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Smart Voting System Using Deep Learning and Computer Vision

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Abstract: ***Since, India being the largest democracy in the world. Still uses voting machines to hold elections, which comes with high costs and manual labour. But voting plays a crucial role in the election of high-ranking government officials and reflects our view of how a governing body should be formed. Investigations are conducted from time to time to troubleshoot the central voting system, increasing anonymity, credibility and security while preventing all types of fraud. In this paper, there is an implementation of a method that uses deep learning techniques which develops a smart voting system. Due to its advanced features, most researchers follow and use the Boosted Cascade framework. The enhanced Cascade Framework features help you calculate and build a classifier that works more accurately. However, this accuracy rate requires a large number of Cascade Stages to help reduce similar performance with the detection and recognition accuracy. This provides protection in the sense that the most secure voter password is verified before a vote is received on the main database of the Indian Electoral Commission and voters can verify that his or her vote has reached to correct participant of election. The votes counting is done automatically, thus saving a lot of time and the results can be announced in a very short time by the Indian Electoral Commission. The user verification process is enhanced by adding a face recognition to the app that will determine whether the voter is a certified user or not.***

Keywords: Online voting system, smart voting, face recognition, face detection, security, user authentication, deep learning, haar cascade classifier, computer vision.

I. INTRODUCTION

In India, being voting system as online is a way for the people to elect their representatives and express their preferences on how they will be governed. It is very important to have belief in the electoral process. The electoral process is secure in the event of an election irregularity and the system will increase security levels. But there is a possibility of Maoist attacks and fraud problems in some areas, there is a chance of losing votes and their lives. So the public needs a more secure voting system.

Elections are a process by which people can talk about their political feelings. They express these feelings in an open democracy to elect a political pioneer. Besides, the political pioneer would have a responsibility, authority, and job. As we can see that election is a conventional cooperative choice creation procedure. Additionally, the chosen political pioneer would hold an open office. The political race is an important pillar of many legal systems. This is on the grounds that; Election gives guarantee that the administration is of the individuals, by the individuals, and for the individuals. Constituent frameworks are having point by point protected plans and casting ballot frameworks. These step by step established ideas and voting structures turn the vote into a political decision.

The expected approach is to establish a firm online voting system using face recognition aimed at overcoming all drawbacks that occur in the existing voting system. The proposed system has many powerful attributes such as accuracy, reliability, comfort, etc. In this system, there is no need of an electoral officer, a ballot paper or any other electronic voting system but only a strong connection of internet and face scanners are essential where one can vote from anywhere.

II. MOTIVATION

Elections are extremely extravagant in India so ordinary people may not be able to afford this. Only the wealthy people can run in the elections. They also use political power and money in an illegal way. But election laws should address the misuse of official equipment at the time of elections. However, the ruling party also uses government vehicles and workers to favour them. Again, on the basis of racism and religion most of the votes are being casted. As a result the people are split up into fractions which is not a good thing in the electoral system. Therefore, to avoid this conflict, an online voting system is proposed.

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III. PROBLEM ANALYSIS

This chapter addresses the concept or issues related with the previous existing systems and their limitations over their implementations. It also focuses on how proposed system will overcome the drawbacks. In existing systems, voters go to the voting centers and they use their votes manually. It is time consuming and there is chance of gambling the votes. These system relies on huge number of skilled people to work at polling booths and hence is difficult to scale up. The current system is used to less transparency because there could be chances of cheating at the voting time. Nowadays with the rise in population, the need for checking the validity of the voters has become a problem. After the industrialization, more number of people leave their native places and come to the cities for the job sake. But many of them still have their voter ids in the address of their native places. On the day of voting they can't able to go their places so they don't cast their valuable vote. This is the main reason for reduction of voting percentage in our country. To overcome this problem, deep learning algorithms were introduced. However, few of these algorithms gave lesser accuracy. So, we used deep learning using Haar Cascading algorithm, Convolutional Neural Networks (CNN) and Computer Vision techniques. The Harr Cascading algorithm gave the better results as it compares the faces which is dependent on Haar features. Many problems were overcome which occurred in Radio Frequency Identification Method and Raspberry Pi Method lacked. The efficiency and accuracy were relatively high. It was less time consuming.

IV. PROPOSED SYSTEM ARCHITECTURE

In the proposed model, a system is developed for online voting of India. This system is much better, secure and efficient than the traditional voting system. Manipulation of votes and delay in results can be avoided easily. In the proposed system, we have tried to build a secure online voting system that is free from unauthorized access while casting votes by the voters.

It is desired that the proposed online voting system will preferably raise the transparency and reliability of the current electoral machines. It uses computer vision techniques for person identification. We are using deep learning method which helps to get secure and accurate results in smart voting system.

1) *Deep Learning:* A type of machine learning which drives many Artificial Intelligence (AI) applications that instructs computers to make the processes easier and faster.
2) *Computer Vision:* Computer vision is nothing but a scientific field of artificial intelligence that teaches computers to resolve and gain knowledge from the visual world. With the help of digital images & videos and deep learning concepts machines and devices can perfectly detect and categorize objects — and proceed to what they "see".
3) *Python:* Python is an interpreted high-level general-purpose programming language. Python is basically used for websites and software development, task automation, data analysis, and data visualization.

A. Architecture

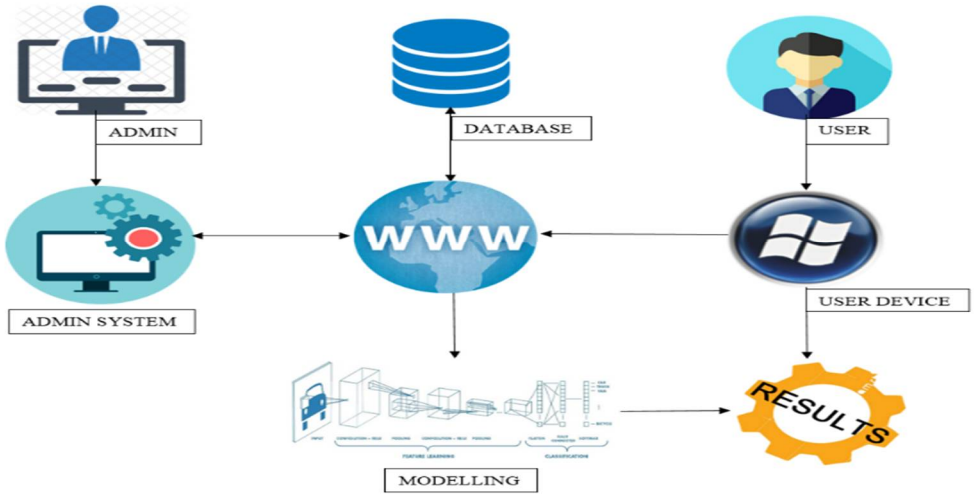


Fig.1. System Architecture

B. Methods

In this section, we have explained a detail information about the methodologies used in this proposed system. We focused on the various factors regarding face detection and recognition from any image or video. So following are the methods used for face detection as well as recognition.

1) *LBPH Algorithm:* Local Binary Patterns Histogram (LBPH) algorithm is used to authenticate the facial image of the voters from the database afford by the election commission. Basically, Local binary Pattern works on the image having a basic structure which compares every pixel with its neighborhood pixels.

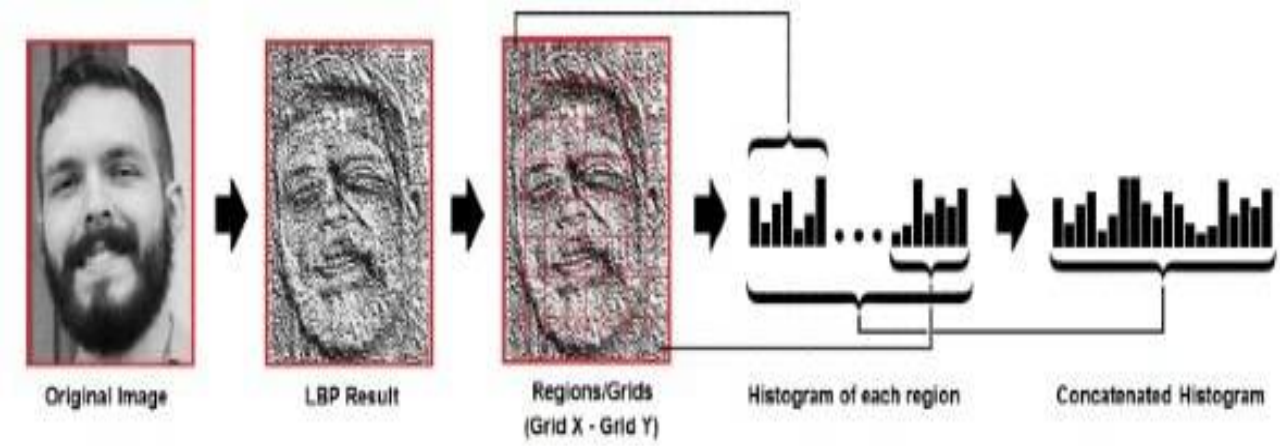


Fig.2. Extracts Histograms from the Face image

2) *CNN Algorithm:* The CNN consists of an input and an output layer between these two layers there is more complex and that includes the multiple convolution layers, pooling layers, fully connected layers and normalization layers which are called hidden layer. CNN's have two components (1) hidden layers or feature extractor that is designed to take classify the 2D structure of an input image and (2) the classification part which is fully connected layers. The convolution layer as it receives an input from the previous layer then transforms the inputs that are specifically designed to process pixel data and then the layer outputs the transformed input to the next convolution layer. These operations of the convolution layers called convolution operation.

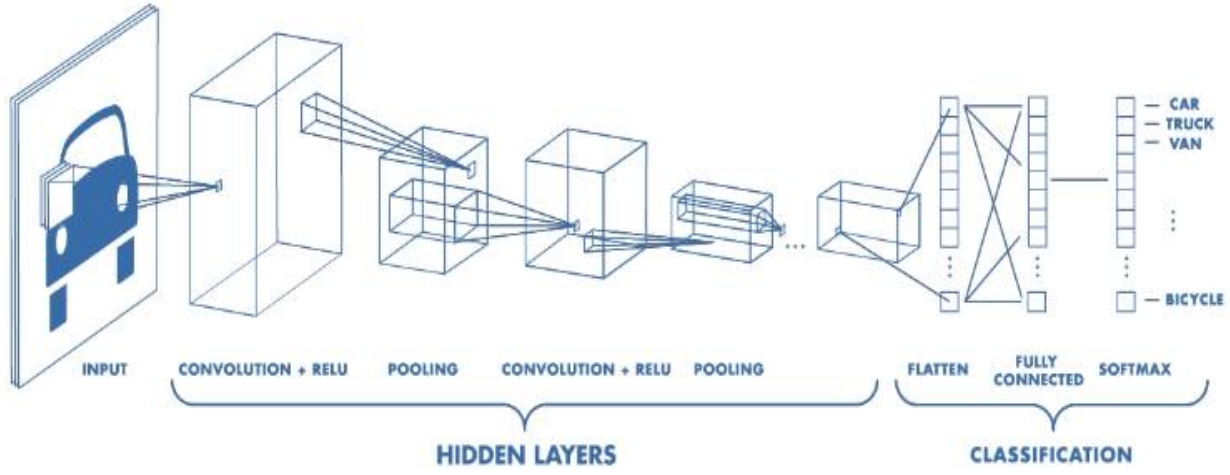


Fig.3. Feature Extraction from Hidden layers by using CNN

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3) *Haar Cascade Classifier:* Haar Cascading Algorithm is an Object Detection Algorithm which is used for image as well as face recognition. It is explained based on two main factors that are Haar features and cascade classifier. Haar features are calculated by considering a rectangular regions of an image and divide it into multiple parts, sums up the pixel intensities and calculates the difference between these sums.

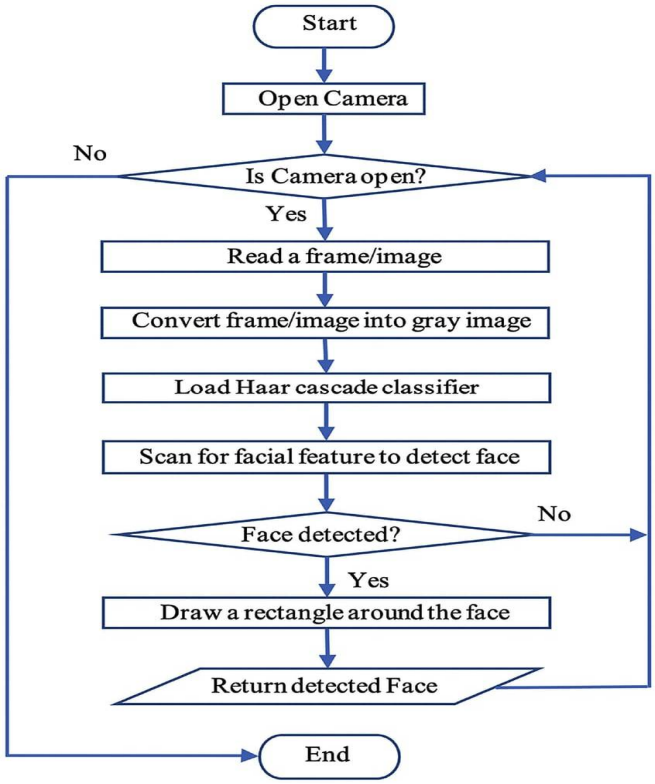


Fig.4. Flowchart of Haar Cascading Algorithm

C. *Block Diagram of Proposed Model*

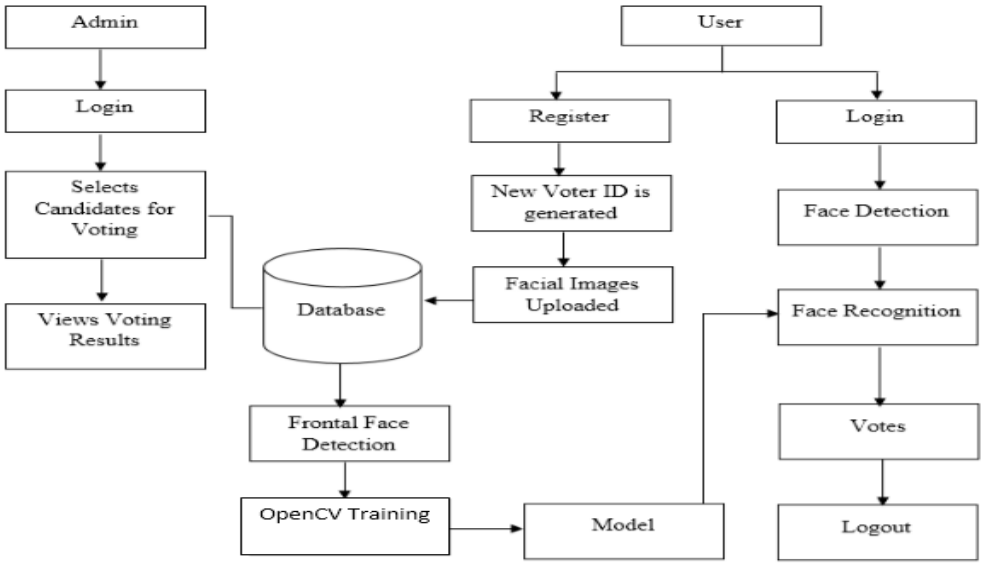


Fig.5. Block Diagram of Proposed Model

V. REQUIREMENT SPECIFICATIONS

A. Software Requirements

1) Operating System : Windows 7+
2) GUI : Flask
3) IDE : PyCharm IDE
4) Libraries Used : Pandas, OS, Pillow, PyMySQL, NumPy.

B. Hardware Requirements

1) Processor : I3/Intel Processor
2) RAM : 4GB (min)
3) Hard Disk : 128 GB
4) Key Board : Standard Windows Keyboard
5) Mouse : Two or Three Button Mouse

VI. SYSTEM IMPLEMENTATION

This chapter provides overall Implementation details of each of the design of proposed system, the screenshots of the system and also describes the modules of the system. Modules are admin and user. Below we can see the work flow diagrams of admin and user.

A. Admin

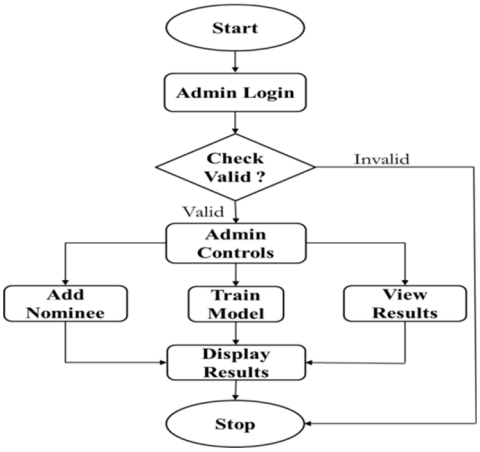


Fig.6. Work Flow Diagram – Admin

B. User

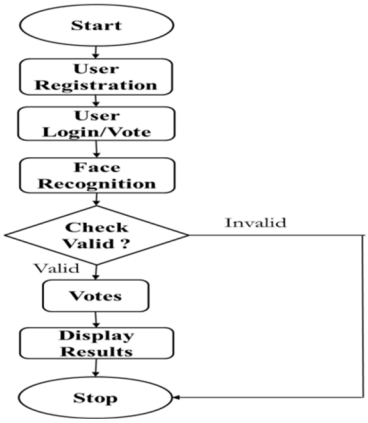
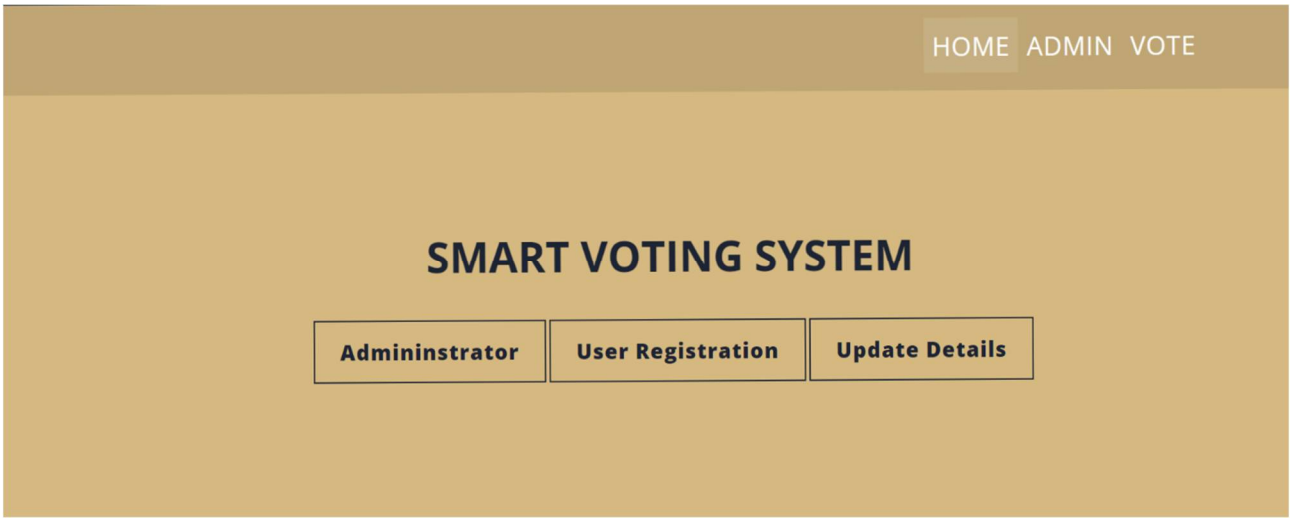


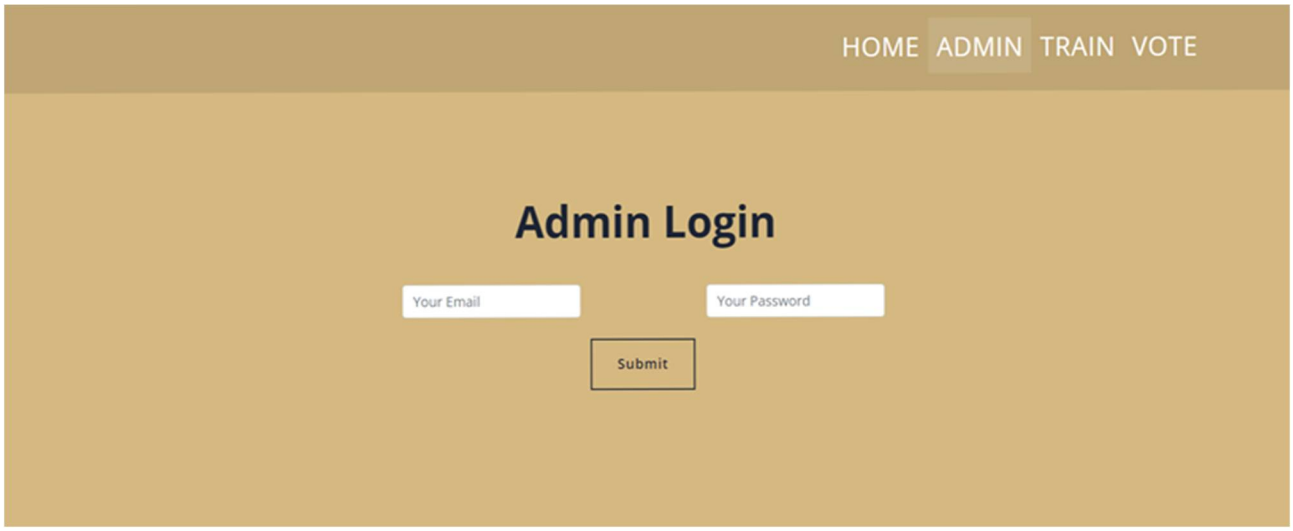
Fig.7. Work Flow Diagram – User

The detail implementation of the proposed model that are Screenshots of the system are as follows…

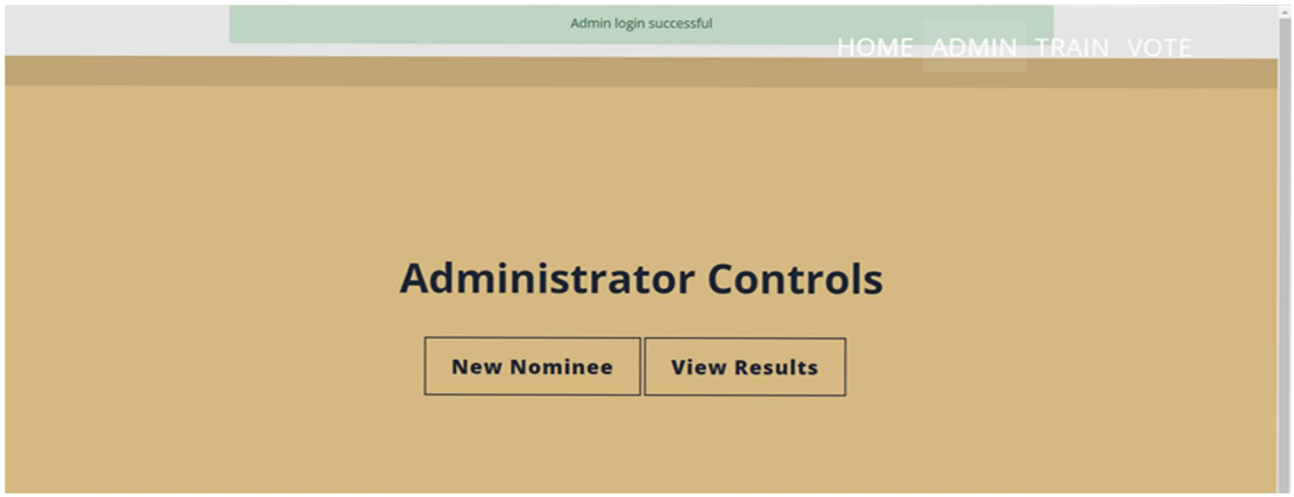
1) *Home Page/ Dashboard:* It contains "Administrator", "New Registration", and "Update Details".



2) *Admin Login:* Admin logs in to the system by clicking on Administrator

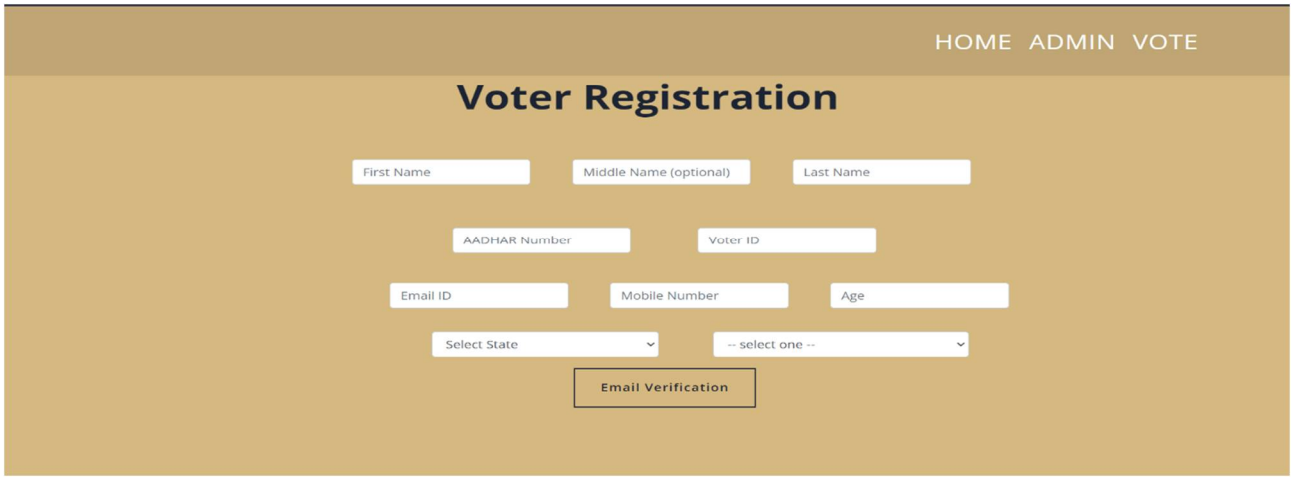


3) *Administrator Controls:* It includes New Nominee and View results.



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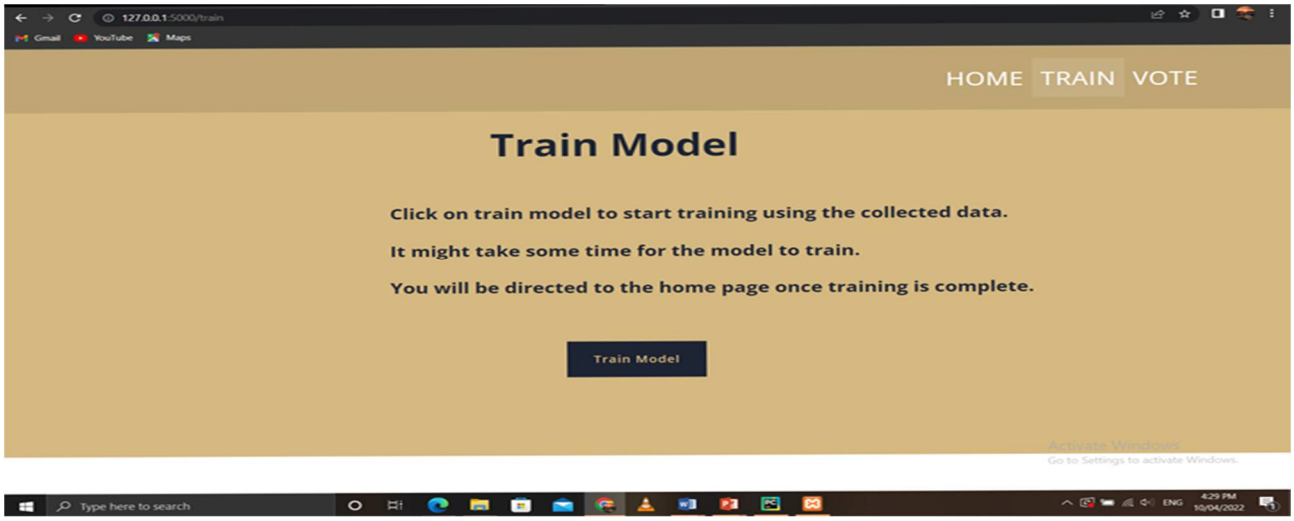
4) *User Registration:* Here User/Voter has to register first with his/her information.



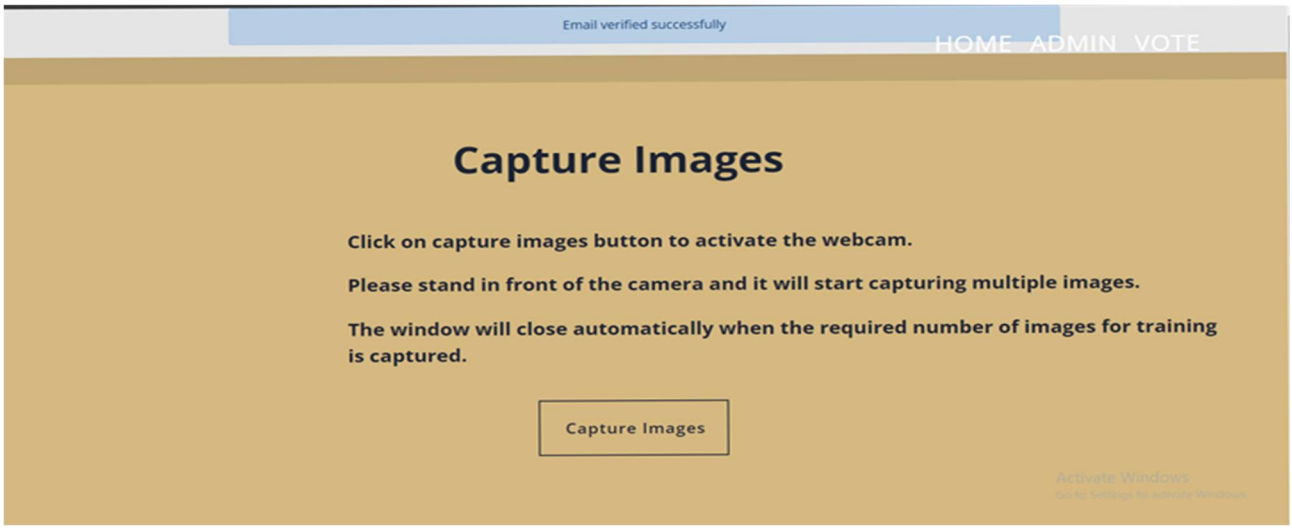
5) *Add Nominee:* Admin has to add nominee participating in the elections.



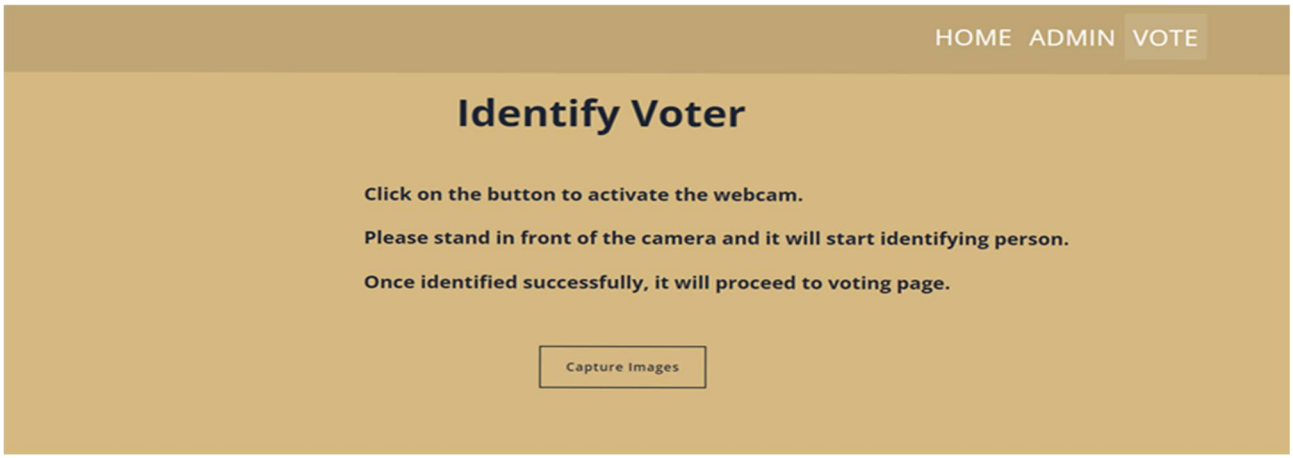
6) *Train Model:* Admin trains the model to save the information.



7) *Capture Image:* After Registration & email verification, voter's image is captured and stored in the database.



8) *Identify Voter:* After clicking on vote, voter is identified by comparing the image stored in database and can vote



9) *Entering Vote:* By identifying the voter, he/she can enter their vote. If not identified then has to click on vote again.



VII. RESULT ANALYSIS

In this section, there are results of experiments done by using both CNN and LBPH. The main platforms of the experiments were OpenCV and Python. There are two main phases of result analysis process of experiment in this section. These are datasets and result. The implementation is done to examine the performance of the LBPH-method on various facial images. Several parameters, like the LBP operator (P and R), non-weighted or weighted regions and the dividing of the regions, are varied to see the influence of these parameters on the performance. In this section, the experimental results of the implementation are presented. We have already discussed the program works in the methodology sections. In this section, we have provided the detail information about the results obtained by us while using this program against some of the test cases. We have explained the output using the screenshots of the output provided by our program. While making this project, we faced a lot of challenges and we have tried to minimize it as much as possible of these problems. We evaluated the proposed algorithm on the real-time video frame (using LBPH and CNN). By the end of the paper, we can say that our CNN model performs better. CNN is a class of deep neural networks and it is an A.I. (artificial intelligent). As compared to other techniques, deep learning method improves rate of recognition of the facial images in voting system.



VIII. CONCLUSION

We have successfully developed an online voting system. The system has a new registration feature which takes in frontal facial images of the person registering. The user needs to verify their emails using OTP for a successful registration. Once someone is registered, the models has to be trained again by the admin in order to detect and recognize the new person. A registered user is identified by their face and then allowed to vote unless they have already voted as no one can vote more than once. Frontal Face Haar cascading algorithm is used for facial embedding generation. Computer Vision is employed for image pre-processing and video streaming. Also Flask is used for the User Interface via Python. To detect and recognize a face of a person, in this paper we have proposed both Convolution Neural Networks (CNN) and Local Binary Patterns Histograms (LBPH) approach for extracting the features and matching the process for face detection, tracking and recognition. We have first shown that current measures used in face detection, tracking and recognition jointly. In this proposed system, we have applied deep learning techniques to improve the positive rate of recognition to identify the person. A training model was considered as a collection of training images and a testing model was then obtained by our proposed technique. Experiments were tested on persons on a real time video and the recognition tasks performed very well.

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BIOGRAPHIES

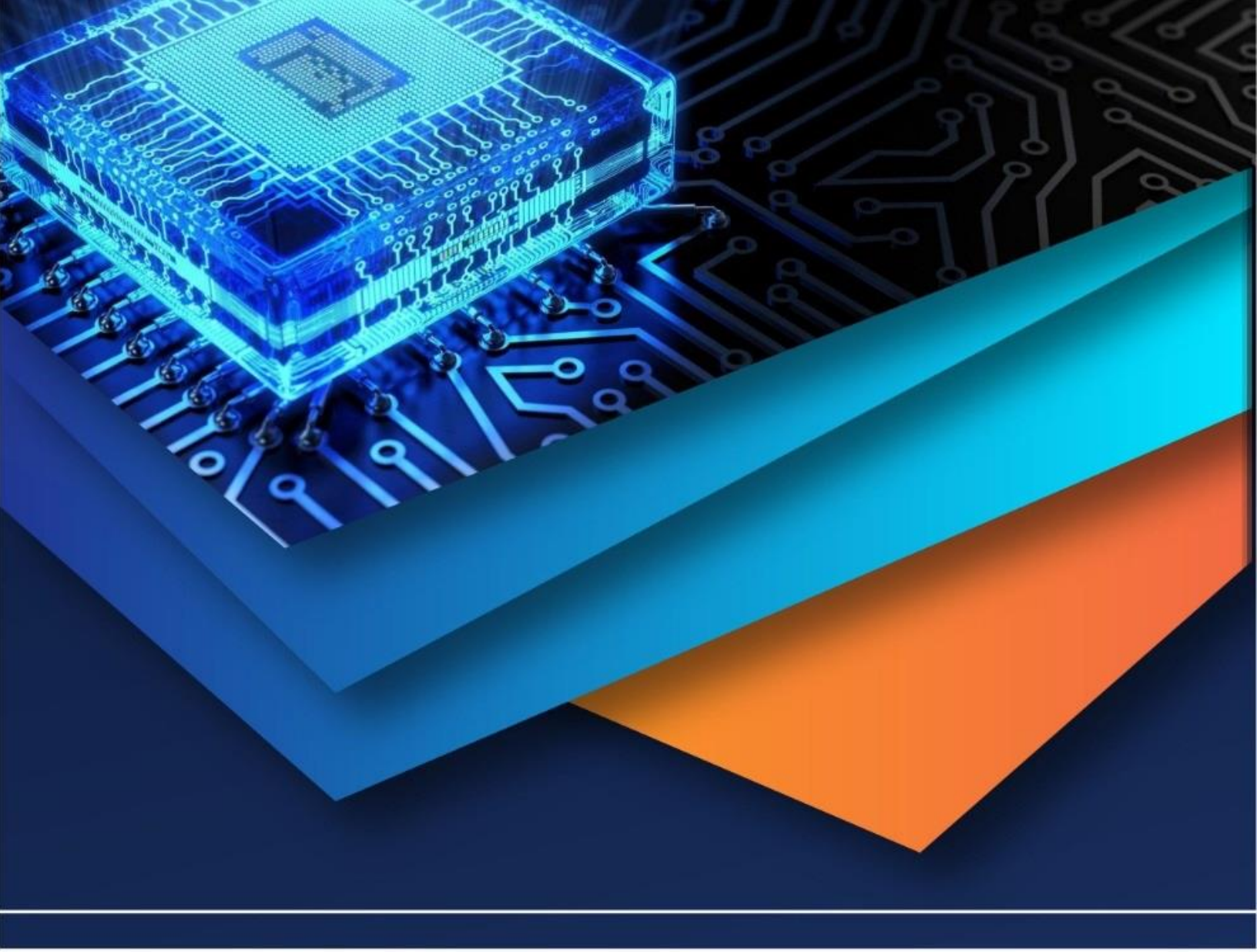


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