 India

[1]gunarachana28@gmail.com

[2]bindulakshman11@gmail.com

[3]monikaadinarayanagowda123@gmail.com

[4]anuradha@sapthagiri.edu.in

***Abstract* –** The **initial stage of facial liveness detection is the detection of the entire face.This is very important for system security by using face detection technology. Facial features are extracted using CNN. The time it takes to train the model is much shorter. To improve the effectiveness of the system, datasets are created by collecting images from camera captures and the Internet and comparing the accuracy of various systems with self-made datasets. The proposed model achieved the highest accuracy and positive results in real testing.**

Keywords – Face Liveness detection, CNN, Deep Learning

I. INTRODUCTION

Due to practical applications in banking, automatic attendance, forensic science. Face recognition has become the keen research areas in machine learning and computer vision. Through advancement in digital technology, the demand for access security is increasing control. For keeping all details secure it uses different methods of authentication. Advanced solution has incorporated biometrics which collects Human physical characteristics, namely the face and iris. Each have various characteristics that are differentiated in its own way.

Though different Face recognition algorithms that have been proposed in recent period because face recognition is too complex due to the high variability of poses, lighting, facial expression changes, image resolution, etc., and is still in the research area.

For more results, this product will describe a face recognition approach based on DNN Evaluate lively human face recognition. Face recognition is considered a special object class recognition. A class called the face is defined by the position and characteristics of all features, such as the nose, eyes, mouth, and the distance between them.

People are increasingly relying on technology to carry out their daily work. As the use of smart devices increases, we also need to protect them from malicious devices. Security is required to protect against unauthorized access. Protect personal data, sensitive corporate information, and high-risk information systems. Therefore, proper protection of these systems is essential. Face verification has become the most common method for this task. However, it is vulnerable tovarious spoofing attacks. Face lifespan detection, also known as face spoofing detection, is designed to protect against spoofing attacks. With the advent of deep learning, machine learning, and computer vision tools, facial vividness detection has become feasible and efficient for general purposes.

II. RELATED WORK

Liveliness detection is the most effective area of study than fingerprint or iris recognition. The difference in sign space distinguishes her from life and non-life. The production of a guaranteesystem is enhanced with the help of aliving concept. The attack method used in the face detector is divided into specific categories. The collection is built to separate the compatibility of the item provided by the user to the face masking system. Verification is a major topic, where the face recognition method of a large lamina is used.

A method based on analysis of texture and background frequency has been proposed by GA Hyun Kim [6]. This distinguishes the details and appearance of active and fake faces.
H. 2D image. The method proposed by the author was based on frequency analysis using both low frequency and high frequency data. The author used frequency information Different 3D face shapes; light components produced by all faces are different in the background of frequency that is low.

Facial details are unique, and fake faces often cause a uniqueness between the two. The anti- face fraud technique is also based on the microtexture approach proposed by Jukka [7], emphasizing the differences in subtle texture spaces. LBP was used by the author to describe spatial information and fine textures. The input to the SVMSupportVectorMachine is a feature vector. Determines whether the microtexture model recognizes real faces or fake faces. Soo Yeon [8] suggests using focus variables for liveness detection. The main method is to detect changes in the pixel values of an image at different focal points. Considering that there are no dramatic changes in movement, the author finds the difference between a fake face and a real face.For a real face, the rest of the depth information is blurry and the focus space is clear. In contrast, images with different focal points in printed facial photographs are not considered entities, so there is a difference. Anactivity detection method based on eye movement analysis was proposed by Hyung Keun Jee [9] for an embedded facial recognition system. Anactivity detection method based on eye movement analysis was proposed by Hyung Keun Jee [9] for an embedded facial recognition system. The authors have proposeda system that recognizes a series of input eyeballs, analyzes each change in the eyeball region, and predicts whether the input is a real face or a fake face. The analysis is based on theblinking of the human eye and the uncontrolledmovement of the pupil. The facial image uses the detected eyes, blurs the area of the face, extracts the area of the eyes as input, and is captured in the center of both eyes. The opticalflow method has been proposed by Bao [10]. The motion of the optical flow field of 4 types of motion, blinking action transformation, movement,oscillation and rotation. The system analyzes difference between the opticalproperties of the 2D plane and the 3D object.

III. PROPOSED SYSTEM

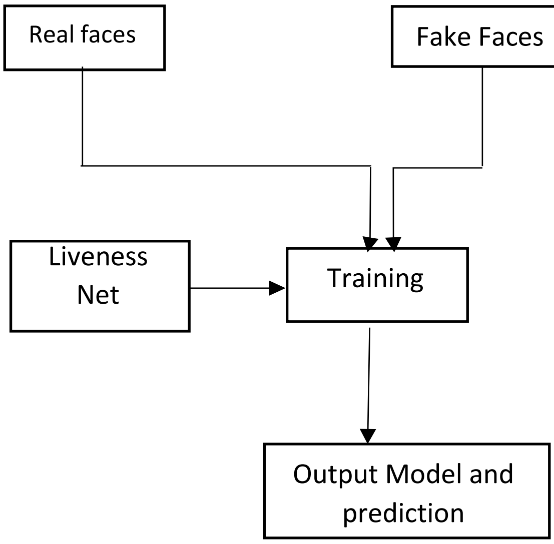
A. Problem Statement

The full-face recognition system includes face recognition processes, face recognition, and face preprocessing. Therefore, the face needs to be extracted from the face recognition process, separating the face from the background pattern and providing subsequent face extraction. The recent increase in faces is based on the depth of knowledge gained about recognition methods compared to traditional methods, which saves time and improves accuracy. The feature extraction process extracts facial features, performs contrast discrimination on the normalized facial image, and identifies the human face from the image.

Figure 1. Visualization of VGG

B. Framework overview

Block Diagram/ Proposed System



IV. LIVENESSNET NETWORK

The CNN automatically learns the filter value. In the context of image classification, CNNs learn the following:

• Detects edges from the raw pixel data of the first layer.
• Use these edges to see the shape of the second layer (that is, the “blob”).
• Use these shapes to demonstrate high- level functionality, such as: B. Detects face. Structures at the top of the network, auto parts, etc.High-level features use the last layer of the CNN to make predictions about the content of the image.From a deep learning perspective, a convolution is an element-by-element multiplication of two matrices followed by a sum.

1. Takes two matrices.
2. Multiply them element by element.
3. Sum the elements.

A. Face recognition algorithms have made great strides in the field of face recognition. As shown in Figure 1, open-source facial recognition algorithms such as SSD [12] have achieved better results.

Later, it's only important for liveness detection, so we'll complete it with an open-source facial recognition model.

A commonly used non- deep learning method for detecting facial vitality is based on the HAIR function. End- to-end networks are discovered using deep learning models such as SSD300 and MTCNN.Designing a Living Light Model, the mostcommon attack technique uses fake HD facial images. Still to identify the attack, the system performed an active assessment using the means of interacting with the user. These actions have been analyzed by the system as important features, but such procedures also reduce the comfort of the system. The end- to-end deep learning network model enables more convenient and faster face recognition.Combine different background data to create a network training set and add stack normalization to each layer of the network model. To speed up the iterative process, theproposed one-to-one training process for the new network structure has been reduced to less than 3 hours and deployment time has been reduced. Using Face AntiSpoofing with patch and depth-based CNN.

The light network structure of the VGG surface model is configured as follows:

1. The activation function used after each complexity layer is relu. In addition to this complex and pooled layer, a BN layer is also added. The BN operation is performed at the input layer stage, but traditional operations have not been able to recognize that the data can change slightly in the middle layer. Therefore, we introduced the BN layer to send data in each layer. Normalized processing allows each network layer to adapt to the data distribution of the previous layer. The results show that this new module in this project improves the accuracy of the algorithm and also accelerates the connection speed of the loss curve. Through repeated experiments, we discovered and established the benefits of adding a BN layer to each layer.

• Improves the slope of the entire network.
• Allows for higher learning rates and significantly improves training speed.
• You do not need to use the local normalization layer. The network structure designed for thistopic is relatively lightweight.

Filigree staging is placed in the inserted representation to set the characteristic diagram of 16. The kernel dimension of complexity is 3x3, 160 frameworks overall, and +1 means that the kernel is biased. The first level of complexity associated with the 3x3 pixels of the image in which each image element is inserted and one party. Therefore, there is a total of 1,413,760interrelationships.

However, you need to understand the 160 frameworks, which are the benefits of bulk release of complex features. A contiguous mixed layer is then sent to the BN layer for modification. Excessive tempo is used to modify the figure across the first element.

IV. METHODOLOGY

A. Gather the dataset

Dataset collection is the first step in building a deep learning network. You will need a photo and a label for each image.

These labels are from a limited number of categories. including: Fake photos, real photos, facial photos, and names of people. Also, the number of photos in each category should be constant. For example, 50 photos from a real dataset and 50 images from a fake dataset. In machine learning, classimbalances are a common problem that can be addressed using different methods.

B. Data Processing

The first and very important phase in building a machine learning model is Data preprocessing. It is a process of preparing raw data for use in machine learning model.

Clean-prepared data is not always used, so you need to clean up and format the data before performing any data-related activities. Therefore, use a datapreprocessing activity for this.

Real-world data contains noise and missingvalues, which are improperly formatted and cannot be used directly in machine learning models. Data preprocessing cleans up the data and makes it suitable for machine learning models, improving the accuracyand efficiency of the model.

C. Train the network

The network is trained with photos from thetraining set. The network needs to learn to recognize each category of tagged data. If the model makes a mistake, it then learns and improves.The learning process uses the steepest descent method.

D. Evaluation

Finally, a well-trained network needs to be evaluated. Each photo in the test set will be displayed on the network and you will be asked to rate the label on the image.Predictions are tabulated based on the model's evaluation of the images in the test set.

Image categories are represented by the Ground truth label. The number of correct predictions made by the classifier is analyzed and used to characterize the overall performance of the network.

V.CONCLUSION

The proposed person identification method can recognize faces very accurately and flexibly. It attributes a liveness detector that uses CNN-based "LivenessNet" to differentiate between fake and real faces. In the early stages of evolving the proposed Liveness Detector face recognitionmodel, hold your smartphone in front of the camera to collect data for training the LivenessNet model. The actual dataset derived from the footage captured directly from the camera. Data records are indistinguishable from actual data records for identification purposes. The activity of the first frame is detected after placing the dataset using the LivenessNet model. Deep learning models based on training datasets are used to recognize faces that are actually encountered.

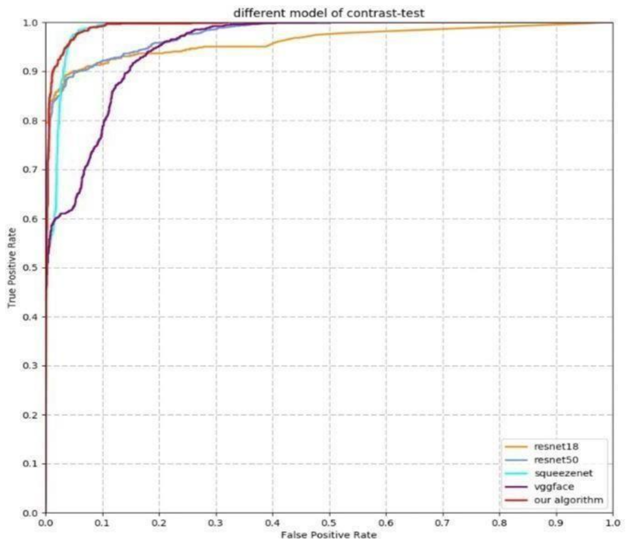


Fig. 2. ROC curves of different model

VI. REFERENCES

[1] Yinlong Zuo , Wenlong Gao , Jintao Wang "Face Liveness Detection Algorithm Based on LivenessLight Network" (2020).

[2] Huang, Chen, et al."Deep imbalanced learning for face recognition and attribute prediction."IEEE transactions on pattern analysis and machine intelligence (2019).

[3] Abudarham, Naphtali, Lior Shkiller, and Galit Yovel. "Critical features for face recognition." Cognition 182 (2019): 73-83

[4] Masi, Iacopo, et al."Face-specific data augmentation for unconstrained face recognition."InternationalJournal of Computer Vision 127.6-7 (2019): 642-667

[5] Deng, Jiankang, et al. "Lightweight face recognition challenge." Proceedings of the IEEE International Conference on Computer Vision Workshops. 2019.

[6] Krishnapriya, K. S., et al. "Characterizing the variability in face recognition accuracy relative to race."arXiv preprint arXiv:1904.07325 (2019).

[7] Singh, Yash, et al."Method for 3D modelling based on structure from motion processing of sparse 2D images." U.S. Patent No. 10,198,858. 5 Feb. 2019.

[8] Sawant, Manisha M., and Kishor M. Bhurchandi. "Age invariant face recognition: a survey on facial aging databases, techniques and effect of aging." Artificial Intelligence Review 52.2 (2019)

[9] Manik Sharma, J Anuradha, H KManne and G S Kashyap (2017). "Facial detectionusing deep learning", School of Computing Science and Engineering, VIT University, Vellore - 632014, India (DOI: 10.1088/1757-899X/263/4/042092) Livenessnet and Face antispoofing SystemDept of CSE, SCE 2021-22 Page 17

[10] Shoja Ghiass, R., Arandjelović, O., Bendada, A., & Maldague, X. (2014). Infrared face recognition: A comprehensive review of methodologies and databases. Pattern Recognition, 47(9), 2807–2824.

[11] S L Happy, A. Dasgupta, A. George and A. Routray, "A Video Database of Human Faces under Near Infra-Red Illumination for Human Computer Interaction Applications," in IEEE Proceedings of 4th International Conference on Intelligent HumanComputer Interaction, Kharagpur, India, 2012.

Identification and Classification of Brain Tumor

Deepthi Yadav G, Manisha L

Guide- Shwetha B N

Department of Computer Science and Engineering

Sapthagiri College of Engineering, #14/5 Chikkasandra,

Hesaraghatta main road, Bangalore-57 India

[1]deepthiyadav112@gmail.com

[2]manishalvaibhav76@gmail.com

[3]shwethabn@sapthagiri.edu.in

Abstract-- **Brain tumors are diseases caused by the growth of abnormal cells in the brain. There are two main classes of brain tumors. That is, benign (benign) brain tumors and malignant (cancerous) brain tumors. The survival rate of a tumor-prone patient is difficult to predict because the brain tumor is rare and varied. Treatment of brain tumors depends on a variety of factors such as: the type of tumor, how rare cells are and where they are in the brain etc.The Deep learning models are used to predict the brain tumor by taking the images of magnetic resonance imaging (MRI). This project detects whether the brain tumor is present or not from MRI scans. It uses the CNN classification method which is used to classify the type of brain tumor present. If the detected tumor is non-cancerous(benign), the further classification of the type of tumor is done. This project model uses Python and TensorFlow environment. Algorithms and methodologies have been implemented and the following results are predicted along with its pros and cons. The significant characteristics of the tumor, such as shape, nature and signal intensity is taken into consideration.**

Keywords- Brain tumor, Image pre-processing, Convolution neural network, Validation dataset, VGG, Testing.

I. Introduction

The brain contains billions of cells which performs convoluted operations every succeeding minute. When the brain is damaged, there will be many things affected. Uncommon growth of the tissue in the human brain that impairs the possible working of the brain is called as brain tumor. The cost of two dimensional MRI readings is beyond reality. Hence the prediction of the tumor helps in providing an answer for the problem of cost-efficient diagnosis.

Researchers describe the tumor's highlights with traditional techniques using certain skeletal highlights. This project has been developed to improve the accuracy in the prediction of tumors.[7] Manual segmentation is a time-consuming task and varies from person-to-person. Hence Programmed segmentation is in demand.

[5] Programmed segmentation provides the data about the surrounding tissues surrounding the tumor. This is due to the intensity dissimilarities among the same group. Surgical methods are used to to provide treatment .This provides the novel method to anticipate the processing of brain tumor classification. This method depends on CNN algorithm and determine the insights that are unique to detection and segmentation.

II. Methodology

In this project, we performed additional data (MRI images of the brain), performed some pre-data processing measures to convert raw data, and investigated two in-depth study models namely CNN and VGG-16 and presented comparative analysis.

The main steps involved in this project are Data Collection, Pre-processing, Feature extraction, prediction model and evaluation.

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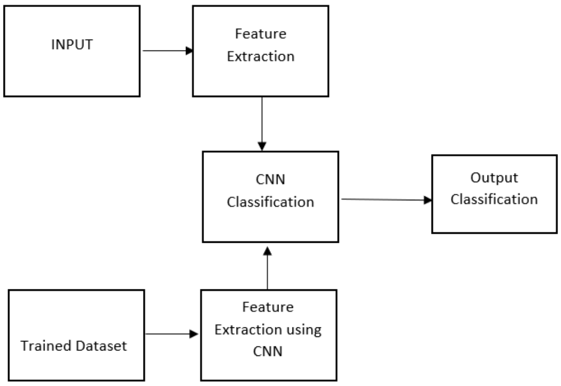
A. Block Diagram



B. Gather the Dataset

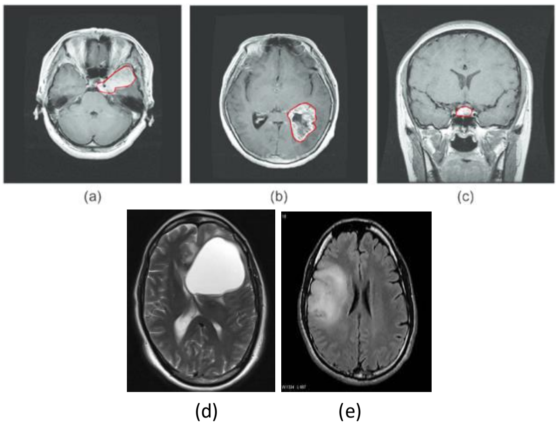


Figure 1. (a) Glioma (b)Meningioma (c) Pituitary (d) Glioblastoma Multiforme (e) Oligodendroglioma Tumors

The first step in building the deep learning network is to gather the primary dataset. The images and labels associated with each image data are necessary. These labels are obtained from a set of categories, such as: glioma tumor, meningioma tumor, pituitary tumor ,glioblastoma multiforme, oligodendroglioma, no tumor. Furthermore, the number of images for each category should be approximately uniform then the classifier will naturally become partial to overfitting[8] these into heavily-represented classes. Class imbalance[4] is a common issue in machine learning and there are many ways to conquer it. This project is focusing on detection of brain tumor and its distinct identification, we gathered our data as MRI scanned images. The dataset includes several images in which tumor is present in different locations and the images in which tumor is not present.

C. Image pre-processing

The main target is to improve image highlights required for additional processing.

The main issues of image imperfections are due to the following :

1. Low resolution
2. Simulation
3. Presence of image artifacts
4. Geometric Distortion
5. Low contrast
6. High level of noise

These are the methods used for Image pre-processing :

1. Greyscale Image Conversion

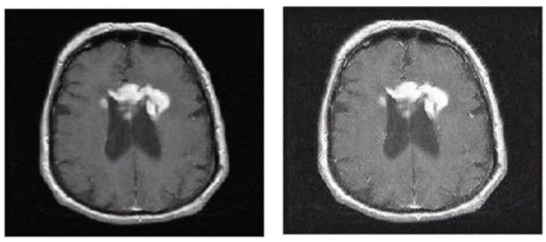


Figure 2. a) Original image b) Enhanced image

The objective of grey scale contrast is to enhance the perception of image which is needed for further processing. Contrast enhancement process[14] makes the image brighter, it improves the visual details in the image.

There are two methods they are direct methods and indirect methods. In the case of the direct method of grey scale contrast , a contrast measure is first initialized, which is then changed by a mapping function[5] to generate the pixel value of the enhanced image.

In indirect method, it improves the contrast by exploiting the under-utilized regions of the dynamic range.

2. Scaling and aspect ratios

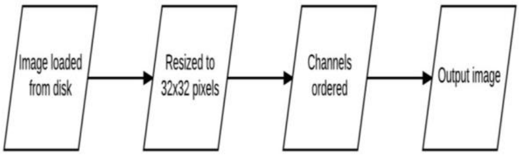
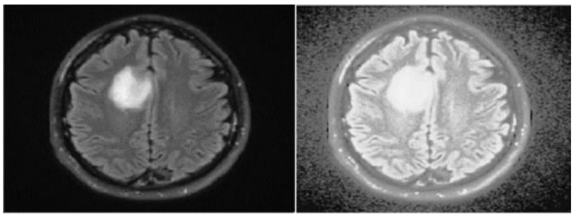


Figure 3. Image pre-processing pipeline that (1) loads an image from disk, (2) resizes it to 32_32 pixels, (3) orders the channel dimensions, and (4) outputs the image.

Scaling or resizing, is the task of increasing or decreasing the size of an image's width and height. When resizing an image, it's important to keep in mind the aspect ratio. Aspect ratio of image is the comparable relationship of the width to the height. For example, a 4x2 inch image's aspect ratio will be 2:1. Aspect ratio represents how large the width is in comparison to the height of the image.

3. Histogram Equalisation



(a)Original image (b)Histogram equaliastion

Figure 4. Histogram Equalization of brain MRI image.

Histogram equalization normalizes the pixel intensities, thus it normalizes some of the illumination problems. The method is used in normalizing the pixel intensities of the brain MRI images. Histogram Equalization is mapping of each pixel of the input image to the relating pixels of the output image. This technique equalizes the intensity values to full range of the histogram to get an enhanced output image. It enhances the contrast and brightness of the input image by increasing the values of each pixel giving rise to dynamic range expansion[10].

4. Adaptive Thresholding

Thresholding is used to part an image by setting all pixels of the image whose intensity values are above a threshold to a foreground value and all the remaining pixels to a background value. Adaptive thresholding takes a grayscale or colour image as input and, outputs a binary image that represents the segmentation. For every pixel in the image, a threshold is been calculated. If the pixel value is lesser than the threshold value then it is set to the background value, or else it is assumed the foreground value.

5. Erosion and Dilation

Dilation and erosion are the two most important operations of morphology. Morphology is to identify the properties of the structure and shape of any element. In the MRI images may contain numerous deformities. The objectives is removing the imperfections by representing picture shape and structure. Dilation operations add pixels to the boundary region of the object, while erosion operations are used to remove the pixels from the boundary region of the objects. Thus these operation of addition and removing pixels from or to the boundary region of the objects structures the element of the selected image.

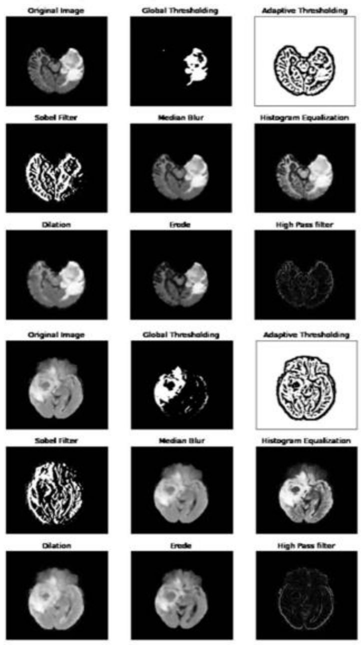


Figure 5. Image pre-processing employed MRI scan

D. Splitting the dataset

The dataset is split into training, testing and validation(fake) dataset. A training dataset is utilized by the classifier to master what each and every category seems like by analysing on the input data and then rectify itself when the analysis are wrong. After the classifier has been trained, we can measure the performance of the model on a testing set.

The training set and testing set are independent of each other and are exclusive of each other.

Neural networks are defined by number of knobs(ex., learning rate, decay, regularization, etc.) that need to be modified to obtain accurate performance. These are the called as the types of hyperparameters.

Validation set is created as the testing set is only used in analysing the performance of the network. Validation set is from the training dataset and is used as "fake test data" so we can amplify the hyperparameters. After determining the hyperparameter values using the validation set, we proceed to predict the values.

E. Training

The training dataset is used to train the model using CNN algorithm for every epoch or iteration, the model is being tested on the validation(fake dataset).

The validation dataset is a type of test data for the model to tune the hyperparameters such as learning rate, decay and hence the validation set becomes unseen data. CNN is implemented for better result. Layers are interconnected with weights of the kernel .Back propagation[11] is used to increase the clarity of the image. The issue of over- fitting is fixed since all units are divided within the kernels. The neighbours of the data are taken by using the kernels. Kernel is a main source of information. Output of neural network is subjected to activation function[7].

1. Convolutional Layers

Extraction of the features from the image serves as a main objective in convolution layers, the part of image is linked to the convolution layer.

2. Padding

Padding is integrating a zero layer with the input volume so the data in the surrounding will not be missed and a similar aspect of output as input volume is obtained. Zero padding is used .

3. Activation Function

Non- linear activation function ReLU is implemented to provide precise results thereby combining them and feeding the output into the following layer in the network. During training, a CNN learns the values for these filters. In image classification, CNN may learn to:

1. Determine edges from raw pixel dataset in the first layer.
2. Using these edges to determine shapes (i.e., "blobs") in the second layer.
3. Use these scenarios to get advanced features such as facial features, car parts, etc. on the upper layers of the network.

4. Pooling layer

Used to combine features near the site. Max-pooling is often used to join features. Reduce the size of the inserted image and control the overlap.

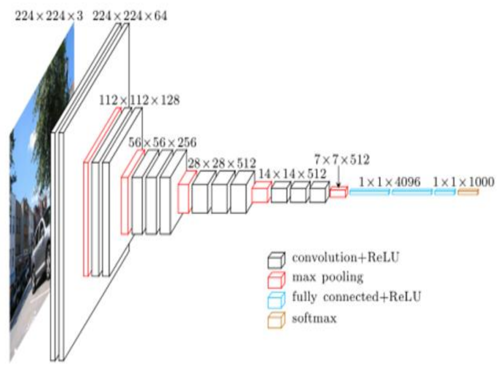


Figure 6:Visualization of VGG architecture

F. Testing

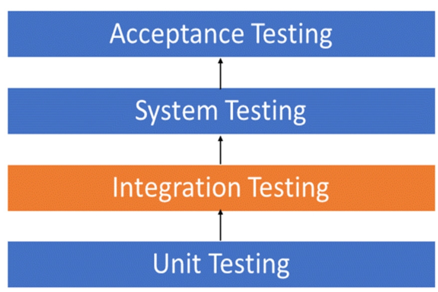


Figure 7.Steps of testing process

Testing is a survey conducted to provide information about the quality of a product .Testing can also provide an objective, independent software to allow the business to inform and understand the risks of using the software. Test methods include the process of using a program or application for the purpose of detecting software bugs.

The test steps are: Unit Test, Integration Test, Verification Test, User Reception Test, Output Test.

III. Conclusion

Brain tumors are relatively rare compared, that is, 1.4% of new cases per year, in developed countries. Deaths from brain tumors have increased in the last few decades. Therefore, the scope of this project is expanded. Brain tumors, especially those that are harmful, are considered to be incurable and deadly. The need for early detection stems from the fact that brain tumors may have invisible and frightening symptoms at first. To identify the type of tumor in the brain, a dangerous medical procedure was performed and a biopsy was performed. This project proposes a way to detect and diagnose the type of brain tumor that is based on MRI (Magnetic Resonance Imaging) of a patient-fed scan of the system. It also provides an accurate diagnosis of existing brain tumors based on CNN classification algorithm. Biopsy can be greatly avoided due to the precise discharge of the system. This is considered to be the least expensive way to solve a brain tumor problem. Previous systems have used various algorithms and methods to prove the existence of a brain tumor by machine learning. Our system provides a clear picture of the precise tumor present in the patient by considering various factors such as location, size etc. We have submitted more than 15 papers to know the need for this program. This method proves to be an accurate and effective method of diagnosing a brain tumor problem.

IV. References

[1] Sobhaninia, Zahra, et al. "Brain tumor segmentation using deep learning by type specific sorting of images." arXiv preprint arXiv:1809.07786 (2018).

[2] Abhishek Anil, Aditya Raj, H Aravind Sarma, Naveen Chandran R, Deepa P L, "Brain Tumor detection from brain MRI using Deep Learning" International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE), Volume 3, Issue 2, DOI: 10.29027/IJIRASE.v3.i2.2019, 458-465, August 2019.

[3] Mrs. Shinde Apurva Swapnil, Ms. Vengurlekar Samidha Girish "Image Mining Methodology for Detection of Brain Tumor: A Review" Proceedings of the Fourth International Conference on Computing Methodologies and Communication (ICCMC 2020) IEEE Xplore Part Number:CFP20K25-ART; ISBN:978-1-7281-4889-2

[4] Mircea Gurbin * , Mihaela Lascu † , and Dan Lascu ‡ "Tumor Detection and Classification of MRI Brain Image using Different Wavelet Transforms and Support Vector Machines" 2019 42nd International Conference on Telecommunications and Signal Processing (TSP)

[5] Daisuke Hirahara "Preliminary assessment for the development of CADe system for brain tumor in MRI images utilizing transfer learning in Xception model" 2019 IEEE 8th Global Conference on Consumer Electronics (GCCE)

[6] Tamjid Imtiaz; Shahriar Rifat; Shaikh Anowarul Fattah "Automated Brain Tumor Segmentation from MRI Data Based on Local Region Analysis" 2019 IEEE International Conference on Biomedical Engineering, Computer and Information Technology for Health (BECITHCON)

[7] Sobhaninia, Zahra, et al. "Brain tumor segmentation using deep learning by type specific sorting of images." arXiv preprint arXiv:1809.07786 (2018).

[8] Abhishek Anil, Aditya Raj, H Aravind Sarma, Naveen Chandran R, Deepa P L, "Brain Tumor detection from brain MRI using Deep Learning" International Journal of Innovative Research in Applied Sciences and Engineering (IJIRASE), Volume 3, Issue 2, DOI: 10.29027/IJIRASE.v3.i2.2019, 458-465, August 2019.

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Self-Automated Agriculture System using IOT

Under the guidances of:
Ms. Shashi Rekha
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India

Namaratha, Abdul Haroon Khan
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India
namrathajaigram@gmail.com
haroon.syeedkhan786@gmail.com

Harshitha J, Akshatha M
Computer Science and Engineering
Sapthagiri College of Engineering
Bangalore,India
akshathaaacharya@gmail.com
Harshithayadav04@gmail.com

Abstract—The world population supposed to reach 9.8 billion by 2050 and is difficult of feed such population . So for feeding the entire population the agriculture sector should be embed with IOT and farmers also should adopt this technology [1]. It is essential to increase the productivity of farming and agricultural process with the help of technologies like IOT. IOT can make farming easier by reducing the cost by decreasing the intervention of farmers in this field through automation. This paper aim is to develop a self- autonomous agriculture system works by connecting physical devices and systems to the internet. IOT is a very promising technology to drive the agriculturalsector, it is the backbone for sustainable development mainly in developing countries that are experiencing rapid population growth like China, India etc, stressed natural resources, agricultural productivity reduction due to climate change. Hence the paper aims at making the agriculture smart using IOT technologies. The projects include a GPS based robot to perform tasks like weeding, spraying, moisture sensing, bird scaring, keeping vigilance, etc. This project requires smart irrigation with smart control and best decision making based on accurate real time data. This includes crop management, waste management, warehouse management, theft control etc.

Keywords—Wi-Fi, Automation, Smart farming, IOT.)

I. INTRODUCTION

IOT is a combination of data, web associated items, is an integral component of the future Internet. IOT focuses on the automation of processes to reduce human intervention. IOT in agriculture focus is on automating the aspects of agricultural methods to make it more efficient and effective[3]. In traditional approaches of farming does not include livestock management and have many inefficiencies such as higher human interaction, labour cost, power consumption, and water consumption etc [4] [5] [6] [7].The use of wireless sensor network is done in this project which collects the data from different of sensors and send it to the main server using wireless protocols. The data that is collected during the process provides the information about different environmental factors which is used to monitor the entire process.Monitoring environmental factors is not the solution to improve yield, quality and production of thecrops. It is necessary to develop combined and unique system which will take care of all factors affecting the productivity like cultivation, harvesting and post harvesting storage.This paper introduces a system which is self-autonomous where it monitors the field throughout the process and necessary controls are also taken according to various signals sent by the agricultural devices to a connected system. This process includes a GPS based controlling robot which can work both manually and automatically for doing weeding, seeding, harvesting, etc. It also uses different kinds of sensors to detect the temperature of soil, moisture, humidity, growth control, and many more. Warehouse management is also done in this project by connecting the automatic baler, tractor, harvest machine, crop planting machine to the system through internet. Controlling of all these operations will be through a smart device or computer connected to Internet and the operations will be performed by using sensors, Wi-Fi or ZigBee modules.

II. LITERATURE SURVEY

The new scenario of decreasing water beds, drying up of rivers, lakes, and severe environmental conditions asks for the urgent need of protection of water by conserving it. To cope up with this issue different temperature and moisture sensors are used and implemented in the field. The threshold values of temperature and soil moisture is programmed into a micro-controller gateway to preserve and water quantity. The system is powered by photovoltaic panels and have a duplex communication link based on a cellular Internet interface that allows data inspection and irrigation scheduling through a web page. The technology development in Wireless Sensor Networks made it easy to use monitoring and control of greenhouse parameter in agriculture.A remote sensing and control irrigation system using distributed wireless sensor network aiming for variable rate irrigation, real time in field sensing, controlling of a site specific precision linear move irrigation system to maximize the productivity with minimal use of water was developed by Y. Kim.In the studies related to wireless sensor network, researchers measured soil related parameters such as temperature and humidity.The system was developed using micro-controller, universal asynchronous receiver transmits interface and sensors while the transmission was done by hourly sampling and buffering the data, transmit it and then checking the status messages. The drawbacks of the system were its cost and deployment of sensor under the soil which causes attenuation of radio frequency signals.In this studies related to wireless sensor network , researcher measured soil realted parameters such as temperature and humidity. The System was developed using micro-controller , universal asynchronous receiver transmits interface and sensors while transmission was done by hourly sampling and buffering the data,transmit it and then checking the status messages.

III. APPLICATIONS

In Agro-Smart agriculture IOT applications include farm vehicle tracking, warehouse management, crop management,livestock monitoring, storage monitoring, irrigation management, theft monitoring,waste management, smart farming, pest controlling, soil management etc. Few applications of self-autonomous agriculture system includes the precision farming, usage of agriculture drones, smart greenhouses, energy management, livestock monitoring. In agricultural field by using IOT there will be less use of farmers, human errors are less as everything is automated. By using the sensors in this project, it gives the accuracy of actions. A robot is used to monitor the entire process like cattle management, crop management, birds and animals scaring etc.

IV. BENIFITS

Monitoring and collecting the data of soil conditions, air temperature, air and soil humidity and sunlight intensity across fields improves efficiency of usage of water, quality of the crop and crop yield in large farms.

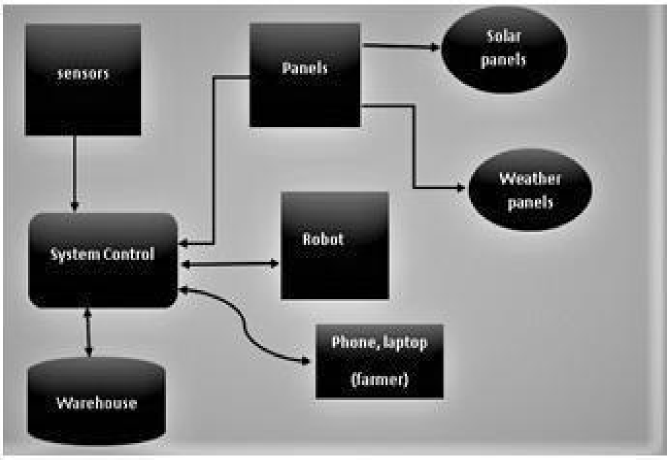

Figure 1 System Overview

For everyone should also increase as a result the farming should opt such a way where the expectations and needs will meet.Low cost sensors, insights of data and IOT Platforms will enable the increase in efficiency and production. The other applications

A. INCREASE OF PRODUCTION

As every step that we follow by using this technology is very much accurate like accurate planting, watering and harvesting then the production of the crop increases.

B. CONSERVATION OF WATER

With the use of automated and accurate details of crops and the amount of water needed also the sensors of moisture and humidity the water is used whenever it is required. Hence the water wastage won't be a problem and water will be conserved

C. LOWERED OPERATION COST

With the use of automated machines and the database containing complete information about the crops there won'tbe any human errors hence there won't be any excess cost for the operations which reality without accuracy errors occur and have to spend excess cost to cover it up.

D. QUALITY OF PRODUCTION

With the help of accurate results the quality of the crop is increased because the pests, bacteria in soil, etc will be minimized automatically once they are detected.

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H . QUALITY OF PRODUCTION

With the help of accurate results the quality of the crop is increased because the pests, bacteria in soil, etc will be minimized automatically once they are detected and the quality of soil is improved which also improves the quality of the crop

I . IMPROVED LIVESTOCK FARMING

With the usage of sensors and robot the health and the reproduction of animals are monitored and the necessary steps are taken automatically which improves livestock management.

J . REMOTE AND EQUIPMENT MONITORING

Hence every machine is interlinked the user can use the machines manually or pre programmed algorithms (automation) can also be used.

K . DRAWBACKS

The smart agriculture based on IOT is basically use of the data collected from different sensors and parameters to take accurate actions and to automatically once they are accurate actions and to better predict the crop productivity an quality .The dis advantages are not in motive to use IOT in agriculture sector but it occurs in technicalities while implementing solutions.Some of the disadvantages are

1. Large amount of money is required to install the smart agriculture in the fields.
2. To use the smart agriculture the continuous internet must be a requirement but in the nooks of the country especially in the remote places the internet is not available.
3. The climate conditions cannot always be accurate due to the technicalities of using the smart agriculture.

V. FUNCTIONS OF SYSTEM

This Steps consist of the warehouse .Warehouse has motor driver which contains motors,cutter,sprayer, tractor, mover etc. It has light sensors, motion detectors which helps it to understand the day .The collected data through the warehouse is collected by the system control unit and from there it is sent to robot which runs with the help of USB modems. The entire data is stored in the PC or the phone that is used by the farmer.The different kinds of sensors used in this system are growth sensors, height sensors, humidity sensors, temperature sensors, soil moisture sensors, light sensors, touch sensors, rain sensor, leaf sensors, water meter sensors. These are all the sensors used to collect the data of various actions that are taking place in field for the accurate farming. It also has cameras in built with the robot and separate cameras for the detection of both crop and livestock. The work of cameras here is not only for collecting data about well being of animals and data of crops but also to make sure they are safe and no one's trying steal it .In order when the robots are not working because of some problems then there will be a safety commands pre installed in all the motor driver machines that they can work automatically with all the motion sensors, light sensors , live GPS tracker installed.

The theoretical result of Various automated system in shown in table 1.

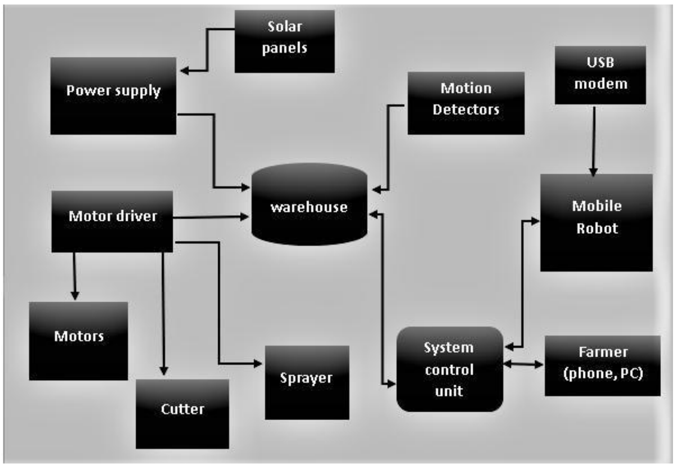


Figure 2 Functions of System

VII . RESULT

In AgroSmart, the self-autonomous agriculture system works in different steps.In this project, the main part system control unit where all the signals from various parts are stored and the required actions is decided either by the farmer who has the built software in his phone or the control unit work .

Table 1. Comparative result of various automated system

Attributes	**Self-autonomous agriculture system**	**A sustainable agricultural system using IoT**	**Automated irrigation and advanced seed germination and pest**	**IoT based smartirrigation monitoring and controlling system**	**IoT based crop field monitoring and irrigation automation**	**Mobile integrated smart irrigation management and monitoring system**	**IoT based smart agriculture**
Areas addressed	Water management Weather monitoring Soil management Theft management Warehouse management Livestock management Pest controlling Nutrition management	Water management	Pest controlling Weather monitoring	Water management	Water management Crop management	Water managem ent	Water management Weather monitoring Soil management Theft management Warehouse management
Data collections of sensors for measurement	Soil temperature Humidity Weather conditions Soil moisture Water level Crop growth controls Crop conditions Thievery condition Livestock conditions Warehouse conditions	Environment temperature Humidity Soil Moisture	Soil, moisture and temperature conditions monitoring. Water level.	Management of Water level, Soil, moisture in environment and soil as well as the Environment, temperature and Humidity.	Temperature Humidity Soil management moisture and Light intensity management.	Soil moisture temperature and Humidity management.	Environment and soil temperature Soil Humidity Moisture Water level Crop condition Thievery conditions Warehouse conditions

CONCLUSION

The IOT applications that are being used in the farming and agriculture sector are helping farmers to collect much useful data. As there are many uses of using IOT in agriculture farmers must understand and install this technology for the better yielding and production. With the increasing population there is a need of producing large amount of crops with good quality it can be obtained with the installation of IOT devices in a prosperous manner. The main purpose of this paper is to show that IOT has the potential to dramatically increase the availability of information and it reduces many problems that are faced in the agriculture sector.

REFERENCES

1. Joaquín Gutiérrez, Juan Francisco, Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta-Gándara, “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module”,IEEE.
2. S. R. Nandurkar, V. R. Thool and R. C. Thool, 2014, “Design and Development of Precision Agriculture System Using Wireless Sensor Network”, IEEE International Conference on ACES

Technology used	Wi-Fi, Zigbee, mobile robot, wireless sensor network, mobile technology, automated robot, growth monitors, automated machines, crop field monitor.	Raspberry pi, Wi-Fi, RFID, Bluetooth, Zigbee	Zigbee	Wireless sensor network, Zigbee, Mobile Technology	Monitor crop field, automate the irrigation system	Raspberry pi, mobile technology	Wi-Fi, Zigbee, remote controlled robot, wireless sensor network, mobile technology, automated robot, crop field monitor.
Drawbacks of the system	Need of high internet speed.	Human interaction Cost for labour Wastage of water Abnormal irrigation	Works only when the user gives the commands.	Human interaction High water consumption	High water consumption High human interaction	Overhead sprinklers Wastage of water	No automated machines which leads to further investment when the robot doesn't work.
Database usage	Use of database of crop information which gives the accurate farming.	No database	No database	No database	No database	No database	Uses the database having informationof crops.
Livestock monitoring	Contains cameras and sensorsinstalled in the livestock for the protection and continuous management of Livestock and Contains-touch sensors to predict accurate conditions of thievery.	No such installed	No such installed	No such installed	No such installed	No such installed	Cameras are onlyinstalled in the robot which cannot give the information and continuous monitoring of live-stock also no touch sensors topredict thievery conditions.

IMAGE BASED SEARCH ENGINE

Aakash Waza
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
wazaakash@gmail.com

Devashish
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
devashish19jha@gmail.com

Faraz Khan
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
wazaakash@gmail.com

Mohit Kumar Shaw
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
mohitkrshaw2000@gmail.com

Prof. Shankar Rana
CSE. Sapthagiri College of Engineering
VTU
Bangalore, India
rana6532@gmail.com

***Abstract*—This Every year millions of photos and images appear in the Internet. Most of them are downloaded to personal cloud storage or become available to the public. With such a huge amount of information, the need for an effective search in the picture ripens. And if excellent tools have already been created for text search, image search remains an unresolved problem. The purpose of this project is to develop a model for creating an effective link production service. To successfully utilize the vast quantity of information that the web provides, we want an effective way to explore it. Image data is much more voluminous than textual data, and visual information cannot be indexed by traditional strategies developed for indexing textual information. Therefore, Image-Based Search Engine (IBSE) has received an excellent deal of interest within the research community. In this project, we aim to confront an advance learning method, known as Convolutional Neural Network (CNN), for studying feature representations and similarity measures. In this project, we explored the applications of CNNs towards solving classification and retrieval problems.**

I. Introduction

Over the past decade multimedia databases, especially those maintained by these huge web search engines like google, bing have grown in size exponentially. While the search engines are robust enough to return semantically meaningful results in response to a text query, there's a lack of efficiency in producing imagebased searches. This project deals with producing meaningful links to produce similar searches. In the experiment we used a test set of images found on the Internet to train the model. Images of famous places, people, animals, paintings were presented in the set. The search is done by scanning the objects present in the image, with which the corresponding links are found for searching. Also, the common methods and functions of description of image content should be used. • Comparison of color content. • Comparison of texture components • Image definition based on the geometric shape of objects.

II. Ease of Use

A. *Identify Object Precisely*

When a search image is entered into a search engine by a user, all of the objects or images which are deemed to be relevant are identified from the index and an algorithm is used to hierarchically rank the relevant set of objects into a set of results. The algorithms used to rank the most relevant results differ for each search engine.

B. *Maintaining the Time Complexity Problem overhead*

The processing of images is faster and more cost-effective. One needs less time for processing, as well as less film and other photographing equipment. It is more ecological to process images. Images based search engine is a way to visually discover information on the web. Users can quickly explore information with more context around images.

III. THE PROPOSED APPROACH

An effective solution to the image search problem requires he development of a global distributed service "Search by Image", which uses a comprehensive approach and is based on the latest achievements of knowledge engineering in the areas of: data mining, database organization, algorithms and data structures, expert systems and machine learning.

In this situation, the concept of using Artificial intelligence – is the continuous optimization of a search service by developing and applying the algorithms of: 1) expert evaluation and 2) machine learning.

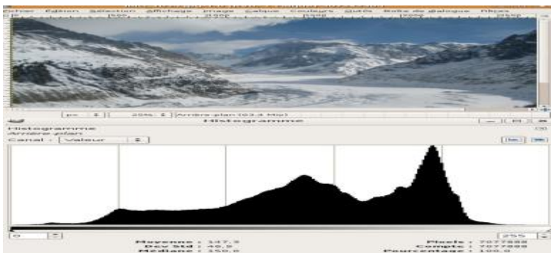
Therefore, an effective search by image should be based on the data mining approach of image context, which is called "Search by Image".

Also, the common methods and functions of description of image content should be used.

- Comparison of color content;
- Comparison of texture components;
- Image definition based on the geometric shape of objects.

A. *Comparison of the image using color content*

Searching for images by comparing the color components is done by plotting the histogram (Fig. 7) of their distribution. At the moment, studies are provided to construct a description in which the image is divided into regions according to similar color characteristics, and their mutual arrangement is then taken into account. The description of the images with the colors that contain them is the most common, since it does not depend on the size or orientation of the image. The construction of histograms with their subsequent comparison is used often but is not the only way to describe the color characteristics.



Comparison of texture components

The methods of such a description work by comparing the texture patterns present in the image and their relative positioning. To determine the texture, patterns that are grouped into sets are used. They contain not only information describing the texture, but also its location in the described image. Texture as an entity is difficult to describe formally, and it is usually represented as a twodimensional array of brightness changes.

A. Image definition based on the geometric shape of objects

The description of the form implies the description of the geometric shape of the individual regions of the image. The main drawback is the need for frequent human intervention, since methods such as segmentation are difficult to fully automate for a wide variety of tasks.

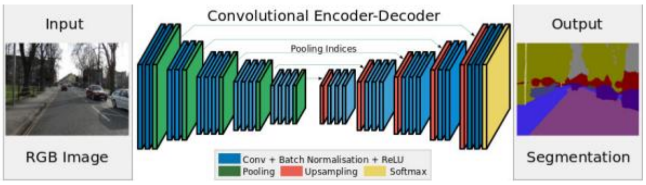
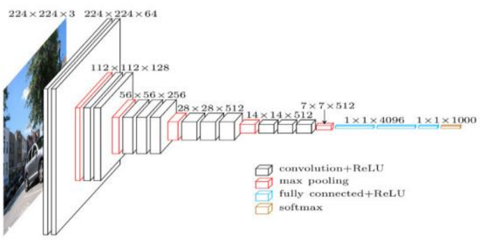


Fig. 1. Image segmentation process

Fig. 2. Borders highlighting

B. Use of artificial neural networks

The layers of a neural network on the image consist of a set of different convolution-filters. Each of the filters is responsible for finding a particular pattern, and when it finds a portion of the image that has this pattern, the filter sends a signal to the next layer. In turn, the signals of the previous layer form a new image for the next layer.



Building cascades of convolutional layers and teaching the model, we obtain layers containing the abstractions of images. The first layers in themselves can contain small details: lines. Next come combinations of figures. The following layers can already contain forms, and in the end the whole objects. Another feature of the convolution in this model should be noted: each next layer is "thicker", since it has more filters, but "smaller", since the image is specially reduced by the MaxPooling operation. Use this technique for the following reason: the fact of detecting a certain feature-object is more important than knowing the exact location of this object in the image. That's why they take a maximum inside a small window, thereby creating a map of the location of the signs.

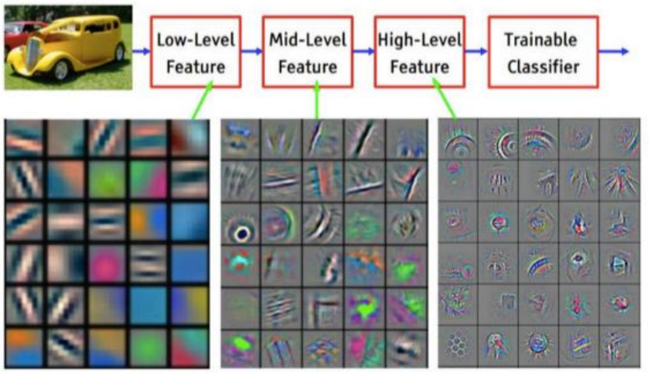


Fig. 3. Expanding the image into abstract layers

The advantages are greater flexibility in customization and recognition accuracy. The disadvantage is the need for a large set of test samples and the probabilistic result of the comparison.

IV. RESULTS AND IMPLEMENTATION

Step1: The user uploads the image for which he wants to find a match.

Step2: The image that has been uploaded undergoes the process and compares it with the images stored in the database through the networks of neural network for its refinement in terms of color, shape, size etc.

Step3: After the images are matched for similarity by using machine learning algorithms, the matched results are displayed in the form of links which when clicked displays the searched similar image

V. FUTURE RESEARCH

The next step of research is experimental approval of the proposed model efficiency and improvement of existing feature extraction algorithms. The final aim is creating of efficient search engine.

VI. CONCLUSION

The issue of image search is a pressing one. The problem is hard, but it can be solved, according to an analysis of image estimate methods. Currently, there are multiple services that provide various solutions. Some services use the user's search history to find images, therefore the search results will vary depending on the user. Furthermore, all services perform problem, a model of service for image search is proposed, which could allow for sufficient image search dependability. The main components of this model:

1. Algorithms and data structures: Data structures and image search algorithms are developed, taking into account the principles of Search Engine Optimization. Speaking of data structures, it's mainly concerned with trees and hash tables for image search.

2. Expert systems and machine learning: The concept of using Artificial intelligence – is the continuous optimization of a search service by developing and applying the algorithms of expert evaluation and machine learning.

3. Training ML models: Machine learning is still not up to that level yet; it takes a lot of data for most of the algorithms to function properly. For a simple task, it needs thousands of examples to make something out of it, and for advanced tasks like -- Image or speech recognition, it may need lakhs(millions) of examples

4. Database organization: Search effectiveness, in the first place, depends on the time complexity of computing the image features, and on the degree of image data structuredness.

5. Overfitting and underfitting: Machine Learning is all about making machines better by using data so that we don't need to code them explicitly. The model will not perform well if training data is small, or noisy with errors and outliers, or if the data is not representative (results in biased), consists of irrelevant features (garbage in, garbage out), and lastly neither too simple (results in underfitting) nor too complex (results in overfitting). After we have trained a model by keeping the above parameters in mind, don't expect that your model would simply generalize well to new cases we may need to **evaluate and fine-tune it**

Acknowledgment

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References

[1] L. Manso, C. Duque, P. Ribeiro, "Power Quality Waveform Recognition Using Google Image Search Engine (iPQ-Google)," International Conference on Harmonics and Quality of Power (ICHQP), IEEE, 2016, pp. 1010-1013.

[2] K. Sankar, G. N. K. Suresh Babu, "Implementation of Web Image Search Portal with automated concealed annotation," Communication and Electronics Systems (ICCES), IEEE, 2016.

[3] S. Mashtalir, V. Mashtalir, "Sequential temporal video segmentation via spatial image partitions," Data Stream Mining & Processing (DSMP), IEEE First International Conference, IEEE, 2016, pp. 239-242.

[4] D. Kinoshenko, S. Mashtalir, V. Shlyakhov, M. Stolbovyi, "Video Shots Retrieval with Use of Pivot Points," International Conference on Theory and Applications of Fuzzy Systems and Soft Computing, Springer, Cham, 2018, pp.102-111.

[5] S. K. Pawaskar, S. B. Chaudhari, "Web image search engine using semantic of Images's meaning for achieving accuracy," Automatic Control and Dynamic Optimization Techniques (ICACDOT), IEEE, 2017, pp. 99-103.

[6] S. Bogucharskiy, S. Mashtalir, "Image sequences texture analysis based on vector quantization," Radio Electronics, Computer Science, Control, no. 2, 2014, pp. 94-99.

[7] Zhengbing Hu, S. Mashtalir, O. Tyshchenko, M. Stolbovyi, "Video Shots' Matching via Various Length of Multidimensional Time Sequences," vol. 9, International Journal of Intelligent Systems and Applications, Modern Education and Computer Science Press, 2017, pp. 10.

[8] D. Tian, D. Tao, "Global hashing system for fast image search," vol. 26, no. 1, IEEE Transactions on Image Processing, IEEE, 2016, pp. 79-89.

[9] Yuan Cao, Heng Qi, Jien Kato, Keqiu Li, "Hash Ranking with Weighted Asymmetric Distance for Image Search," IEEE Transactions on Computational Imaging, IEEE, vol. 3, no. 4, Dec. 2017, pp. 1008-1019.

[10] S. Mashtalir, O. Mikhnova, "Detecting Significant Changes in Image Sequences," Multimedia Forensics and Security, Springer, Cham, 2017, pp. 161-191.

[11] Dawei Liang, Ke Yan, Wei Zeng, Yaowei Wang, Qingsheng Yuan, Xiuguo Bao, "Deep hashing with mixed supervised losses for image search," IEEE International Conference on Multimedia and Expo Workshops, IEEE, 2017, pp. 507-512.

[12] M. Mohmmadi Kashani, S. Hamid Amiri, "Leveraging deep learning representation for search-based image annotation," Artificial Intelligence and Sigral Processing Conference, IEEE, 2017, pp. 156-161.

[13] Jun-yi Li, Jian-hua Li, "Fast image search with deep convolutional neural networks and efficient hashing codes," Fuzzy Systems and Knowledge Discovery (FSKD), IEEE, 2015, pp. 1285-1290.

[14] Weicheng Sun, Songhao Zhu, Yanyun Cheng, "Image search via semantic hashing learning," Control And Decision Conference (CCDC), IEEE, 2017, pp. 1986-1990.

Diabetic Retinopathy Detection using CNN

Preetha S Jois[#1], Supriya K[#2], Thanushree K J[#3], Yashaswini M Kotegar[#4]

[#1,2,3,4] *Student, Dept. of Computer Science, Sapthagiri College of Engineering, Karnataka, India*

***Abstract* — A side effect of diabetes that affects vision is called diabetic retinopathy. This disorder is brought on by harm to the blood vessels in the light-sensitive tissue in the back of the eye (retina). At initially, diabetic retinopathy may not manifest any symptoms or manifest just mild vision problems. This paper seeks to automating the illness diagnosis into its many stages employing the Deep Convolutional Neural Network model without physically screening by an ophthalmologist, which is a laborious process. In order to automatically diagnose and categarise high-resolution fundus images of the retina into five severity stages, we employed a sizable dataset to train a model next recommend a course of action in accordance with the severity stage.**

***Keywords-* Automate, diabetic retinopathy, fundus, convolutional neural network, retina**

I. INTRODUCTION

Diabetic Retinopathy (DR) is the major reason for blindness in adults and cause of vision loss in diabetic patients. Damaged blood vessels in the retina, the light-sensitive lining at the back of the eye, cause diabetic retinopathy. The retina senses light and sends the signal through the optic nerve to the brain.

The brain decrypts the signals to view the objects around. Diabetic retinopathy is a disorder in which blood and other fluids flow into the retina due to sugar blockages in tiny blood vessels, which causes swelling of retinal tissue; as a result, the vision becomes cloudy or blurred. The lens's shape and curve are altered as a result of the fluid accumulation, affecting the vision. If not treated at the early stage, it will lead to blindness.

In the initial stages, there are no visual symptoms. Some common symptoms may include hazy vision, difficulty sensing colors, and eye floaters. So, it's suggested that every year, diabetic patients must get a full dilated eye checkup. Diagnosing and treating it at the initial stage can lessen the chance of losing vision.

According to statistics globally, 95 million diabetic patients have high chances of developing DR. In a study of 130 patients, it was discovered that 23.85% of them tested positive for DR. Among them, 25.8% were diagnosed with the Proliferative DR stage, which is the last stage of DR.

Figure 1 illustrates a comparison of a healthy and a diabetic retinopathy eye's fundus picture.

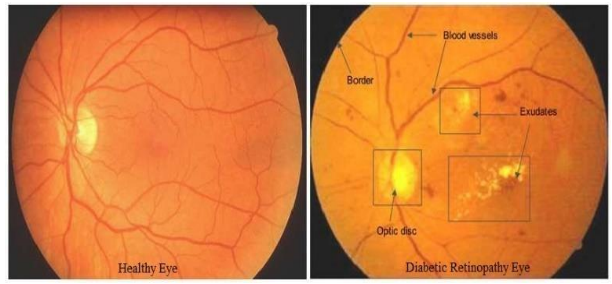


Figure 1: Illustration of the fundus of Healthy and Diabetic Retinopathy Eye. The left image shows a healthy eye and the rightimage shows a DR eye.

Depending on how severe the problem is, diabetic retinopathy can be split into stages. These are the stages:

i. No DR: This stage indicates a healthy eye.

ii. Mild DR: The first stage of Diabetic Retinopathy is mild non-proliferative. In this stage, the walls of the blood vessel narrow down, and decrease blood flow, but do not have a significant effect on the vision.

iii. Moderate DR: Moderate non-proliferative retinopathy is the second stage. In this stage, microaneurysms are present in three retinal quadrants and/or soft exudates, hard exudates, or venous beading.

iv. Severe DR: Severe non-proliferative retinopathy is the third stage. Increased blood vessels are clogged at this stage, resulting in more blood and fluid leakage, which has a substantial impact on vision.

v. Proliferative DR: Proliferative retinopathy is the fourth and most advanced stage. New blood vessels and scarring emerge on the retina at this stage, causing visual problems.

When DR is diagnosed at early stages, the odds of progressing from NPDR to PDR can be reduced.

Convolution neural networks are used in the proposed method to quickly and accurately identify all stages of DR from a set of fundus images. Images of a healthy eye and a diabetic retinopathy eye are acquired in this method. Firstly, image preprocessing is performed to reduce noise from the images and to formulate the image for the feature extraction process. Convolution neural networks receive the pre-processed images as input for automatic feature extraction. CNN maintains the link between pixels by detecting image features using tiny squares of input data. An image matrix and a filter or kernel serve as its two inputs in this mathematical method. To obtain output feature maps, each input image will be passed through a succession of convolution layers with filters (kernels). Finally, a comparison between the test image and the trained model takes place to display the results.

II. RELATED WORK

The categorization of DR using various techniques. In this section, various proposed system methodologies have been contemplated.

Gondal *et al.*[20] proposed a CNN model, making use of the Kaggle and DiaretDB1 datasets, where training was performed on the Kaggle dataset and DiaretDB1 was used for testing. The normal and mild stages are known as non-referable DR and moderate, severe, and proliferative DR are known as referable DR. The accuracy of the model evaluated in terms of sensitivity and specificity is 93.6% and 97.6% respectively, on DiaretDB1.

Garcia *et al.*[17] proposed a CNN model using Alexnet, VGGnet16. The contrast of the image was improved by preprocessing and augmentation. The best results were achieved using VGG16 without a fully connected layer, with an accuracy of 83.68%, 54.47% sensitivity, and 93.65% specificity. But the main drawback of the work was that it was not able to predict the stages.

The recent model proposed by Qummar *et al.*[21]on the Kaggle dataset using five CNN models, namely Resnet50, Dense169, Inceptionv3, Dense121, and Xception achieved an accuracy of 80.8%. In this work, a diverse group of classifiers is used to create stacks. The constraint is that the ensemble model grows overly complex, making it difficult to access a model that compensates for errors. Their research does not reveal which model performs best at which point of the DR process.

Mohammed Ghazal *et al*. [22] deployed a model using the OCT dataset. First, the model extracts retinal patches from the input image, which is later used to train the convolution neural network without image resizing. They have combined features to optimize performance. It is observed that transfer learning achieves high accuracy and combining the output characteristics of two separately trained CNNs that operate on opposite sides of the fovea yields the best results. The model has achieved the highest accuracy with the least computational complexity. The overall accuracy of the model is 94%.

D. Álvarez *et al.*[24] proposed a radial basis function model for automatic detection of hemorrhages and microaneurysms on a dataset of 115 images the performance of the model was calculated based on two criteria one is image-based criterion which resulted in the mean sensitivity, mean specificity, mean accuracy of 100%, 56.00%, 83.08% respectively and the other is a lesion-based criterion that produced average values of 86.01 percent sensitivity and 51.99 percent mean positive predictive value.

Abhilash M *et al.*[23] proposed a model using Cubic Convolution Interpolation and the features are extracted using LBP operator which is carried out for the classification phase depending on the feature set values SVM classifies the image as diabetic retinopathy or healthy eye image when compared to other texture description LBP gives better accuracy. The main drawback of this work included is as more images were being tested and the calculation of some statistical parameters were complex.

III. METHODOLOGY

A. Data Acquisition

The data set is gathered from a source, and a thorough analysis is performed. Only if the image meets our requirements and is not duplicated it is chosen for training/testing purposes.

The Data Acquisition starts with collecting dataset from an authenticated source. Then the features of the dataset are analyzed, only if it matches the requirement, the dataset is considered.

B. Preprocessing

To make processing easier, the image is converted from RGB to greyscale, later an averaging filter is used to remove the noise, global basic thresholding is used to filter the background and only then will it consider the image, after which a high-pass filter is used to sharpen the image by amplifying the finer details.

1) Conversion from RGB to Greyscale

Converting the RGB image to Greyscale image is the first step in pre-processing. It can be derived by calculating the below formula for the RGB image

$$2989*R+0.5870*G+0.1140*B$$

2) Noise Removal

Removing or reducing noise from an image is a well known technique which is a noise removal algorithm. The second phase in image pre-processing is noise removal. The grayscale image obtained in the previous phase is used as the input here. We're using the Median Filter, which is a Noise Removal Technique, in this case.

Median Filtering:

A popular non-linear digital filtering technique is median filter which is used for removing noise from images and signal

3) ‘Basic Global Thresholding

Thresholding is an image segmentation technique that involves changing the pixels in a picture to make it easier to analyse. If A(i,j) is greater than or equal to the threshold T, keep it. Otherwise, omit the value and use 0 instead. The value of T can be modified to meet the needs of varied photos in this scenario. To figure out what threshold value is best, use the trial-and-error method.

4) Image Sharpening

Increased sharpening gives a more sharpened image.Any enhancing method that highlights edges and small details in an image is referred to as image sharpening.

High Pass Filtering:

A high-pass filter can be used to improve image sharpness. These filters focus the viewer's attention on the image's smaller details. The output of the thresholding is used as input here. We're using a filter here, and we're appending the closest values to pixels at the boundary pixels first.

C. Image classification:

Because CNN is a classifier, we use the output of the high-pass filter as input and omit feature extraction. It uses convolution, correction, and bundling as three jobs in the iteration submodule to output the final comparison matrix, which will be classified by a classification algorithm such as Softmax. Based on its shared weight architecture and the translational invariance of the human brain, A convolutional neural network (CNN or ConvNet) is a type of deep neural network that is most typically used to analyse visual pictures. It is also known as a SIANN (space-invariant artificial neural network). Each set of neurons in a CNN is split into 3D structures and evaluates a small region or feature of the image. To put it another way, each group of neurons is trained to recognize a certain element of the image. The final output of a CNN is a vector of probability values representing the probability that a given feature belongs to a given class. CNN’s use the predictions from each layer to produce the final output.

Layers of CNN:

1) Convolutional layer:

Following the computer's reading of the image in pixels, we use the convolutional layer to extract a small portion of the image. Features or filters are the names given to these images or patches. In both photos, these basic feature matches are sent at roughly the same place. Convolutional layers are more effective at detecting similarities than complete picture matching situations. It derives a feature map by scanning the entire image and importantly a few pixels at a time. It uses a filter to forecast the class likelihood for each feature.

2) Pooling layer (down sampling) or Max-pooling Layer:

Reduce the amount of data you have. For each feature, a convolutional layer is created that holds the most important information (the process of convolutional and pooling layers is usually repeated multiple times). The feature with the highest weight is extracted in the max-pooling layer, which is accomplished by transforming the 3x3 matrix to a compressed matrix. The 3x3 matrix is reduced to a 2x2 matrix with only the highest weights. A 3x3 matrix contains features.

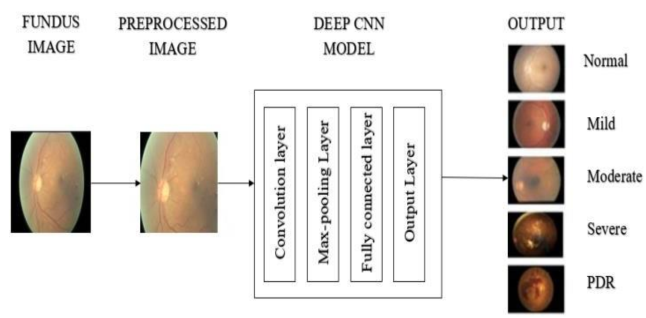
3) Fully connected layer:

The preceding layer's outputs are smoothed, resulting in a single vector that may be used as the input to the following layer. To anticipate proper labels, apply weights to the data provided by feature analysis.

4) Output layer:

The output layer calculates final probabilities in order to identify the image's class. A softmax layer or sigmoid neurons, relies on the solution goal - binary or multi-class classification - is the final layer that generates network output.

We use ReLU and Softmax that has activation functions in the overall process of classification.



IV. IMPLEMENTATION DETAILS

A. Technologies used:

1) Python IDE:

Python is a general-purpose interpreted programming language with a high level of abstraction. Guido van Rossum created Python, which was initially released in 1991. Python's design philosophy prioritises readability of code, especially through the use of significant whitespace. On both small and big scales, it provides structures that allow for clear programming. After 30 years as a leader in the language community, Van Rosen stepped down in July 2018.

2) Keras:

Keras is a high-level neural network API for TensorFlow, CNTK, and Theano that is written in Python. It was created with the goal of allowing users to experiment quickly.

3) OpenCV-Python:

OpenCV is a programming function library mainly for real-time image processing. It is modular, which means that a package contains multiple shared or static libraries. The image processing modules we use include linear and nonlinear image filtering, geometric image transformations, color space transformations, histograms, and more. The system includes libraries like HOG.

4) Flask Library:

Flask is a lightweight Python web framework. It is classified as a microframework because it does not require any other tools or libraries. It lacks a database abstraction layer, form validation, and other common-functioning third-party library components. Extensions, on the other hand, can be utilised to enhance your application's functionality as if they were written in Flask. Object-relational mappers, form validation, upload handling, many open authentication protocols, and a number of popular framework-related tools all have extensions available. The core Flask software is updated less frequently than extensions. Flask is frequently used with MongoDB to offer the database and history more control.

5) HTML,CSS:

HTML, along with Cascading Style Sheets, is a standard markup language for building web pages and web applications, and it is one of the two cornerstone technologies of the World Wide Web (CSS).

B. Results:

We have established a webpage where the user can upload an image of the patient's eye to determine whether Diabetic Retinopathy is present or not.

Dashboard:

Figure 2 depicts the page where user can upload the eye image and when analyze button is clicked, the system displays the result.

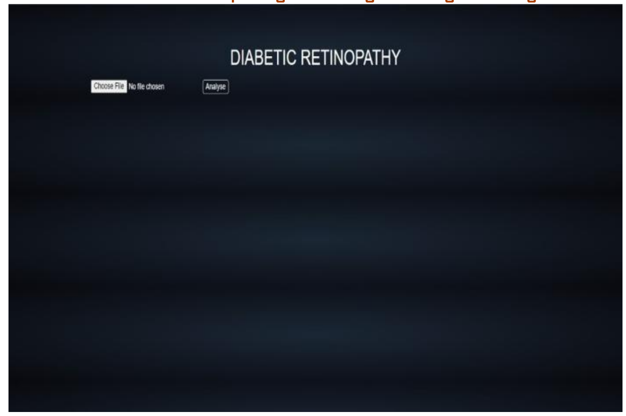


Figure 2: Dashboard

Prediction:

Figure 3: Convolution Neural Network predicting result

Figure 3 depicts the result, it displays the image uploaded by the user and to the right of the image, it displays the disease name and the stage of disease. The result also suggests the remedies to be followed by the patient.

V. CONCLUSION

We apply a transfer learning approach in this system to develop an unique convolutional neural organization strategy for diabetic retinopathy detection. The process includes preprocessing, including automatic extraction of retinal plaques to improve results. Furthermore, for DR classification, the suggested method outperforms other CNN models, including VGG16. Our results reveal that the inception CNN model performs better in terms of classification and accurately represents retinal disease aspects. Referral to DR yielded the best results with 96.29% accuracy. We'll look into some advanced deep learning algorithms for multimodal retinal images in the future.

Because our well-trained neural network can detect diabetic retinopathy quickly and correctly, and because our technology can help limit the damage caused by diabetic retinopathy at an early stage, this strategy is successful. The generative system examines a patient's eyes to assist doctors in making quick decisions. Our method can be further improved by training our neural network models for a variety of eye illnesses.

VI. REFERENCE

[1] Conference Report: Screening for Diabetic Retinopathy in Europe 15 years after the St. Vincent declaration the Liverpool Declaration 2005. Retrieved March 18, 2006

[2] Abate Diabetes: Diabetes. Accessed March 21, 2006

[3] SightSavers: The structure of the human eye. Accessed, August 2, 2006,

[4] My Eye World: Eye Structure and function. Referenced, August 2nd 2006

[5] St. LukesEye.Com: Eye Anatomy. Acessed August 2nd 200

[6] Junichiro Hayashi, Takamitsu Kunieda, Joshua Cole, Ryusuke Soga, Yuji Hatanaka, Miao Lu, Takeshi Hara and Hiroshi Fujita: A development of computer-aided diagnosis system using fundus images. Proceeding of the 7th International Conference on Virtual Systems and MultiMedia (VSMM 2001), pp. 429-438 (2001).

[7] The Berries: Diabetic Retinopathy, Accessed August 4, 2006

[8] Vallabha,D., Dorairaj, R., Namuduri K. R., and Thompson, H., "Automated Detection and Classification of Vascular Abnormalities in Diabetic Retinopathy", 38th Asilomar Conference on Signals, Systems and Computers, November 2004.

[9] Image segmentation Techniques: Methods for Segmenting High Spatial Resolution Images by Debasish Chakraborty (Author), Goutam kumar Sen (Author), Sugata Hazra.

[10] "Design and Implementation of Inspection Model for knowledge Patterns Classification in Diabetic Retinal Images Kajal Sanjay Kothare, Prof. Kalpana Malpe. "IEEE Journal of Biomedical and Health Informatics

[11] "Detection of Retinal Disease Screening Using Local Binary Patterns S. B. Manojkumar, U. Shama Firdose and H. S. Informatics. Sheshadri." IEEE Journal of Biomedical and Health

[12] "Exudate Detection for Diabetic Retinopathy With Convolutional Neural Networks Shuang Yu, Di Xiao,Yogesan Kanagasingam." IEEE Journal of Biomedical and Health Informatics.

[13] "Retinal Disease Screening through Statistical Texture Analysis and Local Binary Patterns using Machine Vision." IEEE Journal of Biomedical and Health Informatics.

[14] Mohammadian, S., Karsaz, A. and Roshan, Y.M., 2017, November. Comparative Study of Fine-Tuning of Pre-Trained Convolutional Neural Networks for Diabetic Retinopathy Screening.

[15] Wan, S., Liang, Y. and Zhang, Y., 2018. Deep convolutional neural networks for diabetic retinopathy detection by image classification. Computers & Electrical Engineering, 72, pp.274- 282

[16] Mansour, R.F., 2018. Deep-learning-based automatic computer-aided diagnosis system for diabetic retinopathy

[17] G. García, J. Gallardo, A. Mauricio, J. López, and C. Del Carpio, ‘‘Detection of diabetic retinopathy based on a convolutional neural network using retinal fundus images,’’ in Proc. Int. Conf. Artif. Neural Netw. New York, NY, USA: Springer, 2017, pp. 635–642.

[18] Dutta, S., Manideep, B.C., Basha, S.M., Caytiles, R.D. and Iyengar, N.C.S., 2018. Classification of Diabetic Retinopathy Images by Using Deep Learning Models

[19] Gao, Z., Li, J., Guo, J., Chen, Y., Yi, Z. and Zhong, J., 2018. Diagnosis of Diabetic Retinopathy Using Deep Neural Networks. IEEE Access, 7, pp.3360-3370.

[20] W. M. Gondal, J. M. Köhler, R. Grzeszick, G. A. Fink, and M. Hirsch, ‘‘Weakly-supervised localization of diabetic retinopathy lesions in retinal fundus images,’’ in Proc. IEEE Int. Conf. Image Process. (ICIP), Sep. 2017, pp. 2069–2073.

[21] S. Qummar, F. G. Khan, S. Shah, A. Khan, S. Shamshirband, Z. U. Rehman, I. Ahmed Khan, and W. Jadoon, ‘‘A deep learning ensemble approach for diabetic retinopathy detection,’’ IEEE Access, vol. 7, pp. 150530–150539, 2019.

[22] Mohammed Ghazal, Samr Samir Ali,Ali H. Mahmoud, Ahmed M. Shalaby,Ayman El-Baz "Accurate Detection of Non-Proliferative Diabetic Retinopathy in Optical Coherence Tomography Images Using Convolutional Neural Networks" IEEE Access, vol. 8, 2020.

[23] Abhilash M, Sachin Kumar"Retinal Disease Screening Through Local Binary Patterns" IEEE Access, vol. 5, 2018.

[24] M. García, M. López, D. Álvarez and R. Hornero, "Assessment of four neural network based classifiers to automatically detect red lesions in retinal images." IEEE Access, vol. 32, 2014.

Chronic Kidney Disease Prediction using Machine Learning Methods

Shanu Himkar
Students, Dept. of Computer Science Engineering, SCE, Karnataka, India-560073,
shanu.bgp32@gamil.com

Nishant Rana
Students, Dept. of Computer Science Engineering, SCE, Karnataka, India-560073,
nrana012345@gmail.com

Mrs. Shobha K
Assistant Professor, Dept. of Computer Science Engineering, SCE, Karnataka, India-560073,
Shobha_k@sapthagiri.edu.in

***Abstract* — Chronic kidney disease (CKD) causes severe damage to the kidneys. The kidneys have the ability to remove waste products from the body. If CKD condition occurs, all the waste will be accumulated in the body as it leads to severe health damage. This proposed work aims to identify CKD, the initial step is to preprocess the data by removing Nan values, and second step is data visualization to improve the statistical analysis of the data. Logistic regression was used in our research work. The performance of the model like high accuracy and high recall score, etc. Were achieved. Various results were obtained from these data sets and stored as historical data for future analysis.**

Keywords:* *Chronic kidney disease, blood pressure, Anemia, Diabetes Mellitus, data Visualization, Pre-processing.

1. INTRODUCTION

Chronic kidney disease (CKD) is a condition that affects the human body. Certain parameters, such as RBC count, specific gravity value, blood pressure (BP), albumin levels, sugar content, anemia, and WBC count, can help prevent this. Other disorders that might cause CKD include coronary artery disease, diabetes mellitus (DM), and bacterial infections. Chronic renal disease manifests itself in a gradual manner. I'm feeling nauseated, Vomiting, Appetite lessness, Weakness and exhaustion Having trouble sleeping, how much urine do you alter on a daily basis? Mental acuity is deteriorating. Twisting muscles and numbness Swelling of the ankles and feet, itching that doesn't go away, if fluid develops around the heart, it can cause chest pain. When fluid builds up in the lungs, it causes suffocation and death. High blood pressure (hypertension) is a tough condition to manage.

2. LITERATURE SURVEY

The regression and decision tree are two common data mining algorithms that are used to forecast the disease CKD. The dataset that was used here is quite little. A supervised algorithm is a decision tree. In truth, data mining can be used in the healthcare business to "mine" clinical data for hidden information that can be used to make intelligent and productive decisions. Advanced data processing techniques in discovery of hidden patterns and relationships may be a fruitful as remedy to the present state of affairs, principally deals with Prediction of Chronic urinary organ illness. Information covers several attributes like blood, urine, cardiovascular disease check, and external symptoms applied to predict chronic urinary organ illness.[1]

Nine models were developed and compared to predict the severity of CKD using readily available clinical data. The model required re-examination data from the patients, which they were unable to provide at the time of the patient's initial appointment. Elastic Net and lasso regression are examples of linear models. Quantification of urinary protein is crucial for determining the severity of chronic renal disease (CKD). The current approach for diagnosing the severity of CKD involves analyzing 24-hour urine protein, which is inconvenient during follow-up. We created and analyzed multiple prediction models using statistical, machine learning, and neural network methodologies to swiftly predict the severity of CKD using more easily available demographic and blood biochemical variables during follow-up. [2]

These models forecast the likelihood of a patient getting chronic renal disease in the next 6 to 12 months. The data was taken from Taiwan's National Health Insurance System (NHIS). The findings of laboratory tests, on the other hand, are not included. Algorithms based on trees are employed. Because of the rising number of patients, the high risk of progression to end-stage renal disease, and the poor prognosis of morbidity and mortality, chronic kidney disease (CKD) is a significant burden on the healthcare system. The goal of this project is to create a machine-learning model that leverages comorbidity and medication data from Taiwan's National Health Insurance Research Database to predict the development of CKD in the following 6 to 12 months, and hence the prevalence of the disease in the community. A total of 18,000 people with CKD and 72,000 people without CKD diagnosis were selected using propensity score matching [3].

Based on comparative analysis, it can be seen hat proposed technique produced solution for the CKD diagnosis problem which are accurate and cost effective. Embedded system is used which has lacks generalization capabilities for other models. Generally expensive than filter methods. The ensemble algorithm is implemented. One of the most important machine learning applications in the healthcare industry is automated medical diagnosis. The majority of efforts in this area are primarily concerned with improving the accuracy of categorization models.

We propose in this paper that, unlike general-purpose classification issues, medical applications, such as CKD diagnosis, necessitate particular treatment. Apart from model performance, additional parameters such as data gathering cost may be considered in the case of CKD to improve the applicability of the automated diagnosis system. [4].

From CT data, it is capable of kidney localization and segmentation-free volume estimation. The CT scans of 100 patients were obtained from the records of the Vancouver General Hospital (VGH). The most up-to-date ml-based approaches for estimating kidney volume and localization from CT scans Kidney volume is an important biomarker for a variety of kidney diseases, including chronic kidney disease. Existing total kidney volume estimation methods frequently rely on a kidney segmentation phase in the middle. Automatic kidney localization in volumetric medical pictures, on the other hand, is a crucial step that frequently comes before data processing and analysis. The majority of existing methods use an intermediary classification or regression phase to locate the kidneys. This paper proposes an integrated deep learning approach for kidney localization in computed tomography scans and segmentation-free renal volume estimation [5].

3. DATA COLLECTION

The following are the sources from which we gathered data for our research on CKD detection and prediction.

https://archive.ics.uci.edu/ml/datasets/chronic_kidney_disease

data sets are consisting of 25 features like Age, Blood Pressure, specific gravity, albumin, sugar, red blood cells, puscell, puscell clumps, bacteria, blood glucose random, blood urea, serum creatinine, sodium, potassium, hemoglobin, packed cell volume, white blood cell count, white blood cell count, red blood cell count, hypertension, diabetes mellitus, coronary artery, disease, appetite, pedal, edema, anemia, classification.

4. METHODOLOGY

To predict CKD and obtain a good accuracy of the model the following steps are followed

i) Data pre-processing.

ii) Data visualization

iii) ML model structure.

i. Data pre-processing: There are some missing values in the dataset, as can be seen. The backward fillna approach is used to overcome them. The next step is to check the Columns' data types; if any string or object data types exist, they must be changed to integer and float, respectively.

```
for column in df.columns:
    if df[column].dtype == np.number:
        continue
    df[column] = LabelEncoder().fit_transform(df[column])
```

Above Code for converting object data type to integer and float data types.

Above code shows for converting from object to integer and float data type.

ii. Data Visualization: It is a process of plotting graphs and charts. It provides a clearer picture of the data. Below are various counter-plots, general and hierarchical property distributions, and a heat map to show the given Co relationship.

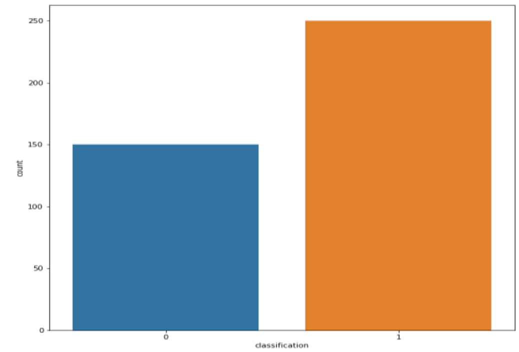


Figure 1 Number of CKD patients(dataset1)

Above Figure 1 shows the data visualization on number of CKD patients from dataset1

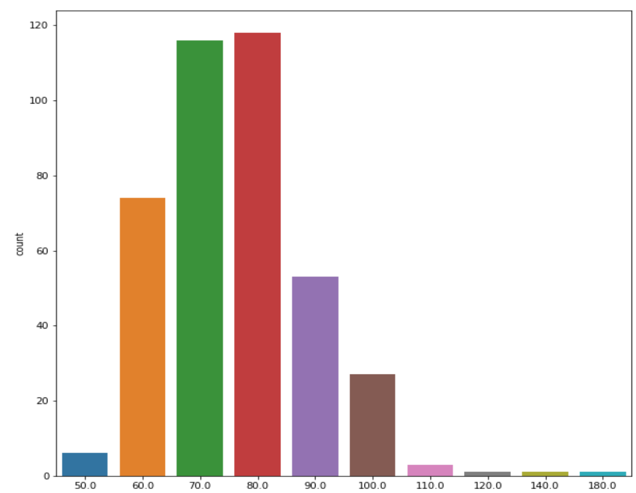


Figure 2: Blood Pressure range

The above figure 2 shows the data visualization on blood pressure range.

```
numericalFeatures = []
categoricalFeatures = []

for i in df.columns:
   if df[i].nunique()>=9:
      numericalFeatures.append(i)
   else:
      categoricalFeatures.append(i)
```

Code for numerical and categorical features classification.

It illustrates a code snippet for categorizing features into numerical and category kinds. Numerical data is just data that has numbers in it. It is further subdivided into two categories. There are two types of data: continuous data and discrete data. Discrete data is less accurate. It's mostly made up of integers. The dataset has an example number of features. Continuous data is a type of data that can have any value, including integers and floating points. Consider the issue of ageing. All binary values fall under this feature because categorical values are either 0 or 1.

The below figure 5 shows distribution of numerical features. The attributes which come under numerical distribution are: id, age. BP, blood urea, random blood glucose and albnum.

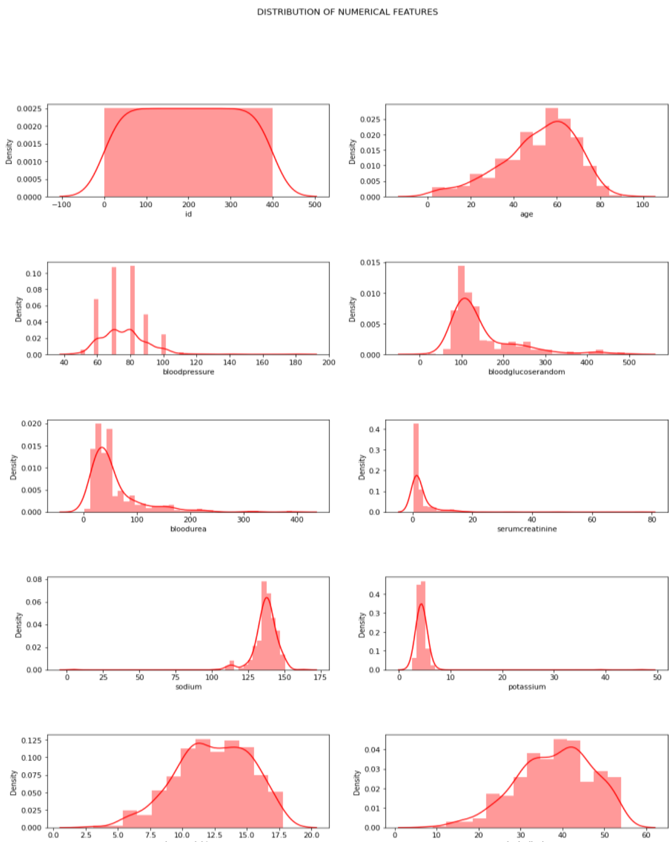


Figure 3: Distribution of Numerical features.

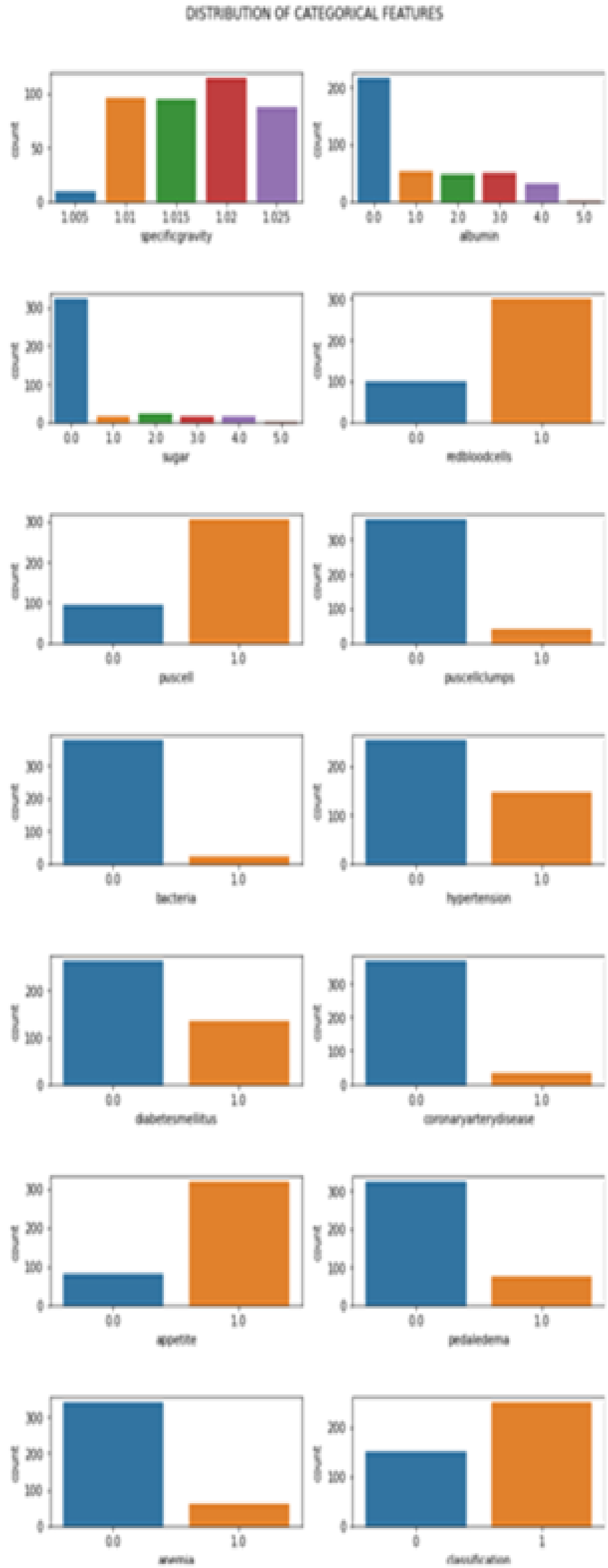


Figure 4: Distribution of Categorical features.

The above figure 4 shows the distribution of categorical features

- Heat Map

Heat map to show the correlation between the data attributes as shown below figure 5:

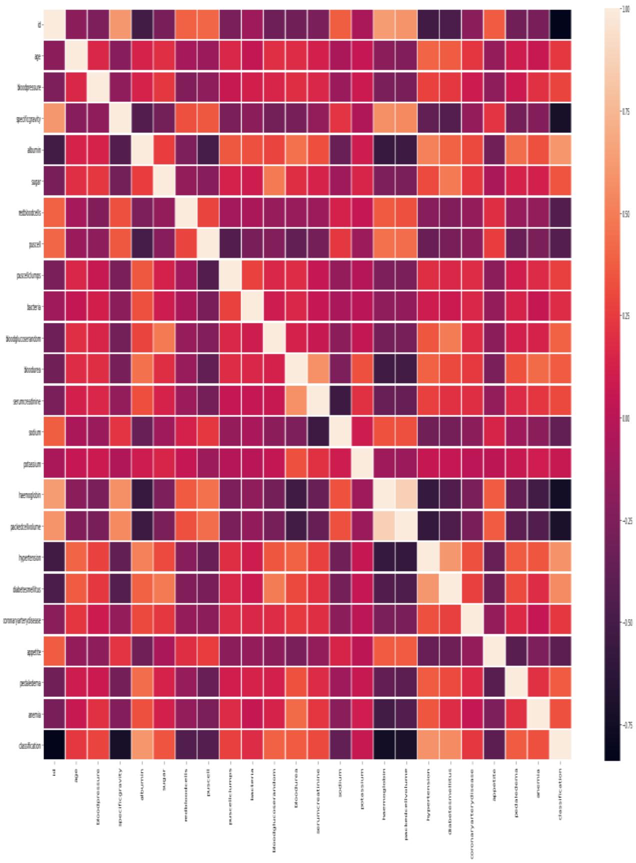


Figure 5 Heat map

In The below figure 6 it clearly shows the classification of

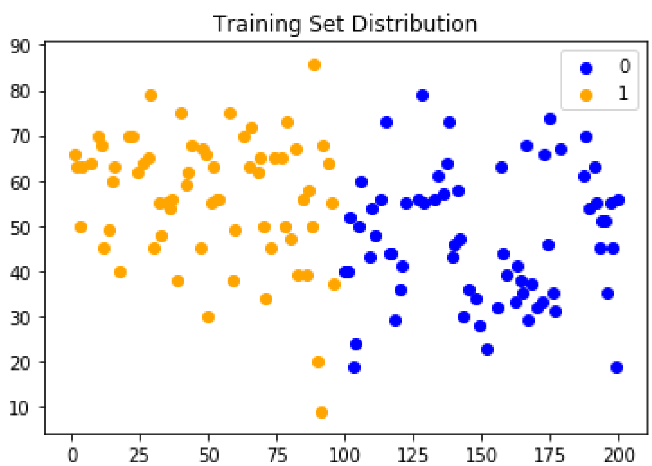


Figure 6 Training set distribution

Patients with and without CKD the blue color represents the person without CKD and yellow represents with CKD patients.

3. BUILDING ML MODELS

Logistic Regression -Logistic Regression is a supervised learning algorithm that is used when the target variable is categorical. Hypothetical function h(x) of linear regression predicts unbounded values. When the target variable is categorical, however, we must restrict the range of predicted values in Logistic Regression. Consider a classification problem in which we must determine whether or not an email is spam. As a result, the hypothetical linear regression function could not be utilised to predict because it predicts unbound values, but we must anticipate either 0 or 1. To do so, we use the sigmoid activation function on a hypothetical linear regression function. As a result, the following is a hypothetical logistic regression function.

- Heuristic function

$$h(x) = \text{sigmoid}(wx + b)$$

Here, w is the weight vector.
x is the feature vector.
b is the bias.

- Sigmoid function

$$\text{sigmoid}(z) = 1 / (1 + e^{(-z)})$$

Mathematical Intuition:
Because it is a non-convex function of weights, the cost function of linear regression (or mean square error) cannot be employed in logistic regression. Gradient descent and other optimization methods only converge convex functions to a global minimum. So, the simplified cost function we use:

- Cost function

$$J = -y\log(h(x)) - (1 - y)\log(1 - h(x))$$

This cost function is because when we train, we need to maximize the probability by minimizing the loss function.

$$\text{repeat until convergence } \{ \quad tmp_i = w_i - \text{alpha} * dw_i \quad w_i = tmp_i \}$$

where alpha is the learning rate.

- Difference chain rule

$$\frac{\partial J}{\partial w} = \frac{\partial J}{\partial a} * \frac{\partial a}{\partial z} * \frac{\partial z}{\partial w}$$

here, a = sigmoid (z) and z = wx + b.

KNN -K Nearest Neighbor algorithm falls under the Supervised Learning category and is used for classification (most commonly) and regression. It is a versatile algorithm also used for imputing missing values and resampling datasets. As the name (K Nearest Neighbor) suggests it considers K Nearest Neighbors (Data points) to predict the class or continuous value for the new Datapoint. It is used for regression and classification both. In KNN, K should be selected according to its neighbor. The new data should be assigning to the data whose neighbors are maximum. If the value of K is less such as (K=1 or K=2) thin it is noisy. If the value of K is more such as (k=8 or k=9) it is good but face some difficulties.

4. RESULT

As shown in Figure 9, the model was trained and tested using logistic regression, and it achieved a 98.5 percent accuracy.

GitHub link: https://github.com/shanuhimkar/Chronic-Kidney-Diseases.git

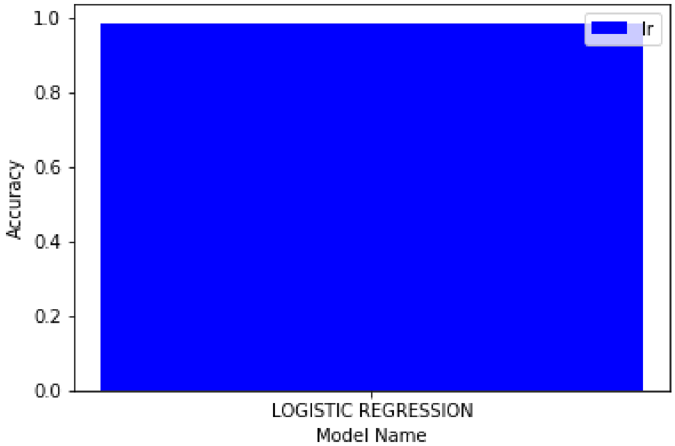


Figure 9 Logistic Regression

As shown in Figure 10, the model was trained and tested with KNN and attained an accuracy of 97.76 percent.

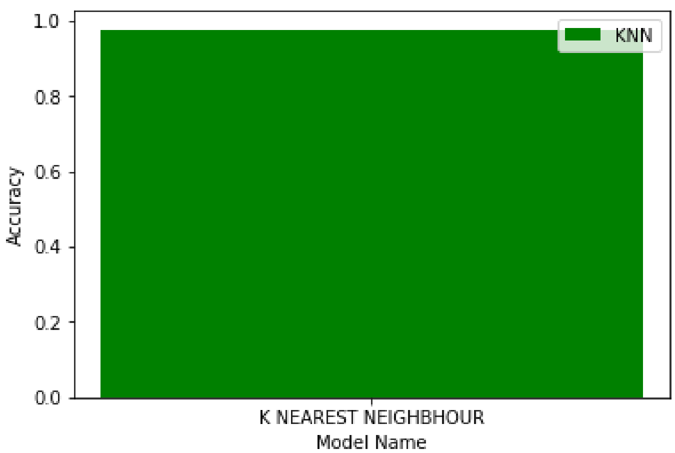


Figure 10 KNN

Table 1 comparison between LR, KNN

	Sensitivity	Specificity	Precision	Recall	Accuracy	FScore
LR	0.97	0.97	0.96	1	0.98	0.98
KNN	0.96	0.941	0.96	1	0.97	0.97

Table 1 shows the performance of various ML Algorithms used on dataset 1

5. CONCLUSION

When two different Machine Learning Algorithms were applied on the dataset, it was observed that logistic regression showed the best performance when compared to K Nearest Neighbors. It showed 98% accuracy which is highest when compared to 97% accuracy of K Nearest Neighbors. It can also be observed that none of our models gave false negative values. False negatives in a way are acceptablesince the patients can take early precautions and can get cured from this disease.

6. REFERENCES

[1] IEEE TRANSACTIONS ON MEDICAL IMAGING, VOL. 40, NO. 6, JUNE 2021 1555 Cascaded Regression Neural Nets for Kidney Localization and Segmentation-free Volume Estimation Mohammad Arafat Hussain, Ghassan Hamarneh, Senior Member, IEEE, and Rafeef Garbi, Senior Member, IEEE,2021.

[2] Dr. S. Vijayarani1, Mr.S. Dhayanand2," DATA MINING CLASSIFICATION ALGORITHMS FOR KIDNEY DISEASE PREDICTION", International Journal on Cybernetics & Informatics (IJCI), VOL 4, August 2015.

[3] Jing Xiao1,2†, Ruifeng Ding3†, Xiulin Xu3, Haochen Guan1,2, Xinhui Feng1,2, Tao Sun3, Sibo Zhu4* and Zhibin Ye1,2," Comparison and development of machine learning tools in the prediction of chronic kidney disease progression", Journal of Translational Medicine,2019.

[4] Vikas Chaurasia1, Saurabh Pal1, B.B. Tiwari2," Chronic Kidney Disease: A Predictive model using Decision Tree", International Journal of Engineering Research and Technology,VOL 11,2018.

[5] Syed Imran Ali, Bilal Ali, Jamil Hussain, Musarrat Hussain, Fahad Ahmed Satti, Gwang Hoon Park and Sungyoung Lee, "Cost-Sensitive Ensemble Feature Ranking and Automatic Threshold Selection for Chronic Kidney Disease Diagnosis ", MDPI, August 2020.

[6] Surya Krishnamurthy1, Kapeleshh KS2, Erik Dovgan3, Mitja Luštrek3, Barbara Gradišek Piletič4,Kathiravan Srinivasan1, Yu-Chuan Li5, Anton Gradišek3*, Shabbir Syed-Abdul, "Machine Learning Prediction Models for Chronic Kidney Disease using National Health Insurance Claim Data in Taiwan ", medRxiv,July 2020.

Tool for Evaluating Subjective Answers using AI (TESA)

Prof. Akshatha Kamath#1, Prerana Shetty #2, Rashmitha P #3, Sonali M #4, Raskshitha M #5

Department of Computer Science and Engineering, Sapthagiri College of Engineering
#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57, India
[1]akshathakamath@sapthagiri.edu.in
[2]preranashetty0674@gmail.com
[3]rashmithapu2000@gmail.com
[4]sonalimorey2000@gmail.com
[5]rakshithacs16016@gmail.com

***Abstract*— Modes of evaluation can be divided into two main types, namely, objective answer evaluation and subjective answer evaluation. The technique of objective answer evaluation is widely used for most entrance examinations. Examinations such as the GATE examinations are known to have never repeated questions. One of the major limitations of the objective examinations is that it fails to analyze how well a student has understood a particular subject.**

***Keywords*—Natural Language Processing (NLP), Bidirectional Encoder Representations from Transformers (BERT), Sentence Similarity, Optical Character Recognition (OCR).**

I. INTRODUCTION

Every year about 20 Lakh engineering students give their semester subjective written examinations, which accounts for more than 1.2 crores of papers to be corrected every semester. These tests consist of multiple choice questions that include explanations as responses. Subjective questions are the most constructive way to assess a student's understanding and play a significant role in determining how well a student has understood a subject. Many researchers claim that the essay's evaluated by assessment tools and by human graders leads to great variation in score awarded to students. Also, many evaluations are performed considering specific concepts (technical terms). If those particular concepts are present then only award grades otherwise answer is marked as incorrect. So to overcome this problem a new system is proposed. It involves parsing text and finding the semantic meaning of student answers and finally comparing it with instructors' answers and assigning the final scores. Manual answer evaluation is a very tedious task. Manual checking is a time-consuming process and also requires lots of manpower.

So, our system will evaluate answers based on keywords, and also manpower will be saved. Only one has to scan the paper then based on the keyword in the answer the system will provide the marks to the question according to the model answer sheet present. Also, in this system, the evaluation error of the marks to the particular question will be reduced. So, our system will evaluate answers based on some keywords, and also manpower will be saved. Only one has to scan the paper then the system will split the answer using OCR[1], based on the keyword in the answer the system will provide the marks to the question according to the dataset present [2]. Hence there is a need for such an application that will provide an easy evaluation of answers and can provide eligible marks.

II. PROPOSED SYSTEM

TESA comes with the opportunity of making a tedious task in the field of education more efficient and less time-consuming. The use of artificial intelligence to get optimized solutions in the form of marks obtained by the student is the core principle of the proposed system. The input answer sheets of the student will get compared to the model answer sheet by the evaluator and will then generate the final score based on multiple parameters. The score generated will be the final score that the student has obtained based on the answer given. The various parameters will be sentence splitting, Jaccard similarity, grammar checking, and sentence similarity. A few of the major challenges faced while developing a system for evaluation of student answers are stated below:

• Ensuring that every line of the model answer is compared to each line of the student answer i.e., even if the student structures the answer differently, it should be taken into consideration.

• A student can answer a question in multiple ways. Hence, it is essential to take into account the synonyms as well as similar meanings of words of the words present in the model answer.

• The speed of the system must be fast so the algorithm chosen must generate quicker results.

To achieve the objectives stated previously, as well as to encounter the major challenges faced while developing a system for evaluation of student answers, this proposed system is divided into the following phases: Phase 1- OCR will be used to convert handwritten student answers into digital letters. Phase 2- Splitting the model answer and student answer into sentences and then applying Jaccard similarity, grammar checking, and algorithm for sentence similarity using BERT on both the texts. Phase 3- Assigning marks based on a weighted average and displaying the score obtained by the student. A workflow diagram of phase 2 and phase 3 is depicted in Fig. 1.

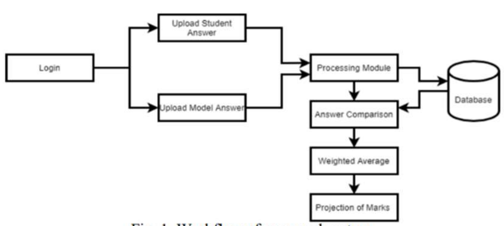


Fig. 1. Workflow of proposed system.

Existing systems evaluate answers on a text-basis only i.e., they match identical keywords from two sets provided and award marks based on the occurrence of those keywords [9]. This fails to take into account the different ways in which the same concept can be explained. Several methods and algorithms were studied and implemented to find the best way for the evaluation of the subjective answers. For the implementation of the system, a method for estimation of the degree of text similarity was needed. Jaccard Similarity was hence tried. Jaccard similarity can be described as the total intersection upon the summation of the union of both sets.

III. WORKING PRINCIPLES

After all the analysis and research, the most efficient methods were found to be:

a) OCR: It stands for Optical character recognition and it is used for the conversion of handwritten text to editable and searchable data. A picture in either format is fed into the recognition system (jpeg, png, etc). This is done by scanning an image from one of the optical scanners or accessing it from internal storage. Image preprocessing is one of the most essential and primary steps in image processing. For Image pre-processing, a machine learning model can be built in a variety of environments. Python language is one such dependable environment, and r studio is another useful tool for efficiently predicting, plotting, and depicting data.

Obtaining the dataset, or the image to be worked on is the first step of image pre-processing. The necessary libraries can then be imported, and these libraries come with several pre-built functions that assist in manipulating and visualizing data effectively. Python has several powerful libraries for high-end arithmetic operations, such as NumPy. The AFORGE library is imported, which supports computer vision, image and video processing, ANN, and Optical Recognition of Digital Characters using features of Machine Learning. The training set is then generated from the dataset. The training data is expected to train the computer, and the machine learns from this data. The test data is the information that is fed into the computer to obtain results. Function scaling is performed after the data set has been classified into test and train sets. It works with the image's most important features, such as the minimum bound box, segmentation, etc. Hence, it will be efficient for converting scanned student answer sheets to text format [13, 14].

b) Sentence splitting: As the name suggests, the function of this is to split multiple sentences in a paragraph into individual sentences accurately. This can be done using various NLP frameworks.

c) Jaccard Similarity: The Jaccard similarity is used for measuring the similarity between data sets, dissimilarity, and distance [12]. The Jaccard similarity coefficient between two data sets is calculated by dividing the total number of shared features by the total number of properties, as shown below. Where, J= Jaccard Distance, A= Set 1, B= Set 2.

d) Bidirectional Encoder Representations from Transformers (BERT): It is a recently developed model which provides high accuracy and hence is reliable. The full form of BERT is Bidirectional Encoder Representations from Transformers and in our system, it is used with Jaccard similarity to find out the sentence similarity. The BERT system is divided into two main parts: pre-training and fine-tuning. The model is conditioned on datasets through various pre-training activities. The BERT model is fine-tuned using labeled data from downstream tasks after it is iinitializedwith the pre-trained parameters. Further, if they are all initialized with the same pre-trained parameters, each downstream activity has its own fine-tuned model. [8]. BERT embeddings are contextual i.e., BERT can differentiate between words with the same spelling used in different contexts. Cosine similarity is shown between the indicated word pairs. As stated by Google, BERT achieves a 93.2% F1 score (a measure of accuracy), surpassing the previous state-of-the-art score of 91.6% and a human-level score of 91.2%.

The detailed flowchart for the proposed system discussed in the previous sections is shown in Fig. 4.:

Fig. 4. Detailed Flowchart of the Proposed System.

IV. ALGORITHMS

1.OCR Retrieval:

```
try:
  from PIL import Image
except ImportError:
 import Image
import pytesseract
import glob
def process(path):
   for filename in glob.glob(path+'/*.png'):
pytesseract.pytesseract.tesseract_cmd= r'C:\Program Files\Tesseract-OCR\tesseract.exe'
text=pytesseract.image_to_string(Image.open(filename))
# We'll use Pillow's Image class to open the image and pytesseract to detect the string in the image
return text
```

2.Evaluation Of Answer:

```
import numpy as np
import nltk as nlp
def word_tokenizer(sequence):
   """Tokenize string sequence on word level
   Arguments:
      sequence {str} -- String sequence
    Returns:
      list -- Contains word tokens out of the string sequence
   """
   # Perform sentence tokenization and word tokenization in a nested fashion
   word_tokens = list()
   for sent in nlp.sent_tokenize(sequence):
      for w in nlp.word_tokenize(sent):
         word_tokens.append(w)
return word_tokens


def create_vector(answer_tokens, tokens):
   """Create a one-hot encoded vector for the answer_tokens` on the basis of `tokens`
  Arguments:
      answer_tokens {list} -- Tokenized user answer
      tokens {list} -- Tokenized actual answer corpus
      Returns:
      numpy.array -- A one-hot encoded vector of the answer """
   return np.array([1 if tok in answer_tokens else 0 for tok in tokens])
def cosine_similarity_score(vector1, vector2):
   """Cmpute the euqlidean distance between teo vectors
      Arguments:
      vector1 {numpy.array} -- Actual answer vector
      vector2 {numpy.array} -- User answer vector
      Returns:
      float -- Distance between two vectors """
```

```
def vector_value(vector):
  """Compute the value of a given vector Arguments:
       vector {numpy.array} -- Vector array
       Returns:
       float -- Value of the n-dimensional vector
        """
        return np.sqrt(np.sum(np.square(vector)))
# Get vector value
v1 = vector_value(vector1)
v2 = vector_value(vector2)
# Compute euclidean distance
v1_v2 = np.dot(vector1, vector2)
return (v1_v2 / (v1 * v2)) * 100

def process(original_answer, user_answer):
   score_obt = 0
   original_ans_list= word_tokenizer(original_answer)
   user_ans_list = word_tokenizer(user_answer)
   # Join both word based vectors to get the overall vector
   overall_list = original_ans_list + user_ans_list
   # Create numeric vectors for both original answer and user answer based on the overall vector
   vector1=create_vector(original_ans_list,
overall_list)
   vector2 = create_vector(user_answer, overall_list)
   # Compute the similary score between the original ans vector and user ans vector
   score_obt=cosine_similarity_score(vector1,vector2)
   return score_obt
```

3. Score Calculation:

```
     def finalevaluvation(text,qid,rollno):
          total_score=0.0
          scoreforaquest=0.0
          print("text==",text)
          print("qid==",qid)
     cmd="SELECT answer FROM quest where qid='"+qid+"'"
     print(cmd)
     conn.execute(cmd)
     data=conn.fetchall()
     total_score += sc.process(str(data), text)
     #total_score /= 2
     cmd="SELECT mark FROM quest where qid='"+qid+"'"
     print(cmd)
     conn.execute(cmd)
     data1=conn.fetchall()
     actualmark=data1
     print("Actual mark==",actualmark[0])
     am=int(''.join(map(str, actualmark[0])))
     print("am==",am)
     total_score = round(total_score, 3)
     if total_score > 40.0:
            scoreforaquest=am
            status = "Pass"
     elif total_score > 30.0 and total_score<40.0 :
            scoreforaquest=am/2
            status = "Pass"
     elif total_score > 20.0 and total_score<30 :
            scoreforaquest=am/3
            status = "Pass"
     else:
            scoreforaquest=0.0
            status = "Fail"
     print("Score for Question 1=",total_score)
     print("Result=",status)
     session["score"] = np.round(scoreforaquest, decimals=2)
     session["result"] = status
     mark=np.round(scoreforaquest, decimals=2)
     print("mark==",mark)
```

V. MODULE DESCRIPTION

Teacher: In this module, Teachers can log in to our application using their credentials and they can add the questions and answer keys. Teachers can publish the results to the students.

Student: In this module, students can register to our application and log in through their credentials if they are authorized students they can upload the image of the answer into our system. Students can view their own results.

Exam paper evaluation: In this model will work when teachers click evaluate. All the answers are stored in our server in image format. In this module, we are applying the OCR model to extract the content from the image. Once the text content is extracted we are applying the NLP tokenizing and vectorizing techniques to convert the text to vectors.

Score calculation: Then we are comparing the Jaccard similarity between the actual answer with the student answer. Based on the similarity matches we are applying the score for questions.

VI. CONCLUSION

All the studies which have been reviewed show that there are various different techniques for the evaluation of subjective answer sheets. The advantage of the system lies in the fact that it uses a weighted average of the closest to accurate techniques to provide the most optimized result. TESA is a systematic and reliable system that eases the role of evaluators and provides faster and more efficient outputs. This system offers a reliable, robust, and obvious short response time result. In the future, a system can be developed to evaluate diagrams as well as tables, an inbuilt system can also be made to type and make diagrams to shift examinations from handwritten paper based to completely online.

REFERENCES

[1] P.A.A. Dumal, W.K.D Shanika, S.A.D Pathinayake, and T.C. Sandanayake.: Adaptive and Automated Online Assessment Evaluation System. In: 2017 11th International Conference (SKIMA)

[2] Nisarg Dave, Harsh Mistry, and Jai Prakash Vera, Assist. Prof.: Text Data Analysis: Computer Aided Automated Assessment System. In: IEEE-CICT 2017, 978-1-5090-6218-8/17/$31.00 ©2017 IEEE

[3] Dharma Reddy Tetali, Dr. Kiran Kumar G and Lakshmi Ramana.: A Python Tool for Evaluation of Subjective Answers (APTESA). IJMET Volume 8, Issue 7, July 2017, pp. 247–255, Article ID: IJMET_08_07_029

[4] Prince Sinha, Sharad Bharadia, Dr. Sheetal Rathi, and Ayush Kaul.: Answer Evaluation Using Machine Learning.In: https://www.researchgate.net/publication/333856264, March 2018

[5] Ms. Shweta M. Patil and Prof. Ms. Sonal Patil.: Evaluating Student Descriptive Answers Using Natural Language Processing. (IJERT) ISSN: 2278-0181 Vol. 3 Issue 3, March – 2014

[6] V. Lakshmi and Dr. V. Ramesh.: Evaluating Students' Descriptive Answers Using Natural Language Processing and Artificial Neural Networks. 2017 IJCRT | Volume 5, Issue 4 December 2017 | ISSN: 2320-2882

[7] Piyush Patil, Sachin Patil, Vaibhav Miniyar and Amol Bandal.: Subjective Answer Evaluation Using Machine Learning. International Journal of Pure and Applied Mathematics Volume 118 No. 24 2018, ISSN: 1314-3395 (online version)

[8] Jacob Devlin, Ming-Wei Chang, Kenton Lee and Kristina Toutanova.: BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding. In: Proceedings of NAACL-HLT 2019, pages 4171–4186 Minneapolis, Minnesota, June 2 - June 7, 2019. 2019 Association for Computational Linguistics

[9] Shun LONG, Qunhao FENG and Wenwei CHEN.: A Novel Approach to Automatic Rating of Subjective Answers based on Semantic Matching of Keywords. In: 2016 12th International Conference on Computational Intelligence and Security

[10] Xinming Hu and Huosong Xia.: Automated Assessment System for Subjective Questions Based on LSI. 978-0-7695-4020-7/10 $26.00 © 2010 IEEE

[11] Kittakorn Sriwanna.: Text Classification for Subjective Scoring Using K-Nearest Neighbors. In: The 3rd International Conference on Digital Arts, Media, and Technology (ICDAMT2018) 978-1-5386-0572-1/18/$31.00 ©2018 IEEE

[12] Suphakit Niwattanakul, Jatsada Singthongchai, Ekkachai Naenudorn, and Supachanun Wanapu.: Using of Jaccard Coefficient for Keywords Similarity. In: Proceedings of the International MultiConference

Stock Market Prediction using Machine Learning and Sentimental Analysis

Niranjan S, S Mohit
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India
niranjanrajini20001gmail.com
macsuresh2001@gmail.com

Shreyas.V.Rao,Suprith K S
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India
shreyasvrao@gmail.com
kssuprith2015@gmail.com

Chaitra N C
Computer Science and Engineering
Sapthagiri College of Engineering
Banglore,India

Abstract— The stock market, sometimes known as the stock exchange, is one of the most complicated and advanced ways to do business. The stock market is liable, but it is also one of the most functional techniques to make huge profits when approached with proper order. Small businesses, brokerage firms, and financial sectors all depend on this entity to generate revenue and distribute risks. This work aspire to use open-source libraries and existing methods to create machine learning models in a Web application to prognosticate future stock market prices for stock exchange, in order to aid this liable kind of tradinga bit more. To avoid the usual method and avoid getting the outcome fully based on numbers, a system to consolidate text-based machine learning model and pattern recognition is applied. The objective is to create a platform for small and non-professional traders, from the existing stock prediction models considering parameters like news editorial, stock volume, previous close, etc. to predict the future stock market values.

Keywords—Stock market prediction, machine learning, Sentimental Analysis.

I INTRODUCTION

Stock Market is one of the classic methods where a normal person would trade stocks, make investments, and gain some money out of organizations that sell a part of their company in this market. Stock market provides a platform for almost all major economic deals in the world at a dynamic rate called the stock value which is based on market symmetry. This method shows to be a capable investment scheme if done wisely.

Projecting this stock value offers large profit opportunities which are a great motivation for research in this area. Even a small amount of knowledge about stocks can result in large earnings. Likewise, in the repeated context, possibly correct prediction might get great earnings., in both industry and academics to find a way past the problems like volatility, seasonality and dependence on time, economics and rest of the market. However, the platform's prices and liquidity are highly unpredictable, which is where technology comes into aid.

Earlier, one of the most likely study areas was stock market prediction. Small-scale industries, and banking sectors all depend on the stock market to initiate mony and so spread prospect. As a result, predicting the stock

value is a topmost priority. If we use network of people to plot graph of the stock exchange price, we will get an appropriate result to a real-time graph, but it will be very slow process. Trading algorithms of stock market can now more accurately forecast stock price movements. thanks to recent developments in deep learning. Unfortunately, there is a huge gap in the implementation of this improvement in the real world, In addition these advancements are rarely used to benefit small-scale industries.

The objective behind "Stock Market Prediction using Machine Learning and Sentimental Analysis" is to make a dynamic web-application with proper machine learning models that may aid many pint-sized industries to invest for a long term.

II. LITERATURE REVIEW

A. NETWORK MODEL OF LSTM

Long-Short-Term Memory Recurrent Neural Network belongs to the family of deep learning algorithms. It is a recurrent network because of the feedback connections in its architecture. It has an advantage over traditional neural networks due to its capability to process the entire sequence of data. Its architecture comprises the cell, input gate, output gate and forget gate.

The cell remembers values over arbitrary time intervals, and the three gates regulate the flow of information into and out of the cell. The cell of the model is responsible for keeping track of the dependencies between the elements in the input sequence. The input gate controls the extent to which a new value flows into the cell, the forget gate controls the extent to which a value remains in the cell, and the output gate controls the extent to which the value in the cell is used to compute the output activation of the LSTM unit.

B.CONVOLUTIONAL RECURRENT DEEP LEARNING MODEL FOR SENTENCE CLASSIFICATION

Natural Language Processing (NLP) is a vast area of computer science that is concerned with the interaction between computers and human language. Language modelling is a fundamental task in artificial intelligence and NLP. A language model is formalized as a probability distribution over a sequence of words. Recently, deep learning models have achieved remarkable results in speech recognition and computer vision classification plays an important role in many NLP applications, such as spam filtering, email categorization, information retrieval, web search, and ranking and document classification, in which one needs to assign predefined categories to a sequence of text. A popular and common method to represent texts is bag-of-words. However, the bag-of-words method loses the words order and ignores the semantics of words. N-gram models are popular for statistical language modelling and usually perform the best.

However, an n-gram model suffers from data sparsity. Neural Networks have become increasingly popular it has become possible to train more complex models on a much larger dataset. They outperform n-gram models and overcome the data sparsity problem semantically similar words are close in vector space. The embedding of rare words is poorly estimated, which leads to higher perplexities for rare words. With the progress of machine learning in recent years, it has become possible to train more complex models on much larger data sets.

C. STUDY ON THE PREDICTION OF STOCK PRICE BASED ON THE ASSOCIATED NETWORK MODEL OF LSTM

Stock market has received widespread attention from investors. It has always been a hot spot for investors and investment companies to grasp the change regularity of the stock market and predict its trend. Currently, there are many methods for stock price prediction. The prediction methods can be roughly divided into two categories: statistical methods and artificial intelligence methods. Statistical methods include logistic regression model, ARCH model, etc. Artificial intelligence methods include multi-layer perceptron, convolutional neural network, naive Bayes network, back propagation network, single-layer LSTM, support vector machine, recurrent neural network, etc. But these studies predict only one single value. In order to predict multiple values in one model, it need to design a model which can handle multiple inputs and produces multiple associated output values at the same time. For this purpose, it is proposed an associated deep recurrent neural network model with multiple inputs and multiple outputs based on long short-term memory network. The associated network model can predict the opening price, the lowest price and the highest price of a stock simultaneously. The associated network model was compared with LSTM network model and deep recurrent neural network model. The experiments show that the accuracy of the associated model is superior to the other two models in predicting multiple values at the same time, and its prediction accuracy is over 95%

D.STOCK MARKET PREDICTION USING MACHINE LEARNING CLASSIFIERS AND SOCIAL MEDIA, NEWS

Accurate stock market prediction is of great interest to investors; however, stock markets are driven by volatile factors such as microblogs and news that make it hard to predict stock market index based on merely the historical data. The enormous stock market volatility emphasizes the need to effectively assess the role of external factors in stock prediction. Stock markets can be predicted using machine learning algorithms on information contained in social media and financial news, as this data can change investors' behavior. In this paper, we use algorithms on social media and financial news data to discover the impact of this data on stock market prediction accuracy for ten subsequent days. For improving performance and quality of predictions, feature selection and spam tweets reduction are performed on the data sets.

E.STOCK LEVERAGE FINANCIAL NEWS TO PREDICT STOCK PRICE MOVEMENTS USING WORD EMBEDDINGS AND DEEP NEURAL NETWORKS.

Financial news contains useful information on public companies and the market. In this paper we apply the popular word embedding methods and deep neural networks to leverage financial news to predict stock price movements in the market. Experimental results have shown that our proposed methods are simple but very effective, which can significantly improve the stock prediction accuracy on a standard financial database over the baseline system using only the historical price information.

III. RELATED WORKS

1.Financial news contains useful information on public companies and the market. In this paper we apply the popular word embedding methods and deep neural networks to leverage financial news to predict stock price movements in the market.

2. Experimental results have shown that our proposed methods are simple but very effective, which can significantly improve the stock prediction accuracy on a standard financial database over the baseline system using only the historical price information.

3.Asur et all focus on predicting box office revenue of movies using sentiment from twitter messages. Their main hypothesis was that the more a movie is talked about, the more likely it is to be successful at the box office. They performed prediction using the following two approaches. Without any sentiment analysis: A mention in a tweet is assumed positive.

4.The underlying assumption is that people post positive comments about movies way more than they post negative comments. They use this to construct a feature called "tweet rate" and use a regression model to perform prediction. With sentiment analysis using an N-gram language model.

5.Gold data was generated using Amazon Mechanical Turk and the prediction was compared with HSX (Hollywood Stock Exchange). Their overall results showed that twitter data can be used for predicting box office success.

6.Bandari et all propose a method to predict the popularity of news items on the social web. For each news article, features are generated based on the source of the news story, news category, subjectivity of the news, and named entities mentioned in the news. They apply regression and classification algorithms to predict news popularity based on these features.

7.Experiments showed that it is possible to estimate ranges of popularity with an overall accuracy of 84% considering only content features. In contrast to [6], Hong et al. predict popularity of recent messages on twitter. They model the problem as a classification problem, and construct features based on message content, temporal information, metadata of messages and users, as well as the users' social graph.

8.Gilbert et all estimate anxiety, worry and fear from over 20 million posts on LiveJournal, and find that an increase in these negative expressions predict downward pressure on the S&P 500 index.

9.Zhang et all describe a simple approach to predict stock market indicators such as Dow Jones, NASDAQ, and S&P 500 by analyzing twitter posts. The authors estimate tweet mood based on tweet count of words expressing certain pre-decided mood (hope, fear, worry), number of followers of the mood, number of re-tweets of the moods, etc.

IV. PROPOSED SYSTEM

The proposed method involves developing an interactive Web App for stock traders to use to forecast future stock market values. The Web App also shows market prices, volume, and associated statistics, as well as the selected stock's prediction. The goal is to create a platform with many efficient stock market machine learning methods. Individually learned stock prediction parameters include Finance News, and Stock data.
The entire Web Application can be divided into the following sections:

1. Login/Register: Web Application has a initial page for user verification where users can login to the app to view the on-going status and forecast of various stocks. The user can also sign up/register if login for the first time.

2. Stock live Page: The stock live page has a glider with list of stocks, a livestock price display, and predicted values. Users can choose the required stocks from the glider and the corresponding live stock values, predicted graphs, and ML model results will be displayed.

3. YFinance stock data: The current stocks about the specific stock will be displayed in the new bar which the user can view and also navigate to the data by clicking the link. The Current stock is fetched from the cloud and displayed in the web application, the same news is also vectorized to its positive or negative factor and displayed to lookover its impact on thestock price. The closing price of the market is collected to forecast the upcoming prices using LSTM. thereafter graphically represented in the web application. The XGBoost prediction model collects the OHLC (open, high, low, close) price along with volume and news vector to predict the following days trends. It is also illustrated in the web application through graph.

FLOW OF PROCESS

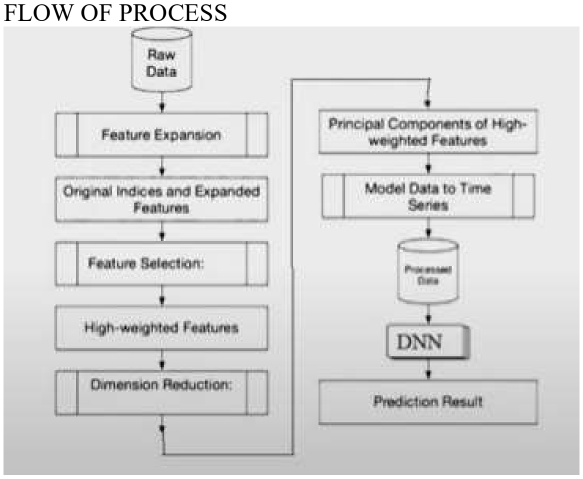


Fig: Flow Process of the Proposed System

V. IMPLEMENTAION

The backend of the whole project is executed using python and Django framework. PostgreSQL manages the user data and login information. HTML, CSS and JavaScriptis used effectively to make a reactive web app. Chart.js library is used to display the stock charts.

Stock Live Data: The ML models need online data like news editorial, volume, tweets etc. The web application also needs the data to display the ongoing stock graph. Thus, the data is fetched using Yahoo Finance API and nsepython package

ML Models: The application has 3 stock prediction models.
Sentiment Vector: Searches for the trend of the current news of thestock. LSTM finds the closing price of next 30 days. XGBoost forecasts the stock price with news data, volume, previous close, open, tweets etc.

1) LSTM: The LSTM model is used to forecast the stock closing price for the next 30 days from the current date. The Long-short term memory model is trained with the closing price the stock to predict the future closing patters. The 20 years of closing price of was taken for LSTM. 80% of the data was trained and 20% was used for testing. The model showed an accuracy of 99% accuracywith the test data. The model was then saved with the web application.

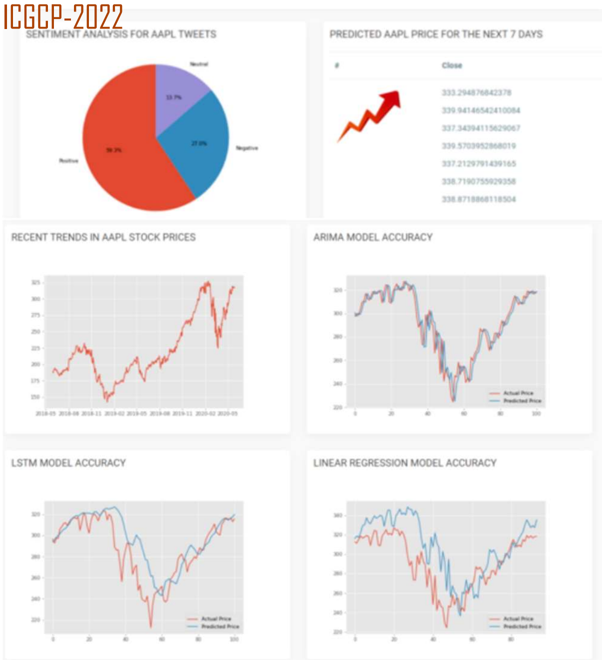
2) Data Vector: The Tfidf Vectorizer from scikit-learn is used to analyze the current stock data. The model takes the news data as input and gives a vectorized value of the news. It gives the positivity and negativity of the news. It is then incorporated with the webapp. The current news data is fetched through yahoo finance API.

3)XGBoost: The XGBoost algorithm gives the most accurate and reasonable prediction. The model takes news vector, open price, close price, volume of 3 days as input and predicts the closing price for the next 3 days.

The model was trained with 2 years of data. The news editorial data is extracted by web scraping dataset was processed to combine the news editorial data with the quant on the basis of date. 80% of the data wasused for training and 20% was used for testing. The model showed 90% accuracy. It is then saved with the web application

VI. RESULTS AND CONCLUSION

An interactive web application to forecast the stock market prices for companies which let the users to buy the stocks which help small scale traders and small-scale industries to wisely invest reducing risk. Our works clearly showed an increased accuracy in stock market prediction compared to other similar works.



REFERENCES

[1] T. Wilson, P. Hoffmann, S. Somasundaran, J. Kessler, J. Wiebe, Y. Choi, C. Cardie, E. Riloff, and S. Patwardhan, “Opinionfinder: a system for subjectivity analysis,” in Proceedings of HLT/EMNLP on Interactive Demonstrations, HLT-Demo ’05, (Stroudsburg, PA, USA), pp. 34–35, Association for Computational Linguistics, 2005.

[2] S. Asur and B. A. Huberman, “Predicting the future with social media,” in Proceedings of the 2010 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology - Volume 01, (Washington, DC, USA), pp. 492–499, IEEE Computer Society, 2010.

[3] R. Bandari, S. Asur, and B. A. Huberman, “The pulse of news in social media: Forecasting popularity,” CoRR, 2012.

[4] L. Hong, O. Dan, and B. D. Davison, “Predicting popular messages in twitter,” in Proceedings of the 20th international conference companion on World wide web, WWW ’11, (New York, NY, USA), pp. 57–58, 2011.
Computational Techniques (ICCT)Manipal University Jaipur, Dec 22-23, 2017

[5] Sentiment analysis using harn algorithm-D V Nagarjana Devi -Assistant Professor, IIIT, Rgukt,Nuzvid , DR.T.V.Rajanikanth Professor,Snist , Hyderabad.Tg , Pantangi Rajashekar -UG Student,IIIT,Rgukt,Nuzvid Gangavarapu Akhil - UG Student , IIIT,Rgukt,Nuzvid

[21] StockClue: Visual Interpretation of Text-based Deep Stock
Prediction- Lei Shi, Senior Member, IEEE, Zhiyang Teng, Le Wang, Yue Zhang, and Alexander Binder - IEEE Transactions On Knowledge And Data Engineering

[6] Leverage Financial News to Predict Stock Price Movements Using Word Embeddings and Deep Neural Networks-Yangtuo Peng and Hui Jiang - Department of Electrical Engineering and Computer Science York University, 4700 Keele Street, Toronto, Ontario, M3J 1P3, Canada

[7] Stock market prediction using machine learning classifiers and social media, news-Wasiat Khan , Mustansar Ali Ghazanfar ,Muhammad Awais Azam , Amin Karami , Khaled H. Alyoubi and Ahmed S. Alfakeeh - Journal of Ambient Intelligence

[8]Humanized ComputingIntegrated Long-Term Stock Selection Models Based on Feature Selection and Machine Learning Algorithms for China Stock Market-Xianghui Yuan Jin Yuan , Tianzhao Jiang , and Qurat Ul Ain - IEEE AccessThe news data vectorized using TfidfVectorizerThe Django interface showing all the stock predictions.
Comparison of our model with other models stated in other approaches from various journals.

[9] Short- term stock market price trend prediction using a comprehensive deep learning system – Jimgyi Shen and M Omair Shafq, Shen and Shafiq J Big Data

[10] Study on the prediction of stock price based on the associated network model of LSTM - Guangyu Ding and Liangxi Qin -International Journal of Machine Learning and Cybernetics(2020)

[11] Vector Representation of Words for Sentiment Analysis Using GloVe - Yash Sharma, Gaurav Agrawal, Pooja Jain, Member,
IEEE,Tapan Kumar Senior Member IEEE Indian Institute of Information Technology, Kota-2017 International Conference on Intelligent Communication and Computational Techniques (ICCT) Manipal University Jaipur, Dec 22-23, 2017

[12] Sentiment analysis using harn algorithm-D V Nagarjana Devi -Assistant Professor, IIIT, Rgukt,Nuzvid , DR.T.V.RajanikanthProfessor,Snist , Hyderabad.Tg , Pantangi Rajashekar - UG Student, IIIT,Rgukt,Nuzvid Gangavarapu Akhil - UG Student , IIIT,
Rgukt,Nuzvid

Sign Language Recognition Using OpenCV

Anusha S#1, Preethi U#2, Sangeetha R#3, Varshitha T M#4

Department of Computer Science and Engineering, Sapthagiri College of Engineering

#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India

[1]anuchinnupoo@gmail.com
[2]preethiumakantha@gmail.com
[3]sangeetharaj169@gmail.com
[4]varshithatm09gmail.com

***Abstract*– In the human society there are different kinds of people living. Some of them are normal, special and some are disabled. For those disabled people especially for deaf, dumb, and blind people communication will become a big problem. To help those disabled people sign language recognition provides some of the facilities which are required for the communication with other people. To reduce the communication gap between disabled and normal people, there are four main modules in the project, each module has its own specification like converting voice to text, recognizing hand gestures, text to voice and image to speech. By training data modules the project will achieve to help required people.**

***Keywords*- espeak, Tesseract OCR, Image capture, Image Preprocessing , Feature extraction.**

I. INTRODUCTION

God has given n number of gifts to human beings but in that most important one are visual, hearing and speaking. Through the gifts people will express their feelings, emotions and can hear and communicate with each other. The project is about helping disabled people like deaf, dumb and blind to communicate with them and also with normal people. In many situationsnormal people ignore disabled one's because lack of communication. To overcome from all the problems that ate facing by disabled people sign language recognition is a solution.For the dumb people, they are unable to speak for them text to speech has implemented through that they can listen and respond or communicate with others. In deaf case they cannot hear for that implemented speech to text, through that they can respond or communicate. But in blind case they cannot see any text, they can use speech and hand gestures to communicate. To develop all the modules project requires some of software's and hardware components. Specially software like Tesseract OCR, OpenCV, Espeak and also machine learning algorithm. Tesseract OCR, an open source optical character recognition. It uses language specific training data in the recognize words. OpenCV is a open source computer vision library which provides common infrastructure to computer vision application and accelerates use of machine perspective and produces the output. Espeak it also an open source software, it is a speech synthesizer for English and other languages. By using all these software to achieve better communication for disabled people with others. So that leads to better communication with all people .

II. LITERATURE REVIEW

For two-way communication, the system turns their sign symbol to text and audio output, as well as a regular person's speech to the matching sign symbol. To detect the sign symbol, the system includes a flex sensor and an IMU (Inertial Measurement Unit), as well as a speech synthesis chip for voice output and a speech recognising module for converting voice to sign symbol. Y. Usha Devi created and developed the site[1]. Subhankar invented a system that works without hand-held gloves or sensors by continuously collecting motions and converting them to voice and vice versa. The system will concentrate on hand gesture detection and the construction of a human-computer interface (HCI) system that achieves accuracy, real-time gesture processing, and reduced processing time [2]. The project is a two-way smart communication system for Deaf and Dumb people as well as the general public. The Leap Motion technology can be used to create an innovative two-way communication system that eliminates all barriers to hearing handicapped people communicating with their surroundings[3]. Using a real-time automatic sign language gesture recognition system and several tools. Although our planned project called for recognising sign language and translating it into text. The data set was split into two sections, one for training and the other for testing [4]. The prototype is made up of 40 mics that are worn on the wrist. The performance of gesture recognition is assessed by identifying 36 gestures in American sign language [5].

III. PROPOSED SYSTEM

We used a tiny credit card-sized computer called a Laptop to solve problems with visually and verbally handicapped persons. We provide a solution for blind, deaf, and dumb individuals with this technology. The suggested system includes an input–microphone for recording speech modulation, a camera for capturing photos, a keyboard for typing messages, and an output–speaker and device screen for displaying texts and images. The device converts text to speech (TTS) and the user can reply as a text message. The sound is produced by a small but powerful speaker. The image is recorded using the camera, then text to speech (TTS) conversion is used to read the text. The device also recognizes the users' gestures and displays the words associated with them. The device then converts speech to text (STT) and displays it on the device screen, based on what the user says. It takes inputs from the microphone.

IV. SYSTEM ARCHITECTURE

The ability to visualize, listen, speak, and respond appropriately to the situation is one of the most valuable gifts a humans. However, some unfortunate people are denied with this opportunity. It is always a difficult task to create single compact gadget for persons with visual, hearing, and vocal impairments. Communication between deaf-dumb and blind people has always been difficult.

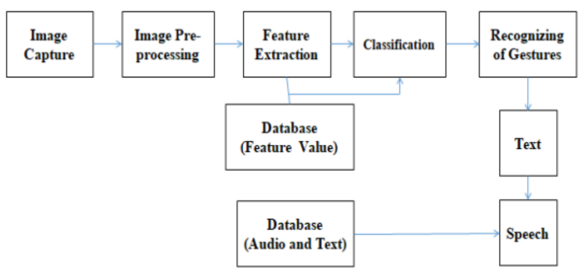


Figure 1: System Architecture of the Proposed System

In a single compact device, the system presents a novel communication system architecture for deaf, dumb, and blind individuals. A method for a blind person to read a text that involves taking an image with a camera and converting the text to audio (TTS).It uses voice to text (STT) conversion technology to allow deaf persons to read a text. It also has a text-to-voice conversion tool for deaf individuals. The system comes with four switches, each of which serves a particular purpose. The blind can use Tesseract OCR (Optical Character Recognition) to read words, the stupid can transmit their message through text that will be read out by espeak, and the deaf can hear others' voice through text, allowing them to communicate with regular people. It has a minimal footprint and supports a large number of languages.

V. DATACHART OF THE SYSTEM

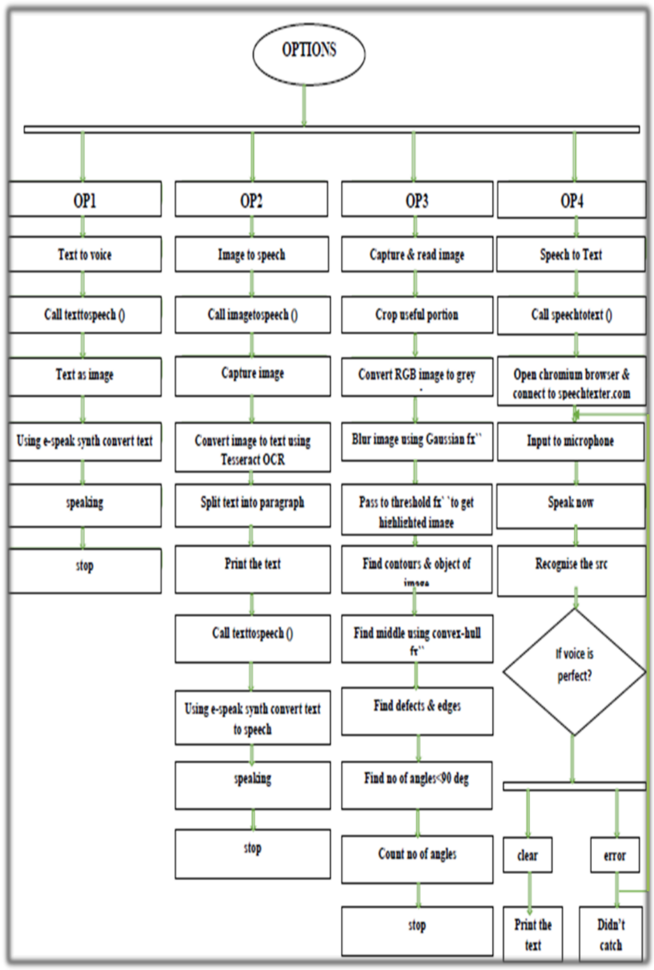


Figure 2: Datachart of the system

A. TEXT-TO-SPEECH (TTS)

The first step, converts text to speech for the deafeningly. The Dumb translate their thoughts into text that can then be converted into a speech signal. The espeak synthesizer speaks out the transformed voice signal. The OS and sub-processes were imported after selecting option OP1. Call the text-to-speech function and type the text into the input box. The espeak synthesizer turns text to speech when it is entered from the keyboard. The ctrl+C keyboard interrupt is also included in the procedure.

B. IMAGE-TO-SPEECH USING CAMERA (ITSC)

The second method was created for blind people who are unable to read standard text. We used the OPENCV program to link the Logitech camera to collect the image in order to assist blind individuals. Tesseract OCR is used to transform the captured image to text, which is then saved as fileout.txt. Split the paragraph into sentences in the text file and save it. Adaptive thresholding algorithms are used in OCR to convert photos into binary images, which are then converted into character outlines. The espeak reads out the transformed text.

C. GESTURE-TO-SPEECH (GTS)

The third process is designed for those who are deaf or hard of hearing and are unable to communicate their thoughts to others. Dumb individuals communicate with regular people through gestures that are mostly unintelligible to normal people. The procedure begins with the capture of an image and then cropping out the useful area. Convert the RGB image to grayscale for better performance. To retrieve the highlighted section of the image, use the Gaussian blur function to blur the cropped image and then put it through the threshold function. Find the outlines of two fingers and an angle between them. The finger point can be implemented using the convex hull function. The number of flaws is determined by counting the number of angles that are less than 90 degrees. The text is printed on display and read out by the speaker based on the number of flaws.

D. SPEECH-TO-TEXT (STT)

The fourth process was created for those with hearing impairments who are unable to understand regular people's statements. In order to assist them, our project includes a switch that converts the voice of ordinary people into text. We utilized the chrome browser, which is immediately linked to the speechtexter.com URL. To recognize the voice signal, the operation is carried out by setting a minimal threshold voltage. The input comes in the form of a microphone, which is then transformed to text. A number of languages are supported by the URL. If the speech signal is recognized, the text will be printed; otherwise, an error message will be displayed.

VI. IMPLEMENTATION

Although there are a variety of ways to implement this project, we choose Python since It is a widely used general-purpose, high-level, dynamic programming language that is interpreted. Its design philosophy emphasizes clarity, and its syntax allows programmers to express concepts with fewer lines of code than languages like C++ or Java. The language offers elements that allow for the creation of concise programs on both a small and big scale. Object-oriented, imperative, functional, and procedural programming are among the programming paradigms supported by Python. It comes with a large and comprehensive standard library, as well as a dynamic type system and smart memory management. Python interpreters are available for a variety of operating systems, allowing Python code to operate across multiple platforms. Using third-party tools like Py2exe or Pyinstaller, Python code can be packaged as stand-alone executable files for some of the most popular operating systems, allowing Python-based applications to be distributed without requiring the installation of a Python interpreter. CPython, is a reference version of Python, and all of its alternative implementations are free and open-source software with a community-driven development plan. CPython is managed by the Python Software Foundation, a non-profit.

VII. PSEUDOCODE

1. Text-to-speech (TTS) Algorithm

Step 1: Begin
Step 2: It converts from text to speech, select option OP1.
Step 3: Invoke Text-to-Speech feature ().
Step 4: Use e-speak synthesizer to convert from text to speech.
Step 5: The voice is produced.
Step 6: Put an end to it.

2. Camera based Image-to-speech (ITSC) Algorithm

Step 1: Begin.
Step 2: It converts an image into voice, select option OP2.
Step 3: Invoke Image-to-Speech tool ().
Step 4: Take the photograph you'll need.
Step 5: Using Tesseract OCR, convert the image to text.
Step 6: Make paragraphs out of the text.
Step 7: On the screen, text is displayed.
Step 8: Call the TexttoSpeech () function next.
Using the e-speak synthesizer, convert the text to speech.
Step 10 is the creation of a voice.
Step 11: Put an end to everything.

3. Gesture-to-speech(GTS) Algorithm

Step 1: Begin
Step 2: To translate gestures to text, select option OP3.
Step 3: Take a picture of the gesture and read it.
Step 4: Cut out the useful part of the image.
Step 5: Change the RGB image to a greyscale image.
Step 6:Using the Gaussian Blur method, blur the image.
Step 7: To obtain an image, pass the processed image to the threshold method.
Step 8: Locate the image's outlines and object.
Step 9: Next, use the convex HULL method to determine the middle component.
Step 10: Locate the image's flaws and edges.
Step 11: Count the number of 90-degree angles.
Step 12: Count how many angles there are.
Step 13: The appropriate text appears.
Stop at step 14.

4. Speech-to-Text (STT) Algorithm

Step 1: Begin
Step 2:To convert from Speech-to-Text, select option OP4.
Step 3: Invoke Speech to-Text function ().
Step 4: Launch the Chrome browser and go to www.peechtexter.com.
Step 5: Choose an international language.
Step 6: Now its the time to speak by activating the microphone.
Step 7: Listen to the voice to see if it's perfect.
7.1: Wipe the screen clean.
7.2: The text appears on the screen.
Step 8: Recognize the problem and resubmit the voice, then return to step 4.
Step 9: Repeat the previous steps until you get the desired result.
Step10: Stop

VIII. CONCLUSION

The project's goal is to bridge the communication gap between the deaf, dumb, and blind and the rest of the world, allowing them to live a normal life. The technology converts the voice from text/image for the blind, speech to conversion for the deaf, and hand motions to text for the dumb. The prototype model was created to combine the needs of the deaf-dumb and blind into a single little gadget. The project's benefit is that it is simple to carry out. A single compact system has been built as a prototype model for blind, deaf, and stupid persons. It is a language-independent technology that can be used as a smart assistant for differently impaired persons to communicate with others.

IX. FUTURE ENHANCEMENTS

The system can be expanded further because the input can also be in formation of films, which is broken into frames and then converts to text. By putting the system inside a cell phone, it can be made more convenient. It is possible to create a product for blind people that translates information from handwritten notes, newspapers, and books into an audio signal. For all languages, the system may be more efficient.

ACKNOWLEDGMENT

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REFERENCES

[1] L. Anusha, Y. Usha Devi, “Implementation of Gesture Based Voice and Language Translator for Dumb People”,IEEE, Issue 7, 2016.

[2] SubhankarChattoraj, Karan Vishwakarma, TanmayPaul, “Assistive system for physically disabled people using gesture recognition”Issue 1, August 2017.

[3] Areesha Gul, BatoolZehra, Sadia Shah, NazishJaved, Muhammad Imran Saleem, “Two-way Smart Communication System for Deaf and Dumb and Normal People”, International Conference on Information Science and Communication Technology, Issue 2020 .

[4] Prof. Radha S. Shirbhate, Mr. Vedant D. Shinde, Ms. Sanam A. Metkari, Ms. Pooja U. Borkar,Ms. Mayuri A. Khandge, “Sign language Recognition Using Machine Learning Algorithm”, IRJET, Vol.7, Issue 3, March 2020.

[5] Nabeel Siddiqui, Rosa H M, “Hand Gesture Recognition Using Multiple Acoustic Measurements at Wrist” IEEE transactions on Hunan-machine system, Vol.51, no.1, Issue February.

Image Restoration and Upscaling using Swin Transformer

Rakesh S [1], Sagar K[2], Yasha Niranjan[3] ,

Department of Computer Science and Engineering, Sapthagiri College of Engineering

#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57, India

[1]rakeshrakhi323@gmail.com
[2]sagarsanjan9448@gmail.com
[3]yashaniranjan@gmail.com

***Abstract*—Image restoration is a long-standing concern in low-level vision that attempts to restore high-quality images from low-quality images (e.g., downscaled, noisy and compressed images).Whereas most current image restoration solutions use convolutional neural networks, there have been a few experiments with Transformers which have shown wonderful results on high-level vision tests. Based on the Shifted Window Transformer, we offer a robust baseline model Shifted window IR for picture restoration in this study. We test picture super-resolution (classical, lightweight, and real-world image super-resolution), image denoising (grayscale and colour image denoising), and JPEG compression artefact reduction on three sample tasks. Shifted window IR outperforms state-of-the-art approaches by up to 0.14 0.45dB on several tasks, despite the fact that the overall number of parameters can be reduced.**

Keywords—Restoration , JPEG compression , CNN , extraction.

Abbrevations-- swin-shifted window

I. INTRODUCTION

Image restoration techniques such as image super-resolution (SR), image denoising, and JPEG compression artefact removal strive to rebuild a high-quality clean image from a low-quality damaged equivalent. Convolutional neural networks (CNN) have emerged as the major workhorse for image restoration[3] in the wake of many groundbreaking studies. The majority of CNN-based approaches place a premium on complex architectural designs like residual learning and dense connections. The fundamental convolution layer causes them to have two major difficulties. For starters, there is no content dependency in the interactions between pictures and convolution kernels. It's possible that using the same convolution kernel to recover various picture sections isn't the greatest option. Second, convolution is ineffective for long-range dependency modelling because of the local processing concept.

Transformer designs a self-attention mechanism that captures global interactions across contexts as an alternative to CNN, has demonstrated promising results in a variety of vision difficulties. However, image restoration vision Transformers[1] divide the input image into patches of a predefined size (e.g., 4848) and analyse each patch separately[4]. Two main drawback arises as a result of such a technique first one being , border pixels can't use adjacent pixels that aren't in the patch to restore the image. Second one is that the border artifacts surrounding each patch may be introduced by the restored picture. While patch overlapping may help in solving the problem, it also puts to the computational load. Swin Transformer, which combines the benefits of CNN and Transformer, has recently showed significant promise.

II. RELATED WORKS

In comparison to classic picture restoration approaches, which are often model-based, learning-based methods, and CNN-based methods have grown in popularity because to their superior performance. From large-scale paired datasets, they frequently learn mappings between low and high quality pictures. Since the groundbreaking work of SRCNN (for image SR), DnCNN (for image denoising), and ARCNN (for JPEG compression artefact reduction), a slew of CNN-based models have been proposed to improve model representation ability by employing more elaborate neural network architecture designs, such as residual block, dense block, and others. Some of them have taken use of the CNN framework's attention mechanisms, such as channel attention, non-local attention, and adaptive patch aggregation. Transform your vision Transformer, a natural language processing paradigm, has recently received a lot of traction in the computer vision world.It learns to attend to significant picture areas by studying the global interconnections between distinct regions when employed in vision issues such as image classification, object identification, segmentation, and crowd counting. Transformer has also been introduced for picture restoration due to its amazing performance.Chen et al. [1] proposed a backbone model IPT for various restoration problems based on the standard Transformer. However, IPT relies on large number of parameters (over 115.5M parameters), large-scale datasets (over 1.1M images) and multi-task learning for good performance. Cao etal. [5] proposed VSR-Transformer that uses the self-attention mechanism for better feature fusion in video SR, but image features are still extracted from CNN. Besides, both IPT and VSR-Transformer are patch-wise attention, which may be improper for image restoration. In addition, a concurrent work [7] proposed a U-shaped architecture based on the Swin Transformer [6].Image SR's ultimate objective is to be used in real-world applications. A realistic deterioration model called BSRGAN was recently developed for real-world picture SR, and it produced astonishing results in real-world circumstances. We re-train SwinIR using the same degradation model as BSRGAN for low-quality image synthesis to assess its performance for real-world SR. We only give visual comparison with representative bicubic model ESRGAN and state-of-the-art real world picture SR models RealSR, BSRGAN, and Real-ESRGAN because there are no ground-truth high-quality photos.

III Datasets

DIV2K is a single-image super-resolution dataset which contains 1,000 images with different scenes.This dataset contains low resolution images with different types of degradations. Apart from the standard bicubic downsampling, several types of degradations are considered in synthesizing low resolution images for different tracks of the challenges. The DIV2K dataset is divided into train data starting from 800 high definition high resolution images we obtain corresponding low resolution images and provide both high and low resolution images for 2, 3, and 4 downscaling factors ,validation data 100 high definition high resolution images are used for genereting low resolution corresponding images, the low res are provided from the beginning of the challenge and are meant for the participants to get online feedback from the validation server; the high resolution images will be released when the final phase of the challenge starts ,test data 100 diverse images are used to generate low resolution corresponding images.

IV PROPOSED SYSTEM

Swin Transformer architecture is shown in below fig 1, as well as a miniature prototype of the Swin Transformer. A patch splitting module like ViT separates an input RGB picture into non-overlapping patches first. Each patch is considered as a "token," with its feature set to the raw pixel RGB values concatenated.SwinIR is divided into three sections: shallow feature extraction, deep feature extraction, and high quality (HQ) image reconstruction. For all restoration jobs, we use the same feature extraction modules, but distinct reconstruction modules for various tasks.

easier. Then, we extract deep feature $F_{DF} \in \mathbb{R}^{H\times W\times C}$ from F_0 as

$$F_{DF} = H_{DF}(F_0)$$

where H_{DF} is the deep feature extraction module and it contains K residual Swin Transformer blocks (RSTB) and a 3 × 3 convolutional layer. More specifically, intermediate features $F_1, F_2, \ldots, F_K$ and the output deep feature F_{DF} are extracted block by block as

$$F_i = H_{RSTB}(F_{i-1}), \quad i=1,2,\ldots,K$$

$$F_{DF} = H_{CONV}(F_K)$$

Where H_{RSTB} denotes the i-th RSTB and H_{CONV} is the last convolution layer. The inductive bias of the convolution process may be brought into the Transformer-based network by using a convolutional layer at the conclusion of feature extraction, laying a better foundation for the subsequent aggregation of shallow and deep features.

Image reconstruction. As an example, considering SR picture. By combining shallow and deep characteristics, we can recreate a high-quality picture.

$$I_{RHQ} = H_{REC}(F_0 + F_{DF})$$

where H_{REC} is the reconstruction module's function. Low-frequencies are mostly contained in shallow features, whereas high-frequencies are mostly recovered in deep features. SwinIR may communicate low-frequency information straight to the reconstruction module using a long skip connection, which can allow the deep feature extraction module focus on high-frequency input and stabilise training. We employ the sub-pixel convolution layer to upsample the feature while implementing the reconstruction module.

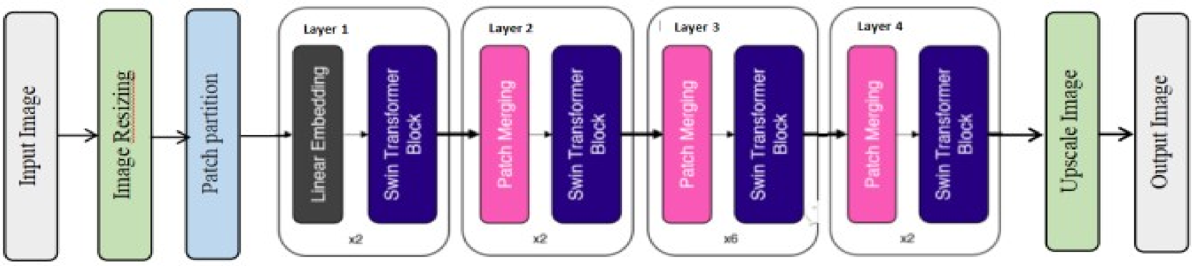

Figure 1: Proposed system architecture

Shallow and deep feature extraction. Given a low quality (LQ) input $I_{LQ} \in \mathbb{R}^{H\times W\times C_{in}}$ (H, W and C_{in} are the image height, width and input channel number, respectively), we use a 3 × 3 convolutional layer H_{SF} to extract shallow feature $F_0 \in \mathbb{R}^{H\times W\times C}$ as

$$F_0 = H_{SF}(I_{LQ})$$

where C is the feature channel number The convolution layer excels in early visual processing, resulting in more consistent optimization and improved outcomes. It also makes mapping the input picture space to a higher-dimensional feature space

A single convolution layer is employed for reconstruction in jobs that do not need upsampling, such as picture denoising and JPEG compression artifact removal. Furthermore, we apply residual learning to recreate the residual between the LQ and the HQ image. This is written as

$$I_{RHQ} = H_{SwinIR}(I_{LQ}) + I_{LQ}$$

where H_{SwinIR} denotes the function of SwinIR.

Loss function. For image SR, we optimize the parameters of SwinIR by minimizing the L_1 pixel loss

$$L=\|I_{RHQ} - I_{HQ}\|_1$$

Where I_{RHQ} is obtained by taking I_{LQ} as the input of SwinIR, I_{HQ} is the corresponding ground-truth HQ image.For classical and lightweight image SR, we only use the naive L_1 pixel loss as same as previous work to show the effectiveness of the proposed network. For real-world image SR, we use a combination of pixel loss, GAN loss and perceptual loss to improve visual quality. For image denoising and JPEG compression artifact reduction, we use the Charbonnier loss

$$L = \sqrt{\|I_{RHQ} - I_{HQ}\|^2 + e^2}$$

Where e is a constant that is empirically set to 10^{-3}

Residual Swin Transformer Block. The residual Swin Transformer block (RSTB) is a residual block with Swin Transformer layers (STL) and convolutional layers, as seen in Figure 2. We initially extract intermediate features from the given $F_{i,0}$ of the i-th RSTB's input feature $F_{i,1}, F_{i,2}, \ldots, F_{i,L}$ by L Swin Transformer layer as

$$F_{i,j} = H_{STL}(F_{i,j-1}), \quad j=1,2,\ldots,L,$$

Where H_{STL} is the j-th Swin Transformer layer in the i-th RSTB. Then additional of convolutional layer before the residual connection .The output of RSTB is formulated as

$$F_{i,out} = H_{CONV}(F_{i,L}) + F_{i,0}$$

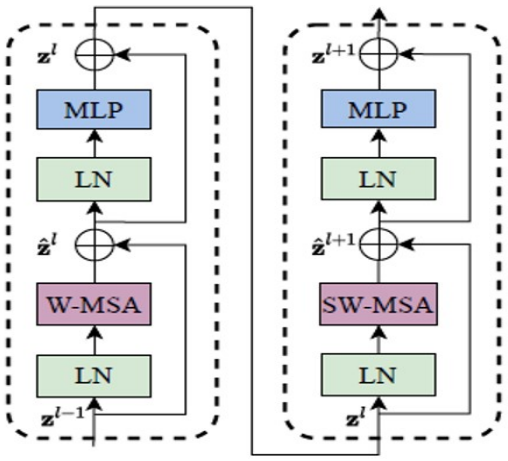

Figure 2: Residual Swin Transformer Block

Where H_{CONV} is the convolutional layer in the i-th RSTB. There are two advantages to this design. First, Transformer may be seen of as a special instantiation of spatially changing convolution, the translational equivariance of SwinIR can be improved by using covolutional layers with spatially invariant filters. Second, the residual connection allows the aggregation of distinct levels of features by providing an identity-based connection from separate blocks to the reconstruction module.

Swin Transformer layer. Swin Transformer layer (STL) is based on the standard multi-head selfattention of the original Transformer layer. The main differences lie in local attention and the shifted window mechanism. As shown in figure 2 ,Given an input of size H×W×C Swin Transformer first reshapes the input to a $\frac{HW}{M^2} \times M^2 \times C$ feature by partitioning the input into non overlapping M×M local windows, where $\frac{HW}{M^2}$ is the total number of windows. Then, it computes the standard self-attention separately for each window For a local window feature the query, key and value matrices Q, K and V are computed as

$$Q = XP_Q, \quad K = XP_K, \quad V = XP_V,$$

where P_Q, P_K and P_V are projection matrices that are shared across different windows.

For additional feature modifications, a multi-layer perceptron (MLP) with two completely connected layers and GELU non-linearity between them is utilised. Before MSA and MLP, the LayerNorm (LN) layer is added, and the residual connection is used for both modules. The entire procedure is described as follows.

$$X = \mathrm{MSA}(\mathrm{LN}(X)) + X$$

$$X = \mathrm{MLP}(\mathrm{LN}(X)) + X$$

However, there is no link between local windows when the partition is fixed for distinct levels. To enable cross-window connections, conventional and shifted window partitioning are employed alternatively, where shifted window partitioning involves changing the feature by ($[\frac{M}{2}]$, $[\frac{M}{2}]$) pixels before partitioning.

V SYSTEM REQUIREMENTS

Software Requirements

- Dataset: DIV2K,Manga109
- Language: Python Technologies and
- Tools: Open CV, Keras and Tensorflow
- Model: Swin transformer

VI EXPERIMENTAL SETUP

The RSTB number, STL number, window size, channel number, and attention head number are commonly set to 6, 6, 8, 180, and 6 for classical image SR, real-world image SR, image denoising, and JPEG compression artefact reduction, respectively. One exception is that the window size is set to 7 for JPEG compression artefact removal since we see a substantial performance decline when using 8, presumably because JPEG encoding utilises an 8 x 8 picture size

VII RESULTS

Figure 3 : RGB input image

Figure 4 : RGB output image

Figure 5 : Greyscale input image

Figure 6 : Greycsale output

Figure 7 : Digital input image

Figure 8 : Digital output image

VIII CONCLUSION

The image restoration model based on Swin Transformer is divided into three parts: shallow feature extraction, deep feature extraction, and HR reconstruction modules. For deep feature extraction, we utilise a stack of residual Swin Transformer blocks (RSTB), each of which is made up of Swin Transformer layers, a convolution layer, and a residual connection. SwinIR achieves state-of-the-art performance on three representative image restoration tasks and six different settings: classic image SR, lightweight image SR, real-world image SR, grayscale image denoising, colour image denoising, and JPEG compression artefact reduction, demonstrating the efficacy and generalizability of the proposed SwinIR.

REFERENCES

[1] Hanting Chen, Yunhe Wang, Tianyu Guo, Chang Xu, Yiping Deng, Zhenhua Liu, Siwei Ma, Chunjing Xu, Chao Xu, and Wen Gao. Pre-trained image processing transformer. In IEEE Conference on Computer Vision and Pattern Recognition, pages 12299–12310, 2021.

[2] Tobias Plotz and Stefan Roth. Neural nearest neighbors net- ¨ works. arXiv preprint arXiv:1810.12575, 2018

[3] Yunxuan Wei, Shuhang Gu, Yawei Li, Radu Timofte, Longcun Jin, and Hengjie Song. Unsupervised real-world image super resolution via domain-distance aware training. In IEEE Conference on Computer Vision and Pattern Recognition, pages 13385–13394, 2021.

[4] Swin-unet: Unet-like pure transformer for medical image segmentation

[5] Jiezhang Cao, Yawei Li, Kai Zhang, and Luc Van Gool. Video super-resolution transformer. arXiv preprint arXiv:2106.06847, 2021.

[6] Ze Liu, Yutong Lin, Yue Cao, Han Hu, Yixuan Wei, Zheng Zhang, Stephen Lin, and Baining Guo. Swin transformer: Hierarchical vision transformer using shifted windows. arXiv preprint arXiv:2103.14030, 2021.

[7] Zhendong Wang, Xiaodong Cun, Jianmin Bao, and Jianzhuang Liu. Uformer: A general u-shaped transformer for image restoration. arXiv preprint arXiv:2106.03106, 2021.

Food classification using Deep Learning

Supriya B Tavanshi#1, Suhas G C#2, Siri M Kashipathi#3

Department of Computer Science and Engineering, Sapthagiri College of Engineering

#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57, India

1supriyatavanshi@gmail.com
2suhasgowda.channappa@gmail.com
3sirimanju123@gmail.com

***Abstract* — The food plays important role in human's life as it provides us different nutrients and hence it is necessary for every individual to keep a watch on their eating habits. Image classification has become easier with deep learning and availability of larger datasets and computational resources. The Convolutional neural network is the most popular and widely used image classification technique in the recent days. In this paper image classification is performed on various food dataset using different transfer learning techniques. Therefore, food classification is a quintessential thing for a healthier life style. Unlike the traditional methods of building a model from the scratch, pre-trained models are used in this project, which saves the computation time, cost, and has given better results. The food dataset of many classes with many images in each class is used for training and validating.**

Keywords- Image acquisition, pre-processing, segmentation, Image classification.

I. INTRODUCTION

Calories are a must for the body, as they generate energy. But it is said that an excess of anything is bad and the same applies to the intake of calories too. If there is an excess of calories in our body, it gets stored in the form of fats, thus making us overweight.The rate of obesity is increasing in alarming rate from last few years.So the main cause for obesity is imbalance of the amount of food intake and energy consumed by the individual since it is necessary to have healthy meal. One way to achieve this is by tracking the amount of calories consumed, this tracking process can be very tedious as it requires the user to keep a food journal and to do messy calculations to be able to estimate the amount of calories consumed in every food item. Recently, automatic ways to calculate the amount of calories consumed in a food item have been surfacing. In this project, the proposed to alleviate the user from the burden of entering the above information in order to calculate the number of calories consumed in a food item.

Motivation in today's world everything is almost done digitally and it leads to problems like weight gain, obesity, cholesterol etc., thus it has become very important for people to keep fit. A healthy diet can be maintained by keeping track of the amount of calories consumed in the form of food on a daily basis.

II. LITERATURE SURVEY

They have proposed a system to classify the food to three different classes. They used the CNN(convolutional neural networks) and Food-101 dataset for the classification.3 types of classification can be done(apple pie,baby pork ribs and baklavas)[1].In this paper, they have used Google Inception-V3 based convolutional neural networks (CNNs) model.The dataset contains data from the Yummly API and some real time south-Indian food data where some of the training and testing images has some noise, different color intensity and images with the wrong-labels. All the food images are separated into their respective class folder and labelled properly.With transfer learning a solid machine learning model can be built with comparatively little training data because the model is already pre-trained the model obtained great accuracy[2]. In this paper, multi SVM classifier for accurate classification. The gray level co-occurrence matrix (GLCM) is used to calculate different texture features.For dataset, five categories of fruit images are captured using Samsung grand prime mobile phone and the images acquired were 3264 x 1836 pixels in size. Pre-processing steps such as rgb to gray conversion, filtering, resizing to 256 x 256, adaptive histogram equalization is carried out. 100 Total samples[3]. They proposed a model which focuses on estimation of number of calories in the food item by just taking its image as input using SVM. The proposed model applies some techniques of image processing followed by feature extraction. The authors designed the dataset, applied this dataset to some image processing techniques, and then processed dataset is applied to the feature extraction process[4]In this paper, they present the food and drink image detection and recognition system that we built, in the scope of which they developed a deep convolutional neural network architecture called NutriNet in order to provide a higher classification accuracy for the recognition of food and drink images from the 520-class dataset that we acquired using Google image searches, while keeping the model training time low to enable faster finetuning. Each of the outputs of this model would represent a separate food or drink item that could then be used as the input to the existing recognition model. [5].

III. PROPOSED SYSTEM

A deep learning algorithm, Convolution Neural Networks (CNN) is implemented to recognize and classify the Indian food images.

CNN is considered to be the best deep learning algorithm for image classification tasks because it automatically extracts and learns the features from the input images.

In neural networks, Convolutional neural network (ConvNets or CNNs) is one of the main categories to do images recognition, images classifications. CNN image classifications take an input image, process it and classify it under certain categories.

Computers sees an input image as array of pixels and based on the image resolution, it will see h x w x d (h = Height, w = Width, d = Dimension). E.g., An image of 6 x 6 x 3 array of matrix of RGB (3 refers to RGB values) and an image of 4 x 4 x 1 array of matrix of grayscale image.

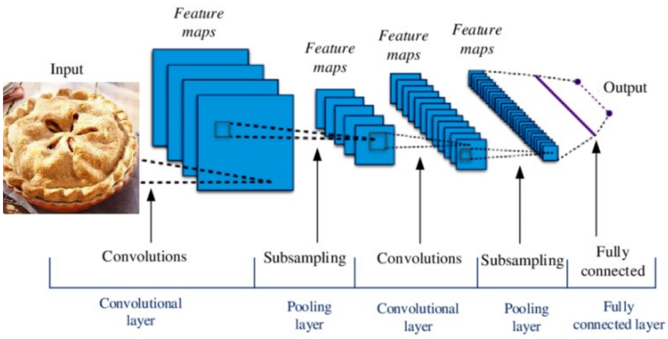

Figure 1. CNN model

IV. WORKING PRINCIPLES

Food Image Dataset – It contains different classes of food and each class has sample images. The dataset inherently comes with a lot of noise since there are images in which there is more than one food item. The image samples also contain a lot of color and few of them are wrongly labeled too. The figure below shows the sample food images from the Indian Food dataset.

Image preprocessing- The dataset contains different classes of food images. Each class of image is divided into training and testing images wherein images from each class are considered as training samples and the remaining samples as test samples. Overall, there are training samples and test samples. The training set images are fed to the CNN model and validation is made using the test dataset.

Training the CNN classifier using pre-trained models -The greater part of the Computer Vision Problems doesn't have exceptionally huge datasets (10,000 images—50,000 images). In Machine learning early layers will detects edges, middle layers detect the shapes and the last layers will detect some high level data features. These transfer learning models are useful in many computer vision and image classification problems.

Validation and Testing - Once the model is trained using the train dataset (the sample of data used to fit the model) then validated using validation dataset (The sample of data used to provide an unbiased evaluation of a model fit on the training dataset while tuning model hyper parameters.) and finally tested using the test dataset.

Calories extraction of the classified image - Our classifier can be used to estimate the calorific content of the classified food from the internet. Suitable python or any scripts can be used to perform web scraping to fetch the nutrition facts for the classified image from the web and provide it to the user.

The block diagram of food classification is shown in following fig

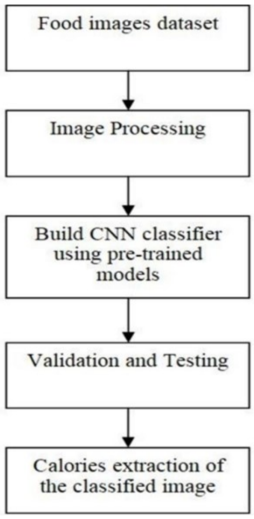

Figure 2. Block diagram of food classification

V. MODULE DESCRIPTION

Image Acquisition: Creating the representation of visual characteristics of an object.To detect food ingredients, we first have to capture live images of the food to be monitored and kept under surveillance. This is done by using camera.Comparing the present current frames captured with previous frames to detect food: for checking whether any ingredients of the food in the image are missing or not, we compare the images being provided by the web cam with each other so that we can detect changes in these frames and hence predict the exact amount of ingredients in the food.

Image Pre-processing: Improving the images by removing undesired distortion and enhancing some of the features that are important. Pre – Processing is heavily dependent on feature extraction method and input image type. Some common methods are:

- De-noising: applying a Gaussian or simple box filter for de-noising.
- Contrast enhancement: if gray level image is too dark or bright.
- Down sampling to increase speed.
- Morphological operations for binary images.
- Scaling by some factor.

Image Segmentation: In the images research and application, images are often only interested in certain parts. These parts are often referred to as goals or foreground (as other parts of the background). In order to identify and analyze the target in the image, we need to isolate them from the image. The image segmentation refers to the image is divided into regions, each with characteristics and to extract the target of interest in the process. The image segmentation used in this is a threshold segmentation. To put it simply, the threshold of the gray scale image segmentation is to identify a range in the image of the compared with the threshold and accordingly to the results to corresponding pixel is divided into two categories, the foreground and background.

Threshold segmentation has two main steps:

- Determine the threshold T
- Pixel value will be compared with the threshold value T

In the above steps to determine the threshold value is the most critical step in partition. In the threshold selection, there is a best threshold based on different goals of image segmentation. If we can determine an appropriate threshold, we can correct the image for segmentation.

Image Classification: It is extracting information classes from a multiband image. This is done by image classification Toolbar.

VI. SYSTEM ARCHITECTURE

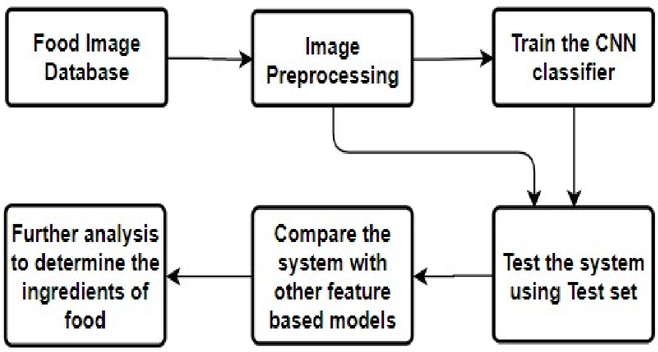

Figure 3. System architecture

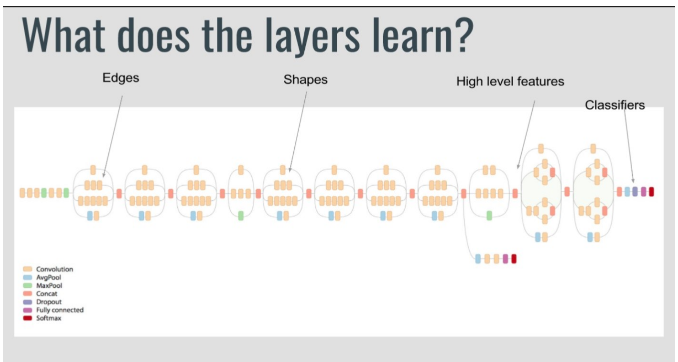

Figure 4.Google Inception model

It consists of four modules:Image acquisition, pre-processing, image segmentation and image classification modules.Creating the representation of visual characteristics of an object is done in image acquisition module.Improving the images by removing undesired distortion and enhancing some of the features is done in pre-processing module.In image segmentation image is segmented/partitioned into multiple segments.This is used to locate objects and boundaries. In classification module extraction of information classes from a multiband image takes place.

VII. ALGORITHM

Step 1: Image/video acquisition from the camera
Step 2: Convert video to frames.
Step 3: Store images of each food as database which is used as training set for our program .
Step 4: Compare camera captured frames with the database.
Step 5: Use imread function to read the image and Pre-processing is done on that image. Perform Blob detection on the frame and blobs are matched with images from training database images.
Step 6: And check if it is matching or not.
Step 7: To identification calories in the food is desired or not. An array is created and program is written for Food to be identified.
Step 8: To obtain the count- we use if statements to increment count when identified.

Camera is used to collect database either video and image of the Food in real-time for training set data and testing data which are used during the image processing techniques.

The image that is sent by the camera is received by the PC for classification of food. Database is created and the set of sample images are stored in it. The program consists of functions such as index Image, image Set and retrieve Image. The Image Set is used to hold a collection of images. Index Image is used to create an image search index. Index Image is used with the retrieved image function to search for images. The captured image is given as a query image to the processing system. The retrieve image function takes two arguments, a query image and the image stored in the database. The resultant is the indices corresponding to images index that are visually similar to the query image. The image ID's output contains the indices in ranked order, from the most to least similar match. The value match range is from 0- 1. If the value is 0, then the image is not matched. If it is 1, then the query image is same as that of the stored image. If the value is between 0-1 then the query image falls under the category of the stored image i.e., the contents in the query image are same as that of the stored image. If the name of the image matches with that of the regular expression of the image then the ingredients in the food id healthy otherwise it is not. If the score is in the range of 0.1 to 0.9, then the image is matched with that of the stored image.

VIII. SYSTEM REQUIREMENTS

1. HARDWARE REQUIREMENTS

• Processor Type	: Intel Core™ – i5
• Speed	: 2.4 GHZ
• RAM	: 6GB RAM
• Hard disk	: 40 GB HDD

2. SOFTWARE REQUIREMENTS

• Operating System	: Windows 64-bit
• Technology	: Python
• IDE	: PythonIDLE
• Development Environment	: OpenCV Tool
• Python Version	: Python 3.6

IX. CONCLUSION

In this research study, the Convolutional Neural Network, a Deep learning technique is used to classify the food images in to their respective classes. The dataset considered is the Indian food dataset. The Flowchart shows the flow of operation done to detect the particular livestock and count them accordingly that is shown in result. Here first the image is captured by using a camera and which is then converted to a grey scale image to make it feasible for comparison with the existing data set values.

X. FUTURE ENHANCEMENT

As far as the future enhancement is concerned, the task of classification can be improved by removing noise from the dataset. The same research can be carried out on larger dataset with more number of classes and more number of images in each class, as larger dataset improves the accuracy by learning more features and reduces the loss rate. The weights of the model can be saved and used to design a web app or mobile app for image classification and further calories extraction of the classified food.

XI. REFERENCES

[1] Diksha Solanki1, Ankit Anurag2, Dr. Amita Goel3, Ms. Vasudha Bahl4, Ms. Nidhi Sengar5 "Detection and Classification of Food Consumption Using Convolutional Neural Networks", 2020.

[2] Machine Learning Based Approach on Food Recognition and Nutrition Estimation by Zhidong Shen ,Adnan Shehzad, Si Chen, Hui Sun, Jin Liu, 2020.

[3]A Comparative Study of Indian Food Image Classification Using K-Nearest Neighbour and Support-Vector-Machines by Pathanjali C, Vimuktha E Salis, Jalaja G, Latha A(2019).

[4] Narit Hnoohom and Sumeth Yuenyong , "Thai Fast Food Image Classification Using Deep Learning", 15th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-NCON2018).

[5] Calorie Estimation from Fast Food Images Using Support Vector Machine by Hemraj Raikwar and Himanshu Jain (2018).

[6]Recognition and Classification of Fast Food Images by Amatul Bushra Akhi, Farzana Akter, Tania Khatun & Mohammad Shorif Uddin, 2018.

[7] Recognition and Classification of Fast Food Images by Amatul Bushra Akhi, Farzana Akter, Tania Khatun & Mohammad Shorif Uddin, 2018.

[8]Gözde ÖZSERT YİĞİT Buse Melis ÖZYILDIRIM Comparison of Convolutional Neural Network Models for Food Image Classification 2017 IEEE.

[9] Deep Dish : Deep Learning for Classifying Food Dishes by Abhishek Goswami and Haichen Liu, 2017.

[10] David J. Attokaren, Ian G. Fernandes, A. Sriram, Y.V. Srinivasa Murthy, and Shashidhar G. Koolagudi, "Food Classification from Images Using Convolutional Neural Networks" Proc. of the 2017 IEEE Region 10 Conference (TENCON), Malaysia, November 5-8, 2017.

Emotion Based Music Player

Shivansh [1], Shoib Akhter[2]

[1-4]UG Students, Department of CSE, Sapthagiri College of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Jayshree N Nemade**, Dept of Computer Science and Engineering, Bengaluru, Karnataka-560057, India
Shivanshk282@gmail.com, loneshoib2018@gmail.com,

Abstract:- The magical power of music is scientifically proven. People always like to hear the music depending on their emotional feelings. Music is considered to be a tool for stress relief. Many psychological states can be very well controlled by listening to music. . We focus on developing an emotion based music system. The image of the face is captured in a camera and the emotions are classified. The classification is done using CNN classifier. The neural network model is trained and used to find the emotion from the image of the face captured .Depending on the mood of the user a playlist is formed in the music player implemented using PyQt5.

Keywords:- *Machine Learning, Image Processing Convolutional Neural Network, Haar Cascade, PyQt5.*

I. INTRODUCTION

Music is an essential component of our daily life. We listen to songs as per our mood. Music is one of the media of entertainment and even imparts a therapeutic approach. It is important to play an appropriate song on the particular emotional state. In the present scenario the user has to manually select the music from the play list according to his mood and play the songs. This project is based on the principle of detection of human emotions to play appropriate songs for current emotional state. The current emotional state of human being can be easily observed through their facial expressions. It can be achieved with help of image processing and machine learning techniques. Our project aims to recommend and play the appropriate music, based on users current emotional state with the help of image processing techniques through users facial expressions. The emotions are classified into five categories like happy, sad, neutral, and angry respectively.

II. LITERATURE SURVEY

In[4], they have proposed a mood detection system. They have used modern CNN for building framework. Their architecture is fully-convolutional neural network contains 4 residual separable convolutions and each convolution is followed by a batch normalization operation and ReLU activation. Architecture has 60000 parameter, which is corresponds to reduction of 10x of Naive and 80X of original CNN. They have achieved 66% of accuracy in mood detection.

Sentiment-Based Music Play System [**?**] Sentiment-Based Music Play System [1], has implemented RASPBERRY-PI based module for mood detection and generate music playlist. The conversations carried in a room are recorded using a microphone which is connected to Raspberry Pi. The recorded speech is converted to text using Speech Recognition tool in python library. The Naive Bayesian classifier is used to classify the sentiment from the recorded text. The tempo of the songs are assigned a BMP value and this value is used to relate the song to a particular mood. The system will playa song on the basis of sentimental analysis of text generated from speeches in the room. There is ample work has been done in the field of face-based emotion detection. Proposed mood based music player [2], it scans memory for audio files, and classifies audio files using audio extraction module. After dividing audio files into mood based segregation, it captures image from device camera. Feature detection is done with the help of Viola and jones algorithm [3]. With help of OpenCV libraries, it recognizes the emotional state and device plays music accordingly the mood.

III. BACKGROUND

With the advancement in technology, people are finding shortcuts to do their daily works. With the system, the process of manually searching a song from a large list is reduced. Separate playlists corresponding to every emotion ease the task. In the scenario where everything is automated, its time saving.

IV. OVERVIEW

The proposed system will provide an effective approach to detect and classify human emotions using computer vision and deep learning and then play music according to the current emotion. The system provides a real time platform. Viola Jones algorithm provides Haar cascade feature which is used to detect the face from the input video stream. Image preprocessing techniques such as smoothening, gray scale conversion, image resizing are done on the input test image. Inception v3 is used to train the image dataset. Classification of the test input image provided by the user in realtime is done through convolutional neural network approach. At last music is played based on the classified emotion. Music is linked with the help of OS module provided by OpenCV.

A. HAAR CASCADE

Haar cascade is a machine learning based approach which is used for effective object detection. Here our object is face. The training of the cascade function is done using a large number of images with faces(positive image)and without faces(negative image).

Object Detection using Haar feature-based cascade classifiers is an effective object detection method. It is a machine learning based approach. [6] In this approach a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images. First of all, lot of positive images (images of faces) and negative images (images without faces) are used to train the classifier. Then features are extracted from it. For this, Haar features shown in below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle. [5] Now all possible sizes and locations of each kernel are used to calculate plenty of features. But among all these features we calculated, most of them are irrelevant. In the figure below top row shows two good features. The first feature selected seems to focus on the property that the region of the eyes is often darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose. Now, common Haar features are shown in the diagram below. They are classified into Edge, Line and Four-Rectangle features.

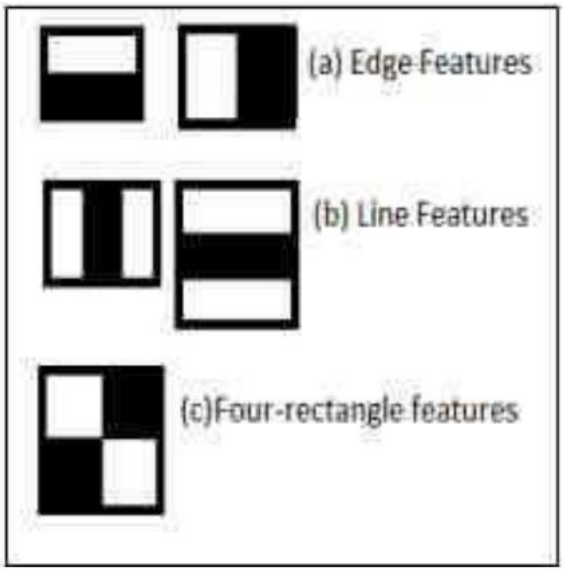

Fig 1. Common Haar Feature

B. INCEPTION V3

The inception V3 convolution neural network is trained on large number of images from the image data set. The network has 48 layers and can classify images into l000 object categories. We use Classify to classify new images using the inception v3 model. It is a widely used image recognition model that can give an accuracy greater than 78.1% on the image data set given. It consists of two parts: Feature extraction part with a convolutional neural network and classification part with fully connected layers.

C. CONVOLUTIONAL NEURAL NETWORK

The input image obtained through camera is the test image. This image has to be classified into one of those five emotions (neutral, happy, sad, angry and surprise). This is done through convolutions neural network (CNN) approach. A multi layered CNN is used to evaluate features of the test image with respect to the trained data set. This contains an input layer, hidden layer and an output layer. Input layer brings the initial data (test image) into the system for further processing by subsequent layers. It is the very beginning of the workflow for CNN. The Hidden layer constitutes the classification of the input with the help of the trained dataset. The test image will be tested against various emotion classes. A set of weighted input is given and an activation function is applied to produce the output. The output layer will consist of the final emotion class to which the test image is mapped into.

D. DATASET OF FACE EXPRESSION

The dataset from a Kaggle Facial Expression Recognition Challenge (FER2013) is used for the training and testing. It comprises pre-cropped, 48-by-48-pixel grayscale images of faces each labeled with one of the 7 emotion classes: anger, disgust, fear, happiness, sadness, surprise, and neutral. Dataset has training set of 35887 facial images with facial expression labels.. The dataset has class imbalance issue, since some classes have large number of examples while some has few. The dataset is balanced using oversampling, by increasing numbers in minority classes. The balanced dataset contains 40263 images, from which 29263 images are used for training, 6000 images are used for testing, and 5000 images are used for validation.

V. SYSTEM ARCHITECTURE

Initially the dataset for the four emotions (neutral, happy, sad, angry) are collected and trained using inception v3. The music folder is made which contains subfolders for each emotion containing music. The Usergives the input as a continuous stream of video of about 5 to 10 seconds to the camera. Haars frontal face classifier is used to detect the presence of face in the image/video stream. On obtaining the input it is converted from RGB to grayscale, resized and then smoothening is performed toremove any distortions if exists. These image preprocessing techniques makes further process of classifying the emotions easier. After this the emotion recognition phase takes place.

The input is then classified to the corresponding emotion by convolutional neural network with the help of the trained dataset. After successfully finding out the emotions the next step is to play the music according toit. We have designed our music players GUI using Python PyQt5 package. It is Python binding for Qt5. Music player imports finalized mood and loads recommended playlist from their modules. And plays songs from that generated playlist. To load these sound objects and control playback, Pythons Pygame package is used. From Pygame package, Pygame mixer module is used for loading sound objects and controlling them. By using pygame.mixer module, we have given basic functionalities to our music player so that user can pause the playback, resume the playback, playing previous and next song in playlist, increase and decrease system volume.

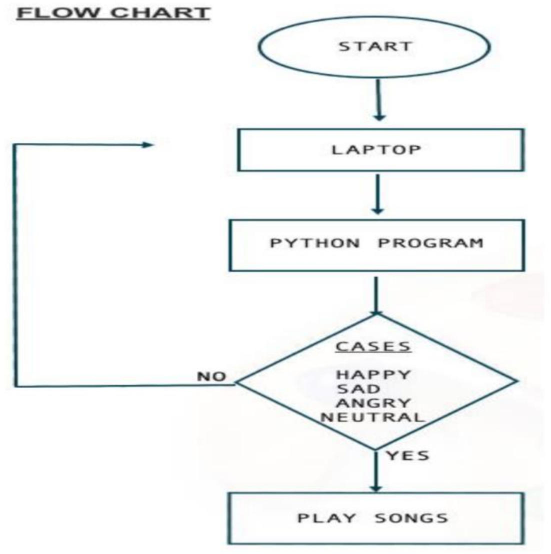

Fig 2. System working design

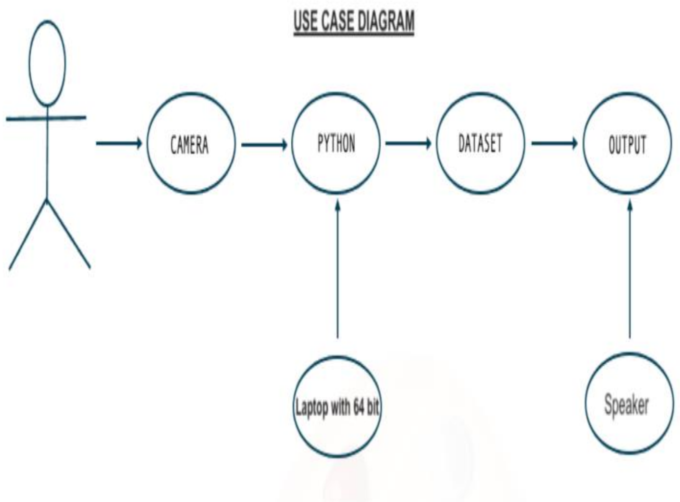

Fig 3. Use Case Diagram

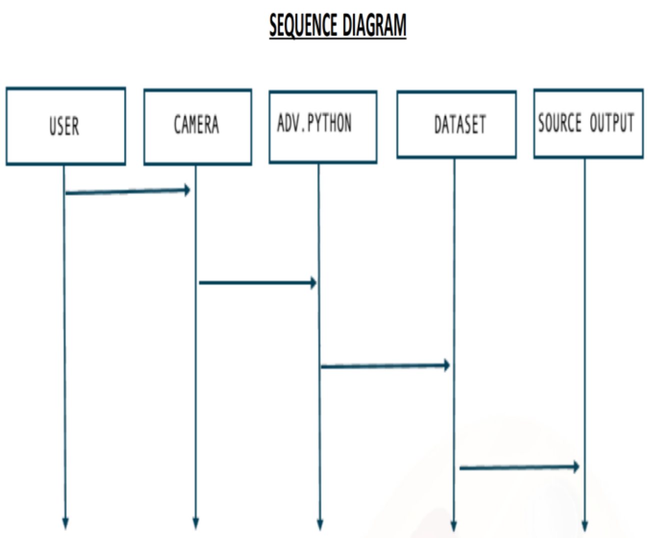

Fig 4. Sequence Diagram

A. IMPLEMENTATION

- Initially whole block diagram and logical connections of the project is analysed. Required hardware and software are collected.
- Each hardware is tested manually and conditions that need to be met during interfacing are noted down.
- Every hardware is interfaced with controller and tested.
- Overall logic of the project built and tested.
- Project is tested for good number of times to meet its needed accuracy

B. BLOCK DIAGRAM

The facial expression recognition system is implemented using convolutional neural network. The block diagram of the system is shown in following figures.

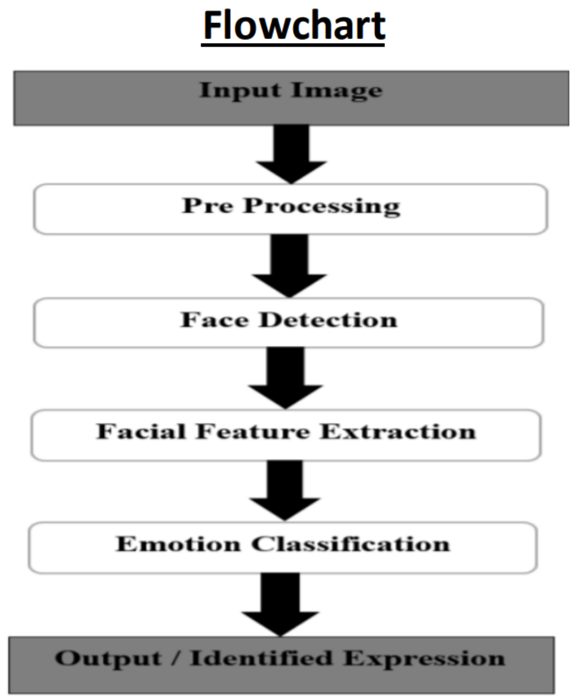

Fig 5. Flow Diagram

C. TRAINING AND TESTING

During training, the system received a training data comprising grayscale images of faces with their respective expression label and learns a set of weights for the network. The training step took as input an image with a face. Thereafter, an intensity normalization is applied to the image. The normalized images are used to train the Convolutional Network. To ensure that the training performance is not affected by the order of presentation of the examples, validation dataset is used to choose the final best set of weights out of a set of trainings performed with samples presented in different orders. The output of the training step is a set of weights that achieve the best result with the training data.

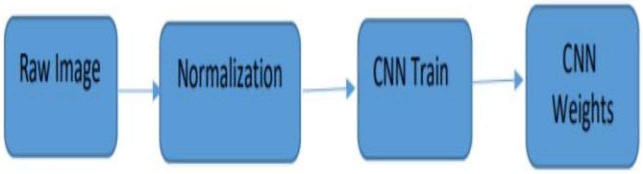

Fig 6. Training Dataset

During test, the system received a grayscale image of a face from test dataset, and output the predicted expression by using the final network weights learned during training. Its output is a single number that represents one of the seven basic expressions.

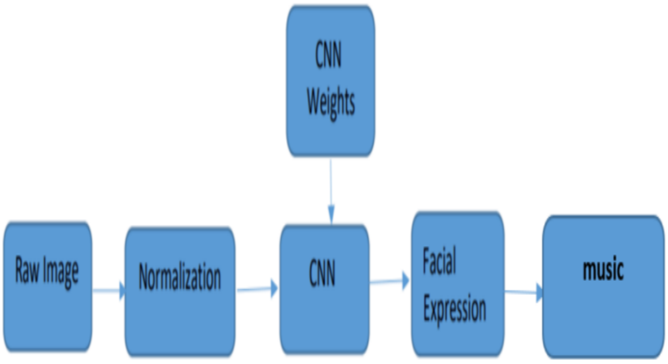

Fig 7. Testing Dataset

VI. RESULT

Web camera with better technical specifications gives better result. Proper lightning condition is required. Song choices may vary from person to person.

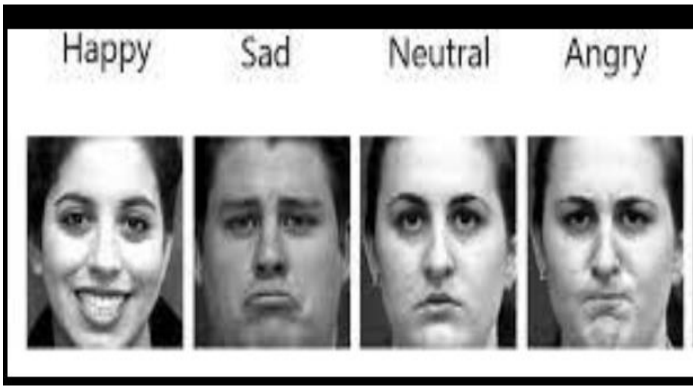

Fig 8. Emotion Detected Pictures

Once you start the app, emotion is detected and the emotion based music player plays the music according to the mood automatically and pressing the refreshing button will get u back to the initial window.

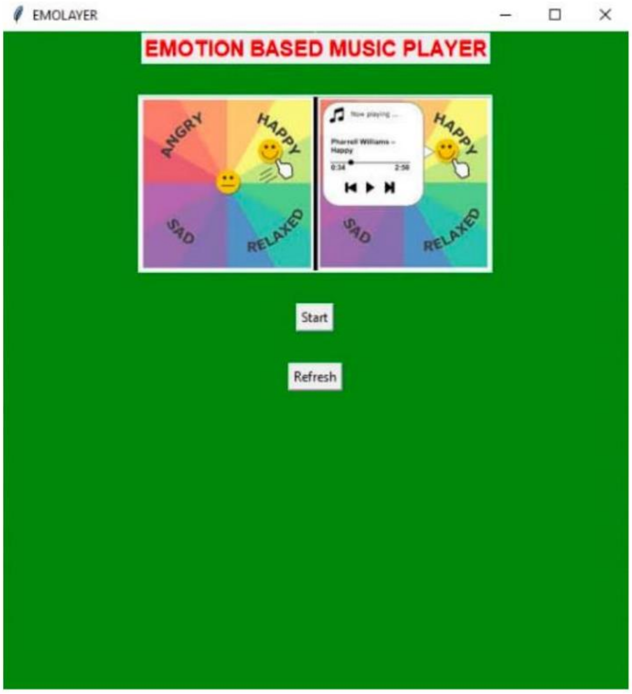

Fig 9. User Interface of Emotion based Music Player

VII. CONCLUSION

The research done in the area of human psychology has proven that music has an intense effect on the listeners. Music and mood are closely dependent. This is the basic idea behind the project. The existing systems do not provide the user with the facility to listen to songs according to his/her mood. The user has to manually select the songs that he/she wants to listen. So here a emotion based music player is proposed. This project is relevant in the scenario where people tend to listen to music according to their moods. The entire process of selecting a song from large list of songs is automated. Thus, the application developed will reduce the efforts of user in creating and managing playlist. It willprovide better enjoyment to the music listeners by providing the most suitable or appropriate song to the user according to his/her current emotion. It will not only help user but also the songs are systematically sorted.

VIII. FUTURE SCOPE

A. *FUTURE SCOPE FOR IMPLEMENTATION*

- Facial recognition can be used for authentication purpose.
- Android Development.
- Can detect sleepy mood while driving.
- Can be used to determine mood of physically challenged & mentally challenged people.

B. *FUTURE SCOPE OF THE PROJECT*

The future scope in the system would to design a mechanism that would be helpful in music therapy treatment and provide the music therapist the help needed to treat the patients suffering from disorders like mental stress, anxiety, acute depression and trauma. The proposed system also tends to avoid in future the unpredictable results produced in extreme bad light conditions and very poor camera resolution.

REFERENCES

[1]. R. Lomte P. Shakthi H. B. Kandala V. Patchava, P. Jain. Sentiment Based Music Play System.
[2]. S. G. Kamble and A. P. A. H. Kulkarn. Emotion based music using smartband. 2016.
[3]. S. C. Raphatsak Sriwatanaworachai Krittrin Chankuptarat. Emotionbased music Player,. 2019.
[4]. Balasubramanian Anand Anshul Sharma Sudha Veluswamy, Hariprasad Kanna. Smart music player integrating facial emotion recognition andmusic mood recommendation,. In *2015 International Conference on Pervasive Computing (ICPC).*
[5]. G. Paul O. Arriaga. Real-time Convolutional Neu-ral Networks for Emotion and Gender Classificati- https://www.overleaf.com/project/5ca06acc3fa3f57a70e395a4on,
[6]. Balasubramanian Anand Anshul Sharma Sudha Veluswamy, Hariprasad Kanna. Method And Apparatus For Recognizing An Emotion Of An Individual Based On Facial Action Units,.
[7]. Mutasem K. Alsmadi. Facial Expression Recognition,.
[8]. M. Arun K. S. Nathan and M. S. Kannan. An emotion based music player for Android,. In 2017 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT).
[9]. Rushabh Banthia3 Hilesh Kalal4 K.R. Pathak5 Rahul Hirve1, Shrigu- rudev Jagdale2. EmoplayerAn Emotion Based Music Player,. In 2016 IJIR Department Of Computer Engineering.
[10]. Rushabh Banthia3 Hilesh Kalal4 K.R. Pathak5 Rahul Hirve1, Shrigu- rudev Jagdale2. EmoplayerAn Emotion Based Music Player,. In 2016 IJIR Department Of Computer Engineering.
[11]. Mirim Lee and Jun-Dong Cho. Logmusic: context-based social mu- sic recommendation service on mobile device,. In Ubicomp'14 Ad- junct,2014.
[12]. E.E.P. Myint and M. Pwint. An approach for mulit-label music mood classification,. In 2010 2nd International Conference on Signal Processing Systems.

Automated Door System Integrated with Facemask and ID Card Detection using Deep Learning Approach

Amandeep Singh[1], Deepak Sah[2], Lalit Mudgal[3], Mayank[4], Mrs. Kavitha B[5]

[1, 2, 3, 4, 5]Department of Computer Science Engineering, Sapthagiri College of Engineering
#14/5 Chikkasandra, Hesaraghatta Main Road, Bangalore – 57, India
[1]ps772117@gmail.com
[2]sahdeepak19@gmail.com
[3]lalitmudgal68@gmail.com
[4]mayank.sawarn88@gmail.com
[5]kavitha_b@sapthagiri.edu.in

***Abstract* — COVID-19 pandemic caused by novel coronavirus is still spreading continuously around the world, affecting nearly all sectors of development. Various precautionary measures have been taken to reduce the spread of this disease where wearing a mask is one of them. Individual surveillance of people entering the public places is required and our system serves the purpose. The Automated Door System integrated with Facemask and ID Card Detection raises a warning if a person without mask or wearing mask improperly is detected and also performs identity verification using QR code. Our system uses YOLO as the state-of-art deep learning model along with OpenCV, and the NodeMCU as microcontroller. Keeping track of individuals wearing masks and their authentication will be easy with the Automated Door System for all public places.**

Keywords- Covid-19, Convolution Neural Network, Deep Learning, YOLO, Facemask Detection, ID Card Detection, NodeMCU, Sliding Door

I. INTRODUCTION

As we all know COVID-19 had struck the humanity badly in each and every aspect which one can think about. COVID-19 pandemic is an ongoing global pandemic which had distressed our normal day to day life [1]. It resulted into death of millions of people, markets were closed and this caused instability in the country's economy. Schools and colleges were shut down, etc. And in the current scenario China is still fighting with the new COVID variant.

As per the guidelines issued by the World Health Organization (WHO), wearing of masks, maintaining social distancing, and using hand sanitizers were made compulsory [2]. Amongst these wearing of mask is the first and foremost thing which is to be done to avoid the spread of virus. Keeping this in mind we have developed a live working project which will ensure the proper wearing of masks while entering in an institute or in a building.

The security of an organizational building or any other concerned premises is of great importance. Especially during the times of pandemic, it becomes necessary to keep a check on the people entering or leaving the premises. This project is basically for an automated door that opens only when the person is wearing a facemask properly and has a valid identity card. The system raises an alarm warning about the person not wearing the mask or wearing it improperly.

The facemask is detected using OpenCV and YOLO which are based on Deep Learning. The unique ID of a person is scanned and detected using a QR Code present on the ID card. The data present in the QR Code is verified against the organizational database for authenticity. After the authentication and detection of proper wearing of a facemask the NodeMCU sends signal to the servo motor which opens on getting activated.

The rest of the paper is organized as follows: Section II talks about the literature reviews that has been considered for this project. Section III consists of the various methodology used for the implementation. Section IV discusses about implementation of the proposed system. Experimental results and analysis are reported in section V. Section VI concludes and draws the line towards future works.

II. LITERATURE REVIEW

[1] In this research, a technique is suggested for limiting COVID-19 proliferation by identifying people who are not wearing a facial mask in a smart city network where all public spaces are monitored using Closed-Circuit Television (CCTV) cameras. When a person without a mask is spotted, the local network notifies the appropriate authority. A dataset of photos of people with and without masks acquired from diverse sources is used to train a deep learning architecture. For previously unreported test data, the trained architecture distinguished people with and without a facial mask with 98.7% accuracy.

[2] This paper proposes a simplified approach to accomplishing this goal utilising TensorFlow, Keras, OpenCV, and Scikit-Learn, as well as some basic Machine Learning packages. The suggested method successfully detects the face in the image and then determines whether or not it is covered by a mask. It can also detect a face and a mask in motion as a surveillance task performer. On two separate datasets, the technique achieves accuracy of up to 95.77 percent and 94.58 percent, respectively. We investigate optimum parameter values using the Sequential Convolutional

Neural Network model to appropriately detect the existence of masks without overfitting.

[3] This paper describes an automatic hand sanitizer and temperature sensor system that allows people to sanitise their hands whenever they want, without having to touch the sanitising equipment. When the temperature sensor is touched, it displays the person's body temperature. If the body temperature is normal, the door will open automatically; otherwise, it will remain shut.

[4] The goal of this paper's work is to design, construct, and test a low-cost automatic door assembly using locally available raw materials. It is suggested that research on aluminium door parts, low speed high torque electric motors, and long-range sensors that meet the requirements of automatic sliding doors be conducted in Nigeria.

[5] The verification of the user's ID card and the extraction of information from the user's ID card are the two most difficult aspects of identity authentication. To address the problem, an identity authentication system is presented that uses face verification and ID picture recognition to extract and validate personal information. The proposed face verification model, Inception-ResNet Face Embedding, is used to achieve identity authentication (IRFE). To ensure good feature extraction and precise face verification, IRFE employs an Inception-ResNet framework. Furthermore, to extract ID information, a robust ID card extraction approach called Morphology Transformed Feature Mapping (MTFM) is developed. The suggested IRFE and MTFM outperform state-of-the-art approaches in both face verification and ID extraction, according to experimental results.

[6] To collect sub-sample data on histopathology pictures, this work presents a conditional sliding window technique. Depending on the image and window size, the conditional sliding window technique can generate a variety of sub-samples. Furthermore, the images were utilised to train a CNN, which was shown to accurately predict benign and malignant tissues when compared to the original dataset's model. Furthermore, both the Warwick public dataset and the one developed in this study have sensitivity values above 0.80, indicating that the proposed CNN architecture is more stable than previous approaches such as AlexNet and DenseNet121.

[7] A simple and scalable detection technique is described in this research that enhances mean average precision (mAP) by more than 30% compared to the previous best result on VOC 2012, obtaining a mAP of 53.3 percent. This method combines two key ideas: (1) high-capacity convolutional neural networks (CNNs) can be used to localise and segment objects from bottom-up region proposals, and (2) when labelled training data is scarce, supervised pre-training for an auxiliary task followed by domain-specific fine-tuning yields a significant performance boost. The method is known as R-CNN: Regions with CNN features because it combines region suggestions with CNNs. OverFeat, a recently suggested sliding-window detector based on a similar CNN architecture, is also compared to R-CNN. On the 200-class ILSVRC2013 detection dataset, R-CNN outperforms OverFeat by a considerable margin.

[8] For object detection, this paper presents a Fast Region-based Convolutional Network approach (Fast R-CNN). Fast R-CNN builds on past work that used deep convolutional networks to efficiently classify object suggestions. Fast R-CNN leverages numerous advancements over earlier work to improve training and testing efficiency while also enhancing detection accuracy. On PASCAL VOC 2012, Fast R-CNN trains the very deep VGG16 network 9 times faster than R-CNN, is 213 times faster at test time, and has a higher mAP. Fast R-CNN trains VGG16 3 times quicker, tests 10 times faster, and is more accurate than SPPnet. Python and C++ are used to implement fast R-CNN (using Caffe).

[9] This research proposes a Region Proposal Network (RPN) that shares full-image convolutional features with the detection network, allowing for near-cost-free region suggestions. RPNs are fully convolutional networks that predict object limits and objectness scores at each point simultaneously. The RPN is trained from start to finish to create high-quality region proposals that Fast R-CNN uses for detection. We combine RPN and Fast R-CNN into a single network by sharing their convolutional features—the RPN component informs the unified network where to look, utilising the lately trendy nomenclature of neural networks with "attention" processes.

[10] A novel approach to object detection called YOLO. Classifiers have been repurposed to do detection in previous work on object detection. Rather, we consider object detection to be a regression issue with spatially separated bounding boxes and associated class probabilities. In a single assessment, a single neural network predicts bounding boxes and class probabilities directly from entire images. Because the entire detection pipeline is a single network, it can be optimised directly on detection performance from beginning to end.

III. METHODOLOGY

This section talks about the various modules involved in the proposed system. It includes Webcam, Image/Video, YOLO, ID Card, gTTS, Servo Motor, OpenCV and CNN. The web camera is used for capturing the images from the premises. These images/videos are fed as input to the YOLO algorithm which detects the facemask using CNN and OpenCV. These modules are further discussed in detail.

A. *Web Camera*

A webcam is a video camera that sends or streams an image or video to or through a computer network, such as the Internet, in real time. Small cameras that sit on a desk, attach to a user's monitor, or are incorporated into the hardware are known as webcams. It needs to be of high resolution to capture the images or videos effectively.

Figure 1: Web Camera

B. *Image/Video*

Pictures and movies that have been converted into a computer-readable binary format consisting of logical 0's and 1's is referred to as digital images and digital video, respectively. A still image that does not change with time is usually referred to as an image, but a video grows with time and typically comprises moving and/or changing things. Although “direct digital” systems are becoming more common, digital images or video are mainly obtained via transforming continuous signals into digital format.

Digital visual signals can also be viewed on a variety of display medium, such as digital printers, computer displays, and digital projection systems. Because the frequency with which information is transmitted, stored, processed, and displayed in a digital visual format is rapidly increasing, also the interests in developing engineering methods for efficiently transmitting, maintaining, and even improving the visual integrity of this data is increasing.

Figure 2: Image/Video

C. YOLO

It stands for You Only Look Once. It is the algorithm that has been used for real-time object detection, i.e., face-mask in our case. Convolutional neural networks (CNN) are used in the YOLO method to recognise objects in real time. There were many algorithms that were proposed before YOLO like Sliding Windows [6], R-CNN [7], Fast R-CNN [8] and Faster R-CNN [9]. To detect objects, the YOLO approach just takes a single forward propagation through a neural network, as the name suggests. This indicates that a single algorithm run is used to anticipate the entire image. The CNN is used to forecast multiple bounding boxes and class probabilities at the same time. There are several variations of the YOLO algorithm. Tiny YOLO and YOLOv3 are two popular examples.

YOLO algorithm has many benefits including:

• Speed: Because it can forecast objects in real time, this approach enhances detection speed.

• High Accuracy: YOLO is a predictive approach that yields precise findings with minimum background noise.

• Learning Capabilities: The algorithm has strong learning abilities, allowing it to learn object representations and use them in object detection.

YOLO algorithm works using the following three techniques:

• Residual Blocks: The image is broken into several grids. The dimensions of each grid are S x S. Objects that appear within grid cells will be detected by each grid cell. If an object centre emerges within a specific grid cell, for example, that cell will be responsible for detecting it.

• Bounding Box Regression: A bounding box is an outline that draws attention to a certain object in a picture. The following attributes are present in every bounding box in the image: width (bw), height (bh), Class (for example, person, car, traffic light, etc.) - represented by the letter c, and Bounding Box Center (bx,by).

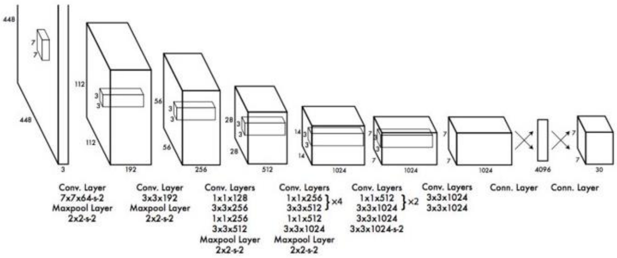

Figure 3: YOLO Architecture

The bounding box width and height are normalised by the image width and height to be between 0 and 1. The bounding box x and y coordinates are parametrized to represent offsets of a certain grid cell location; therefore, they are also constrained between 0 and 1.

For the final layer, a linear activation function is employed, while all previous layers utilise the leaky rectified linear activation:

$$\phi(x) = \begin{cases} x, & \text{if } x > 0 \\ 0.1x, & \text{otherwise} \end{cases}$$

In the output of the YOLO model, sum-squared error has been optimised. Sum-squared error is utilised because it is simple to improve, but it falls short of the goal of optimising average precision. It gives equal weight to localization and classification errors, which isn't ideal.

In addition, many grid cells in each image do not include any objects. This reduces those cells' "confidence" scores to zero, often overwhelming the gradient from cells that do contain objects. This can cause model instability, leading early training divergence.

To remedy this, the loss from bounding box coordinate predictions can be increased and the loss from confidence predictions for boxes that don’t contain objects can be decreased. Two parameters are used to accomplish this, λ_{coord} and λ_{noobj}. Set $\lambda_{coord} = 5$ and $\lambda_{noobj} = .5$.

In addition, the sum-squared error equally weights errors in large and small boxes. Tiny variations in large boxes should matter less than small deviations in small boxes, according to the error metric. To overcome this, instead of predicting the width and height of the bounding box explicitly, the square root of the bounding box width and height is forecasted

Per grid cell, YOLO predicts numerous bounding boxes. Only one bounding box predictor should be accountable for each object during training. One predictor is “responsible” with predicting an object based on which prediction has the highest current IOU with the ground truth. As a result, the bounding box predictors become more specialised. Each predictor improves its ability to anticipate specific sizes, aspect ratios, or item types, increasing overall recall.

The following multi-part loss function is optimised during training:

$$\lambda_{\textbf{coord}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left[(x_i - \hat{x}_i)^2 + (y_i - \hat{y}_i)^2 \right]$$
$$+ \lambda_{\textbf{coord}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left[\left(\sqrt{w_i} - \sqrt{\hat{w}_i} \right)^2 + \left(\sqrt{h_i} - \sqrt{\hat{h}_i} \right)^2 \right]$$
$$+ \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left(C_i - \hat{C}_i \right)^2$$
$$+ \lambda_{\textrm{noobj}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{noobj}} \left(C_i - \hat{C}_i \right)^2$$
$$+ \sum_{i=0}^{S^2} \mathbb{1}_{i}^{\text{obj}} \sum_{c \in \text{classes}} (p_i(c) - \hat{p}_i(c))^2$$

where 1_i^{obj} indicates if an object occurs in cell i and 1_{ij}^{obj} indicates that the jth bounding box predictor in cell i is "responsible" for the prediction [10].

D. ID Card

QR Code has been used to store the USN of the student. There are various methods to validate the ID card [5] in which scanning the barcode is one of them. For our system we have used QR code which will be present on the ID card of an individual which will be detected by the webcam. It is verified against the validation phase that uses Pyzbar.

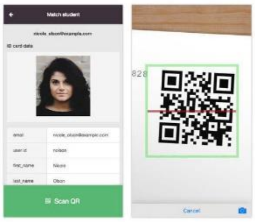

Figure 4: QR code in ID card

E. gTTS

It stands for Google Text-To-Speech. It is a Python library that allows converts certain text to speech and we can hear it. Here, warning message will be audible if a person does not wear the mask or wears it improperly.

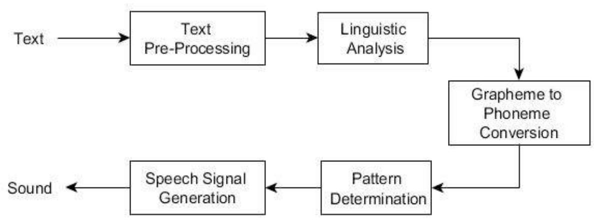

Figure 5: Flow of gTTS

F. Servo Motor

A servomotor is a rotary or linear actuator that can control angular or linear position, velocity, and acceleration with precision. It consists of a suitable motor coupled to a sensor for position feedback. It is connected to the NodeMCU. It gets triggered when a person has a valid ID Card and wears the mask properly. It helps to open or close the door unlike some of the systems that uses sensor or thermal controlled system [3] [4].

Figure 6: Servo Motor

G. OpenCV

It is a library of programming functions mainly aimed at real-time computer vision. OpenCV is used for computer vision, machine learning, and image processing, and it currently plays an essential part in real-time operations, which are critical in today's systems. It may be used to detect objects, faces, and even a human's handwriting by processing photos and videos. Our system uses these features of OpenCV in resizing and colour conversion of data images [2].

H. Convolution Neural Network (CNN)

It is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.

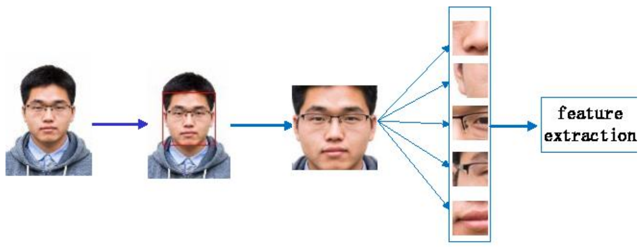

Figure 7: Feature Extraction using CNN

The main goal of Convolution Layer (CNVL) is to take out features from the image's data (the input). In a considerable image, a small section is taken and passed throughout all points in the big image (the input). At the time of passing at every point, they are convoluted within a single position (the output). Each small section which passes over the big image is called kernel or filter. This creates an activation map or a feature map in the output image. After that, the activation maps are sustained like input data to the following CNVL.

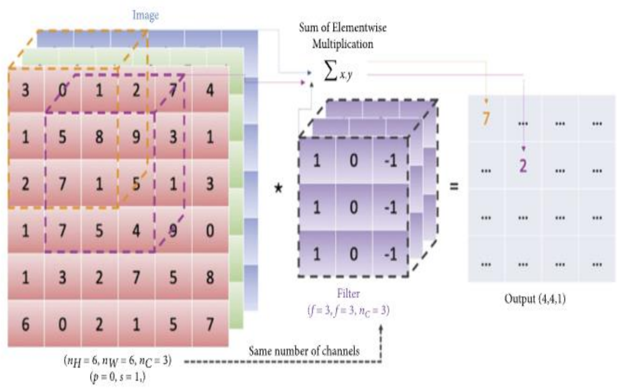

Figure 8: Working of CNN

IV. IMPLEMENTATION

This section discusses the implementation and deployment of the proposed system. The system was implemented in two phases. In the first phase, the training and testing of the facemask detection model was implemented along with the function for ID card verification using Pyzbar library and in the second phase the same model was deployed using the automatic door system. The whole system was implemented using Python on Windows environment of 8 GB RAM capacity. For the microcontroller NodeMCU has been used. The pin GND, 3V3 and D4 was used to connect the NodeMCU to the servo motor. Arduino software has been installed to connect the microcontroller to the system using the port 'COM3'.

The data was loaded into the NodeMCU and then the code was executed. The web camera is opened in new windows and it starts capturing the image/video. This is sent to the YOLO algorithm [10] where the facemask is detected using CNN and deep learning technique. The person's authentication is validated by detecting the QR code available on his/her ID card. The door opens only if the person wears the facemask properly and is authorized to the respective premises. If not, then a warning is raised to wear the facemask properly alerting the people nearby.

The image dataset used consists of 3833 images out of which 1915 images are for the class 'with_mask' and 1918 images are for the class 'without_mask'. There are three classes used for the system, i.e., with_mask, without_mask and mask_weared_incorrect. This dataset is a pretrained dataset downloaded from an open-source platform.

The accuracy rate of detecting a facemask range between 96-99% depending on the digital capabilities. The confidence values and epoch values are stored in an excel file. This excel file is used to plot a graph of confidence versus epoch which gives a rough idea of how accurate our output is for each epoch value. The following is the flow of our system depicted in the rough form:

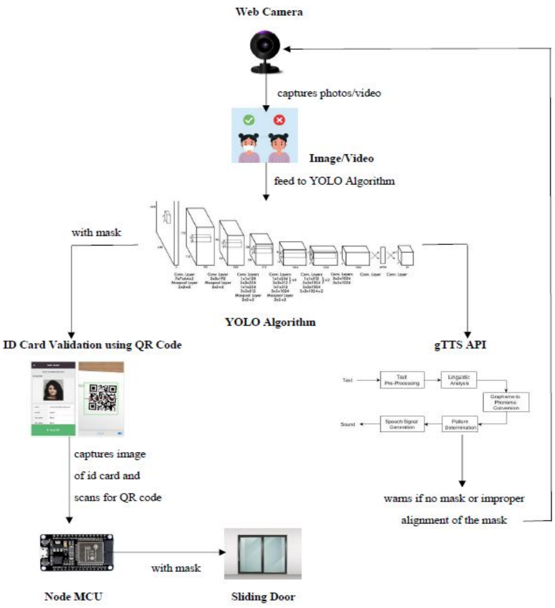

Figure 9: Flow of the proposed system

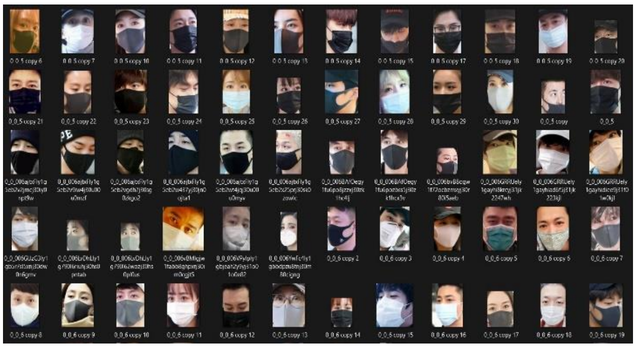

Figure 10: with_mask dataset

Figure 11: without_mask dataset

The proposed system was approached by the following algorithm:

Algorithm:

Step 1: Run the python file which eventually opens web camera.

Step 2: Web camera captures image or video.

Step 3: The captured image/video is fed to the YOLO algorithm.

Step 4: If mask with proper alignment is detected then:

Then:

- Person will have to authenticate themself.
- Pyzbar library is used to decode the QR code present in the person's ID card.
- Extracted text/roll number is matched against the data present in excel sheet (openpyxl library is used to read excel file).
- If data is present then a signal is sent from NodeMCU to servo motor to open the door.

Step 5: Else If no mask is detected:

Then:

- pyttsx library raises a warning asking the person to wear facemask.

Step 6: If mask with improper alignment is detected:

Then:

- pyttsx library raises a warning asking the person to wear facemask properly.

Step 7: Stop the system.

V. RESULT AND ANALYSIS

This section includes the output and its evaluation. The model is trained, validated and tested upon the dataset. The system achieved the accuracy of 99% but it usually varies between 95-98%. The pyzbar library is 100% efficient and detects the QR code correctly all the time. The detection of facemask is sometimes not appropriate because of digital capabilities including poor resolution of the web camera, background light, etc.

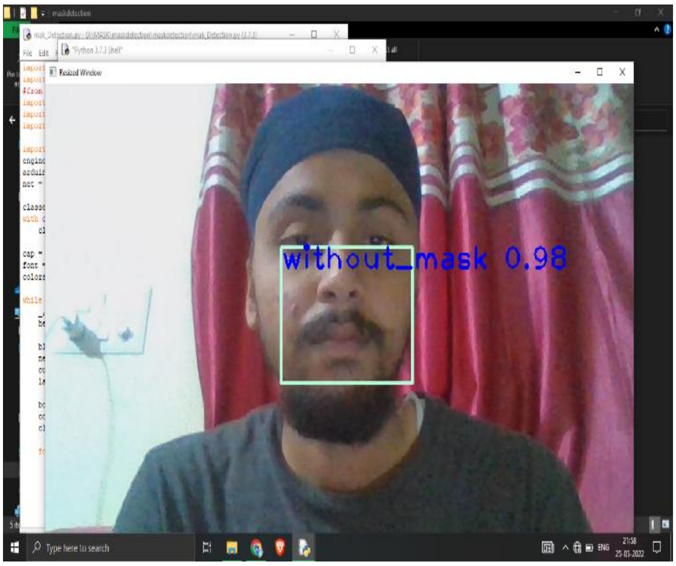

Figure 12: Accuracy while not wearing a facemask

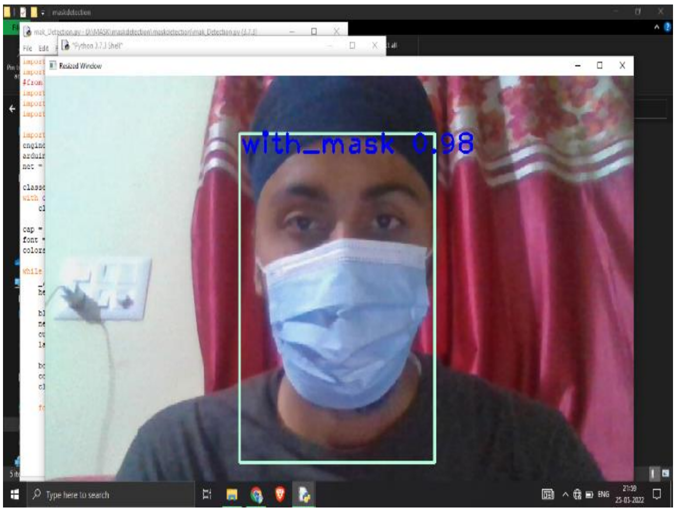

Figure 13: Accuracy while wearing a facemask

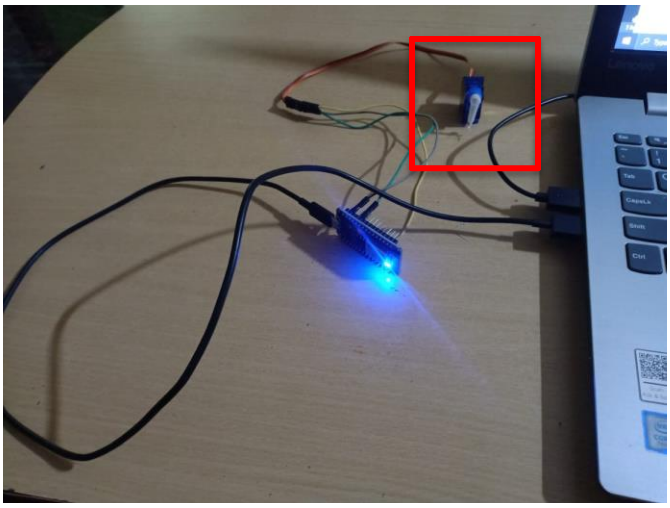

Figure 14: Door Closed

Figure 15: QR code detection and ID card authentication

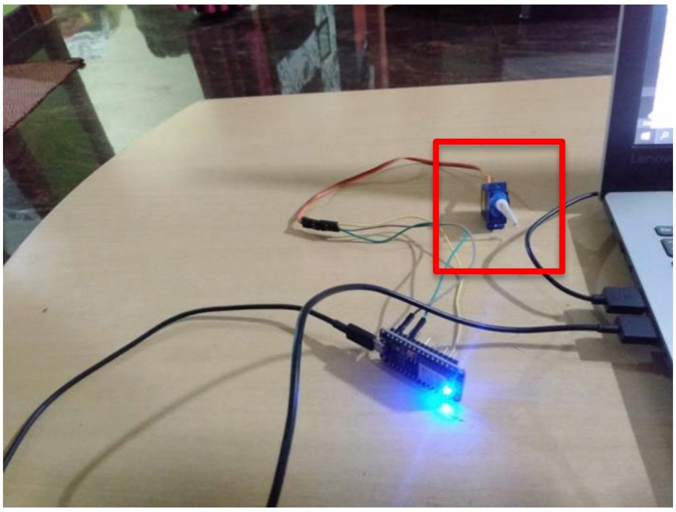

Figure 16: Door Open

Our system outperformed the existing systems in terms of accuracy for facemask detection and training loss was also reduced. The graph for both of them has been shown below:

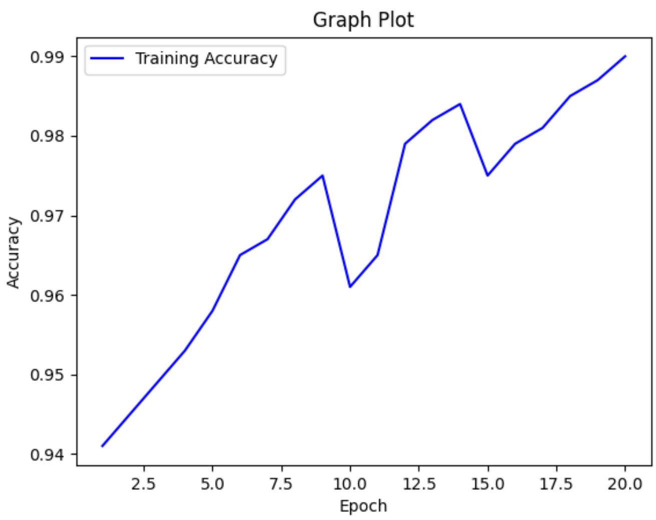

Figure 17: Accuracy vs Epoch Graph

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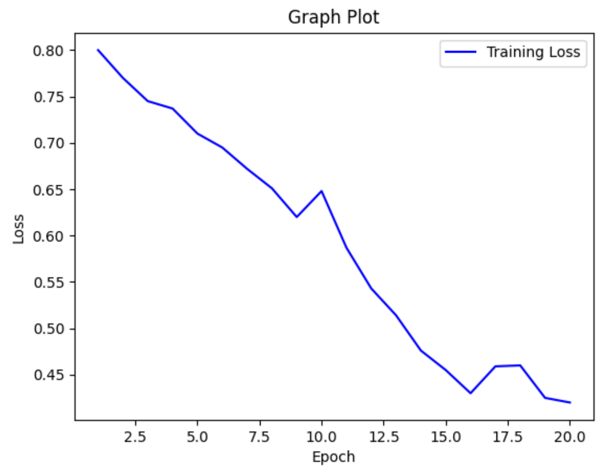

Figure 18: Loss vs Epoch Graph

The confidence in machine learning is the likelihood that the output of a machine learning model is correct and its value ranges between 0 and 1. Epoch is the total number of passes of a training dataset the machine learning algorithm has completed. The graph of 'confidence' against 'epoch' value has been plotted which looks like below:

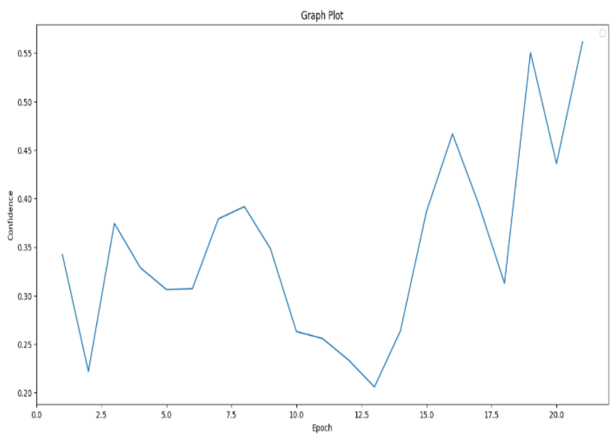

Figure 19: Graph plotted for confidence against epoch

VI. CONCLUSION

Due to the urgency of controlling COVID-19, the application value and importance of real-time mask and social distancing detection are increasing. It is computationally efficient, thus making it easier to deploy the model to embedded systems (Raspberry Pi, Google Coral, etc.). The automatic door along with facemask detection and identity authentication can therefore be used in real-time applications which require face-mask detection for safety purposes due to the outbreak of Covid-19 and also ensures the security of the concerned premises by authenticating the person's identity. This project can be integrated with embedded systems for application in airports, railway stations, offices, schools, and public places to ensure that public safety guidelines are followed.

Threats to Validity:

Every project comes with challenges and our project had few of them too. Due to the limited resources and heavy and complex computation our system was slow. The training took longer time because of the low processing power of our system, in this case our laptops. We could not train the model efficiently to recognize the cloth or hand or some other object that could seem to be a facemask but in reality, it is not. There was no pre-trained model for the same.

Future Scope:

As our system could not efficiently recognize the presence of facemask when we are actually using some other cloth or our hands, the system and its model can be trained with the dataset of the same. As the technology is advancing every day, our system can be modified easily and can be upgraded to any of the latest available technology. This system can be installed in public places and it can be integrated with other system to make it more effective.

REFERENCES

[1] Mohammad Marufur Rahman, Md. Motaleb Hossen Manik, Md. Milon Islam, Saifuddin Mahmud, Jong-Hoon Kim, "An Automated System to Limit COVID-19 Using Facial Mask Detection in Smart City Network" [2020], https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9216386

[2] Ariya Das, Mohammad Wasif Ansari, Rohini Basak, "Covid-19 Face Mask Detection Using TensorFlow, Keras and OpenCV" [2021], https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9342585

[3] Swapnil Kumbhar, Kartikraj Patil, Shubham Lohar, Vyankatesh Bhongale, "Thermal Controlled Contactless Smart Door System and Touchless Sanitizer" [2021], https://www.ijert.org/research/thermal-controlled-contactless-smart-door-system-and-touchless-sanitizer-IJERTV10IS050149.pdf

[4] D. I. G. Chomo, D. S. Yawas, Z. S. Johnson, "Development of an Automatic Door System" [2018], https://www.ajer.org/papers/Vol-7-issue-5/T0705168173.pdf

[5] Xing Wu, Jianxing Xu , Jianjia Wang , Yufeng Li , Weimin Li, Yike Guo, "Identity authentication on mobile devices using face verification and ID image recognition" [2019], https://bit.ly/32SS0Lg

[6] Toto Haryanto, Heru Suhartanto, Aniati Murni Arymurthy, Kusmardi Kusmardi , "Conditional sliding windows: An approach for handling data limitation in colorectal histopathology image classification" [2021], https://bit.ly/37S8Bld

[7] Ross Girshick, Jeff Donahue, Trevor Darrell, Jitendra Malik, UC Berkeley, "Rich feature hierarchies for accurate object detection and semantic segmentation" [2014], https://arxiv.org/pdf/1311.2524.pdf

[8] Ross Girshick , "Fast R-CNN" [2015], https://arxiv.org/pdf/1504.08083.pdf

[9] Shaoqing Ren, Kaiming He, Ross Girshick, and Jian Sun, "Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks" [2016], https://arxiv.org/pdf/1506.01497.pdf

[10] Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi , "You Only Look Once: Unified, Real-Time Object Detection" [2016], https://arxiv.org/pdf/1506.02640.pdf

Automated Door System Integrated with Facemask and ID Card Detection using Deep Learning Approach

Mayank[1], Amandeep Singh[2], Lalit Mudgal[3], Deepak Sah[4], Mrs. Kavitha B[5]

[1, 2, 3, 4, 5]*Department of Computer Science Engineering, Sapthagiri College of Engineering*
#14/5 Chikkasandra, Hesaraghatta Main Road, Bangalore – 57, India

[1]mayank.sawarn88@gmail.com
[2]ps772117@gmail.com
[3]lalitmudgal68@gmail.com
[4]sahdeepak19@gmail.com
[5]kavitha_b@sapthagiri.edu.in

***Abstract* — Nearly all areas of development are being adversely affected by the COVID-19 pandemic, which is being driven by a new coronavirus. Wearing a mask is one of the significant steps that have been considered to stop the transmission of this illness. Individual surveillance of people entering public places is required and our system serves the purpose. The Automated Door System integrated with Facemask and ID Card Detection raises a warning if a person without a mask or wearing a mask improperly is detected and also performs identity verification using a QR code. Our system uses YOLO as the state-of-art deep learning model along with OpenCV, and the NodeMCU as the microcontroller. Keeping track of individuals wearing masks and their authentication will be easy with the Automated Door System for all public places.**

Keywords- Covid-19, Convolution Neural Network, Deep Learning, YOLO, Facemask Detection, ID Card Detection, NodeMCU, Sliding Door

I. INTRODUCTION

As we all know COVID-19 struck humanity badly in every aspect that one can think about. COVID-19 pandemic is an ongoing global pandemic which had distressed our normal day-to-day life [1]. It resulted in the death of millions of people, markets were closed and this caused instability in the country's economy. Schools and colleges were shut down. And in the current scenario, China is still fighting with the new COVID variant.

According to the instructions given by the World Health Organization (WHO), wearing masks, maintaining social distancing, and using hand sanitizers were made compulsory [2]. Amongst these wearing a mask is the first and foremost thing which is to be done to avoid the spread of the virus. Keeping this in mind we have proposed which will ensure the proper wearing of masks while entering an institute or a building.

The security of an organizational building or any other concerned premises is of great importance. Especially during the times of pandemic, it becomes necessary to keep a check on the people entering or leaving the premises. This paper is basically for an automated door that opens only when the person is wearing a facemask properly and has a valid identity card. The system raises an alarm warning about the person not wearing the mask or wearing it improperly.

The facemask is detected using OpenCV and YOLO which are based on Deep Learning. The unique ID of a person is scanned and detected using a QR Code present on the ID card. The data present in the QR Code is verified against the organizational database for authenticity. After the authentication and detection of proper wearing of a facemask, the NodeMCU triggers the servo motor to open.

The paper further includes the following sections: Section II discusses about the works that involve the development of a related system. Section III consists of the various methodology used for the implementation. Section IV discusses the implementation of the proposed system. Results are analyzed in section V. Section VI includes the conclusion and the things that can be modified for future work.

II. LITERATURE REVIEW

[1] In this study, whenever a person is spotted without a facemask the local station contacts the concerned authority and takes necessary actions. The model was trained using a huge dataset which managed to attain 98.7% accuracy.

[2] The method proposed in this paper successfully detects the face in an image and checks whether the person is wearing a facemask or not. The technology used in this method were TensorFlow, Keras, OpenCV, and Scikit-Learn. Two datasets were used which gave an accuracy of 95.77 percent and 94.58 percent.

[3] This paper discusses a system that includes an automatic hand sanitizer and temperature sensor. People can sanitize their hands whenever they want without touching the sanitizer dispenser. A person's body temperature is measured whenever they touch the temperature sensor and if it is normal then the door opens automatically, otherwise it will not.

[4] The goal of this paper's work is to design, construct, and test a low-cost automatic door assembly using locally available raw materials. It is suggested that research on aluminum door parts, low-speed high torque electric motors, and long-range sensors that meet the requirements of automatic sliding doors be conducted in Nigeria.

[5] The verification of the user's ID card and the extraction of information from the user's ID card are the two most difficult aspects of identity authentication. To address the problem, an identity authentication system is presented that uses face verification and ID picture recognition to extract and validate personal information. Inception-ResNet Face Embedding (IRFE) is used to achieve identity authentication. Morphology Transformed Feature Mapping (MTFM) approach is developed to extract ID data. The suggested IRFE and MTFM outclassed other available models for face verification and extraction of ID data.

[6] To collect sub-sample data on histopathology pictures, this work presents a conditional sliding window technique. Determined by the image and window size, the conditional sliding window technique can generate a variety of sub-samples. Additionally, a CNN was trained using the images, and when compared to a model created using the original dataset, it was shown to be capable of predicting both benign and lethal tissues. The dataset produced for this study also has sensitivity values over 0.80, demonstrating that the recommended CNN design is more stable than prior approaches like AlexNet and DenseNet121.

[7] This study describes a straightforward and scalable detection method that improves mean average precision (mAP) by more than 30% in comparison to the previous best result on VOC 2012, yielding a mAP of 53.3 percent. This method joins two main ideas: (1) a CNN with high capacity which enables localization of objects from the bottom-up region, and (2) supervised pre-training for an additional task along with domain-specific fine-tuning results in an outstanding boost in performance. The technique is known as R-CNN (Regions with CNN features) because it integrates region suggestions with CNNs. A sliding-window detector, OverFeat, is also compared to R-CNN.

[8] For object detection, this paper presents a Fast Region-based Convolutional Network approach (Fast R-CNN). Fast R-CNN is based on the work that uses deep convolutional networks to categorize object proposals efficiently. Fast R-CNN has many advantages over previous work including improved training and testing efficiency and also amplified detection accuracy. Fast R-CNN is 9 times faster than R-CNN in training the VGG16 network, has a higher mAP and is more precise than SPPnet. Python and C++ are used to implement fast R-CNN (using Caffe).

[9] This research discusses a Region Proposal Network (RPN) that communicates convolutional features of images with the detection network. Object limits and objectness scores are predicted simultaneously. High-quality region proposals that Fast R-CNN uses for detection are created upon training. RPN and Fast R-CNN are combined into a single network by sharing their convolutional features.

[10] An innovative approach to detecting an object is called YOLO. It stands for You Only Look Once. Object detection is considered to be a regression problem with bounding boxes covering the object and are related to probabilities. Only one neural network is required to predict bounding boxes of objects and finds their probability.

III. METHODOLOGY

This section talks about the various modules involved in the proposed system. It includes Webcam, Image/Video, YOLO, ID Card, gTTS, Servo Motor, OpenCV, and CNN. The web camera is used for capturing the images from the premises. These images/videos are fed as input to the YOLO algorithm which detects the facemask using CNN and OpenCV. These modules are further discussed in detail.

A. *Web Camera*

A webcam is a simple camera that may be embedded in a laptop or attached to the system externally and is responsible for receiving images or video. It needs to be of high resolution to capture the images or videos effectively.

Figure 1: Web Camera

B. *Image/Video*

Digital images and digital videos are comprised of logical 0's and 1's since computer can understand only binary format. A still image that does not change with time is usually referred to as an image, but a video consists of image frames and typically comprises moving and/or changing things. Transforming continuous signals into digital format produces digital images or videos even though "direct digital" systems are becoming more common.

Digital visual signals can also be observed on a variety of display mediums, such as digital printers, computer displays, and digital projection systems. The interest in creating engineering methods for effectively transmitting, maintaining, and even improving the visual integrity of this data is growing as a result of the rapid increase in the frequency with which data is channeled, stored, processed, and presented in a digital visual format.

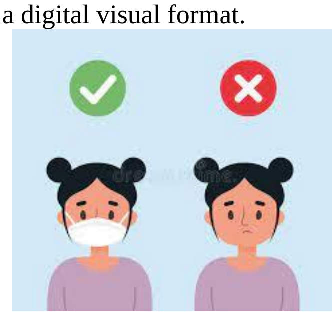

Figure 2: Image/Video

C. *YOLO*

It stands for You Only Look Once. It is the algorithm that has been used for real-time object detection, i.e., face-mask in our case. Objects are detected in real-time using Convolutional Neural Networks (CNN) embedded with the YOLO method. Many algorithms were proposed before YOLO like Sliding Windows [6], R-CNN [7], Fast R-CNN [8], and Faster R-CNN [9]. A single forward propagation through the neural network is responsible for detecting objects using the YOLO approach. The algorithm needs to run just once to predict and explore the entire image. Several bounding boxes and class probabilities are forecasted by the CNN. Tiny YOLO and YOLOv3 are the popular variants of YOLO.

YOLO algorithm has many benefits including:

• Speed: This procedure modifies detection speed as it can forecast objects in real-time.

• High Accuracy: YOLO is better at extracting certain features from an object with minimum background noise.

• Learning Capabilities: The algorithm has better understanding abilities, which allows it to understand object representation and use them in detecting objects.

YOLO algorithm working principle includes following three techniques:

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• Residual Blocks: The image is divided into various grids. The measurement of each grid are S x S. The specific grid cell will be responsible for detecting an object center if it emerges in that grid cell.

• Bounding Box Regression: A bounding box indicates and focuses on a certain object in an image. For every bounding box in the image there are certain characteristics present which includes width (bw), height (bh), class (c), and bounding box center (bx, by).

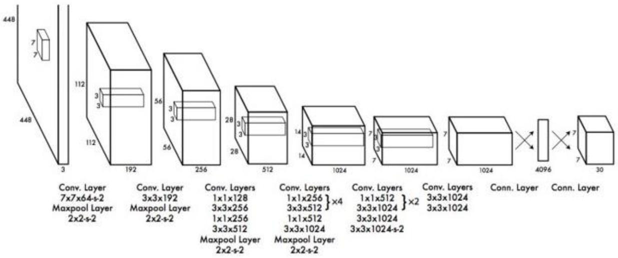

Figure 3: YOLO Architecture

The image dimensions standardise the bounding box dimensions to be in the range of 0 and 1. Since the bounding box's x and y coordinates are parametrized to reflect offsets of a particular grid cell position, they are also limited to values between 0 and 1.

The last layer employs a linear activation function whereas the ones before it all utilize leaky rectified linear activation:

$$\phi(x) = \begin{cases} x, & \text{if } x > 0 \\ 0.1x, & \text{otherwise} \end{cases}$$

The sum-squared error has been reduced in the YOLO model's output. Sum-squared error is used because it can be easily improved, but it falls short of the objective of average precision optimization. It does not always give equal weight to localization and classification errors.

In addition, each image has a number of grid cells that are devoid of any objects. In many cases, this overwhelms the gradient from cells that really contain objects and reduces the "confidence" ratings for such cells to zero. This model instability may lead to early training divergence.

To resolve this, it is possible to increase the loss from bounding box coordinate forecast while decreasing the loss from confidence forecast for boxes without objects. To accomplish this two variables are used, λ_{coord} and λ_{noobj}. The values are set as, $\lambda_{coord} = 5$ and $\lambda_{noobj} = .5$.

Additionally, mistakes in both small and large boxes are equally weighted by the sum-squared error. The error metric predicts that tiny discrepancies in small boxes should be more significant than slight differences in big boxes. To avoid this, the bounding box's dimensions are projected as the square root of the bounding box's dimensions instead of specifically predicting the height and width of the bounding box.

Several bounding boxes are predicted by YOLO per grid cell. During training, just one bounding box predictor should be responsible for each object. This predictor is "responsible" for predicting an object based on which current Intersection over Union (IoU) is highest with the ground truth. This results in the bounding box predictors to become more distinguished. The ability to properly recognize certain sizes, aspect ratios, or item categories is improved by each predictor, increasing overall recall.

During training, the following multiple loss function is optimised:

$$\lambda_{\text{coord}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left[(x_i - \hat{x}_i)^2 + (y_i - \hat{y}_i)^2 \right]$$
$$+ \lambda_{\text{coord}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left[\left(\sqrt{w_i} - \sqrt{\hat{w}_i} \right)^2 + \left(\sqrt{h_i} - \sqrt{\hat{h}_i} \right)^2 \right]$$
$$+ \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left(C_i - \hat{C}_i \right)^2$$
$$+ \lambda_{\text{noobj}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{noobj}} \left(C_i - \hat{C}_i \right)^2$$
$$+ \sum_{i=0}^{S^2} \mathbb{1}_{i}^{\text{obj}} \sum_{c \in \text{classes}} \left(p_i(c) - \hat{p}_i(c) \right)^2$$

where 1_i^{obj} indicates if the cell *i* contains an object and 1_{ij}^{obj} indicates that the prediction is owned by the *jth* bounding box predictor present in cell *i* [10].

D. ID Card

QR Code has been used to store the USN of the student. There are various methods to validate the ID card [5] in which scanning the barcode is one of them. For our system, we have used a QR code which will be present on the ID card of an individual and will be detected by the webcam. It is verified against the validation phase that uses Pyzbar.

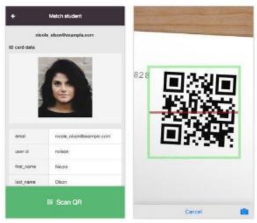

Figure 4: QR code in ID card

E. gTTS

It stands for Google Text-To-Speech. It is a Python module that allows for the conversion of a certain text to voice, and we can hear it. Here, a warning message will be audible if a person does not wear the mask or wears it improperly.

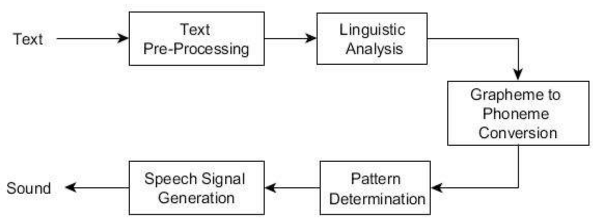

Figure 5: Flow of gTTS

F. Servo Motor

The angular or linear position, velocity, and acceleration are controlled by a rotary or linear actuator called as a servo motor. To obtain the position feedback the servo motor consists of a suitable motor coupled to a sensor. It is connected to the NodeMCU. It gets triggered when a person has a valid ID Card and wears the mask properly. It helps to open or close the door unlike some of the systems that use a sensor or thermal-controlled systems [3] [4].

Figure 6: Servo Motor

G. OpenCV

It is a programming library that focuses on real-time computer vision. Computer vision, machine learning, and image processing use OpenCV and plays an essential role in real-time operations. It processes images and videos to detect objects, faces, and even a human's handwriting. This paper uses these features of OpenCV to resize data images and its colour conversion [2].

H. Convolution Neural Network (CNN)

It is a Deep Learning algorithm that differentiates one image from another by taking an input image and assigning learnable weights and biases to various aspects/objects in the image.

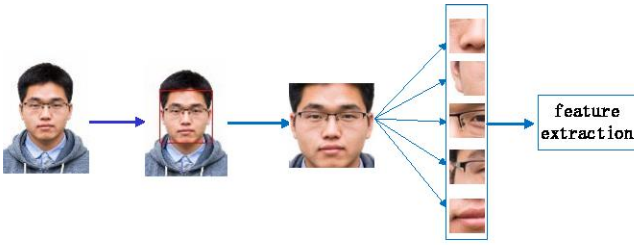

Figure 7: Feature Extraction using CNN

The Convolution Layer (CNVL) aims to take out features from the image's data (the input). A small part of the considered image is taken and compared to all the points in the input big image. They are tangled inside a single position when going through each location (the output). A kernel or filter is any tiny portion of a picture that is applied to the larger input image. In the output picture, this produces an activation map or a feature map. The activation maps are then maintained as input data for the subsequent CNVL.

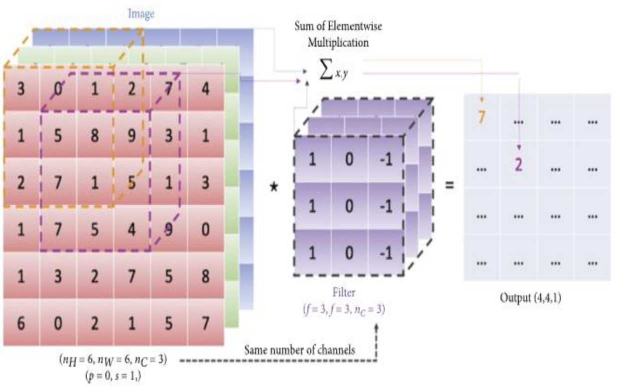

Figure 8: Working of CNN

IV. IMPLEMENTATION

Implementation and deployment of the system has been discussed in this section. The system was set up in two stages. In the first stage, the training and testing of the facemask detection model were implemented along with the function for ID card verification using the Pyzbar library and in the second stage, the same model was deployed using the automatic door system. The whole system was implemented using Python on a Windows environment of 8 GB RAM capacity. For the microcontroller, NodeMCU has been used. The pin GND, 3V3, and D4 were used to connect the NodeMCU to the servo motor. Arduino software has been installed to connect the microcontroller to the system using the port 'COM3'.

The data was loaded into the NodeMCU and then the code was executed. The web camera is opened in new windows and it starts capturing the image/video. This is sent to the YOLO algorithm [10] where the facemask is detected using CNN and deep learning technique. The person's authentication is validated by detecting the QR code available on his/her ID card. The door opens only if the person wears the facemask properly and is authorized to the respective premises. If not, then a warning is raised to wear the facemask properly alerting the people nearby.

The image dataset used consists of 3833 images out of which 1915 images are for the class 'with_mask' and 1918 images are for the class 'without_mask'. There are three classes used for the system, i.e., with_mask, without_mask, and mask_weared_incorrect. This dataset is a pre-trained dataset downloaded from an open-source platform.

The accuracy rate of detecting a facemask range between 96-99% depending on the digital capabilities. The confidence values and epoch values are stored in an excel file. This excel file is used to plot a graph of confidence versus epoch which gives a rough idea of how accurate our output is for each epoch value. The following is the flow of our system depicted in the rough form:

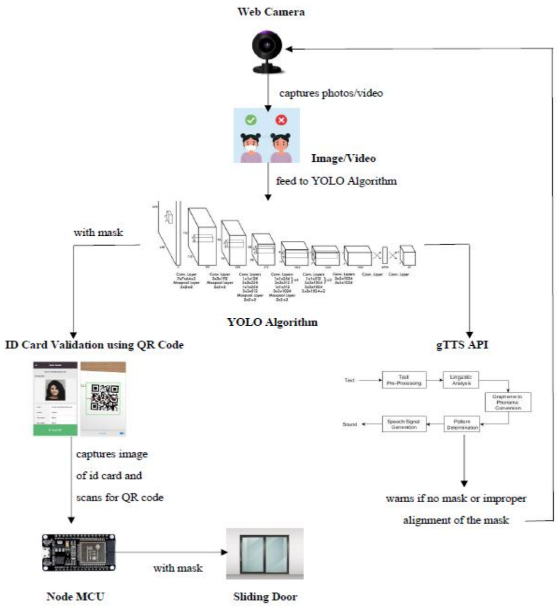

Figure 9: Flow of the proposed system

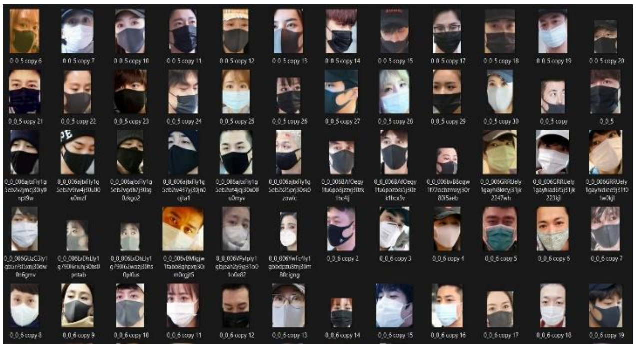

Figure 10: with_mask dataset

Figure 11: without_mask dataset

The proposed system was approached by the following algorithm:

Algorithm:

Step 1: Run the python file which eventually opens web camera.

Step 2: Web camera captures image or video.

Step 3: The captured image/video is fed to the YOLO algorithm.

Step 4: If mask with proper alignment is detected then:

Then:

- Person will have to authenticate themself.
- Pyzbar library is used to decode the QR code present in the person's ID card.
- Extracted text/roll number is matched against the data present in excel sheet (openpyxl library is used to read excel file).
- If data is present then a signal is sent from NodeMCU to servo motor to open the door.

Step 5: Else If no mask is detected:

Then:

- pyttsx library raises a warning asking the person to wear facemask.

Step 6: If mask with improper alignment is detected:

Then:

- pyttsx library raises a warning asking the person to wear facemask properly.

Step 7: Stop the system.

V. RESULT AND ANALYSIS

This section includes the output and its evaluation. The model is trained, validated, and tested upon the dataset. The system achieved an accuracy of 99% but it usually varies between 95-98%. The pyzbar library is 100% efficient and detects the QR code correctly all the time. The detection of facemask is sometimes not appropriate because of digital capabilities including poor resolution of the web camera, background light, etc.

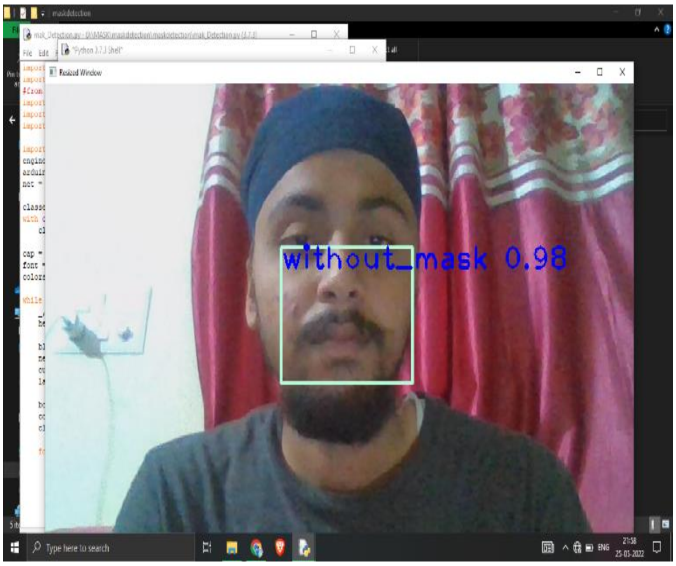

Figure 12: Accuracy while not wearing a facemask

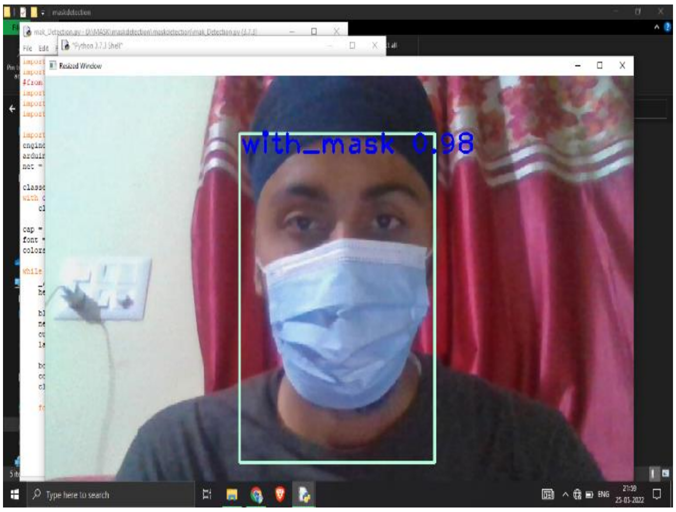

Figure 13: Accuracy while wearing a facemask

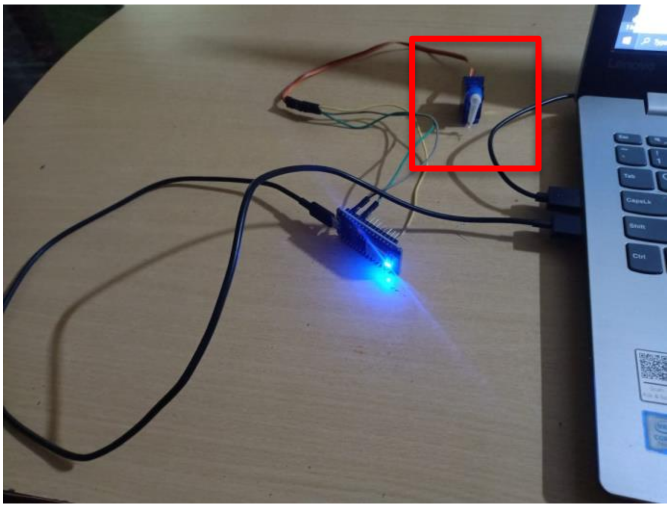

Figure 14: Door Closed

Figure 15: QR code detection and ID card authentication

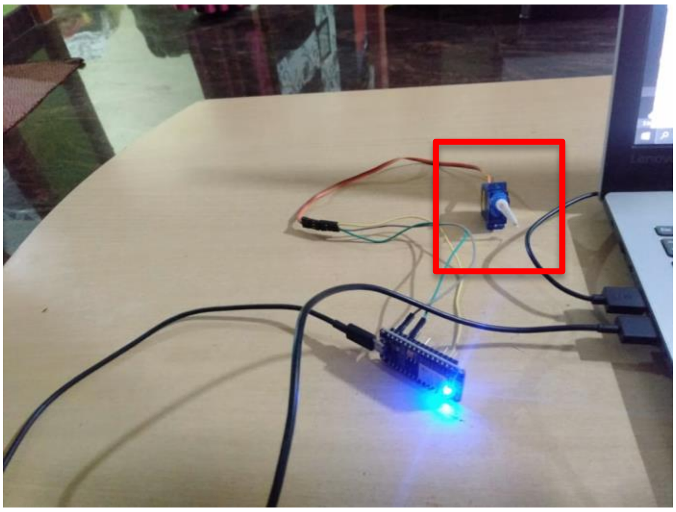

Figure 16: Door Open

Our system outperformed the existing systems in terms of accuracy for facemask detection and training loss was also reduced. The graph for both of them has been shown below:

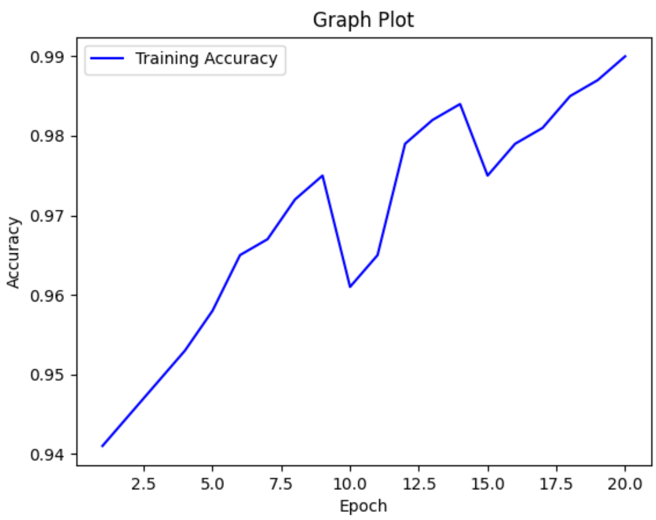

Figure 17: Accuracy vs Epoch Graph

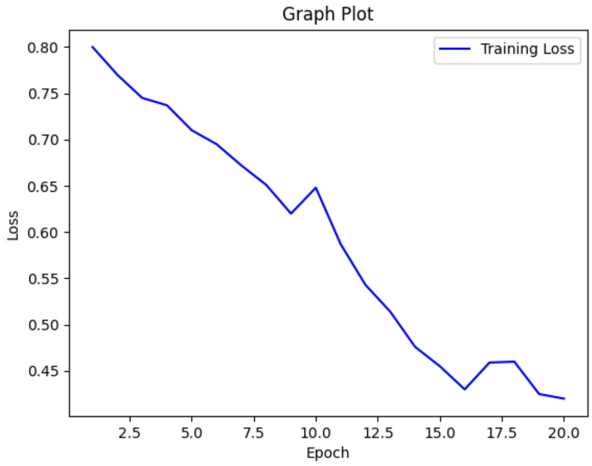

Figure 18: Loss vs Epoch Graph

The confidence in machine learning is the likelihood that the output of a machine learning model is correct and its value ranges between 0 and 1. The number of training dataset passes done by the machine learning algorithm is measured by the epoch value. The graph of 'confidence' against 'epoch' value has been plotted which looks like below:

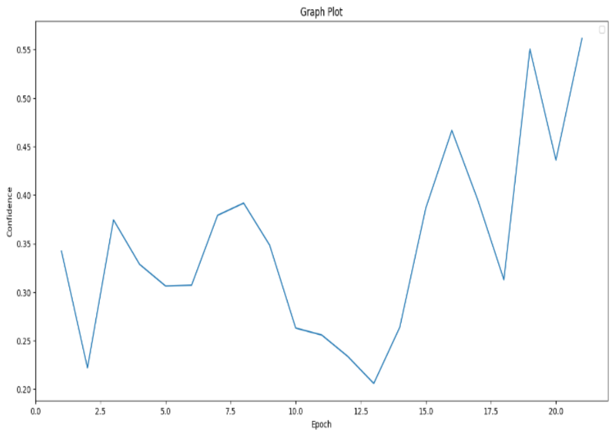

Figure 19: Graph plotted for confidence against epoch

VI. CONCLUSION

Due to the alarming spread of COVID-19, the establishment of a tool has become obvious which can detect facemask along with the social distancing. As the system is computationally efficient the deployment of the model to the embedded system (Raspberry Pi, Google Coral, etc.) has become easier. The automatic door along with facemask detection and identity authentication can be efficiently used in real-time in order to take care of the precautionary measures stated by WHO to suppress the COVID-19 virus. Places like airports, railway stations, offices, educational premises and other public places can make use of this tool to ensure well-being of people.

Threats to Validity:

Every project comes with challenges and our project had a few of them too. Due to the limited resources and heavy and complex computation, our system was slow. The training took a long time because of the low processing power of our system, in this case, our laptops. We could not train the model efficiently to recognize the cloth or hand or some other object that could seem to be a facemask but in reality, it is not. There was no pre-trained model for the same.

Future Scope:

As our system could not efficiently recognize the presence of facemask when we are using some other cloth or our hands, the system and its model can be trained with the dataset of the same. As the technology is advancing every day, our system can be modified easily and can be upgraded to any of the latest available technology. This system can be installed in public places and it can be integrated with another system to make it more effective.

REFERENCES

[1] Mohammad Marufur Rahman, Md. Motaleb Hossen Manik, Md. Milon Islam, Saifuddin Mahmud, Jong-Hoon Kim, "An Automated System to Limit COVID-19 Using Facial Mask Detection in Smart City Network" [2020], https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9216386

[2] Ariya Das, Mohammad Wasif Ansari, Rohini Basak, "Covid-19 Face Mask Detection Using TensorFlow, Keras and OpenCV" [2021], https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9342585

[3] Swapnil Kumbhar, Kartikraj Patil, Shubham Lohar, Vyankatesh Bhongale, "Thermal Controlled Contactless Smart Door System and Touchless Sanitizer" [2021], https://www.ijert.org/research/thermal-controlled-contactless-smart-door-system-and-touchless-sanitizer-IJERTV10IS050149.pdf

[4] D. I. G. Chomo, D. S. Yawas, Z. S. Johnson, "Development of an Automatic Door System" [2018], https://www.ajer.org/papers/Vol-7-issue-5/T0705168173.pdf

[5] Xing Wu, Jianxing Xu, Jianjia Wang, Yufeng Li, Weimin Li, Yike Guo, "Identity authentication on mobile devices using face verification and ID image recognition" [2019], https://bit.ly/32SS0Lg

[6] Toto Haryanto, Heru Suhartanto, Aniati Murni Arymurthy, Kusmardi Kusmardi, "Conditional sliding windows: An approach for handling data limitation in colorectal histopathology image classification" [2021], https://bit.ly/37S8Bld

[7] Ross Girshick, Jeff Donahue, Trevor Darrell, Jitendra Malik, UC Berkeley, "Rich feature hierarchies for accurate object detection and semantic segmentation" [2014], https://arxiv.org/pdf/1311.2524.pdf

[8] Ross Girshick, "Fast R-CNN" [2015], https://arxiv.org/pdf/1504.08083.pdf

[9] Shaoqing Ren, Kaiming He, Ross Girshick, and Jian Sun, "Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks" [2016], https://arxiv.org/pdf/1506.01497.pdf

[10] Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi, "You Only Look Once: Unified, Real-Time Object Detection" [2016], https://arxiv.org/pdf/1506.02640.pdf

Genetic Programming Approach to Detect Hate Speech in Social Media

Rohan Kumar[1], Sakshi Sheoran[2], Simran Verma[3], Mrs. Swetha B N[4]
Department of Computer Science Engineering, Sapthagiri College of Engineering
#14/5 Chikkasandra, Hesaraghatta Main Road, Bangalore – 57, India
[1]r289rohan@yahoo.com
[2]sakshisheoran922@gmail.com
[3]simranverma410@gmail.com
[4]swethabn@sapthagiri.edu.in

***Abstract* —Social media sites, which are central to our daily lives, offer some degree of depersonalization and anonymity, giving users the freedom to express their opinions, feelings and ideas. If left unchecked, these platforms can be used to spread malicious language. In fact, hate speech has increased on social media in recent years. Therefore, malicious expressions on these platforms need to be monitored and prevented. However, creating content on social media sites creates a lot of traffic and cannot be controlled manually. In addition, when using traditional machine learning approaches as a prediction method, the language used and the length of the message are challenges. This paper presents a genetic programming (GP) model for hate speech detection. In this model, each chromosome represents a classifier that uses the universal sentence coder as a characteristic. A new mutation technique that affects only trait values in combination with standard one-point mutation techniques has improved the performance of GP models by enhancing the progeny pool with alternative solutions. The proposed GP model outperformed all state-of-the-art systems in four publicly available hate speech datasets.**

Keywords- Hate speech, Classification algorithms, genetic programming, machine learning, prediction methods, Social media

I. INTRODUCTION

Advances in technology and the proliferation of social media platforms allow users to express their feelings and opinions without restrictions or restrictions, and in some cases incite and spread hatred towards others. All major social media platforms attempt to detect and prevent malicious language, but rely primarily on users to report such behavior. Malicious expression on social media has increased in recent years to prevent malicious expression on these platforms. However, creating content on social media sites creates a lot of traffic and cannot be controlled manually. Due to the impact of hate speech on social dynamics and the ease with which such concepts can be disseminated in social media and virtual environments, there is an urgent need to detect and prevent hate speech automatically and reliably.

Malicious representation on these platforms should be monitored and prevented. However, creating content on social media sites creates a lot of traffic and cannot be controlled manually. The goal is to develop a GP model for binary text classification to detect hate speech on social media platforms. This survey aims to classify tweets into hate or non-hate classes. Hate speech detection can be defined as a binary or multi-class classification task. Documents fall into one of two classes, hate and non-hate, in the binary classification task. In contrast, a multi-classification task classifies a document into three or more classes. This can represent the level of hatred content, or different types of hatred, such as racism or sexism. Use binary classification.

II. LITERATURE REVIEW

[1] In 2016, Waseem and Hovy created one of the first publicly available datasets from Twitter and addressed hate speech detection as a multi-class text classification problem. They employed Logical Regression and a combination of character n-gram and linguistic features achieving a 73.93% F1 score as their highest performance. The experimental results indicated that increasing the number of features resulted in a decrease in performance.

[2] In 2017, Davidson et al. formed the largest publicly available dataset for hate speech on Twitter. They employed a multiclass classifier for detecting hate speech on their dataset, using n-grams, sentiment lexicon, and TF-IDF as features. Using LR, they got a 90% F1-score, but the confusion matrix showed that the classifier was biased to classify the tweet as not hateful.

[3] In 1994, Koza presented the GP as an extension of the genetic algorithms as an optimization model. As an evolutionary algorithm, it uses the Darwinian principle of survival of the fittest to evolve the solution. The individuals in the GP represent programs, and GP evolves programs to provide the optimal solution.

[4]GP was employed to develop a binary classifier for classifying credit-card applications into two classes disapproving and approving.

[5]GP has also been successfully used in other applications such as image classification. For example, Chen and Lu [20] proposed a GP framework for texture classification. Their model employed majority voting to increase the performance and obtained an accuracy of 99.6%.

[6] In the medical field, GP proved to be a good model for diagnosing diseases. GP was applied to diagnose diabetes, the systems achieved 87.0% and 78.5 ± 2.2% accuracy

III. METHODOLOGY

First step is pre processing of the data. The preprocessing step is employed to eliminate the content that is not expected to contribute to the detection of hate speech and to prepare the data for the subsequent steps.

Three steps :

1.Tokenisation

2.Removing stop words

3.Removing punctuations.

The next step is Feature extraction. The feature extraction step of our model uses the universal sentence encoder to represent each tweet as a high/512- dimensional vector. Universal Sentence Encoder encodes entire sentence or text into vectors of real numbers as shown in Fig 1 that can be used for text classification.

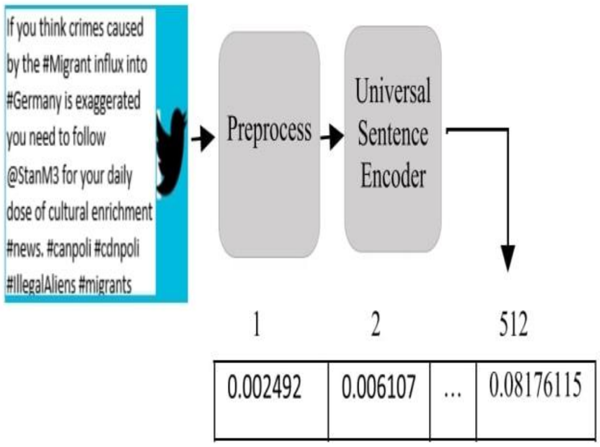

Fig 1: Encoding text into vectors of real number using Universal Sentence Encoder

The next step after feature extraction is initialization. This is the first step in the GP model. This step creates a first generation individual. Each individual is a tree used to categorize tweets. The internal nodes of the tree are drawn from the set of functions S = {+ ,,, ⇤, /,>, & lt;, and, or if-then-else} as shown in Fig 2. The terminal or leaf node is filled with a set of functions starting with F1, F2. .. .. , F512 corresponding to the elements of the 512-dimensional embedded vector of the Universal Sentence Encoder.

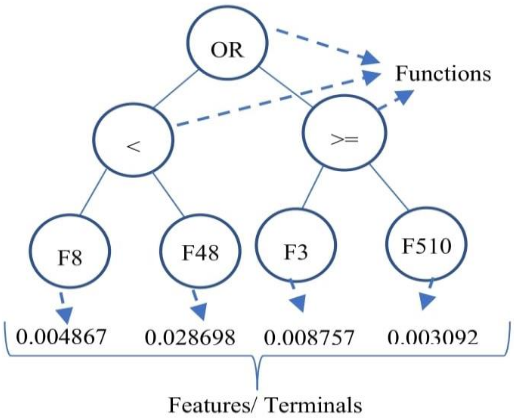

Fig 2: Feature Extraction

The GP uses a selection step to select two individuals from the current population as parents of offspring inserted into the next population. Parents are chosen randomly, but in the most appropriate way. The fitness function is used to assess how well a person is suitable for solving an immediate problem. Use the F1 score as a fitness function. Genetic operators are used to generate offspring from parents selected from the current population as shown in Fig 3. It uses two operators, crossover and mutation. Experiment with three different settings to assess the contribution of the new hybrid mutation operator to performance. The initial setup used a standard one-point mutation. This mutation replaces a subtree rooted at a random point in the offspring with another randomly generated subtree.

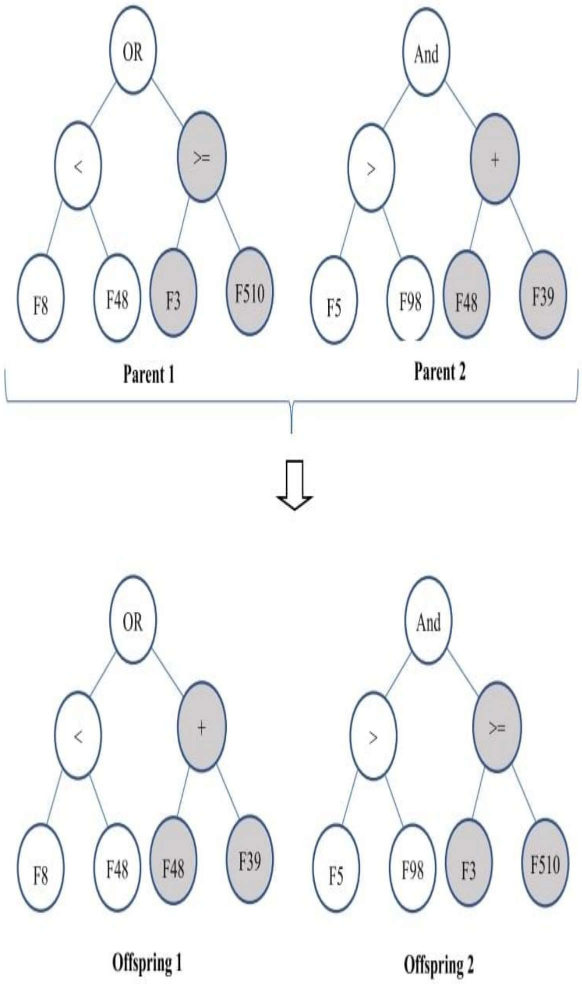

Fig 3: Generation of offsprings from the selected parents.

In the new feature mutation technique, each feature node is mutated by being randomly modified to one of the 512 members of the Universal Sentence Encoder feature as shown in Fig 4.

This work proposes a new hybrid mutation operator that randomly chooses one of the two mutation operators. A standard one-point mutation and a new feature mutation. The termination criterion is the completion of the generation.

The proposed GP model produces the best individuals after completing 500 generations.

When the termination criteria are met, the person who best fits the training data is used to classify the unknown data.

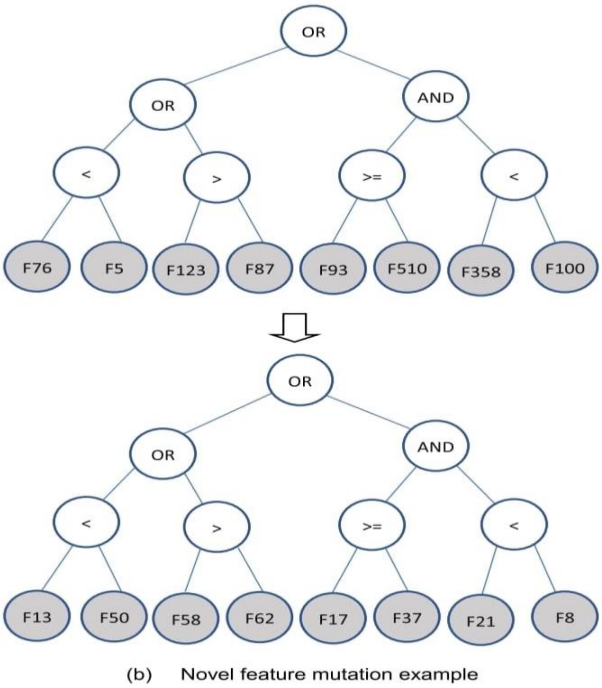

Fig 4: Novel feature mutation technique

SVM Classification

The best way to understand the basics of support vector machines and how they work is to use a simple example. Imagine that you have two tags, red and blue, as shown in Fig 5, and that your data has two characteristics, x and y. Given a pair of (x, y) coordinates, we need a classifier that returns whether it is red or blue. Record the already labeled training data on the plane.

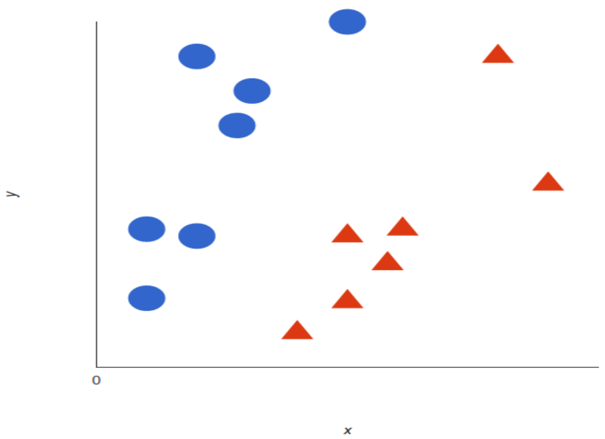

Fig 5: Datasets

The support vector machine takes these data points and outputs a hyperplane (a simple two-dimensional line) that optimally separates the tags as shown in Fig 6. This line is the decision boundary. Everything on one side is classified as a blue plane, and anything on the other side is classified as a red plane.

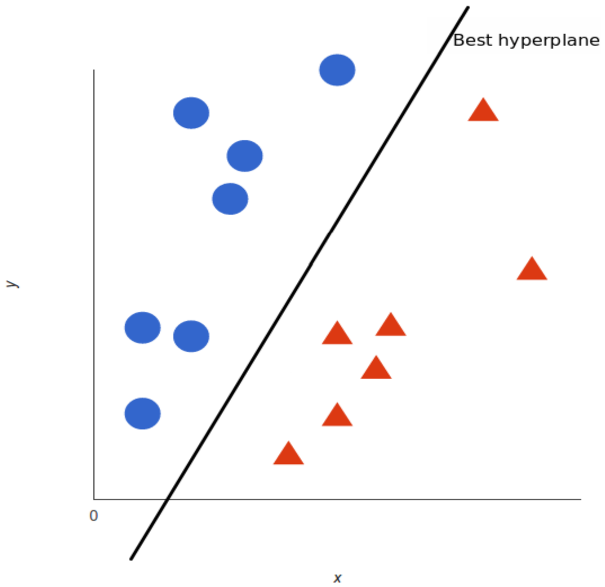

Fig 6: Classification of data using SVM

IV. RESULT AND ANALYSIS

Development of GP model for binary text classification for hate speech detection on social media platforms.

• Presents a new hybrid mutation technique that incorporates new trait mutation methods and standard one-point mutation methods, thereby increasing inter-individual variability.

• Use four published datasets to evaluate the performance of the proposed GP model using the hybrid mutation technique.

• Compare the results of the proposed model with the other two settings and prior art.

• State-of-the-art improvements related to F1 scoring

V. CONCLUSION

This project designs an effective GP model based on Darwinian principles to solve the binary text classification task of hate speech detection on social media. GP's new hybrid mutation technology has been proposed to improve the evolutionary process and develop the best individuals by using only the universal set encoder as a characteristic. The experimental results of the proposed model prove the effectiveness and superiority of the GP model by improving the performance of all datasets over all other classification models without post-processing.

VI. REFERENCES

[1] T. John, ‘‘Hate speech,’’ in Encyclopedia of the American Constitution, L. Levy, K. Karst and, A.
Winkler, 2nd ed. New York, NY, USA: Macmillan, 2000, pp. 1277–1279.

[2] P. Fortuna and S. Nunes, ‘‘A survey on automatic detection of hate speech in text,’’ ACM Comput.
Surv., vol. 51, no. 4, pp. 1–30, Sep. 2018.

[3] Z. Al-Makhadmeh and A. Tolba, ‘‘Automatic hate speech detection using killer natural language
processing optimizing ensemble deep learning approach,’’ Computing, vol. 102, no. 2, pp. 501–522, Feb. 2020.

[4] R. Cao, R. K.-W. Lee, and T.-A. Hoang, ''DeepHate: Hate speech detection via multi-faceted text representations,'' in Proc. 12th ACM Conf. Web Sci., Southampton, U.K., Jul. 2020, pp. 11–20.

[5] Z. Waseem and D. Hovy, ''Hateful symbols or hateful people? Predictive features for hate speech detection on Twitter,'' in Proc. NAACL Student Res. Workshop, San Diego, CA, USA, Jun. 2016, pp. 88–93.

[6] T. Davidson, D. Warmsley, M. Macy, and I. Weber, ''Automated hate speech detection and the problem of offensive language,'' in Proc. ICWSM, Montreal, QC, Canada, May 2017, pp. 15–18.

[7] P. Badjatiya, S. Gupta, M. Gupta, and V. Varma, ''Deep learning for hate speech detection in tweets,'' in Proc. 26th Int. Conf. World Wide Web Companion (WWW Companion), Perth, WA, Australia, Apr. 2017, pp. 759–760.

[8] M. O. Ibrohim and I. Budi, ''Multi-label hate speech and abusive language detection in Indonesian Twitter,'' in Proc. 3rd Workshop Abusive Lang. Online, Florence, Italy, Aug. 2019, pp. 46–57.

[9] I. Alfina, R. Mulia, M. I. Fanany, and Y. Ekanata, ''Hate speech detection in the Indonesian language: A dataset and preliminary study,'' in Proc. Int. Conf. Adv. Comput. Sci. Inf. Syst. (ICACSIS), Jakarta, Indonesia, Oct. 2017, pp. 233–238.

[10] T. Putri, ''Analisis dan deteksi hate speech pada sosial Twitter berbahasa Indonesia,'' M.S. thesis, Dept. Comp. Sci., Indonesia Univ., Indonesia, 2018.

NFT: BUBBLE OR REVOLUTION

Arya Sinha
Department of Computer Science Engineering
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road,
Bangalore-560057, Karnataka, India
aryabaluahi@gmail.com

Aveek Chakraborty
Department of Computer Science Engineering
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road,
Bangalore-560057, Karnataka, India
chakrabortyaveek2@gmail.com

***Abstract* - Our study conjecturally predicts the bubble and revolution of Non-Fungible Tokens (NFTs): transferrable and unique digital assets on public blockchains. The novel feature of each token being unique and different from every other has reinforced the security of belongings and strengthened particular possession. This contemporary technology maintains to develop and capture the eye of the hundreds, as more packages of NFTs are identified with time. This research objectives to offer a complete assessment of NFT and its underlying center technologies, specifically blockchain and Ethereum. This subject is important because, despite their strong market growth, NFTs have not been studied in terms of bubble prediction.**

***Keywords*- Non-Fungible Tokens, blockchain, bubble, revolution, digital assets.**

I. Introduction

NFT, abbreviated for "non-fungible tokens", are transferrable and unique digital assets on public blockchains that are representative of physical or digital creative work or intellectual property including music, digital art, games, gifs, video clips and more. NFT is a way to record, verify, and track the ownership of a unique asset developed as an extension of cryptocurrencies (e.g., Bitcoin; BTC) that enabled decentralized consensus-building on transaction records.

The term "nonfungible" in NFT refers to the fact that each token cannot be exchanged for another, making every token a unique entity that represents a single particular object. These tokens encompass virtual data in the shape of media (music, video, image) the cost of which can be calculated in terms of cryptocurrencies. In particular, NFTs are part of the Ethereum blockchain, but unlike the alternative Ethereum coins, they may be exchanged for equivalent assets.

Rapid technological advances and growth are accompanied by an increase in security risks, including reliability. NFT's uniqueness and non-fungibility, if not completely ruled out, largely minimizes authenticity and counterfeiting issues with the owner's digital signature embedded in each token. Assets can be easily traced back to the owner. In addition, the addresses the issue of tricking customers into buying counterfeit products. B. Tickets or works of art. Buyer can easily track the item for sale to the owner, so can guarantee a legitimate purchase.

You can think of the blockchain as a public ledger, and committed transaction is stored in a list of blocks. This chain grows as new blocks are constantly added. Asymmetric encryption and distributed consensus algorithms have been implemented for user security and ledger consistency. In general, blockchain technology exhibits important characteristics such as decentralization, persistence, anonymity, and auditability. These characteristics allow blockchain to significantly reduce costs and improve efficiency.

This paper contains six sections including this introduction. Section II details about the primers of NFT. Section III discusses about NFT as a revolution. Section IV highlights the NFT bubble. Section V is about the impact of NFT infrastructure. Section VI concludes this paper.

II. Helpful Non- fungible tokens(nft) - a primer

This section provides an overview of the technology used in connection with the concept of NFT and the growth of the NFT marketplace.

A. *Blockchain*

The blockchain is a distributed digital database of transactions that encompasses the whole computer network. It does not demand central privileges to operate because it is distributed. The very first cryptocurrency to leverage blockchain technology was Bitcoin. Developed in 2008 and released in 2009. Since then, numerous initiatives from so many industries have sprung up around the disbursed ledger concept. Nonetheless, the financial world is viewed as a significant user.

The basis for this could be that setting the optimum current owner of an asset is often challenging. The blockchain works in the following way to verify and authenticate ownership: It is conjured up of cryptographically linked data streams called "blocks," and each time you add value a block, a comprehensive digital ledger chain is formed. DLT stands for Distributed Ledger Technology, which is a distributed database that is administered by a group of people. Blockchain is a decentralized technology in which transactions are recorded with an irrevocable cryptographic signature known as a hash and blocks can be recognized over the network using cryptographic techniques. This concept guarantees the integrity of the blockchain up to the first block. The hash value is unique, so if you change block in the chain, the hash value will change immediately, so you can detect fraud. Due to the overall blockchain's organizational structure, all transactions are transparent. Additionally, this technology is being investigated in a variety of fields, including financing, public services, social services, confidentiality, smart contracts, and the Internet of Things.

B. *Ethereum*

Ethereum is a community-driven technology software platform that enables the creation and deployment of hundreds of decentralized applications. Ethereum is based on Blockchain technology. It is a blockchain with the built-in integrated programming language Turing, with an abstraction layer that allows anyone to define their own ownership, transaction format, and state transition methods. This is achieved by using smart contracts, which is a collection of crypto rules that are executed only when certain conditions are met.

A platform like this will also serve as the foundation for a virtual currency called Ether, which is indeed a crypto commodity used on the Ethereum blockchain. In a way, Ethereum is a fuel for Ethereum's decentralized apps. This currency can be used to make payments to another account or to a machine that handles a certain operation. As a result, Ether can be used to develop decentralized applications, smart contracts, tokens, and conventional peer-to-peer payments. As a consequence, Ethereum is also referred to as "Programmable Currency." It is made up of two components: EOA and contracts. The contract account is managed by the contract code, whereas the EOA is controlled by the private key.

C. *NFT Marketplace (Buying and selling NFTs)*

NFT Minting is the process by which Digital Art becomes part of the Ethereum blockchain. NFTs are tokens that are "minted" after they are created, similar to how metal coins are minted and circulated. Digital art, symbolized as NFT, is purchased and sold on the market and is digitally tracked throughout the process.

When the NFT art being sold for $69 million, the NFT market suddenly surged in the second half of 2020. In addition, total NFT sales in 2020 were $2.5 billion, and in the first six months of 2021, total NFT sales exceeded US $10.7 billion. This indicates that there was a major change in NFT growth of over a short period. The normal 24-hour trading volume of the NFT market is $4 billion, while the regular 24-hour trading volume of the entire cryptocurrency market is $344 million.

Numerous digital marketplaces can be used to buy and sell NFTs, although some of them are better than others, as indicated in table 1. Many if not most marketplaces, however, sell the same portfolios or works of art. As an outcome, the type of collectible is predominantly decided by the market type. The significant portion of these marketplaces sell a multitude of NFTs, however their behaviour varies according on the platform.

TABLE I. TOP NFT MARKETPLACES

Market	Traders	Volumes
OpenSea	46,067	$ 73.45m
Axie Infinity	40,429	$ 19.44m
CryptoPunks	12	$ 2.45m
AtomicMarket	7103	$ 1.03m
PancakeSwap	1342	$ 783.74k

* Statistics up to October 2021[1]

Courtesy: Wajiha Rehman, Hijab e Zainab, Jaweria Imran, Narmeen Zakaria Bawany, NFTs: Applications and Challenges.

2021 has seen a significant increase in interest in NFTs, with NFT marketplaces like Nifty Gateway and OpenSea recording the highest trading volumes in the first quarter of 2021. The most expensive NFTs are listed in Table II.

TABLE II. MOST EXPENSIVE NFTS

NFTs	Value
Everydays: the First 5000 Days	$69.3m
CryptoPunk #7523	$11.75m
CryptoPunk #3100	$7.67m
CryptoPunk #7804	$7.6m
Beeple’s Crossroad	$6.6m

*Statistics up to October 2021[2]

Courtesy: Wajiha Rehman, Hijab e Zainab, Jaweria Imran, Narmeen Zakaria Bawany, NFTs: Applications and Challenges.

III. NFT REVOLUTION

This section describes the various NFT applications and how they are shaping the future of digital assets.

A. *Digital Art*

Digital Art is the creative content that exists in virtual or digital media and consists of music, movies, paintings, images and more. Like its physical art counterpart, it can be sold by artists and bought by art collectors and enthusiasts. However, it is also vulnerable to counterfeiting and theft. Using NFTs in this regard adds a unique hash to each artwork so that you can distinguish it. The artist or author of the original work can add a signature to the digital token to enhance the reliability of the created content. Although it is possible to make copies of digital art, NFT guarantees that each copy is owned solely by the purchaser and cannot be exchanged for another copy of the art to amateur art collectors and speculators, thus increases the appeal of art to amateur art collectors and speculators.

The capacity to specify rules for reselling artwork in the secondary market is another characteristic of NFT technology. Smart contracts allow artists to install pre-determined resale rates. This fee automatically applies to subsequent sales in the secondary market. In this way, even American artists who are not normally eligible for so-called Droit de Suite can enjoy it because it is not regulated by US copyright law. This is nothing new in Europe, as the Droit de Suite was introduced by Directive 2001/84 / EC.Typically, artists, such as auction houses and galleries, are entitled to a portion of the resale price attained in the secondary market under Directive 2001/84/EC. Although smart contracts are global, several of them seem to be platform-specific. Equivalently, resale rights are only counted if they were purchased on the same platform as the initial NFT.

B. The Music Industry

This phenomenon has spread to the music industry, and artists see NFTs as an opportunity to connect directly with their fans and control their music. In fact, artists have already embraced this trend by creating NFTs connected to digital art, physical products and live experiences. For example, the co-founder of the band Linkin Park dropped an NFT attached to a clip of an unreleased song with animation. After scrutiny, rights management groups already knew the potential of blockchain in art and music. In fact, SIAE (Italy's largest copyright exploitation agency) partnered with Algorand, the leading blockchain platform, a few years ago. This partnership has recently created over 4 million NFTs that represent the rights of SIAE's over 95,000 author members.

NFT can theoretically have a significant impact on society and the role of collecting labels by giving artists the ability to directly control the use of musical works, but artists do well with NFT. The ability to coin and sell is not a child's play. First of all, the rights to commercial use of musical works are usually assigned to labels, so it is important to know exactly what rights the artist is actually entitled to. What's interesting in this context is that virtually every label deal involves leveraging each recording on every technology and platform that will be developed in the future. That is, all the technology that has not yet been developed by the artist at the time of the contract. I signed it. If the wording of the contract is very broad (as usual), it easily involves creating an NFT associated with the record.

The second notable point is that when creating and selling an NFT, you need to take into account all the rights to your work. This is usually multiple rights, given that a musical piece is generally the author of the song and a collaborator such as the author. Of the text. For example, an artist who wants to create and sell an NFT with a new music video clip needs to make sure they have all the licenses for the NFT, including licenses from musicians and songwriters. This analysis should carefully consider agreements with co-authors and, if applicable, relevant labels. However, even if there is no agreement between the co-authors, the use of financial rights is not free and is based on the rules of ICL Article 33 and beyond, which is the regulation of musical works.

C. The Fashion Industry

NFTs open up new digital channels in the fashion world. In fact, the ability of users not only to buy digital items in fashion, but also to get unique items adds a level of exclusivity that is always important in fashion culture. NFTs can be an effective tool against piracy by supporting brand owners' anti-counterfeiting efforts. In fact, in addition to the garment lifecycle traceability provided by the blockchain technology itself, NFTs provide the ability to embed NFTs in physical products intended to be scanned for authenticity. Take the fight against counterfeiting one step further.

It seems that a method for imprinting, trading, and blending encrypted digital resources in the form of digital shoes has already been trademarked by major US sports brands. Each digitized commodity has the ability to be associated to a physical shoe. When you buy a pair of sneakers with this technology, you also get an NFT. It can be moved together with the shoes, allowing you to test the product's dependability. Customers who purchase this product can also make bespoke shoe designs by digitally mixing the owner's digital shoe design with the digital shoe design of someone else to produce a new hybrid design. However, until a product is owned by the fashion brand, NFTs cannot fully guarantee its integrity. Because the NFT will ensure and perpetuate the untruth if you can validate a fashion accessory and its ownership, but the entry in the ledger is fraudulent or wrong from the start.

D. Licenses and Certifications

NFTs assigned to individual licenses and certifications minimize the time and effort organizations spend reviewing important documents, thereby improving management processes. In addition, certificate and license issuing authorities can eliminate the records management workload by having a unique NFT that allows each document to be validated for authenticity. Issuing licenses and certificates on the blockchain helps prevent tampering and reduces the chance of encountering malicious documents. An example of this use case for the NFT is Zastrin, an education company that sells online programming courses. We use NFTs to purchase course licenses and issue course completion certificates.

E. Collectibles

Collectibles are an important contributor to irreplaceable token use cases. In fact, it was one of the first ways to introduce and further normalize NFT ideas to the general public through CryptoKitties. These are unique digital kittens that users can duplicate to create unique kittens. Each crypto kitten has unique characteristics such as fur patterns and eye color. With the click of a button, users can buy two different cats, male and female, for tame.

The generated kitten has its own personality and genetic algorithm. The value of cryptokitties is determined by a lack of genetic profile. In addition, the frequency with which sire is used to keep other kittens is an important variable in predicting the importance of cryptokitties.

F. Increasing Game Potential

The NFT has received considerable attention from the gaming community and developers. It can provide ownership data for in-game objects, empower the in-game economy, and provide many other perks to support players. In many standardized games, players can purchase a variety of inventory items and objects. However, if the purchased item is an NFT, the player can get the money back by selling it when the item is no longer needed. Players can even make a profit if the value of the item increases over time.

This process is not only beneficial to players, but also to developers in several ways. Every time an NFT is marketed, developers also earn royalties. This provides a more interdependent and profitable business framework in which both players and developers benefit from the NFT midmarket. This also suggests that even if the developer discontinues support for the game, the items accumulated by the player will remain in their possession.

G. Domain Name

This is probably an overlooked method and another way NFTs are used. Blockchain-based domain name services such as Ethereum Name Services (ENS) and Unstoppable Domains are beginning to attract the attention they deserve. Users can change the address from a long and complex string of numbers to any length, making the process more comfortable and user-friendly. In addition, Unstoppable Domains leverages the Crypto Name Service (CNS) developed on the Ethereum blockchain. The process of creating a domain name generator is simple, but the pain lies in the demand for these domains. So far, both ENS and non-stoppable domains have been successfully attempted in distributed domains.

IV. NFT Bubble

NFTs appear to be resolving digital ownership, but so far most NFTs haven't dealt with copyright, actual legal ownership, piracy, theft, or other human issues.

A. Who Owns the Underlying Asset?

NFTs prove that you own something hosted somewhere, but that doesn't mean you actually own the underlying asset. An NFT address is a verifiable receipt that indicates that you own the asset because it indicates that you have traded a particular digital asset.

Genuine NFTs, such as authentic digital artwork, are best kept on distributed file sharing platforms like IPFS, FileCoin, and Storj, however these systems are typically too expensive for huge storage, such as large JPG, GIF, video, or MP3 formats. As a result, it can be stored on a centralized server like AWS. Conversely, in many situations, the blockchain just stores the web URL where the artwork is housed. If the content is hosted centrally, the entity in charge of that server can easily remove it, even if it pays millions of dollars.

The token is a smart contract that points to the blockchain stored in the digital wallet where that web address (referring to the server that maintains the funds) is located. The domain name is recorded on the blockchain and cannot be altered, but it is conceivable for someone to delete the item from the server and return an "404 not found error" by our immutable and costly web address, indicating that the web URL cannot be located.

You may own a receipt for a specific piece of asset, but you do not own the asset unless it is held on a decentralised storage system. It can be regulated and removed by the owner of the server where it is stored.

B. Centralization in a Decentralized Ecosystem

As a result, one of the well-known marketplaces, such as OpenSea, might be ideal, although this does not guarantee success. Because it is a controlled exchange, OpenSea employs IPFS, but it also holds the keys, just like any other centralised crypto exchange. The NFT becomes redundant if OpenSea decides to erase or freeze digital assets for copyright violation or other reasons, as it has done previously.

For example, in late 2021, OpenSea intervened to thwart the $ 2.2 million sale of stolen and expensive NFTs from collector Todd Kramer, the owner of a well-known art gallery. An NFT was stolen from his hot wallet, an internet-connected wallet, using a phishing attack. It may be good for Todd that thieves can't resell NFTs, but it raises important questions about the decentralization of those NFTs.

C. Hacked Wallets and Blockchain Security Challenges

If stored on decentralized storage, only users who own the NFT can access and control it. To make matters worse, most NFTs, which point to where assets are stored, are stored on a centralized exchange, similar to how your cryptocurrency is stored on an centralized exchange, which means that if an exchange gets hacked, you could lose your precious NFTs.

If the NFT is on your decentralized wallet and on a hot wallet connected to the internet, you are responsible for its security. As Todd Kramer discovered, if you get attacked by an online scam, you can still lose your NFT.

To make matters worse, NFTs are stored on a blockchain. It could be Ethereum, Solana, EOS, or one of dozens of other blockchains that support NFT. These blockchains are secured by decentralized miners or staking, administrators, and the more administrators there are, the more secure the blockchain becomes because the harder it is to perform a 51% attack.

This is an attack where a group of miners own more than 50% of the network's hashing rate, and since they control most of it, they can undo transactions that have already been made while the group has control. This means they can double the number of tokens, which is the whole promise that blockchains want to prevent.

There are also other chains used for NFT that will be cheaper to use, but these may be more centralized and therefore have weaker security. All of this means that for NFTs to achieve mass adoption, transaction costs must fall to, ideally, zero or close to zero, while decentralization must increase to ensure that an NFT Bought today for $10 still holds its value in the future.

D. Fat Finger Mistakes

If you're unlucky, you've bought an expensive NFT and your wallet has been hacked, the blockchain that stores the NFT has been compromised, or the central database that stores the actual artwork has been hacked. The criminal deletes the actual asset. In this case, we have an NFT that points to the web address that points to the server, but we don't own anything because the server has nothing.

Don't sell bored ape at the wrong price, as happened to NFT owner Max, who mistakenly sold bored ape tfor 0.75 ETH (about $ 3000) instead of 75 (about $ 300,000). Before the owner corrected the mistake, a bot had snapped up the unique collector's item by sending the transaction with 8 ETH (around $34000) of gas fees to ensure it was instantly processed.

These so-called fat finger errors have happened before. It's annoying to you, but it also shows a bigger problem, which has caused a lot of controversy around the world in the past years; Net neutrality. The goal of net neutrality is to always provide everyone with equal access to the Internet, and Internet Service Providers (ISPs) must treat all Internet communications equally. Obviously, this is no longer true in the blockchain world because of gas charges. This poses a threat to the future and can further increase the digital divide and inequality.

E. Scams and Copyright Infringements

Unsurprisingly, there are also several frauds and copyright infringements of well-known and expensive NFT items such as the Bored Ape Yacht Club, which some refer to as satire or art in and of itself. The Phunky Ape Yacht Club (or PAYC) is one example, which simply switched the right-facing Bored Apes to the left and resold them for roughly $1.8 million.

PAYC has since been banned from centralized markets such as OpenSea, Raible and Mintable, again demonstrating the power of these centralized markets in creating a seamless trading experience for the masses.

Let's say you're lucky and everything is working fine. In that case, you're still not out of the woods yet, as the NFT you purchased might not come with the proper IP or copyright, you can't monetize it, and it may only be used as a beautiful image. Everyone else can do the same to see in your wallet or virtual home.

As a matter of truth, most NFTs put up for sale in 2021 did not include copyright or intellectual property, making it impossible to monetize NFTs, which are an important component of a thriving economy. The Bored Ape Yacht Club collection does essentially what we're talking about and brings a vibrant community and high prices, but most collectibles don't have it, and all you have is a pointer to an item stored somewhere, which isn't a sustainable solution if NFTs are meant to establish mass adoption.

V. Does NFT Infrastructure Add Value to Blockchains?

The 2021 NFT boom shows convincingly that blockchains can 1) solve real problems, 2) deploy quickly, and 3) create value for both users and the underlying network. Many existing blockchains that compete with Ethereum by adopting different consensus mechanisms, thereby increasing transaction speeds and lowering prices, are entering NFT technology with the aim of expanding the user base and boosting market valuations. In August 2021, sales of the NFT on the OpenSea Marketplace reached nearly $ 4 billion, an increase of 50,000% compared to the $ 8 million in January 2017. This highlights the huge revenue potential of the NFT economy built on top of the existing blockchain.

Driven by the excess demand curve, various existing blockchains have begun to integrate the NFT infrastructure. This enables NFT mining, trading, auctions, mining, staking and more. It is no exaggeration to say that NFT enthusiasts have significantly expanded the adoption of blockchain, which is an important step towards the inevitable transformation of commerce and financial services through blockchain technology.

In light of this, we conduct the following research to determine how much worth has been generated for current blockchains as a result of the NFT architecture's recent adoption. To that aim, we're interested in hearing about NFTs in the perspective of the 3rd generation blockchain, which has the biggest market valuation. Algorand, Avalanche, Polkadot, Solana, Tezos, and Zilliga are among the brands we've chosen. Thereafter we conduct a normal event survey to see if the market responds favourably to the NFT's anticipated strategic execution. The 16th aberrant performance and the two-day event timeframe are examined using a onefactor market model (-1 to 0). We use the return on bitcoin to proxy for the market

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return, as we did in earlier studies. Such a method is akin to utilising the S&P 500 as a benchmark for evaluating the performance of funds, including those with various investment approaches and international holdings (Becker, Ferson, Myers, Schill, 1999 etc.)

A handful of NFT occurrences involving the Solana blockchain have been linked to an average unanticipated 22 percent price gain of SOL (Solana's native cryptocurrency), resulting in a $3 billion boost in the Solana network's aggregated market value. Similarly, the announcement of the Unifty launching NFT farming incentives on the Avalanche blockchain raises the value of the Avalanche network by over $1 billion or 4.6 percent, while the announcement of the new NFT dedicated blockchain Efinity built on Polkadot raises the value of Polkadot network by over $1.5 billion or 4.6 percent (18 percent).

The above demonstrates massive value creation for blockchains that expand their functionality into the realm of NFT.

VI. Conclusion

This study examines the risk and return characteristics of NFT-based startups with valuations identified on a crypto exchange. Recent months have seen an increase in the usage of NFTs, including primary NFT services and NFT transactions that are feverish in the secondary market. The NFT sector represents another important use case for blockchains, beyond fundraising, remittance, store of value, borrowing and lending.

Securitization has given rise to a new generation of highly complex transactions monetizing non-financial assets and other rights that do not normally generate cash flows. Although these so-called NFTs (non-fungible tokens) and crypto exchanges promise to cover more than financial and other benefits, they pose a huge liquidity risk for traders and investors. Illiquidity is a leading cause of bankruptcy as well as a major systemic threat to the financial system.

Their use of blockchain and other FinTechs for proof of ownership and transfer of investment interest, which underpins their promise of greater financial inclusion, would be applicable; used to analyze almost anything a security invests in a multitude of interests. In turn, this could greatly expand the pool of investors, not only helping to increase access to finance for SMEs, but also potentially providing cheaper and more accessible credit for all. Notably, if limited to investment securities that generate cash flow (such as debt securities) or have a robust trading market (such as publicly traded equity securities), fractionalizing investment securities in this way can provide the aforementioned benefits without increasing liquidity risk.

We've seen the same pattern in many technological revolutions before, where at one point the market crashed and filtered out counterfeiters and abusers, leaving us with exemplary of the industry and these companies ended up shaping the world we live in. We believe that if we learn from its history and patterns, we can expect the same from NFT-Blockchain revolution. The problem lies in people, ways of seeing things and using them, not the technology itself (if you kill people with a knife, the knife is not the problem, it can be used to cut fruits).

No matter how we look at it, one thing we all know for sure, technology and its applications are revolutionary and they are here to last like the rest of the things from the past that are still here. What we need to do is try to be the beneficiaries of this technology by actively improving it and finding ways for it to benefit the world.

So we think the question has been answered.There is an ‘AND’ rather than an ‘OR’ in it. Part of the blockchain revolution will actually end up as a bubble because of the greedy parasites out there, AND it will also end up being a revolution and changing the world because of the people who truly believe in it’s potential to benefit the world.

A natural extension of our research is to look at the on-chain activity of NFT startups as a potential predictor of market performance. This challenging question is left for future research.

References

[1] Wajiha Rehman, Hijab e Zainab, Jaweria Imran, Narmeen Zakaria Bawany, NFTs: Applications and Challenges.

[2] L. Ante, “The non-fungible token (NFT) market and its relationship with Bitcoin and Ethereum”, SSRN Electronic Journal, 2021. Available: 10.2139/ssrn.3861106.

[3] Q. Wang, R. Li, Q. Wang, and S. Chen, “Non Fungible Token (NFT): Overview, Evaluation, Opportunities and Challenges”, 2021. Available: http://arxiv.org/abs/2105.07447

[4] Kensuke ITO, Kyohei SHIBANO, Gento MOGI, Predicting the Bubble of Non-Fungible Tokens (NFTs): An Empirical Investigation

[5] https://www.lexology.com/library/detail.aspx?g=ccfc7f4c-4536-4ce6-b627-8e4b37f51a02

[6] https://www.thedigitalspeaker.com/nfts-can-amazing-not-just-yet-5-challenges-nfts/

[7] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4044101

[8] https://tribune.com.pk/story/2309855/nfts-and-blockchain-a-revolution-or-a-bubble

[9] Makarov, I., & Schoar, A. (2020). Trading and arbitrage in cryptocurrency markets. Journal of Financial Economics, 135 (2), 293–319.

[10] Mieszko Mazur, Non-Fungible Tokens (NFT). The Analysis of Risk and Return.

[11] https://www.nature.com/articles/s41598-021-00053-8

PAOC

Predictive Analysis Of Cryptocurrency using AI/ML

Faraz Khan
4th year, Computer Science Engineering Student
Sapthagiri College of Engineering
Bangalore, Karnataka, India
farazkhan3020@gmail.com

1. Introduction

Empirical asset pricing is a major branch of financial research. Machine learning methods have been applied increasingly within this domain, due to the ability to flexibly select amongst a potentially large number of features and to learn complex, high-dimensional relationships between features and target.

Although a considerable body of research has examined the pricing of equities and bonds, yielding in a substantial number of potentially market-predictive factors, less attention has been paid to the novel stream of cryptocurrency pricing. In particular, the short-term predictability of the bitcoin market has not yet been analyzed comprehensively. Furthermore, most studies have solely considered technical features and have not analyzed the feature importance of the employed machine learning models. Against this backdrop, tackling this research gap by comparatively analyzing different machine learning models for predicting market movements cryptocurrency provides a way to design a model with high accuracy. In this context, the overarching research question is

- Is it possible to generate a predictive model for cryptocurrency which is accurately able to form predictions?
- If so, what would be the requirements for it? And since this is an unexplored area, are there any other kinds of data and methods that can be used/integrated with the PAOC model?

This paper deals with this problem and presents ways to generate a successful model that could promise more accurate results and helps fabricate the PAOC model in such a way that it enables the model to adapt to various environments and in a vast array of applications.

2. Architecture

PAOC generates Machine Learning models specifically designed to be applied to applications that require predictions to be formed. It focuses on the process of integrating various modules and phases as described in this paper to generate a Machine Learning model and to fabricate a model that doesn't entirely depend on one kind of data, and takes in data, be it structured or unstructured data from various sources and of multiple formats. With the help of a little bit of user intervention in the model generation process it processes and creates a Machine Learning model that conventionally wouldn't have been able to be created using the traditional Machine Learning techniques.

It involves the integration of the 3 phases as described in this paper with the help of which generation of a model is possible, that promises a higher level assurances when compared to the traditional predictive analysis using Machine Learning

- The first model, Alignment of current data points to historical data points, is something that's sometimes used in predicting the stock market curves but has never been applied continuously especially in the case of cryptocurrency.
- Status of cryptocurrency is a module phase based on which the price of the cryptocurrency is majorly determined. Value of something that is always determined by the supply and demand of the certain element, and having a live status of the *Status-data* (as described in section 2.2) accoutres the user with the ability to predict to a significantly higher accuracy of what the curve is going to be.

- Inclusion of expert predictions is something that helps take the best of human knowledge and include that in the prediction process.

By integrating the best predicting systems of the stock marketing system along with the described methods, the PAOC model generation and prediction process is taken up to a new mantle which promises higher accuracy and assurance.

2.1 Alignment of current data points to previous data points

For the data points generated by the price graph of the cryptocurrency, the data points that have already been analyzed and cataloged are brought into play and integrated into the predictive analysis logic

The present price graph is compared with all the previously generated data to find a match. If such a case does exist, then the next few data points of the previous graph are taken into consideration and used for the model generation process. The *"Analyzer value" (ANV)* variable is assigned according to the cataloged predictive value the user wants to consider for the model generation. The number of data points that are collected from the cataloged data depends on the user.

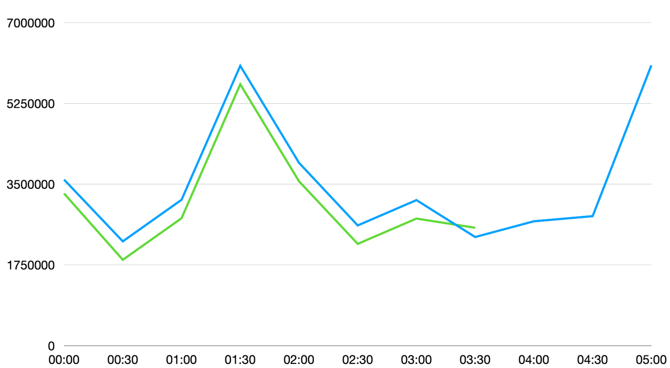

Figure 1: Alignment of current data points to previous data points

As it's visible from the graph, the graph of the current cryptocurrency trend *(Green Line)* aligns with one of the historical trends of the currency *(Blue Line)*. According to the described ANV value by the user the quantity of historical data to be used for analysis is determined. And the historical curve plays a part in the prediction process.

The amount of cataloged data points that's to be used for the predictive analysis is completely dependent on the user. This type of mechanism that's put in place ensures that the client has a considerable amount of leeway and testing ground in order to further improve their prediction using the predictive analyzer. Since the machine can't accurately figure the amount of data points to be considered as of now, the analyzer uses a fraction of human intelligence in order to construct the best prediction model possible.

2.2 Status-data of cryptocurrency

Inclusion of the status of cryptocurrency is something that's going to play a major role in the determination and fabrication of the predictive analyzer.

The price of the cryptocurrencies depend on the supply and demand of the currency *(aka. Status-data of cryptocurrency)*. It is something that can be determined by establishing a connection between the *"predictive analysis of cryptocurrency" (PAOC)* model and the cryptocurrency wallet service providers. The next step is to share the data of the amount of cryptocurrencies bought and sold between both the parties for the analysis process. The PAOC model dedicates a variable in order to integrate the *"status-data"* obtained from the wallet service providers with the analyzer.

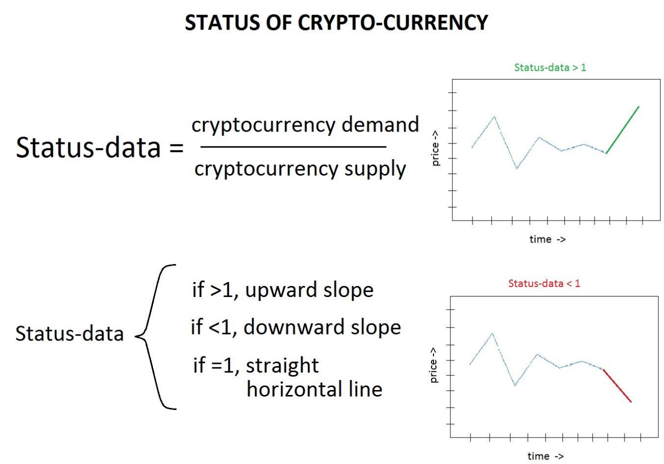

Figure 2: Status of crypto-currency

If the amount of a certain cryptocurrency that's being sold is greater than the amount of cryptocurrency in demand or being bought, the price of the cryptocurrency plummets drastically and significantly. And oppositely if the amount of cryptocurrencies being bought compared to the amount that're being sold increases, this indicates that the price of it is going to take an upward spike. The main part to take into consideration here is that the sudden spike or drop in the value of cryptocurrency comes a bit after the *"status-data"* is generated. So having the *"status-data"* beforehand plays a

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very vital role in the generation of the PAOC model. And this factor is also something that promises prediction with significantly higher assurance when compared to other factors that are available.

So the status variable that's defined holds the ratio of the amount of cryptocurrencies in demand to the amount of cryptocurrencies available. And accordingly the higher the value of the fraction the steeper the hike slope for the predicted graph will be and vice versa.

2.3 Inclusion of expert predictions

The inclusion of expert predictions in the PAOC model enables the application to take in more arbitrary data from other sources and extrapolate its implication on the current trend.

The variable PEX *(Prediction Expert)* is taken into consideration while dealing with *"inclusion of expert predictions"*. The value of this variable is determined by the expert predictor module which takes in all the data regarding the cryptocurrency be it news data, celebrity endorsement, rising or dropping demand etc, and assigns a proper value between the range of -1 to +1. The assignment of the value is exclusive of -1 and +1 since they imply a hundred percent certainty in the rise and drop of the prices which isn't a desirable trait in predictive models.

- The assignment of the PEX variable is in the range of (-1 < PEX < +1)
- If the likelihood of the prices going up are what the experts predict then the module assigns a positive value (0 < PEX < +1) to the PEX variable, and the magnitude of the value is determined by the extent of promise derived from the gathered data.
- If the likelihood of the prices going up are what the experts predict then the module assigns a negative value (-1 < PEX < 0) to the PEX variable, and again the magnitude of the value is determined by the extent of promise derived by the gathered data.

And in this phase, just like the other phases, the user has leeway to generate the model by including only a certain percent of expert predictions data into the actual PAOC model and prediction process. And the degree of integration expert predictions module in the PAOC analyzer is totally dependent on what the user wants it to be and how much human intelligence the user wants to integrate with the predictive analyzer to make it more accurate in forming the predictions.

2.4 The Mean Slope Predictor

The Mean Slope Predictor makes the possible predictions by not only considering the current line of data points for the future prediction but also by generating a Mean slope By taking into consideration the extremes of the generated graph of each month or day.

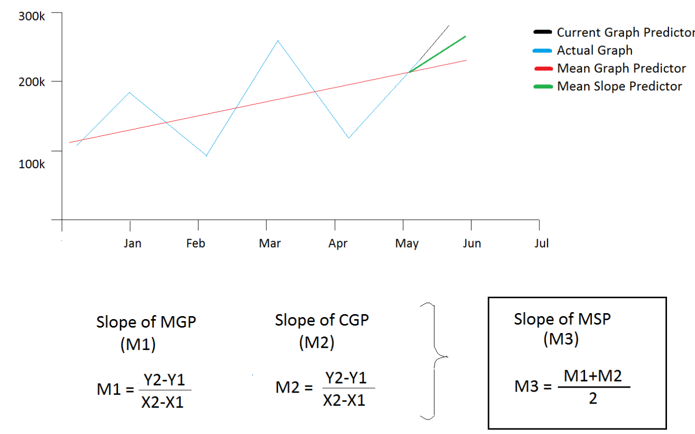

Figure 3: Mean Slope Predictor

The extremes that are taken into consideration further reduces the colossal amount of data points to the mean value, which in turn helps to generate a Mean slope with only the essential data points which prevents the inclusion of any noisy or unnecessary datapoints.

As we can see from the above diagram, at the end of the graph a block predictor slope is made *(Current-Graph-Slope)* according to the data points of only the previous month. The *(Mean-Graph-Slope)* disregards all of the excess data points that had been taken into consideration for the generation of the graph and only includes the extreme data points of every month for the generation of the Mean Slope.

At the end both of the slopes *(Current-Graph-Slope)* and *(Mean-Graph-Slope)* are used to derive a new slope (*Mean-Slope-Predictor)* that would present the probable prediction taking into consideration not only the mean of cataloged data but also the current status and trend of the cryptocurrency.

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3. Application

The lightness, modularity and considerable control of the user to generate a more accurate model enables it to be compatible with a broad range of applications like, but not limited to stock-exchange prediction, cryptocurrency prediction, sales prediction and many more.

3.1 Crypto Currency

This application is suited for providing predictive analysis on cryptography curves, especially since it integrates and implements *status-data* of cryptocurrency.

The value of any cryptocurrency depends on the supply and demand of it like any other asset. But by cohesin with the wallet services and keeping a track on the amount of a certain cryptocurrency bought and sold at every instant, although it doesn't accommodate a hundred percent of the crypto transactions taking place proves to be a very valuable asset in the predictive analysis process of cryptocurrency.

As described in the *"Status-data of cryptocurrency"* phase, the ratio between a certain cryptocurrency in demand to the certain cryptocurrency available. And as explained in detail in section 2.2, the probability of the price curve of the cryptocurrency going up increases drastically if the value of the variable *Status-data* goes over 1 and probability of the slope going downwards increases if the value of the variable *Status-data* goes below 1.

This certain feature of PAOC combined with other modules and phases working with each other, producing best of what they can, and adding to model generation and prediction process in defined ratios makes PAOC an application that is immensely suitable for an application like predictive analysis of cryptocurrency. This way of predictive analysis of cryptocurrency is far more beneficial than any traditional form of Machine Learning technique.

3.2 Stock marketing

People in today's world are more focused on investing than ever before, so instead of implementing archaic ways for investment prediction, PAOC platform is the solution for modern day stock-exchange price prediction.

PAOC is a flexible and modular platform that enables it to adapt to a wide range of applications that involves predictive analysis that even includes stock-marketing along with other applications. Accoutred with the ability to take into consideration human intelligence along with the other data for the generation of model makes it a perfect application for the predictive analysis of stocks in stock market.

Since it's believed in the stock marketing world that expert opinion is something that's profitable to consider while investing in a stock. PAOC application that not only takes expert predictions to consideration but also other forms of predictive analysis and model generation processes to come up with a Machine Learning model in order to form more accurate predictions when compared to the implementation of only one of the models as described in the paper.

3.2.1 Fundamental analysis

Fundamental analysis is built on the belief that human society needs capital to make progress and if a company operates well, it should be rewarded with additional capital and result in a surge in stock price. Fundamental analysis is widely used by fund managers as it is the most reasonable, objective and made from publicly available information like financial statement analysis. So the expert opinions on the prices and inclusion of that in the machine learning model makes it all the more desirable, combined with other phases it logically increases the probability of analysis with higher accuracy.

3.3 Sales predictions

The application of PAOC even extends to sales and sales profit predictions. In this application all the modules and phases play an important role in the predictive analysis process.

In this application the *Status-data* is determined as the ratio of the demand of the product produced by the certain organization to the amount of items that are currently produced. The sales and sales profit prediction may also require additional models to be included for the generation of an accurate predictive model, but still the PAOC model is the primary base of this application, and it's modularity and flexibility enables it to integrate with multiple models, perhaps a model that considers the amount of funding distribution to each sector of the production process of the organization and the cataloged data, and checks whether the current state of production produces profitable sales predictions or not.

This kind of flexibility and modularity enables the PAOC application to adapt to various applications, combining with various other modules and phases to acclimate to making suitable models in the process of generating predictions with higher accuracy. It also enables humans to have a considerable amount of control over the model generation and the prediction process along with autonomous functioning, and the user chooses whichever they deem suitable for the application or the situation.

References

[1] https://www.etherium.org/

[2] https://www.sas.com/

[3] https://www.bitcoin.org/

[4] https://www.wikipedia.org/

[5] https://www.ibm.com/

SMART DUSTBIN FOR WASTE MANAGEMENT AND MAINTENANCE OF CLEANLINESS

HRUTHKARSHA D S[1], CHAITRA D[2], DIVYA B S[3], ARPITHA R[4]

Department of Computer Science Engineering, Sapthagiri College of engineering

#14/5 Chikkasandra, Hesaraghatta main road, Bangalore- 57 India.

[1]hruthkarsha125@gmail.com

[2]chaitrachaitrad40@gmail.com

[3]bsdivya59@gmail.com

[4]rarpitha40@gmail.com

***Abstract*—Now a day's garbage problem is a severe problem not in India but the World also. We can also see that peoples throw the waste near the roads, water bodies, grounds, railway lines, etc, which is polluting our country. It is often seen that waste material including inorganic material in those waste as plastic, paper, animal bones, glass pieces, etc, are dumped in the pens. It is often seen that waste materials including inorganic materials in those waste as plastic, paper, animal bones, glass pieces, etc are dumped in the open. In most such places, animals, mostly cows, buffaloes, pigs, and others. When this waste also harms them. It can also be seen that it is the mentality of people that will throw the waste into such spite of dustbins. The best example of this is schools, colleges, government, offices, etc, where people took something and throw them somewhere or remain at their table where they were taking them. So keeping all things in mind a proposed dustbin model was prepared, which is a smart dustbin, In this, the peoples have to show garbage in a front of a dustbin and it will open automatically and will close automatically after some time. The project was inspired by Swachh Bharat Mission. Nowadays technologies are getting today by day-by-soy so, as to clean the environment we are designing a smart dustbin by using Arduino. For society, it will help toward health and hygiene, for business, efficient plans to be made to make it affordable to many as many possible. So that normal people to rich people can take benefit from it.**

Keywords—Arduino board, Ultrasonic Sensor, Smart Dustbin, Waste Management, Notification, System, cleanliness.

I. INTRODUCTION

As managing garbage is a big issue in many countries, it requires a lot of awareness among people to keep their surroundings as well as their city clean. As India is a developing country, the government is taking many aggressive steps to maintain cleanliness in-country. The population is increasing rapidly which in turn is leading to the maximum usage of resources and also accumulation of garbage which is directly affecting the environmental conditions. And along with this, many individuals tend to be less aware of the cleanliness of their environment. This situation indirectly affects public health. Though Dustbins have been provided by the sanitation department, they are not well maintained and are not monitored regularly, moreover public doesn't make the best use of them as they seem less attractive to them, hence people don't throw waste in the right place and there is more level of laziness. The laziness may be due to the simple method of opening the lid manually and the unhygienic around it. This will cause the hands to be very susceptible to bacteria from the trash. This also leads to many serious environmental issues which not only affect humans but also animals, to overcome this though many schemes and plans have been proposed by the government, it is the responsibility of every citizen to maintain cleanliness. It is very important to dispose of the trash properly. It is a responsibility with which everyone should comply. In the era of covid – 1 9, people are trying to innovate everyday life things as contactless as possible smart mart dustbin is one of that innovative ideas.

So, to raise awareness of environmental concern and their cleanliness, there has to be implemented some techniques so that each individual is interested and is not lazy to throw garbage in the right place. This can be achieved by the design and implementation of an innovative Smart dustbin.

II. LITERATURE SURVEY

The following research work is done by considering the related work presented by S. Zavare and her colleagues [1] on sensors disconnected to an Arduino board-based control system that uses a GSM module to send alert notifications to the municipality by a server hosting web application. The whole system includes a GPS module for tracking the bin and an ultrasonic sensor with Node MCU which is used to connect the control system with the help of a Wi-Fi module which was designed by Trushali vasagade and her team [2], which will check the status and provides status alertness of the Dustbin, whether it is full or not.

This research also included the right allocation of components and their perfect synchronization from Mohit Panjabi and Karan Patel [3] for the digital dustbin and its awareness. The awareness about the implementation of a system based on the Internet of Things(IoT) that can not only send a message to the corporation about the overflow of garbage and its toxicity level but also a website is also developed to supervise the details related to the dustbin, In this website, a citizen can submit their complaints, or could get solved their queries related to the cleanliness of the area. So as designing this system involves maintaining cleanliness in the environment, related work has been proposed by Ahmed Imteaj and his team [4]. This system is an Android-based application where the user can contribute to the cleanliness of the city.

And as considering the lock system of the dustbin, is a different innovative step that could lead to a clean environment and an interesting topic among people which has been proposed by our team. Together considering all these researches and the new idea of our team, this would change the whole thinking capability of the public towards maintaining cleanliness and would find it more interesting to use the smart dustbins.

III. PROPOSED SYSTEM

The system is mainly an interaction between the user, dustbin, and authority. The main aim is to reduce the work of managing the dustbin around the city by making them traceable, which makes the work easier. The user/authority will be able to start and know the data of each dustbin. The dustbin will collect the waste and inform the authority when it is filled so that the dustbin can be emptied regularly and the surrounding is kept clean. This result keeps deadly diseases away from group g. This system can be upgraded gradually making it more reliable [5]. Smarter the system smarter the city. Each dustbin has the ability to close the lid when it is can level lid can be opened by the driver collecting the bin. Influence the Smart City project in cheaper price. This dustbin mainly involves activities like automatic lid opening and closing system whenever any unwanted items have to be thrown just by showing it in front of the sensor placed installed in the dustbin externally, and along with the garbage level monitoring and informing the higher authorities with the same by alert notifications with an interesting feature of the automatic lock system whenever the dustbin is knocked to the ground unknowingly and also when the trash in the dustbin is full and further cannot be filled, this prevents spilling of garbage which maintains hygienic and cleanliness in the surroundings.

Hence this is a decent and smart dustbin consisting of microcontrollers like Arduino Uno, Ultrasonic Sensor, servo motor, GSM module, etc. It is an IoT-based project which can not only be used in public but also can be used in the home which is simple to use.

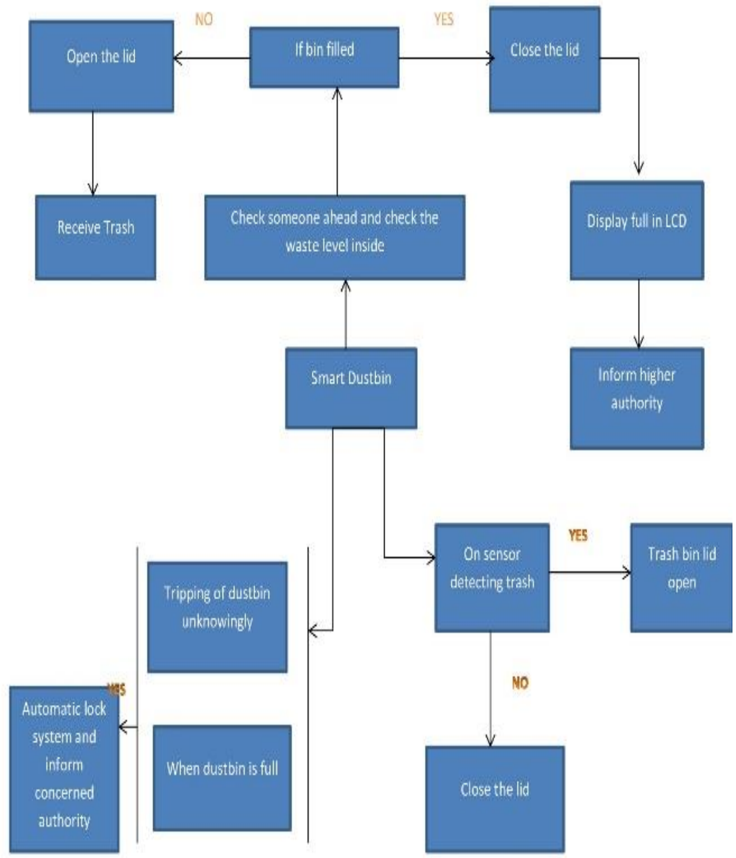

Fig.1: Block Diagram.

IV. COMPONENTS REQUIRED

Hardware Required

A. ARDUINO UNO

The Arduino Uno is an open-source microcontroller board that works based on the Microchip ATmega328P microcontroller. This microcontroller board can be integrated into a variety of electronic projects. It is low cost and flexible and easy to use.

B. ULTRASONIC SENSOR

Ultrasonic sensors measure distance by using ultrasonic waves. Ultrasonic sensors emit ultrasonic waves which hit the target and the sensor receives the wave reflected from the target. Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers.

C. SERVO MOTOR

A servo motor is a type of motor that can rotate with great precision. Servo motors consist of DC motors, these motors get powered by a battery and run at high speed and low torque. Servo motors are controlled by sending an electrical pulse of variable width or pulse width modulation (PWM), through the control wire.

D. GSM MODULE

GSM module is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. This module can receive serial data from radiation monitoring devices such as survey meters or area monitors and transmit the data like text SMS to a host server.

E. PIR SENSOR.

PIR sensors allow you to sense motion. They are used to detect whether a human has moved in or out of the sensor's range. PIRs are made of pyroelectric sensors, a round metal can with a rectangular crystal in the center, which can detect levels of infrared radiation. Everything emits low-level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is split into two halves.

F. LCD DISPLAY

The LCD (Liquid Crystal Display) is a type of display that uses liquid crystals for its operation. The liquid crystals are embedded into the display screen, and there is some form of backlight used to illuminate them.

G. BUZZER

The vibrating disk in a magnetic buzzer is attracted to the pole by the magnetic field. By oscillating the signal through the coil, the buzzer produces fluctuating magnetic field, which vibrates the disk. This movement makes the buzzer sound.

V. METHODOLOGY

This Smart Dustbin work is based on the Internet of Things which mainly focuses on the creation of contactless and automatic smart dustbins. It contains one of the interesting features of automatic lid opening which is on sensing or detecting anything in front of the sensor at a given range then the lid of the dustbin opens automatically, the components required are available locally, through which this feature can be implemented at home dustbin too. Here we are using Arduino Code which is fed to Arduino Board for code execution, and sense, we use an ultrasonic sensor that alerts the servo motor to lift the lid and wait for a few moments as per the given input time range in the code. Ultrasonic Sensor is used which is set on top of the dustbin'scap and when the sensor traces any object like a human hand, it will activate Arduino to open the top of the dustbin. The threshold stature is set at a particular level. Arduino will be programmedin such a way that when someone will come in front of the dustbin the servo motor will come into action and open the lid for the person to put the waste material into the dustbin.

It is the implementation of an Automatic Garbage Fill Alerting system using an Ultrasonic sensor, Arduino Uno, Buzzer, and Wi-Fi module, along with these whenever the garbage in the dustbin has reached a certain level such that further adding garbage leads to overflow, which often happens with the public using dustbins, as authorities forget to empty them often which lead to uncleanliness and spread of diseases, so this can be avoided by monitoring the level and thus informing the same to the authorities in charge of it with the help of GSM module so that the dustbin cleanliness is maintained regularly and keeping the track of it, Here when the bin is filled it will give the user the details of the empty bins which are nearby with the help of LCD is dustbin will generate voice messages with the help of playback IC and speaker which will help to maintain the clean environment. PIR and ultrasonic sensors are used to measure the level of garbage in the dustbin and a buzzer beeps when the dustbin is full with the help of an LCD is used to display the level in the dustbin.

The automatic gravity lock ensures reliable automatic opening and closing. The bin opens automatically at a tipping angle of more than 90 degrees, e.g. on the waste disposal vehicle. Unintentional opening of the lid when the bin falls is reliably prevented by the patented safety device.

It is known to provide a lid for covering the opening of a container, such as a garbage can or dustbin. In a normal storage position, the container stands upright, and the lid naturally falls by force of gravity, thus covering the top opening. However, for lids not of significant weight, an animal may be able to lift a lid and reach for contents stored in the container. Increasing the weight would be wasteful and not effective against tampering with all animals. Additionally, when the container tips over or is knocked down, a lid may also become open due to gravity. In strong wind, lids made of lightweight materials such as plastic also may be blown open.

It is desirable to provide locks or latches for such covered containers to prevent animal tampering and to prevent accidental opening due to strong wind or tipping over of the container. There have been proposals for providing a lock or safety latch for such covered containers [6]. For example, EP2,148,828B1, "Dustbin Lock", discloses a dustbin releasable securing a lid to a dustbin. In the locking position, the lid is prevented from being lifted to uncover the opening. However, the proposed dustbin lock does not permit a one-hand operation to release the lock and lift the lid at the same time, which might be viewed as inconvenient for some users. There also have been proposals for combining a handle with a slider. However, a user will need to lift the handle and also push the slider against a biasing force, required for the lock, to release the lock and lift the lid, which could pose a challenge to some users. Hence automatic lid opener system along with the locking feature provides a better system for maintaining cleanliness in the society for the betterment of the future.

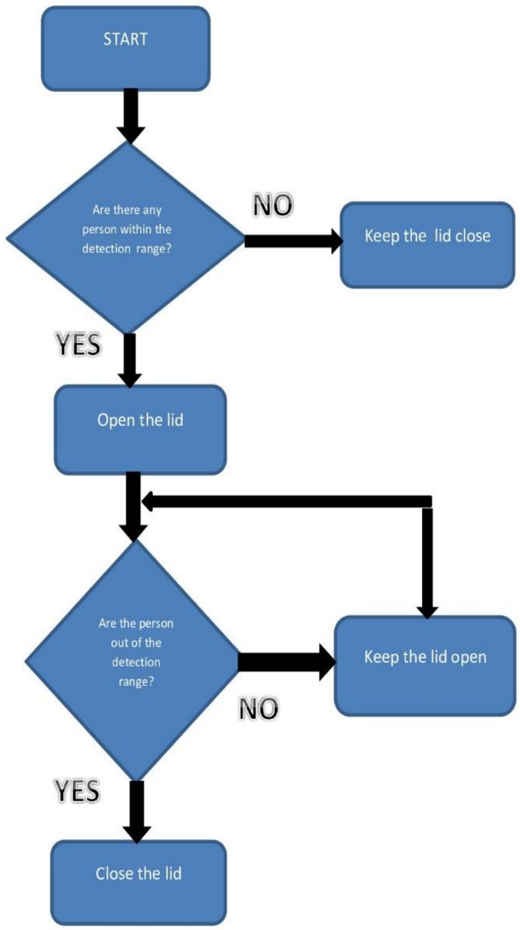

Fig.2: Flowchart of lid opening.

VI. WORKING

After wiring and attaching all the devices and setting up to the smart dustbin now observe all the important setups and whether they are well connected. After connecting set up, the next step is to upload code in Arduino and supply power to the circuit. When the system is powered on Arduino keeps monitoring for any things that come near to the sensor at a given range.

When an ultra-sensor detector detects any object, for example, a hander paper, or other objects, here Arduino calculates its distance and if it is a less than certain predations value then the servo motor gets activated supported by the support of the extended the arm of the lid. Opens for 2 seconds and after 2 seconds, the flap automatically closes. We can change the time limit just by making minor changes to the Arduino Uno IDE code.

IoT-based garbage level monitoring system is an emerging technology that is utilized for monitoring the waste fill level of public and industrial garbage bins. The fundamental purpose of a garbage level monitoring system is to help municipal services to pick up the trash at the right time before garbage overflows and causes discomfort to the general public [7]. Hence when the dustbin is full, the PIR sensor senses the level and whereas the GSM module calculates the level, whether it is minimum or max, and displays the same in LCD, so when the level has reached its maximum, the LCD display shows full and closes the lid thereby informing concerned authority about the same.

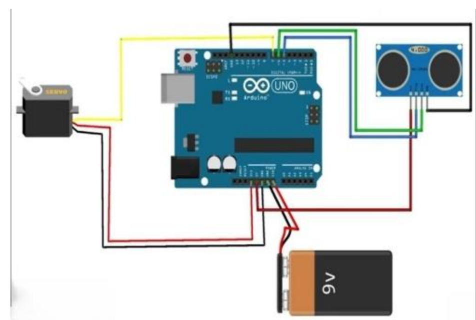

Fig.3: Circuit Diagram.

This advanced garbage monitoring system can not only leveler garbage levels, but can also detect toxic chemical substances, flammable gases, and, even radioactive materials using advanced sensors and alert the authorities immediately via the internet through the Blynk application before any disastrous incident occurs. Installing these IOT based garbage monitoring systems helps the government to work efficiently when it comes to keeping the city clean and saving millions of dollars a year by saving fuel or energy, labor cost, and time, on top of this improvement in general public health which could save millions of lives and billions of dollars around the world otherwise which would be spent on health due to poor management of waste. The present invention discloses a smart garbage bin including a microcontroller, an infrared sensor, an ultrasonic sensor, a rain sensor, an IOT module, a door lock module, and a buzzer. The ultrasonic sensor detects a garbage level, to notify the microcontroller when the bin is full. An infrared sensor sends a buzzer alert upon detecting a person attempting to throw garbage around the smart bin.

When the dustbin trips/knocks down unknowingly, the sensor detects the knock and facilitates locking the smart bin via the microcontroller. In the first aspect of the invention, there is provided a lock for a container lid sized to cover a top opening of a container. The lock has a lock casing for attaching to the container, a strike supported on the lock casing, a hook assembly for attaching to the lid, the hook assembly having a hook for engaging the strike, a biasing member urging the hook, and the strike to engage with each other to keep the lid in a closed position covering the opening, a rocker pivotally attached to the hook assembly at a pivot point, the rocker having a top tab extending upwardly and a release arm extending downwardly, both from the pivot point, wherein pressing down the top tab moves the release arm to disengage the hook from the strike so that the lid can be lifted to uncover the opening and an actuator for a user to press down the top tab and to lift the lid to uncover the opening.

VII. RESULT AND CONCLUSION

The current model as shown in the figure is equipped with an ultrasonic sensor and a load cell is done to achieve maximum but accurate requirements for a smart dustbin. Furthermore, Wi-Fi modules and Bluetooth modules allow to interact with users and attract them Radioactive sensing enables the detection of any kind of radioactive or dangerous substances as the safety of the city has become a quite concern nowadays.

Fig.4: Smart Dustbin.

The design of a smart bin system with an Arduino microcontroller and ultrasonic sensor consists of two designs, namely hardware and software design including Arduino source code socially it helps towards health and hygiene. Normal people to rich people c make benefit from it. Future upcoming work will be adding one more sensor which senses whether the bin is full or not. And the display will be added so that the user can notify the bin whether it is full or not. So it helps the user to maintain the bin clean and tidy.

VIII. FUTURE AND SCOPE.

Smart Dust can be employed in most industries from agriculture to the medical industry and communication. To be precise, the entire world could be measured by means of these omnipresent sensor sign-to-Machine accessible smart dust is made of motes, which are tiny sensors capable of performing a variety of functions. Smart dust is activated by MEMS and brings progression in digital circuitry and wireless communication. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision. We have often seen garbage spilling over from dustbins onto streets and this was an issue that required immediate attention. The status of the bin can be uploaded to a webpage in real-time via the IoT module. Concerned authorities refer to the status of plurality such as smart bins on a particular web page for customizing an effective garbage collection schedule. This could be a milestone in the future that takes the viewing point towards cleanliness to a high level.

IX. REFERENCES

[1]. Zavare. Parashae,S. Patil. P. Rathod,and P. V Babanne,"Smart City Waste Management System Using GSM," Int. J. Comput Sci Trends Techel, vol5. no 3, pp 74-78, 2017 DQQ.

[2].Trushali S Vasagade, Shabanam S Tamboli, Archana D Shinde, "Dynamic solid waste collection and management system based on sensors clevator and GSM", Inventive Communication and Computational Technologies (ICICCT) 2017 International Conference on, pp. 263-267, 2017.

[3].Mohit Panjabi, Karan Patel "Digital Dustbin – Smart Bins for Smart Cities", International Journal of Innovative Technology and Exploring Engineering(IJITEE)ISSN: 2278-3075,volume 9 Issue-7s, May 2020.

[4]. Ahmed Imteaj, Mahfuzulhoq Chowdhury and Md. Arafin Mahamud, "Dissipationof Wasteusing Dynamic Perception and AlarmingSystem: A Smart City Application" , 2nd Int'lConf on Electrical Engineering and Information& Communication Technology (ICEEICT)2015 Jahangirnagar University, Dhaka-1342,Bangladesh, 21-23 May 2015

[5]. Fachmin Folianto, Yong Sheng Low, Wai Leong Yeow "Smartbin: Smart Waste Management System", 2015 IEEE Tenth International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP), 7-9 April 2015.

[6].US CA US10597227B2 ManfredErnstMATUSCHEK Franzen Canada Corp.Priority 2016-04-07 • Filed 2016-06-01 Granted 2020-03-24 Published 2020-03-24 US CA US20170291764A1 Tobias Ackermann Franzen Canada Corp. Priority 2016-04-07 • Filed 2016-06-01 • Published 2017-10-12

[7]. Shubham Thakker,R.Narayanamoorthi, "Smartand Wireless Waste Management", IEEESponsored 2nd International Conference onInnovations in Information Embedded and Communication Systems ICIIECS'15

SURVEY : YIELD PREDICTION USING MACHINE LEARNING : Special Emphasis on Coconut Yield Prediction.

Niranjan S J
Assistant Professor
Department of Computer Science & Engineering
Kalpataru Institute of Technology
Tiptur ,India
niranjansj555@gmail.com

Dr. Praveen Kumar K V
Professor
Department of Computer Science & Engineering
Sapthagiri College of Engineering
Bangalore , India
praveenkumarkv@sapthagiri.edu.in

ABSTRACT :

Coconut is a major plantation crop of coastal India. Accurate prediction of its yield is helpful for the farmers, industries and policymakers. Weather has profound impact on coconut fruit setting, and therefore, it greatly affects the yield.. But the farmers usually plan the cultivation process based on their experiences. But due to the lack of precise knowledge about cultivation, they may end up cultivating undesirable crops which will not give them an expected production rate. So there is an invention of new technologies like ML, IOT, AR but it's not getting used properly in the agricultural field. So our paper proposes a research work helps to predict crop yield from past data. This can be done by applying a machine learning algorithm on that data.

Machine learning is an important decision support tool for crop yield prediction, Several machine learning algorithms have been applied to support crop yield prediction research. We investigated these selected studies carefully, analyzed the methods and features used, According to our analysis, the most used features are temperature, rainfall, soil type, and etc .

Keywords: ***Agriculture production, Machine learning Prediction, Supervised learning, Unsupervised learning.***

1. INTRODUCTION

Coconut is a major plantation crop of coastal India. Accurate prediction of its yield is helpful for the farmers, industries and policymakers. Weather has profound impact on coconut fruit setting, and therefore, it greatly affects the yield. According to recent survey, around 1.82 million farmers dwell in Karnataka. It has been also found that suicide rates of farmers is also increasing from last few years. Therefore, to help the farmers take decisions that can make their farming more efficient and profitable. So in this we are proposing a system that will estimate crop production before harvesting depending on certain parameters. If they are having an idea about the amount of production they can expect, they can contact to their crop production contractor in advance of harvesting, often assuring a more competitive price. And moreover there is no such application exists as of now. Our paper proposes a system to predict crop yield from previous data using the concept of machine learning.

However, due to numerous complex factors, the prediction of crop yield is challenging. Basically, the crop yield is dependent on numerous factors, including landscapes, soil quality, pest infestations, genotype, quality and accessibility of water, climatic conditions and so on .

In global food production, the much attention has given to Crop yield prediction (Khaki et al., 2019). Farmers as well as Growers have got benefitted from prediction of yields for making financial and management decisions (Khaki et al., 2019; Horie et al., 1992). Still, crop yield prediction is highly complex because of varied complex factors like temperature, weather condition, soil condition and so on. Each crop has various attributes or parameters to get predictions with the help of various models and these models could be examined by doing many studies (Medar et al., 2019). Several Machine Learning (ML) models shall apply for getting the maximal production of coconut crop, which is the main objective of this article. Coconut crop production depends upon weather conditions (cloud, temperature, rainfall and humidity) as well as geographical conditions (depth areas, hill areas, river ground) .

The coconut plantation requires a well-distributed rainfall (> 150 cm year−1), mean temperature (27 °C ± 5 °C), sunshine of nearly 2000 h year−1 with a minimum of 120 h month−1 and 80–90% relative humidity for a good harvest. Coconut yield was higher between the southwest monsoon and summer season when the minimum temperature was high. Coconut yield was reduced when the mean minimum temperature fell below 21 °C. However, maximum temperature could adversely affect coconut production by affecting the pollen viability .The minimum temperature was found more important than maximum temperature for batter coconut harvest. Effect of solar radiation was on the rate of photosynthesis and transpiration Decrease in solar radiation during monsoon season compared with summer season led to a decrease in potential photosynthesis .Solar radiation during 29 and 30 months before harvesting also has positive influence on female flowers production

Machine learning, which is a branch of Artificial Intelligence (AI) focusing on learning, is a practical approach that can provide better yield prediction based on several features. Machine learning (ML) can determine patterns and correlations and discover knowledge from datasets.
The models need to be trained using datasets, where the outcomes are represented based on past experience. The predictive model is built using several features, and as such, parameters of the models are determined using historical data during the training phase. For the testing phase, part of the historical data that has not been used for training is used for the performance evaluation purpose.

2. LITERATURE SURVEY

SI .NO	Retrieved From	Reference	Title	Algorithm used	Year
01	Scopus	Rus et al. (2008)	Data Mining with Neural Networks for Wheat Yield Prediction	Neural networks	2008
02	Science Direct	Everingham et al. (2009)	Ensemble data mining approaches to forecast regional sugarcane crop production	stagewise algorithm	2009
03	Springer Link	Rus & Kruse (2010)	Regression Models for Spatial Data: An Example from Precision Agriculture Clustering	random forest, support vector machine	2010
04	Springer Link	Baral et al. (2011)	Yield Prediction Using Artificial Neural Networks	Neural networks	2011
05	Springer Link	Črtomir et al. (2012)	Neural Networks and Image Visualization for Early Forecast of Apple Yield	Neural networks	2012
06	Google Scholar	Romero et al. (2013)	Using classification algorithms for predicting durum wheat yield in the province of Buenos Aires	K-nearest neighbor, decision tree	2013
07	Google Scholar	Ananthara et al. (2013	CRY - an improved crop yield prediction model using bee hive clustering approach for agricultural data sets	Clustering	2013
08	Scopus	Shekoofa et al. (2014)	Determining the most important physiological and agronomic traits contributing to maize grain yield through machine learning algorithms: A new avenue in intelligent agriculture	Decision tree, clustering	2014
09	Scopus	Gonzalez-Sanchez et al. (2014)	Predictive ability of machine learning methods for massive crop yield prediction M5-prime regression tree	k-nearest neighbor, support vector machine	2014
10	Scopus	Pantazi et al. (2014)	Application of supervised self-organizing models for wheat yield prediction	Neural networks	2014
11	Google Scholar	Cakir et al. (2014)	Yield prediction of wheat in south-east region of Turkey by using artificial neural networks	Neural networks, multivariate polynomial regression	2014
12	Scopus	Kunapuli et al. (2015)	Yield prediction for precision territorial management in maize using spectral data Polynomial regression	logistic regression	2015
13	Google Scholar	Matsumura et al. (2015)	Maize yield forecasting by linear regression and artificial neural networks in Jilin, China Neural networks	multiple linear regression	2015
14	Google Scholar	Everingham et al. (2016)	Accurate prediction of sugarcane yield using a random forest algorithm Random forest	a random forest algorithm Random forest	2016
15	Scopus	Gandhi et al.	Rice crop yield prediction in India using support vector machines	support vector machines	2016

		(2016)	Support vector machine		
16	Google Scholar	Gandhi et al. (2016)	Rice crop yield prediction using artificial neural networks	Neural networks	2016
17	Google Scholar	Sujatha and Isakki (2016)	A study on crop yield forecasting using classification techniques	Naive Bayes, J48, random forest, neural networks, decision tree, support vector	2016
18	Google Scholar	Ying-xue et al. (2017)	Support vector machine-based open crop model (SBOCM): Case of rice production in China	Support vector machine	2017
19	Springer Link	Osman et al. (2017)	Predicting Early Crop Production by Analysing Prior Environment Factors Neural networks	linear regression	2017
20	Science Direct	Kouadio et al. (2018)	Artificial intelligence approach for the prediction of Robusta coffee yield using soil fertility properties Extreme learning machine	multiple linear regression, random forest	2018
21	Scopus	Crane-Droesch (2018)	Machine learning methods for crop yield prediction and climate change impact assessment in agriculture	Neural networks	2018
22	Google Scholar	Taherei Ghazvinei et al. (2018)	Sugarcane growth prediction based on meteorological parameter using extreme learning machine and artificial neural network	Neural networks	2018
23	Springer Link	Ahmad et al. (2018)	Yield Forecasting of Spring Maize Using Remote Sensing and Crop Modeling in Faisalabad-Punjab 24Pakistan	Support vector , random forest, decision tree	2018
24	Springer Link	Shah et al. (2018)	Smart Farming System: Crop Yield Prediction Using Regression Techniques Support vector machine, random forest, multivariate polynomial regression	Regression Techniques SVM, RF, multivariate polynomial regression	2018
25	Google Scholar	Rao & Manasa (2019)	) Artificial Neural Networks for Soil Quality and Crop Yield Prediction using Machine Learning Neural networks	Neural networks	2019
26	Springer Link	Ranjan & Parida (2019)	Paddy acreage mapping and yield prediction using sentinel-based optical and SAR data in Sahibganj	sentinel-based optical and SAR data	2019
27	Springer Link	Charoen-Ung & Mittrapiyanuruk (2019)	Sugarcane Yield Grade Prediction Using Random Forest with Forward Feature Selection and Hyper parameter Tuning	R F with Forward Feature Selection and Hyper parameter Tuning	2019

NIRS (Near –infrared reflectance spectroscopy)

Moisture in raw Copra (dried mature coconut) is an important quality parameter in the process of extraction of Coconut oil[1]. A NIRS moisture sensor with in-house designed wireless backhaul network was commissioned at an industrial-scale oil mill in Southern India. The accuracy of the results was validated with laboratory tested values. Furthermore, a chemo metric analysis of NIRS signals captured from copra samples was carried out to accurately measure the moisture content. The moisture sensor was interfaced with a Supervisory Control and Data Acquisition (SCADA) system through a wireless communication network designed and developed in-house. The moisture content values predicted by the online NIRS sensors closely matched laboratory values. The system enabled for smarter operation, aided in improving process capability, reduced manpower, and energy requirements

Limitations :

It does not associated biochemical parameters such as FFA and oil content and how they are influenced by the moisture content.

Solar hybrid dryer

From this study, it can be determined that high-quality white copra can be processed by solar hybrid dryer . Drying copra in a solar hybrid dryer reduces the moisture content from around 50% to 7% after 71 h of continuous drying. The copra was graded as 73% white copra, 21% Milling Ordinary Grade II (M.O.GII) and the remaining 6% M.O.GIII (dusty copra). Thermal efficiency was about 10%. In the Coconut Research Institute copra kiln, the moisture content of copra was reduced from around 52% to 8% in 62 h of intermittent dying. The copra was graded as about 82% M.O.GI and the remaining 18% M.O.GIII (burnt copra). Thermal efficiency was about 15.5%. High quality white copra could be processed in solar hybrid drying. However, no white copra could be processed in kiln drying .

Limitations :

It process only high quality white copra but not process milling copra .

climate information to predict coconut production

In This paper the land is divide into 4 regions based on climate , soil and temperature , based on annual rainfall and as low, mid and up country based on elevation they are wet, intermediate and dry zones . And again they each of these regions is then further classified each region based on soils and the seasonal distribution of rainfall. All the attribute information's are collected from Annual national coconut production (ANCP).

ANCP is sensitive to rainfall during January–March and to a lesser degree during July–September in the principal coconut growing regions. In coconut growing areas the periods during January to March and July to August generally have more dry spells which has more significant impact for coconut yield. ANCP is not sensitive to the rainfall during the wettest quarter from October to December. ANCP was not significantly sensitive to regional temperature trends. The use of quarterly rainfall is more skillful than the use of monsoon rainfall to predict ANCP and is of greater utility.

Limitations :

Here they concentrate on only rain fall , but not concentrate on other climate parameters like humidity , temperature ,

Supervised ML Algorithm:-

In current system farmers are not connected with any technology and analysis. So there are many chances of loss of money. Sometime wrong selection of crop will effect on their income. To reduce these we have proposed to develop an android application, which will predict crop yield production using past years data.

The prediction made which the application will make will be more precise as we are taking several parameters into consideration and the algorithm to be used for the prediction is supposed to be supervised learning algorithm so that their will be minor or no chance of error as the training is guided by the training model.

Limitations :

This model does not support for long term crops.

It has only limited parameters .

Crop Yield using Machine Learning:-

The system proposed in this paper helps farmers to cultivate proper crops for better yield of Production .The system uses supervised and unsupervised machine algorithms for precise and accurate prediction by analyzing nutrients present in soil and crop productivity based on location.

Limitations :

Here they concentrated on only soil properties.

Data Mining with K-nearest algorithm

This paper presents a brief analysis of crop yield prediction using Multiple Linear Regression (MLR) technique for the selected region. It is mainly focused on analyzing the agriculture analysis of organic farming and inorganic farming, time cultivation of the plant, profit and loss of the data and analyze the real estate business land in a specific area. It concentrates organic, inorganic and real estate data sets from which the prediction in agriculture will be achieved.

Limitations :

Here they concentrate on only profit and loss.

"Variation in yield and yield components of different coconut cultivars in response to within year rainfall and temperature variation"

The main yield components that were sensitive and affected by moisture and temperature stresses were found to be the no. of female flowers/inflorescence and the no. of nut set/inflorescence. The moisture stress at the time of floral primordial initiation and the temperature stress at the time of nut setting are the most critical factors affecting the coconut yield. As a result of the higher no. of female flower production at any given condition, the hybrids lead to higher nut yield than that of the tall cultivars. Therefore, this study concluded that the planting of dwarf x tall hybrids even under the moisture and temperature stress in dry zone gives farmers a comparatively more nut yield than planting tall cultivars, although the general perception of the growers is vice versa. This finding further elucidates that screening of existing cultivars is rather ineffective in identifying cultivars suitable for planting in severe moisture and heat stress conditions.

The monthly yield data at the site with unfavorable weather conditions clearly showed that all the cultivars were performing better in the months receiving adequate rainfall which minimized the moisture stress and also to a certain extent mitigated the heat stress. Similarly, at the site with favorable weather conditions, all cultivars showed a significantly higher yield compared to the unfavorable site.

Limitations :

Here they concentrate on only temperature and irrigation. Based on flowering and nuts they predict yield of crop .

“ linear and nonlinear weather-based models ”

In this paper , district-wise annual coconut yield prediction models were developed using six multivariate techniques with the monthly weather variables as inputs . Relative humidity and solar radiation were the major weather variables with maximum impacts on the coconut yield.
Weather indices were generated using monthly cumulative value for rainfall and monthly average value for other parameters like maximum and minimum temperature, relative humidity, wind speed and solar radiation. Different linear models like stepwise multiple linear regression (SMLR), principal component analysis together with SMLR (PCA-SMLR), least absolute shrinkage and selection operator (LASSO) and elastic net (ELNET) with nonlinear models namely artificial neural network (ANN) and PCA-ANN were employed to model the coconut yield using the monthly weather indices as inputs. The model’s performance was evaluated using R2, root mean square error (RMSE) and absolute percentage error (APE). The R2 and RMSE of the models ranged between 0.45–0.99 and 18–3624 nuts ha−1 respectively during calibration while during validation the APE varied between 0.12 and 58.21. The overall average ranking of the models based these performance statistics were in the order of ELNET > LASSO > ANN > SMLR > PCASMLR > PCA-ANN. The least absolute shrinkage and selection operator (LASSO) and elastic net (ELNET) are two sparse regression methods used for handling the multicollinearity. These methods deal with multicollinearity by penalizing the magnitude of regression coefficients.

3.PROPOSED MODEL .

The machine learning-based crop yield prediction method consists of some phases, namely data collection, data pre- processing, data partition and data analysis. Fig. 1 illustrates the architecture of the machine learning-based crop yield prediction method. In data analysis section, machine learning based regression or classification algorithm is employed.

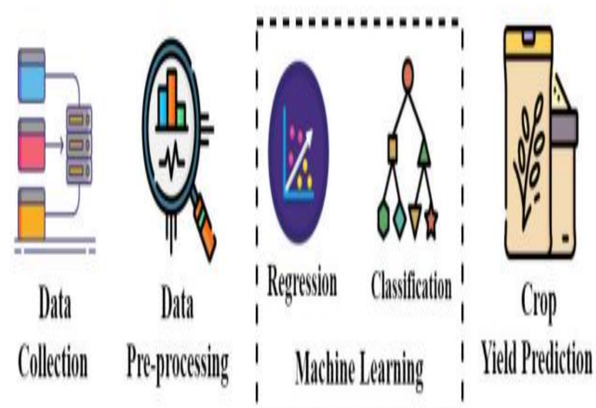

FIGURE 1. The general architecture of machine learning-based crop yield prediction.

A. Popular features used in crop yield prediction.

There are various factors that influence crop yield and the uncertainties connected with cultivation. The feature lists are the most vital components to predict crop yield. According to the recent literature, the most significant factors that contribute to crop yield are the leave and fruit information, irrigation information, soil properties, climatic information, cropland information, vegetation index and satellite data, crop management data, historical yield data, groundwater characteristics, fertilization information, socio-economic factors, phenology data and others. others.

Table 1 lists the most popular features utilized in the prediction of crop yield with data description. There are a wide variety of nutrient supplements used in crop yield, which play a crucial role in improving agricultural production. The most common utilized fertilizer or nutrient supplements are phosphorus, nitrogen, calcium, potassium, sulfur, magnesium, manganese, iron and so on [10]. These factors are equivalently important to the crops though they can differ by quantity to use.

SI. NO	**Feature**	**Data**
01	Leaves and Fruits Information	Healthy and unhealthy images ,leaf development , leaf area index , leaves and fruits mortality , number of leaves ,stems ,fruits
02	Irrigation Information	Irrigation ratio , irrigation method , gross irrigation area , net irrigation area ,
03	Soil Properties	Clay ,Sand , Silt , Organic carbon ,Wet soil bulk density , dry soil density , upper limit plant available water content , lower limit plant available water content , Organic matter percentages , hydraulic conductivity , micro nutrient content , soil moisture , nutrient supplements
04	Climatic Condition	Humidity , vapor pressure ,wind speed , solar radiation , maximum temperature , minimum temperature ,

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05	Fertilization Information	NPK , nutrient supplement of ground water , fertilizer composition , pesticide composition
06	Ground water Information	Rock layer permeability , transmissivity ,
07	Crop Management Data	Seed quality , fertilizer usage , cumulative growth of plant , plant population ,flowering ,maturity
08	Historical yield data	hydraulic conductivity , micro nutrient content , soil moisture , nutrient supplements ,
09	Crop Land Information	Plantation area ,type of soil

Table 2: List of Popular features with utilized data.

B. Prediction Algorithms

Machine learning is an important decision support tool for crop yield prediction, including supporting decisions on what crops to grow and what to do during the growing season of the crops. Several machine learning algorithms have been applied to support crop yield prediction research.

A wide range of regression and classification-based prediction algorithms have been utilized to forecast crop yield. In crop yield prediction, linear regression (LR) and multiple linear regression (MLR), multivariate adaptive regression splines (MARS), k-nearest neighbors (K-NN), support vector machine (SVM) and support vector regression (SVR), decision tree (DT), random forest (RF), extremely randomized trees (extra tree) (ERT), artificial neural network (ANN), deep neural network (DNN), convolution neural network (CNN) and long short-term memory (LSTM) have been employed.

C. Performance evaluation metrics

The performance of a model can be defined by evaluation metrics. Evaluation measure plays a significant role because of their capability in differentiating among the outcomes of different learning models . There are various performance metrics applied to evaluate the performance of the regression model including mean absolute error (MAE), mean squared error (MSE), root mean square error (RMSE), determination coefficient (R-squared) and mean absolute percentage error (MAPE). MAE is defined as an arithmetical mean of the absolute variation between the forecasted observation and the actual observation which is used to calculate the average importance of the errors with a given array of predictions. MSE reflects the closeness of the repressor line to dataset. points which is used to determine the performance of the estimator . RMSE reflects how well the information is concentrated on the best fit line and utilized for the estimation of the residuals or forecasted error's standard deviation.

4. CONCLUSION

In order to feed a rising world population, new technology in the agricultural industry needs to be implemented. Apart from this, agriculturists need a proper guideline in time that will allow them to forecast crop yields so that they can formulate effective strategies to maximize crop yields. ML frameworks offer a clear insight into the process by assessing the vast sets of data and interpreting the obtained information. The models describing the correlations between constituents and actions are built through these technologies.

REFERANCES

[1] D. Elavarasan and P. M. D. Vincent, ``Crop yield prediction using deep reinforcement learning model for sustainable agrarian applications," *IEEE Access*, vol. 8, pp. 86886_86901, 2020.

[2] J. Huang, J. L. Gómez-Dans, H. Huang, H. Ma, Q. Wu, P. E. Lewis, S. Liang, Z. Chen, J.-H. Xue, Y. Wu, F. Zhao, J. Wang, and X. Xie, ``Assimilation of remote sensing into crop growth models: Current status and perspectives," *Agricult. Forest Meteorol.*, vols. 276_277, Oct. 2019,
Art. no. 107609.

[3] S. Li, S. Peng, W. Chen, and X. Lu, ``INCOME: Practical land monitoring in precision agriculture with sensor networks," *Comput. Commun.*, vol. 36, no. 4, pp. 459_467, Feb. 2013.

[4] X. E. Pantazi, D. Moshou, T. Alexandridis, R. L. Whetton, and A. M. Mouazen, ``Wheat yield prediction using machine learning and advanced sensing techniques," *Comput. Electron. Agricult.*, vol. 121, pp. 57_65, Feb. 2016.

[5] M. E. Holzman, F. Carmona, R. Rivas, and R. Niclòs, ``Early assessment of crop yield from remotely sensed water stress and solar radiation data," *ISPRS J. Photogramm. Remote Sens.*, vol. 145, pp. 297_308, Nov. 2018.

[6] A. Singh, B. Ganapathysubramanian, A. K. Singh, and S. Sarkar, ``Machine learning for high-throughput stress phenotyping in plants," *Trends Plant Sci.*, vol. 21, no. 2, pp. 110_124, Feb. 2016.

[7] R. Whetton, Y. Zhao, S. Shaddad, and A. M. Mouazen, ``Nonlinear parametric modelling to study how soil properties affect crop yields and NDVI," *Comput. Electron. Agricult.*, vol. 138, pp. 127_136, Jun. 2017.

[8] Y. Dash, S. K. Mishra, and B. K. Panigrahi, ``Rainfall prediction for the Kerala state of India using arti_cial intelligence approaches," *Comput. Electr. Eng.*, vol. 70, pp. 66_73, Aug. 2018.

[9] W. Wieder, S. Shoop, L. Barna, T. Franz, and C. Finkenbiner, ``Comparison of soil strength measurements of agricultural soils in Nebraska," *J. Terramechanics*, vol. 77, pp. 31_48, Jun. 2018.

[10] A. Chlingaryan, S. Sukkarieh, and B. Whelan, ``Machine learning approaches for crop yield prediction and nitrogen status estimation in precision agriculture: A review," *Comput. Electron. Agricult.*, vol. 151, pp. 61_69, Aug. 2018.

[11] B. Basso and L. Liu, ``Seasonal crop yield forecast: Methods, applications, and accuracies," *Adv. Agronomy*, vol. 154, pp. 201_255, Jan. 2019.

[12] M. Shahhosseini, R. A. Martinez-Feria, G. Hu, and S. V. Archontoulis, ``Maize yield and nitrate loss prediction with machine learning algorithms," *Environ. Res. Lett.*, vol. 14, no. 12, Dec. 2019, Art. no. 124026.

[13] M. Shahhosseini, G. Hu, and S. V. Archontoulis, ``Forecasting corn yield with machine learning ensembles," *Frontiers Plant Sci.*, vol. 11, p. 1120, Jul. 2020.

[14] T. U. Rehman, M. S. Mahmud, Y. K. Chang, J. Jin, and J. Shin, ``Current and future applications of statistical machine learning algorithms for agricultural machine

vision systems," *Comput. Electron. Agricult.*, vol. 156, pp. 585_605, Jan. 2019.
[15] D. Elavarasan, D. R. Vincent, V. Sharma, A. Y. Zomaya, and K. Srinivasan, ``Forecasting yield by integrating agrarian factors and machine learning models: A survey," *Comput. Electron. Agricult.*, vol. 155, pp. 257_282, Dec. 2018.
[16] M. D. Johnson, W. W. Hsieh, A. J. Cannon, A. Davidson, and F. Bédard, ``Crop yield forecasting on the canadian prairies by remotely sensed vegetation indices and machine learning methods," *Agricult. Forest Meteorol.*, vols. 218_219, pp. 74_84, Mar. 2016.
[17] K. L. Chong, K. D. Kanniah, C. Pohl, and K. P. Tan, ``A review of remote sensing applications for oil palm studies," *Geo-Spatial Inf. Sci.*, vol. 20, no. 2, pp. 184_200, Apr. 2017.
[18] L. J. Young, ``Agricultural crop forecasting for large geographical areas," *Annu. Rev. Statist. Appl.*, vol. 6, no. 1, pp. 173_196, Mar. 2019.
[19] T. van Klompenburg, A. Kassahun, and C. Catal, ``Crop yield prediction using machine learning: A systematic literature review," *Comput. Elec- tron. Agricult.*, vol. 177, Oct. 2020, Art. no. 105709.
[20] L. S. Woittiez, M. T. van Wijk, M. Slingerland, M. van Noordwijk, and K. E. Giller, ``Yield gaps in oil palm: A quantitative review of contributing factors," *Eur. J. Agronomy*, vol. 83, pp. 57_77, Feb. 2017.
[21] K. Liakos, P. Busato, D. Moshou, S. Pearson, and D. Bochtis, ``Machine learning in agriculture: A review," *Sensors*, vol. 18, no. 8, p. 2674, Aug. 2018.
[22] B. Li, J. Lecourt, and G. Bishop, ``Advances in non-destructive early assessment of fruit ripeness towards de_ning optimal time of harvest and yield Prediction_A review," *Plants*, vol. 7, no. 1, p. 3, Jan. 2018.
[23] W. W. Guo and H. Xue, ``Crop yield forecasting using arti_cial neural networks: A comparison between spatial and temporal models," *Math. Problems Eng.*, vol. 2014, pp. 1_7, Jan. 2014.
[24] N. Prasad, N. Patel, and A. Danodia, ``Crop yield prediction in cotton for regional level using random forest approach," *Spatial Inf. Res.*, vol. 29, pp. 1_12, Jul. 2020.
[25] S. Khaki, L.Wang, and S. V. Archontoulis, ``A CNN-RNN framework for crop yield prediction," *Frontiers Plant Sci.*, vol. 10, p. 1750, Jan. 2020. *Comput. Electron. Agricult.*, vol. 165, Oct. 2019, Art. no. 104968.
[27] J. Sun, L. Di, Z. Sun, Y. Shen, and Z. Lai, ``County-level soybean yield prediction using deep CNN-LSTM model," *Sensors*, vol. 19, no. 20, p. 4363, Oct. 2019.
[28] D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, D. Altman, G. Antes, D. Atkins, V. Barbour, N. Barrowman, J. A Berlin, and J. Clark, ``Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement (Chinese edition)," *J. Chin. Integrative Med.*, vol. 7, no. 9, pp. 889_896, Sep. 2009.
[29] M. Shahbandeh. *Consumption of Vegetable OilsWorldwide From 2013/14 to 2019/2020, by Oil Type, Statista*. Accessed: Nov. 20, 2020. [Online]. Available: https://www.statista.com/statistics/263937/vegetable-oilsglobal- consumption/
[30] M. Shahbandeh. *Production of Major Vegetable Oils Worldwide From 2012/13 to 2019/2020*. Accessed: Nov. 20, 2020. [Online]. Available: https://www.statista.com/statistics/263933/production-of-vegetable-oilsworldwide-since-2000/
[31] MPOB Of_cial Palm Oil Information Source. *Welcome to Malaysian Palm Oil Board // Malaysian Palm Oil Ind. // Washington, DC // 1-202-572-9768*. Accessed: Nov. 20, 2020. [Online]. Available:

http://www.palmoilworld.org/about_malaysian-industry.html
[32] A. A. Karia and I. Bujang, ``Progress accuracy of CPO price prediction: Evidence from ARMA family and arti_cial neural network approach," *Int. Res. J. Finance Econ.*, vol. 64, no. 64, pp. 66_79, 2011.
[33] N. F. Rahim, M. Othman, and R. Sokkalingam, ``A comparative review on various method of forecasting crude palm oil prices," in *Proc. J. Phys., Conf.*, vol. 1123. Bristol, U.K.: IOP, 2018, Art. no. 012043.
[34] S. B. Hansen, R. Pad_eld, K. Syayuti, S. Evers, Z. Zakariah, and S. Mastura, ``Trends in global palm oil sustainability research," *J. Cleaner Prod.*, vol. 100, pp. 140_149, Aug. 2015.

Drowsiness and Fatigue Detection System using ML

Dr H R Ranganatha[1] Abhigna A Bhardwaj[2] Akshaya R[3] Ankith P Chikkur[4] Minju A J[5]
[1] Head of Department [2,3,4,5] U. G Students [1,2,3,4,5] Department of Information Science & Engineering
[1,2,3,4,5] Sapthagiri College of Engineering, Chikkasandra, Bangalore,Karnataka, India

***Abstract*—The accidents due to driver fatigue has increased the ratio of accidents year by year. Since the advent of technology, it becomes important to develop a driver drowsiness detection system to alert the drivers irrespective of given condition. This detection begins by exploring various physiological features of the drivers such as yawning behaviors. These noticeable features are obtained from the frames that are captured by the camera. We label the frames as automatic datasets and then look for major signs in detection such as frequent yawning patterns, frequent eye blinks etc. We measure the datasets against the threshold; if the measured value surpasses the optimum value then driver is alerted via an alarm. This system provides a good accuracy ratio over most of the detections.**

***Keywords*—drowsiness detection, physiological features, camera, yawning , eye blinks, frames.**

I. INTRODUCTION

Driver drowsiness detection is a car safety Technology which helps prevent accidents caused by the driver getting drowsy. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Some of the current systems learn driver patterns and can detect when a driver is becoming drowsy.

There is much attentional impairment while driving that affect driver‘s reaction. Among which driving while drowsy is oneof the major causes behind road accidents, and exposes the driver to a much higher crash risk compared to driving while alert. Therefore, the use of an assistive system that monitor a driver‘s level of vigilance and alert the driver in case of drowsiness can be significant in the prevention of accidents.

The attention level of driver degrade because of less sleep, long continuous driving or any other medical condition like brain disorders etc. Several surveys on road accidents says that around 30 percent of accidents are caused by fatigue ofthe driver. When driver drives for more than normal period for human then excessive fatigue is caused and also results in tiredness which drives the driver to sleepy condition or loss of consciousness.

Advanced technology offers some hope to avoid these type of accidents up to some extent. Sleep related accidents are more severe, because of the higher speeds involved and as the driver is unable to take any action to avoid accident, or even stamp the brake, prior to the collision.

To mitigate such injuries. Many researchers across the globe are trying to build a device that can diagnose driverdrowsiness. Many methods and techniques were subsequently proposed and built on test and compared by them in order to find out which method has good accuracy and fast detection.

Patterns of eye movement and yawning are two important indications for developing a natural and non-intrusive fatigue detection system for drivers. The entire system is built on the library for processing images from OpenCV and the Facial Landmark algorithm. The main focus is on the faster detection and processing of data by drowsiness. Through the logitech camera, the system is used to detect the eyes whether they are closed or open in real time, along with that we evaluate yawning behaviors in a dataset of spontaneous speech of drowsy drivers, and suggest a new approach for detecting yawning that incorporates anatomical features of the mouth and eye areas, where drivers are not connected to any external devices and failure is also highly impossible.

Substantial advances in computer vision research have recently enabled the eyelids to be unobtrusively tracked and the palpebral fissure accurately measured in real time using camerasystems.

The goal is to increase driver safety without being overwhelming. By using a camera, which usually characterizes a person's level of alertness, visual signs were obtained by eye blink rate and yawning rate. These were extracted in real-time, and joined systematically to test the driver's fatigue level.

The system can monitor the driver's eyes to detect short sleep periods lasting between 3 and 4 seconds. In this approach the system implemented runs at 8-15 frames per second. The application was implemented with a single camera view, using the Open CV environment. This system was used to detect driver drowsiness and thus reduce road accidents.

This paper aims to summarize the progress of the program and to collect the latest methods.

Data from NCRB, Govt. Of India.

II. LITERATURE SURVEY

A National Highway Traffic Safety Administration survey estimated that, in 1996, there were 56,000 sleep-related road crashes in the U.S.A. Another 2007 survey said 18 percent of accidents involved fatigue as the major factor. Up to 20 per cent of serious road accidents in Britain have been caused by fatigue.

1] Ms. Devi 's algorithm used the Hough Transform to identify the iris and assess the eye 's openness. To assess the state of an eye, some researchers are focused on the image projection.

2] Yang 's solution sends high-frequency beeps via the car sound equipment, network An efficient hybrid model for driver drowsiness based on OpenCV, Bluetooth, and using software running on the phone to collect and process sound signals. The beeps are used to measure where the mobilephone is and we then know when the driver (or other personin the car) is speaking on it. The plan has achieved an accuracy of classification of more than 90%. This method works for hands free use, but it depends on the operating system and cell phone brand, and the driver has to activate thedevice continuously.

3] Lu et al. located the facial region of the driver using the difference between two images, and then located the midpoint of the nostrils using an integral directional projection technique. Then, the yawn is observed by measuring the vertical gap between the nostril midpoint and the lip. Nevertheless, these algorithms only use geometric features, making it difficult for them to differentiate between normal opening of the mouth (Example: Speaking, Laughing, Coughing) and yawning.

4] Boon-Giin Lee et al. suggested a system for tracking fatigue driver health using two distinct methods: tracking of eye movement and processing of bio-signal. The monitoring system was built on an Android-based smartphone, where sensory data is collected via wireless sensor network and data is further processed to indicate the driver's current driving aptitude.

5] M. Dehnavi, M. and N. Attarzadeh Eshghi used Image Processing techniques in their paper to detect the eye state. The following algorithm decides the open or closed eye by different iris and pupil color, and the white area present in the open state of the eye. The vertical projection was used to create the state of the eye. Their algorithm was of good size, precision and less complexity.

6] Azim et al. presented a system in which Viola-Jones facial detection was used by the yawning detection method to locate the face, extract the mouth window, and then search the lips through spatial c-means clustering.

7] Seshadri's computer-based vision method determines whether a driver uses the Supervised Descent Method (SDM) to hold a cell phone close to his / her ears, which tracks certain facial landmarks to extract a crop of regions of interest(ROI). Features are extracted from the ROIs and using previously qualified classifiers the phone use is detected.

8] Wang et al. used color analysis to determine the region of interest in the mouth, then segmented skin and lip pixels, and obtained lip features through the study of related components. Then they took geometric features of the mouth region to make up an own vector as the input of a neural network for backpropagation, acquiring the output of three mouth states: regular, yawning, or talking.

9] Anirban Dasgupta suggested a robust framework embedded in real-time to track the driver's loss of concentration during day and night driving conditions. The percentage of close of the eye was used to show the level of alertness. Face identified using HAAR -like software, the eye condition has been marked as open or closed using vector support machines.

III. EXISTING SYSTEM

There is a great deal of attentional impairment while driving that affects the driver's reaction. One of the main reasons behind the road accidents or road crashes is driving while drowsy which exposes the driver to a much higher chance of crashing compared to driving while on alert. The use of an assistive device which monitors the level of vigilance of a driver and alerts the driver in case of drowsiness can therefore be significant in the long run. There is use of an existing systwhich tells us about an approach towards detection of driver's drowsiness based on yawning measurement and head movement. This involves several steps including the real time detection and tracking of driver‘s face, detection and tracking of the mouth contour, the detection of yawning based on measuring both the rate and the amount of changes in the mouth contour area and head movement tracking.

IV. PROPOSED SYSTEM

The entire system is based on the OpenCV image processing library and the Facial Landmark algorithm. The primary focus is on faster data detection and processing of somnolence. The machine is used to detect the eyes if they are closed or opened in real time by means of a logitech camera, where drivers are not connected to any external equipment and malfunctioning is therefore extremely unlikely. The warning will be triggered when the driver head nodes regularly, when the driver's eyes are closed.

Description : Eye tracking is supposed to detect signs of driver exhaustion early enough to avoid a car accident. Fatigue identification requires examination of eye movements and blink patterns in a series of face pictures. Initially, we decided to use MATLAB to detect eye blink patterns. The technique used was the geometric manipulation of the degree of pressure.

Working : Initially we use a webcam to input the facial image. First, the image was binarized for preprocessing. The face tops and sides were found to limit the field of the eyes. The middle of the face was located on the sides of the nose, which is to be used when the left and right eyes are computed. The horizontal averages were measured down from the top of the nose. The eye region was established using significant changes in averages. The period the eyes closed, used to detect a blink, waslittle changed in the horizontal average.

Although, MATLAB had some significant limitations. The processing capacity needed by MATLAB was very high. There were also some issues with speed in real-time processing. MATLAB was only capable of processing 4-5 frames per second. This was even lower on a low RAM system. As we all know, a blink of an eye is a matter of milliseconds. Also, the driver's head movements can be very quick. Although an eye twitch was detected by the MATLAB software developed by us, the performance was found to be severely lacking.

It is the location where OpenCV comes in. OpenCV is a library of open source computer vision. It is designed for computational efficiency and has a strong emphasis on real-time applications. It helps to quickly and easily construct sophisticated vision applications. OpenCV met the low processing power and high speed specifications of our application.

We enter the face picture with a webcam first. First, the image was binarized for preprocessing. The face tops and sides were found to limit the field of the eyes. The middle of the face was located on the sides of the nose, which is to be used when the left and right eyes are computed. The horizontal averages were measured down from the top of the nose. The eye region was established using significant changes in averages. The period the eyes closed, used to detect a blink, was little changed in the horizontal average. To detect this operation, the device uses ring indicators.

The system’s output could be a warning that can regain the driver's attention exclusively to the vehicle and the road or a warning for a transport company or enable a buzzer.

Advantages:
1] The objective is to improve the driver's safety without being stubborn. Visual indications were obtained via a blink of the eye by using a camera that usually characterizes a person's awareness level.
2] Each year, the number of vehicles increases considerably, and a number of vehicle theft and missing technology can therefore be used to solve problems.
3] The aim of this design proposal is to detect driver drowsiness in order to avoid accidents and to improve road safety.
4] With OpenCV we process real-time in around 30 frames per second and thus the device is faster.
5] We can get away with 10 mb RAM for an application in real time with OpenCV. Although the RAM factor is not a major concern with today's computers. Yet our somnolence detection system must be used in a car in a nonintrusive and small manner; a low processing requirement is therefore necessary.

Requirement Specifications: The hardware requirements are the requirements of a hardware device. Most hardware only has operating system requirements or compatibility. Hardware system requirements often specify the operating system version, processor type, memory size, available disk space and additional peripherals, if any, needed.
1] Camera: A camera is an optical instrument to capture still images or to record moving images, which are stored in a physical medium such as in a digital system or on photographic film. A camera consists of a lens which focuses light from the scene, and a camera body which holds the image capture mechanism.
2] 4GB RAM: Random-access memory (RAM) is a type of storage for computer systems that makes it possible to access data very quickly in random order. It's a temporary memory which has a role of a facilitator in between the components like hard disk drive and CPU. Data from hard drive is loaded into RAM so as to get processed by CPU. A 4GB RAM means it can store 4GB of data temporarily or if you count in number of characters then a 4GB RAM can hold 4294967296characters.
3] 64 bit Quadcore: 2.5 GHz minimum per core processor: quad-core processor is
An effective hybrid model for openCV based driver drowsiness, a chip with four independent units called cores that read and execute central processing unit (CPU) instructions such as add, move data, and branch. Within the chip, each core operates in conjunction with other circuits such as cache, memory management, and input/output (I/O) ports.
4] Windows/Linux OS: An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs. Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage, printing, and other resources.
5] Anaconda 3 Environment: Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, largescale data processing, predictive analytics, etc.), that aims to simplify package management and deployment.
6] Python 3.6 Interpreter: An interpreter is a program that reads and executes code. This includes source code, pre-compiled code, and scripts. Common interpreters include Perl, Python, and Ruby interpreters, which execute Perl, Python, and Ruby code respectively. Interpreters and compilers are similar, since they both recognize and process source code.
7] PyCharm: PyCharm is an integrated development environment (IDE) used in computer programming, specifically for the Python language. It is developed by the Czech company JetBrains. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django.

IV. MODULE DESCRIPTION

A. *OpenCv*: It is an open source computer vision library available from http://SourceForge.net/projects/opencvlibrary. OpenCV was designed for computational efficiency and having a high focus on real-time image detection. OpenCV is coded with optimized C and can take work with multicore processors. If we desire more automatic optimization using Intel architectures [Intel], you can buy Intel's Integrated Performance Primitives (IPP) libraries [IPP]. These consist of low-level routines in various algorithmic areas which are optimized. OpenCV automatically uses the IPP library, at runtime if that library is installed. One of OpenCVs goals is to provide a simple-to-use computer vision infrastructure which helps people to build highly sophisticated vision applications fast. The OpenCV library, containing over 500 functions, spans many areas in vision. computer vision and machine learning oft en goes hand-in-hand, OpenCV also has a complete, general-purpose, Machine Learning Library (MLL). This sub library is focused on statistical pattern recognition and clustering. The MLL is very useful for the vision functions that are the basis of OpenCV"s usefulness, but is general enough to be used for any machine learning problem.
B. *Dlib*: Dlib is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real world problems.
C. *Imutils* : A series of convenience functions to make basic image processing functions such as translation, rotation, resizing, skeletonization, and displaying Matplotlib images easier with OpenCV

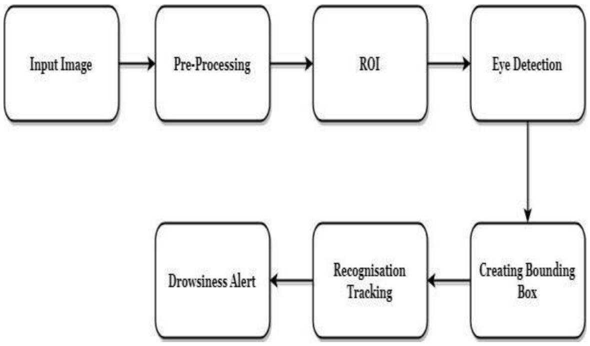

Fig 1 : Flow chart for the Proposed System

Fig 2:Choosing an image
Figure 2 shows the window from which the EAR andMAR are normal

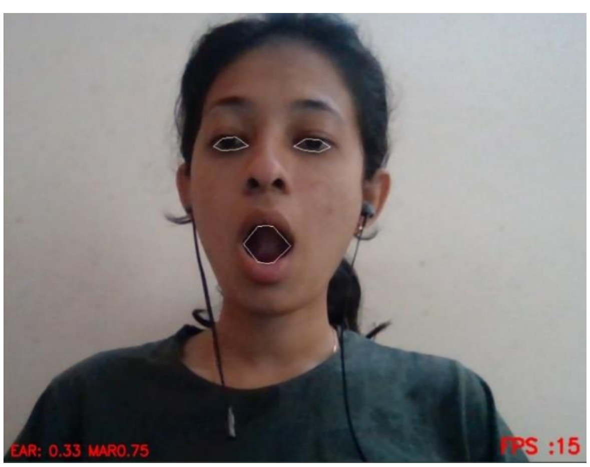

Fig 3: EAR AND MAR exceeds
The figure 3 shows the window in which the EAR and MAR value exceeds.

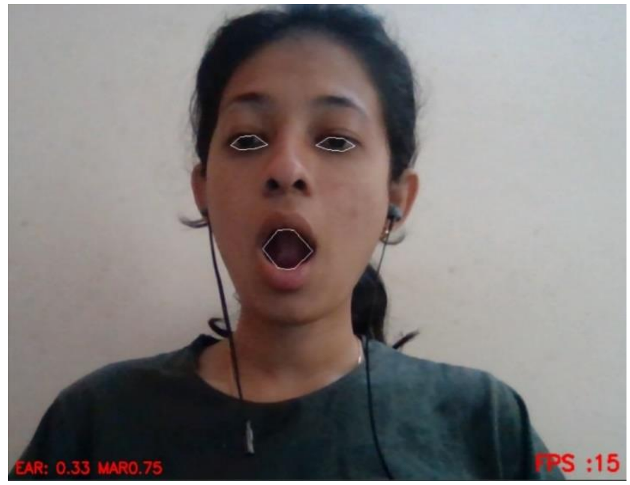

Fig 4: Normal MAR, EAR exceeds.
The figure 4 shows that the MAR value exceeds whereas the EAR remains normal

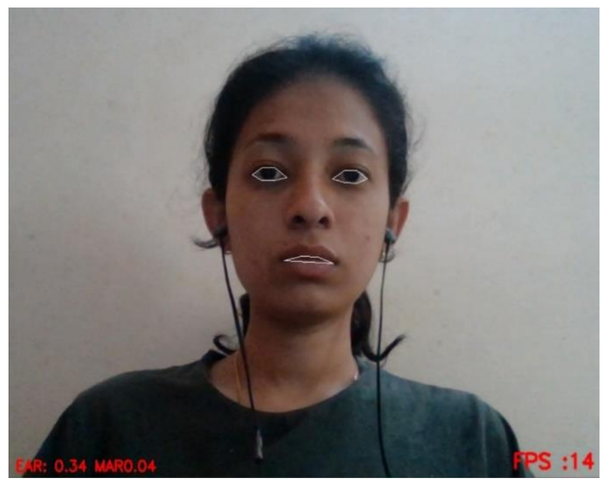

Fig 5: Shows that EAR and MAR are normal
Figure 5 shows the window from which the EAR and MAR are normal.

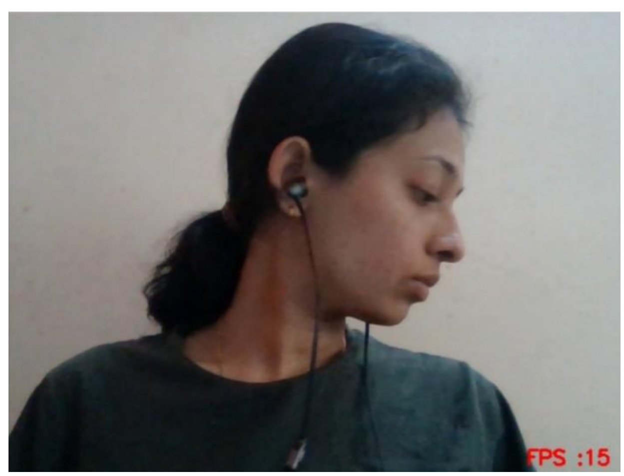

Fig 6: Unable to detect face
The figure 6 shows that the face is unable to detect.

V. CONCLUSION

Finally, we would like to conclude saying, in recent years, driver drowsiness has been one of the major causes of road accidents and can lead to severe physical injuries, deaths and significant economic losses. Statistics indicate the need of a reliable driver drowsiness detection system which could alert the driver before a mishap happens. Researchers have attempted to determine driver drowsiness using the following measures:

(1) Vehicle-based measures
(2) Behavioral measures
(3) Physiological measures.

A review on these measures has provided insight on the present systems, issues associated with them and the enhancements that need to be done to make a robust system. In this paper, we review these three measures as to the sensors used and discuss the advantages and limitations of each. The various ways through which drowsiness has been experimentally manipulated is also discussed. We conclude that by designing a hybrid drowsiness detection system that combines non-intrusive physiological measures with other measures one would accurately determine the drowsiness level of a driver. A number of road accidents might then be avoided if an alert is sent to a driver that is deemed drowsy.

We needed a solution to this at leads subsequent deaths of people and significant financial loss. To minimize this we propose a system to detect the state of the driver when he is driving and detect his drowsiness and alerting him to wake up if found guilty. The project is based on Artificial Intelligence with some of the IOT devices. The aim is on improving the safety of the driver without being obtrusive. Visual cues were obtained through eye blink rate by using a camera, which typically characterize the level of alertness of a person. These were extracted in real-time and systematically joined to check the fatigue level of the driver. The system can monitor the driver‘s eyes to detect short periods of sleep lasting for some seconds. The system implemented in this approach to monitor the consciousness in frames per second. The application is implemented using Open CV environment with a single camera view. This system is used to detect the drowsiness of the driver and thereby reducing the road accidents.

VI. REFERENCES

[1] Data from NCRB, Government of India.

[2] Technologies for Healthcare.

[3] V. Savania, H. Agravata and D. Patela , ―Alcohol Detection and Accident.

[4] Prevention of Vehicle, International Journal of Innovative and Emerging Research.

[5] Blinking and Head movements. IJCA Proceedings on Emerging Trends in Computer.

[6] Viola, Jones: Robust Real-time Object Detection, IJCV 2001.

[7] Open CV Computer Vision with Python; Tracking Faces with Haar Cascades.

[8] S. Motorist, Driver Fatigue is an important cause of Road Crashes, Smart Motorist.

[9] Driver Fatigue and Road Accidents: A Literature Review and Position Paper.

Plant Disease Detection Based On Deep Learning Approach

Darshini A [1], Harshitha P V [2], Monika P [3], Nagashree V S M [4], Manasa P M[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Manasa P M**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
darshinianjinappa@gmail.com, harshithapv8@gmail.com, monika.pam2000@gmail.com, nagashreevsm88@gmail.com, manasapm_ise@sapthagiri.edu.in

ABSTRACT – The projected system enables to identify the sickness in plants and gives preventive measures which will be utilised as a defence over the disease. Data acquired through the web is divided and therefore various leaf species are considered and updated to make accurate data and obtain database that has assorted leaf diseases that are utilised for predicting the accuracy of the project. Then, training the classifier and accurate result is seen. (CNN) Convolution Neural Network that has several layers are utilised for prediction. The proposed system provides 80-90% of accuracy and it offers the name of the leaf disease and the cure.

I. INTRODUCTION

India is a agricultural representative country in the world. Variety of crops are cultivated by farmers in spite of the factors such as soil conditions, climatic variations, numerous maladies, etc have an effect on the assembly of yield.

In order to identify the disease and the preventive measures, constant plant invigilation which is costly for huge fields and consulting the specialists from agriculture is difficult and it consumes more time for crop yielders.

The main objective of the proposed system is to construct a software where leaf pictures are the inputs and the features like textures are extracted and trained. Finally, the disease is identified and the name of that particular malady and the suitable remedy is shown.

This project is implemented using deep learning approach where CNN methodology is implemented.

II. LITERATURE SURVEY

Fatma Marzougui et al. [1] Deep CNN Methodology

This model uses various layers. It starts with convolution layers where different methodologies are carried out for feature extraction and result is passed to next layer that is grouping layers, then there is activation layers and the final layer is fully connected layers. The weight of feature is reduced in clustering layer and to give better learning output for the data. The extracted features are passed on to the final layer where it is classified.

Sammy V. Militante et al. [2] Deep Learning Approach for Corn Plant and tomato plant

Random pictures of leaf species and infections were tested in this model. It shows high accuracy rate for identification of corn plant and classification of healthy and unhealthy plants. This system has recognised the cor plant and tomato plant infected by late blight disease and early blight disease.

Xulang Guan et al. [3] A Novel Methodology for disease detection

This system comprises of CNN models and deep learning technologies. Inception Resnet, Densenet, Inception, Resnet are the models deployed for the database of images of various plant species and accurate class of unhealthy and healthy leaves were segregated into two database with various images for validation and the results were obtained by staking procedure.

Md. Arifur Rahman et al. [4] Improved approach for Segmentation based on three tomato plant diseases

This model is based on three tomato plant diseases such as Septorial Spot, Late Blight, Bacterial Spot. This is commonly found in Bangladesh. Four main stages are proposed in this model which includes classification, enhancement of image, segmentation, extraction of features, but mainly focused on segmentation, extraction methodologies.

N Gobalakrishnan et al. [5] A Systematic Machine Learning and Image Processing Review

Different stages in the life cycle of plant where ML algorithms and image processing techniques are applied to study the plant disease detection techniques. But some of them are precision lacking and incomprehensive. Hence fast and accurate methodologies for identifying pesticides and diseases are needed.

Sharath D M et al. [6] Pomegranate Plant disease detection for Bacterial Blight:

Canny edge procedure is used for identification of affected areas after the image segmentation of the fruit. The accurate infection in fruit is identified depending on the affected fruit by the disease. Chemical, biological and preventive measures are provided by this model.

Santhosh Kumar.S et al. [7] Image Processing Techniques

This system assists pathologists and farmers about the significance of image processing in the field of agriculture and the disease type that is recognised in various plant species.

V V Srinidhi et al. [8] Apple Plant Pathological Disease Identification

Automated classifier is implemented using Deep Neural Network, DenseNet, Capsule network and EfficientNet, to address factors such as image angle, leaf shade and leaf age to properly classify spots utilising Canny Edge.

Pradeep Kumar Mugithe et al. [9] Agricultural Farms Alerting System:

Earlier disease detection and the objective of the farmer is achieved in five different modules that includes acquisition of image, clustering using K-Means method, feature extraction of segmented area, detect disease using features extracted and alert the farmer about the disease.

Gurleen Kaur Sandhu et al. [10] Disease Detection Techniques in plants:

Various procedure like Support vector machine (SVM), K-means clustering, Back propagation neural network (BPNN), Otsu's algorithm, Stochastic gradient descent with momentum (SGDM) and Color correction matrix (CCM) were employed to predict if the plant is healthy or diseased.

Dr. Raghavendra B K et al. [11] Machine Learning Classification Review:

Five types of ML classification procedures like SVM classifier is studied in this review in the area of recognition of plant disease. Further more efficient techniques like Naïve Bayes classifier and decision trees can be implemented.

Ms. Chinmai Shetty et al. [12] ML Technique

Novel approach is provided by Machine learning process to identify leaf disease. It is seen that leaf diseases are classified accurately by various results obtained by experiments. The result obtained after applying pre-processing. The classifier correctly classifies the diseases.

Abdul Hafiz Bin Abdul Wahab et al. [13] Chilli Plants disease detection Using K-Means Segmented Support Vector:

This model is implemented using K-Means Segmented Support Vector. It provide the procedure that is able to distinguish the healthy and affected areas of chilli plant by cucumber mosaic virus.

Akshai KP Karunya et al. [14] Classification of plant diseases

Visual Geometry Group (VGG), DenseNet and ResNet, methodologies are implemented that facilitates earlier diagnosis of leaf diseases and preventive measures for yield loss and disease spreading.

Heri Andrianto et al. [15] Smartphone Application for rice based plant diseases

Cloud server utilises machine learning application on a smart phone that functions to capture rice plant pictures and share it on cloud server on application and get required results of classification that includes various plant diseases and system also provides controls for maximum yields.

Risab Biswas et al. [16] Pathological Disease Identification

Intel® Distribution of OpenVINO™ toolkit is used in this model. Model optimization provides accurate rate using computer vision in deep neural networks.

Dr.Abhishek Gupta et al [17] Study of different detection procedures

Gastric precancerous disease (GPDCNN) is highly recognised and studied. Generative adversarial networks (GANs) have information demonstration in a better way.

Majji v Applalanaidu et al. [18] Machine Learning Approach review

Comparative analysis of different ML and DL functionalities to recognise and segregate diseases in leaf. The system is helpful to control the various chemicals used in the process. Web architecture is needed to recognise and segregate diseases in leaf.

Jobin Francis et al. [19] Pepper plants disease detection

This model is implemented using techniques of soft computing. Good healthy pepper plants can be obtained by using the algorithm that differentiates plants as healthy and unhealthy.

Chau-Chung Song et al. [20] Citrus disease detection

YOLOv4 (You Only Look Once) model is implemented to recognize and divide the leaf diseases in Citrus plants and project the diseased location on the picture. The objective of this model is to implement automation in disease detection.

III. PROPOSED METHODOLOGY

This section illustrates the approach utilized to classify the leaves into unhealthy or healthy and if the leaf is unhealthy, name of the illness is mentioned together with the remedies. Our methodology primarily revolves round the following 5 modules.

1) Acquisition of image

2) Image Pre-processing

3) Segmentation of image

4) Extraction of features

5) Classification

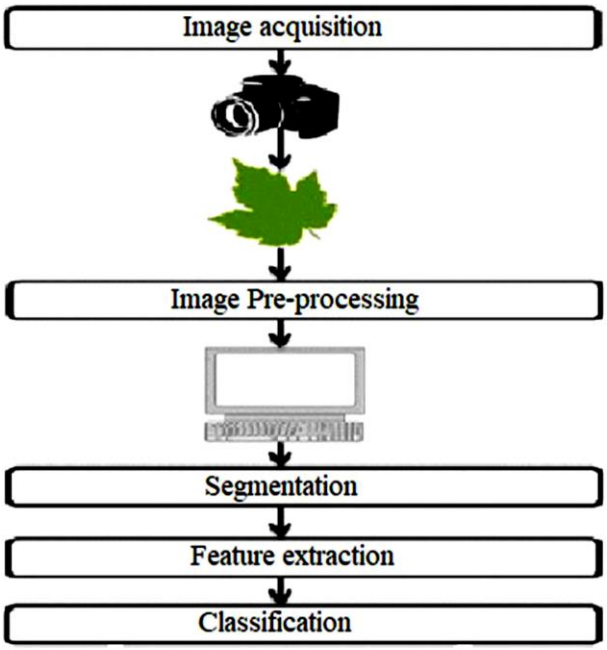

Figure 1. Architectural design of implementation

1] Image Acquiring Module:

This is the first method to gather the database from general public repository. The pathological leaf image is obtained by the camera. Image is captured from a precise uniform distance with ample lighting. Pictures are going to be hold on in some standard format like .bmp, .jpg. Dataset is ready with each black and white background. to train and test the system, pathological likewise as healthy leaf pictures are taken. The color pictures are digitized to supply RGB digital colour pictures

2] Image Pre-processing Module:

The images obtained from the camera are subjected to pre-processing for increasing the standard of the pictures. Color transformation includes RGB to grey conversion. The image resizing to a size of 256*256. Histogram equalization to extend the distinction in low distinction image. the green pixels of the leaf are removed by green masking.

3] Image Segmentation Module:

Image segmentation is performed to divide various areas with specific importance within the picture. Mean shift clustering algorithmic program uses the sliding window methodology for convergence to the centre of most dense space. It is primarily used for detecting extremely dense region.

4] Feature Extraction Module:

The color and texture of a picture are taken under consideration, to attain the distinctive features. Color Co-occurrence methodology where the RGB pictures of leaves are regenerated into Hue Saturation Intensity (HSI) color illustration. Hue is usually associated with the wavelength of a lightweight. Saturation could be a part that measures the "colourfulness" in HSI. Intensity projects the amplitude of a light. Visual patterns describe texture property by modelling textures as 2D deviation of grey level.

5] Classification Module:

Further processing by (CNN) Convolutional Neural Network to classify the plant leaves into healthy or morbid. If it is a unhealthy plant leaf, the name of that specific illness is displayed and remedies for particular illness is recommended.

ConvNet Algorithm: It is a category of neural network, most ordinarily applied to analysing visual representational process. It is a Machine Learning algorithmic program where image is taken as input and given importance to various elements to make it unique.

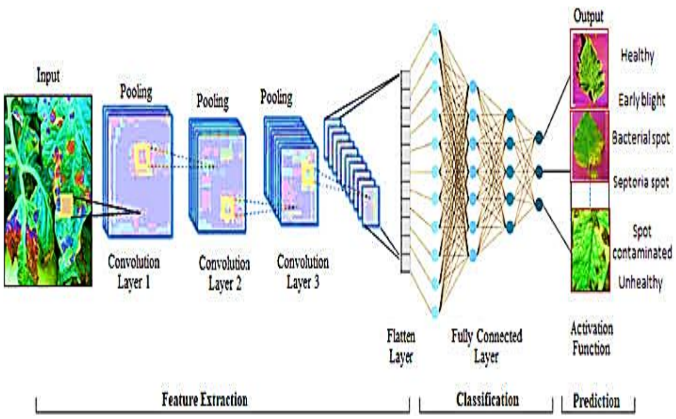

Figure 2. Working of CNN module

Convolution includes processing the whole picture in to a type that is simpler for classifying and formulating. Max pooling offers the most value within the relative matrix region that is taken. Activation wherever values are normalized and fitted in a particular range. ReLU operation permits solely the positive values and rejects the negative values. Fully connected function where features are compared with the options of test image and associate similar features with the defined label. Softmax function produces a probability of the output categories.

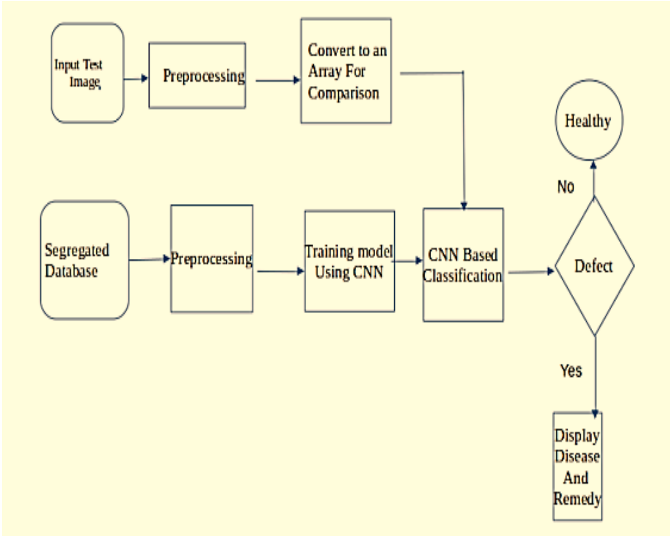

Figure 3. System Approach

IV. RESULT

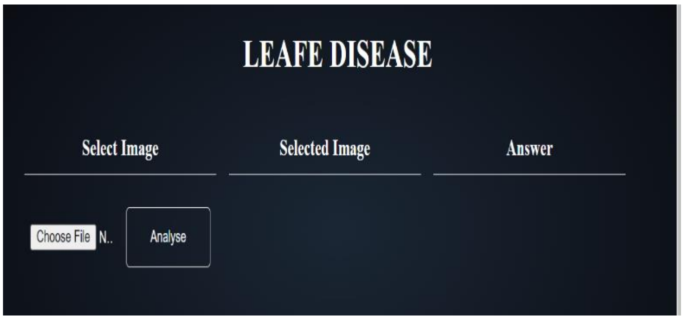

Figure 4. Home page

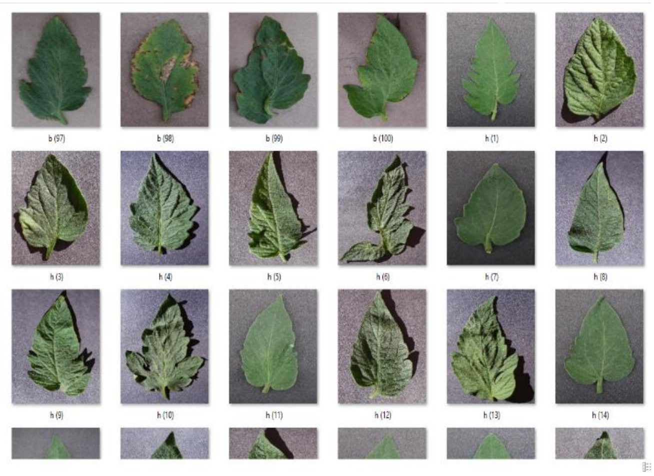

Figure 5. Selecting input

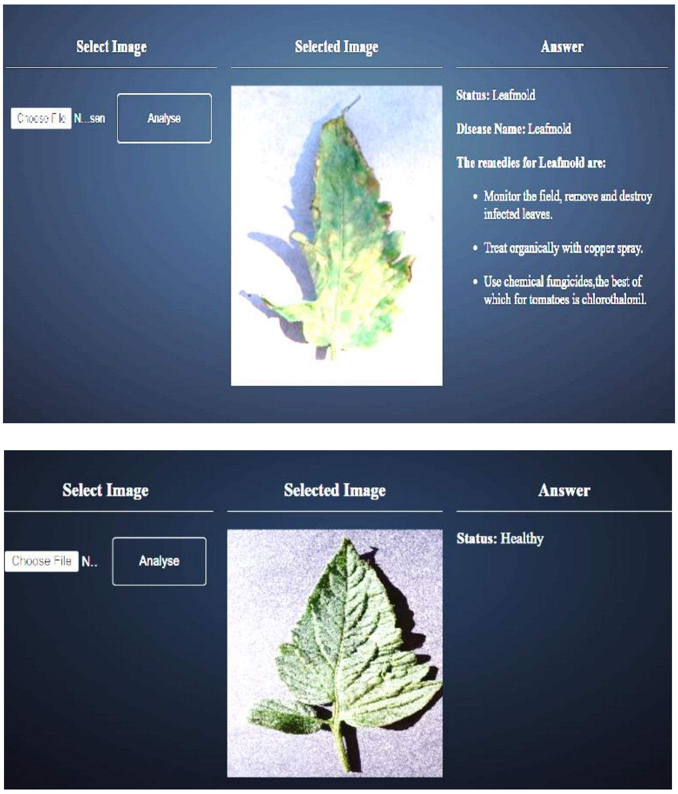

Figure 6,7. Analysing input data, Result and Remedies

```
[2K| Adam | epoch: 010 | loss: 0.21546 - acc: 0.9659 -- iter: 5824/5999
[A[ATraining Step: 938  | total loss: [1m[32m0.19619[0m[0m | time: 19.872s
[2K| Adam | epoch: 010 | loss: 0.19619 - acc: 0.9694 -- iter: 5888/5999
[A[ATraining Step: 939  | total loss: [1m[32m0.17955[0m[0m | time: 20.060s
[2K| Adam | epoch: 010 | loss: 0.17955 - acc: 0.9709 -- iter: 5952/5999
[A[ATraining Step: 940  | total loss: [1m[32m0.16262[0m[0m | time: 21.265s
[2K| Adam | epoch: 010 | loss: 0.16262 - acc: 0.9738 | val_loss: 0.03039 - val_acc: 0.9917 -- iter: 5999/5999
--
```

Figure 8. Accuracy of training data

The system depicts the primary look of front end. we've got a text message known as “choose file” so a user will perceive to click the below button, which may be used to browse the photographs on the system’s hard disk.

The database is correctly divided, various leaf species are obtained are updated to form proper database about leaf diseases. The database will have variety of input pictures to be chosen from the system directory.

There will be a button provided known as 'Analyse Image' for analysing the input image to discover the condition of the leaf.

The system displays the status of leaf i.e., Healthy or Unhealthy, if it's unhealthy it displays particular disease name and the remedies for particular diseases found within the leaf.

This system projects 80-90% of accuracy level.

V. CONCLUSION

This system aims at develop an system automation for plant maladies detection utilising image process techniques as well as prevention using Deep Learning Approach.

The main advantage of the developed system is to help farmers in agricultural activities. This system will detect unhealthy plant and suggest preventive measures against the disease for increasing the plant health. This system utilises CNN and projects an accuracy of 80-90%.

VI. REFERENCES

[1] A Deep CNN Approach for Plant Disease Detection by Fatma Marzougui, Mohamed Elleuch, Monji Kherallah, 2020 21st International Arab Conference on Information Technology (ACIT)

[2] Plant Leaf Detection and Disease Recognition using Deep Learning is the research paper by Sammy V. Militante, Bobby D. Gerardoij, Nanette V. DionisioĴ, 2019 IEEE Eurasia Conference on IOT, Communication and Engineering

[3] A Novel Method of Plant Leaf Disease Detection Based on Deep Learning and Convolutional Neural Network by Xulang Guan, 2021 IEEE 6th International Conference on Intelligent Computing and Signal Processing (ICSP 2021)

[4] Improved Segmentation Approach for Plant Disease Detection by Md. Arifur Rahman, Md. Mukitul Islam, G M Shahir Mahdee Md. Wasi Ul Kabir, 1st International Conference on Advances in Science, Engineering and Robotics Technology 2019 (ICASERT 2019)

[5] A Systematic Review on Image Processing and Machine Learning Techniques for Detecting Plant Diseases by N Gobalakrishnan, K Pradeep, C J Raman, L Javid Ali and M P Gopinath, International Conference on Communication and Signal Processing, July 28 - 30, 2020, India

[6] Image based Plant Disease Detection in Pomegranate Plant for Bacterial Blight by Sharath D M, Akhilesh, S Arun Kumar, Rohan M G and Prathap C

[7] Diseases Detection of Various Plant Leaf Using Image Processing Techniques: A Review by Santhosh Kumar.S, B.K.Raghavendra

[8] Plant Pathology Disease Detection in Apple Leaves Using Deep Convolutional Neural Networks Apple Leaves Disease Detection using EfficientNet and DenseNet by V V Srinidhi, Apoorva Sahay, K. Deeba

[9] Image Processing Technique for Automatic Detection of Plant Diseases and Alerting System in Agricultural Farms by Pradeep Kumar Mugithe, Rohit Varma Mudunuri, Rajasekar. B, Karthikeyan. S

[10] Plant Disease Detection Techniques: A Review by Gurleen Kaur Sandhu,Rajbir Kaur

[11] A Review on Machine Learning Classification Techniques for Plant Disease Detection by Mrs. Shruthi, Dr. Nagaveni V, Dr. Raghavendra B K

[12] A Machine Learning Technique for Identification of Plant Diseases in Leaves by Ms. Deepa, Ms. Rashmi N, Ms. Chinmai Shetty

[13] Detecting diseases in Chilli Plants Using K-Means Segmented Support Vector Machine by Abdul Hafiz Bin Abdul Wahab, Rahimi Zahari, Tiong Hoo Lim

[14] Plant disease classification using deep learning by Akshai KP Karunya, J.Anitha

[15] Smartphone Application for Deep Learning-Based Rice Plant Disease Detection by Heri Andrianto, Fladio Armandika, Ahmad Faizal

[16] Identification of Pathological Disease in Plants using Deep Neural Networks by Risab Biswas, Avirup Basu, Abhishek Nandy, Arkaprova Deb, Roshni Chowdhury, Raja Ram-Mohunpur

[17] A Study on Various Techniques for Plant Leaf Disease Detection Using Leaf Image by Sakshi Raina, Dr. Abhishek Gupta

[18] A Review of Machine Learning Approaches in Plant Leaf Disease Detection and Classification by Majji v Applalanaidu, G. Kumaravelan

[19] Identification of leaf diseases in pepper plants using soft computing techniques by Jobin Francis, Anto Sahaya Dhas D, Anoop B K

[20] Automatic Detection and Image Recognition of Precision Agriculture for Citrus Diseases by Chau-Chung Song, Chih-Lun Wang, Yi-Feng Yang

Detection of COVID-19 Pneumonia Using Convolutional Neural Networks

Amale Vedika Ravindra [1], Gouthami V Kulkarni [2], Prerana Chaithra [3]

[1-2]UG Students, Department of ISE, Sapthagiri College Of Engineering, VTU, Bengaluru, Karnataka-560057, India
[3]Associate Professor, Dept of Information Science and Engineering, Sapthagiri College Of Engineering, VTU, Bengaluru, Karnataka-560057, India
vedikar30@gmail.com, gautamivk@gmail.com, preranachaithra15@gmail.com

Abstract - Coronavirus disease (COVID-19) is a pandemic disease, which has already caused thousands of causalities and infected several millions of people worldwide. Any technological tool enabling rapid screening of the COVID-19 infection with high accuracy can be crucially helpful to the healthcare professionals. The main clinical tool currently in use for the diagnosis of COVID-19 is the Reverse transcription polymerase chain reaction (RT-PCR), which is expensive, less-sensitive and requires specialized medical personnel. X-ray imaging is an easily accessible tool that can be an excellent alternative in the COVID-19 diagnosis. The aim of this project is to propose a robust technique for automatic detection of COVID-19 pneumonia from digital chest X-ray images applying pre-trained deep-learning algorithms while maximizing the detection accuracy. A public database was created by the authors combining several public databases and also by collecting images from recently published articles. The database contains a mixture of 423 COVID-19, 1485 viral pneumonia, and 1579 normal chest X-ray images. Transfer learning technique was used with the help of image augmentation to train and validate several pre-trained deep Convolutional Neural Networks (CNNs). The networks were trained to classify two different schemes: i) normal and COVID-19 pneumonia; ii) normal, viral and COVID-19 pneumonia with and without image augmentation. This would be extremely useful in this pandemic where disease burden and need for preventive measures are at odds with available resources.

Index Terms – COVID-19, X-ray, Pneumonia, Convolutional Neural Networks.

I. INTRODUCTION

Coronavirus disease (COVID-19) is an extremely contagious disease and it has been declared as a pandemic by the World Health Organization (WHO) on 11th March 2020 considering the extent of its spread throughout the world. The pandemic declaration also stressed the deep concerns of the alarming rate of spread and severity of COVID-19. It is the first recorded pandemic caused by any coronavirus. It is defined as a global health crisis of its time, which has spread all over the world. Governments of different countries have imposed border restrictions, flight restrictions, social distancing, and increasing awareness of hygiene. However, the virus is still spreading at very rapid rate. While most of the people infected with the COVID-19 experienced mild to moderate respiratory illness, some developed a deadly pneumonia. There are assumptions that elderly people with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, renal or hepatic diseases and cancer are more likely to develop serious illness. Until now, no specific vaccine or treatment for COVID-19 has been invented. However, there are many ongoing clinical trials evaluating potential treatments. More than 7.5 million infected cases were found in more than 200 countries until 11th June 2020, among which around 421 thousand deaths, 3.8 million recovery, 3.2 million mild cases and 54 thousand critical cases were reported.

II. LITERATURE SURVEY

Distinguishing pneumonia and Covid 19 by Huang C, Wang Y and Li X depicts that in April 2021 the network is trained with single class contours and fine tune through weak patient levels. CNN, ANN suffers hyper parameter tuning. It is possible to say COVID-19 was an opportunity for educational change which helped in preparing for similar future situations, lots of universities or institutes conducted courses online instead of offline. Due this change traditional teaching was adversely affected. It is a lightweight IDE integrated with an online judge that allows the instructor or the teaching assistant (TA) to help students in a form of online pair programming **[1]**. COVID-Net: A tailored deep convolutional neural network design for detection of COVID-19 cases from chest Xray images by L. Wang and A. Wong in March 2021 Granting there are a significant number of infected COVID-19 patients globally algorithms. This rapid shift to emergency remote teaching during the pandemic may or may not be efficient. The difficulties they face are solving the syntax errors, compilation errors and debugging the program. They identified three issues while using such an approach **[2]**. COVID-19 Diagnosis using X-Ray Images and Deep learning by Salehi S, Abedi A, Balakrishnan S published a paper in September 2021. First, since the shared screen can be seen by all participants students felt embarrassed while sharing their incorrect code. Second, since online conducting sessions required huge network bandwidth, it cannot be predicted that both teachers and students have good quality network to conduct or attend an online session. Third, the teachers could only tell the mistakes through audio or chat, instead of correcting the code in their systems **[3]**. Deep Networks Based Classification of COVID-19 Chest X Ray Images by Rocklov J, Sjodin H, Wilder-Smith A. published a paper in May 2021. Here two CNN network's performances were compared on the diagnosis of pneumonia disease. While training the model transfer learning and finetuning was used. According to the experimental results and confusion matrices every network has its own detection capability on the dataset. Exception network is more successful for detecting pneumonia cases than Vgg16 network. At the same time Vgg16 network is more successful at detecting normal cases **[4]**. Development and evaluation of an AI System for early detection of Covid19 pneumonia using Xray by D. Varshni, K. Thakral, L. Agarwal, R. Nijhawan, and A. Mittal in September 2020 described how to apply pair programming in learning and teaching programming courses effectively, there are several related studies which mainly focused on a collaborative environment for practicing programming **[5].** Automatic diagnosis of COVID-19 and pneumonia using FDB method by Wasif Khan, Nazar Zaki, Luqman Ali published in July 2021. In this paper, a low complexity residual neural network with a dilated bottleneck structure, called DeepConvDilatedNet is invoked as the backbone of a two-stage detector using Faster R-CNN because of the turbidity of the pneumonia target. The image has further been enhanced with the CLAHE algorithm to make the target area more prominent. In the RPN, Soft-NMS algorithm to filter the anchor box is used to ensure its quality. To speed up the convergence of the algorithm and improve the prediction accuracy of the target area, the K-Means++ algorithm is also used in YOLOV3 to obtain the initial anchor box size **[6].**

III. PROPOSED METHODOLOGY

System designs is the process of defining the architecture, Modules, Interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of the systems theory to product development. The figure. 4.1 shows a CNN block diagram.

Image Preprocessing:

Chest X-ray images were only resized before applying as input to the networks. Input requirements for different CNNs are different. For Squeeze Net, the images were resized to 227 × 227 pixels whereas for mobilenetv2, ResNet18, ResNet101, VGG19 and DenseNet201, the images were resized to 224 × 224 pixels and for Inceptionv3 the images were resized to 299×299 pixels. All images were normalized according to the pre-trained model standards. Image augmentation techniques were applied to viral pneumonia, normal and COVID-19 X-ray images for training to create a balanced training set. However, COVID-19 images were augmented six times while normal and viral pneumonia images were augmented once only.

Image Augmentation:

In this study, two different image augmentation techniques (rotation, and translation) were utilized to generate COVID-19 training images. The rotation operation used for image augmentation was done by rotating the images in the clockwise and counter clockwise direction with an angle of 5, 10 and 15 degrees, as shown in the figure. 4.2. The translation was done by translating image horizontally and vertically by -5% to 5%. However, only image translation was applied to the viral and normal X-ray training images. Table 1 summarizes the number of images per class used for training, validation, and testing at each fold. Study1 was carried out with COVID 19 and normal images while study2 was carried out with COVID-19, normal and viral pneumonia images.

CNN Model Selection:

Eight different pre-trained CNN models were trained, validated and tested in this study, as shown in the table 4.3. The experimental evaluation of MobileNetv2, Squeeze Net, ResNet18, ResNet101 and DenseNet201. Convolutional neural networks learn to detect features like color and edges in their first convolutional layer. In deeper convolutional layers, the network learns to detect features that are more complicated. Three comparatively shallow networks (MobileNetv2, SqueezeNet and ResNet18) and five deep networks (Inceptionv3, ResNet101, CheXNet, VGG19 and DenseNet201) were evaluated in this study to investigate whether shallow or deep networks are suitable for this application. Two different variants of ResNet were used to compare specifically the impact of shallow and deep networks with similar structure. Performance difference due to initially trained on different image classes other than Xray images were compared with CheXNet, which is a 121-layer DenseNet variant and the only network pre-trained on X-ray images.

Deep Layer Features:

The deep layer features of the image were investigated by comparing the activated areas of the convolutional layers with the matching regions in the original images. The activation map can take different range of values and was therefore normalized between 0 and 1. The strongest activation channels from the COVID-19, normal and viral pneumonia X-ray images were identified and compared with the original images. It was noticed that the strongest channel activates on edges with positive activation on light left/dark right edges, and negative activation on dark left/light right edges. Convolutional neural networks learn to detect features like color and edges in their first convolutional layer. In deeper convolutional layers, the network learns to detect features that are more complicated. Later layers build up their features by combining features of earlier layers.

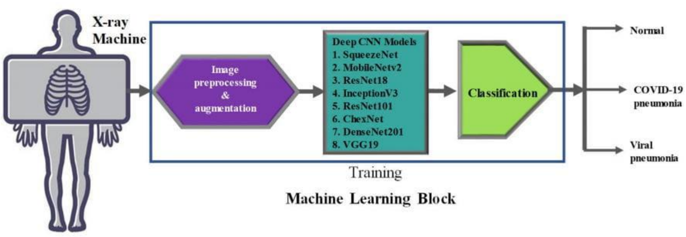

Figure 1. Architectural design of implementation

IV. RESULT

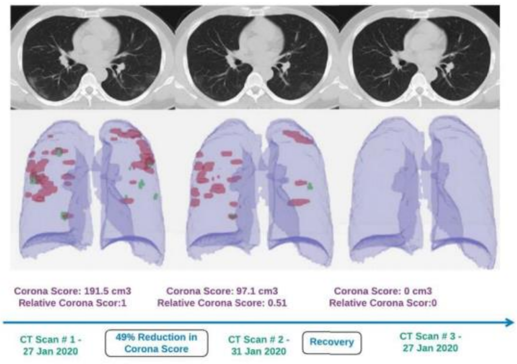

FIGURE 9. Method of corona score calculation for patient disease progression monitoring is illustrated. It is one of the ways infected areas can be visualised, and disease severity can be predicted for better disease management and patient care. [35].

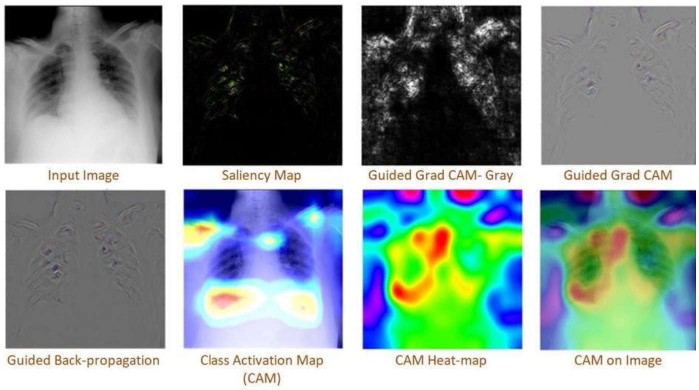

FIGURE 8. Visualizations shown by using different saliency maps that provide additional insights diagnosis. These maps help to identify the areas of activation that can lead to disease progression monitoring and severity detection. Adapted from [57].

V. CONCLUSION

This work presents deep CNN based transfer learning approach for automatic detection of COVID-19 pneumonia. Eight different popular and previously reported efficient CNN based deep learning algorithms were trained, validated and tested for classifying normal and pneumonia patients using chest X-ray images. COVID-19 has already become a threat to the world's healthcare system and economy and thousands of people have already died. The proposed system is more accurate and precise as compared to the existing system. The image classification is generally built with Convolution Neural Net Model. We have done a literature survey of 20 papers. Through those surveys we understood the methodologies and limitations of existing system. In the traditional system we X-Ray for detection of pneumonia was costlier. The system which we are going to propose will be user friendly. The system we are coming up with is easy to use for all the kinds of age. This method combines the existing techniques in a new way to detect Covid-19. As seen in the system architecture we will be using Convolutional Neural Network algorithm.

VI. REFERENCES

[1] Huang C, Wang Y, Li X, "Distinguishing Pneumonia and COVID-19", 2021, pp. 2-8

[2] Salehi S, Abedi A, Balakrishnan S, "COVID-19 Diagnosis using X-Ray Images and Deep learning", 2021, pp. 15-20

[3] Kanakaprabha S, D. Radha, "Analysis of COVID-19 and Pneumonia Detection in Chest X-Ray Images using Deep Learning", 2021, pp. 38-79

[4] Wasif Khan, Nazar Zaki, Luqman Ali, "Automatic diagnosis of COVID-19 and pneumonia using FDB method", 2021, pp. 80-91

[5] Avnish Panwar, Rishika Yadav, Kishor Mishra, "Deep Learning Techniques for the Real Time Detection of Covid19 and Pneumonia using Chest Radiographs", 2021, pp. 101-133

[6] L. Wang and A. Wong, "COVID-Net: A tailored deep convolutional neural network design for detection of COVID-19 cases from chest Xray images", 2021, pp. 25-90

[7] Mohammad Farukh Hashmi, Satyarth Katiyar, Avinash G Keskar, "Efficient Pneumonia Detection in Chest Xray Images Using Deep Transfer Learning", 2021, pp. 880-932

[8] Muhammad e. H. Chowdhury, Tawsifur Rahman, Amith Khandakar, Muhammad Salman Khan, "AI helping in Screening Viral and COVID-19 Pneumonia", IEEE Access, vol. 8, 2021, pp. 132665-132676

[9] O. Ronneberger, P. Fischer, and T.-N. Brox, "Convolutional networks for biomedical image segmentation", Int. Conf. Med. Image Comput. Comput.-Assist. Intervent, 2021, 1022-1201

[10] Q. Li, X. Guan, P. Wu, X. Wang, L. Zhou, Y. Tong, R. Ren, K. S. Leung, E. H. Lau, J. Y. Wong, and X. Xing, "Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia", New England Journal of Medicine, 2020, pp. 1-10

[11] Sammy V. Militante, Nanette V. Dionisio, Brandon G. Sibbaluca, "Pneumonia and COVID-19 Detection using Convolutional Neural Networks", IEEE Xplore, 2020 the third International Conference on Vocational Education and Electrical Engineering (ICVEE), 2020, pp. 1-6

[12] D. Varshni, K. Thakral, L. Agarwal, R. Nijhawan, and A. Mittal, "Development and evaluation of an AI System for early detection of Covid19 pneumonia using X-ray", 2020, pp. 400-590

[13] A. M. Tahir, M. E. H. Chowdhury, A. Khandakar, S. Al-Hamouz, M. Abdalla, S. Awadallah, M. B. I. Reaz, and N. Al-Emadi, "A systematic approach to the design and characterization of a smart insole for detecting vertical ground reaction force (vGRF) in gait analysis", Sensors, Feb. 2020, pp. 1-25

[14] S. Salehi, A. Abedi, S. Balakrishnan, and A. Gholamrezanezhad, "Coronavirus disease 2019 (COVID-19): A systematic review of imaging findings in 919 patients", vol. 215, 2020, p. 1-7

[15] M. Hosseiny, S. Kooraki, A. Gholamrezanezhad, S. Reddy, and L. Myer, "Radiology perspective of coronavirus disease 2019 (COVID-19): Lessons from severe acute respiratory syndrome and middle east respiratory syndrome", vol. 214, May 2020, pp. 202-207

[16] M. Chung, A. Bernheim, X. Mei, N. Zhang, M. Huang, X. Zeng, J. Cui, W. Xu, Y. Yang, Z. A. Fayad, A. Jacobi, K. Li, S. Li, and H. Shan, "CT imaging features of 2019 novel coronavirus (2019-nCoV)", vol. 295, Apr. 2020, pp. 202-207

[17] N. Zhang, L. Wang, X. Deng, R. Liang, M. Su, C. He, L. Hu, Y. Su, J. Ren, F. Yu, L. Du, and S. Jiang, "Recent advances in the detection of respiratory virus infection in humans", vol. 92, Apr. 2020, pp. 408-417

[18] P. Gómez, M. Semmler, A. Schützenberger, C. Bohr, and

M. Döllinger, “Low-light image enhancement of high-speed endoscopic videos using a convolutional neural network”, Med. Biol. Eng. Comput., vol. 57, Jul. 2019, pp. 1451-1463

[19] J. Choe, S. M. Lee, K.-H. Do, G. Lee, J.-G. Lee, S. M. Lee, and J. B. Seo, “Deep learning–based image conversion of CT reconstruction kernels improves radiomics reproducibility for pulmonary nodules or masses”, vol. 292, Aug. 2019, pp. 365-373

[20] X. Gu, L. Pan, H. Liang, and R. Yang, “Classification of bacterial and viral pneumonia using deep learning in chest radiography”, Proc. 3rd Int. Conf. Multimedia Image Process. ICMIP, Jul 2018, pp. 88–93.

Farmer Friendly Crop Price Prediction Model

Aanchal P Jain [1], Ashmita SR [2], Mahadevi NC [3], Mansi Singh [4], Sudarsanan D[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Sudarsanan D**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
anchaljain315@gmail.com, ashmitachitra11@gmail.com, mahadevinc2000gmail.com, mansiisingh.99@gmail.com, sudarsanand@sapthagiri.edu.in

***Abstract* - Accuracy of crop value prediction techniques is very important as a result of it permits the provision chain planners and government bodies to require acceptable actions by estimating market factors like demand and supply. In rising economies like Republic of India, the crop costs at marketplaces ar manually entered a day, which may be vulnerable to human-elicited errors just like the entry of incorrect knowledge or entry of no knowledge for several days. additionally to such human prone errors, the fluctuations within the costs itself create the creation of stable and sturdy foretelling answer a difficult task. Considering such complexities in crop value foretelling, during this paper, we have a tendency to gift techniques to make sturdy crop value prediction models considering varied options like (i) historical value and market arrival amount of crops, (ii) historical weather knowledge that influence crop production and transportation, (iii) knowledge quality- connected options obtained by playing applied math analysis. we have a tendency to in addition propose a framework for context-based model choice and training considering factors like model stability, knowledge quality metrics, and analytic thinking of crop costs.**

I. INTRODUCTION

India is a country wherever the major supply of living and economy is thru agriculture and agricultural business Prediction of costs in agricultural trade goods has continually been a serious drawback for the farmers. The agribusiness sector has been one of the necessary segments of the agriculture sector. This project aims to reduce factory farm risk by deploying the factory farm data to the farmer community.

This Project intends at predicting agriculture trade goods market value victimization through Machine Learning Algorithms. the target of this project is to create a system that provides economical and effective value prediction options.The major issues facing by the farmer is the loss in the price. Getting good price for the product is a big challenge for any farmer and it has become difficult for the government to look after why the farmers are not getting good price for their products and keeping them satisfied is another challenge. The variations in agricultural crop costs are a significant drawback to unravel from the government's perspective as a result, the crop costs square measure affected because of many factors like the space underneath cultivation for a selected crop, shopper demands, and offer chain aspects of producers, etc.

In our project we are trying to find the price variation patterns in the market and around what time. Our main idea is to focus on the variations of price of commodities in the market with the help of data science and machine learning models.

The major issues facing by the farmer is the loss in the price. Getting good price for the product is a big challenge for any farmer and it has become difficult for the government to look after why the farmers are not getting good price for their products and keeping them satisfied is another challenge. The variable trend in crop prices needs government intervention to solve serious issues faced by majority of the farmers all over the India

The main objective of the project is to make profit for the farmers based on the Price Prediction by deploying Time Series Analysis on the previous prices of commodities. Pattern obtained can be used to find out the reason for the hike or downfall of price of particular commodity,crop.

II. LITERATURE SURVEY

[1] Crop-yielding and Price Forecasting: August 2020 by Sadiq A Mulla et.al [1]:

The paper calculates the crop yield, increase or decrease and also its price. It shows the next and previous 12 month forecast time series graph for Rice crop. It shows the top gaining crops and losing crops obtained using Decision tree algorithm. The fertilizer recommendation which is used for soil analysis and growth of crops, which is not suitable for the real time analysis.

[2]Price prediction of crop using machine learning algorithms:2021 by Ranjani Dhanapal et.al[2]:

Decision tree Regression which is a supervised machine learning algorithm is used for crop price predictions and forecast price for next 12 months. This particular project is untrained for climatic aware farming techniques, fertilizer suggestion, system crop monitoring and pest and disease outbreak.

[3] Price prediction and forecasting,March 2020 by Rohith R

et.al [3]:

The paper predicts the output of the crop price by analyzing the dataset using supervised machine learning technique such as K

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nearest neighbor regression algorithm and decision tree learning (ID3). The portal for shopping the fertilizer based machine learning algorithm that which fertilizer give more yield and quality for the specific crop

[4] Estimation Of Prices: September 2021 by CH.Bhanu K : The project uses an online application to estimate crop costs and forecasts. it's supported economical machine learning techniques and technologies and has an easy interface. it's been trained on a spread of Kharif and coracan crops (such as paddy, arhar, bhajra, barley, and others). Agricultural product costs are influenced by a spread of things, and even identical products will have a completely different valuation in several markets. Agricultural trade goods costs are inherently volatile, and they will rise or decrease at any time, wreaking disturbance on the economy.

[5] Support System for Prediction of Prices in 2019 by AmanVohra et.al[5]:

This system is planned to produce facilitate the farmers for expecting a better quantity for his or her crops and for predicting the simplest worth for the crops. The predicting prices of husbandry wares are useful for the farmers as they'll sow crops relying upon their future value. Horticultural specialists pursue the charts and anticipate advertise rates that may be told to farmers. Their area unit several factors that influence the costs of agricultural commodities and even identical commodities will have completely different worth in various markets. Farmers themselves have to be compelled to enter the previous artifact name.

[6]Agricultutral Price Forecasting Using ANN: 2018 by Wiwik Anggraeni et.al[6]:

The paper aims to forecast chili commodity price at consumer level by using artificial neural network(ANN) model. The forecasting considers several factors that can affect the price of chili. In addition, the forecasting results using ANN model will be compared with the results of model obtained using Holt-Winter's method. The error was still greater when it is compared with the forecasted price result using Holt-Winter.The Holt-Winter only forecast based on the price data/ The results from the Holt-Winter was better than that from the ANN model.

[7]The Study on Agricultural Product Price: 2020 by GuangZheng et.al [7]:

From the past influence factors and specific expansive of agricultural product prices, to scale back the interconnection result of every worth knowledge consecutively within the method of examine, this paper created the moving ridge remodel and BP neural network merger forecast model adopting the concept of initial decomposition and so integration. The analysis on Agricultural Product worth prediction Service supported Combination Model.At present, most of the analysis on prediction model solely centered on one variety of product to conduct the empirical examination. Its prediction technique wasn't applicable to all.

[8]Time Series Prediction: 2018 by Koichi Kurumatani et.al[8]:

Paper projected a way for statistic prognosis of agricultural product value and value movement, victimisation basic predictors supported repeated neural networks and their time alignment. Investigation of the accuracy of the generated statistic shows that point series predictors supported by Long Short Term Memory and Gated Recurrent Units capture the long-run tendency of the target system additionally to the great performance for a terribly short prediction of one week when. The study additionally suggests that there's an opening of correctness fall in short-run prediction. At this stage, our methodology demonstrates that the anticipated future statistic has similar characteristics to a past real one.

[9]Analysis and Prediction of Crop Production in Andhra Region: October, 2021 by Vamsidhar Talasila, et.al [9]:

It demonstrate a soybean trend prediction system. It uses Long Short Term Memory to predict soybean price, corn market soybean, and soybean-oil futures values. The study provides a replacement technique for field watching and early warning. within the prediction experiment, the corn market value fitting isn't ok. the most reason is that the worth fluctuation varies. The price variations varies is the compact and also the intensity of variation is the most blatant. Hence, the longer-term effort is to make higher systems for agricultural product value.

[10]Prediction of Soybean Price Trend via a Synthesis Method With Multistage Model: December 2021 by ZhilingXu, Hualing Deng, QiufengWu:

The paper permits the farmer to anticipate the simplest yield with no loss for evey farmers and customers. will directly sell his or her agricultural products through an personal e-commerce website; the client will log in to thereto website and buy those agricultural commodities to the e-commerce website. the worth might vary because of the varied conditions like weather, soil, cost, pesticides so on. The investment with quantity by farmers might not be obtained once a year.

III. PROPOSED METHODOLOGY

The previous datasets are used and the accurate price of the crop is predicted using machine Learning algorithm. This project includes a Time series which is a decision making support model helpful for farmers to set relevant prices. The generated prediction helps the farmer community in their creating|deciding|higher cognitive process} and ultimately achieving their desired goal of profit-making. There are several factors like weather that demands the necessity of crop maintenance that influence the worths|the costs} of agricultural commodities and even equivalent commodities will have completely different prices in numerous markets.

Some of the technologies used in our project are:

MACHINE LEARNING: Machine learning which means teaching a machine that is computers to learn ,predict a certain thing using different algorithms and techniques .It also focuses on the creation of computer logics that can access data and self leran .The primary aim of machine learning is to automate the learning of the computers without human assistance and adjust themselves accordingly.

Time Series analysis as Supervised learning: Time series analysis is a machine learning algorithm which can be included under Supervised learning. Time Series data is sequentially measured variables over fixed interval of time. Time Series is univariate i.e it has only one variable.

Time series is different from Regression problems where target variable is dependent on one or more independent explanatory variables. The algorithm predicts the value for new input on analyzing all the explanatory variables. But Time Series has only target variable, indexed with time and a value here depends on the previous value in time. Time series algorithm uses the previously observed time series variable value to predict the future values.

Statistical Introduction to Time Series

A Time series is an assortment of observations created consecutively in time. When a variable is measured consecutive in time or at a set interval, known as the sampling interval, the ensuing knowledge type a statistic. A sequence of random variables outlined at mounted sampling intervals is observed as Discrete-Time Stochastic Process or Time series Model.

Time series is a series of data points indexed in a time order. It consists of only one variable i.e, Time. The series will be depending on time only. Time series are analyzed to understand the past and to predict the future.

Components of Time Series

Time series has following components:

a) Trend-A systematic change that does not appear to be periodic is known as trend.
b) Seasonal Variations-Duplicated patterns within any fixed period is known as Seasonal variations.These are the rhythmic forces operating in a regular and periodic manner over a span of less than a year.

c) Cyclic Variations-The variations n a time series which utilize themselves over a period of more than one year are the cyclic variations.The oscillatory movement has a periodic manner of oscillation of more than a year .

d) Irregular Fluctuations-Irregular fluctuations are not regular variations in nature and are purely random variations.

Time Series Models

The following notations used are

$\mathbf{x_t}$ denotes observed time series

$\mathbf{m_t}$ denotes trend in time series

$\mathbf{s_t}$ denotes seasonality in time series

$\mathbf{z_t}$ denotes error term

Additive Model-

Additive model is a simple model where seasonal effect remains constant at the trend increase.Here the seasonal effect remains constant from year to year .Additive Time series model is given by:

$$\mathbf{x_t = m_t + s_t + z_t}$$

Multiplicative Model –

Multiplicative model is a model where size of seasonal effect increases as the trend increase. Here the seasonal effect is directly proportional to the trend. The Multiplicative Time series model is given by:

$$x_t = m_t.s_t + z_t$$

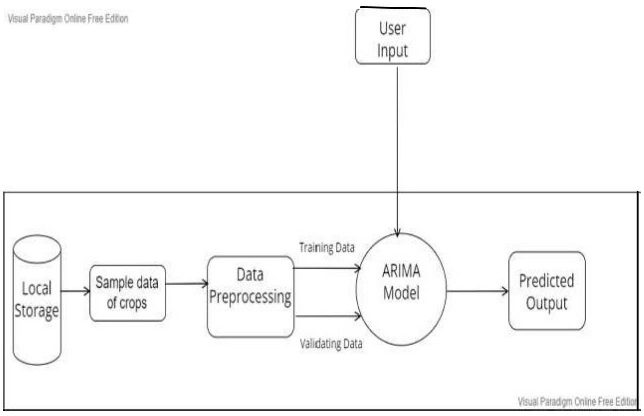


Figure 3.1 Architectural design implementation

Module 1 : Preprocessing

Data preprocessing is a method of preparing (cleaning and organizing) the sensitive information to make it suitable for a working and training Machine Learning models.

The data collected will not be perfectly modelled so that the algorithm can be applied. It requires some pre-processing before it

can be trained. Data may contain null values or it may contain outliers. It is necessary to take care of these values before applying algorithms, which improves the efficiency of algorithm.

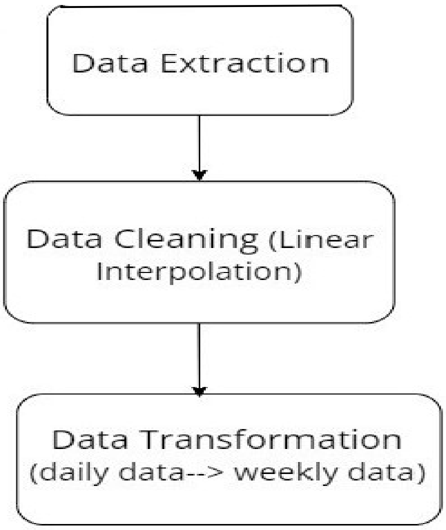


Figure 3.2: Data pre-processing

Module 2 : Weekly interpolation

Interpolation is the method of creating new data points within the range of a unique set of known data points. It is used to fill the missing values. Continuous dates generated are converted to weekly data. Computing daily data requires lot of computational time and resources. Hence converting it into weekly data help us compute with the available resources.

Steps followed in Linear Interpolation are:

Step1: Create rows for any step values that don't currently exists in the dataset.

Step2: Use Linear Interpolation to calculate a value in the measurement column for each new row that is created in step1

Linear interpolation between two known points

If two known points are represented by the coordinates {(x $_0$, y $_0$)} and {(x1,y1)}, the linear interpolant will be the straight line between these points. For a value *x* in the interval {(x0,x1)}, the value *y* along the straight line is given from the equation of slopes

$$\frac{y - y_0}{x - x_0} = \frac{y_1 - y_0}{x_1 - x_0}$$

which can be derived geometrically from the figure on the right. It is a special case of polynomial interpolation with *n* = 1.

Solving this equation for *y*, which is the unknown value at *x*, gives

$$y = y_0 + (x - x_0)\frac{y_1 - y_0}{x_1 - x_0} = \frac{y_0(x_1 - x) + y_1(x - x_0)}{x_1 - x_0}$$

Module 3:ARIMA model for Data Modelling

ARIMA is an excellent model which is used specifically for Time Series Analysis.

AR stands for AutoRegressive Model - AR(p): An autoregressive model is applied when a value from a time series is reverted on previous values from that same time series. I stands for Integrated Model - I(d): represents the differencing of raw observations to allow for the time series to become stationary.

MA stands for Moving Average Model – MA(q):moving average process involves modeling the error term as a linear combination of error terms occurring simultaneously and at various time intervals in the past.

The parameters can be defined as:

p: the number of lag observations in the model; also known as the lag order

.*d*: the number of times that the raw observations are differenced; also known as the degree of differencing.

q: the size of the moving average window; also known as the order of the moving average.

<u>Autoregressive model</u>- When a value from a time series is lapsed on historic values from that same time series.

The series {x_t} is an autoregressive process of order p if

$$x_t = \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \ldots + \alpha_p x_{t-p} + w_t$$

α_i are the model arguments with α_p is not equal to 0 for an order p process.The equation can be shown as a polynomial of order p in terms of the backward shift operation:

$$\theta_p(B)x_t = (1 - \alpha_1 B - \alpha_2 B^2 - \ldots - \alpha_p B^p)x_t = w_t$$

<u>Moving Average model:</u> Moving average process involves modeling an term which would be a linear combination of error terms occurring simultaneously and at various interval of time in the past.

Moving average process is shown by

$$x_t = \emptyset_q(B)w_t = (1 + \beta_1 B + \beta_2 B^2 + \cdots + \beta_q B^2)$$

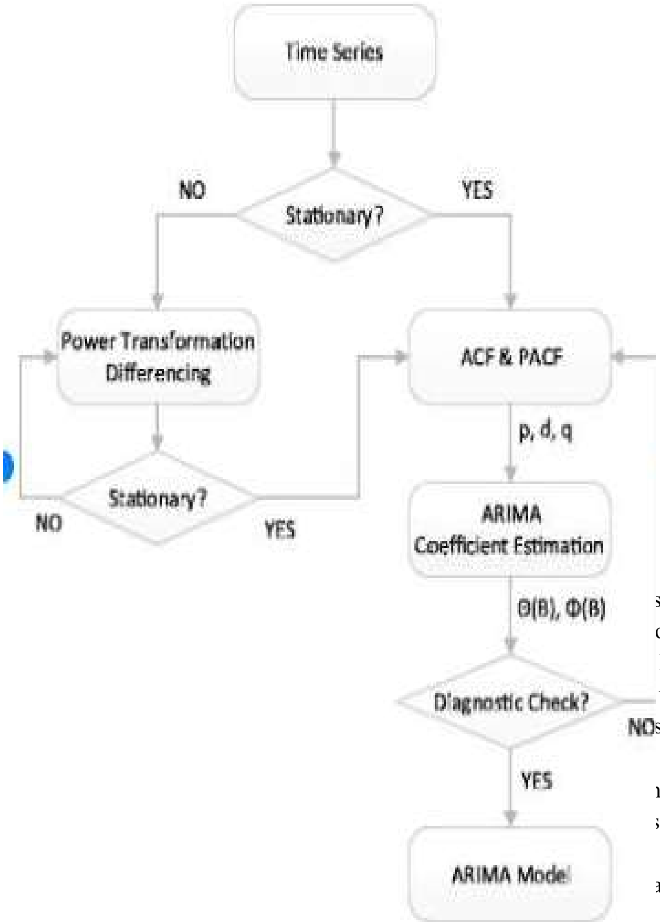
where, $\{w_t\}$ is white noise with zero mean and variance σ^2_w

β_1 are model parameters

B is backward shift operator

$\emptyset$ is polynomial of order q

Moving average (MA) consists of finite sums of stationary white noise terms.Hence they are stationary and we have time invariant mean and covariance.



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VI. REFERENCES

[1] Crop-yield and Price Forecasting using Machine Learning: August 2020 by Sadiq A Mulla, Dr.S.A.Quadri, International journal of analytical and experimental modal analysis.

[2] Crop price prediction using supervised machine learning algorithms:2021 by Ranjani Dhanapal, A AjanRaj, J Balaji, ICCCEBS journal of Physics: conference series.

[3] Crop Price Prediction and Forecasting System using Supervised Machine Learning Algorithms: March 2020 by Rohith R, Vishnu R, Kishore A, DeebanChakkarawarthi, International journal of advanced research in computer and communication Engineering.

[4] Estimation Of Prices In Agricultural Commodity Using Machine Learning: September 2021 by CH.Bhanu Kumar, International journal

IV.Output

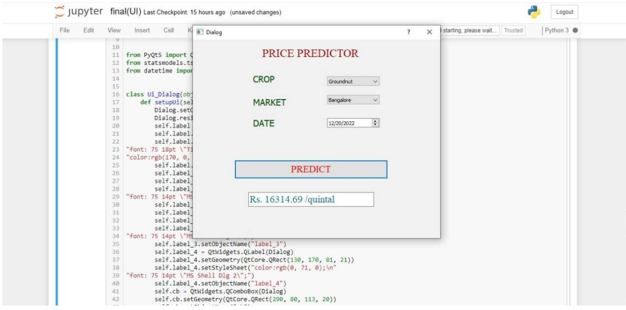


Figure 4.1

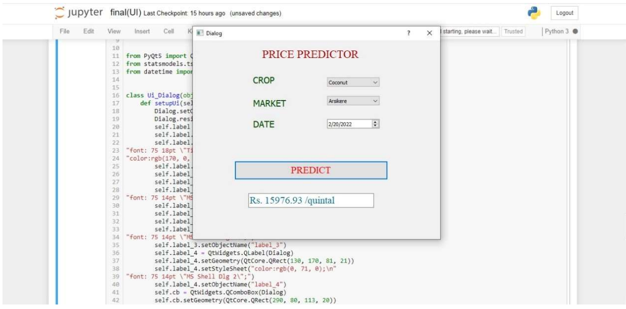
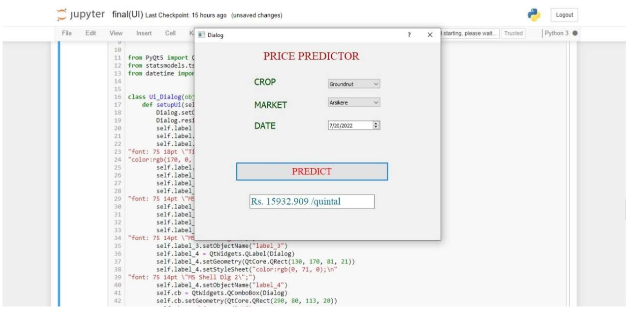


Figure 4.2



of innovative technology and exploring Engineering.

[5] Decision Making Support System for Prediction of Prices in Agricultural Commodity: 2019 by AmanVohra, NitinPandey, S.K.Khatri: Quest journals, journal of software Engineering and simulation.

[6] Agricultutral Strategic Commodity Price Forecasting Using Artificial Neural Network: 2018 by Wiwik Anggraeni, FaizalMahananto, M AunuRofiq, Kuntoro Boga Andri, Zulkifli Zaini, ApolPribadiSubriadi, International journal of agriculture and systems.

[7] The Research on Agricultural Product Price Forecasting Service Based on Combination Model: 2020 by GuangZheng ,Hui Zhang, Jingjing Han, ChenhuiZhuang , Lei Xi, International journal of analytical and experimental modal analysis.

[8] Time Series Prediction of Agricultural Products Price based on Time Alignment of Recurrent Neural Networks: 2018 by Koichi Kurumatani, International journal of advanced research in computer and communication Engineering.

[9] Analysis and Prediction of Crop Production in Andhra Region Using Deep Convolutional Regression Network: October, 2021 by Vamsidhar Talasila, Chitturi Prasad, Guttikonda Trinesh Sagar Reddy, Allada Aparna, International journal of intelligent Engineering and systems.

[10] Prediction of Soybean Price Trend via a Synthesis Method With Multistage Model: December 2021 by ZhilingXu, Hualing Deng, QiufengWu, International journal of agriculture and environmental systems.

Gaze-Based Secured Authentication Using Morse Code

Bharath B[1], Deepika S[2], Deva R[3], L Sandeep Reddy[4], Priyanka M R[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Priyanka M R[5]**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
bharathnut@gmail.com, deepikas0267@gmail.com, devar4928@gmail.com, lsandeepreddy2000@gmail.com, priyankamr@sapthagiri.edu.in

***Abstract* - Morse code is the most basic emergency communication method. It expresses alphabet and numbers by using the combinations of dots and dashes. Because of its simple structure which only contains dots and dashes, Morse code is expressed in a variety of ways. Among the methods of expressing Morse code, methods that use human body movements such as finger gesture, tongue movements and eye blinking have been studied. Our research uses surface electromyography (EMG) signals generated by hand motion. We expressed Morse code according to the duration between folding and stretching the fist. Experimentally, we have shown that the performance is 100% accuracy in recognizing 26 alphabets.**

Morse code is a combination of dots and dashes to represent alphabets and numbers. Since it consists of only dots and dashes, the code is very simple and can be easily used for communication purpose. Because of these advantages, Morse code was used in emergency situations and wars where it is difficult to transmit voice information directly. In addition, Morse code is similar in structure with the binary representation in a computer system consisting of 0 and 1. Recently, there are many studies for using in computers and internet communications such as a study on cloud storage security system using DNA computation with Morse code and zigzag pattern, a study to help people with disabilities access the internet using Morse code and a study on new electronic lock using optical Morse code based on internet. Among them, some researchers have used a part of human body such as Morse code representation using finger gesture recognition, Morse coding of eye blinking for paralysis, Morse coding based on tongue gesture recognition. These studies recognize human body motion using imaging systems.

I. INTRODUCTION

Morse code is a method used in telecommunication to encode text characters as standardized sequences of two different signal durations, called dots and dashes, or dots and dashes.

To create a secure system to authenticate users who aren't completely blind we create a secure password authentication system which uses Morse code and to make sure that the specified parts of the face are recognized accurately by the system.

To provide a platform for the physically challenged and disabled people by whom they will create a secure private account to which only they will access. Our solution would allow persons with motor disabilities to interact with devices and during this authentication is bit more increased by rather than giving some authentication code by keyboard. This project gives catchphrase and fewer using of hardware sensors which is using in nowadays.

II. LITERATURE SURVEY

[1] A new Morse code scheme optimized according to the statistical properties of Turkish: 2021 by Emrah CICEK, Asım Egemen Yilmaz:

Morse code has been in use for more than 180 years, even though its currently known form is slightly different than the form defined by Morse and Vail. The code book constructed by Vail was optimized according to the statistical properties of English. In this study, we propose a new code book optimized for Turkish and demonstrate that it is information-theoretically possible to achieve about a 10% improvement throughout the coding of Turkish texts by means of our proposal. The outcomes of this might serve as a basis for potential (academic and/or applied) Turkish language-specific lossless data compression studies.

[2] A Study of Cyber Security Challenges and Its Emerging Trends on Latest Technologies: 2020 by G.Nikitha Reddy, G.Jugander Reddy:

Cyber Security plays an important role in the field of information technology .Securing the information have become one of the biggest challenges in the present day. Whenever we think about the cyber security the first thing that comes to our mind is 'cyber crimes' which are increasing immensely day by day. Various Governments and companies are taking many measures in order to prevent these cyber crimes. Besides various measures cyber security is still a very big concern to many. This paper mainly focuses on challenges faced by cyber security on the latest technologies .It also focuses on latest about the cyber security techniques, ethics and the trends changing the face of cyber security.

[3] Automatic Morse code Recognition under Low SNR: 2020 by Xianyu Wanga, Qi Zhaob, Cheng Mac, Jianping Xiong:

As an important means of communication, Morse has a wide range of applications in life such as medical treatment, radio broadcasts and so on. However, there has been no systematic method for automatic recognition of Morse codes. This paper designs a Morse code automatic recognition system that combines signal processing and deep learning algorithms. Through experimental analysis of each part of the system, an algorithm suitable for Morse was found and a better result was achieved.

[4] The application of the neural network on Morse code recognition for users with physical impairments: 2020 by C-H Yang, C-H Yang, L-Y Chuang, T-K Truong:

Morse code is a simple, speedy and low cost means of communication composed of a series of dots, dashes and space intervals. Each tone element (either a dot, dash or space interval) is transmitted by sending a signal for a denned length of time. This poses a challenge as the automatic recognition of Morse code is dependent upon maintaining a stable typing rate. In this paper, a suitable adaptive automatic recognition method, combining the least-mean-square (LMS) algorithm with a neural network, was applied to this problem. The method presented in this paper is divided into ve modules: space recognition, tone recognition, learning process, adaptive processing and character recognition. Statistical analyses demonstrated that the proposed method elicited a better recognition rate in comparison with other methods in the literature.

[5] An Approach for Morse Code Translation from Eye Blinks Using Tree Based Machine Learning Algorithms and OpenCV: 2021 by G Sumanth Naga Deepak, B Rohit, Ch Akhil, D Sai Surya Chandra Bharath and Kolla Bhanu Prakash:

For ages, human beings have been communicating with one another through different modes of communication. Communication is a process through which a person can communicate his/her feelings and thoughts to the other person. To communicate we can do it through either speech or sign language. The spoken language is used by able persons, while the differently able persons (deaf and dumb) may find it difficult to understand the same. So, for effective communication between the differently able and able person sign language has been developed. For private communication between two people, Morse code has been developed which is highly efficient to exchange secrets. It also helps in emergencies where a person cannot communicate through hand gestures. Different methods/modes are used in Morse code, but our focus is on eye blinking. Our approach towards this area has been to implement Morse code using eye blinks in real-time assistance using a webcam to provide predicting power based on machine learning's tree algorithms.

[6] Morse Code - A Security Enhancer: 2020 by Manisha Barse, Rodney Manuel:

Morse code was popularly known as the language of dots and dashes. Years later, this language came up with improvised versions like transmitting text information as a series of toggling tones, changing brightness levels, or ticks that can be directly decoded by a skilled listener or a observer without the use of any special type of equipment. It has been the most simplest and inexpensive method of transmitting and receiving messages. Over the years this method was mainly used in radio communication but today this methodology has many applications in aviation, navy and assistive methodology like helping people with disabilities to communicate. This paper demonstrates a basic model of transmitting Morse code through the keyboard via DB9 connector, encoding the alphabets with the help of PIC microcontroller and displaying the transmitted as well the decoded alphabets on the LCD.

[7] Effectiveness of Morse code as an Alternative Control Method for Powered Wheelchair Navigation: 2019 by Hyun Ka, Rich Simpson:

We applied Morse code as an alternative input method for powered wheelchair navigation to improve driving efficiency for individuals with physical disabilities. In lab trials performed by four testers, it demonstrated significant improvement in driving efficiency by reducing the driving time, compared to traditional single switch wheelchair navigation.

[8] Human Computer Interaction through Morse Code: 2020 by S. N. Deshpande, V. A. Deshmukh, G. D. Arjun, H. R. Goskonda, A. R. Butala, D. S. Datar:

The growth of technology in the medical field diminishes the difficulties of patients to an immense extent. The disease is named Motor Neuron Disease (MND). One of the major categories of physical disability leading to paralysis. MND patients are unable to do work like talk, walk, express feelings and communicate due to the weakening of muscles. The patient has control only upon his eye blinks, speech disorders are the most critical condition for human beings which causes brain damage, stroke to paralysis and several other diseases. It can also be caused from motor damage during accidents and leave a person completely unable to communicate. The patient has only a way to interact with others by eye movement only. By using this terminology, making a model where input will be the eyes blinking of paralyzed patients. To overcome the problem of communication (speaking or interaction) of paralyzed patients, the system will be built to implement such a communication model so that the patient will be able to communicate with the help of eyes blinking through Morse code. So we are going to develop a computer vision application that is capable of detecting and counting the duration of eye blink in video streams on the basis of time span of eye blink, then the module will decide whether the blink is dash or dot. These dashes and dots sequence will be stored in an array then it will be decoded into normal text. Then further this text will be converted into audio by the pyttsx python library. In this way the message will be conveyed to another person by our system.

III. PROPOSED METHODOLOGY

The model consists of a interface and rear database.GUI is made such the user can interact with the system. Pygame or OpenCV is employed in to make it. In the frontend firstly the user got to register by providing a user id of choice, a password (PIN) and a keyword. After registration the user can log in by using the credentials i.e. user id and password. With the assistance of an internet camera the PIN is taken as input within the sort of Morse. In the backend, the entered PIN is checked with the stored PIN which was entered into the database by the user while registering. If the entered PIN isn't correct, its exits the screen. If the entered PIN is correct, it displays successful authentication. If the user has forgotten his password then he can use the keyword to authenticate and update the prevailing password with a replacement one.

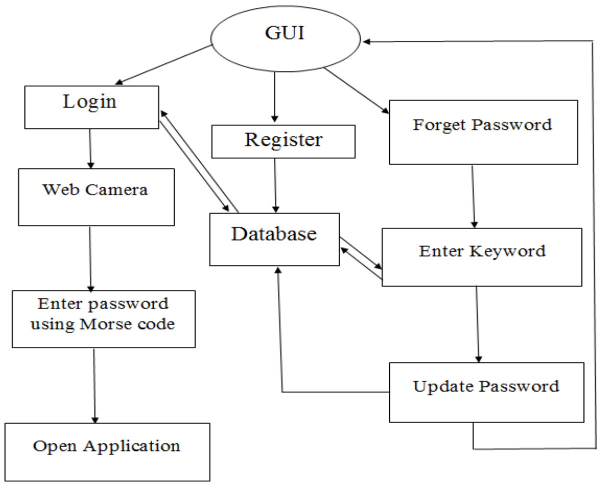


Figure1. Architectural design of implementation

1] Face Detection Module:

In this Module, camera module will start to capture the images. For the face detection OpenCV module is used. The system will focus on the region of interest initially and it will draw a rectangle around the face focused.

2] Eye Tracker Module:

In this module, using the Haar Cascade features we will be concentrating on the eyes. Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or video. Then it will successfully detect the eye ball and after corner detection method is applied for eye region of interest, and find out the corners. .

3] HAAR CASCADE

Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or video. **It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images.** It is then used to detect objects in other images. First step is to collect the Haar Features. A Haar feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums.

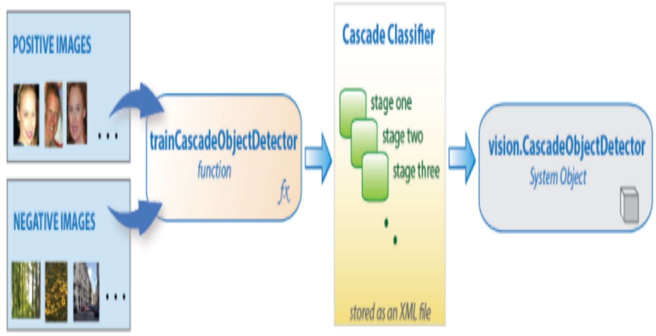


Figure2. HAAR Cascade Algorithm Working

4] Face Landmark Detection Module

Face landmark detection is a computer vision task where we want to detect and track key points from a human face. This task applies to many problems. For example, we can use the key points for detecting a human's head poses position and rotation. With that, we can track whether a driver is paying attention or not. Also, we can use the key points for applying an augmented reality easier. And there are so many solutions that we can generate based on this task. Face landmark detection is that the method of finding points of interest during a picture of an individual's face. Many algorithms were developed and implemented in OpenCV. To run the facemark detector, a pre-trained model is required. This pre-trained model which we've used is shape predictor 68 face landmarks.

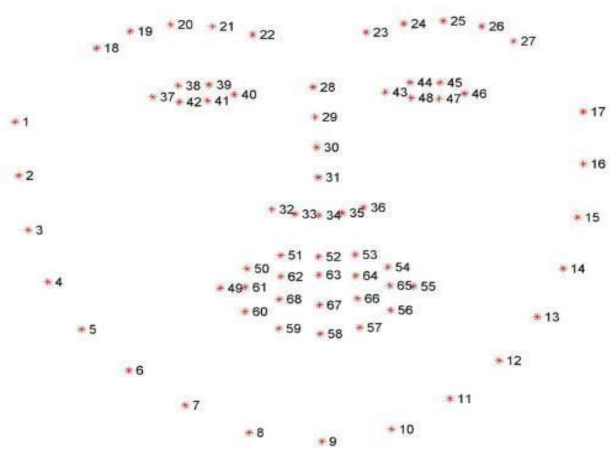
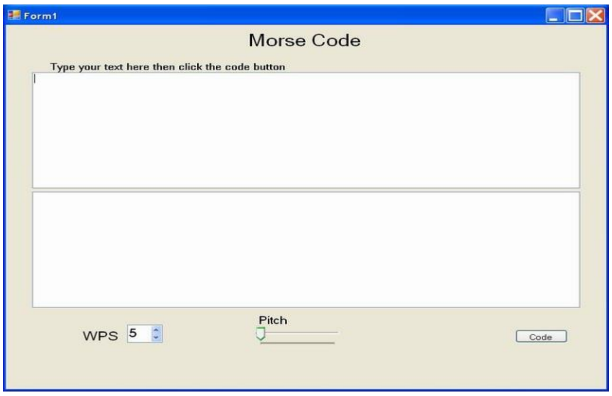


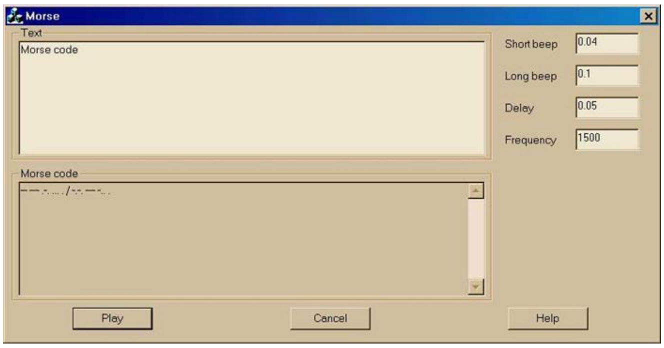
Figure3: Landmark Detection

IV. RESULT



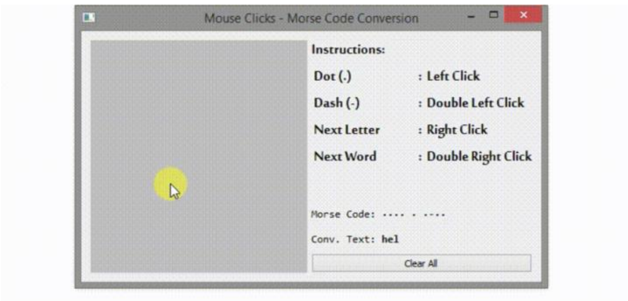
Login Page

The login page of the website is shown in above figure. The student can do the actions where the system detects by webcam and do the respected actions done by the user and gives the message.



Morse Code Converter

In this Phase the system encodes the text characters as standardized sequences of two different signal durations, called dots and dashes, or dits and dahs done by the user.



Morse Code Mouse Clicks Conversion

Here in this phase the feature would allow users to enter text and commands using Morse code, either by clicking the mouse or using another input device like a simple switch. Since sometimes our webcam cannot work properly and with the help of the mouse clicks we can decode the message.

V. CONCLUSION

In conclusion, an individual whose passion was nothing more than art was able to invent a telegraph system, which led to many discoveries in the science field, which is still advancing. To many it seems impossible to have a non-science major people be successful in anything science related. However, many people like Morse have come out of college taking only few classes in science and yet have been able to achieve things that many non-sciences major have not even been able to perceive. Morse code might had a small impact in the history because it only helped during the civil war and that too for northern who wanted to stop spreading the slavery. However, due to the invention of telegraph and Morse code, we are able to communication across the world and even type this paper easily. If not for the thoughts and rigorous work behind this invention, we might not be able to enjoy the great new technologies.

VI. REFERENCES

[1] Emrah CICEK, Asım Egemen YILMAZ- “A new Morse code scheme optimized according to the statistical properties of Turkish”, Turkish Journal of Electrical Engineering & Computer Sciences, 2021, pp. 804 – 811.

[2] G.Nikitha Reddy, G.Jugander Reddy - “A Study of Cyber Security Challenges and its Emerging Trends on Latest Technologies”, IEEE JOURNAL, 2020, pp. 1280-1291

[3] Xianyu Wanga, Qi Zhaob, Cheng Mac, Jianping Xiong – “Automatic Morse Code Recognition Under Low SNR”, 2nd International Journal on Mechanical, Electronic, Control and Automation Engineering 2020, volume 149, pp. 219-224

[4] C-H Yang, C-H Yang, L-Y Chuang, T-K Truong – “The application of the neural network on Morse code recognition for users with physical impairments”, IEEE Access, 2020, pp. 325-331

[5] G Sumanth Naga Deepak, B Rohit, Ch Akhil, D Sai Surya Chandra Bharath and Kolla Bhanu Prakash – “An Approach for Morse Code Translation from Eye Blinks Using Tree Based Machine Learning Algorithms and OpenCV”, Journal of Physics: Journal Series, 2021, pp. 1-10

S[6] Manisha Barse, Rodney Manuel - “Morse Code - A Security Enhancer”, International Journal of Science and Research, Volume 5 Issue 8, 2020, pp. 1190-1192

[7] Hyun Ka, Rich Simpson - “Effectiveness of Morse Code as an Alternative Control Method for Powered Wheelchair Navigation”, IEEE JOURNAL, 2019, pp. 751-765

[8] S. N. Deshpande, V. A. Deshmukh, G. D. Arjun, H. R. Goskonda, A. R. Butala, D. S. Datar - “Human Computer Interaction through Morse Code”, International Journal of Research in Engineering and Science, Volume 9 Issue 7, 2021, pp. 54-61

SMART TRAFFIC SIGN DETECTION

Bhavana B [1], Divya S Madival [2], Girish L [3], K B Geeta [4], Gayathri R [5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Gayathri R** , Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
bhavanab2916@gmail.com, divyamadival252000@gmail.com, lokehgirig@gmail.com, geetakogale@gmail.com, gayathrir@sapthagiri.edu.in

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 ona 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 extractedtraffic 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 commandto 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.

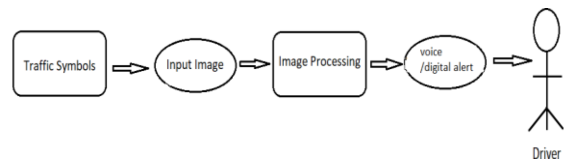


Fig 1: System Architecture

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.

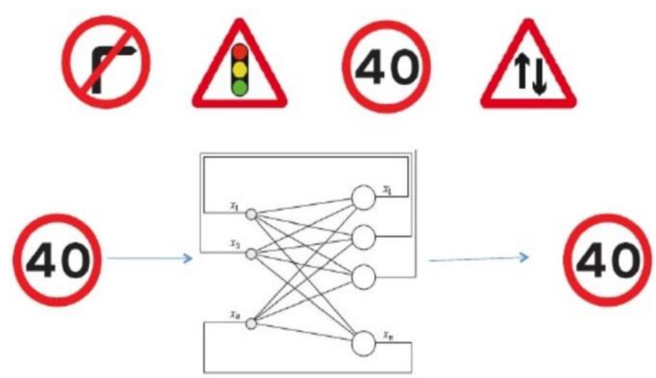


Fig 2: Convolutional neural network

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.

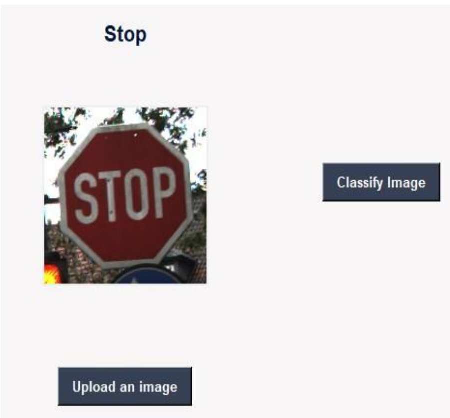


Fig 3: Outcome of system

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.

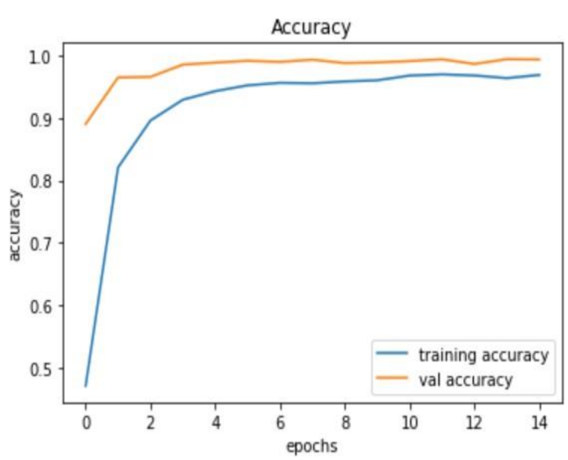


Fig 4: Accuracy Graph

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.

REFERENCES

[1] Yan Lai, Nanxin Wang, Yusi Yang and Lan Lin, " Traffic Signs Recognition and Classification based on Deep FeatureLearning" , Tongji University, vol. January 2018.

[2] Yuga Hatolkar , Poorva Agarwal and Seema Patil, " A Survey on Road Traffic Sign Recognition System using Convolution Neural Network " , Inpressco, vol. 12 Feb 2018.

[3] Domen Tabernik and Danijel Skocaj, " Deep Learning for Large-Scale Traffic-Sign Detection and Recognition" , Publication Standards, vol. 31 March , 2019

[4] Xie Bangquan , (Member, IEEE), and Weng Xiao Xiong, " Real-Time Embedded Traffic Sign Recognition Using Efficient Convolutional Neural Network", Publication Standards, vol. in 19 April 2010

[5]SafatB. Wali 1, Majid A. Abdullah 2, MahammadAHannan 2, Aini Hussain 1,SalinaA. Samad 1, Pin J. Ker 2 and Muhamad Bin Mansor , "Vision-Based Traffic Sign Detection and RecognitionSystems: Cu rrent Trends and Challenges", Journal of Sensors, vol. 6 May 2019

[6] Ali Behloul and Yassmina Saadna," A fast and robust traffic sign and recognition" , International Journal of Innovation and Applied Studies, vol. 2019.

Retinal disease classification using Deep Learning techniques

Ankush L.[1], Ashray B.G.[2], Hemanth V Mane[3], Likhith N.[4] and Ramya R[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, VTU, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Ramya R**, Department of ISE, Sapthagiri College Of Engineering, VTU Bengaluru, Karnataka-560057, India
ankushlsloka@gmail.com, ashraya.gangadhar@gmail.com, hemanth.vasanthmane@gmail.com, likhith.gowda122200@gmail.com, ramyar@sapthagiri.edu.in

Abstract - The retina is a layer of tissue in the back of eye that senses light and sends images to the brain. It is a vital part of the eye. Retinal diseases can lead to irreversible visual impairment without timely diagnoses and appropriate treatments. An efficient automatic decision support system for detection of retinal disorders is important and is the need of the hour. Early detection and diagnosis of ocular pathologies enable efficient management of potentially blinding eye diseases. The medical image analysis performance has steadily improved through deep learning models that automatically learn relevant features for specific tasks instead of handcrafted algorithms. This study proposes a deep learning-based automated screening system capable of detecting and diagnosing diabetic retinopathy (DR), glaucoma, age-related macular degeneration (AMD), and few other pathologies.

I. INTRODUCTION

The retina is the light-sensing tissue that resides in the back of the eye. Retinal fundus diseases can lead to irreversible visual impairment without timely diagnoses and appropriate treatments. Common retinal conditions include bulging, diabetic eye disease, Age related conditions. Most common cause of vision impairment in most populations. Without accurate diagnoses and timely appropriate treatment, these fundus diseases can lead to irreversible blurred vision, metamorphopsia, visual field defect, or even blindness.

However, in rural and remote areas, especially in developing countries, where there is insufficiency in ophthalmic service and a shortage of ophthalmologists, early detection and timely referral for treatment may not be available.AI is an established but still rapidly advancing technology, especially in computeraided diagnosis of human diseases, which helps in developing models to predict the diseases.

The symptomatic variations among retinal disorders are relatively confusing so that a systematic diagnostic strategy is difficult to set in. Therefore, an early detection device is required that is capable of differentiating the various complications and thereby helps in providing the right treatment. The world faces difficulties in terms of eye care, including treatment, quality of prevention, vision rehabilitation services, and scarcity of trained eye care experts. Early detection and diagnosis of ocular pathologies would enable forestall of visual impairment.

II. LITERATURE SURVEY

[1] Neetu Sharma, et al. have proposed that image Processing is having is significance for disease detection on medical images. These disease recognition and classification approaches are specific to human organ and image type. One of such disease class includes detection of retinal disease such as glaucoma detection or diabetic detection. The paper has defined a study on disease recognition approaches such as SVM, DCT, HMM and PCA approaches. Paper also defined the image processing operations applied to filter the medical image and to perform disease area segmentation.

[2] Joon Yul Choi,et al. ,have proposed Retinal disease detection by using computer aided diagnosis from fundus image has emerged as a new method. This applies deep learning convolutional neural network by using MatConvNet for an automated detection of multiple retinal diseases with fundus photographs involved in Structured Analysis of the Retina (STARE) database. Dataset was built by expanding data on 10 categories, including normal retina and nine retinal diseases. The optimal outcomes were acquired by using a random forest transfer learning based on VGG19 architecture.

The classification results depended greatly on the number of categories. As the number of categories increased, the performance of deep learning models was quite diminished. The drawbacks is that, when all 10 categories were included, we obtained results with an accuracy of 30.5%, relative classifier information (RCI) of 0.052, and Cohen's kappa of 0.224.

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[3] Pushpit Das, et al. have proposed that optical Coherence Tomography (OCT) is a non invasive eye-imaging modality for detecting macular edema both in its early and advanced stages. The main aim of this work is to present the automatic detection of edema of the retinal layers particularly around the macula in diabetic patients. After detection and extracting certain features in the OCT retinal images a classification of the type of Diabetic Macular Edema is done. Retinal Disease Classification using Deep Learning Frameworks. In this method during pre-processing stage, we remove the speckle noise followed by flattening and cropping of the image is done. Then this is followed by Speeded up robust feature extraction. The extracted features are then classified using Support Vector Machine binary classifier as normal or abnormal and thus having Diabetic Macular Edema .This technique has been applied for 25 normal and 45 abnormal OCT images. The results show that this method accurately detected edema diseases in between the layers in the retinal. Then we could classify them using Support Vector Machine as normal or abnormal. Experimental results shows that an average retinal disease detection accuracy of 80% for Support Vector Machine (SVM) classifier.

[4] S. Karthikeyan, et al. propose that the health-related complications such as diabetes, macular degeneration, inflammatory conditions, ageing and fungal infections may cause damages to the retina and the macula of the eye, leading to permanent vision loss. The major diseases associated with retina are Arteriosclerotic retinopathy (AR), Central retinal vein occlusion (CRVO), Branch retinal artery occlusion (BRAO), Coat's disease (CD) and Hemi-Central Retinal Vein Occlusion (HRVO). In this research work, 'Deep Convolution Neural Networks (Deep CNN) based machine learning approach has been used for the detection of the twelve major retinal complications from the minimal set of fundus images. The "multi-classretinal disease" model on further cross-validation with real-time fundus image of the gave an accuracy of 95.63 %, validation accuracy of 92.99 % and F1 score of 91.96 %.

[5] Ling-Ping Cen, et al. proposes a deep learning platform (DLP) capable of detecting multiple common referable fundus diseases and conditions (39 classes) by using 249,620 fundus images marked with 275,543 labels from heterogenous sources. Our DLP achieved a frequency-weighted average F1 score of 0.923, sensitivity of 0.978, specificity of 0.996 and area under the receiver operating characteristic curve (AUC) of 0.9984 for multi-label classification in the primary test dataset and reached the average level of retina specialists.

[6] B.Sakthi Karthi Durai, et al. have done a detailed survey on retinal diseases identification using image processing. The retinal diseases are glaucoma, cataract, hypersensitive retinopathy, diabetic retinopathy, age related macular degeneration. The image processing provides greater innovation in medical applications. Image processing gives clear view to determine the infected area. Different algorithms and different procedure were followed here. The survey of detection in retinal diseases includes algorithms are elaborated and compared which are useful for researchers in image processing

[7] G.Saranya, et al. ,propose that a retinal illness frequently alludes to retinal vascular sickness which is as of now developing massively in the field of ophthalmology which is to be analyzed right on time to keep from visual deficiency. To analyze the retinal malady, the system proposes a multiclass and multi-label arrangement method. The framework is prepared on 5,000 examples which are gathered from the STARE database with four distinct classes, for example, Arteriosclerotic Retinopathy, Background Diabetic Retinopathy, Choroidal Neovascularization, and Hypertensive Retinopathy. The CNN contains three main layers, for example, the Convolution layer, the pooling layer, and completely associated layer. The proposed framework delineates the similar investigation of various calculations, for example, support vector machine (SVM), Extra Trees (ET), Random Forest (RF), K-Nearest Neighbor (KNN), Multi-Layer Perceptron (ML), Gaussian Naive Bayes (GNB), Linear Discriminant Analysis (LDA), Quadratic Discriminant Analysis (QDA). Because of every classifier, the most extreme precision achieved inside the scope of (79 – 84 %).

[8] Samiksha Pachade, et al, propose that to enable development of methods for automatic ocular disease classification of frequent diseases along with the rare pathologies, this paper describes a new Retinal Fundus Multi-disease Image Dataset (RFMiD). It consists of 3200 fundus images captured using three different fundus cameras with 46 conditions annotated through adjudicated consensus of two senior retinal experts. To the best of our knowledge, our dataset, RFMiD, is the only publicly available dataset that constitutes such a wide variety of diseases that appear in routine clinical settings. This dataset will enable the development of generalizable models for retinal screening.

[9] Nithya Rajagopalan, et al. ,propose about optical Coherence Tomography (OCT) is the current imaging modality for the early detection of retinal disorders non-invasively. In this work, a Convolution Neural Network (CNN) model is proposed to classify three types of retinal disorders namely: Choroidal neovascularization (CNV), Drusen macular degeneration (DMD) and Diabetic macular Edema (DME). The hyperparameters of the model like batch size, number of epochs, dropout rate, and the type of optimizer are tuned using random search optimization method for better performance to classify different retinal disorders. The proposed architecture provides an accuracy of 97.01%.

III. PROPOSED METHODOLOGY

A multi disease classification system is proposed involving various steps and usage of deep learning frameworks working together to provide classification of the retinal condition.

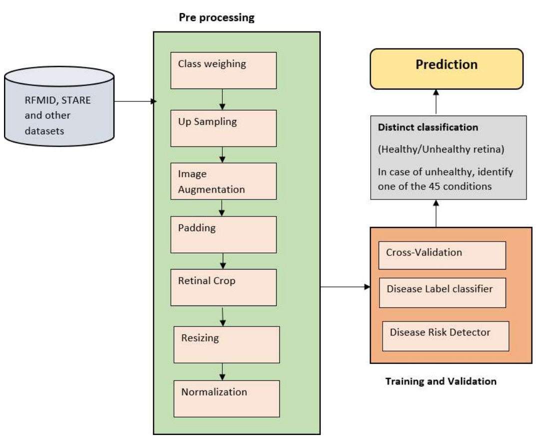

Figure 1: Architecture of the classification model using Deep Learning frameworks

The proposed system constitutes of different modules, namely, Collection of data, pre- processing, training and validation which are described below.

As depicted in the figure1, the model consists of

1. Data Collection:

The data is collected from various sources which consists of retinal images having unhealthy conditions. Primary Databases included is RFMID and STARE Databases.

2. Data Pre-processing:

The data pre-processing involves different stages as described below:

- **Image Augmentation**: A technique of altering the existing data to create some more data for model training process.
- **Upsampling**: Upsampling is the process of inserting zero-valued samples between the original samples of a signal to increase the sampling rate.
- **Retinal Crop**: Cropping parts of image to extract ROI (Region of Interest)
- **Resizing**: The images which were cropped are now resized.

3. Detection and Classification:

- Detection of retinal diseases is done.
- The classification task will be done based on AUCMEDI Pipeline.
- DenseNet, ResNet, Inception V3,VGG-Net and other deep learning frameworks will be built upon training data.
- The model that gives best accuracy will be used in the architecture.

4. Model Validation:

Different validation technique like k-cross validation and others will be used to test the correctness of the model.

5. Model Prediction:

- The built model will predict the retinal condition for given unput image.
- The prediction can be as healthy or unhealthy retinas.
- In case its not a healthy retina, The retinal condition will be detected and predicted.

IV. RESULT

The model performance is analysed using accuracy. Expected accuracy is around 85% to 87%. The predictions od disease Risk Identifier us shown below. First column represents image ID and the second column is risk probability.

116	0.41934
1160	0.987777
1161	0.837527
1162	0.900022
1163	0.928412
1164	0.380723
1165	0.99309
1166	0.982048
1167	0.97586
1168	0.81696
1169	0.933583
117	0.625416
1170	0.912757
1171	0.995115
1172	0.929602
1173	0.701308
1174	0.671038
1175	0.92825
1176	0.789992

Figure 2: Disease Risk Identifier

After pre-processing of the data and image augmentation, new images are added to the existing data.

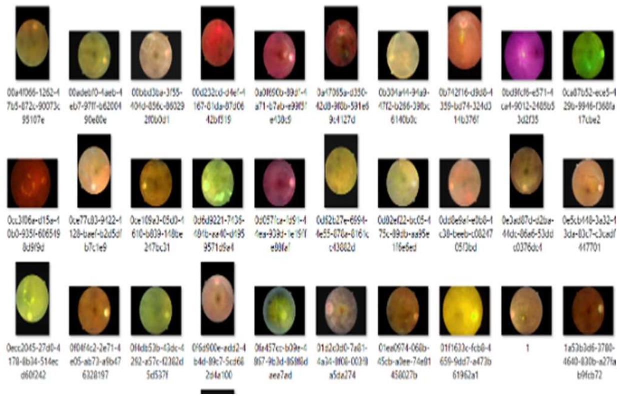

Figure 3: Augmented Images

A class frequency analysis is done and the below graph represens the distribution of diseases in the dataset.

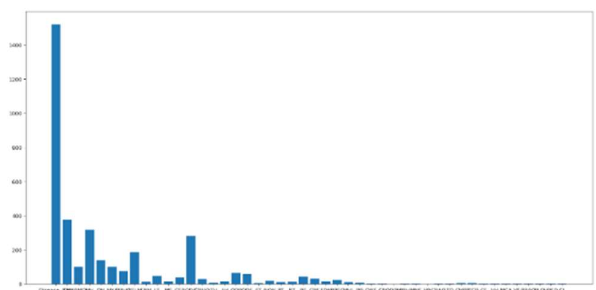

Figure 4: Frequency Analysis Graph

V. CONCLUSION

We conclude that the pre-processing steps and up-sampling of the dataset has been performed. The application of suitable algorithm will be performed in the coming stages. • After detailed analysis of the reference papers, we realized the need for a model which can detect rare retinal pathologies and hence have proposed a system to achieve the same. • Thus, we also conclude that the final model will be useful in hospitals and medical facilities as it assists ophthalmologists in disease identification.

VI. REFERENCES

[1] Neetu Sharma , Parul ," A Study on Retinal Disease Classification and Filteration Approaches", IJCSMC(International Journal of Computer Science and Mobile computing), vol. 4, Issue. 5, pages.158 – 165, May 2016.

[2] Joon Yul Choi, Tae Keun Yoo," Multi-categorical deep learning neural network to classify retinal images: A pilot study employing small database", Journal PlosOne, vol.3, Issue.5, pages.98-137,June 2017

[3] Puspita Das, Dr.AN.Sigappi," Detection and Classification of Retinal Diseases in Spectral Domain Optical Coherence Tomography Images based on SURF descriptors", 2018 IEEE International Conference on System, Computation, Automation and Networking (ICSCA), 2018, pages. 1-6,2018

[4] S. Karthikeyan1 , P. Sanjay Kumar1 , R.J. Madhusudan," Detection of Multi-Class Retinal Diseases Using Artificial Intelligence: An Expeditious Learning Using Deep CNN with Minimal Data", Biomedical & Pharmacology Journal ,vol. 12(3), pages. 1577-1586, 2019.

[5] Ling-Ping Cen ,Jei Ji, "Automatic detection of 39 fundus diseases and conditions in retinal photographs using deep neural networks",Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2021.

[6] B.Sakthi Karthi Durai, J.Benadictraja, C.Sathya, "A Research on Retinal Diseases Prediction in Image Processing ", IJITEE(International Journal of Innovative Technology and and exploring Engineering) ,vol.9 Issue-3S, pages. 33-46, January 2020.

[7] G.Saranya , G. Geetha , M.Safa , K.Meenakshi "Multi-Label and Multi-Class Retinal Classification and Comparative Model of Retinal Diseases ", International Journal of Advanced Science and Technology, vol. 29, No. 6, pages. 2319 – 2329, July 2020.

[8] Samiksha Pachade," Retinal Fundus Multi-Disease Image Dataset (RFMiD): A Dataset for Multi-Disease Detection Research", Data 2021.

[9] Nithya Rajagopalan, Venkateswaran N "Diagnosis of retinal disorders from Optical Coherence Tomography images using CNN", in Proceedings of IEEE International Electronics Symposium (IES) conference 2021

Image Captioning for Blind people using ML and DL

Kavya Bhat[1], **Kousalya B T** [2], **Meghana N** [3], **Meghashree D P** [4], **Sowmya Somanath**[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Sowmya Somanath**, Dept. of Information Science and Engineering, Bengaluru, Karnataka-560057, India
kavyabhat311@gmail.com, kousalya13112000@gmail.com, meghana.n1609@gmail.com, dpmeghashree@gmail.com, sowmyasomanath@sapthagiri.edu.in

***Abstract* - A voice based image caption generation is a process that involves the Natural Language Processing (NLP) concept for understanding the description of an image. We have implemented CNN to extract features of image and LSTM for classification which is considered as the best solution for the project; the main target of the proposed work is to obtain the perfect caption for the given dataset image. After obtaining the description for an image, it will be converted into text and the text into a voice. Implementing methodologies with Deep Learning provide great potential for applications that automatically venture to generate captions or descriptions about images. The application of the project includes automatic caption generation for images, useful for people who suffer from varied degrees of visual impairment; the automated creation of data for pictures to be employed by search engines, all-purpose automaton vision systems, and plenty of others. These application domains will effectively and considerably impact several different task-specific applications. Image description is a useful and effective solution used for a visually impaired people who are unable to comprehend visuals. With the utilization of a voice based mostly image caption generator, the descriptions is obtained as a voice output, if their vision can't be resorted. In future, image process will emerge as a big analysis topic, which can be primarily utilised to save lots of human lives. Automatic caption generation in language to explain the visual content of a picture has attracted an increasing quantity of attention within the last decade because of its potential applications. This paper presents a difficult task which comes up with captions with correct linguistics properties because, it needs a sophisticated level of image understanding that goes way on the far side image classification.**

I. INTRODUCTION

A popular goal of the computer vision is to create algorithms that can replicate a human's ability to caption any given image. While much of the progress has been fuelled by the recent creation of large-scale, publicly-available datasets which are needed to train them and evaluate algorithms provided to them, a limitation is that most existing datasets were created in design settings. Typically, many people were employed to work hard and produce captions for images obtained from online sources, public image datasets and randomly available images.

Deep learning is a type of machine learning and artificial intelligence (AI) that imitates the way humans gain certain types of knowledge. Deep learning is an important element of data science, which includes statistics and predictive modelling. It is extremely beneficial to data scientists who are tasked with collecting, analysing and interpreting large amounts of data; deep learning makes this process faster and easier. At its simplest, deep learning can be thought of as a way to automate predictive analytics. While traditional machine learning algorithms are linear, deep learning algorithms are stacked in a hierarchy of increasing complexity and abstraction. Using CNN and LSTM together can be best fit for this project because LSTM is similar to RNN, and the RNN algorithm is depending on the LSTM because its having the feedback connectivity and also LSTM process the entire sequence of data required for processing and captioning the image datasets.

The main challenge of deep learning is when we deal with large data we need to go deeper that is analysing the huge data need to done thoroughly, The structure of text descriptions should be relevant to the objects present in the image, and the relationship between the objects and it's descriptions need to be clarified, Our ultimate aim of the project is to train the dataset with the good result and with the high accuracy. Flicker dataset is utilized with the huge collection of photographs used for computer vision and image processing algorithms.

So this voice based caption generator act as a eyes for the people don't have the ability to conceptualize the scene happen around themselves, they can roam anywhere without the support of anyone else. Machine Learning (ML) based IDS systems based algorithms such as K-means, Hidden Markov Model and Self Organizing Maps (SOM); Neural networks, decision trees, Naive Bayes and Support Vector Machine. Because deep learning models process information in ways similar to the human brain, they can be applied to many tasks people do. Deep learning is currently used in most common image recognition tools, natural language processing (NLP) and speech recognition software. These tools are starting to appear in applications as diverse as self-driving cars and language translation services.

II. LITERATURE SURVEY

[1] Soheyla Amirian, Khaled Rasheed, Thiab R. Taha and Hamid R Arabina. "Automatic Image and Video Caption Generation with Deep Learning : A Concise Review and

Algorithmic Overlap", December 16, 2020, IEEE ACCESS, pp. 218386-218400.

In this paper, contents are not meant to be comprehensive review of image captioning; rather, it is a concise review of both image captioning and video captioning methodologies based on deep This study treats both image and video captioning by emphasizing the algorithmic overlap between the two. Methodologies that utilize Deep Learning offer great potential for applications that automatically attempt to generate captions or descriptions about images and video frames. Image and video captioning are considered to be intellectually challenging problems in imaging science. In recent years, deep learning-based convolutional neural networks have positively and significantly impacted the field of image captioning allowing a lot more flexibility. In this article, we attempt to highlight recent advances in the field of image and video captioning in the context of deep learning.

[2] Yiqing Huang, Jiansheng Chen, Wanli Ouyang, Weitao Wan, Youze Xue; "Image Captioning With End- to-End Attribute Detection and Subsequent Attributes Prediction",© 2020 IEEE, pp. 4013-4026 .

Semantic attention has been shown to be effective in improving the performance of image captioning. This paper introduces two end-to-end trainable modules to closely couple attribute detection with image captioning as well as prompt the effective uses of attributes by predicting appropriate attributes at each time step. The multimodal attribute detector (MAD) module improves the attribute detection accuracy by using not only the image features but also the word embedding of attributes already existing in most captioning models.

MAD models the similarity between the semantics of attributes and the image object features to facilitate accurate detection. The subsequent attribute predictor (SAP) module dynamically predicts a concise attribute subset at each time step to mitigate the diversity of image attributes. Compared to previous attribute based methods, our approach enhances the explainability in how the attributes affect the generated words and achieves a state-of-the-art single model performance of 128.8 CIDEr-D on the MSCOCO dataset.

[3] Yi Bin, Yang Yang; Fumin Shen; Ning Xie, Heng Tao Shen and Xuelong Li; Describing Video With Attention-Based Bidirectional LSTM, 2018 IEEE, pp. 1-11.

To generate video captions, exploiting another long-short term memory as a decoder to fully explore global contextual information. The benefits of the paper's proposed method are twofold: The BiLSTM structure comprehensively preserves global temporal and visual information and the soft attention mechanism enables a language decoder to recognize and focus on principle targets from the complex content. It is important to verify the effectiveness of the proposed video captioning framework on two widely used benchmarks. The benefits of proposed method are twofold: 1) the BiLSTM structure comprehensively preserves global temporal and visual information and 2) the soft attention mechanism enables a language decoder to recognize and focus on principle targets from the complex content. This paper verifies the effectiveness of proposed video captioning framework on two widely used benchmarks, that is, microsoft video description corpus and MSR-video to text, and the experimental results demonstrate the superiority of the proposed approach compared to several state-of-the-art methods.

[4] Mohana priya R ; Dr. Maria Anu ; Divya S ; Building A Voice Based Image Caption Generator with Deep Learning, © 2021 IEEE, pp. 943-948.

A voice based image caption generation is a task that involves the NLP (natural language processing) concept for understanding the description of an image. The combination of CNN and LSTM is considered as the best solution for this project; the main target of the proposed research work is to obtain the perfect caption for an image. After obtaining the description, it will be converted into text and the text into a voice. The main contribution in this work is developing a product that integrates both the IC model and the VQA model unlike any other product in the current market. Speech to Text and Text to Speech modules have also been constructed to enable real-time demonstration. There has several retrieval-based approaches for caption generation. The traditional approaches have several drawbacks as they were not generic enough, and extremely hand designed with respect to text generation. As Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) are extensively being utilized in Computer Vision (CV) problems, the same are successfully used in IC tasks.

[5] Tai -Yin Chiu, Yinan Zhao, Danna Gurari. "Assessing Image Quality Issues for Real -World Problems", 2020 IEEE/CVF Conference, pp. 3643-3653

This paper introduces a new large-scale dataset that links the assessment of image quality issues to two practical vision tasks: image captioning and visual question answering. Important aspect is to identify for 39,181 images taken by people who are blind whether each is sufficient quality to recognize the content as well as what quality flaws are observed from six options. This paper introduces a new image quality assessment (IQA) dataset that emerges from a real use case. The labels serve as a critical foundation for authors to make the following contributions: (1)a new problem and algorithms for deciding whether an image is insufficient quality to recognize the content and so not captionable, (2) a new problem and algorithms for deciding which of six quality flaws an image contains, (3) a new problem and algorithms for deciding whether a visual question is unanswerable due to unrecognizable content versus the content of interest being missing from the field of view, and (4) a novel application of more efficiently creating a large-scale image captioning dataset by automatically deciding whether an image is insufficient quality and so should not be captioned.

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 2 modules. The 2 modules being,

1] Image Based Module
2] Language Based Module

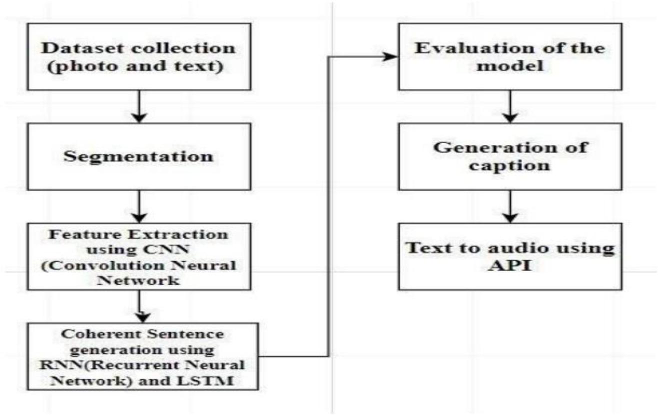

Figure 1. Architectural design of implementation

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 Based Module

A system that automatically generates image captions can be utilized in many applications. This module is responsible to improve images for human interpretation. Examples include: enhancing the accuracy of search engines; recognition and vision applications; enriching and creating new image datasets; enhancing the functionality of systems similar to Google Photos; and enhancing the optical system analysis of self-driving vehicles. In image captioning, the main challenges include the process of extracting visual information from the picture and the process of transforming this visual information into a proper and meaningful language. Captioning research started with the classical retrieval and template-based approaches in which Subject, Verb, and Object are detected separately and then joined using a sentence template. However, the advent of Deep Learning and the tremendous advancements in Natural Language Processing have equally and positively affected the field of captioning. Hence, the latest approaches follow deep learning-based architectures that encode the visual features with Convolutional Neural Networks and decode with a language-based model, which translates the features and objects given with an image-based model to a meaningful sentence. Deep learning-based Convolutional Neural Networks plays a key role in many applications, one of which is image recognition. Image recognition is used to perform a large number of visual tasks, such as understanding the content of images. Several well-known models in the field of CNNs based on object detection and segmentation exist that are heavily used in image captioning and video captioning architecture to extract the visual information.

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.

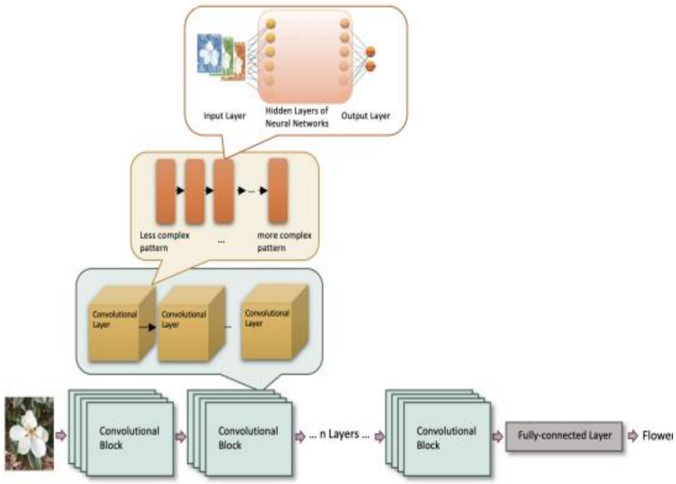

Figure 2. Overall architecture of Convolutional Neural Network that shows each Convolutional Block consists of n Convolutional layers and each of these Convolutional layers is built up of convolutions with filters.

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 input 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.

2] Language Based Module

Language models analyze bodies of text data to provide a basis for their word predictions. They are used in natural language processing (NLP) applications, particularly ones that generate text as an output. Image captioning integrates visual content understanding and natural language processing (NLP) techniques to generate descriptions for given image datasets. Promising research endeavours have been dedicated to proposing effective captioning approaches based on retrieval, grammar rules, and sequence generation. Existing image captioning approaches can be roughly divided into two categories. One category is, in the past couple of years, parsing an image to several semantic parts (i.e., subject, verb, and object) and generating sentences by predefining a sentence template with some grammar rules. Subsequently, how to align visual content with each semantic phrase and generate a comprehensive sentence became a principal problem.

Fig 3: Generated caption without forming a sentence is “Sunset”

To address this problems, 3-D CNNs and LSTM, a variant of RNN, have been proposed to encode video frames to obtain video level representation. Inspired by the superior performance of sequence to sequence learning in machine translation we constructed an end-to end system with two LSTMs, named S2VT, to model images and paired descriptions, respectively. Different from the concatenated encoder and decoder, S2VT stacked two LSTM layers, where the first layer takes images as input sequentially and another translates visual information to the sentence word-by-word after the whole image is read in.

Encoders we have used: 1) VGG: The model is used in Feature extraction for images. It has two versions viz. the VGG16 and VGG19, each of these models have 16 and 19 layers. 2) Inception: The framework of Inception is planned in such a manner that it functions well, even when under strict machine and storage time restraints. It uses a significantly lower set of variables and gives our text recognition tasks a recommended efficiency as seen in the outcomes. Decoders we have used are: 1) LSTM: From the point of generating cinematic intervals, the Long Short Term Memory model is developed, consisting of an internal mechanism called gates that regulates the information flow. The gates decide what data to hold and to discard, which provides the benefit of passing the necessary data to predict the sequence chain. This processes information that passes on data as it transmits forward. It comprised of three windows, namely the gateway of input, gate of output and gateway of forget. 2) GRU: The GRU is the latest Recurrent Neural Networks technology and is very close to the LSTM. The Gated Recurrent Device has got rid of both the cell state and is transmitting information using the secret state. There are also actually two ports, an include some and an upgrade entrance. These gates control the flow of information within the model. These gates determine what data to maintain which information to discard.

In recent years, the soft attention mechanism has achieved great success and received more research attention in the computer vision community. We implemented a basic version of the soft attention model to describe image content with comprehensive sentences, which crops an image into several patches and produces words with corresponding patches. We constructed a bidirectional RNN for speech recognition, which merges two separate expert networks with linear and logarithmic fusion, respectively, and comprehensively utilizes all of the input information. Later on, we designed a variety of bidirectional RNNs, including bidirectional LSTM, a type of improved RNN with long dependency, for sequential processing, especially in the field of NLP. We also applied bidirectional RNN for image captioning. In particular, the authors employed a bidirectional RNN for word embedding and then learned the relationship between representations of images and natural-language sentences.

IV. RESULT

Fig 4: Generated Caption (after using encoders and decoders): “a sunset over a beach”

Figure 5. Generated caption: “A group of young men playing a game of football” (An example output of grammatically correct output.)

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The model has been trained for 50 epochs. As number of epochs used are more, it helps to lower the loss to 3.74. If we consider the large dataset then we should use more epochs for accurate results. Since image recognition and natural language processing have made significant progress due to deep learning technology, we believe that a conversational navigation system that integrates technologies we've used will be of great help to visually impaired.

This work presents a model, which is a neural network that can automatically view an image and generate appropriate captions in natural language like English. The model is trained to produce the sentence or description from given image. The descriptions or captions obtained from the model are categorized into:

• Describe image without errors

• Describe image with minor errors

The categories in results are due to neighbourhood of some particular words, i.e., for word like car it's neighbourhood words like vehicle, van, cab etc. are also generated which might be incorrect. After so much of experiments, it is conclusive that use of larger datasets increases performance of the model. The larger dataset will increase accuracy as well as reduce losses. Also, it will be interesting that how unsupervised data for both images as well as text can be used for improving the image caption generation approaches.

Figure 6. Output

V. CONCLUSION

In this overview, we have compiled all aspects of the image caption generation task, discussed the model framework proposed in recent years to solve the description task, focused on the algorithmic essence of different attention mechanisms, and summarized how the attention mechanism is applied. We summarize the large datasets and evaluation criteria commonly used in practice.

Although image caption can be applied to image retrieval, video caption, and video movement and the variety of image caption systems are available today, experimental results show that this task still has better performance systems and improvement. It mainly faces the following three challenges: first, how to generate complete natural language sentences like a human being; second, how to make the generated sentence grammatically correct; and third, how to make the caption semantics as clear as possible and consistent with the given image content.

VI. REFERENCES

[1] Soheyla Amirian, Khaled Rasheed, Thiab R. Taha and Hamid R Arabina. "Automatic Image and Video Caption Generation with Deep Learning : A Concise Review and Algorithmic Overlap", December 16, 2020, IEEE ACCESS, pp. 218386-218400.

[2] Yiqing Huang, Jiansheng Chen, Wanli Ouyang, Weitao Wan, Youze Xue; "Image Captioning With End- to-End Attribute Detection and Subsequent Attributes Prediction",© 2020 IEEE, pp. 4013-4026 .

[3] Yi Bin, Yang Yang; Fumin Shen; Ning Xie, Heng Tao Shen and Xuelong Li; Describing Video With Attention-Based Bidirectional LSTM, 2018 IEEE, pp. 1-11.

[4] Mohana priya R ; Dr. Maria Anu ; Divya S ; Building A Voice Based Image Caption Generator with Deep Learning, © 2021 IEEE, pp. 943-948.

[5] Tai -Yin Chiu, Yinan Zhao, Danna Gurari. "Assessing Image Quality Issues for Real -World Problems", 2020 IEEE/CVF Conference, pp. 3643-3653.

[6] Smriti Sehgal, Jyoti Sharma,Natasha Chaudhary. "Generating Image Captions based on Deep Learning and Natural language Processing", 2020 8th International Conference on Reliability, pp. 165-169.

[7] Sruthi K V, Meharban M S. Review on "Image Captioning and Speech Synthesis Techniques", ©2020 IEEE 6th International Conference, pp. 352-356.

[8] Juan Wang, Yiping Duan, Xiaoming Tao, Jianhua Lu. "Local-to-Global Semantic Supervised Learning for Image Captioning" ©2020 IEEE, pp. 5089-5094.

Intelligent Packaging Solutions

Hemanth Kumar K[1], Hemanth P.T [2], K P Chandan [3], Nandana S Hegde [4], Ambika S[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor Ambika S, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
hemanthk2207@gmail.com, hemanth24madikeri@gmail.com, hegdenandan013@gmail.com, @gmail.com, ambikas@sapthagiri.edu.in

***Abstract* -The paper aims to develop the Intelligent Packaging solution intends to use an electronic packaging solution to battle the problem of packages opening during transportation and to measure the product's qualities, as well as the package's inner and exterior atmosphere. The goal of the IPS DevKit is to leverage electronic packaging technologies to successfully trigger an alert when a product is damage and also when the package has been opened. This is accomplished through the use of many sensors in a fail-safe system. The problem with single sensor-based systems is that they don't combine data from several sources.IPS employs a number of sensors to continuously monitor the physical characteristics within the package ascertain if the package has been opened or if the temperature (for pharmaceutical and temperature-sensitive products). Once this alert has been sent to those concerned, they can take necessary action. If there is no alert and a normal delivery takes place, if there is no notice and a normal delivery occurs, the consumer enters the OTP shown on the IPS kit with his or her mobile phone will reset the device. The IPS kit is then taken out of the box and given to the delivery person to be reused.**

Keywords-Ecommerce,Sensors,Aurdino Mega,Packaging

I. INTRODUCTION

Ecommerce, also known as electronic commerce refers to the buying and selling of various goods and services online. In the recent days the word "Ecommerce "has become very familiar due to the internet boom and due to the kind of comfort (and other services) it provides to its users. Many companies have either established their business or have increased their profits with the help of Ecommerce. There are various studies which show that there is an exponential increase in the Ecommerce sales and services and it is very much evident that it will reach new heights in the upcoming years. Ecommerce businesses has seen a 265% growth rate, from $1.3 trillion in 2014 to $4.9 trillion in 2021 also higher. With such a mass boom in Ecommerce people don't prefer to buy goods offline since they receive more benefits by buying online. But unfortunately, there are a few problems that both the company and its customers are facing. And gradually such problems have been increasing and major issues were with regard to the faulty delivery system. To handle such situations, we propose a solution to avoid any delivery related problems that are caused during delivery and to put a stop to such problems by making sure every customer gets the products as it is by the dealer directly without any interference while delivering products as it is by the dealer directly without any interference while delivering the product to its customer.

Internet of thing (IoT) is not only a promising research topic but also a blooming industrial trend. Some problems that often arise in the packaging of products are difficulty and inaccuracy in determining appropriate packaging options according to type and condition the product to be packaged. Incorrect decision of packaging option can cause quality loss, physical damage, spoilage of the packed products, especially perishable and time sensitive products. Security of data is of primary concern and the system is fully compliant with all data protection standards. With the rise of e-commerce, there is an increasing need to manage online purchase deliveries effectively.

The Internet of Things (IoT) is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, microelectromechanical systems (MEMS) and the Internet.With IoT, devices typically gather data and stream it over the Internet to a central source, where it is analyzed and process Today, Internet is migrating from connecting people to connecting things, leading to the new concept of Internet of thing (IoT). This new trend brings things or objects into the Internet and generates new applications and business. The increasing packaging types and options nowadays also necessitates more systematic and precise way to select the best packaging option for a certain type of product. The application mainly faces to two types of users, couriers and customers. When they log-in to the system through the password and username, they can use different functions. The mobile terminal mainly use the electronic map with GPS location information through IOS API, to obtain the real-time location of courier and package, and then make the automatic route planning for the courier.

In the modern world, human mistakes sometimes lead to catastrophic events leading to loss of valuables. One such instance, sometimes intentional is the over loading of all the packages in vehicle. It leads to damage and mishandling of the package. Increased customer's experience, expectations and product complexity are driving traditional packaging techniques obsolete. In addition to this, traditional packaging methods do not provide the customer as well as the manufacturer with important information about the product during shipping.The proposed system aims to design a kit that is able to detect any kind of intrusion in its space, it should be able to give information about all the necessary parameters of the environment in which the product is kept inside the package, should alert everyone who is in charge of the delivery cycle of the product and the kit should be able to reset at the end of the delivery cycle and be reusable on the next instance.This would be best solution for the modern packaging solution and can be carried out efficiently.

II. LITERATURE SURVEY

[1] Cost Effective Wireless Sensors for Detection of Packaging : Opening and tampering by Wei Wang, Aydin Sadeqi, Hojatollah Rezai Nejad IEEE 2020.

The three different package opening detection solutions based on RFID technology integrated on low-cost paper or thread substrates.The significance of this work is that the opening detection and recording relies on any passive RFID tag, there is no need for a specialized sensor, electronics or battery. Solutions range from the foldable antenna for real-time detection, paper-based switch across RFID tag to an all-around thread-based RFID tag for all-around package security. All solutions are flexible, lightweight and compatible with most packaging formats. This zero-power and low cost approach can be used in the supply chain (transportation and storage) to quickly detect any opened, tampered or act of opening events. While a specific RFID frequency band was chosen, the approaches can be easily applied to transponders or tags using other wireless standards, which broaden the possible usages and application of the proposed sensor platform.

[2] Enabling Low Cost Flexible Smart Packaging System With Internet-of-Things Connectivity via Flexible Hybrid Integration of Silicon RFID Chip and Printed Polymer Sensors, by H. Zhou, S. Li, S. Chen, Q. Zhang, W. Liu and X. Guo IEEE 2020.

A flexible hybrid integration strategy combing both advantages of the silicon RFID chip and the printed polymer sensors is proposed for smart packaging IoT. To prove its feasibility, a flexible smart packaging system is implemented with packed pork by integrating a 13.56 MHz RFID chip with on chip temperature sensor and two off chip sensors (ammonia and anti open) onto a packaging film. The RFID chip is designed with multi-sensor interface, and the off-chip sensors are fabricated based on PEDOT:PSS using solution printing processes. The functions of the RFID chip and the sensors are characterized. It is shown that both the product quality and the integrity of the packaging can be conveniently inspected with the system via a smartphone. Such a flexible hybrid integration approach would be able to provide an economic solution for adding sensing functions according to specific packaging requirements in terms of function and form factor without obviously increasing the cost.

[3] A Comprehensive Smart IoT Tracker for the Children, Elder, and Luggage With the Assistance of Mobile App by A. Z. M. Tahmidul Kabir, A. Mamun Mizan, P. K. Saha, G. Kibria, A. J. Ta-sin and M. Saniat Rahman Zishan IEEE 2020

It represents an IoT based tracking system,through which it is very easy to track the child, elder, or any type of luggage. This system has separate features for tracking each of these things, which have been completed by the IoT device and the Android app. It is possible to track anything manually or automatically with this device.NodeMCU, GPS, and GSM have been used as hardware to build the system, and Firebase Server and Google API services have been used for the Android app. Parcel exchange has become very common nowadays. With this system, in addition, the location of the parcel can be easily tracked,and administrative help can be taken for any unforeseen situation. Working in both modes, with the help of the internet as well as without the internet, makes this system autonomous and more reliable. A multifunctional features app gives the user more convenient and makes the system versatile. Additionally, this system is very cheap and scalable because all its components are available in the local market. However, as like every other electronics system, it also has some inadequacy.

[4] The visual distribution system of terminal logistics based on IOS by Z. Yufeng and W. Jingyi ICSAI 2016.

It mainly contributes to the designing of a logistics distribution visualization system. According to the comparison of the usage of different smart phone operating systems, this project chose IOS as main developing environment, which is one of the most popular operating systems nowadays. The logistic system mainly consists of two parts, couriers' distribution system and customer system, which has the function of courier route planning, dynamic tracking of the package and nearby courier and so on. This system can dramatically improve the visualization of the "last one kilometer's logistics". It helps greatly with the improvement of the terminal logistics distribution's efficiency. the system is secure, stable and scalable, which can be used in the particular daily work. Meantime, the system can also be improved through the problem discovered from daily tasks. Other different functions can also be integrated into the system to satisfy different requirements in the future work.

[5] A Uniform Parcel Delivery System Based on IoT by Wang, Y., Zhu, H. ,Wang, Z. , Li, H. and Li, G Internet of Things 2018.

Based on technologies such as RFID, IoT and cloud computing, this smart system provides a uniform interface for parcel delivery serviceincluding storage management, parcel distribution, transportation arrangement and so on. By treating a city as a whole, it integrates every aspect of delivery process in this city from the beginning such as sales companies to the end which are customers and is capable of delivery every different kind of parcels like fresh food and household appliances from different clients. Moreover,the priority levels and storage demand can also be satisfied according to the type of parcels and demand of customers. With this system, every people, companies and suppliers can deliver parcels to the destination in a more convenient and secure way. With this system, the whole package delivery process including classification of packages, vehicle scheduling, path planning,transportation monitoring can be intellectualized as well as managed automatically, and the use of both material resources and manpower resources can be reduced accordingly.

[6] An Adaptation of IoT to Improve Parcel Delivery System by H. Y. Song and H. Han FedCSIS 2019

IoT technology has been applied in various field. One of the possible fields of an application is logistics system. In current system, a delivery must go through the designated logistics hub, which doesn't provide shortest distance. Such system costs time and inefficient expenses. In this paper, we propose an enhanced parcel delivery system based on IoT technology for reducing total delivery distance and seeking for much economy. First, we designed a sort of IoT devices which can be attached to parcels. This device has various functionalities including the ability to figure out current delivery route. Second, we addressed some difficulties such as : (i) issues linking IoT device into its platform; (ii) issues for designing IoT devices functionalities. Third, we propose ways to improve the efficiency of IoT based parcel delivery system. From these considerations, our system may improve total economics of parcel delivery system. In current IoT platform, computing and saving process of data is mostly done in central cloud.However, the centralized IoT system is causing many issues.Centralized IoT system requires a giant central server which processes and saves data that are received from a number of devices. This demands big administrative expense. It is difficult to increase connection of IoT devices continuously,since central server has its limit. To resolve this problem, we should expand the central server, but expanding the central server is very inefficient and will not be recommended. In addition, IoT devices require efficient management of data and central server is very important due to its real time data processing. Therefore, if there is a problem with the central server, every IoT device belongs to the platform will become useless. It is predicted that distributed networking of IoT will take place in the future to solve these problems.

[7] Verifiable Smart Packaging with Passive RFID by G.Wang ,Jinshong Han,Chen Qian IEEE 2019.

Smart packaging adds sensing abilities to traditional packages.This paper investigates the possibility of using RF signals to test the internal status of packages and detect abnormal internal changes. Towards this goal, we design and implement a non destructive package testing and verification system using commodity passive RFID systems,called Echoscope. Echoscope extracts unique features from the backscatter signals penetrating the internal space of a package and compares them with the previously collected features during the check-in phase. The use of backscatter signals guarantees that there is no difference in RF sources and the features reflecting the internal status will not be affected. Compared to other non destructive testing methods such as X-ray and ultrasound, Echoscope is much cheaper and provides ubiquitous usage. Our experiments in practical.

[8] Intelligent packaging and intelligent medicine box for medication management towards the Internet-of-Things by Z. Pang, J. Tian and Q. Chen 2019.

The medication noncompliance problem has caused serious threat to public health as well as huge financial waste would wide. The emerging pervasive healthcare enabled by the Internet-of-Things offers promising solutions. In addition, an in-home healthcare station (IHHS) is needed to meet the rapidly increasing demands for daily monitoring and on-site diagnosis and prognosis. In this paper, a pervasive and preventive medication management solution is proposed based on intelligent and interactive packaging (I2Pack) and intelligent medicine box (iMedBox). The intelligent pharmaceutical packaging is sealed by the-Controlled Delamination Material (CDM) and controlled by wireless communication. Various vital parameters can also be collected by wearable biomedical sensors through the wireless link.On-site diagnosis and prognosis of these vital parameters are supported by the high performance architecture. Additionally, friendly user interface is emphasized to ease the operation for the elderly, disabled, and patients.

III. PROPOSED METHODOLOGY

The proposed methodology of Intelligent Packaging Solution is as shown in the figure 1. The system uses LCD display to display each operation, LDR sensor is used to determine whether the IPS properly closed or not, MEMS sensor is used to determine whether the IPS box have been mishandled or not.IR Sensor is used to determine the package presence in the IPS kit. GPS tracks the current location, GSM (Node MCU) will send the message to user about any mishandling of the product, and DHT sensor monitors the temperature and humidity inside the IPS.

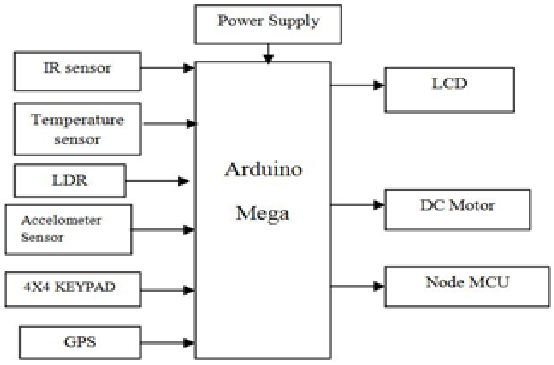


Figure 1 System Architecture

A. Aurdino Mega

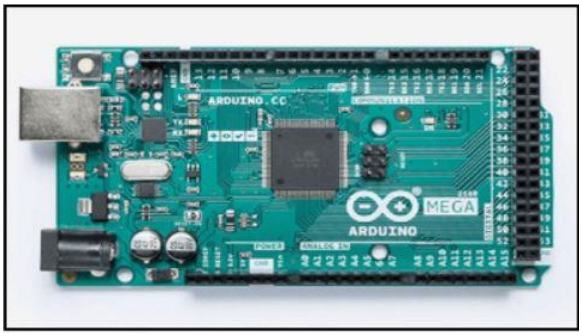


Figure 2 Aurdino Mega 2560

As shown in the figure 2 Arduino MEGA 2560 is designed for projects that require more I/O lines, more sketch memory and more RAM. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities maintaining the simplicity and effectiveness of the Arduino platform.

B. IR Sensor

As shown in the figure 3 the IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or measure the heat of a target and its motion.

In many electronic devices, the IR sensor circuit is a very essential module. This kind of sensor is similar to human's visionary senses to detect obstacles. The sensor which simply measures IR radiation instead of emitting is called PIR or passive infrared.

Figure 3 IR Sensor

C. LCD(Liquid Crystal Display)

Figure 4 LCD

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight.

D. LDR(Light Dependent Resistor)

Figure 5 LDR

As shown in the figure 5, A Light Dependent Resistor (also known as a photoresistor or LDR) is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light-sensitive devices. They are also called as photoconductors, photoconductive cells or simply photocells.They are made up of semiconductor materials that have high resistance. There are many different symbols used to indicate a photoresistor or LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it.

E. Node MCU

Figure 5 Node MCU

NodeMCU is based on the Esperessif ESP8266-12E WiFi System-On-Chip, loaded with an open-source, Lua-based firmware. it's perfect for IoT applications, and other situations where wireless connectivity is required. This chip has a great deal in common with the Arduino they're both microcontroller-equipped prototyping boards which can be programmed using the Arduino IDE. If you're familiar with Arduino, using NodeMCU is a logical next step if you're looking for a more compact, WiFi-equipped alternative.

*F. 4*4 Keypad*

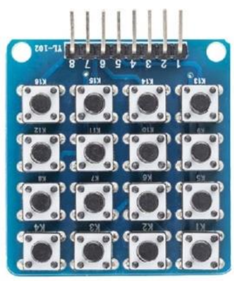


Figure 6 4*4 Keypad

As shown in the figure 6,the 4*4 matrix keypad usually is used as input in project. It has 16 keys in total, which means the same input values. It is used to enter the OTP or to select any options in the project ,by entering the OTP the lid get opened and the package can be safely delievered for the customer.

G. DHT11 Sensor

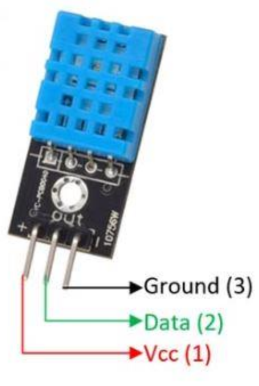


Figure 7 DHT11 Sensor

DHT11 sensor is used to measure the temperature of human beings and their surrondings.It provides measurement in degree centigrade [27-30].The reading of this sensor ranges 0 to 50 degrees centigrade.The benefit of this sensor over the thermistor is that it does not require external calibration[36-40].It is cost efficient and also provides high accuracy Fig 7 represents the DHT11 sensor.

F. Working Principle

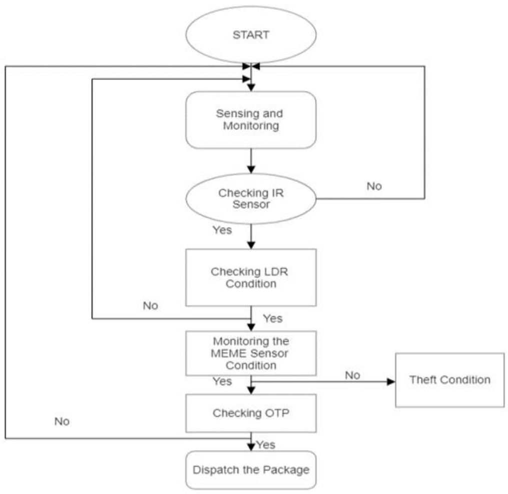


Figure 8 Flowchart of IPS

As shown in the above figure 8,the IPS kit starts working by monitoring and sensing all the internal package,and by checking with the IR sensors ,LDR,MEME sensor the kit is monitoring the package.The OTP will be generated during the delievery to the customer’s mobile and finally if the OTP matches with generated OTP,the box lid will be opened. The primary aim of this project is to provide safety of the packages during transportation as well as to measure the characteristics of the product, the inner and outer atmosphere of the package.The kit will be reused after the customer gets the package.

IV. RESULT

The IPS development kit is compressed and placed into the packaging that needs to be protected. The package has sufficient space for the kit to function properly. The sensors in the IPS development kit will be powered up and begin to function. The kit will travel within the package until it arrives at its destination, where it will be removed after the data has been verified. The IPS development kit begins to run the application that has been programmed into it, and therefore begins to communicate data to the BotFather. If there is a problem with the package, a notification is sent to the client. This allows them to take action that is necessary to either stop the package in transit or to verify its integrity. On receiving the OTP,the IPS development kit is reset and it is ready to be taken back by the shipping company and installed on another parcel and the cycle of the IPS development kit continues.

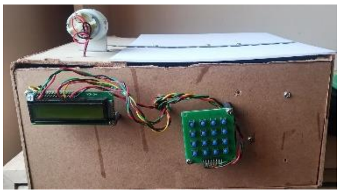


Figure 9 Overview of the model

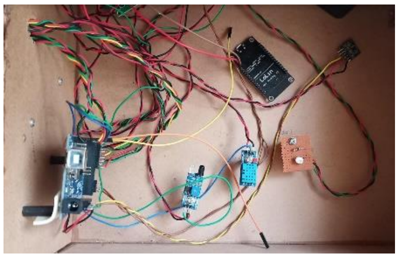


Figure 10 Internal look of the model

Figure 11 IR sensor monitoring

V. CONCLUSION

In our suggested approach, the security flaw in courier delivery can be addressed. This implementation has the potential to be extremely effective in terms of ensuring the security of goods as well as the safe delivery of goods to respective enterprises/customers. We can trace the location of a delivery that needs to be delivered from the source to the customer's destination using GPS.For courier tracking, a server and a smart phone are utilised in the car. A vehicle's geographic coordinates and unique ID will be captured from the black box, and its whereabouts can be traced from anywhere at any time. This solution improves the safety of packages by adding innovation to existing technology.

VI. REFERENCES

[1] W. Wang, A. Sadeqi, H. R. Nejad and S. Sonkusale, "Cost-Effective Wireless Sensors for Detection of Package Opening and Tampering," in IEEE Access, vol. 8, pp. 117122-117132, 2020.

[2] H. Zhou, S. Li, S. Chen, Q. Zhang, W. Liu and X. Guo, "Enabling Low Cost Flexible Smart Packaging System With Internet-of-Things Connectivity via Flexible Hybrid Integration of SiliconRFID Chip and Printed Polymer Sensors," in IEEE Sensors Journal, vol. 20, no. 9, pp. 5004-5011,1 May1, 2020.

[3] A. Z. M. Tahmidul Kabir, A. Mamun Mizan, P. K. Saha, G. Kibria, A. J. Ta-sin and M. Saniat Rahman Zishan, "A Comprehensive Smart IoT Tracker for the Children, Elder, and Luggage With the Assistance of Mobile App",IEEE 2020 International Conference on ICT for Smart Society (ICISS), 2020, pp. 1-5.

[4] G. Kilari, R. Mohammed and R. Jayaraman, "Automatic Light Intensity Control using Arduino UNO and LDR," 2020 International Conference on Communication and Signal Processing (ICCSP), 2020, pp. 0862-0866.

[5] W. Tu, T. Zhao, B. Zhou, J. Jiang, J. Xia and Q. Li, "OCD: Online Crowdsourced Delivery for On-Demand Food," in IEEE Internet of Things Journal, vol. 7, no. 8, pp. 6842-6854, Aug. 2020.

[6] T. Zhang, C. Cao, H. Yu and Y. Liu, "Design and Implementation of Dairy Food Tracking System Based on RFID," 2020 International Wireless Communications and Mobile Computing (IWCMC), 2020, pp. 2199-2203.

[7] H. Nadella, G. Narayanan, P. Gouda, S. Krishnan, A. Gupta and A. Marripelly, "LDR Based Power Consumption of Vehicle Tracking System," 2020 International Confer-ence on Wireless Communications Signal Processing and Networking (WiSPNET), 2020, pp. 145-148.

[8] Z. Pang, J. Tian and Q. Chen, "Intelligent packaging and intelligent medicine box for medication management towards the Internet-of-Things," 16th International Conference on Advanced Communication Technology, 2019, pp. 352-360.

[9] G. Wang ,Jinshong Han,Chen Qian "Verifiable Smart Packaging with Passive RFID," in IEEE Transactions on Mobile Computing, vol. 18, no. 5, pp. 1217-1230, 1 May 2019.

[10] Ajay Doltade,Ankitha Kadam,Sayali Honmore,"Intelligent Grain Storage Management System based on IOT", International Journal of Science and Research,Volume 8 Issue 3,March 2019.

[11] H. Y. Song and H. Han, "An Adaptation of IoT to Improve Parcel Delivery System," 2019 Federated Conference on Computer Science and Information Systems (FedCSIS), 2019, pp. 497-500.

[12] Y. Sun, K. Wei, Z. Qiao, J. Wen and T. Jiang, "A Personalized Service for Scheduling Express Delivery Using Courier Trajectories," 2016 IEEE International Conference on Web Services (ICWS), 2018, pp. 220-227.

[13] Y. -M. Wei, X. -Q. Qiao, J. -L. Chen, Y. -Z. Feng and C. Wang, "SmartDODS: A Smart Dynamic Order Dispatch System for Short-Distance Instant Logistics Service," 2017 IEEE International Conference on Web Services (ICWS), 2017, pp. 818-821.

[14] Z. Yufeng and W. Jingyi, "The visual distribution system of terminal logistics based on IOS," 2016 3rd Interna-tional Conference on Systems and Informatics (ICSAI), 2016, pp. 502-506.

[15] Z. Yufeng and W. Jingyi, "The visual distribution system of terminal logistics based on IOS," 2016 3rd Interna-tional Conference on Systems and Informatics (ICSAI), 2016, pp. 502-506.

Predicting Unwanted User on Social Media

Kumar Priyanshu [1], Bishak Dey [2], Bhupendra Chaturvedi [3], Abhishek Raj [4], Ramya R[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Ramya R**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
pp.5485pan@gmail.com, bishakdey@gmail.com, bhupendra.chaturvedi.1000@gmail.com, abhishekraj070299@gmail.com, ramyar@sapthagiri.edu.in

***Abstract** - Social media like Twitter, Facebook, Instagram, LinkedIn, etc. are an integral part of our lives. People all over the world are actively engaged in it. But at the same time, it faces the problem of fake profiles. Fake profiles are generally human-generated or bot-generated or cyborgs, created for spreading rumours, phishing, data breaching, and identity theft. Therefore, in this article, we discuss a detection model, which differentiates between fake profiles and genuine profiles on witter based on visible features like followers count, friends count, status count and more by using various machine learning methods. We used the dataset of Twitter profiles, TFP and E13 for genuine and INT, TWT and FSF for fake accounts. Here we talk about Neural Networks, Random Forest, XG Boost, and LSTM. The significant features are selected for determining the authenticity of a social media profile. Further, the architecture and hyperparameters are discussed. Finally, the models are trained, and results are obtained. As a result, we get output as 0 for real profiles and 1 for fake profiles. After a profile is detected fake it can blocked/deleted and cybersecurity threats can be avoided. The language used for implementation is Python3 along with all the required libraries like NumPy, Sklearn, and Pandas.*

I. INTRODUCTION

Social media has become a vital part of our lives. From sharing attractive extravagant photographs to follow celebrities to chat with close and far away friends, everyone is active on social media. It is a great platform to share information and interact with people. But everything has a downside. As social media is footing a rm spot in our lives, there are instances where it has turned out to be a problem. There are 330 million monthly active users and 145 million daily active users on Twitter. Facebook also adds about 500,000 new users every day and six new users every second. Loads of information are shared over Twitter every single day. From hot trending topics to the latest hashtags and news to one's most recent trip, you get everything on Twitter. People react, like, comment, share their views, and raise their opinions all through the 280-character limit. There are genuine issues that are discussed, yet sometimes there are rumours. These rumours lead to conflicts between different sections of society. The concern of privacy, misuse, cyberbullying, and false information has come to light in the recent past. All these tasks are performed by fake proles.

Fake accounts can be human-generated or computer-generated or cyborgs. Cyborgs are accounts initially created by humans but later operated by computers. Fake proles usually get created in pseudo names and misleading and abusive posts and pictures are circulated by these profiles to manipulate the society, or to push anti-vaccine conspiracy theories, etc. Every social media platform is facing the problem of fake profiles these days.

The goal behind creating fake profiles is mainly spamming, phishing, and obtaining more followers. The malicious accounts have full potential to commit cybercrimes. The counterfeit accounts propose a major threat like identity theft and data breaching. These fake accounts send various URLs to people which when visited, send all the user's data to faraway servers that could be utilized against an individual. Also, the fake proles, created seemingly on behalf of organizations or people, can damage their reputations and decrease their numbers of likes and followers.

Along with all these, social media manipulation is also an obstacle. The fake accounts lead to the spread of misleading and inappropriate information which in turn give rise to conflicts.

II. LITERATURE SURVEY

[1] FAKE SOCIAL PROFILE DETECTION USING MACHINE LEARNING (June 2021): Er. Ashpreet Kaur, Dr. Abhinav Bhandari

Social Networks are gaining more momentum in businesses around the world and has become one of the most used and popular platforms of digital marketing and to check the latest trends among the public and to better understand what people wants. Fake Social Profiles are increasing rapidly that spreads fake news and information over this growing channel. This paper looks at different machine learning algorithms and how they help to solve the problems related to fake social profile detection. Python is used in Jupyter Notebook along with various ML and data analytics library like Pandas, Sklearn, NumPy etc. Three machine learning algorithms i.e., Support Vector Machines (SVM), Random Forest and Neural Networks are used in this paper and are compared on the basis of AUC Score, Confusion Matrix, and total number of Fake and Genuine Users are detected. Results are plotted in the form of graphs for better analysis and comparison among all the algorithms. [1]

[2] Spam Detection Framework using ML Algorithm (March, 2020): Vinodhini. M, Prithvi. D, Balaji. S

With the advent of technology and everything getting digitalized, we make some of our decisions based on the content of information that we see available on the internet to make the wise or ideal decision to maximize the benefits obtainable when making a choice. From choosing electronic devices to even healthcare products and foods, we tend to check product reviews and pick the one that is most reliable and trustworthy according to the reviews from customers. This in most cases works for the best but there are cases where a fake review or a spam message tends to cheat or divert people away from valid products to potentially harmful or hazardous substances and in some cases even scam gullible people. [2]

[3] FRAUDULENT ACCOUNT DETECTION USING MACHINE LEARNING AND DATA SCIENCE July 2020*:* J. Sucharitha, S. Srivarshini, V. Anusha

Now a days, Online Social Media is dominating the world in several ways. Day by day the number of users using social media is increasing drastically. The main advantage of online social media is that we can connect to people easily and communicate with them in a better way. This provided a new way of a potential attack, such as fake identity, false information, etc. A recent survey suggests that the number of accounts present in the social media is much greater than the users using it. This suggest that fake accounts have been increased in the recent years. Online social media providers face difficulty in identifying these fake accounts. The need for identifying these fake accounts is that social media is flooded with false information, advertisements, etc. [3]

[4] Detecting Fake Accounts in Media Application Using Machine Learning (September 2020): Gayathri A, Radhika S, Mrs. Jayalakshmi S.L

In the present generation, everyone in society has become associated with the Online Social Networks (OSN). These OSN have made a drastic change in the way we pursue our social life. Making new friends, keeping in contact with them and knowing their updates has become easier. But with the rapid growth of social media many problems like fake profiles, online impersonation have also grown. There are no feasible solution existing to control these problems. Fake accounts can be either human-generated, computer generated (also referred as "bots"), or cyborgs. A cyborg is half-human, half-bot account. Such an account is manually opened by a human, but from then onwards the actions are automated by a bot. To become member of the OSN the user has to create his profile by entering information like name, photo, date of birth, Email ID, graduation details, place of work, home town, interests and so on. Some of the fields are mandatory and some are optional and it varies from one OSN to the another. These websites are popular because of people's interest in finding friends, sharing pictures, tagging people in group photos, sharing their ideas and views on common topics, maintain good business relationship and general interest with others. In this paper we came up with a framework in which automatic detection of fake profiles is possible and is efficient. [4]

[5] Deep Learning for Hate Speech Detection in Tweets (August 2020): Pinkesh Bajdjatiya, Shashank Gupta, Manish Gupta, Vasudeva Varma

With the massive increase in social interactions on online social networks, there has also been an increase of hateful activities that exploit such infrastructure. On Twitter, hateful tweets are those that contain abusive speech tar- getting individuals (cyber-bullying, a politician, a celebrity, a product) or particular groups (a country, LGBT, a religion, gender, an organization, etc.). Detecting such hateful speech is important for analysing public sentiment of a group of users towards another group, and for discouraging associated wrongful activities. It is also useful to iter tweets before content recommendation, or learning AI chatterbots from tweets. [5]

III. PROPOSED METHODOLOGY

We define an account as fake when it doesn't meet the minimum engagement rate, have artificial activities or when the account has a history of Spam comments.

1] Web Scrapping
2] Calculation of Engagement rates
3] Artificial Activity
4] Spam Comments
5] Detecting Fake Accounts

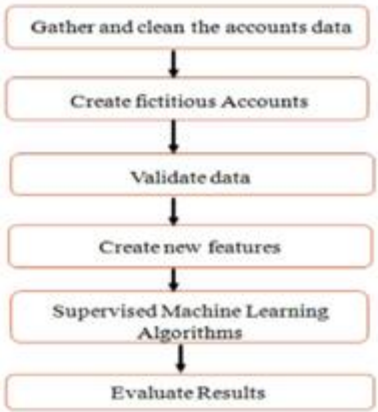


Figure 1. Proposed Methodology

1] Web Scrapping

Web Scraper is used to extract data from a website. When a user pastes a link of a social media Account, Using Outwit hub, a Web scraper tool, we extract necessary pieces of information from the social media site.

We extract data such as login activity, Total Likes, Total Comments, Number of posts, Number of followings and Number of Followers.

2] Calculation of Engagement Rate

An engagement rate is a metric that measures the level of engagement of a Post or Story received on social media. It is the percentage by which the audience interact with a post. By checking the number of interactions with the number of followers we can evaluate the engagement rate. Interactions can be of likes, comments, and shares. Most Fake accounts will boast of 1000s of followers and a very minimum number of likes. Since the engagement rate is relatively calculated, comparisons between popular accounts and semi-popular accounts are comparatively easy. This metric is one of the most vital ones because lesser audience engagement signifies that the account is fake.

$$\text{Engagement rate percentage} = \left(\frac{\text{Total number of interactions}}{\text{Total number of followers}} \right) \times 100$$

Equation 1. Engagement Rate Calculation

3] Artificial Activity

Normal social media activities such as liking, commenting and sharing turns into an artificial activity when the frequency of the above mentioned are very high. Around clock activity also signifies that the account is used by a Bot. At this stage, we look into the number of likes, comments, and shares this particular account has made since its creation. If an enormous amount of likes or comments are found, then that account will be considered as fake. By enormous we mean a number which is not achievable by an average social media user. Also, the amount of time the account was online will be looked upon before concluding. Other factors that are considered are insufficient information on the account and Status of verification of the mobile number and email.

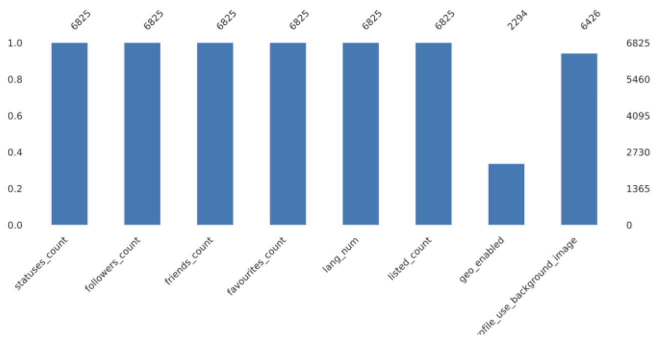


Figure 2. Datasets

4] Spam Comments

BOT comments are always known to be very Generic and often lack Substance. At this stage, the comments made from the account will be gone through in a detailed manner. Total number of comments by the user made since the creation of the account will be compared with average comments of users in that particular OSN's. If there is a big difference the account may be considered fake. Commenting links will lead to the account being termed as Fake account. Same or

5] Detection of Fake Accounts

In this step, we combine all the data we extracted from the website. In this paper we mainly focus on engagement rate, artificial activity and spam comments. The data collected using web scraper is used to compute the values for the factors mentioned above. Using these factors different decision tress is formed. Using gradient boosting algorithm and with the formed decision trees fake accounts are detected.

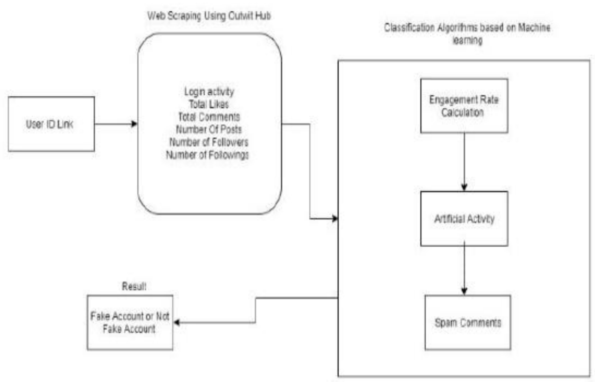
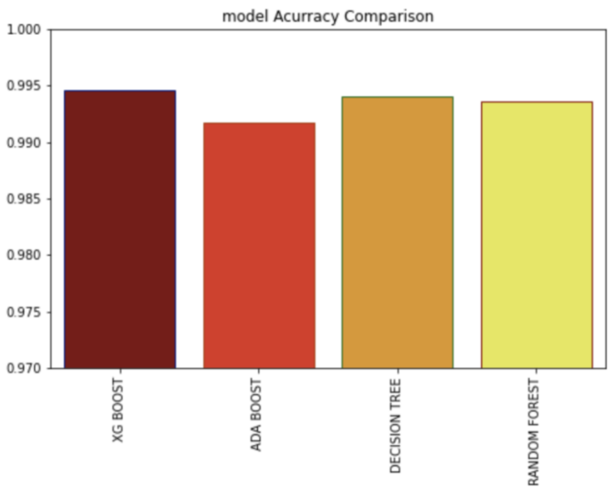


Figure 3. System Architecture

IV. RESULT



Accuracy Score of different models

Figure 4. Output

In the comparison chart above we observe accuracy of different models namely random forest, xg boost, ada boost, and decision tree.

The maximum accuracy is achieved by XG boost that equals to 0.996. Further

we have decision tree and random forest with approx similar accuracy of 0.99.

At last, we have ADA boost.

Histogram for accuracy comparison and the ROC curves are as follows::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.

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 hate comments, spam links, or connection request from non-genuine accounts, this algorithm recognises them. For each of the labels detected, this application generate output. The software will pause until all of the identified labels have been outputted.

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V. CONCLUSION

Detection of spam is important for securing message and e-mail communication. However, these methods have a lack of capability to detect the spam accurately and efficiently.

To solve this issue, we have proposed a method for spam detection using machine learning predictive models. The method is applied for the purpose of detection of spam. The experimental results obtained show that the proposed method has a high capability to detect spam.

Thus, the results suggest that the proposed method is more reliable for accurate and on-time detection of spam, and it will secure the communication systems of messages and e-mails.

VI. REFERENCES

[1] Er. Ashpreet Kaur, Dr. Abhinav Bhandari, “Fake Social Profile Detection Using Machine Learning”, vol. 10, Jun. 2021, pp. 5-100

[2] Vinodhini. M, Prithvi. D, Balaji. S, “Spam detection Framework using ML Algorithm”, vol. 8, Mar. 2020, pp. 1-4

[3] J. Sucharitha, S. Srivarshini, V. Anusha, “Fraudulent Account Detection using Machine Learning and Data Science”, vol. 40, Jul. 2021, pp. 1-38

[4] Gayathri A, Radhika S, Mrs. Jayalakshmi S.L, “Detecting Fake Accounts in Media Application Using Machine Learning”, vol. 40, Jul. 2021, pp. 45-120

[5] Pinkesh Bajdjatiya, Shashank Gupta, Manish Gupta, Vasudeva Varma, “Deep learning for Hate Speech detection in Tweets”, vol. 1, Apr. 2019, pp. 32-70

[6] Dr. K. Sreenivasa Rao, Dr. G. Sreeram, Dr. B. Deevena Raju, “Detecting Fake accounts on Social Media Using Machine Learning Algorithms”, vol. 13, Apr. 2019, pp. 5-100

[7] S.P. Maniraj, Harie Krishnan G, Surya T, Pranav R, “Fake Account detection using Machine Learning and Data Science”, vol. 9, Nov. 2019, pp. 78-175

[8] Siva Nandini, P. Bhaya Anjali, K. Devi Manaswi, “Fake Profile Identification in Online Social Networks”, vol. 8, Jul. 2019, pp. 45-120

CKD PREDICTION USING MACHINE LEARNING

Ananya A [1], Chandana H C [2]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Akshatha A R**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
ananyaa2408@gmail.com , hcchandana352@gmail.com , akshathaar@sapthagiri.edu.in

Abstract: **Chronic Kidney Disease is one of the most critical illness nowadays and proper diagnosis is required as soon as possible. Machine learning technique has become reliable for medical treatment. With the help of a machine learning classifier algorithms, the doctor can detect the disease on time. For this perspective, Chronic Kidney Disease prediction has been discussed in this article. Chronic Kidney Disease dataset has been taken from the UCI repository. Seven classifier algorithms have been applied in this research such as artificial neural network, C5.0, Chi-square Automatic interaction detector, logistic regression, linear support vector machine with penalty L1 & with penalty L2 and random tree. The important feature selection technique was also applied to the dataset. For each classifier, the results have been computed based on (i) full features, (ii) correlation-based feature selection, (iii) Wrapper method feature selection, (iv) Least absolute shrinkage and selection operator regression, (v) synthetic minority over-sampling technique with least absolute shrinkage and selection operator regression selected features, (vi) synthetic minority oversampling technique with full features. From the results, it is marked that LSVM with penalty L2 is giving the highest accuracy of 98.86% in synthetic minority over-sampling technique with full features. Along with accuracy, precision, recall, F-measure, area under the curve and GINI coefficient have been computed and compared results of various algorithms have been shown in the graph. Least absolute shrinkage and selection operator regression selected features with synthetic minority over-sampling technique gave the best after synthetic minority over-sampling technique with full features. In the synthetic minority over-sampling technique with least absolute shrinkage and selection operator selected features, again linear support vector machine gave the highest accuracy of 98.46%. Along with machine learning models one deep neural network has been applied on the same dataset and it has been noted that deep neural network achieved the highest accuracy of 99.6%.**

I. INTRODUCTION

Chronic kidney Disease (CKD) means your kidneys are damaged and not filtering your blood the way it should. The primary role of kidneys is to filter extra water and waste from your blood to produce urine and if the person has suffered from CKD, it means that wastes are collected in the body. This disease is chronic because of the damage gradually over a long period. It is flattering a common disease worldwide. Due to CKD may have some health troubles. There are many causes for CKD like diabetes, high blood pressure, heart disease. Along with these critical diseases, CKD also depends on age and gender. If your kidney is not working, then you may notice one or more symptoms like abdominal pain, back pain, diarrhea, fever, nosebleeds, rash, vomiting. There are two main diseases of CKD: (i) diabetes and (ii) high blood pressure. So that controlling of these two diseases is the prevention of CKD. Usually, CKD does not give any sign till kidney is damaged badly. CKD is being increased rapidly as per the studies hospitalization cases increase 6.23 per cent per year but the global mortality rate remains fixed. There are few diagnostic tests to check the condition of CKD: (i) estimated glomerular filtration rate (eGFR) (ii) urine test (iii) blood pressure.

Data mining is suitable to mining in data if the dataset is huge but we can also do it with the help of machine learning with a small dataset. The machine learning can also find data analysis and pattern detection. A variety of health dataset is present so machine learning algorithms are best fit to improve the accuracy of diagnosis prediction. As healthcare electronic dataset grows rapidly, machine learning algorithms are becoming more common in healthcare.

The new examples are not simply duplicating of existing minority cases. Instead, the calculation takes tests of the component space for each target class and its closest neighbours and then produces new models that join attributes of the objective case with the highlights of its neighbours. This methodology builds the highlights accessible for each class and makes tests progressively broad.

Classification problem for the large dataset based on a simple iterative approach. It is created the SVM model in linear CPU time of the dataset. Machine learning problems in less expensive computing resource. Support Vector Machine is a supervised classifier algorithm.

II. LITERATURE SURVEY

Q.-L. Zhang, et al. [1] systematically reviewed Chronic kidney disease (CKD) is becoming a major public health problem worldwide. This article reviews the published evidence of prevalence of CKD in population-based study samples that used the standardized definition from the Kidney Disease Outcomes Quality Initiative of the National Kidney Foundation (K/DOQI) practice guideline, and particularly focus on performance of serum-creatinine based equations for GFR estimation. We provide a summary of available data about the burden of CKD in various populations. W. M. McClellan et al. [2] reviewed the causes of the increased risk for ESRD among African Americans are not completely understood. Here, we examined whether higher levels of urinary albumin excretion among African Americans contributes to this disparity. We analyzed data from 27,911 participants in the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study who had urinary albumin-to-creatinine ratio (ACR) and estimated GFR (eGFR) measured at baseline. We identified incident cases of ESRD through linkage with the United States Renal Data System. At baseline, African Americans were less likely to have an eGFR <60 ml/min per 1.73 m(2) but more likely to have an ACR ≥ 30 mg/g. The incidence rates of ESRD among African Americans and whites were 204 and 58.6 cases per 100,000 person-years, respectively. After adjustment for age and gender, African Americans had a fourfold greater risk for developing ESRD (HR 4.0; 95% CI 2.8 to 5.9) compared with whites. Additional adjustment for either eGFR or ACR reduced the risk associated with African-American race to 2.3-fold (95% CI 1.5 to 3.3) or 1.8-fold (95% CI 1.2 to 2.7), respectively. Adjustment for both ACR and eGFR reduced the race-associated risk to 1.6-fold (95% CI 1.1 to 2.4). Finally, in a model that further adjusted for both eGFR and ACR, hypertension, diabetes, family income, and educational status, African-American race associated with a non-significant 1.4-fold (95% CI 0.9 to 2.3) higher risk for ESRD. In conclusion, the increased prevalence of albuminuria may be an important contributor to the higher risk for ESRD experienced by African Americans. M. K. Haroun et al. [3] explored Chronic kidney disease (CKD) is an increasing cause of morbidity and mortality in the United States. Prospective data on risk factors for CKD are limited to men, and few studies examine the importance of smoking. The authors performed a community-based, prospective observational study of 20-yr duration to examine the association between hypertension and smoking on the future risk of CKD in 23,534 men and women in Washington County, Maryland. CKD was identified as end-stage renal disease in the Health Care Financing Administration database or kidney disease listed on the death certificate. All cases were confirmed as CKD by medical chart review. Adjusted relative hazards of CKD were modeled using Cox proportional hazards regression including age as the time variable and baseline BP, cigarette smoking, gender, and diabetes status as risk factors. The adjusted hazard ratio (95% confidence interval) of developing CKD among women was 2.5 (0.05 to 12.0) for normal BP, 3.0 (0.6 to 14.4) for high-normal BP, 3.8 (0.8 to 17.2) for stage 1 hypertension, 6.3 (1.3 to 29.0) for stage 2 hypertension, and 8.8 (1.8 to 43.0) for stages 3 or 4 hypertension compared with individuals with optimal BP. In men, the relationship was similar but somewhat weaker than in women, with corresponding hazard ratios of 1.4 (0.2 to 12.1), 3.3 (0.4 to 25.6), 3.0 (0.4 to 22.2), 5.7 (0.8 to 43.0), and 9.7 (1.2 to 75.6), respectively. Current cigarette smoking was also significantly associated with risk of CKD in both men and women (hazard ratio in women 2.9 [1.7 to 5.0] and in men 2.4 [1.5 to 4.0]). A large proportion of the attributable risk of CKD in this population was associated with stage 1 hypertension (23%) and cigarette smoking (31%). In conclusion, CKD risk shows strong graded relationships to the sixth report of the Joint National Committee (JNC-VI) on Prevention, Detection Evaluation and Treatment of High BP criteria for BP, to diabetes, and to current cigarette smoking that are at least as strong in women as in men. W. Mula-Abed et al. [5] showed Chronic kidney disease (CKD) is an important epidemic and public health problem that is associated with a significant risk for vascular disease and early cardiovascular mortality as well as progression of kidney disease. Currently it is classified into five stages based on the glomerular filtration rate (GFR) as recommended by many professional guidelines. Radiolabelled methods for measuring GFR are accurate but not practical and can be used only on a very limited scale while the traditional methods require timed urine collection with its drawback of inaccuracy, cumbersomeness and inconvenience for the patients. However, the development of formula- based calculation of estimated GFR (eGFR) has offered a very practical and easy approach for converting serum creatinine value into GFR result taking into consideration patient's age, sex, ethnicity and weight (depending on equation type). The commonly used equations include Cockraft and Gault (1976), Modification of Diet in Renal Disease (MDRD) (1999) and Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) (2009). It is the implementation of these equations particularly the MDRD that has raised the medical awareness in the diagnosis and management of CKD and its adoption by many guidelines in North America and Europe. The impact and pitfalls of each of these equations in the screening, diagnosis and management of patients with CKD are presented and discussed in this review. A. S. Levey et al. [6] showed changes in proteinuria have been suggested as a surrogate outcome for kidney disease progression to facilitate the conduct of clinical trials. This report summarizes a workshop sponsored by the National Kidney Foundation and US Food and Drug Administration (FDA) with the following goals: (1) to evaluate the strengths and limitations of criteria for assessment of proteinuria as a potential surrogate end point for clinical trials in chronic kidney disease (CKD), (2) to explore the strengths and limitations of available data for proteinuria as a potential surrogate end point, and (3) to delineate what more needs to be done to evaluate proteinuria as a potential surrogate end point. We review the importance of proteinuria in CKD, including the conceptual model for CKD, measurement of proteinuria and albuminuria, and epidemiological characteristics of albuminuria in the United States. We discuss surrogate end points in clinical trials of drug therapy, including criteria for drug approval, the definition of a surrogate end point, and criteria for evaluation of surrogacy based on biological plausibility, epidemiological characteristics, and clinical trials. Next, the report summarizes data for proteinuria as a potential surrogate outcome in 3 broad clinical areas: early diabetic kidney disease, nephrotic syndrome, and diseases with mild to moderate proteinuria. We conclude with a synthesis of data and recommendations for further research. At the present time, there appears to be sufficient evidence to recommend changes in proteinuria as a surrogate for kidney disease progression in only selected circumstances. Further research is needed to define additional contexts in which changes in proteinuria can be expected to predict treatment effect. We recommend collaboration among many groups, including academia, industry, the FDA, and the National Institutes of Health, to share data from past and future studies.

III. PROPOSED METHODOLOGY

Suggested that the early detection of CKD for diabetic patients with the help of machine learning classifiers algorithms. They collected data from Chennai based diabetes research center and applied Naive Bayes and Decision tree on the dataset. For finding the accuracy they used Weka tool and concluded that Naïve Bayes classifier achieved the highest accuracy of 91%.

This research article primarily aims to predict whether a person has Chronic Kidney Disease or not. In this perception, seven different machine learning classifiers were applied on the dataset. All the algorithms were running with both full features and selected features. SMOTE was used for oversampling and all the results were recorded. All the machine learning model results were also compared with one deep neural network algorithm. Deep learning neural network was used with two hidden layers. IBM SPSS Modeler was applied for computational purpose. The contribution reveals the accuracy estimate of 99.6% when applying deep neural network on the dataset.

There are many filter methods are available, but Correlation-based Feature Selection (CFS) method has been used. CFS is the algorithm to select the feature-based on the attribute ranks. It assigns the rank to attribute subset as based on the correlation heuristic evaluation function. The function works on the strategy that creates two class labels, one is correlated to class and low correlated class and selects only correlated label class attributes.

Module Description

i.Machine Learning Models

In this research, we have developed a model to predict CKD disease in patients. The performance of the model was tested on both all attributes and selected features. Among feature selection methods there were Wrapper, Filter and Embedded allowing to select vital features. Classifier algorithms performance was tested on the selected features. IBM SPSS tool is used for preparing the model. The machine learning classifiers such as artificial neural network (ANN), C5.0, logistic regression, linear support vector machine (LSVM), K- nearest neighbors (KNN) and random tree were used for training the model. Each classifier validation and performance matrix were computed. The procedure of this research including five stages: (i) dataset pre-processing, (ii) feature selection, (iii) classifier application, (iv) SMOTE and (v) analyzing the performance of the classifier. Along with machine learning models, a deep neural network was applied for comparing the result of machine learning models and deep neural network. Artificial Neural network classifier was used for this purpose. In this research the significance of two model were checked by statistic testing namely McNemar's test.

ii.Wrapper Method

Wrapper method selects the subset of features based on a precise machine learning algorithm. It used the greedy search method for finding a possible subset of features. The method can be implemented with using any of the following algorithms forward selection, backward elimination and recursive elimination. In the research, we used the forward feature selection method. The forward feature selection iteratively selects the feature. This procedure starts with the null model and work iteratively and add the attribute in each step. The attribute is keeping add in the model until the attribute does not improve model performance.

iii.Artificial Neural Network

Artificial neural network is a part of artificial intelligence. It is a type of supervised machine learning. Its structure is the same as the human brain. ANN also have neurons and just like in human all neurons are interconnected to one another, ANN neurons are connected to each other in layers of the network. Neurons there are known as nodes. ANN can solve the problem that has been impossible for human or statistical standards. ANN consists of three layers: input, hidden and output layers. The input layer takes input and weight and passes to hidden layer for performing calculation and finding the hidden structures and patterns.

iv.Linear Support Vector Machine (Lsvm)

Linear support vector machine (LSVM) is the modern particularly fast machine learning algorithm for solving multiclass classification problem for the large dataset based on a simple iterative approach. It is created the SVM model in linear CPU time of the dataset. LSVM can be used for the high dimensional dataset is the sparse and dense format. It is used for solving the large dataset machine learning problems in less expensive computing resource. Support Vector Machine is a supervised classifier algorithm. It is used kernel trick for solving the classification problem. Based on these transformations, ideal edge is found between the possible outputs. SVM is used for the nonlinear kernel, such as RBF. For the linear kernel, LSVM is an appropriate choice. LSVM classifier is sufficient for all linear problems

Figure 1. Architectural design of implementation

IV. RESULT

TABLE I. FEATURE NAME AND FEATURE TYPE OF THE CHRONIC DISEASES DATASET

SL	FEATURE	DATA TYPE
1	Age	Numerical
2	B.P	Numerical
3	Specific Gravity	Numerical
4	Albumin	Numerical
5	Blood Glucose	Numerical
6	Blood Urea	Numerical
7	Sodium	Numerical
8	Potassium	Numerical
9	Hemoglobin	Numerical
10	Hypertension	Nominal
11	Diabetes	Nominal
12	Appetite	Nominal

TABLE II. OUTCOMES OF ARTIFICIAL NEURAL NETWORK

EVALUATION METRICS	ARTIFICIAL NEURAL NETWORK
Total number of instances	455
Accuracy	94.5%
Error	5.5%
Recall(Weighted Avg)	0.940
F1-Score	0.95
Precision	0.95

The accuracy has received for artificial neural network is 94.50%. Error Occurred 5.5%. Precision, Recall and F1 score are 0.95, 0.94 and 0.95 respectively.

TABLE III. FINAL RESULTS

ANN	OUTPUT
0	NEGATIVE
1	POSITIVE

V. CONCLUSION AND FUTURE PROSPECT

This article objects to predict Chronic Kidney Disease based on full features and important features of CKD dataset. For feature selection three different techniques have been applied: correlation-based feature selection, Wrapper method and LASSO regression. In this perception, seven classifiers algorithm were applied viz. artificial neural network, C5.0, logistic regression, CHAID, linear support vector machine (LSVM), K-Nearest neighbors and random tree. For each classifier, the results were computed based on full features, selected features by CFS, selected features by Wrapper, selected features by LASSO regression, SMOTE with selected features by LASSO, SMOTE with full features. It was observed that LSVM achieved the highest accuracy of 98.86% in SMOTE with full features. All classifiers algorithms performed well on features selected by LASSO regression with SMOTE and without SMOTE. SMOTE with full features gave the best result for all 5 classifiers. In this research, a total of 7 classifiers were used. However, Logistic and KNN did not give suitable results and it was why they were not used in SMOTE. As per the result, it is concluded that SMOTE is a best technique for balancing a dataset. It is noted that SMOTE gave better results with selected features by LASSO regression as compare to without SMOTE on LASSO regression model. LSVM achieved the highest accuracy in all experiments as compared to other classifiers algorithms.

VI. REFERENCES

[1] Q.-L. Zhang and D. Rothenbacher, ``Prevalence of chronic kidney disease in population-based studies: Systematic review,'' *BMC Public Health*, vol. 8, no. 1, p. 117, Dec. 2008.

[2] W. M. McClellan, D. G. Warnock, S. Judd, P. Muntner, R. Kewalramani, M. Cushman, L. A. McClure, B. B. Newsome, and G. Howard, ``Albuminuria and racial disparities in the risk for ESRD,'' *J. Amer. Soc. Nephrol.*, vol. 22, no. 9, pp. 1721_1728, Aug. 2011.

[3] M. K. Haroun, ``Risk factors for chronic kidney disease: A prospective study of 23,534 men and women in Washington County, Maryland,'' *J. Amer. Soc. Nephrol.*, vol. 14, no. 11, pp. 2934_2941, Nov. 2003.

[4] W. D. Souza, L. C. D. Abreu, L. G. D. SilvaI, and I. M. P. Bezerra, ``Incidence of chronic kidney disease hospitalisations and mortality in Espírito Santo between 1996 to 2017,'' Wisit Cheungpasitporn, Univ. Mississippi Medical Center, Rochester, MN, USA, Tech. Rep., 2019, doi: 10.1371/journal.pone.0224889.

[5] W. Mula-Abed, K. A. Rasadi, and D. Al-Riyami, ``Estimated glomerular _ltration rate (eGFR): A serum creatinine-based test for the detection of chronic kidney disease and its impact on clinical practice,'' *Oman Med. J.*, vol. 27, no. 4, pp. 339_340, 2012.

[6] A. S. Levey, D. Cattran, A. Friedman, W. G. Miller, J. Sedor, K. Tuttle, B. Kasiske, and T. Hostetter, ``Proteinuria as a surrogate outcome in CKD: Report of a scienti_c workshop sponsored by the national kidney foundation and the US food and drug administration,'' *Amer. J. Kidney Diseases*, vol. 54, no. 2, pp. 205_226, Aug. 2009.

[7] S. Gerogianni, ``Concerns of patients on dialysis: A research study,'' *Health Sci. J.*, vol. 8, no. 4, pp. 423_437, 2014.

[8] J. R. Chapman, ``What are the key challenges we face in kidney transplantation today?'' *Transplantation Res.*, vol. 2, no. S1, pp. 1_7, Nov. 2013.

[9] T. Xiuyi and G. Yuxia, ``Research on application of machine learning in data mining,'' in *Proc. IOP Conf., Mater. Sci. Eng.*, 2018, doi: 10.1088/1757-899X/392/6/06220.

[10] B. Zupan, A. J. Halter, and M. Bohanec, ``Qualitative model approach to computer assisted reasoning in physiology,'' in *Proc. Intell. Data Anal. Med. Pharmacol. (IDAMAP)*, Brighton, U.K., 2018, pp. 1_7. ddd

Diagnosis of Pneumonia from Chest X-Ray Images using Deep Learning

Ayushman Srivastava [1], Arnav Raj [2], Veena Dhavalgi [3]

[1-2]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[3]Assistant Professor **Veena Dhavalgi**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
ayushmansrivastava77@gmail.com, Arnavraj0804@gmail.com, Veenadhavalgi@sapthagiri.edu.in,

***Abstract* - Chest CT is emerging as a valuable diagnostic tool for clinical management of Pneumonia associated lung disease. Artificial intelligence (AI) has the potential to aid in rapid evaluation of CT scans for differentiation of COVID-19 findings from other clinical entities. Pneumonia is an acute respiratory infection that affects the lungs. It is a fatal illness in which the air sacs get filled with pus and other liquid. There are mainly two types of pneumonia: bacterial and viral. Generally, it is observed that bacterial pneumonia causes more acute symptoms. The most significant difference between bacterial and viral pneumonia is the treatment. Treatment of bacterial pneumonia is done using antibiotic therapy, while viral pneumonia will usually get better on its own. It is a prevalent disease all across the globe. It can be prevented with simple interventions and treated with low-cost, low-tech medication and care. One of the following tests can be done for pneumonia diagnosis: chest X-rays, CT of the lungs, ultrasound of the chest, needle biopsy of the lung, and MRI of the chest. Currently, chest X-rays are one of the best methods for the detection of pneumonia.**

I. INTRODUCTION

Pneumonia is a disease which occurs in the lungs caused by a bacterial infection. Early diagnosis is an important factor in terms of the successful treatment process. Generally, the disease can be diagnosed from chest X-ray images by an expert radiologist. The diagnoses can be subjective for some reasons such as the appearance of disease which can be unclear in chest X-ray images or can be confused with other diseases. Therefore, computer-aided diagnosis systems are needed to guide the clinicians Pneumonia is inflammation of the tissues in one or both lungs that usually caused by a bacterial infection. In the USA annually more than 1 million people are hospitalized with the gripe of pneumonia. Unfortunately, 50.000 of these people die from this illness. Fortunately, pneumonia can be a manageable disease by using drugs like antibiotics andantivirals.

However, early diagnosis and treatment of pneumonia is important to prevent some complications that lead to death. Chest X-ray images are the best-known and the common clinical method for diagnosing of pneumonia. However, diagnosing pneumonia from chest X-ray images is a challenging task for even expert radiologists. The appearance of pneumonia in X-ray images is often unclear, can confuse with other diseases and can behave like many other benign abnormalities. These inconsistencies caused considerable subjective decisions and varieties among radiologists in the diagnosis of pneumonia.

II. LITERATURE SURVEY

[1] Diagnosis of Pneumonia from Chest X-Ray Images using Deep Learning Author Enes AYAN, Halil Murat(April 2019)

In this paper, we compared two CNN network's performance on the diagnosis of pneumonia disease. While training our model we used from transfer learning and finetuning. According to the experimental results and confusion matrices every network has own detection capability on the dataset. exception network is more successful for detecting pneumonia cases than Vgg16 network. At the same time Vgg16 network is more successful at detecting normal cases. In the future work we will ensemble of two networks. In this way we will combine strengths of two networks and will achieve more successful results on diagnosing of pneumonia from chest X-ray images

[2] Pneumonia Detection using an improved Algoritm Based on Faster R-CNN Author: Shangjie Yao,Yaowu Chen,Xiang Tian and Rongxin Jiang(April 2021)

In this paper, In this paper, a low complexity residual neural network with a dilated bottleneck structure, called DeepConv-DilatedNet, is invoked as the backbone of a two-stage detector using Faster R-CNN. Because of the turbidity of the pneumonia target, the image has further been enhanced with the CLAHE algorithm to make the target area more prominent. In the RPN, we use the Soft-NMS algorithm to filter the anchor box and ensure its quality. To speed up the convergence of the algorithm and improve the prediction accuracy of the target area, we also used the K-Means++ algorithm in

YOLOV3 to obtain the initial anchor box size. We implant deconvolutions in FPN to variance in scale and thus facilitate recognition from features computed on a single input scale.

[3] Pneumonia Detection using Deep Learning Based on CNN Author: Luka Račić, Tomo Popović, Senior Member, IEEE, Stevan Čakić, Stevan Šandi(February 2021)

This paper describes the use of deep learning in order to classify digital images of chest X-rays according to presence or absence of changes consistent with pneumonia. The implementation was based on CNN model using Python programming and scientific tools. Initial experiments show promising results, but more research is needed. Even though the model accuracy is relatively high, there is a possibility of overfitting due to the size of the dataset. Also, the high accuracy means that the prediction model could potentially be used as a decision support tool, but there is still much work to be done. The proper diagnosis of any kind of disease still requires the involvement and presence of medical specialists. In order to build a good andreliable disease classification model, it is very important to gather as muchlabel that is marked in real time. The clever frame skipping ensures that the recognised object is tracked smoothly while inside the frame data as possible. Further research steps will include experimenting with various preprocessing and CNN configurations, data augmentation techniques, as well as using additional X-ray datasets with additional data labels showing other pathologies.

[4] Pneumonia Detection from Chest X-ray Images Based on Convolutional Neural Network Author: Dejun Zhang, Fuquan Ren, Yushuang Li, Lei Na, Yue Ma(June 2021)

In this paper it describes a CNN-based model aiming to diagnose pneumonia on a chest X-ray image set. The contributions in this paper are listed as follows. First, we utilized the Dynamic Histogram Equalization (DHE) technique to enhance the image contrast. This technique has the potential to enhance image contrast without washing out appearance or causing problems like checkerboard effects. Then, we designed a simple VGG-based CNN model to extract the features from original images or previous feature maps, which contained only six layers combining ReLU activation function, drop operation, and maxpooling layers.

[5] Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning Author:Pranav Rajpurka, Hershel Mehta, Aarti Bagul, Brandon Yang(December 2019)

In this Paper, develop an algorithm which detects pneumonia from frontal- view chest X-ray images at a level exceeding practicing radiologists. We alsoshow that a simple extension of our algorithm to detect multiple diseases outperforms previous state of the art on ChestX-ray14, the largest publicly available chest X-ray dataset. With automation at the level of experts, we hope that this technology can improve healthcare delivery and increase access to medical imaging expertise in parts of the world where access to skilled radiologists is limited.

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 2 modules. The 2 modules being,

1] Front end for UI

2] Backend for the working of Project

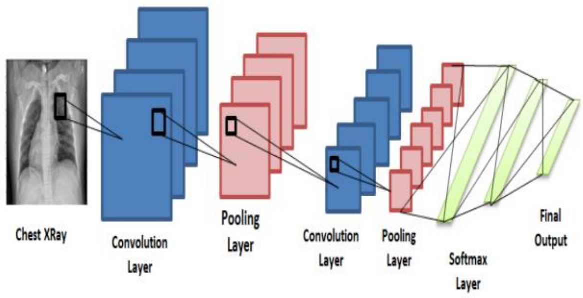


Figure 1. Convolutional neural network consisting of convolution and pooling layers and fully connected Softmax layers at the end to give the final prediction.

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] Frontend for UI

In this project the frontend is the app created for the user. To create the frontend we write the code in dart language using the flutter framework. To install flutter..Step 1: Navigate to flutter.dev on your webpage. On the top menu bar, select Docs > Get Started > Install > Windows. Step 2: Check for the System Requirements. Henceforth, you can begin the installation. Step 3: Restart the system after installing Git on your windows. Once done, let's get to the installation of Flutter Software development Kit (Flutter SDK).Once the zip file is downloaded, extract the 'flutter' folder (drag and drop) to any path/directory of the system where you get the read and write access. Typically, it is better to create a new folder in a separate directory apart from the system drive due to permission issues.Now double-click on the 'flutter' folder. Go to 'flutter_console.bat' file and double-click to open a command prompt window. It should look something like this:Step 4: Check and edit environment variables for global system access. For this, scroll down to 'Update your path' on the official Docs page of the flutter installation page. For this, go to Control Panel > System and Security > System > Advanced System Settings > Environment Variables… . A dialog box displaying a list of the available environment variables appears on your screen. Check for 'Path' variable under User Variables list. If not already present, create a new variable ('New…') and assign the 'flutter\bin' directory as its value.Now double-click on the 'Path' variable and add a new entry by double-clicking on a column below .In the path, copy the entire directory of flutter\bin folder and paste it. Click 'Ok' twice to complete the setup. Now, make sure that you have closed any existing Command Prompt/Windows PowerShell windows that are open.Step 5: Now, you have to analyze and check whether something is missing/has to be installed further. To do this, under the Command Prompt terminal, type in 'Flutter Doctor' to check for other requirements.Step 6: The first step is to download and install Android Studio. To do this, navigate to the official page of Android Studio and click on 'Download Android Studio'.Wait for Android Studio to launch on your computer. On the home screen, click Next > Custom > Next.Step 7: Set SDK as an environment variable, for global access.Now, open Command Prompt terminal and run 'flutter doctor' again. If you have installed Android SDK in the default directory suggested by Android Studio, there wouldn't be any problem that would appear. Nevertheless, if you have installed it in a non-default directory, flutter would not be able to detect it in your system. To help it able to do that, we would be assigning it as an environment variable, giving global access.Step 8: Accept required Android Licenses.On the Command Prompt terminal, type in:flutter doctor --android-licensestype y whenever "Accept? (y/N):" is asked.Step 7: Setup Android Emulator.For setting up Android Emulator, you need to go through the following steps:Open Android Studio.On the topmost menu bar, click on Tools > SDK Manager.Verify whether you have the latest SDK installed. Remember to install the latest stable version too by checking on the box to the left. In my case, it is 'Android 9.0 (Pie)'. You can even uncheck the latest version (if not stable), to not only save space but also run all your applications on the stable version itself.Under the 'SDK Tools' tab, don't forget to check Google USB Driver to later connect a real Android Device. With that, click 'Apply'. Click 'OK' to start SDK installation.Click on 'Create Virtual Device…', select a device and its dimensions according to your preference, select a system image and lastly, under all default settings, click on 'Finish'. Click on the '▶' button to fire up your emulator.Now that flutter is installed, go ahead and write code for the app using any text editor or IDE. This might take a couple of minutes to complete. After the setup is done, click on 'Finish'. Your setup is now complete!To have a first look at your Android Emulator, open Android Studio. Go to Tools > AVD Manager. A dialog box appears.

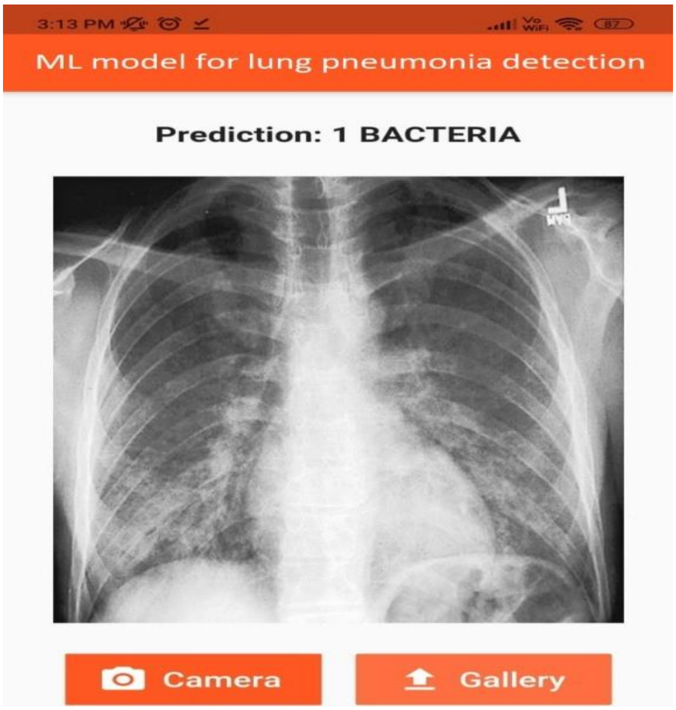
2] Backend for the working of project

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 In this project the backend is the deep learning model that would actually do the work of detecting the disease in the background.To create the backend we use python language.Collect the image dataset of lung diseases and use ImageDataGenerator to separate data into train, test and class!Use keras to create a Sequential model.Fit the model with data.

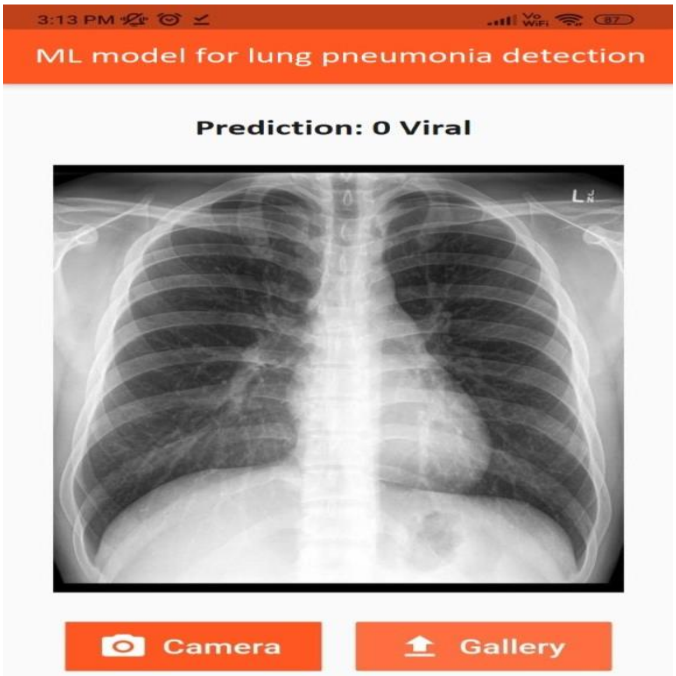
```
model.fit(train_dataset, batch_size = 3)
```

To connect this model with app, export this model as tflite.

IV. RESULT



Pneumonia Due to Bacteria



Pneumonia Due to Virus

Our proposed model is designed and development to detect and classify pneumonia from chest X-ray images. It contains both image processing and convolutional neural network. We developed a model The algorithm begins by transforming chest X-ray images into sizes smaller than the original. The next step involves the identification and classification of images by the convectional neural network framework, which extracts features from the images and classify them. This work has presented the X-Ray images for Pneumonia detection based on convolutional neural networks and different machine learning. By training a set of strong CNNs on a large scale dataset, we built a model that can accurately predict Pneumonia.During each epoch data is trained over and over again to learn the feature of data. The performance evaluation of the model is estimated by using classification accuracy and cross-validation. We performed 5-fold and 10- fold cross-validation and presented the results in terms of mean and standard deviation(SD). Performances of seven Machine learning classification models are presented in

V. CONCLUSION

With the help of a friendly device and an Pneumonia detecting system, people with Pneumonia will be able to diagnose the disease at an Early Stage. 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 surroundin g environment. Computer vision is a vast field, and this device is still in its early stages of development.

VI. FUTURE WORK

This Webapp can be made into an Android/iOS app since REST API has already been applied. It will also help in connecting to various pharmacies across the country to get immediate medicine. It will also help in keeping updated about medical problems faced in the country and also help in analysing solutions. Speech recognition and text to speech can be applied to go completely hands free, using python modules pyttsx3 and speech , recognition. 5.Use of NLP or Natural Language Processing . Adding a list of nearby hospitals using location trackers in devices. 6.Arduino based tumour detection.

VI. REFERENCES

[1]“Diagnosis of Pneumonia from Chest X-Ray Images Using Deep Learning” Author: Enes Ayan, Halil Murat(April 2019)

[2]“Pneumonia Detection using an Improved algorithm based on Faster R-CNN” Author: Shangie Yao, Yaown Chen, Xiang Tian and Rongxin Jiang(April 2021)

[3]“Pneumonia Detection Using Convolution Neural Networks V.Sirish Kaushik 2020. Pneumonia Detection using Deep Learning Basedon CNN” Author: Luka Raci Tomo Popovic, Senior Member, IEEE, Stevan Cakic Stevan Sandi(February 2020).

[4]“Pneumonia Detection From Chest X-Ray Images Bases on CNN” Author: Dejun Zhang, Fuquan Ren, Yushuang Li, Lei Na, Yue Ma(June 2021)

[5] Pedestrian Detection Based on YOLO Network Model Wenbo Lan ; Jianwu Dang ; Yangping Wang ; Song Wang 2018 IEEE International Conference on Mechatronics and Automation (ICMA)

[6]“Automated Methods for Detection and Classification Pneumonia based on X-Ray Images Using Deep Learning” Author: Khalid EL ASNAOUI, Youness CHAWKI, Ali IDRI (2020)

[7]“Deep Learning Framework to Detect Lung Abnormality – A study with Chest X-Ray and Lung CT Scan Images” Author: Abhir Bhandary, G. Ananth Prabhu, V. Rajinikanth, David E (2019)

[8]“An Efficient Deep Learning Approach to Pneumonia Classification in Healthcare” Author: Okeke Stephen, Mangal Sain, Uchenna Joseph Maduh, Do-Un Jeong (March 2019)

[9]“A Novel Transfer Learning Based Approach for Pneumonia Detection in Chest X-ray Images” Author: Vikash Chouhan, Sanjay Kumar Singh, Aditya Khamparia, Deepak Gupta (January 2020)

[10]“Transfer Learning Withh Deep Convolutional Neural Network (CNN) for Pneumonia Detection Using Chest X-ray” Author: Tawsifur Rahman,Muhammad E. H. Chowdhury, Amith Khandakar, Khandaker R. Islam (May 2020)

[11]“Efficient Pneumonia Detection in Chest Xray Images Using Deep Transfer Learning” Author: Mohammad Farukh Hashmi,Satyarth Katiyar, Avinash G Keskar, Neeraj Dhanraj Bokde (June 2020)

[12]“Deep-Pneumonia Framework Using Deep Learning Models Based on Chest X-Ray Images” Author: Nada M. Elshennawy and Dina M. Ibrahim(August 2020)

[13]“Investigation Of The performance of Machine Learning Classifiers for Pneumonia Detection in Chest X-ray Images” Author: Rabia Emhamed Al Mamlook, Shengfeng Chen, Hanin Fawzi Bzizi (2019)

[14]“Deep Learning for Automatic Pneumonia Detection” Author: Tatiana Gabruseva, Dmytro Poplavskiy, Alexandr A. Kalinin (May 2020)

[15]“Pneumonia Detection Using Convolutional Neural Networks” Author: V. Sirish Kaushik, Anand Nayyar, Gaurav Kataria, Rachna Jain (April 2020)

[16]“Pneumonia Detection in chest X-ray images using an ensemble of deep learning models” Author:Rohit Kundu, Ritacheta Das, Zong Woo Geem, Ram Sarkar (September 2021)

[17]“A novel deep learning architecture for detection of Pneumonia from chest x-ray images” Author: Chaimae Ouchicha, Ouafae Ammor, Mohammed Meknassi (September 2020)

Mouse And Keyboard Motion Sensing Using Hand Signs

Kishore Kumar A[1], Aakash G Prasad[2], Arjun B R[3], Hrithik R kharvi[4], Chaitanya V[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Chaitanya V**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
kishoreroxx13@gmail.com, aakashgprasad604@gmail.com, arjunbr270@gmail.com, hrithikkharvi9@gmail.com, chaitanyav@sapthagiri.edu.in

***Abstract* - This project promotes an approach for the Human Computer Interaction (HCI) where cursor movement can be controlled using a real-time camera, it is an alternative to the current methods including manual input of buttons or changing the positions of a physical computer mouse. Instead, it utilizes a camera and computer vision technology to control various mouse events and is capable of performing every task that the physical computer mouse can.**

The Virtual Mouse color recognition program will constantly acquiring real-time images where the images will undergone a series of filtration and conversion. Whenever the process is complete, the program will apply the image processing technique to obtain the coordinates of the targeted colors position from the converted frames. After that, it will proceed to compare the existing colors within the frames with a list of color combinations, where different combinations consist of different mouse functions. If the current colors combination found a match, the program will execute the mouse function, which will be translated into an actual mouse function to the users' machine.

If we consider a keyboard where its purpose is to interact with the system through typing alphabets or special symbols but there are few disadvantages like wear and tear or hard use of keyboard the keys might not properly or any other damages in keyboard it might not function properly. So all the problems can be solved through virtual Keyboard where we function virtually through web camera by hand gestures.

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 colored 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 where there will be a keyboard present on the Screen and can type on any platform.

II. LITERATURE SURVEY

[1] Deep Learning- Based Real-Time AI Virtual Mouse System Using Computer Vision to Avoid COVID-19 Spread: 2021 by S. Shriram , B. Nagaraj , J. Jaya , S. Shankar, P. Ajay:

The mouse is one of the wonderful inventions of Human-Computer Interaction (HCI) technology. Currently, wireless mouse or a Bluetooth mouse still uses devices and is not free of devices completely since it uses a battery for power and a dongle to connect it to the PC. In the proposed AI virtual mouse system, this limitation can be overcome by employing webcam or a built-in camera for capturing of hand gestures and hand tip detection using computer vision. The algorithm used in the system makes use of the machine learning algorithm. Based on the hand gestures, the computer can be controlled virtually and can perform left click, right click, scrolling functions, and computer cursor function without the use of the physical mouse. The algorithm is based on deep learning for detecting the hands. Hence, the proposed system will avoid COVID-19 spread by eliminating the human intervention and dependency of devices to control the computer.

[2] Gesture Recognition Based Virtual Mouse and Keyboard:2020 Sugnik Roy Chowdhury, Sumit Pathak, M.D. Anto Praveena:

In this project, computer vision is used in creating an Optical mouse and keyboard using hand gestures. The camera of the computer will read the image of different gestures performed by a person's hand and according to the movement of the gestures the Mouse or the cursor of the computer will move, even perform right and left clicks using different gestures. Similarly, the keyboard functions may be used with some different gestures, like using one finger gesture for alphabet select and four-figure gesture to swipe left and right. It will act as a virtual mouse and keyboard with no wire or external devices. The only hardware aspect of the project is a web-cam and the coding is done on python using Anaconda platform. Here the Convex hull defects are first generated and then using the defect calculations an algorithm is generated and mapping the mouse and keyboard

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functions with the defects. Mapping a couple of them with the mouse and keyboard, the computer will understand the gesture shown by the user and act accordingly.

[3] Finger Recognition and Gesture based Virtual Keyboard: 2020 by Chinnam Datta Sai Nikhil, Chukka Uma Someswara Rao, E.Brumancia, K.Indira, T.Anandhi, P.Ajitha:

Hand motion acknowledgment is critical for humanPC connection. Right now, present a novel constant strategy for hand motion recognition. The proposed framework is vision based, which uses AI methods and contributions from a PC webcam. Vision based signal acknowledgment following and motion acknowledgment In our structure, the hand area is separated from the foundation with the foundation subtraction technique. At that point, fingers are portioned in order to identify and perceive the fingers. At long last, a standard classifier is applied to anticipate the names of hand motions. The examinations on the informational index of 1300 pictures show that our strategy performs well and is exceptionally productive. Besides, our technique shows preferred execution over a condition of-workmanship strategy on another informational collection of hand motions.

[4] A new 3D Viewer system based on hand gesture recognition for smart interaction: 2020 by Muhammad Jehanzeb, Muhammad Sajid Khan, Umair Hassan, Majid Mehmood:

The visualization of the 3D models is a scorching topic in computer vision and human- computer interaction. The demands for 3D models have been increased due to high involvement in animated characters, virtual reality and augmented reality. To interact with 3D models with the help of mouse and keyboard is a very hectic, less efficient and complex process because of multiple types of operations required by the models to view properly in all sides. So it is essential to improve the user interaction with the 3D system. In this paper, a new method is introduced by using the Microsoft Kinect v2 to detect the human body and joints. First, we trained the Kinect to understand the specific gestures, and then recognize to perform the specific task on an object in the proposed environment.

[5] Fingertips Detection in Egocentric Video Frames using Deep Neural Networks: 2019 by Purnendu Mishra* , Kishor Sarawadekar:

In recent years, there has been much advancement in Augmented Reality technologies. Also, there has been a rise in the usage of wearable cameras. These technologies allow us to interact with the virtual world and the real world simultaneously. Hand gestures or finger gestures can be used to provide input instructions replacing conventional tools like a keyboard or a mouse. This paper introduces an improvement over the YOLSE (You Only Look what You Should See) model towards multiple fingertip position estimation. We propose a regression-based technique to locate fingertip(s) in a multi-gesture condition. First, the hand gesture is segmented from the scene using a deep neural network (DNN) based object detection model. Next, fingertip(s) positions are estimated using MobileNetv2 architecture. It is difficult to use direct regression when the varying number of visible fingertips are present in different egocentric hand gestures. We used the multi-label classification concept to identify all the visible extended fingers in the image. Average errors on RGB image with a resolution of 640 × 480 is 6.1527 pixels. The processing time of 9.072 ms is achieved on Nvidia GeForce GTX 1080 GPU.

[6] Virtual Mouse Control Using Colored Finger Tips and Hand Gesture Recognition: 2020 by Vantukala VishnuTeja Reddy, Thumma Dhyanchand, Galla Vamsi Krishna, Satish Maheshwaram:

In human-computer interaction, virtual mouse implemented with finger tip recognition and hand gesture tracking based on image in a live video is one of the studies. In this paper, virtual mouse control using finger tip identification and hand gesture recognition is proposed. This study consists of two methods for tracking the fingers, one is by using colored caps and other is by hand gesture detection. This includes three main steps that are finger detection using color identification, hand gesture tracking and implementation on on-screen cursor. In this study, hand gesture tracking is generated through the detection of the contour and formation of a convex hull around it. Features of hands are extracted with the area ratio of contour and hull formed. Detailed tests are performed to check this algorithm in real world scenarios.

[7] The Indirect Keyboard Control System by Using the Gaze Tracing Based on Haar Classifier in OpenCV: 2019 by Chang-Zheng Li, Chung-Kyue Kim, Jong-Seung Park:

This paper describes on the indirect interface system in which general users assign computer instructions just through the gaze tracing, without mouse or keyboard. We use the web camera to replace the computer-input system. The face region and the eye region were extracted based on Haar classifier implemented on Open source Computer Vision Library (OpenCV). It controls mouse-moving by automatically affecting the position where eyesight focuses on, and simulates mouse-click by affecting blinking action. We use the virtual keyboard displayed on monitor to simulate the keyboard entry. As a result, more than 95% of the tracing accuracy was achieved when the size of a single key is larger than 25pixels.

[8] Virtual Keyboard and Virtual Mouse: 2020 by KRUTIKA JADHAV, FAHAD JAGIRDAR, SAYALI MANE, JAHANGIR SHAHABADI:

Computing is not limited to desktops and laptops; it has found its way into mobile devices like palm tops and even cell phones. But what has not changed for the last 50 or so odd years is the input device, the good old QWERTY keyboard. Virtual keyboard uses sensor technology and artificial intelligence to let users work on any surface as if it were a keyboard. This paper develops an application to -visualize the keyboard of computer with the concept of image processing. The virtual keyboard should be accessible and functioning. With the help of camera image of keyboard will be fetched. Camera will capture finger movement while typing. So basically this is giving the virtual keyboard. This paper also presents a vision based virtual mouse that will take finger co-ordinates as input. The mouse will use our finger for recognition of our mouse.

III. PROPOSED METHODOLOGY

The method for performing project summarization is described in this section. System design is the process of defining the architecture, Modules, Interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of the systems theory to product development.

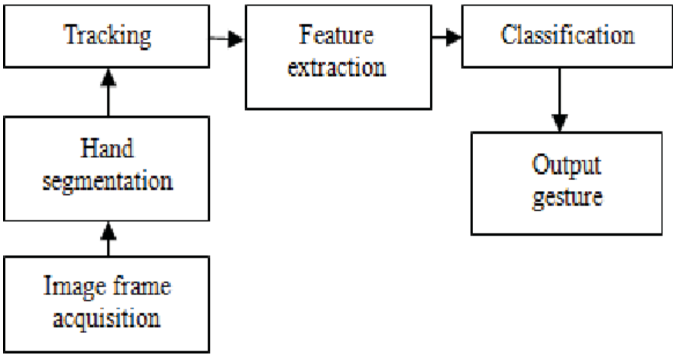

Figure 1. Architectural design of implementation

1] 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

2] Keyboard

We used this following procedure to type on virtual keyboard using our fingertips:

Step 1: Capturing the entire 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 hand where it detects the hand over the virtual keyboard.

Step 7: Print the character which is pointed by hand.Converted into greyscale image. So, we convert the RGB image into Gray image and thus converting the Gray image into Binary image.

Figure 2. RGB to Gray Conversion

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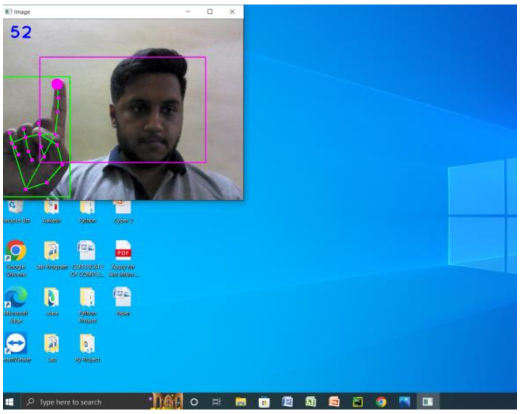
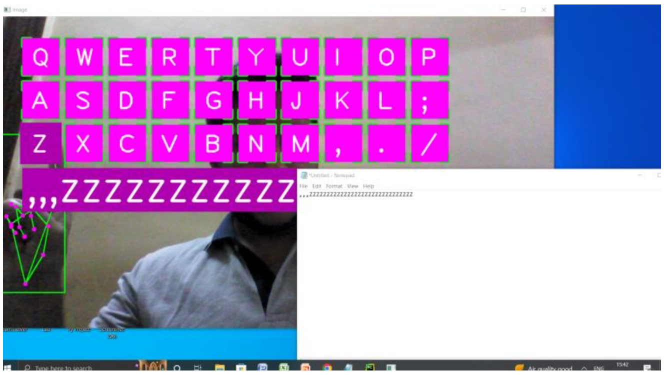
IV. RESULT



Virtual Mouse

The Virtual Mouse where inside the rectangular box if we move our hand the cursor will do the same actions. The Virtual Mouse will execute every action of mouse like right, left click, drag, drop, select, etc. Inside the rectangular box the hand will be detected and every part of the hand will be given a landmark position.



Virtual Keyboard

In this Image we can see a virtual keyboard present on the screen and can print anything in any sites like notepad or where the keyboard action is wanted. The Virtual Keyboard can replace the manual keyboard and can do actions faster and more easily. There cannot be any wear and tear of the Keyboard in this case.

V. CONCLUSION

The Virtual Mouse color recognition program will constantly acquiring real-time images where the images will undergone a series of filtration and conversion. Whenever the process is complete, the program will apply the image processing technique to obtain the coordinates of the targeted colors position from the converted frames. After that, it will proceed to compare the existing colors within the frames with a list of color combinations, where different combinations consist of different mouse functions. If the current colors combination found a match, the program will execute the mouse function, which will be translated into an actual mouse function to the users' machine.

By providing a virtual keyboard where the keyboard will be displayed on the monitor screen, the user can use the virtual keyboard through virtual signs by this we conclude to make a virtual environment to interact with the computer system.

VI. REFERENCES

[1] S. Shriram, B. Nagaraj, J. Jaya, S. Shankar, P. Ajay - "Deep Learning-Based Real-Time AI Virtual Mouse System Using Computer Vision to Avoid COVID-19 Spread", Engineering, Volume 2021, pp. 1-8.

[2] Sugnik Roy Chowdhury, Sumit Pathak, M.D. Anto Praveena - "Gesture Recognition Based Virtual Mouse and Keyboard", 2003 International Journal on Multimedia and Expo. ICME'03. Proceedings, 2020, pp. 585-589.

[3] Chinnam Datta Sai Nikhil, Chukka Uma Someswara Rao, E.Brumancia, K.Indira, T.Anandhi, P.Ajitha – "Finger Recognition and Gesture based Virtual Keyboard", 2020, 2016 IEEE 6th International Journal on Advanced Computing, pp. 1321-1324.

[4] Muhammad Jehanzeb, Muhammad Sajid Khan, Umair Hassan, Majid Mehmood – "A new 3D Viewer system based on hand gesture recognition for smart interaction", International Journal on Advanced Computing Volume: 01, Issue: ICCIT- 1441, Page No.: 116 - 119, 9th & 10th Sep. 2020.

[5] Purnendu Mishra , Kishor Sarawadekar – "Fingertips Detection in Egocentric Video Frames using Deep Neural Networks", International Journal on Image and Vision Computing 2019, pp. 456-460.

[6] Vantukala VishnuTeja Reddy, Thumma Dhyanchand, Galla Vamsi Krishna, Satish Maheshwaram - "Virtual Mouse Control Using Colored Finger Tips and Hand Gesture Recognition", Journal on Medical Technologies, 2020, pp. 1-4.

[7] Chang-Zheng Li, Chung-Kyue Kim, Jong-Seung Park - "The Indirect Keyboard Control System by Using the Gaze Tracing Based on Haar Classifier in OpenCV", International Journal on Information Technology and Applications, 2019, pp. 362-366

[8] Krutika Jadhav, Fahad Jagirdar, Sayali Mane, Jahangir Shahbadi – "Virtual Keyboard and Virtual Mouse", IEEE Access, 2020, pp. 36-43.

HEALTHCARE ASSISTANT AND COMPANION USING AI/ML AND OPENCV

Anshul Kumar [1], Anurag Mozumdar [2], Ayush Srivastav [3], Bhaskar Anand [4], Roopa KT[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Roopa KT**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
anshulkumarsingh2181@gmail.com, anurag.mz19@hotmail.com, ayushsrivastav11@gmail.com, bhaskaranand796@gmail.com, roopakt@sapthagiri.edu.in

Abstract **- Ideally users should be able to maintain a Work-Life balance when working on a PC, and have regular intervals to keep a track of their health, posture, water intake and have healthy interactions outside of their designated work. In reality users sit and work for long hours on their PCs and immerse themselves in their tasks and don't track their health, take breaks or engage in conversations. This has become a regular issue since starting of pandemic. This has led to Workplace Loneliness, Mental Issues and Health Issues. Our work strives to tackle these issues with an assistant and companion application by interacting with the user and tracking their vitals, posture and water intake etc, and track user emotions and mood by capturing user image in real time.**

I. INTRODUCTION

Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experiences.

Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so. Machine learning algorithms use historical data as input to predict new output values.

Personal Assistance are one of the most trending application. It is the service provided in a software platform with an interactive user interface. One needs to take care of themselves to lead a healthy life. Taking a look at the daily routine of people, they spend time spending long hours working on their PCs. Most of the time this leads to an unhealthy lifestyle. User cannot track their own lifestyle. For users with such busy schedule, this application provides major help.

This application plays various roles in day-to-day life of the users. We present the virtual assistant. More than that it provides steps for care, keeping track of their activities.

A personal health assistant that is capable of monitoring a patient's day to day activities and health condition. Along with a wearable device that senses the body temperature, heart rate, and mood, it provides real time tracking. It also captures the user's facial expressions and emotion and suggest appropriate actions to help the user.

II. LITERATURE SURVEY

[1] Big Data and Cognitive Computing, "DASentimental: Detecting depression, anxiety and stress in texts via emotional recall, cognitive networks and machine learning", A. Fatima, , Y. Li , T.T. Hills and M. Stella, 2021, 77-103:

Most current affect scales and sentiment analysis on written text focus on quantifying valence (sentiment) –the most primary dimension of emotion. However, emotions are broader and more complex than valence. Distinguishing negative emotions of similar valence could be important in contexts such as mental health. This project proposes a semi-supervised machine learning model (DASentimental) to extract depression, anxiety and stress from written text. First, we trained the model to spot how sequences of recalled emotion words by N=200 individuals correlated with their responses to the Depression Anxiety Stress Scale (DASS-21). Within the framework of cognitive network science, we model every list of recalled emotions as a walk over a networked mental representation of semantic memory, with emotions connected according to free associations in people's memory.

[2] International Journal of Research in Engineering and Science, "Portable Voice Recognition with GUI Automation", P.Krishnaraj,F.Mohamed Faris,D.Rajesh, 2021, 20-23:

Artificial intelligence technologies are beginning to be actively used in human life. Autonomous devices are becoming smarter in their way to interact with both a human and themselves. One of the relevant trends in artificial intelligence is the technology of recognizing the natural language of a human. New insights in this topic can lead to new means of natural human-computer interaction, in which the machine would learn how to understand human's language, adjusting and interacting in it. One of such tools is voice assistant, which can be integrated into many other intelligent systems. In this paper, the principles of the functioning of voice assistants are described, its main shortcomings and limitations are given. The method of creating a local voice assistant without using cloud services is described, which allows to significantly expand the applicability of such devices in the future.

[3] 2020 Fourth World Conference on Smart Trends in Systems, Security and Sustainability, "Artificial Intelligence-based Voice Assistant", Subhash S, Prajwal N Srivatsa, Siddesh S, Ullas A,Santhosh B ,2020, 593-596:

Conversational agents are natural language interaction interfaces designed to simulate human conversations using Artificial Intelligence (AI). This paper explores current applications of these systems and raises the lack of their availability in education. To address this problem, we provide the design of a conversational agent system, which is efficient and time-saving in assisting student/college seeking information about curriculum, scheduling, teachers, classroom location at any

time 24/7/365. To verify and validate the design and implementation of our proposed model, a pilot project has been set up involving three leading academic institutions. This platform is designed and developed to help universities provide continuous and instant assistance to their student, staff, and faculty communities

[4] Translational Psychiatry, "Personalized machine learning of depressed mood using wearables", Rutvik V. Shah, Gillian Grennan, Mariam Zafar Khan, Fahad Alim, Sujit Dey , Dhakshin Ramanathan and Jyoti Mishra, , 2021:

Depression is a multifaceted illness with large interindividual variability in clinical response to treatment. In the era of digital medicine and precision therapeutics, new personalized treatment approaches are warranted for depression. Here, we use a combination of longitudinal ecological momentary assessments of depression, neurocognitive sampling synchronized with electroencephalography, and lifestyle data from wearables to generate individualized predictions of depressed mood over a 1-month time period. This study, thus, develops a systematic pipeline for N-of- 1 personalized modelling of depression using multiple modalities of data. In the models, we integrate seven types of supervised machine learning (ML) approaches for each individual, including ensemble learning and regression-based methods. All models were verified using fourfold nested cross- validation. The best-fit as benchmarked by the lowest mean absolute percentage error, was obtained by a different type of ML model for each individual, demonstrating that there is no one-size-fits-all strategy.

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] Graphical User Interface
2] Virtual Assistant
3] Emotion Classification
4] Smart Watch Data

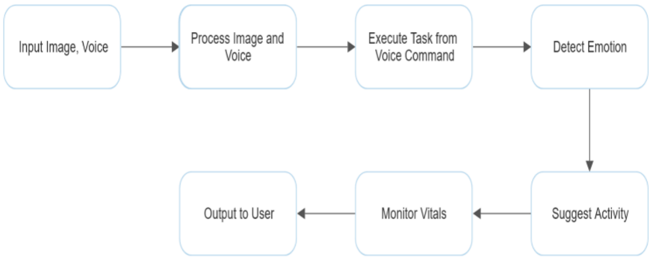


Figure 1. Architectural design of implementation

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] Graphical User Interface

This module provides a user interface for ease of interaction with user. It contains 3 user-defined functions. The first function **Ui_MainWindow()** Contains the visual and component layout of the User Interface. All the borders, font properties, window size, buttons etc are defined in this. The second **startTask()** function has an event button starts that virtual assistant processes and other defined tasks like clock and UI transition. The function **showTime()** starts the clock embedded in the GUI.

2] Virtual Assistant

This module performs automated tasks based on voice commands like - search, email etc. It takes input as audio from microphone and the output is text to speech along with executing the task. 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. Tasks like query execution, Google search, Wikipedia search, playing music and some more utility tasks are performed.

3] Emotion Classification

This module classifies the user's emotion and sends it as output. In order to make computers classify images, it has to be trained on datasets to be able to distinguish between images. We have trained our model using OpenCV to recognize user emotions. The user defined function, **emoDet()**, takes input from user's webcam as frames(individual pictures) sends it to a detection model, compares it against its database and classifies user emotion into seven categories and calculate which has the maximum probability. The detected emotion is stored in a string and returned to the main function.

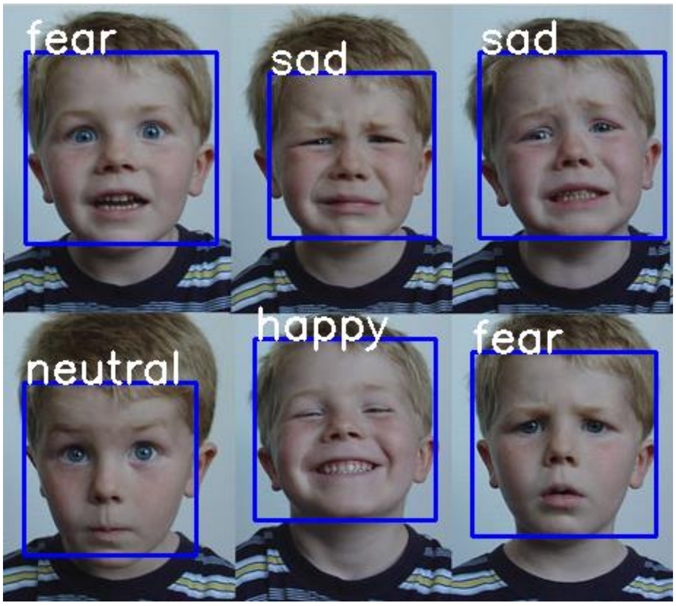


Figure 2. How a computer classifies an image

ANN is made of three layers namely input layer, output layer, and hidden layer/s. There must be a connection from the nodes in the input layer with the nodes in the hidden layer and from each hidden layer node with the nodes of the output layer. The input layer takes the data from the network. The hidden layer receives the raw information from the input layer and processes them. Then, the obtained value is sent to the output layer which will also process the information from the hidden layer and give the output. The interconnection of the nodes between the layers can be divided into two basic classes, namely the feedforward neural network and recurrent neural network. In the feedforward ANN, the information movement from inputs to outputs is only in one direction. On the other hand, in the recurrent ANN, some of the information moves in the opposite direction as well

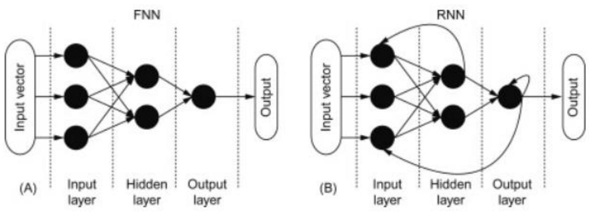


Figure 3. Working of ANN in image detection

4] Smart Watch Data

Wearable devices are products controlled by electronic components and software that can be incorporated into clothing or worn on the body like accessories. Smartwatch is one such device. In our work we have added support for smartwatch data to be monitored. This module provides integration of smartwatch into the application. The data from smartwatch is fetched monitored using this module.

There are three functions in this module :

1] steps() - Gets the step count from user's smartwatch and displays it on the GUI.

2]calories() - Gets the number of calories burnt and displays it on GUI.

3]doWork() - Over a scheduled time if the steps and calories don't change it notifies the user to take a break and walk a few steps.

This module helps in achieving real-time monitoring.

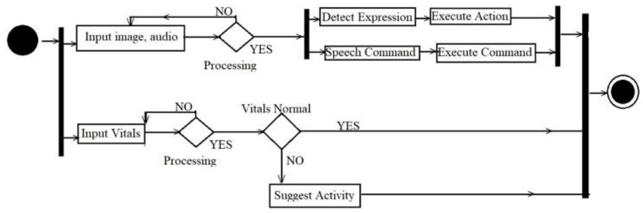


Figure 4. Activity Diagram of working of modules.

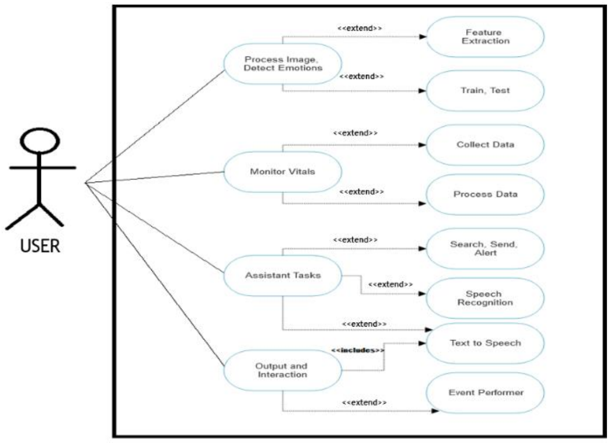
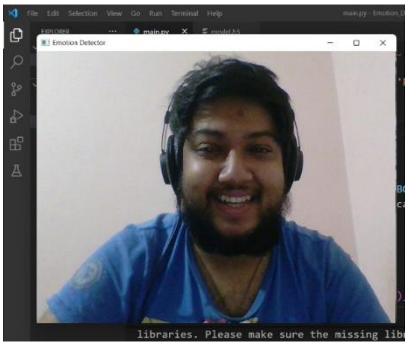
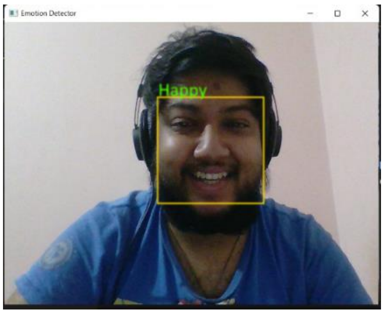


Figure 5. Use case Diagram

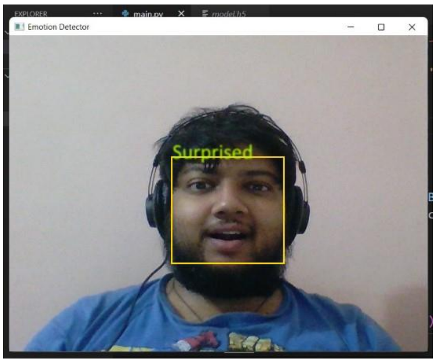
IV. RESULT



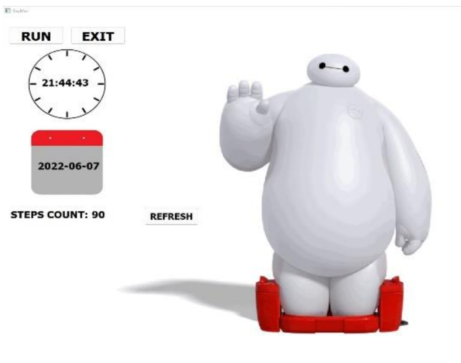
Plain image



Detected image



Detected Emotion Surprise



GUI with step count from smartwatch

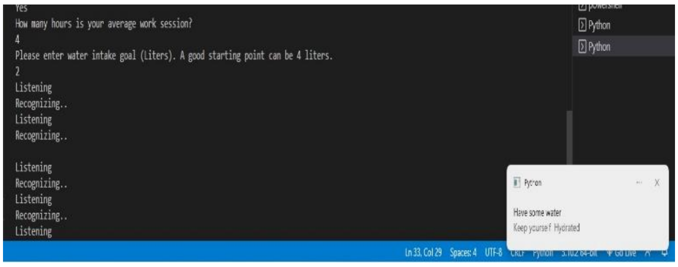
Figure 5. Output

Combining a Virtual Assistant with Emotion Tracker and Health tracker seemed like the need of the hour. Our project takes an image as input, computes the facial emotion out of 7 states and produces the result. If the user is sad, activity like listening to joke or playing songs is suggested.

The second part keeps listening to the audio from user and performs automated actions like playing songs, opening G-mail for sending mails, summarize Wikipedia articles, searching google among other utility services. The assistant uses gTTS to reply to the user, like telling a joke. This makes the session interactive as it simulates to a certain extent a real-world conversation. In the background it also tracks the water intake and periodically sends notification.

The front-end of the program, which is the GUI, starts the execution of the above modules. It also maintains a clock and step-count of user in the Home-screen. If user is idle for some time, it is reflected in the step count, a notification for taking a break like walking a few steps is sent.

All the modules work in tandem to provide the functioning of the Virtual Assistant and Healthcare Companion.



Virtual Assistant running in background taking input, performing tasks and displaying water intake notification.

Figure 6. Program Output

V. CONCLUSION

Looking at the various uses and applications of Virtual assistant to perform tasks and provide a form of companionship and interaction to the user, and the requirement for Healthcare tracker that can bring a positive lifestyle change to user, our endeavour was to merge the two components. Creating a Virtual assistant that also acts as a healthcare companion. The proposed system combines the virtual assistant with the healthcare system, keeps the user engaged in small real-life activities, tracks their vitals in real time, provides companionship and makes decisions based on their health data for a healthy work- life balance and lead to better lifestyle choices. Our work can further be improved by updating the GUI, reducing the code and library size and adding more wearable device support. The aim of our project to bridge the gap between Virtual Assistant and Healthcare companion has been achieved.

VI. REFERENCES

[1] Big Data and Cognitive Computing, “DASentimental: Detecting depression, anxiety and stress in texts via emotional recall, cognitive networks and machine learning”, A. Fatima, , Y. Li ,T.T. Hills and M. Stella, 2021, 77-103.

[2] International Journal of Research in Engineering and Science, “Portable Voice Recognition with GUI Automation”, P.Krishnaraj, F.MohamedFaris,D.Rajesh, 2021, 20-23.

[3] International Journal of Engineering and Advanced Technology, “The Voice Enabled Personal Assistant for Pc using Python”, V. Geetha, C.K.Gomathy, Kottamasu Manasa Sri Vardhan, Nukala Pavan Kumar, July 2021, 162-165.

[4] Frontiers in Psychology, “Facial Expression Emotion Recognition Model Integrating Philosophy and Machine Learning Theory”, Zhenjie Song ,2021, 50-59.

[5] 2020 Fourth World Conference on Smart Trends in Systems, Security and Sustainability,“Artificial Intelligence-based Voice Assistant”, Subhash S, Prajwal N Srivatsa, Siddesh S, Ullas A,Santhosh B , 2020, 593-596.

[6] Translational Psychiatry, “Personalized machine learning of depressed mood using wearables”, Rutvik V. Shah, Gillian Grennan, Mariam Zafar Khan, Fahad Alim, Sujit Dey ,Dhakshin Ramanathan and Jyoti Mishra , 2021.

Network Intrusion Detection System Using Artificial Neural Network

Chandrakala C Y [1], Anjana G Nadig [2], Harshitha R [3], Likhitha D J [4], Chandini A [5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Chandini A**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
chandrakalayalival@gmail.com, anjanagnadig721@gmail.com, harshuhamsa@gmail.com, likitharam@gmail.com

Abstract - Intrusion detection plays an important role in ensuring information security, and the key technology is to accurately identify various attacks in the network. In our study, we explore how to model an intrusion detection system based on deep learning, and we propose a deep learning approach for intrusion detection using recurrent neural networks (RNN-IDS). Moreover, we study the performance of the model in binary classification and multiclass classification, and the number of neurons and different learning rate impacts on the performance of the proposed model. We compare it with those of J48, Artificial Neural Network, Random Forest, Support Vector Machine and other machine learning methods proposed by previous researchers on the benchmark dataset. The experimental results show that RNN-IDS is very suitable for modeling a classification model with high accuracy and that its performance is superior to that of traditional machine learning classification methods in both binary and multiclass classification. The RNN-IDS model improves the accuracy of the intrusion detection and provides a new research method for intrusion detection. The computer security has become a major challenge. Tools and mechanisms have been developed to ensure a level of compliance. These include the Intrusion Detection Systems (IDS).

I. INTRODUCTION

Today, information systems represent the essential point of all enterprises, regardless of their size or sector of activity. Nevertheless, the data stored and the services rendered by these information systems present themselves as potential targets for various types of attacks. With their great diversity and specificity to systems, these attacks can have catastrophic consequences. In this context, computer security has become a major challenge, and work in this area of research is increasing. Various tools and mechanisms are developed to ensure a level of safety that meets the demands of modern life. These tools include the Intrusion Detection System (IDS). IDS are tools designed to detect attempted attacks on a network, and to identify abnormal activities and behaviors that are designed to interfere with the proper functioning of the system. Intrusion detection is classified into network-based intrusion detection system (NIDS), host-based intrusion detection system (HIDS) and Hybrid IDS. And detect malicious activity by monitoring the entire network traffic. IDS systems are installed in general by placing the network interface card in promiscuous mode to capture all networks traffic segments. While HIDS is used to monitor encrypted traffic data to a specific host. It works on information collected from within an individual computer system. Hybrid IDS bring together the characteristics of NIDS and HIDS. They allow, to monitor the network and terminals Network based IDS.

This paper proposes a device for get admission to inside DL. IDS are gear designed to locate tried community assaults, and to perceive uncommon sports and behaviors designed to disrupt device overall performance. DL-IDS, which makes use of a hybrid community of Recurrent Neural Network (RNN) and Deep Neural Network (DNN) to extract brief and neighborhood functions of community visitors facts to enhance the accuracy of intrusion detection. In the version schooling section, DL-IDS makes use of section weights to scale the version. This technique reduces the impact of the wide variety of unprecedented samples of plenty of assaults for plenty of version schooling on version overall performance and improves the power of schooling and prediction. Finally, we take a look at DL-IDS to differentiate a couple of kinds of community visitors from the CICIDS2017 database and examine it to the CNN version only, the LSTM version only, and different device studying fashions due to the fact CICIDS2017 is a actual community visitors datase that simulates actual-international situations. The outcomes display that DL-IDS reached 98.67% with whole accuracy, and the accuracy of every kind of assault become greater than 99.50%, which accomplished remarkable outcomes in all fashions.

In this have a look at ,we followed a malicious visitors evaluation technique primarily based totally on RNN and DNN in an effort to extract and examine unstructured community facts facts for each short-time period and short-time period facts. We have carried out schooling and checking out primarily based totally at the CICIDS2017 database that nice fits the real community environment. We completed a sequence of exams to illustrate that the proposed version allows the evaluation of the energetic go with the drift go with the drift. IDS is a completely vital protection device in complicated and huge community assaults, however the loss of to be had public information presently hinders its continuation.

IDS are tools designed to detect unauthorized use, misuse and signature of the computer network by insiders or outsiders. In order to detect attacks that a system may experience, it is necessary to have a specialized software to collect data passing through the system and which will be used subsequently in the detection process. There are several tools that can accomplish this task among them we cite network traffic sniffer like Wireshark, Snort, Prelude. However, the data from this collection tool are voluminous and their processing by existing methods is time-consuming.

Machine Learning (ML) based IDS systems based algorithms such as K-means, Hidden Markov Model and Self Organizing Maps (SOM); Neural networks, decision trees, Naive Bayes and Support Vector Machine. Not long ago, Deep learning (DL) has revolutionized a multitude of fields newly and has supplied state-of-the-art performances in fields such as computer vision and natural language processing.

II. LITERATURE SURVEY

[1] Wang Peng, Xiangwei Kong, Goujin Peng proposed a "Network Intrusion Detection System".With the continuous development of computer network technology, security problems in the network are emerging one after another, and it is becoming more and more difficult to ignore. For the current network administrators, how to successfully prevent malicious network hackers from invading, so that network systems and computers are at Safe and normal operation is an urgent task. This paper proposes a network intrusion detection method based on deep learning. This method uses deep confidence neural network to extract features of network monitoring data, and uses BP neural network as top level classifier to classify intrusion types. The method was validated using the KDD CUP'99 dataset from the Lincoln Laboratory of the Massachusetts Institute of Technology. The results show that the proposed method has a significant improvement over the traditional machine learning accuracy.

[2] Sara Al-Emadi, Aisha Al-Mohannadi, Felwa Al-Senaid proposed "Using Deep Learning Techniques for Network Intrusion Detection" In recent years, there has been a significant increase in network intrusion attacks which raises a great concern from the privacy and security aspects. Due to the advancement of the technology, cyber-security attacks are becoming very complex such that the current detection systems are not sufficient enough to address this issue. Therefore, an implementation of an intelligent and effective network intrusion detection system would be crucial to solve this problem. In this paper, they use deep learning techniques, namely, Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) to design an intelligent detection system which is able to detect different network intrusions. Additionally, they evaluate the performance of the proposed solution using different evaluation matrices and they present a comparison between the results of our proposed solution to find the best model for the network intrusion detection system.

[3] Gabriel Chukwunonso Amaizu, Cosmas Ifeanyi Nwakanma, Jae-Min Lee, and Dong-Seong Kim, proposed "Investigating Network Intrusion Detection Datasets Using Machine Learning" There's been a series of datasets with regards to network intrusion detection in recent years, and a significant number of studies has also been carried out using these datasets. In this paper they aim to explore these datasets while also showing the capability of the proposed model to accurately detect and classify network intrusions. This paper presents a deep learning based model for network intrusion as well as a comparative analysis of the performance of three major network intrusion datasets using the proposed model. Results showed the model to perform best for NSL-KDD, followed by UNSW-NB15 and CSECIC-IDS2018 respectively. Model accuracy achieved for these datasets were NSL-KDD (97.89%), UNSW-NB15 (89.99%), and CSE-CIC-IDS2018 (76.47%) was achieved.

[4] Dimitra Chamou, Petros Toupas, Eleni Ketzaki,Stavros Papadopoulos, Konstantinos M. Giannoutakis,Anastasios Drosou, Dimitrios Tzovaras proposed "Intrusion Detection System based on Network Traffic using Deep Neural Networks" Nowadays, the small-medium enterprises security against cyber-attacks is a matter of great importance and a challenging area, as it affects them financially and functionally. Novel and sophisticated attacks are emerging daily, targeting and threatening a large number of businesses around the world. For this reason, the implementation and optimization of the performance of Intrusion Detection Systems have attracted the interest of the scientific community. The malicious behavior detection in terms of DDoS and malware cyber-threats using deep learning methods constitutes an extended and the most important part of this paper. The experimental results for the real-time intrusion detection system showed that the proposed model can achieve high accuracy, and low false positive rate, while distinguishing between malicious and normal network traffic.

[5] Lubna Ali Hassan Ahmed,YahiaAbdalla Mohamed Hamad proposed "Machine Learning Techniques for Network Intrusion Detection System: A Survey Paper" The rapid growth of internet technologies and further dependence on online services, increase the demand for keeping these networks and data secure. The protection of online information is becoming even more vital to the national security and economic stability.

Recently, network security has become one of the most concerning subjects in the current research and industry fields. Intrusion Detection Systems (IDS) are considered as the backbone for network and data protection. Throughout time, different IDS approaches have been implemented to attain maximum detection accuracy. Machine learning IDS is one of the promising IDS techniques that have been created to detect known as well as unknown attacks. This paper investigates various machine learning techniques used to deploy Network-based Intrusion Detection System(NIDS). This survey could provide a more robust understanding of the existing techniques and assists intrigued researchers to identify research opportunities and investigate more in this direction.

III. PROPOSED METHODOLOGY

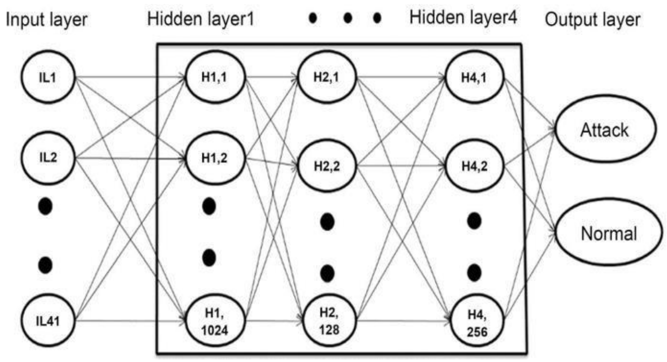
The method for performing project summarization is described in this section. To meet given requirements, we used the process of defining the components, modules, interfaces, and data for the system.

1] DNN Bases Intrusion Detecting System

2] RNN Based Intrusion Detection System

1] DNN Bases Intrusion Detecting System

We proposed an algorithm of deep neural networks or DNN that contains 41 layers of input, 4 layers of hidden and 2 layers of output, the neurons in input-layer to hidden-layer and hidden to output-layer are connected completely, and with 100 iterations. Indeed, the learning is kept constant at 0.01 while the other parameters are optimized. After that for DNN, the number of neurons of the first hidden layer was further increased to 1280 but did not give any appreciable increase in accuracy. Therefore, the number of neurons was set to 1024. We preferred Relu activations for hidden layers (for reasons that the Relu activation function is the most used in neural network architectures and more particularly in convolutional networks, where it has proven to be more effective than the widely used logistics sigmoid function. Since 2017, this activation function is the most popular for deep neural networks) and softmax for the output layers to other activation functions.



Proposed architecture of DNN.

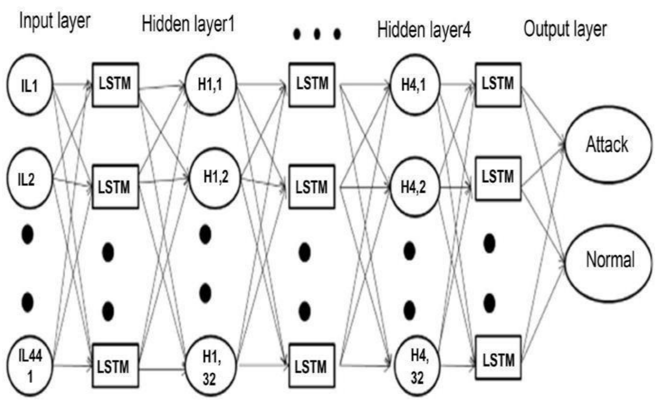
Conventionally, increasing the count of the layers results in better results compared to increasing the neuron count in a layer. Therefore, the following network topologies were used in order to scrutinize and conclude the optimum network structure for our input data. We proposed a DNN architecture with 1, 2, 3, 4 layers for all use cases, as shown in Fig

We proposed a RNN architecture as shown in Figure . The detailed information and configuration details of the RNN architecture is shown in Figure

Layer (type)	Output Shape	Param #
dense_1 (Dense)	(None, 1024)	43008
dropout_1 (Dropout)	(None, 1024)	0
dense_2 (Dense)	(None, 768)	787200
dropout_2 (Dropout)	(None, 768)	0
dense_3 (Dense)	(None, 512)	393728
dropout_3 (Dropout)	(None, 512)	0
dense_4 (Dense)	(None, 256)	131328
dropout_4 (Dropout)	(None, 256)	0
dense_5 (Dense)	(None, 1)	257
activation_1 (Activation)	(None, 1)	0

Capture of configuration of the proposed DNN model.

2] RNN Based Intrusion Detection System



Proposed Architecture of RNN

Considering that recurring neural networks (RNN) with short-term memory (LSTM) can learn from feature representations and automatically model long-term temporal dependencies, as we have seen in Part 7, we offer a fully connected deep LSTM end-to-end for attack-based action recognition. We set the number of neurons of all hidden layers to 8 then 16 and finally 32.

We proposed a RNN architecture as shown in Figure. The detailed information and configuration details of the RNN architecture is shown in Figure.

Different from flow, the packets in sessions have a strict order relationship. The sequence features mainly contain the packet length sequence and the time interval sequence.

Analyzing the sequence can obtain detailed session interaction information. Most machine learning algorithms cannot deal with sequences, and related methods are relatively rare. At present, most sequence feature-based detection adopts the RNN algorithm. Encoding raw data is a common preprocessing step for RNN methods.

Layer (type)	Output Shape	Param #
lstm_1 (LSTM)	(None, None, 32)	9472
dropout_1 (Dropout)	(None, None, 32)	0
lstm_2 (LSTM)	(None, None, 32)	8320
dropout_2 (Dropout)	(None, None, 32)	0
lstm_3 (LSTM)	(None, None, 32)	8320
dropout_3 (Dropout)	(None, None, 32)	0
lstm_4 (LSTM)	(None, 32)	8320
dropout_4 (Dropout)	(None, 32)	0
dense_1 (Dense)	(None, 1)	33
activation_1 (Activation)	(None, 1)	0

3] DATASET Used in NIDS

For several years, research groups have created datasets for Sdis and KDD-Cup 99. These collections provide learning data and tests for the various deep learning models. In addition, they offer the possibility to compare the performance of several IDS on the same data collection. These datasets represent system information grouped together. These data are obtained either by simulators or by real systems

The data used for our experiments are actual data from the CICIDS database.

IDS is a completely vital protection device in complicated and huge community assaults, however the loss of to be had public information presently hinders its continuation. IDS is a completely vital protection device in complicated and huge community assaults, however the loss of to be had public information presently hinders its continuation. Many researchers use personal information from a single organization or behavior information series to check IDS programs, which impacts the reliability in their outcomes to a few degree. Public databases including KDD99 and NSLKDD incorporate information that consists of hand-decided on broadcast functions in place of preliminary community visitors. Data series time is likewise old in comparison to fashionable techniques of assault. In this study, in order to higher mirror actual-time visitors styles on actual networks and new assault techniques, we decided on a CICIDS2017 (Canadian Institute for Cybersecurity) [30] database that consists of visitors congestion and not unusual place time-associated assaults representing actual community visitors Many researchers use personal information from a single organization or behavior information series to check IDS programs, which impacts the reliability in their outcomes to a few degree. Public databases including KDD99 and NSLKDD incorporate information that consists of hand-decided on broadcast functions in place of preliminary community visitors.

4]. ALGORITHMS USED:

DECISION TREE:

The drug decision-making process (DT) is one of the most widely used methods of machine learning in binary categories. It can predict based on training data after making quick choices by creating a small tree. Trees have nodes, and attributes mean test, as its name implies. The branch represents the result of the test, and the leaves are labeled for the separation of each last or last item. The most important step in this process is to choose the best material. The tree tree algorithm ID3 was developed by Ross Quinlan. Data mining and data mining were its main applications. It is now used to process natural language and machine learning. . In this paper, the proposed model used the ID3 algorithm to determine whether the website was legitimate or criminal for sensitive information. To determine the result of a split algorithm, the following steps are taken: 1. Start by reviewing the training data set. Give it the letter 'S,' and it must be structured and separated.

2. Find out which data sets have the best quality.
3. Divide the 'S', each with a number of excellent features.
4. Create a node of the decision tree that contains the best attribute.
5. Repeat step 3 over and over again to create a new solution tree unless you can no longer split it. As a result of the section, it represents the area behind the leaf. Entropy can be used to obtain information. Different attributes with numerical values are selected using divisive and profit denominated data.

NAÏVE BAYES ALGORITHM:

Is a conditional planning algorithm. Bayes theory governs its operation. Recommended because it is easy to use and requires little training. However, it is not desirable for a variety of reasons, including low limitations for a few details, assuming the features are independent. XG Boost is a tree-based algorithm that makes decisions that come first in terms of speed and performance. Its purpose is to minimize damage to the old tree by creating a new tree regularly. This approach, however, can be time consuming. It is also easier than balance.

RANDOM FOREST:

The traditional jungle approach of random decision-making was first proposed by Ho in 1995. Ho established that tree forests separated from wet planes can gain accuracy as they grow without suffering the excessive increase, as long as the forests are periodically barred from being sensitive only to the magnitude of selected features. The next work on the same line concludes that other methods of separation behave in the same way, as long as they are randomly forced to be resistant to the magnitude of a particular factor. Note that this perception of complex segregation (larger forest) to obtain more precisely is almost independent of the general belief that the severity of the divider can grow to a certain degree of precision before being severely damaged. An explanation of the forest's approach to overcrowding can be found in Kleinberg's stochastic prejudice

• If the number of cases in the training set is N, the sample of N cases at random - but by change, from the original data. This sample will be the training used to grow the tree.

• If there is a variation of the input of M, the number m << M is defined for the fact that in one area, the variant m is randomly selected from M and the best division in these m is used to divide the area. The value of m is always maintained as the forest grows. Each tree is grown on a very large scale. No pruning.

IV. RESULT

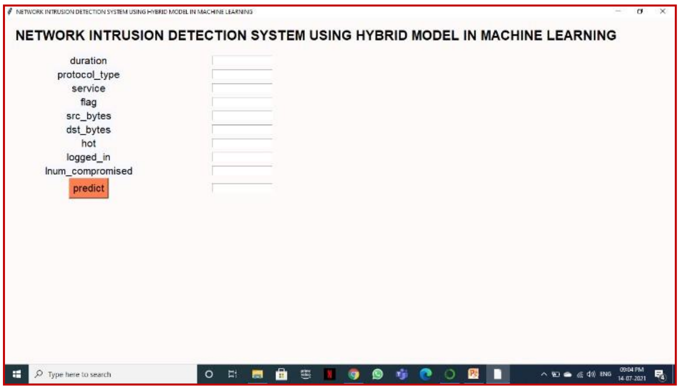


Figure 1.Performing the task to predict the type of intrusion.

The above figure performs the task of prediction to identify the type of attack. Once the type of attack is identified in the intrusion detection it displays the content of message in the below figure represenntation.

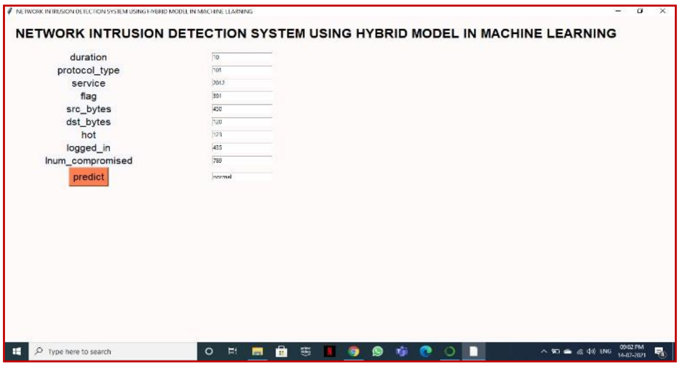


Figure 2. Display after prediction.

Here we can see the network had no Intrusion so the prediction displays the message NORMAL.If no detection is found in the network.

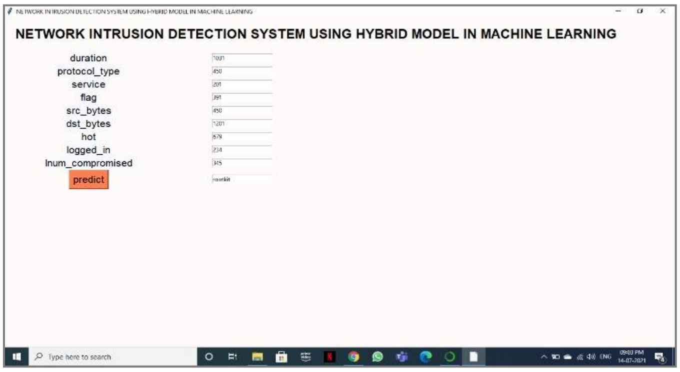


Figure 3.Input data is inserted to the network.

Here we can see that the provide input data is attacked by a ‘rootkit’ intrusion. When the data is inserted to the intrusion detection network.

V. CONCLUSION

The objective of this work was to propose a new approach based on learning algorithms that makes it possible to prevent, detect and respond to an attack in order not to allow the same aggression to recur. Detection allows the identification of a certain characteristic that violates security policies. This allow us to automate intrusion detection using Deep Learning algorithms, which provide an instant update of a new malware sample following its introduction into the classification system. The results are interesting. However, there are still areas for improvement in this approach. The future of network security technologies may be in the further integration of the various available deep learning tools to ensure network security, because the administration of equipment safety is an increasingly complex and extensive task, while security needs are growing.

VI. REFERENCES

[1] Thing, Vrizlynn LL. "IEEE 802.11 Network Anomaly Detection and Attack Classification." 2017 IEEE Wireless Communications and Networking Conference (WCNC). IEEE, 2017.

[2] M. M. Hassan, A. Gumaei, S. Huda, and A. Ahmad, “Increasing the trustworthiness in the industrial IoT networks through a reliable cyberattack detection model,” IEEE Transactions on Industrial Informatics, vol. 16, no. 9, 2020.

[3] F. A. Khan and A. Gumaei, “A comparative study of machine mlearning classifiers for network intrusion detection,” in Proceedings of the International Conference on Artificial Intelligence and Security, pp. 75–86, New York, NY, USA, July 2019.

[4] Vinayakumar R., Soman K. and Prabaharan P. (2020) “Evaluation of Recurrent Neural Network and It’s Variant for Intrusion Detection System (IDS)”.

[5] Abhijit Das; S G Balakrishnan “A Comparative Analysis of Deep Learning Approaches in Intrusion Detection System”2021 IEEE

[6] Loreen Mahmoud Raja Praveen ”Artificial Neural Networks for detecting Intrusions: A survey”2020 IEEE

[7] Dimitar Nikolov, Iliyan Kordev, Stela Stefanova “Concept for network intrusion detection system based on recurrent neural network classifier” 2018 IEE

[8] Tuan A Tang, Lotfi Mhamdi, Des McLernon, Syed Ali Raza Zaidi and Mounir Ghogho “Deep Recurrent Neural Network for Intrusion Detection in SDN-based Networks”2018 IEEE

[9] Jin Kim, Nara Shin, S.Y. Jo, and Sang Hyun Kim, ”Method of Intrusion Detection System based on Deep Neural Network”, in 2017

[10] Alom, M.Z. and Taha, T.M. (2017) Network Intrusion Detection for Cyber Security Using Unsupervised Deep Learning Approaches. 2017 IEEE National Aerospace and Electronics Conference (NAECON), Dayton, OH, 63-69.

Face Mask and Social Distance detection using AI and ML

Bharath Gowda R[1],Likhith R [2], Bharath R[3], Anjan Gowda C[4], Prof. Akshatha AR[5] 1-4

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India

[5]Professor **Akshatha A R**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India

bharathgwda06@gmail.com,bharathkumar9161@gmail.com,anjancgowda13@gmail.com,Likhiraam2000@gmail.com, akshathaar@sapthagiri.edu.in

Abstract: **The thought is to design a facial covering acknowledgment alongside recognizing social removal using PC vision techniques. The calculation likewise creates an exact face division cloak from any optional size input picture. Beginning from the RGB image of any size, calculation utilizes predefined preparing loads with VGG-16 Architecture used to feature extraction. Just go for it one of the pre-arranged models accessible in python libraries has been used to perceive individuals with the accessible Database. Models like YOLOv3 and Retina MobileNetv2 are utilized for social distance and facial covering distinguishing proof independently. Convolutional Networks have been examined to semantically divide the ROI of face pictures. Besides, the proposed technique has furthermore shown unimaginable perceptions about seeing non-forward looking countenances. Close by this perceiving different facial covers in a singular casing is moreover prepared. Tests and assessments were performed on Multi Parsing Human Dataset (MPHD), anticipating an accuracy of 95% and the sky's the limit from there.**

KEYWORDS: Convolution Networks, YOLOv3, Retina MobileNetv2 , MPHD.

I. INTRODUCTION

The accessible existing used face ROI computations will be by and large low to distinguish the forward looking countenances. This adventure proposes a model for face ID using semantic division in an image by gathering each pixel as face and non-face that is sufficiently making a matched classifier and afterward, distinguishing that divided district will be thought of as a contribution to our proposed model. Semantic division of human face is performed with the assistance of a totally convolutional network. The lively improvement of the significant learning, considering the significant examination of target acknowledgment, has made exceptional new development. There are two kinds of item identification dependent on profound learning: one is the R-CNN series reliant upon neighborhood acknowledgment: Fast R-CNN, Faster R-CNN and the other is the backslide SSD and YOLO. In view of the locale target acknowledgment strategy, it contains an extensive variety of potential regional delivering parts what's more, unique component layers.

CNN based association models YOLOv3 and Retina MobileNetv2 are utilized to achieve the acknowledgment accuracy. CNN has a significant learning plan and contains more superior layers. Planning of the model will be conceivable easily when the brain network examinations by utilizing arrangements out of an image. It essentially understands the best way to deal with removing features from an image or a video and builds a model according to prerequisite. We had mixed the strategy of cutting edge significant learning and praiseworthy projective computation methodology which helps as well as assists with meeting the persistent necessities, yet moreover keeps high gauge precision. In the proposed model that the individual perceived isn't keeping the Coronavirus prosperity guidelines, encroachment alerts will be likewise shipped off to control the local area for taking further action. It grants mechanizing the course of action and approves the wearing of the cover and observes the guidelines of social elimination. Model accuracy assumption around 95% accuracy.

II. BACKGROUND STUDY (Literature)

By and large, the majority of the paper's which are alluded to are zeroing in on facial covering location, for the subsequent goal on keeping social separation we have less references. The center is to display a calculation which are utilized to identify both facial covering and distance between one individual to the next. In [1] The author proposed a framework constructed utilizing profound learning calculation. OpenCV, MobilenetV2 for face acknowledgment and SSD for recognizing individuals. SSD is fit for identifying numerous articles in a single casing yet in this framework, it was restricted to just a single individual. By alluding [2] Usage of Retina Facemask locator which utilizations include pyramid network for high semantic data. A ResNet spine for accomplishing exactness and furthermore consideration component which mirrors people to zero in on significant highlights in the edge. With the overview of [3] creator introduced a framework to identify concealed and exposed faces utilizing the OpenCV, CNN, Keras, Tensorflow, PyTorch library alongside barely any AI libraries. For removing more vigorous elements MobilenetV2 is made as the spine. In [4], the creators have planned a framework utilizing PC vision. The CCTV streams to guarantee individuals' security by setting off alarming motors. By executing move learning approach, the distance was determined utilizing Euclidian equation. Alluded paper[5], has featured preparing on enormous number of datasets and proposed a face include based strategy to approve wearing covers by a dynamic calculation. The author in [6], has been examined by considering many face acknowledgment methods, for example, eigenface, brain organizations, fisherface, mathematical component coordinating. Out of which brain networks showed

96.2% exactness ending up the best face recognizer. In [7], Yolov3 is utilized, whose speed of recognition, power makes it an optimal model for identification. Since ROI (Region of Interest) is estimated the model results exact outcome with insignificant blunder which is conceivable by its viable. certainty score. Yonghui [8], proposed a constant item recognition model, yolov3 which is lightweight and proficient. Two phase CNN including highlights, for example, bouncing box and item order was made as the spine for the reduced Yolov3 model.

Research Gap

Distance between people is determined when every unique individual (moving/stale) are identified obviously. In conditions of cross-over, individual acknowledgment will be fruitless and the distance can't be figured. The principal hole is recognized in existing framework is highlight extraction for dimensionality decrease and class expectation for facial coverings. The significant downsides of existing frameworks are exactness, it doesn't recognize the non-front facing faces and various countenances in single edge.

III. METHODOLOGY

The endeavor proposes a strategy for obtaining division covers clearly from the photos containing something like one appearance and taking an alternate route. The data image of any emotional size is resized to 224 * 224 and dealt with the pre-arranged VGG model association for feature extraction and assumption. The yield of the association is then presented to the post taking care of. At first the pixel potential gains of the face and establishment are presented to overall thresholding. Post dealing with movement should be performed on the eventual outcomes of face cover and individual revelation using PC vision techniques. For ensuring the social elimination among the perceived individuals, Geometrical (shape) features like district, edge, major and minor center point are still up in the air and assess the distance of each and every individual perceived. The proposed system helps with ensuring the security of people at public spots through normally noticing whether they keep a safeguarded social division, and besides by recognizing whether an individual wears face cover. The structure uses a trade advancing method for managing execution smoothing out with a significant learning computation and a PC vision to thus screen people transparently with a camera composed with a raspberry pi4 and to perceive people with cover or no cloak.

The proposed system has an effective architecture consisting of four modules:

1. Training module : trained on appropriately large datasets containing images labeled “with mask” and “without mask”.
2. face mask detection on images and videos : trained separately by providing the facemask dataset to the Retina Facemask detector which is a MobilenetV2 model, a basic variant of CNN classifier.
3. social distance detection on videos: built using the YOLOv3 model which is pre-trained on the coco datasets. YOLO upscales images or videos at every detection layer. Here YOLO detects the class “person” and outputs a confidence score that tells how certain the predicted bounding box actually encloses some object. It always looks for greater than 50% confidence before making any prediction.
4. integrated face and social distance detection module: integration is done with a suitable activation function by utilizing the TorchVision from the PyTorch library.

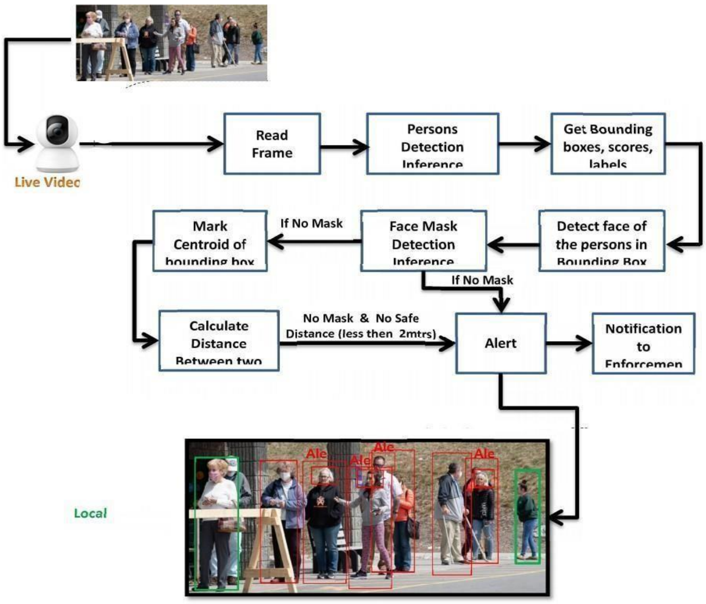


Figure 1: System Architecture

IV. IMPLEMENTATION

Yolov3 for guaranteeing the social distance with its system of SSD will isolate the picture into helpful matrix cells that predict bouncing boxes. The picture is taken into the darknet engineering which is an Open-source brain network structure present in Yolov3 and the spine being CNN. Since the n number of center layers present in the CNN is crossed more elements are separated and subsequently the model's certainty score is expanded. The model results just when the certainty score is half or more. Mathematical (shape) highlights like region, edge, major and minor hub are determined for estimating the distance among every single individual identified. The administrator checking can undoubtedly picture the protected and hazardous count by setting up a limit.

V. RESULTS

The graph in figure 2 connotes the model's preparation exactness after the number of age testing done. As it's clear that low exactness obtains improved results with rehashing the number of tests. Figure 3 addresses the CCTV live stream location of individuals and their distance between one another alongside protected and hazardous count and furthermore all out number of individuals distinguished. Assuming this count passes a specific boundary count, the administrator will be cautioned. Figure 4 portrays exact recognition of front facing and non-front facing facial coverings. Figure 5 implies recognition of people remaining in line who are limited with red and green boxes showing infringement and non-violation of the guidelines respectively.

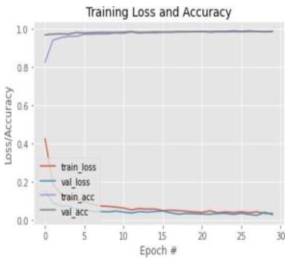


Figure 2: Model training accuracy/lose curves.

Figure 3: Detection from CCTV live streams.

Figure 4: Detection of frontal and non-frontal face masks.

Figure 5: Detection of people in crowded places.

VI. CONCLUSION

Proposed model with the location of facial covering and social separating shields each person and screen individuals openly places to stay away from the spread of novel Covid. Facial covering recognition and social distance is a difficult issue in many fields. In this way, we use the Retina MobileNetv2 model for facial covering identification and YOLOv3 for social distance location with the assistance of CCTV observation coordinated in open regions. The administrator checking the CCTV can undoubtedly see the quantity of individuals disregarding the standards by setting up an edge. The model can possibly distinctly diminish infringement by mediations continuously. Thus, the proposed framework would propel local area wellbeing through saving time and assisting with decreasing the victory of Covid. It likewise gives high expectation precision of above 95% despite the fact that sematic division actually stays a test. Recognizing the front facing and non-front facing faces has forever been incorrect, yet it is moderated from the proposed model. This model is great and adaptable to be utilized in places like air terminals, clinics, enterprises, schools, banks, shopping centers, and so on.

REFERENCES

[1] Shashi Yadav, “Deep Learning based Social distancing detection”, International Journal for Research in Applied Science & Engineering Technology, ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429 Volume 8 Issue VII July 2020.

[2] Mingjie Jiang, Xinqi Fan and Hong Yan, “Retina Face Mask – A Face Mask detector”, Innovation and Technology Commission and City University of Hong Kong, arXiv:2005.03950v2 [cs.CV] 8 Jun 2020.

[3] .Vinitha.V, Velantina.V, “COVID-19 Face mask detection using Deep Learning and Computer Vision”, International Research Journal of Engineering and Technology, ISSN: 2395-0056 Volume: 07 Issue: 08 Aug 2020.

[4] P. Khandelwal, A. Khandelwal, S. Agarwal, “Using computer vision learning to enhance safety of workforce in manufacturing in a post covid world”, arXiv.org>cs> arXiv:2005.05287, May 2020.

[5] D. Matthias, M. Chidozie, “Face mask detection application and dataset”, African Journals Online, Journal of computer science and its application, 3 March 2021.

[6] Riddhi Patel, Shruti B. Yagnik “A Literature Survey on Face Recognition Techniques”, International Journal of Computer Trends and Technology (IJCTT) - volume 5 number 4 - Nov 2018.

[7] Wang Yang, Zheng Jiachun, “Real-time face detection based on YOLO”, 1st IEEE International Conference on Knowledge Innovation and Invention 2018.

[8] Yonghui Lu, Langwen Zhang, Wei Xie “YOLO-compact: An Efficient YOLO Network for Single Category Real-time Object Detection”, 2020 Chinese Control and Decision Conference (CCDC 2020).

Crop Yield Prediction Using Machine Learning Algorithms

Sowmya C
Student; Dept. of ISE
SCE, Bengaluru, India
csowmya319@gmail.com

Sri Varshni K S
Student; Dept. of ISE
SCE, Bengaluru, India
srivarshini078@gmail.com

Swetha S
Student; Dept. of ISE
SCE, Bengaluru, India
swethashree96990@gmail.com

Tejesh B S
Dept. of ISE
Student
SCE, Bengaluru, India
tejujetly@gmail.com

Dr. H R Ranganatha
Dept of Information Science and Engineering
Professor and Head of Department of ISE
Sapthagiri College of Engineering
Bengaluru, India
hodise@sapthagiri.edu.in

***Abstract*—This paper presents a prediction model that supports farmers to take decisions and help them with best crop selection and fertilizer prediction in India. This project has incorporated Machine Learning that can aid farmers or investors to maximize yield. It attempts to solve the issue by building a prototype of an interactive prediction system. Implementation of such a system with an easy-to-use web based graphic user interface and the machine learning algorithm will be carried out. The results of the prediction will be made available to the farmer. The proposed system facilitates the farmer in accurate decision making to gain more quality and quantity of crops.**

***Keywords*— Crops, Machine learning, Agriculture**

I. INTRODUCTION

Agriculture is the most important sector of the Indian Economy. The Indian agriculture sector accounts for 18% of India's GDP and employs 50% of the country's workforce. But latest studies have shown a steady decline in the contribution made by agriculture to the Indian economy although it is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. Due to the impact of climate change in India, most of the agricultural crops are being affected in terms of their performance over a period of the last two decades. Predicting the crop yield in advance of its harvest would help the farmers to take appropriate measures for marketing and storage. The concept of boosting the yield of crops is rising popularly at present. It will be incredibly beneficial as the yield can be maximized and therefore can diminish the vulnerabilities and losses regarding crop cultivation that is caused when an inexperienced individual decides to invest in or cultivate a crop. The use of technology incorporated into the daily tasks performed by individuals has become customary. Hence, the use of technology to gain accurate outcomes regarding crop yield maximization is a boon specially to the younger generation who are investing in agriculture. Currently, there is a lack of mechanism present in India to support the decision making and interaction with agriculture officials regarding the issues that can affect income.

India is a highly populated country and randomly changes in the climatic conditions needed to secure the world's food resources. Farmers face serious problems in drought conditions. The type of soil plays a major role in crop yield. Suggesting the use of fertilizers may help the farmers to make the best decision for their cropping situation. Several studies on Information and Communication Technology (ICT) can be applied for the prediction of crop yield. By the use of data mining, analysing the previous data we can suggest better crop to farmer for better yield. An emerging research area in the development of an automated system for the identification and classification of various contaminated plant diseases is the need of the hour. Smart agriculture is the way of conveying information from traditional to educated farmers. Regression and coefficient of determination analysis is carried out in the model to make a decent comparison with our actual result which is called target. It is a friendly interface for farmers, which gives the analysis of production based on available data. Different data mining techniques were used to predict the crop yield for maximizing crop productivity. Accurate and timely monitoring of agricultural crop conditions and estimating potential crop yields are essential processes for operational programs because of the importance of predicting crop yield. The purpose of this study is to apply several forecasting methods for evaluating crop yield estimates, crop yield forecasting, which provide information to farmers. The next section will discuss about the research studies.

II. LITERATURE REVIEW

There were several studies carried out related to the proposed project. This section addresses identifications in similar studies.

Soaring population is resulting in a huge pressure on the limited fresh water resources of the world. Growing population is also contributing in an increased demand for water from domestic as well as industrial sectors. Consequently, increasing scarcity of available water demands efficient use of irrigation water in agriculture. Since the available water sources are already almost completely exploited, there is need for achieving increased water productivity through efficient irrigation. Usually, 15% of the water delivered is lost in conveyance, another 15% is lost during on-farm supply through field channels and 25% is lost due to inefficient water use practices, thus leaving only 45%

of the water supplied to be utilized by the crop. The efficiency of the irrigation water use depends on the timing, duration and method of the irrigation employed. To efficiently manage irrigation requirement in crops, information from multiple sources such as soil, plant and atmosphere is required. There are two different approaches for estimating the crop water requirement. One, a conceptual approach based on various factors viz. soil moisture, seepage transpiration, etc. and the other, a theoretical approach based on training a model using the available data. The theoretical approach is more accurate than the conceptual approach [1].

The occurrence of natural disasters is unavoidable, but the damage can be degraded through early predictions. In the proposed system heavy rain damage for a given day is predicted using two algorithms; the first algorithm uses weather data of the same day whereas the second algorithm uses past weather data for predictions. After comparing two algorithms, the algorithm that uses past weather data was implemented since past data is comparatively high reliable. The SPEI drought index was used to identify the characteristics of the drought and calibrate the prediction model. The model was trained using a support vector machine (SVM), artificial neural network (ANN), k-nearest neighbour (KNN) and concluded that the SVM drought model provides better performance on capturing the temporal and spatial characteristics of droughts compared to ANN and KNN. Accurate crop selection is vital to gain the maximum benefits from the limited number of cultivable lands. Additionally, it directly affects the economy of farmers [2].

Much research has been performed in the domain of agriculture to increase agility with use of the IoT technology. Another work to determine the quality was proposed by the authors of [3] on rice using IoT and machine learning. The authors stated that the quality of the rice depends on the origin country. They conducted experiments to determine the geographical origin of rice. Specifically, it was determined using inductively coupled plasma mass spectrometry (ICP-MS) together with different classification methods. Random Forest and SVM were the techniques that achieved the best performance (96%). The conclusion was that the variation in non-essential element profiles in rice grain depends on the geographical origin [3].

In this paper [4] multivariate models are used to predict farmers' offered strawberry prices using previous California stations strawberry yields and weather data. First, the weekly yield is predicted using the weekly weather data and then the daily prices are predicted using the daily yields. Second, the daily weather data is used as a direct input to predict the farmers' offered daily prices for strawberry. The conventional machine learning models such as Artificial Neural Network (ANN) and K-Nearest Neighbour regression (KNN) as well as the simple long short term memory (LSTM) DL model are mainly utilized for yield prediction. In this paper, more complex deep learning models are used for the first time not only for more precise yield prediction but also for price prediction. To choose the most appropriate prediction model, three performance evaluation measures are utilized: the mean absolute error (MAE), mean square error (MSE) and R2 as well as an aggregated measure that summarizes the results of the three measures to decide the winning model. It is found that the compound DL models outperform the ML and simple DL models in the price prediction using yield application. Additionally, adding attention to the compound models helps in improving the prediction performance. It is also found that the ATT-CNN-LSTM model outperforms the rest of the ML and DL models across both applications of yield and price prediction using weather [4].

II. METHODOLOGY

To achieve the goal of successfully developing this model, machine learning algorithms and different techniques are used.

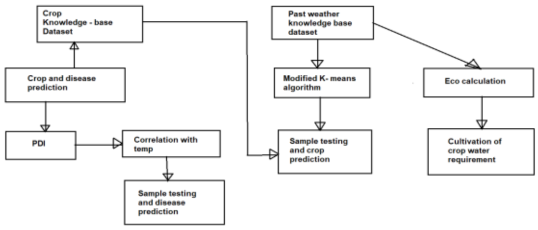


Fig. 1. System design diagram

A. Crop yield Prediction design

1. Data extraction

The data extraction was conducted with the help of our data extraction excel sheet. A unique index was given to each paper based on the database retrieved. Afterward, data were extracted with respect to the defined research questions for this study.

2. Data synthesis and reporting

Examining the data extraction, there was information overlapping each other and thus, an attempt was made to synthesise, merge or group them. By this, it was possible to discover trends and variance in the data. The data synthesis and reporting were conducted in the Anaconda environment using the Jupiter Notebook framework with Python. The libraries used to synthesise data frames and figures were Pandas, Collections, Matplotlib, Numpy, Seaborn, Itertools, and JSON.

The crop knowledge base consists of farm knowledge such as crop types, soil types, soil-pH value, crop disease and pesticides, seasonal parameter such as kharif, rabi and summer crops. The knowledge-base also consists of zones as well as district information, environmental parameter such as maximum and minimum temperature value and average rainfall.

B. Technologies

1. Machine Learning

Supervised ML algorithms including Random Forest and Decision Tree were utilized to develop all components of interface.

III. TESTING AND EVALUATION

The results presented shows that modelling the yield of crop varieties during the growing season is reasonable and brings promising application possibilities.

A. Front end

Front end of this model is a localhost done using HTML and styled using CSS. This consists of a section called "crop yield" where the user can enter values of parameters to get the desired output.

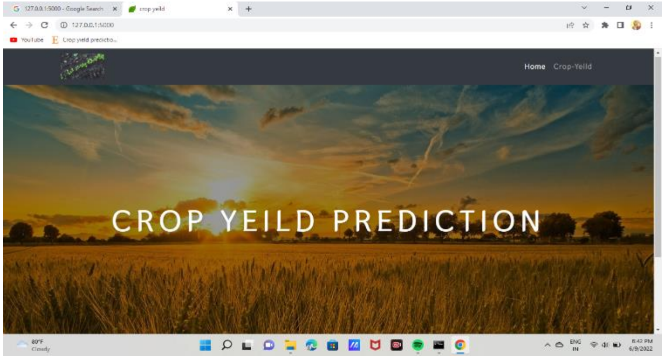


Fig. 1: Homepage of crop yield prediction model

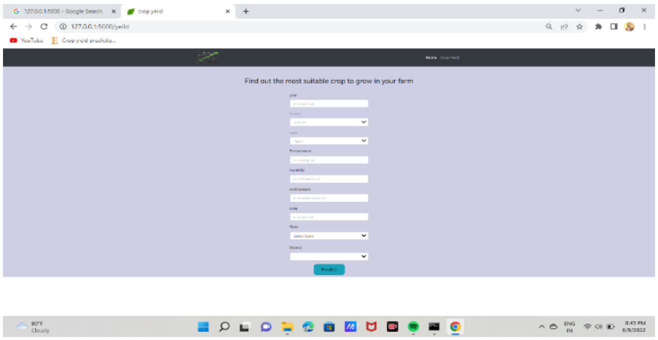


Fig. 2: Prediction section of crop yield prediction model

B. Backend

Backend of this model is programmed in python using Jupyter notebook. The following are some graphical output obtained by using the seaborn library.

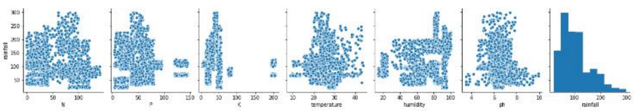


Fig. 3: Pairplot of crop yield prediction parameters alongside rainfall

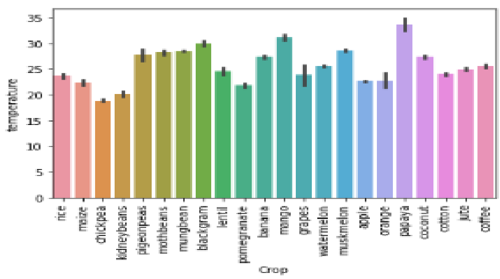


Fig. 4: Barplot of crop yield prediction parameters alongside temperature

IV. CONCLUSION AND FUTURE WORK

Working with predictive models, regression and neural models, is burdened with certain limitations. In the case of regression models, it is impossible to use data in qualitative form. For building models, it is recommended to use the full set of experimental data. Despite extensive research in this area, adoption at an operational level to effectively substitute the manual sampling estimation is residual. Methods made available to farmers should estimate production as far in advance and as simple as possible with data that producers can access quickly, easily, and cheaply and without the need for intensive training or validation. The best approach must consider the availability and/or possibility to have the required inputs, the adequate spatial resolution, the necessary granularity and required precision. The agricultural field is extremely crucial to the economy of India. Failures in forecasting temperature, rainfall, soil conditions, disaster management, diseases etc. will have an impact on agricultural output. To encapsulate the mentioned challenges, a robust system is to be developed.

V. REFERENCES

[1] Ravneet Kaur Sidhu, Ravinder Kumar, Prashant Singh Rana, "Machine learning based crop water demand forecasting using minimum climatological data," 2019.

[2] Dayalini. S, Sathana.M, Navodya P.R. N, Weerakkodi R.W.A.I.M. N, Anuradha Jayakody, Narmada Gamage " Agro-Mate: A Virtual Assister to Maximize Crop Yield in Agriculture Sector," 2021.

[3] A´ngel Luis Perales Go´mez, Pedro E. Lo´pez-de-Teruell, Alberto Ruiz, Gine´s Garcı´a-Mateos, Gregorio Bernabe´ Garcı´a, Fe´lix J. Garcı´a Clemente, "FARMIT: continuous assessment of crop quality using machine learning and deep learning techniques for IoT-based smart farming," 2021.

[4] Lobna Nassar, Ifeanyi Emmanuel Okwuchi, Muhammad Saad, Fakhri Karray, Kumaraswamy Ponnambalam, Prarabdha Agrawal, " Prediction of Strawberry Yield and Farm Price," 2020.

[5] Suresha, Kumar,P.G, Ramalatha,M, "Prediction of major crop yields of Tamilnadu using K-means and Modified KNN," 2018.

[6] Jianxi Huang, "Regional Winter Wheat Maturity Date Prediction Using Remote Sensing-Crop Model Data Assimilation and Numerical Weather Prediction," 2018.

[7] Kanagaraj Narayanasamy, R. Selvam, M. Ilayaraja "Intelligent and effective crop yield prediction using machine learning techniques for cloudbased big data analytics," 2021.

[8] Mamunur Rashid, Bifta Sama Bari, Yusri Yusup, Mohamad Anuar Kamaruddin, Nuzhat Khan, "A Comprehensive Review of Crop Yield Prediction Using Machine Learning Approaches With Special Emphasis on Palm Oil Yield Prediction," 2021.

CROWD COUNTING USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Prakhar Srivastava [1], Shreya Srivastava [2], Tanu Raghav [3], Vatsal Anand [4], Manasa P M[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Manasa P M**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India,
prakhar8119@gmail.com, shreya.srivastava1962@gmail.com, tanu.raghavv2@gmail.com, vattuanand@gmail.com, , manasapm_ise@sapthagiri.edu.in

***Abstract* Crowd Counting is a task to count people in image. It is mainly used in real-life for automated public monitoring such as surveillance and traffic control.**
Our goal is to deploy a machine learning model that could predict the sizes of crowds.

The estimation is a popular topic in the machine learning community. It has various applications including crowd control, customer management, and urban planning. Crowd counting is an active research area within scene analysis. Over the last 20 years, researchers proposed various algorithms for crowd counting in real-time scenarios due to many applications in disaster management systems, public events, safety monitoring, and so on. Reliable people counting and human detection is an important problem in visual surveillance. An accurate and real time estimation of people in a shopping mall can provide valuable information for managers. In recent years, this field has seen many advances, but the solutions have restrictions: people must be moving, the background must be simple, or the image resolution must be high. However, real scenes always include both moving and stationary human beings, the background may be complicated, and most videos in a visual surveillance system have a relatively low resolution. Human beings perceive images through their properties like color, shape, size, and texture described in Main goal is a vision system that monitors activity in a site over extended periods of time is described in. In describes a technique for crowd density estimation based on Minkowski fractal dimension. A neural based crowd estimation system for surveillance in complex scenes at underground station platform is presented in. In surveillance systems for public security are going beyond the conventional CCTV.

Computer vision best satisfies artificial intelligence tasks that would otherwise be solved with human eyesight. Hence, People counting, also known as crowd counting, is a common application of computer vision. We make use of the CNN algorithm.

The motive of our research is to scrutinize the image data and portend the counting using Artificial Neural Network.

I. INTRODUCTION

Fill An ever-increasing population issue is coupled with the occurrence of crowds and situations of overcrowding. The main motivation behind this research effort has been driven by an increased attention by computer vision research community towards crowd control and management. This has become a crucial issue especially due to ever growing world's population, and this increase directly relates to concerns regarding the security and safety of the larger population [29]. This motivation is tied also with the excess available surveillance data which is assigned to the limited amount of manpower available to process it. In several real-world problems, the issue of identifying the number of objects, specifically people, in images and videos arises for different reasons including crowd creation alarm, crowd management, emergency evacuation of the crowd, design, and analysis of buildings and spaces for crowd management for safety and security. In certain scenarios, obtaining the people location and/or count is of direct importance, such as in public rallies, marathons, public parks, or transportation hubs. Manually identifying creation and movement of the crowd round the clock, or manually counting of individuals in very dense crowds is an extremely laborious task hence, several automation methods based on computer vision techniques have been proposed.

I.I PROBLEM STATEMENT

Crowd Counting is a technique to count or estimate the number of people in an image. Accurately estimating the number of people/objects in a single image is a challenging yet meaningful task and has been applied in many applications such as urban planning and public safety. Crowd counting is particularly prominent in the various object counting tasks due to its specific significance to social security and development.

I.II OBJECTIVES

Accurately estimating the number or density of crowds is an increasingly important application for purposes of crowd control and public safety. In overcrowding scenarios, people counting offers an essential piece of information which can be used as an accident avoidance and congestion control mechanisms

II. LITERATURE SURVEY

In order to get required knowledge about various concepts related to the present application, existing literature were studied. Some of the important conclusions were made through those are listed below.

A literature survey on crowd (people) counting:

The categories of crowd counting in video falls in two broad categories: (a) ROI counting which estimates the total number of people in some regions at certain time instance (b) LOI counting which counts people who crosses a detecting line in certain time duration. The LOI counting can be developed using feature tracking techniques where the features are either tracked into trajectories and these trajectories are clustered into object tracks or based on extracting.

CNN-based Density Estimation and Crowd Counting: A Survey:

This paper aims to compare the decision tree algorithms such as Decision Stump, Hoeffding Tree, J48, CTC, J48graft, LMT, NBTree, Random Forest, Random Tree, REP Tree, and Simple Cart in predicting CKD. The CKD dataset are analysed usingabove decision tree algorithms and compare their performance with respect to seven performance metrics (FACC, MAE, PRE, REC, FME, Kappa Statistics and Runtime)

Survey of Crowd Counting CNN-based

Benefiting from the powerful feature representation ability of deep learning, Convolutional Neural Network (CNN) provides a better solution to estimate accurately the number of people in a crowded scene, but it still faces many problems that need to be solved urgently. It is one of the key and difficult points in the field to reduce the complexity of the network and to improve the real-time performance of the network, so as to improve the accuracy of crowd counting.

Crowd Scene Analysis by Output Encoding

Grasping the accurate crowd location (rather than merely crowd count) is important for spatially identifying high-risk regions in congested scenes. In this paper, we propose a Compressed Sensing based Output Encoding (CSOE) scheme, which casts detecting pixel coordinates of small objects into a task of signal regression in encoding signal space. CSOE helps to boost localization performance in circumstances where targets are highly crowded without huge scale variation. In addition, proper receptive field sizes are crucial for crowd analysis due to human size variations. We create Multiple Dilated Convolution Branches (MDCB) that offers a set of different receptive field sizes, to improve localization accuracy when objects sizes change drastically in an image. Also, we develop an Adaptive Receptive Field Weighting (ARFW) module, which further deals with scale variation issue by adaptively emphasizing informative channels that have proper receptive field size. Experiments demonstrate the effectiveness of the proposed method, which achieves state of-the-art performance across four mainstream datasets, especially achieves excellent results in highly crowded scenes. More importantly, experiments support our insights that it is crucial to tackle target size variation issue in crowd analysis task, and casting crowd localization as regression in encoding signal space is quite effective for crowd analysis.

Crowd Behaviour Monitoring and Analysis in Surveillance Applications:

Some authors proposed deep learning-based approaches for counting, localization and behaviour analysis, whose performance was comparatively better than the traditional approaches. The traditional machine learning approaches was good for the organized crowd, however, when the complex in nature type dataset used for these approaches, the performance dropped significantly. Our proposed paper includes the literature review of crowd behavior analysis and managing field over a decade. We focused mainly on state of art crowd monitoring systems which have been in discussion over a decade. We also tried to point out the shifting paradigm in crowd behavior analysis and managing system from a traditional to deep learning approaches.

Crowd Monitoring and Localization Using Deep Convolutional Neural Network

In conclusion, this review paper provides a comprehensive literature review on crowd monitoring using different machine learning techniques and methods. Existing approaches on crowd monitoring were thoroughly reviewed. From this review, we concluded that Scale Driven Convolutional Neural Appl. Sci. 2020, 10, 4781 12 of 17 Network (SD-CNN) and DISAM models are to be considered as novel models for crowd counting and localization in dense crowd images with highest accuracy on different datasets. These models have the applications to detect the visible heads in an image with respect to its scale and density map. Extensive experiments on different datasets demonstrate that these models have achieved a significant improvement over the previous models as explained in the literature review section. The future development of deep CNN on crowd monitoring and localization has different opportunities and challenges. Author Contributions: A.K. and J.A.S. have collected and prepared the data. A.K., K.K. and F.K. have contributed to review and analysis. W.A. has supervised the process of this review. The manuscript was written by A.K. and J.A.S. All authors have read and agreed to the published version of the manuscript. Funding: This research was funded by Ministry of Education in Saudi Arabia through project number QURDO001. Acknowledgments: The authors extend their appreciation to the Deputyship for Research and Innovation, Ministry of Education in Saudi Arabia for funding this research work through the project number QURDO001. Project title: Intelligent Real-Time Crowd Monitoring System Using Unmanned Aerial Vehicle (UAV) Video and Global Positioning Systems (GPS).

People counting and human detection

In this paper, a brief literature survey for people counting and human detection methods are discussed elaborately and neural network based people counting and EM based individual detection methods are studied The best results for estimating the number of people has an average error of 10% over 51 test cases are shown in Table. These methods provide better performance and high accuracy than existing methods. This people counting and human detection process is very useful for safety control in public areas by using static camera.

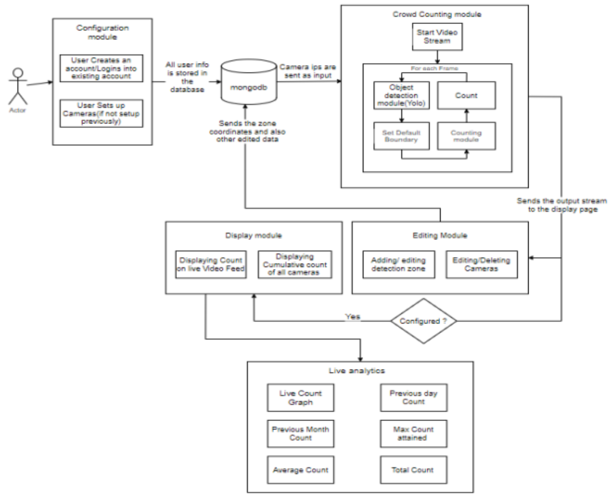
Recent advances in CNN-based single image crowd counting and density estimation:

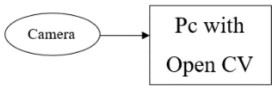
We proposed an end-to-end face parsing method which tries to address three face image analysis tasks, including race, age, and gender classification. We trained the MCFS-DCNNs model through a DCNNs model by extracting information from various face parts. The MCFS-DCNNs classified every pixel to one of the seven categories (hair, eyebrows, eyes, skin, nose, back, and mouth). We used probabilistic classification method to generate PMAPS for seven face classes. We built another DCNNs model by extracting features from the corresponding PMAPs for each of the three demographic tasks (race, age, and gender). We performed a series of experiments to investigate which face parts help in the race, age, and gender classification. We validate our experiments on seven face databases, obtaining much better results as compared to SOA.

Crowd detection and counting using a static and dynamic platform: state of the art

While crowd detection is an oft-explored research area, but several challenges persist and current methods fail to provide a robust solution in case of those challenges. In this paper, challenges faced by current work and applications of the suggested future improvements have been discussed. In this paper, we presented a review on crowd detection, estimation, and counting. This review focuses on crowd detection methods in more challenging scenarios; different crowd motion states, and varying camera motion. For crowd motion states, static and non-static, several methods present in literature are discussed. We also explore limitations in those methods, such as those which oversee the difference in the state of motion. Camera motion state affects the results of current crowd detection systems. While pedestrian detection from a camera mounted on moving the vehicle is a much-studied work, this paper discusses the current work and possibilities of future directions for research in this novel area: crowd detection from an aerial view. Covering these research gaps can help in automating the surveillance, security, and relief based activities.

III. PROPOSED METHODOLOGY





Configuration Module

First, we created a method to connect with user's local network of cameras through internet or use the internet accessible IP cameras. For our solution we have made use IP cameras but we can make use of other types cameras as well with slight changes to the code. Each camera has its own instance and it will leverage all the features discussed in this paper and process for each instance will be the same as shown in Fig (1). To connect cameras to the application, users have to provide their camera IPs/or anything equivalent to it like RTSP URL, etc. These IPs will be saved in database for reuse.

Crowd counting module

We use the IPs stored in the database as input for object detection module and we use OpenCV for any image processing related tasks. For object detection we are using pretrained YOLOv4 model trained on COCO dataset because of its high accuracy. As showed by [8] YOLOv4 is better than previous proposed algorithms hence it is our preferred choice of object detection model. YOLO recognizes objects more precisely and faster than other recognition systems. It can predict up to 80 classes. It can be easily trained and deployed in a production system. YOLO is based on a single Convolutional Neural Network (CNN). The CNN divides an image into regions and then it predicts the boundary boxes and probabilities for each region. It simultaneously predicts multiple bounding boxes and probabilities for those classes. YOLO sees the entire image during training and test time so it implicitly encodes contextual information about classes as well as their appearance. The real-time recognition system will recognize multiple objects from an image. The backbone of YOLOv4 is CSPDarknet-53. Darknet is an open-source neural network framework written in C and CUDA and it is used to train new YOLO models and run the existing ones. After the training is done the results are stored in a .weights file. We have converted this darknet model which is in .weights format to a TensorFlow model in .pb format. We use this saved model for object detection. YOLOv4 sends us the coordinates of detections along with confidence score which we then use as input for OpenCV to draw bounding boxes on the detections and count these detections. We count detections on every frame and the process repeated for each frame. We also able to selective counting with help of detection boundary which discussed below.

Data Annotation

To train YOLO we need to annotate images for object detection models. Our dataset should be well annotated. There are different types of annotations available. Here a bounding boxes method is used. It creates a rectangle area over images that are present in our dataset. Since Annotation needs more time we are using a tool called LabelIMG to annotate our data. 3.3.3 YOLOv5 Configuration The YOLOv5 configuration involved the creation of two files and a custom Yolov5 cfg file.

YOLOv5 configuration

first creates a ”obj.names” file which contains the name of the classes which the model wanted to detect. Then a obj.data file which contains a number of classes in here is 2, train data directory, validation data, ”obj.names” and weights path which is saved on the backup folder. Lastly, a cfg file contains 2 classes. figure 3.2 shows the configuration steps involved. Next is training of our YOLOv3 in which an input image is passed into the YOLOv5 model. This will go through the image and find the coordinates that are present. It divides the image into a grid and from that grid it analyzes the target objects features. Here 80 percent data is used for training , and remaining 20 percent is used for validation. Now weights of YOLOv5 trained on the dataset are created under a file. Using these trained weights now we can Detect and count the crowd.

Crowd Detection Algorithm

Step 1: Start the program.

Step 2: Input image is loaded .

Step 3: YOLOv5 trained weights are loaded from the disk.

Step 4: Human Detected and marked by means of object detection algorithm.

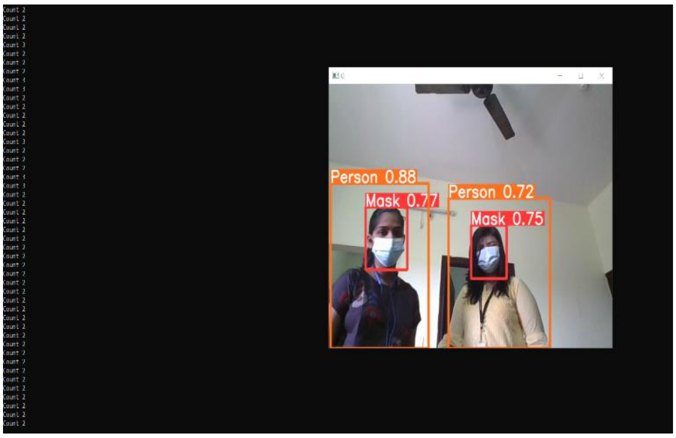
Step 5: After detection resultant image is displayed.

Step 6: Count Detection and Intimation

Yolo V 5 Training:

There is an existing implementation using YOLOV5 in github however the model is incomplete and also doesn’t support additional architectures due to which is not published. We used this as reference and built a YOLOv5 social distancing model which is capable of working on multiple architectures used in the YOLOv5 model as well on our custom architecture (modified backbone CSP). By doing this, we have successfully implemented the first working social distancing model based on YOLOv5 and other supporting architectures based on YOLOv5. Implementation of Social Distancing on YOLOv5 Models Our key objective is to implement a working YOLOv5 based social distancing model using YOLOv5s, YOLOv5s6, and YOLOv5s6 modified bottleneck CSP architecture. There is no existing social distancing working model based on the above YOLOv5 architectures. From the screenshots below the model’s sample output can be seen which clearly indicates the risk category based on centroid distance calculations. Parameters for High, Medium, and Low risk: High Risk: Distance between people less than 200 units. Medium Risk: Distance between people between 200 - 250 units. 11 Low Risk: Distance between people more than 250 units.

IV. RESULT



V. CONCLUSION

We have successfully implemented a crowd counting application that works with live video feed in real-time and provides live analytics from the generated count in form of graphs. We created a selective counting method that solve the problem of edge cases. We have created an application that is easy to setup and work with. Our solution can help in crowd management and improve security for user's infrastructure. Using our analytics users can identify at parts of their infrastructure they need to improve and where they need adds more security. With newer iterations of YOLO framework, we can improve the object detection capabilities of the solution. Since we are making use of the existing user infrastructure it demonstrates the useability of our solution in sparse crowd scenarios.

VI. REFERENCES

[1] Chowdhury, M., Nooman, S. 2013. Access Control of Door and Home Security by Raspberry Pi through Internet.

[2] Senthikumar, G., Gopalkrishnan, K., Sathish Kumar, V. 2014 Embedded Image Capturing System Using Raspberry Pi System.

[3] Çarıkçı, M., ,Özen, F. 2012 A Face Recognition System Based on Eigen faces Method.

[4] Jogdand, S., Karanjkar, M. 2015Implementation of Automated Door Accessing System withFace Design and Recognition.

[5] Sowmiya, U., shafiqmansoor, J. 2015 Raspberry pi based home door security through 3g dongle.

[6] Kartik J. Srimadhavan V. 2013 SMS Alert and Embedded Network Video Monitoring Terminal.

[7] Sahani, M., Nanda, C., Sahu, A., Pattnaik, B. 2015Web Based Online Embedded Door Access Control and Home Security System Based on Face Recognition.

[8] Mulla.,M.Patil,R.2015.Facial Image Based Security System

Efficient Eye Blink Detection Method to Assist Paralyzed Patient using Artificial Intelligence

Sahana A[1], Roshan Anegundi[2], Anmol Singh[3], Sadvi H.D[4], PreranaChaithra[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Associate Professor **Prerana Chaithra**, Dept of ISE, Sapthagiri college of Engineering. Bengaluru, Karnataka-560057, India
sahanaa1401@gmail.com, anegundiroshan2000@gmail.com, sarvanbhatti155@gmail.com, savihd1999@gmail.com, preranachaithra@sapthagiri.edu.in

Abstract - The objective of this project is to propose a human computer interface for a completely paralyzed patient using or depend on active infrared sensors. The interface detects voluntary eye blinks and pupil motion then interprets them as control commands. The detected eye direction can be useful through applications such as medical assistance, S.O.S, basic utility. The video frame is processed by OpenCV library which is open-source software. Paralysis can result from brain or spinal cord injury or by diseases such as multiple sclerosis or amyotrophic lateral sclerosis. In severe paralysis patient, communication abilities are extremely restricted. Even in extreme cases the patient can control muscles around the eyes like eye movements or eye-blinks. The noble aim behind this project is to study and capture the natural eye movement and apply a blink detection to create a fluid interface for the patient. The different technologies used for implementing the communication between paralyzed patient and the people attending and caring for them are mouth actuated joysticks, breathe puffing straws, tongue movement analysis, switch mounted near user's head, etc.

I. INTRODUCTION

Paralysis can result from brain or spinal cord injury or by diseases such as multiple sclerosis or amyotrophic lateral sclerosis. In severe paralysis patient, communication abilities are extremely restricted. Even in extreme cases the patient can control muscles around the eyes like eye movements or eye-blinks. The noble aim behind this project is to study and capture the natural eye movement and apply a blink detection to create a fluid interface for the patient. With the help of HCI, an alternative channel can be established without speaking and hand movements, which will increase the quality of life for a paralyzed patient. For severely paralyzed patient an HCI should fulfill several conditions. It should run in real time, it should operate on a consumer grade computer, and should be integrated with various help lines for the patient. The different technologies used for implementing the communication between paralyzed patient and the people attending and caring for them are mouth actuated joysticks, breathe puffing straws, tongue movement analysis, switch mounted near user's head, etc. These systems are costly to implement, increase stress on the patients and need skilled labour to setup and maintain system for proper functioning. Many other camera-based interfaces that analyse eye motion make use of active infrared illumination for pupil and iris localization which increases the system equipment cost. Avoiding specialized hardware and infrared light sources, the proposed system uses inexpensive webcam on a consumer grade computer which takes input in the form of video frames and analyses eye parameters frame by frame. The proposed system then interprets them as control commands. No special lightning or medical equipment is required for the communication between the patient. With the help of OpenCV library video frames that are taken by webcam can be analysed and processed using various image processing techniques and produce desired output. The facial landmark detector implemented inside dlib produces 68 points on the face. These 68 point-mappings were obtained by training a shape predictor on the labelled iBUG 300-W dataset. Using these points, region of eye can be detected and pupil motion and blink detection can be implemented.

II. LITERATURE SURVEY

Efficient Eye Blink Communication _Assistance for Paralyzed Patients by Sivakumar D, Ramkumar P, Sridhar V, Yamuna A, Shashi B 2021, The research study presents a real time method based on some video and image processing algorithms for eye blink detection to voice conversion. [1]. This is a type of disorder in which cells of the central nervous system stop working or die. In this disease usually it gets worse and have no cure. It is interferometric approach for detecting the movement of the head and the eyes blinking. This model helps in the case of heavy neurodegenerative disorder to enable the communication of a person with another person. The main disadvantage of this proposed system is that buildup cost is very high and the maintenance required is more. Eye Fatigue Prediction System Using Blink Detection Based on Eye Image by Akihir Kuwahara, Rin Hirakawa, Hideki Kawano, Kenichi Nakashi in 2021, The experimental show that gesture-based interaction can be used as a novel human computer interaction for consumer electronics and mobile devices [2]. In this project the Eye Aspect Ratio Mapping can classify blinks with high accuracy at a low cost. The authors created strong correlation between the median Spontaneous Blink Rate and the time between the objective estimation of eye fatigue and the subject's awareness of eye fatigue. As the proposed system is gesture based, there is a drawback that it forces the wearer to wear glasses and requires regular costs for operation. All the proposed gesture-based interaction systems are time consuming and physically restrictive, as the patient must use a Smartphone to perform the vision test and questionnaire-based distance vision assessment. A similar type of existing system based on the gesture-based interaction is Detection of a Drowsy state of the Driver on road using wearable sensors by Dishita Mashru, Vaibhav Gandhi in 2018, A wearable device that measures the drowsiness of the person on road by various methods like measuring the physiological measurements of the person [3]. Physiological measurements consists of heart rate, pulse rate etc. When the person is drowsy there will be change in the frequency of the eye blink, eye brows movement, by measuring the vehicular behavior like deviations from the particular lane etc. The limitation of this system is, it is reliable at particular environments only based on geographic conditions. As this system uses electrodes which is attached directly to the body part and which is harmful to the body, to overcome this problem the electrodes are placed on the steering wheel or on the driver's seat. And the detection of drowsiness can sent to the Smartphone's wirelessly and the level of the drowsiness is detected. A Human-Computer Control System Based on Intelligent Recognition of Eye Movements and Its Application in Wheelchair Driving by Wenping Luo, Jianting Cao, Kousuke Ishikawa and Dongying Ju in 2021 told that human-computer interaction system for wheelchair motion through eye tracking and eye blink detection. The limitation of this technique was that it just works for the gaze movement [4]. Eye Blink Detection System for Paralyzed Patients by Kavitha H. S., Suguna G. C, in this Brain wave technique and Electro-oculography techniques were used [5]. The drawback of this device is that it is difficult to test on the patients. There was one more approach using the machine learning technique, Efficient machine learning approach for volunteer eye-blink detection in real-time using webcam by Paulo Augusto de Lima Medeiros, Gabriel Vinícius Souza da Silva, Felipe Ricardo dos Santos Fernandes in 2021. In this an intelligent Computer Vision detector was built for handling the captured data in real time using a generic webcam [6]. The main drawback with this technology is the cost of the equipment.

III. PROPOSED METHODOLOGY

In the proposed system, a unique idea is implemented by designing a simple and interactive user interface, which can be easily controlled by a Paralyzed patient. The UI is so intuitive that any untrained patient can easily be trained. This UI can easily be operated by all age group from a kid to highly aged person. The proposed interface works with the help of two algorithm, eye motion detection and eye blink detection. Fig 1 shows the architectural design pattern of the implementation.

Face Detection: Haar cascade algorithm is used for face detection. Object is recognized using Haar cascade feature. This feature consider adjacent rectangle at a specific location in a detection window. The common Haar feature for face detection has two adjacent rectangles that lie above the eye and the cheek region. Haar cascade algorithm always captures positive images as well as negative images for face detection. In face detection edge detection and line detection is carried out. The algorithm has four stages those are Haar Feature Selection, Creating an Integral Image, Adaboost Training, and Cascading.

Facial Landmark Detection: Face landmark detection is a computer vision task where we want to detect and track key points from a human face. This task applies to many problems. For example, we can use the key points for detecting a human's head pose position and rotation. With that, we can track whether a driver is paying attention or not. We can use the key points for detecting a human's head pose position and rotation. With that, we can track whether a driver is paying attention or not. Also, we can use the key points for applying an augmented reality easier. And there are so many solutions that we can generate based on this task.

Face Tracking Mechanism: Face localization is initiated at initial phase to detect the facial features of the patient. This method should function smoothly in varying light conditions, head positions, facial features, hairstyle or glasses etc. The face can be detected with the help of facial landmark detector implemented inside dlib in real time. There are various solutions put forward for the face detection which include feature-based methods using eyes, mouth, and nose-based detection. The second method is the template matching method based on pre-recorded template of the face. Third method detects the face using neural networks, that trains the system using haar-cascades and facial landmark detector implemented inside dlib to detect facial features like eye, nose, ear, etc. The dlib library is used plot 68 points on the face to detect particular facial feature. Using these indexes, the required region of face can be extracted and a bounding box can be computed around the eyes.

Eye Detection: A digital processing concept Template matching is used for detecting small parts of image with templates cv2. Matching Template () function is used in OpenCV. Template means loading an input image and a patch image. In template matching it compares the patch of input image under the template image. In this algorithm, bounding boxes are calculated using the detected left and right eye from the previous stage. The right side of the image region must contain the left eye and vice versa. Using his, the algorithm crops out two separate sub-images containing the left eye and the right eye. By linear interpolation, the system generates eye images of a fixed size. This size depends upon the scale at which the face was detected. It is assumed that is patient head is stable, and there is no movement in the position of the eye. A slight movement of the head may result an error or inaccurate eye motion. Therefore, in this stage the motion of the eye is stabilized after the cropped eye image is scaled. In this stabilization, the system tries to differentiate movements from voluntary and involuntary eye movements. Therefore, using this algorithm, an accurate eye motion can be determined and can be used as an important parameter for the graphical user interface. In figure 4.3 shows the 6 facial landmarks associated with eye. Eye Image Segmentation: In this, eye region is located from live video frames. From the detected face, the portion of the eye is located with the help of facial landmark features. From the extracted eye region, it is further processed for eye blink detection. The eye region localization is done at the initialization of the system. The located eye region from the detected face is further used for eye tracking and blink detection.

Gaze Estimation: Gaze estimation reveals where a person is looking. It is an important clue for understanding human intention. The recent development of deep learning has revolutionized many computer vision tasks, the appearance-based gaze estimation is no exception. The facial keypoint detector takes a rectangular object of the dlib module as input which is simply the coordinates of a face. To find faces we can use the inbuilt frontal face detector of dlib.

Blink Detection: In this algorithm, the detected blink is classified into two sections, voluntary eye blinks and involuntary eye blinks. The voluntary eye blink duration is set to be larger than 250ms. The Eye Aspect Ratio (EAR) is a parameter used to detect these blinks. The threshold values calculated using EAR are used to detect if the eye when it is shut. This change in EAR values is used to detect an eye blink. Using various time intervals blink gesture can be encoded like double voluntary blinks. These gestures used by the patient.

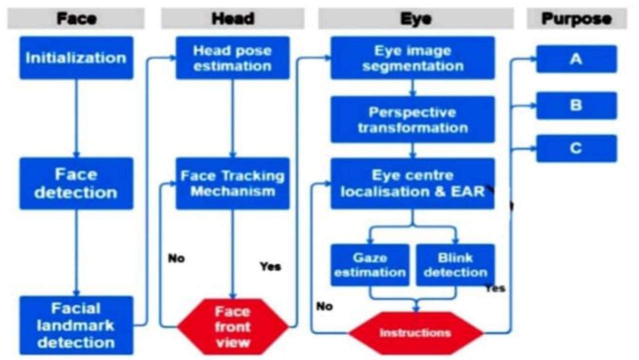


Figure 1. Architectural design of implementation

IV. RESULT

The system was developed on Windows 10 PC with 8th gen Intel Core i5 processor and 4GB RAM. The entire coding and algorithm implementation was done on OpenCV Python. Although the input video feed is of 30fps, for all the processing purposes it reduces to 4fps. The system assigns 2 blinks to light, 3 blinks to fan, and so on which can be customized according the consumer requirements before installation. But 5 blinks are always set to actuate a loud buzzer to intimate the neighbours about the emergency and also sends an SOS mail to family/caretaker. Along with this, the system monitors the heart rate of the patient and on any occasion of irregularities, it immediately follows the emergency protocol by sending an SOS mail and actuating the buzzer. This is to aid in the easy usage of the patient's family/caretaker.

Figure 2: Detection of closed and open eye

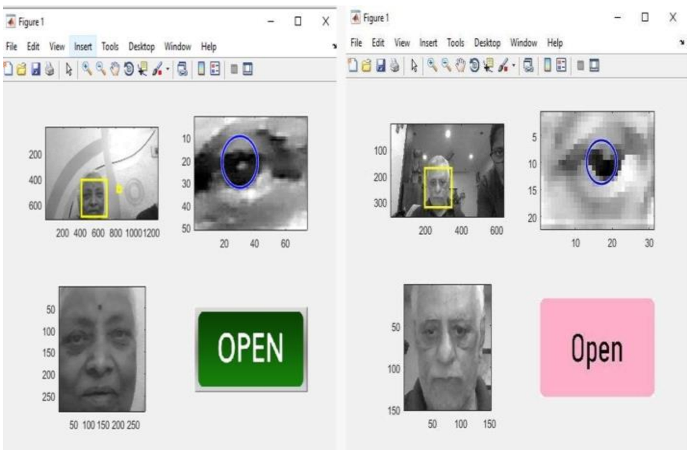


Figure 3: System used to detect the blinks of senior citizens

Figure 5: SOS mail sent on occasion of emergencies

V. CONCLUSION

This report concludes about smart eye blink solution for MND patient, which can be overcome with proposed method with greater accuracy and quick response compare to older techniques. This helps us in successfully developing a low-cost, easy-to use and effective eye-motion detection system for MND patients. Through the surveys we understood the methodologies and limitations of existing systems. In the traditional methods people used gesture based assistive system, electro oculogram Analysis Based Assistive System, Voice Based Assistive System. Gestures are difficult in understanding and these methods are not precise and these techniques are sometimes vague. The electro-oculogram techniques are very painful at times. Voice recognition techniques are also not fully reliable. Hence, we have proposed a new technique which uses the eye blinking method. This method is easier to use and reliable. The proposed system enables people with severe paralysis to communicate their thoughts and needs. It also helps patient to show their intellectual potential which can sometimes dispose their mental disability diagnosed by the doctor. The proposed system provides a unique and new UI which can be easily controlled by any age group patient. This method combines the existing techniques in a new way to detect eye motion and eye blink detection. As seen in the system architecture we will be using facial landmark and haar cascade algorithm to develop this user-friendly device.

VI. REFERENCES

[1] CNN based Auto-Assistance System as a Boon for Directing Visually Impaired Person, Samkit Shah; Jayraj Bandariya; Garima Jain; Mayur Ghevariya; Sarosh Dastoor, 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI)

[2] Video Content Analysis using Convolutional Neural Networks, Inad Aljarrah, Duaa Mohammad, 2018 9th International Conference on Information and Communication Systems (ICICS)

[3] Real time object identification using deep convolutional neural networks, Rajeswari Sujana S.; Sudar Abisheck S.; Tauseef Ahmed A.; Sarath Chandran K.R, 2017 International Conference on Communication and Signal Processing (ICCSP)

[4] Moving object detection and tracking Using Convolutional Neural Networks Shraddha Mane Prof.Supriya Mangale Proceedings of the Second International Conference on Intelligent Computing and Control Systems (ICICCS 2018) IEEE Xplore Compliant Part Number: CFP18K74-ART; ISBN:978-1-5386-2842-3

[5] Pedestrian Detection Based on YOLO Network Model Wenbo Lan; Jianwu Dang; Yangping Wang; Song Wang 2018 IEEE International Conference on Mechatronics and Automation (ICMA)

[6] Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks Shaoqing Ren, Kaiming He, Ross Girshick, Jian Sun.

[7] Jiuwen Cao, Long Chen, Dinghan Hu, Fang Dong, Tiejia Jiang, Weidong Gao, Feng Gao "Unsupervised --Eye Blink Artifact Detection from EEG With Gaussian Mixture Model", IEEE J __Biomed Health Inform, 2021, pp 2895-2905. [8] Jannatul Mawa Akanto, Md. Kamrul Islam, A jiju l Hakim, Md. Azizul Hoque Sojun, Kawshik Shikder --"Eye Pupil Controlled Transport Riding Wheelchair", 2nd International Conference on __Robotics,Electrical and Signal Processing Techniques (ICREST), 2021, pp 413-417.

[9] Afraa Z. Attiah, Enas F.Khairullah "Eye-Blink Detection System for Virtual Keyboard", National _ _Computing Colleges Conference, 2021, pp 1-6.

[10] Mahek Jain, Bhavya Bhagerathi, Sowmyarani C N "Real-Time Driver Drowsiness Detection using _Computer Vision" International Journal of Engineering and Advanced Technology (IJEAT), Volume-_11 Issue-1, October 2021, pp 109-113.

[11] Federico Wadehn , Thilo Weber , David J. Mack, Thomas Heldt , and Hans-Andrea Loeliger "Model- _Based Separation, Detection, and Classification of Eye Movements", VOL. 67, NO.2, IEEE _TRANSACTIONS ON _BIOMEDICAL ENGINEERING, February 2020, pp 588-600.

[12] Tackhyun Jung, Sangwon Kim, Keecheon Kim "Deep Vision: Deepfakes Detection Using Human Eye _ Blinking Pattern", Volume-8,2020, IEEE Access, 2020, pp 83144 - 83154.

[13] Paulo Medeiros, Gabriel Silva, Felipe Fernandes "Computer Vision and AI Applied to Blink Detection _ for Communication Interface for ALS Patients", Vol 11, Univ Access Inf Soc, 2020, pp 409-419.

[14] Reshma Abraham,Ritta Maria Thaliath, Swapna Davies, Thara Jacob "Eye Controlled Wheelchair with Asthenopia Detection", IEEE Access, Vol-5, 2019, pp 1-10.

[15] Alberto J. Molina, Clara Lebrato-Vazquez, Manuel Monge, Roylan Tabares, Juan Garcia "Communication Technologies Based on Voluntary Blinks", VOL-7, IEEE Access, June 2019, pp ___70770-70798.

[16] Woon-Hee Lee, Jong-Hyuk Woo, Jong Mo Seo "The Method for Visualization and Analysis of Eye-blinking Patterns using Dynamic Vision", IEEE 2019, pp 409-412.

[17] Veena N, Anitha N "Converting Intent of Physically Impaired into Text using Eye _Blink Detection", International Journal of Recent Technology and Engineering _(IJRTE), Volume-8 Issue-2, July 2019, __pp 447-451. [18] Vin´ıcius Vecchia, Marcos Flavio Silva, Davies William de Lima Monteiro "Eye-Fi: integrating optical __data communication into intraocular lenses", IEEE TRANSACTIONS ON BIOMEDICAL __ENGINEERING, 2018, pp 1-12.

[19] Yuezun Li, Ming-Ching Chang, Siwei Lyu "In Ictu Oculi: Exposing AI Generated Fake Face Videos __by Detecting Eye Blinking", IEEE International Workshop on Information Forensics and Security (WIFS), 2018, pp 1-7.

[20] Kushal Chaudhari, Rajinish Kumar, Milan Pandey, Anoop Shinde, Divyanshu Totla, Prof. N.D. Mali "Assistance for Paralyzed Patient Using Eye Motion Detection", Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), 2018, pp 1-8.

FAKE CURRENCY DETECTION USING IMAGE PROCESSING

Nandini R [1], Poornima J [2], Priyanka O [3], Dinesh Reddy P N [4], Sudarsanan D[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor , Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
nandini6451@gmail.com, poornimaj02@gmail.com, priyanka990426@gmail.com, aaryareddy31@gmail.com, sudarsanand@sapthagiri.edu.in

Abstract - *The advancement of color printing technology has increased the rate of fake currency note printing and duplicating the notes on a very large scale. Few years back, the printing could be done in a print house, but now anyone can print a currency note with maximum accuracy using a simple laser printer. As a result the issue of fake notes instead of the genuine ones has been increased very largely. India has been unfortunately cursed with the problems like corruption and black money. And counterfeit of currency notes is also a big problem to it. This leads to design of a system that detects the fake currency note in a less time and in a more efficient manner. The proposed system gives an approach to verify the Indian currency notes. Verification of currency note is done by the concepts of image processing. This article describes extraction of various features of Indian currency notes. Currency recognition is used for processing currency images that is used to catagorize the banknotes of different denominations and also detect the fake notes. The technology of currency recognition basically aims for identifying and extracting visible and invisible features of currency notes. Several researchers are inspired to develop strong and economical automatic currency detection machine. Digital image processing techniques help in manipulation of the digital images through the use of computers. Python along with the use of CNN are very much efficient in image classification and supervised image comparision.The proposed system has got advantages like simplicity and high performance speed. The result will predict whether the currency note is fake or not.*

I. INTRODUCTION

Technology is growing very fast these days. Consequently the banking sector is also getting modern day by day. This brings a deep need of automatic fake currency detection in automatic teller machine and automatic goods seller machine. Many researchers have been encouraged to develop robust and efficient automatic currency detection machine. Automatic machine which can detect banknotes are now widely used in dispensers of modern products like candies, soft drinks bottle to bus or railway tickets.

The era of currency popularity basically objectives for identifying and extracting visible and invisible functions of currency notes. until now, many strategies have been proposed to pick out the forex notice. but the nice way is to apply the visible features of the be aware. As an example, colour and length. however this way is not beneficial if the be aware is dirty or torn. If a observe is dirty, its color characteristic are changed broadly. So it is important that how we extract the features of the photo of the currency word and observe right algorithm to enhance accuracy to apprehend the observe. We apply right here a simple set of rules which works properly.

The photograph of the foreign money observe is captured through a digital digicam. The hidden capabilities of the be aware are highlighted in the ultraviolet light. Now processing on the photo is completed on that obtained photo using concepts like image segmentation, area records of photograph and characteristics characteristic extraction. Python is the correct device for computational paintings, and analysis. function extraction of images is tough assignment in virtual photograph processing. It includes extraction of invisible and visible capabilities of Indian foreign money notes. This approach consists of different steps like photo acquisition, aspect detection, grey scale conversion, characteristic extraction, photo segmentation and selection making.

Acquisition of photograph is process of creating virtual pix, from a bodily scene. right here, the picture is captured through a simple virtual digicam such that each one the capabilities are highlighted picture is then stored for in addition processing. Currently, most of the tasks in this area the brink detection is performed with the help of algorithms like Sobel, Canny, Prewitt, Roberts and Fuzzy logic algorithms. However in the proposed machine using CNN the specificity turns into exceedingly useful and correct, instead of giving an difficult to understand attitude.

II. LITERATURE SURVEY

[1] Research on Fake Indian Currency Note Detection Using Image Processing: 2021 by Miss.I. Santhiya Irulappasamy , Dr. Vipin Kumar Jain :

Vipin Kumar Jain [2019] have proposed a paper Acknowledgment of Fake money location done by picture preparing technique. This paper based on Fake Cash Recognizable proof by Android Portable Phone Utilizing Advanced Picture Handling. This is often helpful use of Hand-Written Character Include Extraction, the cell phone contraption is utilized to capture picture, it is open wherever the image captured by android cell phone live in sort of video and it is saved there, once more it is changed over in gray scale plan, binaries picture and a few morphological assignment performed on it, at last we found piece of each character from total images. Amol A. Shirsat, S.D. Bharkat [2013] have proposed a Paper Money Acknowledgment Framework. This framework primarily comprises of three parts. The picture of intrigued is to begin with handled and extricating the include by applying tool compartment MATLAB. The moment portion is money recognition where classifier such as neural arrange is utilized. And at last, the result is shown on pc.

[2] Review on Detection of Fake Currency Using Image Processing Techniques: 2021 by Dr.S.V. Viraktamath, Kashama Tallur :

Due to a audit of the foremost later cash in India after group, it is critical to decide in the event that the arrival notes interior the sort of money are honest to goodness or not. The as of late arrived cash is in Indian rupees, with notes in groups of 10, 20, 50, 200, 500 and 2000 rupees. There is as it were a restricted sum of inquire about on fake currency. A few analysts have proposed different methods to decide the authenticity of a note. A few of the most important sources are talked about in this section. Sharan and Kaur proposed a method to distinguish between real and copy notes where the mean concentrated of RGB channels of an picture is measured and three particular highlights, like Inactive picture, RBI Symbol and category numeral with Rupee image, are collected. The proposed framework contains a tall rate of accuracy.

[3] Fake Currency Detection Using Image Processing: 2016 by S.Atchaya, K.Harini, G.Kaviarasi, B.Swathi :

Extortion discovery strategy by utilizing execution metrics is used in this paper. This strategy is utilized to identify credit card fraud, computer interruption and tele-communication extortion. Neural networks and demonstrate based thinking are the two methods behind this strategy. The common traits like distinguishing proof mark and serial numbers of money are extricated. Denomination of cash [2] is known by recognizable proof check. Next era interruption location master framework is utilized in this paper by utilizing the genuine time and bunch procedure. Expansive volume of fake cash will cause numerous issues. Utilizing machines it is simple to recognize fake money. Each year RBI (Save Bank of India) confront the fake cash or annihilated money. Different strategies like water checking, optically variable ink, florescence, etc are utilized to identify fake money in this paper. In this framework, different two components of two pictures are combined together to discover the variety among the images.

[4] A Review on Fake Currency Detection Using Feature Extraction: 2019 by Ms.Namrata Rathore, Mrs.Jyotsna Sagar :

Falsifying of cash isn't a modern issue and has been show since the coinage of cash was started by the Greek in around 600 B.C. Amid that time, the edges of coins were utilized to be clipped off to induce precious metal and the metal was used to form fake coinage. Notes came inexistence in 1200s in China utilizing the wood of mulberry trees was utilized to create cash. Amid that time, the watches utilized to see after mulberry forests and forging of cash were punishable by passing. History tells us that counterfeiting of cash has been an ancient fiendish. In modern times the issue still wins and subsequently the use of diverse sorts of printing strategies and inclusion of distinctive sorts of highlights in monetary standards has been happening, pointing to supply an simpler way to identify limitations.

[5] Fake Currency Detection Using K-NN Technique: 2019 by Y.Neeraja, B.Divija, M.Nithish Kumar

Fake notes are expanding everywhere in this advanced innovation. At display fake note acknowledgment gotten to be the major issue. The primary point is to perceive the fake notes from the unique notes. The money recognizable proof system ought to be vital and it is fundamental. There are so numerous steps counting in this handle is edge location, highlight extraction, picture segmentation, picture procurement, grayscale conversion, pre handling and comparison of images. In this paper, there are distinctive sorts of writing study which depicts distinctive techniques of distinguishing fake cash notes. This paper moreover proposes a audit on Fake Currency distinguishing proof methods to identify counterfeit notes. By applying a few productive pre1processing and include extraction strategies, there are chances to still move forward the exactness of currency distinguishing proof framework.

[6] Yemeni Paper Currency Detection System: 2019 by Ghazi Alnowaini, Aisha Alabsoi, Heba Ali

There are many ways to avoid counterfeiting as encryption of the security features in banknotes, so the researchers started to develop different algorithms to detect counterfeiting, taking into account different currencies in the world. The conducted studies on a currency verification system using image processing based on the extraction of characteristics (2012). This study was applied to Indian banknotes. The System consists of Six phases (Image Acquisition, Gray Scale Conversion, Edge Detection, Image Segmentation Characteristic Extraction and Comparison) The edge detection and image segmentation were used to make a comparison between the original and the counterfeit notes. However, they used only old of image processing techniques. The conducted studies on an Intelligent paper currency recognition system (2015). This study was applied to Saudi Arabia banknotes. The System consists of four phases (Image Acquisition, Pre-processing, Feature extraction and classification). However, they used the statistical feature (width, high, area and Euler) in dataset with 110 input images only and they used old algorithm of neural network (Radial Basis Function Networks) in classification.

[7]. Evaluation of Machine Learning Algorithms for the Detection of Fake Bank Currency: 2021 by Anju Yadav, Tarun Jain

The implementation of SVM (support vector machine) based on multiple Kernel to reduce false rate and compare with SVM (single kernel). To classify real and forged network the author used Texture based feature extraction method for the recognition and to model texture Markov chain concept is used. This method is able to recognize different Countries currencies. To classify whether the note is forged or not global optimization algorithms are applied in Artificial Neural Network (ANN) training phase, and they have observed good success in classification of note. Decision tree and MLP (multilayer perception) algorithms are used to classify the bank currency. Further multi-classification was done using wavelet for feature extraction by BPN (back propagation neural network) and SVM machine learning algorithms are used to classify the bank currency and it's found that BPN is giving more accuracy than SVM. The counterfeit type of currency notes classification is done using segmentation for the feature extraction based on different regions of the note. Same type of study is done where bank currency features are extracted using segmentation of image and further these features are given as input to SVM for determining the note authentication. Neural network (NN) is applied to the bank currency for classification, scanner is used to collect the note image and to convert in bit map for feature extraction and then these data are given to BPN for detecting authentication of Bank currency.

[8]. Currency Identification and Forged Banknote Detection Using Deep Learning: 2019 by Ms.Megha Jadhav, Dr.Yogesh Kumar Sharma, Dr.G.M.Bhandari

The study presents the Deep Learning technique. It is a type of machine learning in which a model is built to learns and perform classification tasks directly from images, text, or sound. It is implemented using neural network framework. The term “deep” denotes to the number of layers in the network—the more layers, the deeper the network. Normally, Existing neural networks contain only 2 or 3 layers, while deep networks can have hundred layers. These algorithms are largely made by the field of artificial intelligence, which has the general goal of emulating the human brain`s ability to monitor, analyze, learn, and make decisions, especially for extremely complex problems. Deep Learning architecture is mainly used to generate learning patterns and relationships beyond immediate neighbours in the data. Deep learning is an important step toward artificial intelligence provides complex representations of data which are suitable for artificial intelligence tasks. The guarantee of deep learning is more accurate machine learning algorithms compared to traditional machine learning.

[9]. Fake Currency Detection with Machine Learning Algorithm and Image Processing: 2021 by Aman Bhatia, vansh Kedia, Anshul Shroff

Different types of study and research work have been carried out in earlier days a different time. Different enhancements and progress were observed. In the past studies the data collected for the fake note detection was with professional cameras but in those data, accuracy seen was to be fair and good due to simple machine learning algorithms. K nearest neighbor algorithms were used traditionally for the detection of fake notes. Systems were getting slower when the data size became large. After that system came across to classify the precision and recognition rate with some enhancement in Machine learning algorithms and deep learning concepts. Due to high and large data sets, data sets were getting distorted, and the precision was not effective a lot though it was 98%. All of these detections were carried out earlier only with open cv and python but time and again with modern deep learning techniques data were collected with the count of 100 images per denomination and then measured. Accuracy of training and testing sets were measured. This brings the chain type efficiency that elongates to a larger value in comparison to other techniques.

[10]. LDA Based Paper Currency Recognition System Using Edge Histogram Descriptor: 2014 by Shafin Rahman, Prianka Banik and Shujon Naha

The study presents various fake currency detection techniques proposed by various researchers. The review highlighted the methodology implemented on particular characteristics feature with success rate of each method to detect counterfeited currency. Moreover, the study includes the analysis of widely acceptable statistical classification technique for currency authentication. The comparative analysis of Logistic Regression and Linear Discriminant Analysis (LDA) was performed to realize the better model for currency authentication. It has been found that classification Model using Logistic regression shows better accuracy of 99% then LDA. The study will benefit the reader in identifying most feasible technique to be implemented based on the accuracy rate.

[11]. Recognition of Fake Currency Note Using Convolutional Neural Networks: 2019 by Navya Krishna G, Sai pooja G, Naga Sri Ram B, Yamini Radha V, Rajarajeshwari P

This paper presents a cellular neural network based edge detection of noisy images using Time-Multiplexing CNN Simulator. The experimental results of Time-Multiplexing CNN Simulator are compared with traditional edge detection operators Canny and Sobel. Simulation results show that the proposed simulator is accurately detecting the edge of noisy images. In image processing that deals with gray-scale image inputs, CNN can be applied to perform feature extraction and classification, motion detection and estimation, collision avoidance, object counting and size estimation and path tracking. In analyzing 3-D complex surfaces, the CNN is capable of detecting minima and maxima and detecting area with gradients that exceeds a given threshold. An edge in an image is the boundary between two different regions. Edge detection is one of the most important steps in image processing, analysis and pattern recognition systems. Its importance arises from the fact that edge often provides an indication of the physical extent of object within the image. Sufficient information to characteristic feature is provided by the detection of edge because the size of the image data is reduced into a size that is more suitable for image analysis. The performance of the later tasks such as image segmentation, boundary detection, object recognition and classification, image registration, and so on depends on the success of the edge characterization step.

[12]. A Hybrid Fake Banknote Detection Model Using OCR, Face Recognition and Hough Features" 2019 Adiba Zarin, Jia Uddin

This paper proposes a model comprised of Optical Character recognition (OCR), Face Recognition and Hough transformation algorithm. The micro printing, water-mark, and ultraviolet lines features of Bangladeshi notes are extracted for testing of genuine notes. The experimental results of the proposed model give accuracy as high as 93.33% which makes it suitable for deployment on a mobile application. Moreover, the obtained results are compared with the output from individual algorithm of OCR, Face Recognition and Hough transformation, to show that the proposed algorithm gives the highest accuracy.

[13]. Fake Currency Detection Using Image Processing2017 by Tushar Agasti, Gajanan Burand, Pratik Wade and P Chitra

The image of the currency note is captured through a digital camera. The hidden features of the note are highlighted in the ultraviolet light. Processing on the image is done on that acquired image using concepts like image segmentation, edge information of image and characteristics feature extractions. MATLAB is the perfect tool for computational work analysis. Feature extractions of images is challenging task in digital image processing. It involves extraction of invisible and visible features of Indian currency notes.

[14]. Paper Currency Verification System Based on Characteristic Extraction Using Image processing: 2012 by Rubeena Mirza, Vinti Nanda

The main feature of the paper currency recognition system is the recognition phase of the image. Symmetrical masks are used for considering specific signs of paper currency. Using this method, the summation of non-masked pixel values in each banknote is computed and fed to a Neural Network. The overall recognition accuracy of the system is computed as 91.5%. It focuses on the image area with both Prewitt Method and Canny Method masks to distinguish between the different denominations. As the number of features considered is high, processing time is large because symmetric masks need to be generated for each feature and each denomination.

[15]. Real Time Fake Currency Note Detection using Deep Learning: 2019 by M. Laavanya, V. Vijayaraghavan

The approach presented in this paper is based upon physical appearance of the Indian currency. Image processing algorithms have been adopted to extract the features such as security thread, intaglio printing(RBI logo) and identification mark, which have been adopted as security features of Indian currency. To make the machine extra robust and accurate, the decisive score of all the 3 features has been fused to distinguish among actual and pretend currencies. some other parameter used to degree the performance of the proposed machine is suggest square errors, that's approximately 1% it can be adopted with the aid of the not unusual humans as well, who quite often face the hassle of differentiating between actual and fake currencies.

[16]. Design and Implementation of Indian Paper Currency Authentication System Based on Feature Extraction by Edge Based Segmentation: 2012 by Rubeena Mirza, Vinti Nanda

Significant information in an image, which can describe the target outline, its relative position within the target area.The traditional edge detection algorithms are accomplished through detecting the maximum value of the first derivative or zero crossing of the second derivative. Although the representative first order differential operators have known advantages like simple computation, speed and ease of implementation, they are more sensitive to noise and their detection effect are not perfect in engineering application.

[17]. Statistical Techniques to Detect Counterfeit Indian Currency: 2018 by Komal Ramne, Prof. Sushma Agarwal

Extracting capabilities from a corpus the use of conventional statistical techniques turned into a challenging task and then prediction set of rules or clustering turned into applied on information to discover useful information. Now the state of affairs has modified with the involvement of deep gaining knowledge of. the use of deep gaining knowledge of version.jEdge detection is one of the most critical manner in photograph processing, and the detection outcomes directly impacts the image analysis. conventional aspect detection algorithms are finished thru detecting the maximum fee of the first by-product or zero crossing of the second one spinoff. even though it appears the consultant first order differential operators have recognized blessings like simple computation, speed and simplicity of implementation, they're more sensitive to noise and their detection impact aren't ideal in most engineering application.

[18]. Counterfeit Currency Detector: 2015 by Ajinkya Babar, Swapnil Jawalekar, Kiran Yadav, Dr.D.B.Salunke

Building automatic picture annotation is a key step in photo retrieval and photograph information. in this paper, we present an cease-to-end automated picture annotation method primarily based on a deep convolutional neural community (CNN) and multi-label facts augmentation. different from traditional annotation fashions that commonly carry out function extraction and annotation as independent tasks, we propose an give up-to-stop automatic image notation model based totally on deep annotation model based totally on deep CNN (E2E-DCNN). E2E-DCNN transforms the photo annotation trouble right into a multi-label learning hassle. It makes use of a deep CNN shape to perform the adaptive function gaining knowledge of, before the give up-to-stop annotation structure the use of a couple of cross-entropy loss functions for education.

[19]. Paper Currency Verification with Support Vector Machines: 2008 by Chin-Chen-Chang, Tai-Xing and Hsuan-Yen Yen

This reputation gadget contains simple image processing techniques such like photograph acquisition, picture pre processes, extract functions and category the use of aid vector system. Basically camera or scanner used for image acquisition. The images of currency processed using a variety of pre processing techniques and different features of the image extracted using local binary pattern technique, once the features are extracted it is important to recognize the currency using effective classifier called Support vector machine and Finally a prototype able to recognize Ethiopian paper currency with accuracy of 98% shows high performance classification model for paper currency recognition and also verify the validity of given banknotes with average accuracy of 93% rate.

[20]. Automatic Indian New Fake Currency Detection Technique: 2017 by Mayadevi A.Gaikwad, Vaijinath V. Bhosle

MATLAB based system which identifies Fake note from the genuine one. For this purpose here we are using MATLAB software. The characteristics extraction is performed on the image of the currency and it is compared with the characteristics of the genuine currency. The currency will be verified by using image processing techniques. The approach consists of a number of components including image processing, edge detection, image segmentation and characteristic extraction and comparing images. The desired results shall verify with MATLAB soft-ware.

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 5 modules. The 5 modules being,

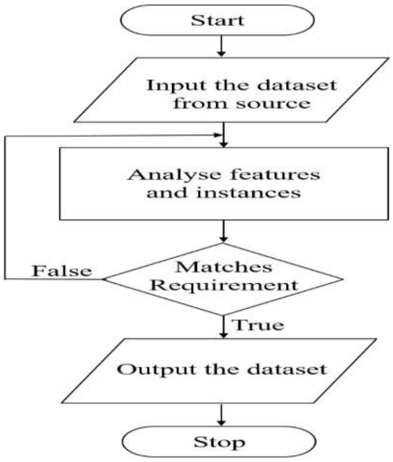
1] Image Acquisition Module

2] Pre-processing Module

3] Edge Detection Module

4] Feature Extraction Module

5] Comparison Module



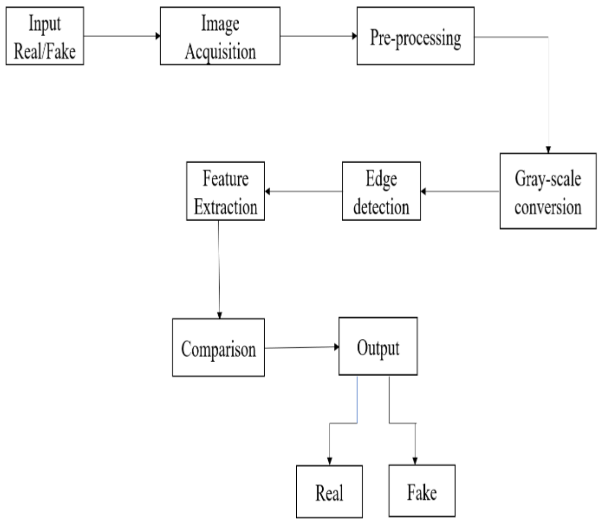


Figure 1. Architectural design of implementation

1]Image Acquisition Module

Figure 1.1 Flowchart for Image Acquisition

Image acquisition consists of capture image through camera. The quality of image depends on camera parameters, camera resolution, lighting conditions, environmental condition, size of objects and distance from which image is taken. For better results, cameras with higher resolution are preferred. The dataset is collected from a source and a complete analysis is carried out. The image is selected to be used for training/testing purposes only if it matches our requirements and is not repeated.

2] Pre-processing Module

Figure 1.2 Flowchart for Pre-processing

This involves converting the image from the RGB format to greyscale to ease processing, the use of an averaging filter to filter out the noise, global basic thresholding to remove the background and consider only the image and a high-pass filter to sharpen the image by amplifying the finer details.

- **Conversion from RGB to Greyscale**

The first step in pre-processing is converting the image from RGB to Greyscale. It can be obtained by applying the below formula to the RGB image. The figure depicts the Conversion from RGB to grayscale.

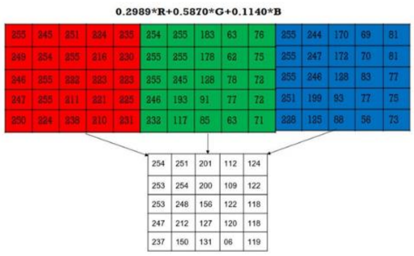


Figure 1.2.1 Conversion from RGB to grayscale

The Original matrix:

244	250	246	249	237
251	253	248	211	149
202	202	153	127	132
112	110	123	120	105
124	121	117	116	119

Append 0s at edges and corners:

0	0	0	0	0	0	0
0	244	250	246	249	237	0
0	251	253	248	211	149	0
0	202	202	153	127	132	0
0	112	110	123	120	105	0
0	124	121	117	116	119	0
0	0	0	0	0	0	0

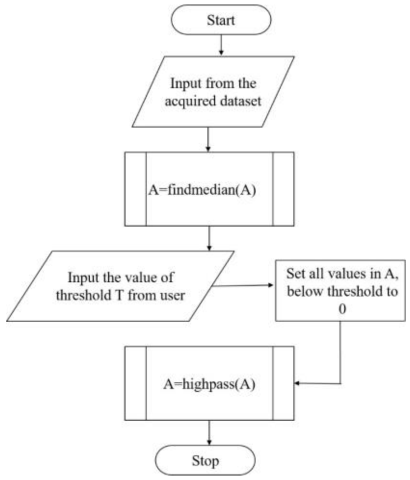
The enhanced matrix:

0	246	246	237	0
202	246	246	211	132
202	202	153	132	120
112	123	121	120	116
0	112	116	116	0

- **Noise removal**

Noise removal algorithm is the process of removing or reducing the noise from the image. The noise removal algorithms reduce or remove the visibility of noise by smoothing the entire image leaving areas near contrast boundaries. Noise removal is the second step in image pre-processing. Here the grayscale image which was obtained in the previous step is given as input. Here we are making use of Median Filter which is a Noise Removal Technique.

- **Median Filtering**



The median filter is a non-linear digital filtering technique, often used to remove noise from an image or signal. Here 0's are appended at the edges and corners to the matrix which is the representation of the grey scale image. Then for every3*3 matrix, arrange elements in ascending order, then find median/middle element of those 9 elements, and write that median value to that particular pixel position.

- **Basic Global Thresholding**

Thresholding is a type of image segmentation, where we change the pixels of an image to make the image easier to analyze. A(i,j) is greater than or equal to the threshold T, retain it. Else, replace the value by 0.

Here, the value of T can be manipulated in the frontend, to suit the varying needs of different images. We use trial and error method here to obtain threshold value which may be best suited for us. Thresholding using basic global thresholding is shown in figure.

0	246	246	237	0
202	246	246	211	132
202	202	153	132	120
112	123	121	120	116
0	112	116	116	0

Suppose, T=150

0	246	246	237	0
202	246	246	211	0
202	202	153	0	0
0	0	0	0	0
0	0	0	0	0

The leaf, minus the background

Figure 1.2.2: Thresholding using Basic global Thresholding

3] Edge Detection Module

Edge detection is one of the image processing techniques. It is used for finding the boundaries of objects within the image. It works by detecting discontinuities in brightness. The Edge detection is a basic tool in image analysis, image processing, image pattern recognition and computer vision techniques. Edge detection is basic tool particularly in the area of feature detection and feature extraction.

Image Sharpening

Image sharpening refers to any enhancement technique that highlights edges and fine details in an image, Increasing yields a more sharpened image.

High-Pass Filtering

A high-pass filter can be used to make an image appear sharper. These filters emphasize fine details in the image. Here the output from the thresholding is given as input. Here, we are making use of a filter, first we append the nearest values to pixels at the boundary pixels. Image Sharpening using High-Pass Filter We multiply the elements of the 3*3 input matrix with the filter matrix, this can be represents as A(1,1)*B(1,1), in this way all the elements in the 3*3 are multiplied and their sum id divided by 9, which gives the value for the particular pixel position. In the same way the values of all the pixel positions are calculated. The negative values are considered as zero, as there can be no such thing as negative illumination.

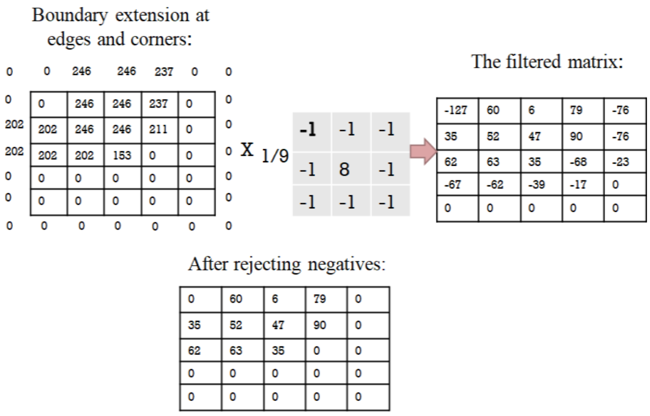
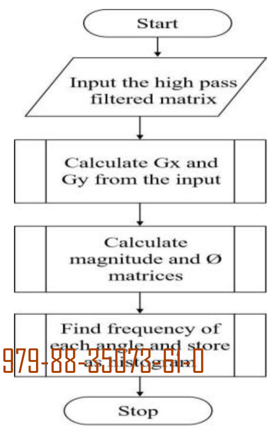


Figure 1.3: Image Sharpening using High-Pass Filter



4] Feature Extraction

Figure 1.4 :Feature Extraction

Here, we use a method called Histogram Orientation Gradient (HOG) to extract the features from the preprocessed image received as input. It involves multiple steps like finding Gx and Gy, which are gradients about each pixel in the x and y axes. Then, these gradients are substituted in relevant formulae to get the magnitude and gradient of the pixel's orientation. Then, the angles and their respective frequencies are plotted to form a histogram, which is the output of this module. Feature extraction is a process of dimensionality reduction by which an initial set of raw data is reduced to more manageable groups for processing.

Histogram Orientation Gradient

The Histogram of Oriented Gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in in localized portions of an image.

Here 0's are appended at the edges and corners to the matrix. Then Gx and Gy are calculated. Gx is calculates as Gx = value on right –value on left and Gy is calculated as Gy=value on top-value on left. Figure 4.10 shows Gx and Gy in HOG.

5] Comparison Module

Comparison is the last step of this process here the features extracted from original currency are compared with features extracted from testing currency. After the features are extracted from original currency the white pixels are calculated and recorded. Then the features of testing currency are extracted and their respective white pixels are calculated.

Classification using Convolutional Neural Networks

In deep learning, a convolutional neural network (CNN, or ConvNet) is a class of deep neural network most commonly applied to analyzing visual imagery. They are also known as shift invariant or space invariant artificial neural networks (SIANN), based on their shared-weights architecture and translation invariance characteristics.When CNN is used for classification, we don't have to do feature extraction. Feature Extraction will also be carried out by CNN. We feed the preprocessed image directly to CNN classifier to obtain the type of weapon if present.

By considering all the features in the output layer which gives the result with some predictive value. These values are calculated by using SoftMax activation function. SoftMax activation provides predictive values. Based on the predictive value the final result will be identified as weapon.

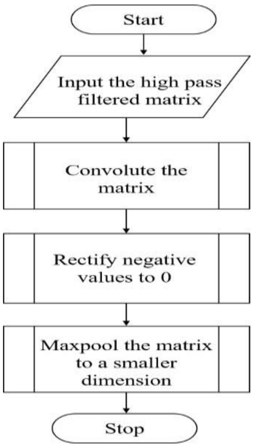
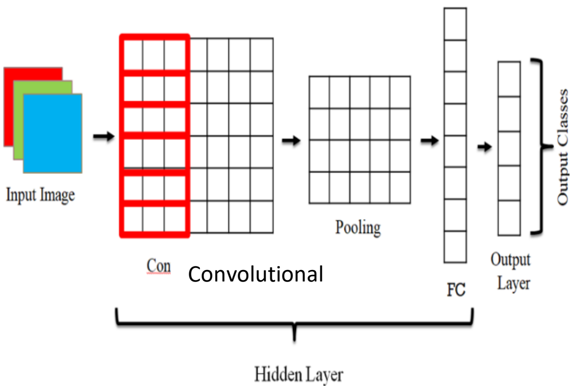


Figure 4.12 Flowchart for classification using CNN

CNN Architecture

CNN architecture is inspired by the organization and functionality of the visual cortex and designed to mimic the connectivity pattern of neurons within the human brain. The neurons within a CNN are split into a three-dimensional structure, with each set of neurons analyzing a small region or feature of the image.

In other words, each group of neurons specializes in identifying one part of the image. CNNs use the predictions from the layers to produce a final output that presents a vector of probability scores to represent the likelihood that a specific feature belongs to a certain class. Figure 4.13 shows the Typical CNN Architecture



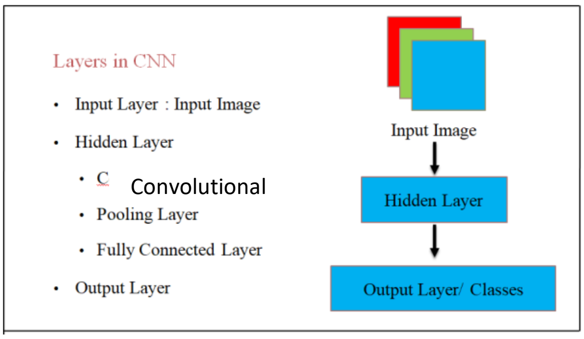
A CNN is composed of several kinds of layers:

- **Convolutional layer**- In convolution layer after the computer reads an image in the form of pixels, then with the help of convolution layers we take a small patch of the images. These images or patches are called the features or the filters. By sending these rough feature matches is roughly the same position in the two images, convolutional layer gets a lot better at seeing similarities than whole image matching scenes. It creates a feature map to predict the class probabilities for each feature by applying a filter that scans the whole image, few pixels at a time.

- **Pooling layer (down sampling)**-scales down the amount of information the convolutional layer generated for each feature and maintains the most essential information (the process of the convolutional and pooling layers usually repeats several times).

- **Fully connected layer**-"flattens" the outputs generated by previous layers to turn them into a single vector that can be used as an input for the next layer. Applies weights over the input generated by the feature analysis to predict an accurate label.

- **Output layer**-generates the final probabilities to determine a class for the image.



IV. RESULT

Testing Image

Fake Currency

Analyse Image

Real Currency

The features are compared based on the intensities of the features (pixel count). Based on the number of matched features, the results are obtained on whether the currency is original or fake.

V. CONCLUSION

Analysis of the Currency picture is more accurate and efficient in terms of cost and time compared to previous procedures when employing digital image processing. For this analysis, OPEN CV software was used. The amount of study being done in this sector is growing all the time, and various image processing techniques are being used to produce a more accurate result. The proposed technique has been successfully used to extract a characteristic from Indian money photos.

In this project, detection of fake Indian currency note is done by using image processing principle. This is the low cost system. The system works for denomination of 100, 500 and 1000 for Indian currency. The system also provides accurate and valid results. The process of detection of fake note is quick and easy. In this system input is taken by camera and output is displayed on PC.

VI. REFERENCES

[1]. Miss.I. Santhiya Irulappasamy Volume 6, Issue 3 March 2021, Dr. Vipin Kumar Jain “Research on Fake Indian Currency Note Detection Using Image Processing” S.S. Jain Subodh P.G. College, Volume 10, Issue-II June 2019, IJSDR, pp. 196-199.

[2]. Dr.S.V. Viraktamath, Kashama Tallur “Review on Detection of Fake Currency Using Image Processing Techniques” 2021, ICICCS, pp. 865-870.

[3]. S.Atchaya, K.Harini, G.Kaviarasi, B.Swathi "Fake Currency Detection Using Image Processing" September 2016, IJTRD, pp. 72-73.

[4]. Ms.Namrata Rathore, Mrs.Jyotsna Sagar "A Review on Fake Currency Detection Using Feature Extraction" Volume 10, Issue 11, November 2019, JES publication, pp. 407-411.

[5]. Y.Neeraja, B.Divija, M.Nithish Kumar "Fake Currency Detection Using K-NN Technique" Volume 9, Issue 1, May 2019, IJRE, pp. 201-205.

[6]. Ghazi Alnowaini, Aisha Alabsoi, Heba Ali "Yemeni Paper Currency Detection System" 2019, ICOICE, pp. 978-984.

[7]. Anju Yadav, Tarun Jain " Evaluation of Machine Learning Algorithms for the Detection of Fake Bank Currency" June 2021, ICOCC, pp. 810-815.

[8]. Ms.Megha Jadhav, Dr.Yogesh Kumar Sharma, Dr.G.M.Bhandari "Currency Identification and Forged Banknote Detection Using Deep Learning" 2019, ICITAET, pp. 178-183.

[9]. Aman Bhatia, vansh Kedia, Anshul Shroff "Fake Currency Detection with Machine Learning Algorithm and Image Processing" 2021, ICICCS, pp. 755-760.

[10]. Shafin Rahman, Prianka Banik and Shujon Naha "LDA Based Paper Currency Recognition System Using Edge Histogram Descriptor" 2014, ICOCIT, pp. 326-331.

[11]. Navya Krishna G, Sai pooja G, Naga Sri Ram B, Yamini Radha V, Rajarajeshwari P "Recognition of Fake Currency Note Using Convolutional Neural Networks" Volume 8, Issue 5, March 2019, IJITEE, pp. 58-63.

[12]. Adiba Zarin, Jia Uddin "A Hybrid Fake Banknote Detection Model Using OCR, Face Recognition and Hough Features" 2019, IJECS, pp. 91-96.

[13]. Tushar Agasti, Gajanan Burand, Pratik Wade and P Chitra "Fake Currency Detection Using Image Processing" 2017, ICSET, pp. 1-8.

[14]. Rubeena Mirza, Vinti Nanda " Paper Currency Verification System Based on Characteristic Extraction Using Image processing" Volume 1, Issue 3, February 2012, IJEAT, pp. 68-71.

[15]. M. Laavanya, V. Vijayaraghavan " Real Time Fake Currency Note Detection using Deep Learning" Volume 9, Issue 1S5, December 2019, IJEAT, pp. 95-98.

[16]. Rubeena Mirza, Vinti Nanda " Design and Implementation of Indian Paper Currency Authentication System Based on Feature Extraction by Edge Based Segmentation" Volume 3, Issue 2, August 2012, IJERD, pp. 41-46.

[17]. Komal Ramne, Prof. Sushma Agarwal " Statistical Techniques to Detect Counterfeit Indian Currency" Volume 9, Issue 6, June 2018, IJSER, pp. 588-592.

[18]. Ajinkya Babar, Swapnil Jawalekar, Kiran Yadav, Dr.D.B.Salunke " Counterfeit Currency Detector" Volume 3, Isssue 3, May-June 2015, IJTRA, pp. 106-108.

[19]. Chin-Chen-Chang, Tai-Xing and Hsuan-Yen Yen " Paper Currency Verification with Support Vector Machines" 2008, SITIS, pp. 860-865.

[20]. Mayadevi A.Gaikwad, Vaijinath V. Bhosle " Automatic Indian New Fake Currency Detection Technique" Volume 6, Issue 11, November 2017, IJERT, pp. 84-87.

Sahapaathi: A web based real time collaborative code development and execution system with A.I. pair programmer

Neha M P
Information Science and Engineering
Sapthagiri College of Engineering
Bangalore, India
nehamp930@gmail.com

Prajwal C Patil
Information Science and Engineering
Sapthagiri College of Engineering
Bangalore, India
prajwalpatil128@gmail.com

Shreyas M Kaushik
Information Science and Engineering
Sapthagiri College of Engineering
Bangalore, India
shreyasmk.mathur@gmail.com

Yashaswini P
Information Science and Engineeering
Sapthagiri College of Engineering
Bangalore, India
yashprashanthn@gmail.com

Prof. Sudarsanan D
Information Science and Engineering
Sapthagiri College of Engineering
Bangalore, India
sudarsanad@sapthagiri.edu.in

***Abstract*—In this paper, we present "*Sahapaathi*", a standalone, light-weight, web-based IDE and collaborative compiler that supports duplex editing in a collaboration session. It is a combination of a code-editor and a compiler module that supports execution of over 60 programming languages without any software to be installed. The system has an A.I. pair programmer which suggests code based on user comments. It also features a chat and voice call for real-time communication. The System uses web-socket API to connect users to the platform. This system can be used by teachers to teach programming in a remote environment effectively. It can also be used by professionals to co-develop any software with real-time compilation and debug errors in a socially interactive remote environment promoting pair programming.**

Keywords—Collaborative compiler, editor, web-socket API, A.I. pair programmer

I. Introduction (*Heading 1*)

Collaborative coding is all about tackling problems and discovering solutions together. It encompasses techniques like pair programming, which several tech companies take seriously enough to screen candidates during their interview processes. It also cultivates useful skills that are tough to learn if you are coding alone. Irrespective of industries, collaborative coding never stops being useful. After the start of the cloud era, almost every company started storing and processing data in remote servers. Even large applications such as Netflix etc. are stored in a remote server. So, the need for large spaces for physical servers has vanished. This remote shift gave birth to remote pair programming where people can work from anywhere around the world without physically being present in same place at a time. Remote pair programming, also known as virtual or distributed pair programming, is technique in which the two programmers are in different locations working via a collaborative real-time editor, shared desktop, or a remote pair programming IDE plug-in. "**Sahapaathi**" is a system that provides a user-friendly web interface to collaborate with multiple users and work on different projects and files. It features a editor with code snippets which suggests the code completion. In collaboration session all the users can work on same or different files on the same editor. Every user can make use of the locally available compiler to execute code of any languages available. It also provides an A.I. Pair Programmer that auto completes code based on a user's comment. This A.I. model fetches the code as per the user requirements. All users in a collaboration session can make use of chat and audio to communicate with one another. All these services need a minimal requirement of a mobile/laptop with an active internet connection.

II. Literature Review

The International Impact of COVID-19 and "Emergency Remote Teaching" on Computer Science Education Practitioners **[1]** depicts that In March 2020, the COVID-19 global pandemic imposed "emergency remote teaching" throughout the world. This lead universities and schools across the world to adapt online teaching, learning, and assessment. There were many advantages and disadvantages due to this rapid shift to online especially on working and teaching areas. Due to this CS practitioners were not able to effectively deliver technical presentations and also conduct online examinations and assessments. This alternate method of emergency remote teaching during the pandemic may or may not be efficient. The efficacy of digital learning is unclear. It is possible to say COVID-19 was an opportunity for educational change which helped in preparing for similar future situations.

CodeHelper: A Web-Based Lightweight IDE for E-Mentoring in Online Programming Courses says beginners usually find it difficult to write the program correctly in their first attempt while analysing and mastering a new programming language. The struggle they face are resolving the programming errors, compilation errors and debugging the program **[4]**. For programming courses teachers were not able to help students in rectifying the errors in their code during the virtual classes. Teachers hosted sessions on ZOOM, Google meet, Microsoft teams and allowed students to share their screen and then the teachers looked into the code and tried to correct their mistakes which was not that efficient **[2]**. They identified three issues while using such an approach. First, since the shared screen can be viewed by all users(participants). Students felt uncomfortable to share their incorrect code. Second, since online conducting sessions required huge network bandwidth, it is difficult to predict that both teachers and students have good quality network to conduct or attend an online session. Third, the teachers could only tell the mistakes through audio or chat, instead of correcting the code in their systems a form of online pair programming. CodeHelper enables individual screen sharing between a student and a teacher, hence it protects the users privacy. Pair programming is a technique in which the two programmers are in different locations working together on a common project **[5]**. In order to implement this in teaching and learning programming tutorials efficiently, there are many researches which is mainly focused on a collaborative environment for practising programming **[3]**.

Another similar system SCEPPSys **[5]** is an extension of Eclipse IDE which provides a collaborative environment for pair programming. Users can utilise this system for sharing their editor for collaboration session. There is an instructor whose role is to observe the whole progress and will not be included in the session of pair programming. Students have to solve their problems without any help on their own and the instructor will not be able to help them via this system.

EdCode: Towards Personalized Support at Scale for Remote Assistance in CS Education **[6]** conveys the huge software development fields that has paved way to increase in the thirst of learning programming **[7].** Therefore, demand for computer science education has increased. Previous studies has proved that in-person support learning has helped students in their programming courses. Supporting in-person helps instructors to review students code and allows them to provide continual assistance. This type of support will be difficult to provide in courses that have more participants. Community question & answering platforms (e.g., Stack-Overflow) are very common help seeking websites, although they lack personalized assistance for programmers **[13] [14]**. To measure personalized assistance, prior studies has suggested automated methods to debug the program **[8]**, construct in-situ explanations for code examples **[15]**. Through their studies they found that support provided by Edcode can be used in educational institutions for in-person support.

A visual framework to support collaborative coding activities **[13]** portray that visual programming environments can help in lowering the convolution of coding and assisting students for the betterment in programming. Visual framework gives the overview of the design and architecture of a virtual environment that enables remote users to collaborate through an iconic programming language. This system, which is supported by web-technology enables users to practice together and enjoy learning programming. Collaboration is achieved via sharing collaborative work space with objects depicting the structure of the programming language. These space of objects is hosted in cloud platforms, where the users will be able to access the virtual environment through web-browsers. This framework and the programming language, can be customized to be supported on different operating systems (OS), different usability and language requirements and so on). The SIRENE is a framework which permits the students to analyse and practice coding in an effective environment. The increase of open-source communities have driven and encouraged the coders or programmers throughout the globe to collaborate with each other even if the distance and many other things matters. It has set an example to the world and achieved success in using the tool more precisely and effectively to collaborate with each other and discuss their ideas. Such groups proved to be effective and their success is based on how effectively they use the tool to collaborate and share ideas. There were numerous efforts that mainly focused on computer-supported collaborative work platforms supported by social and other media functionalities **[9]**. Suppose if we want to take an example it may be in the field of education or health and many more which basically focuses and are related to collaboration. Pappachan et al. in **[10]** provides collaborative way for the patients and professionals in health department that is done through mobile devices.

SIRENE helps the user to focus on the correct syntax of the programming language, and on the logical construction of an algorithmic solution to a problem. Another characteristic feature of this system is to create a multi tasked web-room with different tools which work at the same time. Many users can collaborate together and see the same work-space throughout the world. Therefore, teachers can start a collaboration session and simultaneously, his/her students can connect to the session with their devices remotely.

According to COLLECE-2.0: A real-time collaborative programming system on Eclipse **[11]**, the challenges faced by students in their initial days of college studies in Computer Science and related branches is to learn computer programming. The main challenges they face are related to syntax errors which is the wrong use of syntax (lack of semi-colon, colon, brackets, parentheses, quotation marks and other symbols) and few other complications such as, constructing an appropriate code snippet for resolving a given code. In this circumstance, learning in group may be found very useful in learning this course.

COLE-PROGRAMMING **[12]**, is designed to learn algorithms and programming languages. It also facilitates teachers to conduct many activities related to programming and must be solved by the students, and evaluated by multiple testcases. This system evaluates all the answers that students have provided by the use of an algorithm. This system doesn't support collaborative coding, code-execution and code-debugging.

After reviewing all these papers there were many pros and cons which were related to our project. Most of them emphasized on collaboration, pair programming and virtual learning and teaching. But the approaches to achieve them were not that effective. In our project we focus on improvising these by adapting new methods which are effective.

III. 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 for the system. In the system we are proposing, the working of all the modules. The modules are as follows:

1. Register and Login module
2. Collaboration module
3. Compiler module
4. A.I. module

A. Architecture

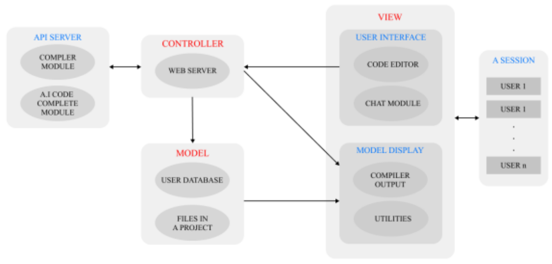


Fig. 1: MVC Architecture

The system is designed based on a modified version of the Model View Controller (MVC) design pattern that supports interaction of multiple users in a session concurrently.
The view is comprised of two entities: User Interface and Model Display. The UI encloses the Code Editor and Chat modules, which the users can use to interact with the system and also other users in a session. Model display renders the result of compilation of a code which is returned from a Web Server which acts as a Controller. The files and user details are stored in the database which is called the Model. The model display can take inputs from the controller as well as the model.
In addition to these, there is an API server consisting of an A.I based auto code completion and a compiler module, which the controller (web server) uses to perform the task of completing code based on user's comments and compilation of codes. Controller employs the observer pattern that watches every user input and changes made on the code editor and broadcasts the same to the model which then notifies the view to make it consistent with the model.

B. Modules

1. Register and Login module

In register module, user/client registers with username, email-id and password. On successful registration, user can login with email-id and password. Once the user is authenticated, he/she will be directed to the Dashboard page. registerUser(name, email_id, password). Register function takes 3 parameters i.e. username, email-id and password. Checks for the user email-id, if it is present then it will redirected to login page and user has to login with the credentials, if it is not present then the account will be created for the user and simultaneously a folder will be created in Amazon S3 Bucket by successfully registering the user.

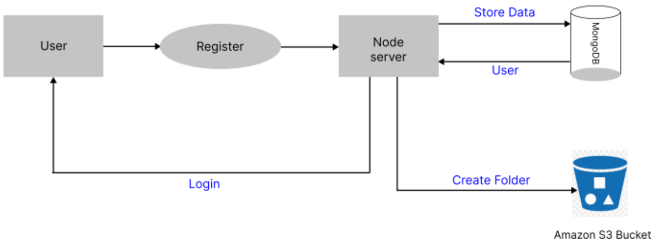


Fig. 2: Register module

Login function takes 2 parameters i.e. email-id and password,(login(email_id, password)) then the password will be hashed and checks with the password, if it matches then the user will be authenticated and will be directed to Dashboard page. In the dashboard page, the user can create projects. The projects can be deleted, opened and downloaded as zip file.

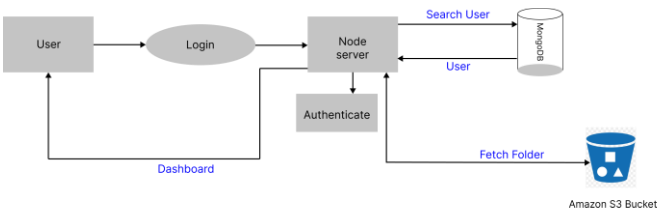


Fig. 3: Login module

2. Collaboration module

When host starts the collaboration session , node server creates collaboration room with the unique room id. Host can share the room-id with multiple users and client/user can join the collaboration session with the room-id shared by the host. startCollaboration(isHost, room_id). When host starts a collaboration session this function makes the project room-id(generated on project creation) publicly available and returns it to the host for further sharing. joinCollaboration(room_id). When the user wants to join the collaboration session this function accepts the room-id which is given by the host and joins the user to the collaboration session.

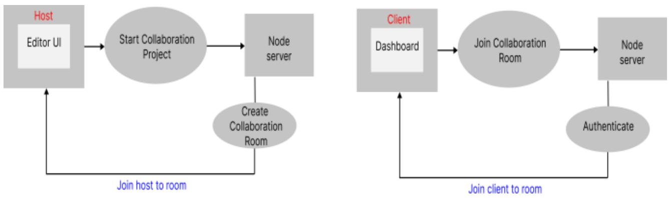


Fig. 4: Collaboration module

In a collaboration session, the user can perform operation on file such as creating, deleting, renaming and updating the files. Collaborators can work on same or different files simultaneously. If the files are not present in local storage, a fetch request is sent to node server to fetch the files to local storage. Any changes made in the projects, is updated in the node server and it is periodically uploaded in Amazon S3 bucket.

Another feature is, in collaboration session the host has the priviledge to use the restrict editing option when he/she doesn't want the collaborators to make any changes in the files. If the collaborators need to communicate with each other, there is a chat and voice call option through which they can communicate in real time.

3. Compiler module

The compiler in this system supports many languages. When the user compiles the code , node server sends the API request to Jdoodle API server to compile the code. After compilation, the compiled result is sent back to the user. compile(code, language, inputs). Compile function takes 3 parameters i.e. code, language, inputs. An API request is sent to JDoodle.com which compiles the code based on the parameter provided by the user and returns output.

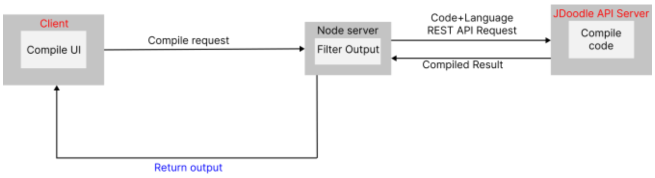


Fig. 5: Compiler module

4. A.I. module

This system also has an A.I. module in which the Python server performs Web scraping for the particular code string that is requested by the user and then returns back the highest voted code snippet.

When client/user requests for any code, the code string must start with “//” and end with a “.”. For example, “ // Palindrome in python.” autoSuggest(codeString). Upon autosuggest request from the user, this function accepts the user entered value in the editor and performs web-scraping for the code string on codegrepper.com, parses the response, filters and returns the highest voted answer.

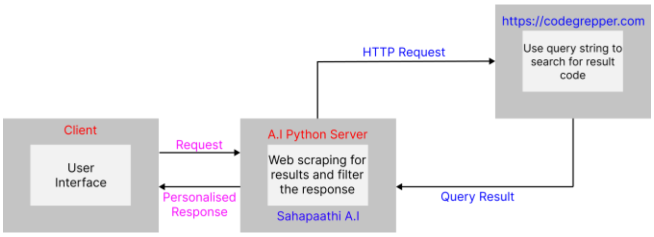


Fig. 6: A.I. module

IV. RESULT

The Sahapaathi system is flexible, user-friendly and supports many programming languages and can be used to support different use scenarios. This system can be used by anyone who has a knowledge of programming and needs to work in a group. Using this platform users can collaborate and work on same project from their home anywhere in the world. Sahapaathi can be used in educational purpose where teachers can teach efficiently and students can learn computer programming much effectively. This platform is compatible with all operating systems like Android, Windows, Linux, Mac. This system supports virtualization in which each user connected to the same collaboration room displays same work space. In the collaboration room, all the users are connected to each other through a socket. This socket connection lasts till the host ends the collaboration session.

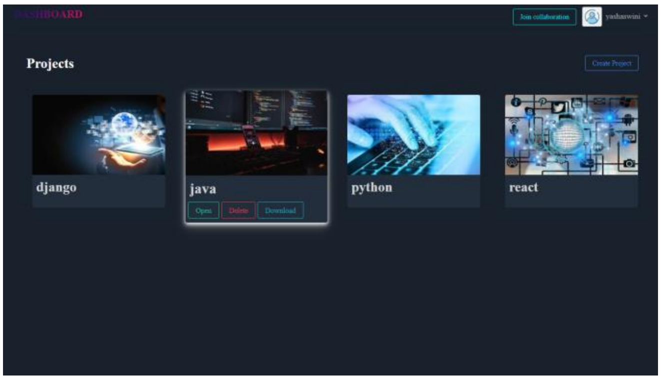


Fig. 7: Dashboard

After the user login successfully there redirected to dashboard page. In dashboard users can create projects and perform CRUD (Create, Read, Update, Delete) operations on the project.

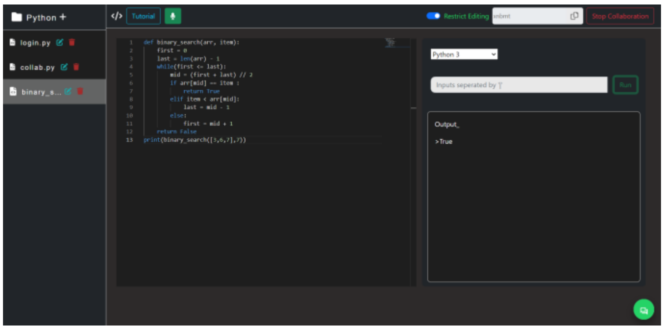


Fig. 8: Editor

After opening any project, user can create files and perform CRUD operation on the files. On opening the file, an editor and a compiler is displayed. In the editor, user can write code in any programming language. After joining the collaboration session, all the collaborators can work and edit in the same editor.

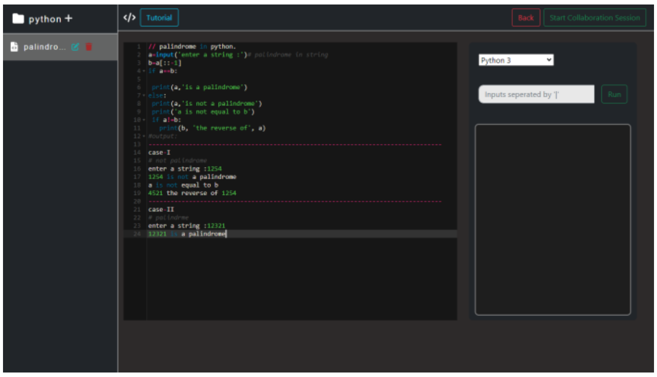


Fig. 9: A.I. pair programmer

In editor, there is an A.I. module which auto suggests code based on the code string provided by the user.

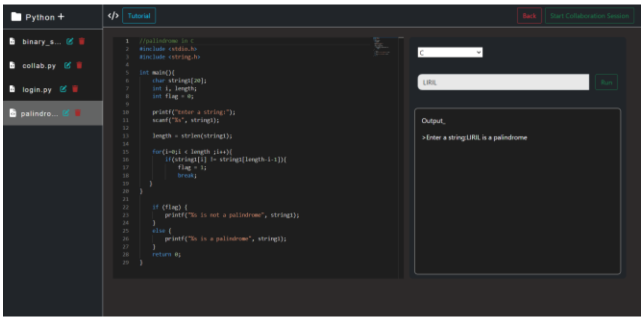


Fig. 10: Compiler

The compiler consists of a dropdown including different programming languages, an input field for providing the inputs, run button to compile the code and an output section to display the output.

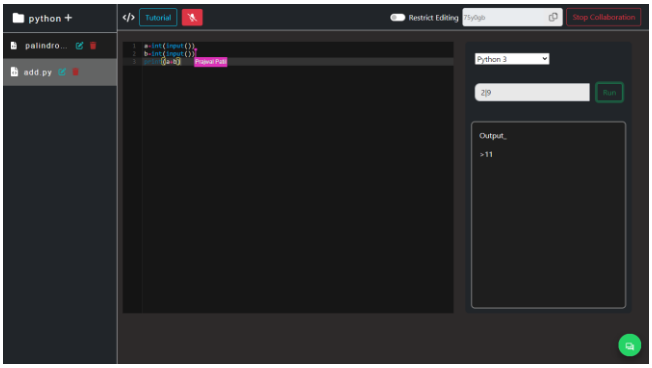


Fig. 11: Collaboration

When host starts the collaboration session, a room-id is generated and the host can share it with the people who wants to join the collaboration session. In a collaboration session, the collaborators can edit the code in the editor simultaneously and compile the code. Also, they can update the existing files and create new files. Host can restrict the users from editing by using the restrict editing option. Collaborators can communicate with each other using chat and voice call. When the host stops the collaboration session, each collaborator is removed from session.

V. CONCLUSION

We were able to meet all the requirements of our project by using all the above-mentioned modules and other tools. Sahapaathi can be used for educational purpose. Teachers can use this platform to teach programming languages much effectively. Students can clarify their doubts by asking teachers and teachers can demonstrate the code in real-time. This platform can also be used by professionals to collaborate in real-time and work on same projects or research together in a group from anywhere in the world.

REFERENCES

[1] Tom Crick, Cathryn Knight, Richard Watermeyer and Janet Goodall. “The International Impact of COVID-19 and “Emergency Remote Teaching” on Computer Science Education Practitioners”, 2021, Ref. No. 978-1-7281-8478-4/21/$31.00 ©2021 IEEE.

[2] Xiao Liu and Gyun Woo. “CodeHelper: A Web-Based Lightweight IDE for E-Mentoring in Online Programming Courses”, 2021, Ref. No. 978-1-7281-7618-5/21/$31.00 ©2021 IEEE.

[3] L. Silva, A. J. Mendes, and A. Gomes, “Computer-supported collaborative learning in programming education: A systematic literature review,” In *2020 IEEE Global Engineering Education Conference (EDUCON)*, April 2020, pp. 1086-1095.

[4] Y. Bosse and M. A. Gerosa, “Why is programming so difficult to learn? Patterns of Difficulties Related to Programming Learning Mid-Stage,” ACM SIGSOFT Software Engineering Notes, vol. 41(6), pp. 1-6, 2016.

[5] S. Xinogalos, M. Satratzemi, A. Chatzigeorgiou, D. Tsompanoudi, “Student perceptions on the benefits and shortcomings of distributed pair programming assignments,” In *2017 IEEE Global Engineering Education Conference (EDUCON)*, April 2017, pp. 1513-1521.

[6] Yan Chen, Jaylin Herskovitz, Gabriel Matute, April Wang, Sang Won Lee, Walter S. Lasecki, Steve Oney. “EdCode: Towards Personalized Support at Scale for Remote Assistance in CS Education” Ref. No. 978-1-7281-6901-9/20/$31.00 ©2020 IEEE.

[7] P. K. Chilana, C. Alcock, S. Dembla, A. Ho, A. Hurst, B. Armstrong, and P. J. Guo, “Perceptions of non-cs majors in intro programming: The rise of the conversational programmer,” in *Visual Languages and Human-Centric Computing (VL/HCC), 2015 IEEE Symposium on*. IEEE, 2015, pp. 251–259.

[8] X. Liu and H. Zhong, “Mining stackoverflow for program repair,” in *2018 IEEE 25th International Conference on Software Analysis, Evolution and Reengineering (SANER)*. IEEE, 2018, pp. 118–129.

[9] M. Storey, A. Zagalsky, F. F. Filho, L. Singer and D. M. German. 2017. “How Social and Communication Channels Shape and Challenge a Participatory Culture in Software Development”. in *IEEE Transactions on Software Engineering*, vol. 43, no. 2 (2017), pp. 185-204.

[10] P. Pappachan, R. Yus, A. Joshi, and T. Finin. 2015. “Rafiki: A semantic and collaborative approach to community health-care in underserved areas”. CollaborateCom 2014 - Proceedings of the 10th IEEE International Conference on Collaborative Computing: Networking, Applications and Worksharing (2015), 322–331.

[11] Carmen Lacave, Santiago Sánchez, M. Angeles García, Miguel A. Redondo, Ana I. Molina and Manuel Ortega, “COLLECE-2.0: A real-time collaborative programming system on Eclipse”, Ref. No. 978-1-7281-3182-5/19/$31.00 ©2019 IEEE.

[12] F. Jurado, A. I. Molina, M. A. Redondo, and M. Ortega, “Cole-Programming: Shaping Collaborative Learning Support in Eclipse,” *IEEE Rev. Iberoam. Tecnol. Del Aprendiz.*, vol. 8, no. 4, pp. 153–162, Nov. 2013.

[13] J. Zhu, J. Warner, M. Gordon, J. White, R. Zanelatto, and P. J. Guo, “Toward a domain-specific visual discussion forum for learning computer programming: An empirical study of a popular mooc forum,” in 2015 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC). IEEE, 2015, pp. 101–109.

[14] R. Slag, M. de Waard, and A. Bacchelli, “One-day flies on stackoverflow why the vast majority of stackoverflow users only posts once,” in 2015 IEEE/ACM 12th Working Conference on Mining Software Repositories. IEEE, 2015, pp. 458–461.

[15] A. Head, C. Appachu, M. A. Hearst, and B. Hartmann, “Tutorons: Generating context-relevant, on-demand explanations and demonstrations of online code,” in 2015 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC). IEEE, 2015, pp. 3–12.

LEUKEMIA CANCER CELLS DETECTION USING IMAGE PROCESSING

Suhana S[1], Sujan Ravindra[2], Sushmitha C[3] and Gayathri R[4]

[1-3]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[4]Assistant Professor Gayathri R , Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
suhanasriv5979@gmail.com, sujanravi3@gmail.com, sushmithac24012001@gmail.com, gayathrir@sapthagiri.edu.in

Abstract---White Blood Cells (WBC) Cancer detection is a tedious task because cancer diseases worsen rapidly in a short period of time. The Manual diagnosing systems used today to detect WBC cancers are Lumbar Puncture, Bone Marrow Biopsy and Lymph Node Biopsy. These systems are not only time consuming and expensive, but might be inaccurate sometimes which leads to a misdiagnosis in most cases posing a life-threatening situation for patients. To avoid these situations, this survey paper proposes a method by which an automated system is developed and designed to ease the detection of cancer disease in a short period of time and also which is cost efficient. The aim of the system is to produce a highly accurate and promising results in diagnosing the cancer using digital image processing method of Machine Learning. And an automatic model is developed to work without any requirement of the lab technicians to analyze the result. A robust segmentation, clustering and deep learning techniques like Multi-Layer Perceptron will be used and for classification Support Vector Machine (SVM) will be used to achieve accurate results on the bone-marrow images by training the system. The proposed system will detect the WBC cancer cells with the less amount of dataset by undergoing several processes.

Keywords---Bone Marrow Biopsy, Digital Image Processing, Lumbar Puncture, Lymph Node Biopsy, Multi-Layer Perceptron (MLP), Support Vector Machine (SVM), White Blood Cells (WBC).

I. INTRODUCTION

ACCORDING To the WHO, cancer is the most fatal disease. Around 9.6 million of the population have died due to this disease in the world.

In the blood, cells are of three varieties:

- Platelets
- Red Blood Cells
- White Blood Cells

The above cells are continuously produced in bone marrow and are released into the bloodstream in particular intervals. Uncontrolled growth of abnormal WBC's causes White Blood Cells cancer along with normal blood cells. Generally, WBC cancer is called as Leukemia.

Detection of WBC disease is a very tedious task since the symptoms are often misunderstood to other diseases. Manual diagnosing systems like Bone Marrow Biopsy and other systems used today to detect these diseases consumes a lot of time and these systems are highly inaccurate leading to misdiagnosis of the disease posing a threat to patient's life.

Recognition of these diseases initially is to be done by observation of blood sample by skilled-workers. It's often lengthy, repetitive and tedious task since it depends upon operator's skill and a main disadvantage in the manual systems.

White Blood Cells (WBCs) perform vital role in our immune system, as they act as back bone of the defense system for our body and fight against diseases and infections. Therefore, the WBC's classification is on high demand. Although their dark purple-like appearance will be used for detection, the analysis and implementation become very difficult due to differences in shape and texture.

Hence, it is very important to design image processing and Machine Learning used automated systems which is fast and accurate detection of these diseases. The automated systems not only help patients to undergo treatment immediately after the detection, but helps medical professionals in detection of diseases with minimal errors since it does not depend upon the operator's skill. This is a main advantage of automated systems when compared with the manual diagnosing systems.

II. LITERATURE SURVEY

An important part of human body to keep it alive is blood as it is responsible for carrying Oxygen, minerals and so on. White Blood Cells such as lymphocytes and Red Blood Cells are produced in Bone Marrow, which is inside a body's large bones tissue. Drastic number of abnormal WBC production in Bone Marrow leads to the occurrence of Acute Lymphoblastic Leukemia, generally referred to as Leukemia. The abnormal WBCs are usually called "Blasts" which are in drastic numbers in the blood compared to other healthy cells. The cells are manually studied by hematologists which is time consuming and is subjected to some errors. A completely automated system is needed to avoid such situations. This can be done by segmenting the Nucleus of the cell by using suitable algorithms in LabVIEW and MATLAB. The segmentation of Nucleus can help in the feature extraction by which the occurrence of Leukemia can be detected. LabVIEW algorithm is usually less sensitive to input images and complete segmentation of Nucleus can be achieved. [1]

Acute Lymphoblastic Leukemia is generally found in children less than 5-year-old and above 50-year-old in adults. The word "Acute" is given to the cancer since it can spread to central nervous system, Spleens, Liver in case it is undetected and untreated. 108 sample images of healthy and cancer affected patients with 24-bit color depth generally consisting of WBCs and RBCs. Image conversion of color space from BGR to CMYK by removing the background using Zack Algorithm. Separation of grouped and ungrouped cells is done using Watershed segmentation and the cells can be counted after removal of abnormal cell components to determine the extent of ailment in the patient. The algorithm was inaccurate and for irregular shapes of WBCs grouped in large numbers. Improvement of the algorithm to provide better results and accuracy can be done by using self-learning mechanisms which can separate the grouped cells in a better way and provide greater accuracy in the detection of Leukemia. [2]

Usually if there are abnormalities in the WBC counts when a Complete Blood Count is performed, a morphological analysis will be done by taking the blood smear of the patient. Specific tests will be done to detect the presence of ALL. The error rate in the manual detection is around 30% to 40%. The Artificial Neural Networks which work similar to human brain can be applied to overcome this problem. 4 major steps are image acquisition, image segmentation, feature extraction and classification by using ANN. Classification is done on the images captured at 40x magnification through Leica Microscope. Multi-Layer Perceptron which is an Artificial Neural Network is used for classification of ALL. In the segmentation the RBC Background of blood smear were removed as they usually don't contain any information. The HSI (Hue, Saturation, Intensity) color segment is used for image segmentation of WBC. Feature Extraction is done on a fully segmented image. Feature Extraction is purely based on the color, size and shape-based features. Hematologists usually classify by considering the shape of the cells and their nucleus. Several factors like roundness and compactness are to be taken during the Feature Extraction. The Levenberg-Marquardt Algorithm is used instead of Back-Propagation algorithm due to better learning rate and relative stability. The Simplified Fuzzy ARTMAP Neural network is used for a fast and incremental learning system. Therefore, the classification of the WBCs is done by using MLP and SFAM networks are analyzed based on cell's shape, color and size. The accuracy of 95.7% was achieved for the model which used MLP and BP network whereas the accuracy of 95.55% was achieved for the model which used MLP and LM Network. The accuracy of 92.43% was achieved for the model which used SFAM network by considering all the constraints of WBCs. [3]

The present methodologies for detection of leukemia cancer detection are performed using manual testing, which mainly relies on a set of experts and also consumes a lot of time. An automated leukemia detection provides all possibilities of accurate results and it also minimizes human intervention. Our proposed method creates a path which is relied on image processing techniques, which automatically identifies acute lymphoblastic leukemia from microscopic blood images. Henceforth, 16 powerful features were excerpted from the pictures in the way that professionals achieve. This increases the potentiality of the classifiers to perceive leukemic cells in microscopic images. To carry out this classification, the application of two conventional machine learning classifiers such as the Artificial Neural Network (ANN) and the Support Vector Machine (SVM) are used. Our proposed methods reached an accuracy of 95.32%. [4]

Acute leukemia has two dominant forms and they are acute myelogenous leukemia and acute lymphocytic leukemia. From acute leukemia blood images, 6 features have been gathered and are being used as neural network inputs for the distribution. To perform the classification, the famous Hybrid Multilayer Perceptron Neural Network is being used. For 1474 data samples, we are making use of modified RPE training algorithm to train the neural network. The results were noted down where the neural network produced an accuracy of 97.04%. Thus, the results obtained indicate the proficiency and aptness of the Hybrid Multilayer Perceptron neural network for the classification and differentiating blasts from subtle leukemia blood samples using a modified RPE training algorithm. [5]

The White Blood Cells Cancer detection is a tedious task because the cancer diseases worsen rapidly in a very short period. The diagnosing systems used today to detect WBC cancers are one Marrow Biopsy and Lumbar Puncture, Lymph Node Biopsy. These systems are not only time consuming and expensive, but also are inaccurate sometimes which leads to a misdiagnosis in most cases which can cause a life-threatening situation for patients. In order to avoid these situations, the proposed method is implemented which has an automated system and is developed and designed to ease the detection of cancer disease in a short period and also is cost-efficient. This system aims at producing highly accurate and promising results in diagnosing cancer using the digital image processing method of Machine Learning. An automatic model is developed, which works without any requirement of the lab technicians to analyze the result. Segmentation, clustering and deep learning techniques like Multi-Layer Perceptron and Support Vector Machine are being used to achieve accurate results on the bone-marrow images by training the given system. Our proposed system will detect the WBC cancer cells with less amount of dataset by undergoing several processes. [6]

The analysis and diagnosing of a colossal range of diseases are done by investigation and blood cells classification. Acute lymphoblastic leukemia (ALL) detection is done by analyzing while blood cells. Currently, the manual examination of blood cells is done by virtuoso operators. However, slow analysis, non-standard accuracy, and operator's dependency are some of disadvantages. Methods: The planned approach isolates the full white blood corpuscle so separates the nucleus and protoplasm. From every cell part, totally different options, like form, color and texture, square measure extracted employing a new method for element's background removal. The training was required for these set of features which used totally different models for classification. 92% accuracy was obtained in the current technique. Therefore, the planned technique removes the need of the various medical tools required to detect the cancer by using image processing. Thus, it irradicates the manual mistakes. [7]

Automated detection of malignant neoplastic disease and metastatic tumor may be a difficult medicine analysis topic. Diseases are categorized into 2 different classes; every class has similar features conflicting the diagnosis. Different methodologies have been applied to these classes based on various options. Finally, judgment is done by Random Forest classifier. The early detection of cancer is done by the current approach reducing the mistakes done during the diagnosis. The planned approach achieved 93% of accuracy for the 1st class and 95% for the second class. [8]

The origin of blood cancer is due to unrestricted growth of white blood cells. The SN-AM dataset has been used which provides strong mechanism for classification of cancer. The manual monitoring of this technique is done by talent professionals which took large amount of time for the analysis. The convolution neural network technique has been implemented in this model to overcome manual mistakes. The image of the cell is pre-processed, required features were extracted. As a result, classification of type of cancer is done using CNN. The overall accuracy was recorded to be 97.2%. By this work, they concluded that CNN has higher performance even with a smaller number of parameters. And also, it is observed that computation time required to analyze the dataset is also less. [9]

The revelation of malignant neoplasm, Acute Chronic Leukemia, Acute Lymphocytic Leukemia in White Blood Cell (WBC) cancer could be an advanced task in medical field. The proposed technique comes up by developing an automatic system which is able to assist the medical professionals in properly categorizing the types of this illness. Our proposed method uses completely unique technique during which microscopic blood pictures are taken as a degree input image. A dataset of a hundred pictures in which 62 coaching and 38 testing pictures is taken as input, then the picture is converted to correct scheme for partitioning. In partitioning, the mixture of Otsu adaptive thresholding, Gaussian Distribution and K-Mean's clustering technique are implemented. By making use of Level Co-occurrence Matrix (GLCM), the options are taken and are used for CNN classification. The general efficiency of this method obtained is 97.4%. [10]

The analysis of the white platelet's neoplasm like Leukemia and metastatic tumor could be a testing medical specialty investigate purpose. The early detection of cancer has a major advantage in detecting complexity in the health of a patient. The blood smudge photos are a unit adept that helps in extraction of information and provide options just in case of an incident of any kind of discovery in the growth of cancer. The advancement in cancer like leukemia cancer picture, feature extraction and reduction should be done adequately. By making use of processes like Bone marrow diagnostic assay, lymphatic tissue diagnostic assay and spinal tap, the White Blood Cancer can be examined manually. The manual detection of white blood cells can cause high computation time and misdiagnosis that will even price the patient's life. Therefore, the automatic detection deduces the time and reduces the misdiagnosis. [11]

Hematologists or consultants are responsible for identifying disorders in blood, by examining them using microscopes. It assists in classifying various blood related diseases. They have conducted varied studies within this field, especially to categorize them. The major focus was given to identify the leukemia type by analyzing their various digital pictures. Various options have been used to concentrate on different kinds of leukemia. Finally, various techniques were compared to identify their drawbacks. [12]

For quick and reliable identification of patient information, numerous image process methods or computer code were developed to induce desired data from medical pictures. The malignant neoplastic disease will develop within no time and might lead to death if left untreated. progress quickly and if not treated or if it is misdiagnosed. Classifying the cells manually is very tough and consumes more time. Therefore, suitable treatment needs to be given to the patient as early as possible. As an answer to the present downside the system selects the lymph cells. Morphological indices are evaluated from those cells and the presence of leukemia is identified. [13]

III. OBJECTIVES

- Detection of malicious blood cell amidst normal blood cells.
- Extraction of unique characteristic feature of malicious cell useful for cancer detection.
- To recognize malicious cells by using a suitable algorithm.
- Provide a system for both patients and doctors.
- Reduce manual process errors by providing an automated and a reliable detection system by using image processing technique.

IV. PROPOSED APPROACH

The proposed system comprises of Image Acquisition followed by Pre-Processing of images, segmentation of images, morphological operations, extraction of features from the images and finally classification of these images to find the presence of blasts in the blood smear. The fig. shows the block diagram of our proposed system.

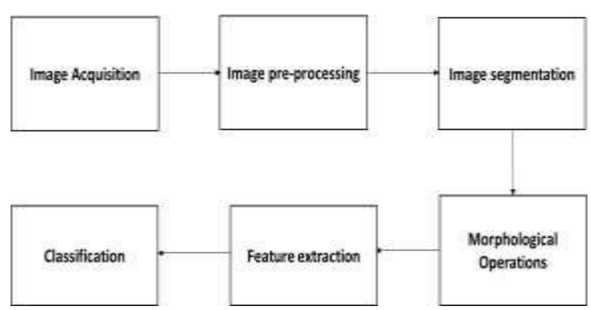


Fig.1 Steps for Automatic WBC Detection

A. *Image Acquisition*

Images are acquired from dataset ALL-IDB1. There are 49 images of Cancerous WBC and 60 images of Healthy WBC.

B. *Image Pre-processing:*

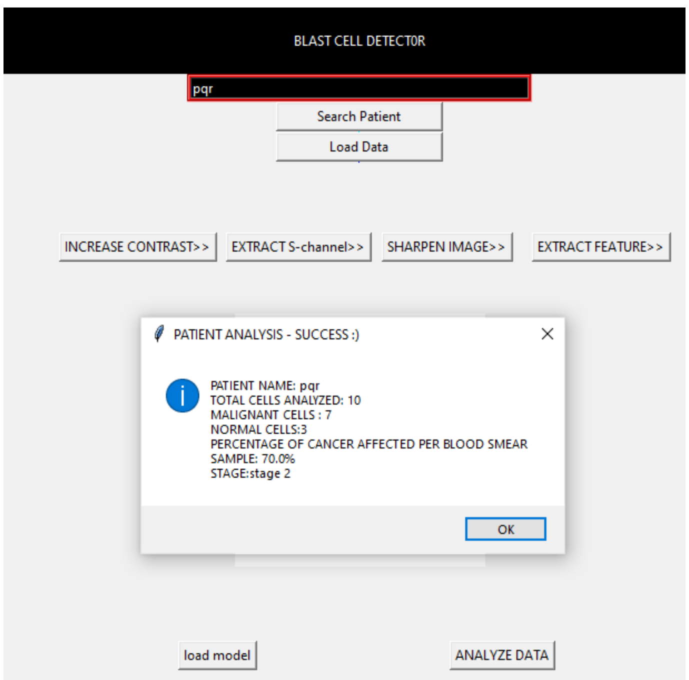
Images are resized to a particular size for the model. This is mainly done for the Machine Learning model to work efficiently.

C. Morphological Operations:

1. Contrast: The contrast of the image is increased. This is done since the ML model will work better with images of high contrast.
2. S-channel extraction: The images are converted to HSV Format and the s-channel is extracted out of it. The
3. S-Channel is extracted since the dark colored areas in the images can be identified quickly and easily differentiated to remove unwanted areas in the images.
4. Sharpening: The images are sharpened by applying suitable processing operations.

D. Image Segmentation and Feature Extraction:

Each image is segmented and pixel average of each segment is taken as a feature. Therefore, obtaining a feature vector of 1 image. The extracted features of all images are fed into model training.



V. Machine Learning Model

An Artificial Neural Network model will be used to classify the features extracted from the images. The fig.2 shows the Multi-Layer Perceptron ALL.

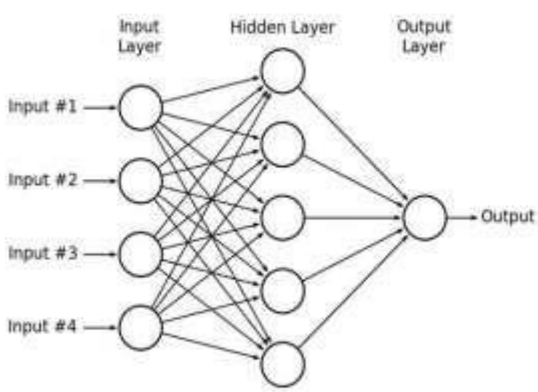


Fig.2 MLP Model

A feed-forward ANN, Multi-Layer Perceptron (MLP) will be used in the project to classify the features. MLP uses a supervised learning technique. Backpropagation algorithm will be used for the training of the model.

MLP consists of 3 Layers, mainly, Input Layer, Hidden Layer and Output Layer. In the proposed model there are 1 input Layer, 4 Hidden Layers and 1 output layer.

The aim is to produce around 95% to 97% accuracy from the proposed MLP Model, which will accurately differentiate between healthy and malicious WBCs and detect the presence of blasts in the patient's blood smear.

VI. Expected Outcome

1. With the less amount of dataset, the detection of WBC cancer cells can be done.
2. An automatic model is developed to work without any requirement of the lab technicians to analyze the result.
3. The developed model can have a greater efficiency and provides better results than the manual procedure, which is less time consuming and provides instant results.

VII. Conclusion

An automatic model for easy white blood cells cancer detection using image processing is being developed. The system provides the results without any doctor intervention. Depending upon the result the user can easily decide to go for doctor consultation as a second opinion. In this paper Multi-Layer Neural Networks is being used, through which the system will detect the presence of leukemia. Here in this model, the microscopic image of blood cells is being considered as input data. The proposed model eliminates the mistakes made in the contemporary procedure by making use of a intense learning technique. And also, doesn't require any highly knowledgeable or experienced technicians to analyze the result. The developed model provides instant results with greater efficiency and is less time consuming.

References

[1] Rehman, A, Abbas, N, Saba, T, Rahman, SIU, Mehmood, Z and Kolivand, H "Classification of acute lymphoblastic leukemia using deep learning", Microscopy Research and Technique, LJMU Research Online (2018).

[2] Alexandra Bodzas', Pavel Kodytek and Jan Zidek, "Automated detection of Acute Lymphoblastic Leukemia from microscopic images based on human visual perception", Department of Cybernetics and Biomedical Engineering, Faculty of Electrical Engineering and Computer Science,

[3] VSB-Technical University of Ostrava, Ostrava, Czechia, Aug-2020

[4] H. Mohamed et al., "Automated detection of white blood cells cancer diseases," 2018 First International Workshop on Deep and Representation Learning (IWDRL), Cairo, 2018

[5] Kumar et al., "Automatic Detection of White Blood Cancer from Bone Marrow Microscopic Images Using Convolutional Neural Networks," in IEEE Access, vol. 8, pp. 142521-142531, 2020.

[6] Rohit Agrawal; Sachinandan Satapathy; Govind Bagla; K Rajakumar

[7] ,"Detection of White Blood Cell Cancer using Image Processing", 2019 International Conference on Vision Towards Emerging Trends in Communication and Networking.

[8] Manisha. S 1, Dr. T. Sethukarasi2," Automated Detection of White Blood Cell Cancer Diseases Using Classification Techniques – A Survey" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 06 Issue: 02 | Feb 2019.

[9] Riya T Raphael, K R Joy, "Segmentation and classification of Leukemia using Image Processing", International Conference on Intelligent Sustainable Systems (ICISS 2019).

[10] Deepika Kumar1 , Nikita Jain1 , Aayush Khurana, (Student Member, Ieee), Sweta Mittal1 , Suresh Chandra Satapathy, (Senior Member, Ieee), Roman Senkerik , (Member, Ieee), And Jude D. Hemanth, “Automatic Detection of White Blood Cancer From Bone Marrow Microscopic Images Using Convolutional Neural Networks”, IEEE Access 2020.

[11] Ranjitha P, Sudharshan Duth P, ”Detection of Blood Cancer-Leukemia using K-means algorithm”, Proceedings of the Fifth International Conference on Intelligent Computing and Control Systems (ICICCS 2021).

Soldier Tracking And Health Monitoring System

Pavithra M B[1], Sharanya Madhusudhan[2], Rashmi K P[3], Vanshika Singh[4], Ramya R[5]

[1-4]UG Students, Department of ISE, Sapthagiri College Of Engineering, Bengaluru, Karnataka-560057, India
[5]Assistant Professor **Ramya R**, Dept of Information Science and Engineering, Bengaluru, Karnataka-560057, India
pavithragowda4443@gmail.com, sharanya.simhadri@gmail.com, rashmigangatiga1998@gmail.com, vanshika.meethi2306@gmail.com, ramyar@sapthagiri.edu.in

Abstract - In present scenario nations security has become important constrain. During war, tactics is main factor in any country's security. The nation's security mainly depends on army (ground), navy (sea) and air-force (air). The army soldiers play a crucial role and there are many concerns regarding safety of soldiers. As soon as any soldier enters the war field it is very vital for the army base station to know the location as well as the health status of all soldiers. It is also necessary for the base station to guide the soldier on a correct path if he is lost in the battlefield. So we are implementing an idea of tracking the soldier as well as to give the health status of the soldier during the war, which enables the army personally to plan the war strategies. By using the location sent by GPS, the base station can understand the position of soldier (Latitude and Longitude) as well as health parameters sent by GSM using bio-sensors will give base station an idea about his health.

I. INTRODUCTION

We are living in the technological era, where every field is trying to develop it self-using technology and military forces are no exception for it.
To protect the boarders of any nation the infantry soldiers of future will be one of the most technologically advance forces in the world. All over the world a lot of research is going on to develop the technologies in which soldiers safety and nations security is prioritize. The countries like United States, United Kingdom developed such systems.

During war it is of less benefit to increase number of protective systems and ammunitions until present situation is not provided at the operational edge of military networks. On the war field solider has to face many challenges like loss in war, low ammunition, health issues, crossing borders etc.

So in these situations, soldier has to communicate with base station or there should be some facility to guide him. For this purpose we are trying to track location of soldier using GPS, also trying to get his health parameters with the help of biosensors.

This information will be sent to base station using LAN. As soon as base station will receive all information about soldier, they will be able to guide soldier about the direction, strategy and situation.

Also, the base station will be able to provide necessary help to soldier. Here GPS is used to display the locations of soldiers. With the help of GPS, it is possible to know the current status of war field also location of each solider can be seen on single screen which will be more beneficial for army base station to decide its tactic.

System Requirements

The hardware requirements are as follows

A.Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

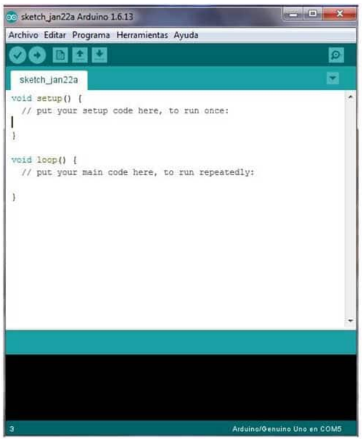


Fig 1-Arduino IDE Software

B. Atmega 328 Microcontroller

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.

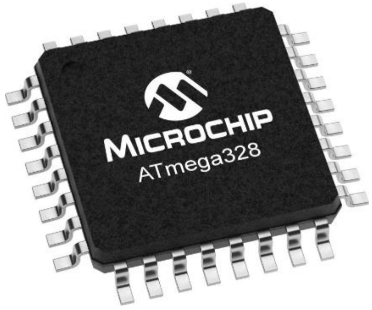


Fig -2 Atmega 328 Microcontroller

C. Heartbeat Sensor

The sensor used in this project is pulse sensor-SEN11574. Heart rate data can be really useful for determining the health status of a person. The pulse sensor amped is a plug and play heart rate sensor for Arduino. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. It sips power with just 4 mA current draw at 5V. To use it simply clip the pulse sensor to earlobe or fingertip.

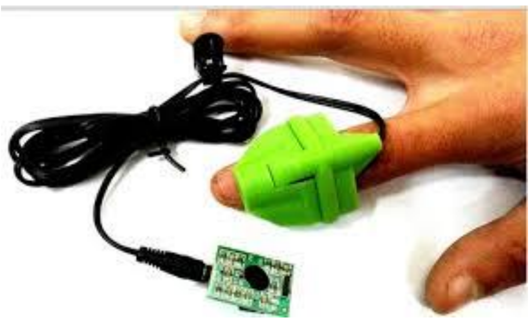


Fig-3 Heartbeat Sensor

D.Temperature sensor

The LM 35 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 sensor calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient centigrade scaling. To find the health status of soldier base station should know the body temperature and pulse rate of the soldier. So we are using LM35 body biosensor as it is a low cost temperature sensor and it does not require signal conditioning. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. As the temperature increase above the specified value the GSM module will immediately alert the Base station and thus will not wait for heart beats to go out of the normal range.

Fig-4 Temperature Sensor

E. Power Supply

AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from mains power. The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply. External power supplies are used both with equipment with no other source of power and with battery-powered equipment, where the supply, when plugged in, can sometimes charge the battery in addition to powering the equipment. Use of an external power supply allows portability of equipment powered either by mains or battery without the added bulk of internal power components, and makes it unnecessary to produce equipment for use only with a specified power source; the same device can be powered from 120 VAC or 230 VAC mains, vehicle or aircraft battery by using a different adapter. Another advantage of these designs can be increased safety; since the hazardous 120 or 240 volt mains power is transformed to a lower, safer voltage at the wall outlet and the appliance that is handled by the user.

F. GPS Module

The Global Positioning System (GPS) is a space-based global navigation satellite system that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to four or more GPS satellites.

Fig -5 GPS Module

F. GSM Module

GSM, which stands for Global System for Mobile communications, reigns as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. GSM module is a breakout board and minimum system of SIM900 Quad-band/SIM900A Dual-band GSM/GPRS module. It can communicate with controllers via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands). This module supports software power on and reset. It has a quad-band 850/900/1800/1900 MHz and a dual-band 900/1900 MHz It has control via AT commands, a very low power consumption of 1.5mA (sleep mode).

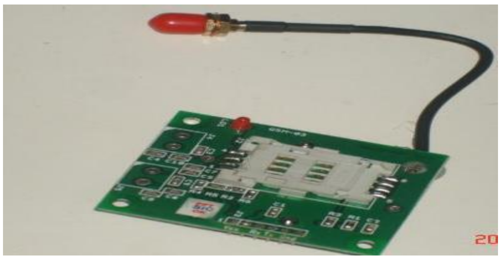


Fig -6 GSM Module

II. LITERATURE SURVEY

[1] Design and Implementation of a Smart Soldier Uniform: 2021 by Antoine Abi Zeid Daou, Christian Haddad1 And Roy Abi Zeid:

The death toll of military soldiers deployed in theatres of war or zones of conflicts remains considerable today, despite the advancements in military technology to protect and preserve the lives of combat soldiers as much as possible. In some situations, rescuers or paramedics are unable to reach injured soldiers in time. Under such circumstances, said injured soldiers are unable to practice first aid on themselves to stop or reduce the bleeding, which can often lead to their deaths.

Based on the idea of a smart vest worn by soldiers, this paper aims to help the military deal with such critical situations and reduce military casualties by saving the lives of military personnel. The project consists of a Uniform whose primary objective is to track the vital signs and health of the soldiers by detecting bullet impacts and transmitting to a military data centre the whereabouts of the injured soldier, i.e their accurate location, the hit zone as well as injured organs. The smart Uniform will also utilize a system that will apply an adequate pressure on the bullet impact location to reduce as much as possible the bleeding.

This system has been fully implemented and was virtually tested to make sure that all features within the vest are working properly. Although some minor modifications would give it better usability, the results were very satisfying.

[2] Soldier Health And Position Tracking System:2020 Ch. China Meerabi1, G. Navya, K. Priyanka, Ch. Sai Priya

In enemy territory soldiers not only have to deal with the physical threat, but also with stress and fatigue caused by protracted operations or lack of sleep. So for the security purpose we need a tool for remote soldier performance and health monitoring. So in this project a tool is implemented using biosensors for health monitoring purpose.

Also a GPS system is used in order to track the location of soldier. Additionally a GSM modem is also used to make the system wirelessly compatible. Any abnormalities in the readings of wireless body area sensor network (WBASNs) is considered as a trigger for GSM to establish the connection between the soldier and base unit and send current location and health status to the receiver.

By using all this equipment's they had tried to implement the basic guarding system for the soldier in low cost, light weighted, portable device

[3] Detection, Monitoring and Tracking Of Survivors under Critical Condition Using Raspberry-Pi: 2019 byR.Vithiya1 S.Karthika2 G.Sharmila3:

This paper reports the tracing of survivors in remote locations based on the continuous monitoring of health parameters using the Internet of things. In times of natural conflicts or other defects the survivors can be located using this tracking system. The important health parameters measured are breathing, pulse rate, heartbeat of survivors.

In our proposed work, portable and miniaturized framework of sensors and other transmission units are integrated using GPS and mounted on the war zone soldiers. This provides continuous monitoring of their health and all the data obtained are transmitted using IOT to central base system. So, with the available information the survivors can be tracked during conflict and their safety can be ensured using the proposed model

[4] Developing a Secure Soldier Monitoring System using Internet of Things and Blockchain:2019 Jitesh Vaibhav Sharma, Rajalakshmi Krishnamurthy

This paper had a states army considered a vital tool for its security. Therefore, tracking and monitoring the health and position of a soldier becomes necessary to ensure their safety.

In recent years, a lot of technological advances happen in the field of sensors. One of the popular areas utilizing sensors is developing human healthcare system to monitor vital body signals. The network of such sensors that are used to monitor vital human signal for health care is called Body Sensor Network (BSN).

Similarly, a small GPS module can be used to track a person's location. In this paper, we describe a system comprising of a sensor module to be mounted on a soldier's arm for real-time health and position monitoring, which transmits and stores a soldier's data in an encrypted form in a Block Chain, thus making the data tamper proof and distributed.

The mounted sensor module consists of a temperature, heart-rate, and GPS module, with 1.15%, 11.1% relative errors in the sensors respectively and 1.62 m, 2.05 m deviation in latitude and longitude of the GPS module in their readings compared against commercial devices. The Block Chain will exist on army controlled computers.

III. PROPOSED METHODOLOGY

The whole system is divided in to two parts i.e. soldier unit and base unit. Soldier unit is placed on the soldier's body and this unit is divided into three parts. i.e. Biomedical sensors, Emergency keys, GPS+GSM unit.

Army base unit is at base station this unit is nothing but a PC on which all the information received from soldier unit will be displayed. To implement this system as real time a main component required is controller. As we are using GPS and Wi-Fi units we required two UARTS which available in Atmega 328 processor, RFID Reader and tags are used to identify soldier, each tag contains individual soldier details.

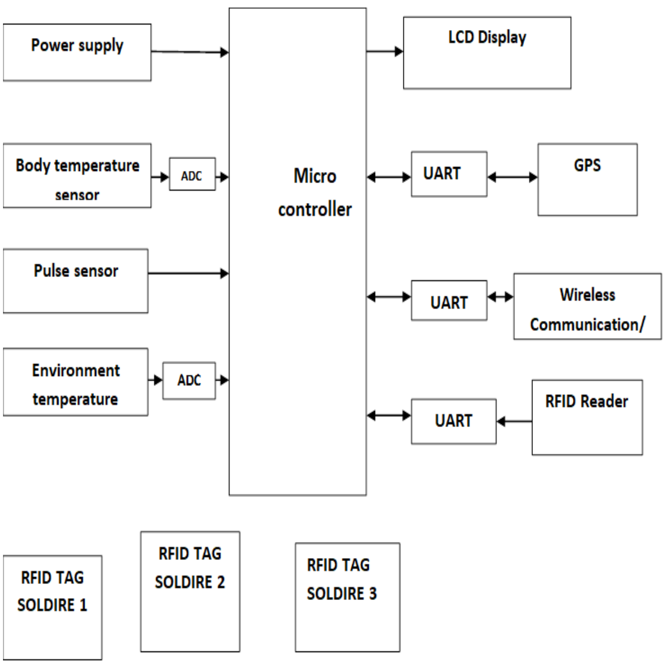


Fig-7 Architectural design of implementation

Operation of the Project-

1.If the soldier is in danger ,the soldier has to swipe the RFID tag on the RFID Reader. This information will be sent to the base station through Wi-fi.

The people in the base unit will be monitoring the soldier inside the hub. This RFID Reader will be able to scan the soldiers temperature and pulse rate.

The location of the soldier will be tracked using the GPS.

All of these information will be displayed on the PC that is made available to the base station. We also have the UART these will help transmit the signal from the transmitter from the soldier and received using the receiver in the base station.

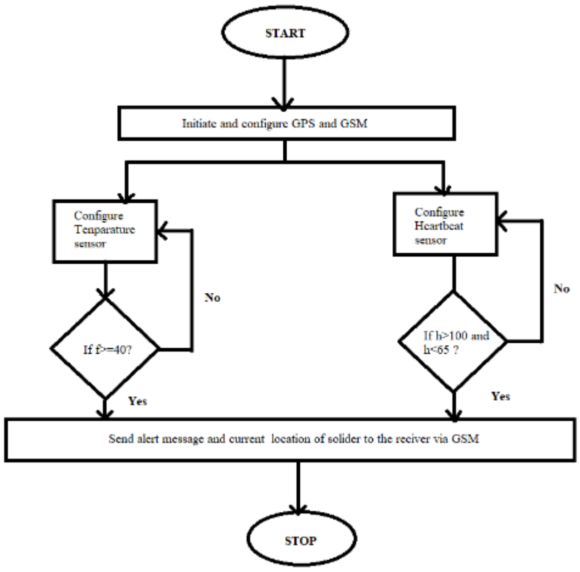


Fig-8 Flowchart of the Project

First power supply is given to Arduino then GPS and GSM modules will be initiated. Th sensor and heartbeat sensor measure temperature (in Celsius) and heartbeat (in BPM) of the soldier respectively. If temperature (t) exceeds 40 and heartbeat (t) is not in between 65 and 100 then GPS tracks the exact location of the soldier and sends an alert message to the authority by using GSM module.

IV.RESULT

Fig-9 The output of the components connected

A message is send on the registered number confirming about GSM and GPS configuration. Later as the body parameters (temperature and heartbeat) deviates from the given threshold values, an alert message is send to base station along with the precise location of the soldier. The health status of soldier is shown in Figure.

The temperature of the Soldier is calculated using the below formula

Temperature=ADC/15

Fig-10 The message displayed on registered phone

V. CONCLUSION

Arduino board is used which is a low cost solution for the possessing purpose. Biomedical sensors provides heartbeat, body temperature, and environmental parameters of every soldier to control room. This technology can be helpful to provide the accurate location of missing soldier in critical condition and overcome the drawback of soldiers missing in action. The addressing system is also helpful to improve the communication between soldier to soldier in emergency situation and provide proper navigation to control room. Thus we can conclude that this system will act as a lifeguard to the army personnel of all over the globe. In future, a portable handheld sensor device with more sensing options may be developed to aid the soldiers

VI. REFERENCES

[1] Design and Implementation of a Smart Soldier Uniform by Antoine ABI ZEID DAOU, Christian HADDAD and Roy ABI ZEID,2021 IEEE 3rd International Multidisciplinary conference on Engineering Technology(IMCET)

[2] Soldier Health And Position Tracking System by Ch. China Meerabi1, G. Navya, K. Priyanka, Ch. Sai Priya,2020,IRE journals volume3 issue 10,ISSN:2456-8880

[3] Detection, Monitoring and Tracking Of Survivors under Critical Condition Using Raspberry-Pi by R.Vithiya1 S.Karthika2 G.Sharmila3,2019 proceeding of International conference on system computation automation and networking

[4] Developing a Secure Soldier Monitoring System using Internet of Things and Blockchain JiteshPabla, Vaibhav sharma, Rajalakshmi Krishnamurthy,2019 IEEE

[5] Development of Tank-Based Military Robot and Object Tracker by Widodo Budiharto 2019 4th Asia-Pacific Conference on Intelligent Robert System

[6] " IoT Based Smart Multi Application Surveillance Robot" by Aishwarya K Telkar Proceedings of the second International Conference on Inventive Research in computing application(ICIRCA-2020)