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SECURE VOTING SYSTEM THROUGH FACE RECOGNITION

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in

COMPUTER SCIENCE & ENGINEERING

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Certificate

This is to certify that the Project report entitled **SECURE VOTING SYSTEM THROUGH FACE RECOGNITION** is the bonafide work carried out by **C.R.G. Susmitha, M. Rohini, G. Sai Preethi and K. Sai Pavani** bearing Roll Number **194G1A05B3, 194G1A0581, 194G1A0586 and 194G1A0572** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science & Engineering** during the academic year 2022 - 2023.

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DECLARATIONS

We, Ms C.R.G. Susmitha with reg no: 194G1A05B3, Ms M. Rohini with reg no: 194G1A0581, Ms G. Sai Preethi with reg no: 194G1A0586, Ms K. Sai Pavani with reg no: 194G1A0572 students of SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY, Rotarypuram, hereby declare that the dissertation entitled **"SECURE VOTING SYSTEM THROUGH FACE RECOGNITION "** embodies the report of our project work carried out by us during IV year Bachelor of Technology under the guidance of **Mrs. S. Sunitha,**M.Tech.,(Ph.D). Department of CSE, **SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY**, and this work has been submitted for the partial fulfillment of the requirements for the award of the Bachelor of Technology degree.

The results embodied in this project have not been submitted to any other University of Institute for the award of any Degree or Diploma.

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LIST OF ABBREVIATIONS

CNN	Convolution Neural Network
EVM	Electronic Voting Machine
HOG	Histogram Oriented Gradients
LBPH	Local Binary Pattern Histograms
LDA	Linear Discriminant Analysis
PCA	Principal Component Analysis
SRS	System Requirements Specification
UML	Unified Modelling Language

ABSTRACT

Now-a-days in India there are two types of methods are used for voting. The first method is secret ballot paper, in which lots of paper are used and second method is EVM(Electronic Voting Machine) which is used since 2003 but both of those methods have some limitations. There is a necessity for a method for online voting that is more secure than the existing system. In our proposed system we introduce a secure way for online voting by using face recognition system and email verification at the time registration of a new voter which is used to authenticate a person. Authorized Voter also can able to cast their vote only once and the tallying of the votes will be done automatically, thus saving a huge time and enabling administrator to announce the result to announce the result within a very short period.

Keywords: Smart Voting, ballot paper, Face Recognition, Authentication, EVM.

CHAPTER 1

INTRODUCTION

Every person in our nation has the fundamental right to vote. The "right to vote" belongs to everyone. But for a variety of reasons, not everyone is making use of their rights. Voting takes place at different levels, including municipal, state, and national elections. Therefore, we use technology to improve the technique of voting through face recognition in order to make it simple to vote and to boost the voting percentage.

So we are developing an effective solution to this as secure voting system through face recognition. It will enables voters to vote securely. In this we employ the LBPH method (Linear Binary Pattern Histograms). The face is photographed and trained for use in this algorithm. During training, at this phase, the faces are turned first into grayscale images, then the points or pixels.

Computers can be programmed to use prior knowledge to optimize Performance criteria using machine learning (ML). We have a model that has been developed up to a certain point, and learning is the application of a computer program to optimize the model's parameters using training data or prior knowledge. The model may be descriptive to learn from the data or predictive to make future predictions. By learning to represent the world as a layered hierarchy of concepts, with each concept defined in relation to simpler concepts and more abstract representations computed in terms of less abstract ones, deep learning is a specific type of machine learning that reaches considerable power and flexibility.

The practice of recognizing or confirming a person's identification by their face is known as face recognition. It records patterns based on a person's face characteristics, analyses them, and compares the results. In order to identify and locate human faces in images and videos, the face detection method is a necessary first step. Based on the subject's facial traits, the face capture procedure converts analogue information (a face) into a collection of digital information (data or vectors). By using a face match, you may determine whether two faces belong to the same person or not.

A computer vision is a machine learning software library called OpenCV is available for free use. A standard infrastructure for computer vision applications was created with OpenCV in order to speed up the incorporation of artificial intelligence into products. More than 2500 optimized algorithms are available in the collection, including a wide range of both traditional and cutting-edge computer vision and machine learning techniques. These algorithms can be used to find similar images from an image database, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch together images to produce high-resolution images of entire scenes, and remove red eyes from photographs taken.

The LBPH algorithm, which is used to improve the performance of face recognition results, combines the Local Binary Pattern (LBP) and Histogram Oriented Gradients (HOG) techniques. The performance and precision of LBPH, which can identify a person's face from both the front and the side, are well known.

In this algorithm, the face is captured and trained. At this stage during training, first the faces are converted into gray scale images and then the points or pixels obtained through the gray images are then converted into Histograms and these histograms contains some values and these values are converted into a single value i.e., from binary digits to a decimal number.

A secure Voting System is Proposed of having Objectives like Face recognition is implemented while voter is going to cast their vote, Email verification is implemented while new user is registering, and Fake votes can be reduced, and only one time an user can cast their vote.

1.1 Problem Statement

The Problem Statement revolves around reducing the fake votes by face recognition using Machine Learning Techniques. The goal of the project is to secure the users vote and in order reduce the human work by accessing through online.

The system proposed tries to overcome the drawbacks of existing systems. The solution we are proposing is to design a system taking email verification at the time voter registration and face recognition at the time of voting. This would help to reduce

the fake votes and at anywhere voters can cast their vote so participation for voting can be increased.

The system consists of two main modules:

i. User/Voter Module – In this the user can register and cast their vote through authentication process.

ii. Admin Module – In this module admin can add the add the new nominee to the voting page and can see the voting results.

1.2 Objectives

To accomplish the project's purpose, the following particular objectives have been established.

i. machine-learning model selection and development
ii. development of a web-based interface for Voting
iii. Integration of the developed model to a web application

1.3 Scope of the Project

The following are the boundaries that have established in the proposed system which defines scope.

i. Reduce the fake votes by validating an user through face recognition at college level.
ii. An User can cast their vote, only if the user details already existed in database.
iii. The system does not allow same voter to cast their vote for multiple times.

CHAPTER 2

LITERATURE SURVEY

[1] Jehovah Jireh Arputhamoni and Gnana Saravanan, have proposed that different biometrics they are Iris Detection in Voting System, Voting System using Fingerprint Recognition, Smart Voting. Since the suggested concept is a totally web-based system, its fundamental features such as database construction and picture processing capabilities— determine the system's software requirements. The face and fingerprints of the voter will be taken with the use of a laptop, PC, or mobile camera. Using the CNN technique, fingerprints may be compared with images stored in a database and the captured image can be recognised using the Haar Cascade algorithm. The technology is distinctive and effective because of the CNN algorithm used. Prior to voting, it ensures that the voter is verified. Smart voting is a better way to vote since the planned technology makes the election process less time-consuming, less expensive, and hassle-free. We can use a single biometric authentication method rather than using two.

[2] Aman Kumar and Vishwash Kumar, have clearly explained about three differentdifferent working security levels in smart voting system. The level 1 Unique Id Number (UID) registration mechanism will ask the user for a single unique id at that time. So through the unique id verification from database the voter can enter to next security level. The voter must input their voter id number at level 2 Election Commission id card number, where it will be checked against the database. If the voter's face matches the image saved in the database at level 3 facial recognition with their unique voter ID number, they can cast their ballot. In India, every new user must first register to vote. At the moment of registration, the system takes a picture of the user's face and stores it in the server database. The benefits of these security levels include more convenience, lack of corruption, swiftness, and speed. We chose these security settings, however the method for face recognition is different.

[3] Nilam Choudary, Shikar Agarwal and Geerija Lavania, have proposed an effective voting system using three different face recognition algorithms. Eigenfaces does facial recognition using eigenvectors, and Principal Component Analysis (PCA) is used to determine eigen values.By reducing common features, PCA reduces

dimensionality and generates eigen space. The eigenface approach has been extended to include Fisher faces. Linear Discriminant Analysis (LDA), performed in conjunction with PCA, aids in identifying the classificationrelated directions. Rapid picture comparison and similarity-invariant representation are made possible by Speed Up Robust Features (SURF). The training data set in this study includes 2316 photos as well as 4 additional samples for each image, for a total of 9264 images. Future research will use extensive training data sets to apply crucial techniques like CNN

[4] XueMei Zhao, ChengBing Wei, An easy approach to the face recognition problem is the Local Binary Pattern Histogram (LBPH) algorithm, which can identify both the front and side faces. The pixel neighbourhood grey median-based modified LBPH algorithm (MLBPH) is suggested. After the feature value is extracted by the sub blocks and the statistical histogram is established to form the MLBPH feature dictionary, which is used to recognise the human face identity in comparison to the test image, the grey value of the pixel is replaced by the median value of its neighbourhood sampling value. The Eigenfaces, Fisherfaces, and Local Binary Pattern Histogram (LBPH) face recognition algorithms are all included in the free and opensource computer vision package known as OpenCV. The LBPH algorithm is more flexible than the other two algorithms in that it can distinguish between the front and side faces in addition to the front face. The information acquisition module, feature extraction module, classification module, and training classifier database module are the four key components of a face recognition system. In the classification module, test samples are classified using a classifier that has been database-trained in order to ascertain the samples' identities. A Haar cascade classifier is available in OpenCV and can be used to find faces. The LBP characteristic spectrum histogram serves as the feature vector for classification in the LBPH method.

[5] Shubham Shinde, Manas Shende, Jeet Shah, Harshdeep Shelar[5] This project's software architecture is client-server. Our system requires a person to register with his fingerprint and face image first. The Google Firebase Real-time Database contains data about voters, candidates, constituencies, and votes. A GUI will collect the login information and the voter's face image at the client-side, where a fingerprint device will take the voter's fingerprint and a neighbour) classifier will take the login

information. The following 4 steps make up the entire facial recognition process: 1. Face recognition in images 2. Isolation and face projection Third, Face Coding 4. Facial recognition. By applying the HOG (Histogram of Oriented Gradients) algorithm, faces in the image can be found. The faces, including the eyes, lips, and other features, are next flawlessly warped in the frame. Accurate face alignment improves performance during both training and testing. The final stage is to locate the person in our database whose measurements are most similar to those in the test photograph. Using a KNN (k-nearest neighbour) classifier, the image is classified.

CHAPTER 3

METHODOLOGY

As you can see, each image are presented in the matrix formats, which are made up of rows and columns. The pixel is an image's fundamental building block. A group of pixels make up an image. These are all little squares. We may build the entire image by arranging them side by side. The smallest amount of information that can be present in an image is a single pixel. Every image has pixels with values ranging from 0 to 255.

Each pixel is composed of Three values are R, G, and B, which are the basic colours red, green, and blue. The combination of these three basic colours will create all these colours here in the image so we conclude that a single pixel has three channels, one channel for each one of the basic colours.

3.1 Machine Learning

Machine Learning is undeniably one of the most influential and powerful technologies in today‘s world. Machine learning is a tool for turning information into knowledge. In the past 50 years, there has been an explosion of data. This mass of data is useless; we analyse it and find the patterns hidden within. Machine learning techniques are used to automatically find the valuable underlying patterns within complex data that we would otherwise struggle to discover.

The hidden patterns and knowledge about a problem can be used to predict future events and perform all kinds of complex decision making. To learn the rules governing a phenomenon, machines have to go through a learning process**,** trying different rules and learning from how well they perform. Hence, why it‘s known as Machine Learning.

Basic Terminology:

- Dataset: A set of data examples, which contain features important to solving the problem.
- Features: Important pieces of data that help us understand a problem. These are fed into a Machine Learning algorithm to help it learn.

- Model: The representation (internal model) of a phenomenon that a Machine Learning algorithm has learnt. It learns this from the data it is shown during training. The model is the output you get after training an algorithm. For example, a decision tree algorithm would be trained and produce a decision tree model.

Types of Machine Learning:

There are multiple forms of Machine Learning; supervised, unsupervised, semi supervised and reinforcement learning. Each form of Machine Learning has differing approaches, but they all follow the same underlying process and theory.

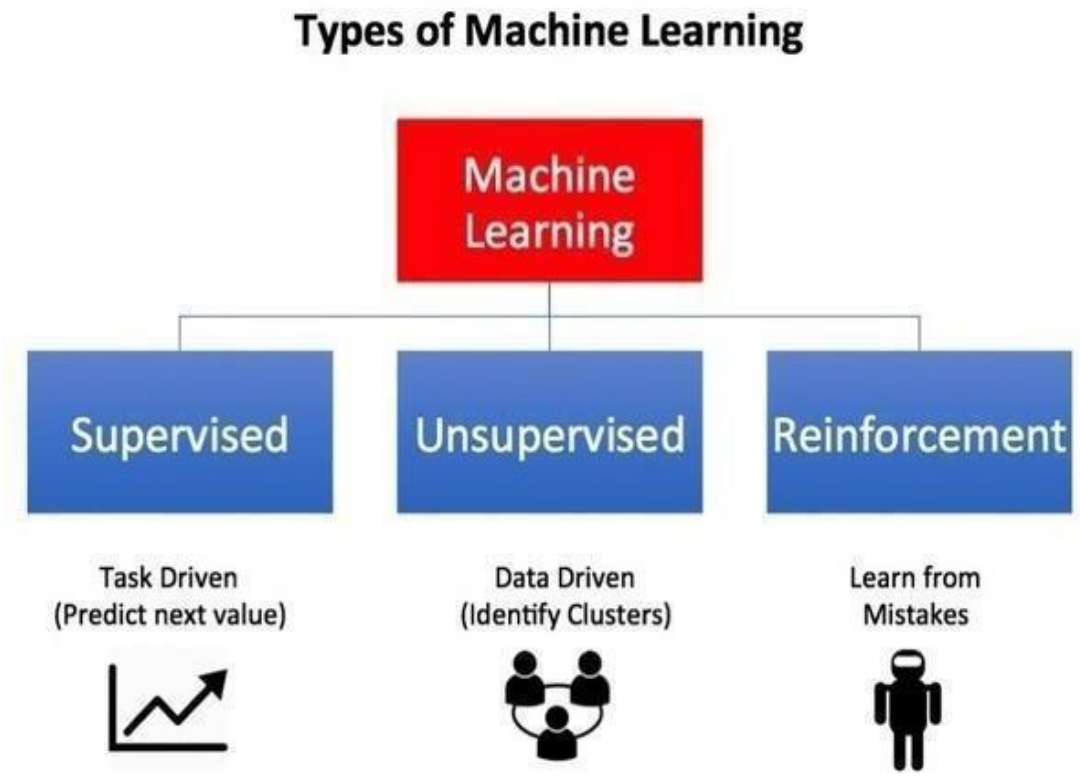

Fig 3.1: Types of Machine Learning

Supervised Learning: It is the most popular paradigm for machine learning. Given data in the form of examples with labels, we can feed a learning algorithm these example-label pairs one by one, allowing the algorithm to predict the label for each example, and giving it feedback as to whether it predicted the right answer or not. Over time, the algorithm will learn to approximate the exact nature of the relationship between examples and their labels. When fully-trained, the supervised learning

algorithm will be able to observe a new, never before-seen example and predict a good label for it.

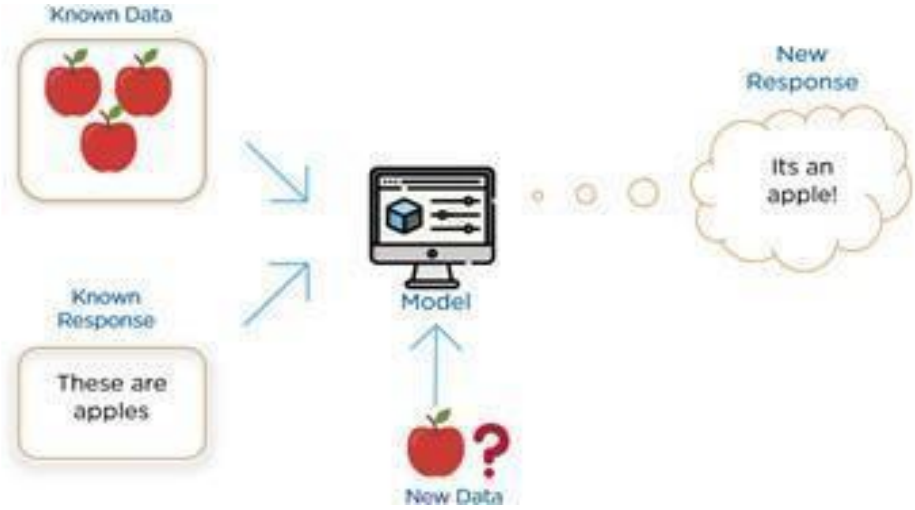

Fig 3.2: Process of Supervised Learning

Unsupervised learning: It is very much the opposite of supervised learning. It features no labels. Instead, the algorithm would be fed a lot of data and given the tools to understand the properties of the data. From there, it can learn to group, cluster, and organize the data in a way such that a human can come in and make sense of the newly organized data. Because unsupervised learning is based upon the data and its properties, we can say that unsupervised learning is data- driven. The outcomes from an unsupervised learning task are controlled by the data and the way it‘s formatted.

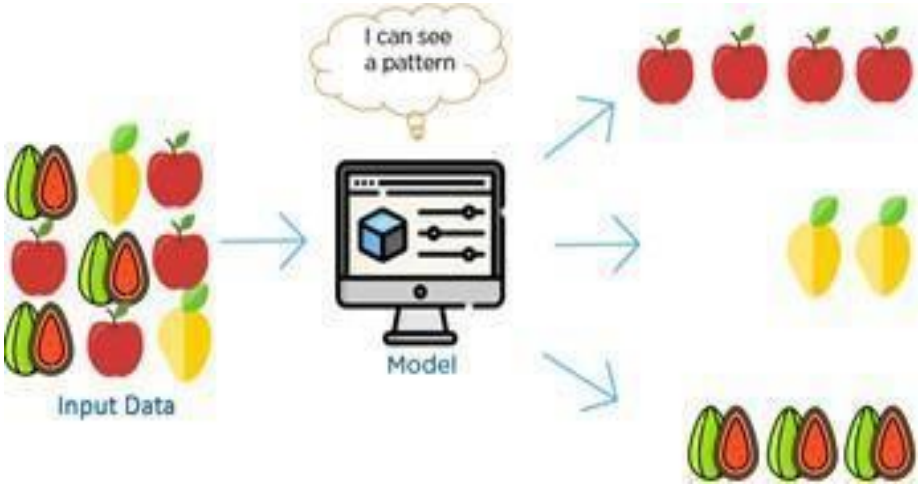

Fig 3.3: Process of Unsupervised Learning

Reinforcement learning: It is fairly different when compared to supervised and unsupervised learning. Reinforcement learning is very behaviour driven. It has influences from the fields of neuroscience and psychology. For any reinforcement learning problem, we need an agent and an environment as well as a way to connect the two through a feedback loop. To connect the agent to the environment, we give it a set of actions that it can take that affect the environment. To connect the environment to the agent, we have it continually issue two signals to the agent: an updated state and a reward (our reinforcement signal for behaviour).

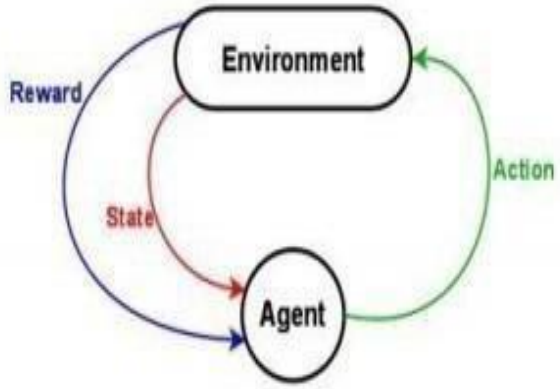

Fig 3.4: Reinforcement Learning

3.2 Algorithm Used

Local Binary Pattern Histograms

You can see that each image is represented using a matrix format, which consists of rows and columns. The fundamental unit of an image is the pixel. An image is made up of a set of pixels. Each of these is a little square. By placing them side by side, we can construct the full image. A single pixel is the lowest unit of information that may be found in an image. Pixels in every image have values ranging from 0 to 255.

Each pixel is composed of Three values are R, G, and B, which are the basic colours red, green, and blue. The combination of these three basic colours will create

all these colours here in the image so we conclude that a single pixel has three channels, one channel for each one of the basic colours.

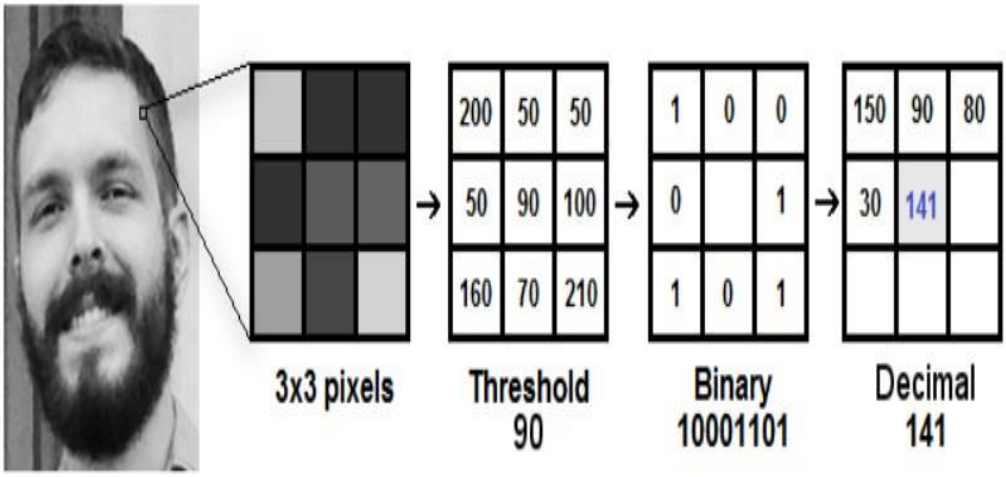

Fig 3.5: Basic Process of LBPH Algorithm

LBPH is an excellent feature for the classification of certain textures like faces. It requires four distinct parameters to process an image, they are radius (*r*), neighbors (*n*), X-axis and Y-axis. Here X and Y-axis represents the dimensionality of the features grid in vertical and horizontal manner. The first step is to train the algorithm, and to do so, it is necessary to use correct dataset with facial images of the people that we need to identify. For the computational step, it is imperative to transform an image of a person into set of 3×3 macro-block for better representation. By doing this, it is possible to pin point each and every feature that exist on a person's face. Each macro-block have 9 pixels and they have the range of 0 to 255 as they are of grayscale format.

Computer Vision is a field of deep learning that enables machines to see, identify and process images like humans. Images and text are both seen and processed by machines using numbers. The pixel intensity for each number corresponds to that specific position. The pixel values for a grayscale image, where each pixel only has one value—the intensity of the black colour at that location—are displayed in the image above. Every project using computer vision needs to be able to read and write images. Additionally, the OpenCV package greatly simplifies this function. Thresholding is a technique for segmenting images. It updates itself based on a comparison between pixel values and a threshold value. There are numerous thresholding variations supported by OpenCV.

CHAPTER 4

SYSTEM REQUIREMENTS SPECIFICATIONS

A software requirements specification (SRS) is a description of a software system to be developed. It lays out functional and nonfunctional requirements, and may include a set of use cases that describe user interactions that the software must provide. It is very important in a SRS to list out the requirements and how to meet them. It helps the team to save upon their time as they are able to comprehend how are going to go about the project. Doing this also enables the team to find out about the limitations and risks early on.

A SRS can also be defined as a detailed description of a software system to be developed with its functional and non-functional requirements. It may include the use cases of how the user is going to interact with the software system. The software requirement specification document is consistent with all necessary requirements required for project development. To develop the software system we should have a clear understanding of Software system. To achieve this we need continuous communication with customers to gather all requirements.

A good SRS defines how the Software System will interact with all internal modules, hardware, and communication with other programs and human user interactions with a wide range of real life scenarios. It is very important that testers must be cleared with every detail specified in this document in order to avoid faults in test cases and its expected results.

Qualities of SRS

- Correct
- Unambiguous
- Complete
- Consistent
- Ranked for importance and/or stability
- Verifiable
- Modifiable
- Traceable

Fig 4.1: Types of Requirements in SRS

Some of the goals an SRS should achieve are to:

- Provide feedback to the customer, ensuring that the IT Company understands the issues the software system should solve and how to address those issues.
- Help to break a problem down into smaller components just by writing down the requirements.
- Speed up the testing and validation processes.
- Facilitate reviews.

4.1 Functional Requirements

A Functional Requirement is a description of the service that the software must offer. It describes a software system or its component. A function is nothing but inputs to the software system, its behaviour , and outputs. It can be a calculation, data manipulation, business process, user interaction, or any other specific functionality which defines what function a system is likely to perform. In software engineering and systems engineering, a Functional Requirement can range from the high-level abstract statement of the sender's necessity to detailed mathematical functional requirement specifications.

Functional software requirements help you to capture the intended behaviour of the system.

Benefits of functional requirements:

- Helps you to check whether the application is providing all the functionalities that were mentioned in the functional requirement of that application
- A functional requirement document helps you to define the functionality of a system or one of its subsystems.
- Functional requirements along with requirement analysis help identify missing requirements. They help clearly define the expected system service and behavior.
- Errors caught in the Functional requirement gathering stage are the cheapest to fix.
- Support user goals, tasks, or activities

4.2Basic Requirements

1. Data collection: The dataset can be collected at the time voter registration in this project. It consists of First name, middle name (optional), last name, generated pin number, Roll number, Email address, phone number, age, States and districts.

2. Data Preprocessing: The purpose of preprocessing is to convert raw data into a form that fits machine learning. Structured and clean data allows a data scientist to get more precise results from an applied machine learning model. The technique includes data formatting, cleaning, and sampling. Here, data pre-processing focuses on finding the attributes with null values or invalid values and finding the relationships between various attributes as well. Data Pre-processing also helps in finding out the impact of each parameter on the target parameter. To preprocess our datasets we used EDA methodology. All the invalid and null values were handled by removing that record or giving the default value of that particular attribute based on its importance.

3. Model training: After a data scientist has preprocessed the collected data and split it into train and test can proceed with a model training. This process entails ―feeding‖ the algorithm with training data. An algorithm will process data and output a model that is able to find a target value (attribute) in new data an answer you want to get a predictive analysis. The purpose of model training is to develop a model. We trained

our model using the random forest algorithm. On training the model it predicts the yield on giving the other attributes of the dataset as input.

4.Model evaluation and testing: The goal of this step is to develop the simplest model able to formulate a target value fast and well enough. A data scientist can achieve this goal through model tuning. That‘s the optimization of model parameters to achieve an algorithm‘s best performance.

Application Requirements

1. Users must be able to register as a new user.
2. Users should be able to login if they already have registered.
3. User can able to update the details.
4. The Face recognition algorithm must give accurate prediction of the Voter at the time login.
5. The user should be able to vote to any one of the nominee displayed at the voting page.
6. All the modules of the application must work in a proper manner.
7. The predictions must be accurate.
8. Users must be able to access the Fertilizers module as well.
9. The secure voting system must help to reduce the fake voter and to check authorized user or not.
10. The user must be able to logout.

4.2 Non-Functional Requirements

Non-Functional Requirement (NFR) specifies the quality attribute of a software system. They judge the software system based on Responsiveness, Usability, Security, Portability and other non-functional standards that are critical to the success of the software system. Failing to meet non-functional requirements can result in systems that fail to satisfy user needs. Non-functional Requirements allows you to impose constraints or restrictions on the design of the system across the various agile backlogs. Example, the site should load in 3 seconds when the number of simultaneous users are > 10000. They specify the criteria that can be used to judge the operation of a system rather than specific behaviour. 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:- Product Requirements, Organizational Requirements, User Requirements, Basic Operational Requirement, etc.

Benefits of Non-Functional Requirements:

- The nonfunctional requirements ensure the software system follows legal and compliance rules.
- They ensure the reliability, availability, and performance of the software system.
- They ensure good user experience and ease of operating the software.
- They help in formulating security policy of the software system.

Requirements

1. The access permissions for system data may only be changed by the system‘s data administrator.
2. Passwords shall never be viewable at the point of entry or at any other time.
3. Application should be able to adapt themselves to increased usage or be able to handle more data as time progresses.
4. Application should be responsive to the user Input or to any external interrupt which is of highest priority and return back to the same state.
5. Users should be able to understand the flow of the Application easily i.e. users should be able to use the Application without any guideline or help from experts/manuals.
6. There should be a common plan where the user can access the application to install and look for regular updates to give feedback.
7. The application should be able to render it‘s layout to different screen sizes. Along with automatic adjustment of Font size and image rendering.
8. The application should run at a speed that is desirable by the users. A slow application can lead to frustration and hence, will not be preferred over other faster applications.
9. The application must be stable. It should never crash or force close in the case of many users using it simultaneously.
10. The application must be easy to maintain.
11. It must be user-friendly. Having a user-friendly application is of key importance for the success of the application.

4.3 Python Libraries:

Normally, a library is a collection of books or is a room or place where many books are stored to be used later. Similarly, in the programming world, a library is a collection of precompiled codes that can be used later on in a program for some specific well-defined operations. Other than pre-compiled codes, a library may contain documentation, configuration data, message templates, classes, and values, etc.

A Python library is a collection of related modules. It contains bundles of code that can be used repeatedly in different programs. It makes Python Programming simpler and convenient for the programmer. As we don't need to write the same code again and again for different programs. Python libraries play a very vital role in fields of Machine Learning, Data Science, Data Visualization, etc.

Working of Python Library

As is stated above, a Python library is simply a collection of codes or modules of codes that we can use in a program for specific operations. We use libraries so that we don't need to write the code again in our program that is already available. But how it works. Actually, in the MS Windows environment, the library files have a DLL extension (Dynamic Load Libraries). When we link a library with our program and run that program, the linker automatically searches for that library. It extracts the functionalities of that library and interprets the program accordingly. That's how we use the methods of a library in our program. We will see further, how we bring in the libraries in our Python programs.

Python standard library

The Python Standard Library contains the exact syntax, semantics, and tokens of Python. It contains built-in modules that provide access to basic system functionality like I/O and some other core modules. Most of the Python Libraries are written in the C programming language. The Python standard library consists of more than 200 core modules. All these work together to make Python a high-level programming language. Python Standard Library plays a very important role. Without it, the programmers can't have access to the functionalities of Python. But other than this, there are several other libraries in Python that make a programmer's life easier. Let's have a look at some of the commonly used libraries:

1.Pandas: Pandas are an important library for data scientists. It is an open-source machine learning library that provides flexible high-level data structures and a variety of analysis tools. It eases data analysis, data manipulation, and cleaning of data. Pandas support operations like Sorting, Re-indexing, Iteration, Concatenation, Conversion of data, Visualizations, Aggregations, etc.

2. Numpy: The name "Numpy" stands for "Numerical Python". It is the commonly used library. It is a popular machine learning library that supports large matrices and multi-dimensional data. It consists of in-built mathematical functions for easy computations. Even libraries like TensorFlow use Numpy internally to perform several operations on tensors. Array Interface is one of the key features of this library.

3. Flask: Flask is a micro web framework written in Python. It is classified as a micro framework because it does not require particular tools or libraries.[2] It has no database abstraction layer, form validation, or any other components where pre-existing third-party libraries provide common functions. However, Flask supports extensions that can add application features as if they were implemented in Flask itself. Extensions exist for object-relational mappers, form validation, upload handling, various open authentication technologies and several common framework related tools.

4. OpenCV: OpenCV is an open-source software library for computer vision and machine learning. The OpenCV full form is Open Source Computer Vision Library. It was created to provide a shared infrastructure for applications for computer vision and to speed up the use of machine perception in consumer products. OpenCV, as a BSD-licensed software, makes it simple for companies to use and change the code. There are some predefined packages and libraries that make our life simple and OpenCV is one of them.

Use of Libraries in Python Program

As we write large-size programs in Python, we want to maintain the code's modularity. For the easy maintenance of the code, we split the code into different parts and we can use that code later ever we need it. In Python, modules play that part.

Instead of using the same code in different programs and making the code complex, we define mostly used functions in modules and we can just simply import them in a program wherever there is a requirement. We don't need to write that code but still, we can use its functionality by importing its module. Multiple interrelated modules are stored in a library. And whenever we need to use a module, we import it from its library. In Python, it's a very simple job to do due to its easy syntax. We just need to use **import**.

4.4 Hardware Requirements

The hardware requirements include the requirements specification of the physical computer resources for a system to work efficiently. The hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be a complete and consistent specification of the whole system. The Hardware Requirements are listed below:

System Processor	:	Intel I3
Hard Disk	:	500 GB
Ram	:	4 GB

1. **Processor:** A processor is an integrated electronic circuit that performs the calculations that run a computer. A processor performs arithmetical, logical, input/output (I/O) and other basic instructions that are passed from an operating

system (OS). Most other processes are dependent on the operations of a processor. A minimum 1 GHz processor should be used, although we would recommend S2GHz or more. A processor includes an arithmetical logic and control unit (CU), which measures capability in terms of the following:

- Ability to process instructions at a given time
- Maximum number of bits/instructions
- Relative clock speed

Fig 4.2: Processor

The proposed system requires a 2.4 GHz processor or higher.

2. Ethernet connection (LAN) OR a wireless adapter (Wi-Fi): Wi-Fi is a family of radio technologies that is commonly used for the wireless local area networking (WLAN) of devices which is based around the IEEE 802.11 family of standards. Devices that can use Wi-Fi technologies include desktops and laptops, smartphones and tablets, TV‘s and printers, digital audio players, digital cameras, cars and drones. Compatible devices can connect to each other over Crop Yield Prediction and Fertilizer Analysis Using Machine Learning Wi- Fi through a wireless access point as well as to connected Ethernet devices and may use it to access the Internet. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors. Hotspot coverage can be as small as a single room with walls that block radio waves, or as large as many square 20ilometers achieved by using multiple overlapping access points.

Fig 4.3: Ethernet Connection

3. Hard Drive: A hard drive is an electro-mechanical data storage device that uses magnetic storage to store and retrieve digital information using one or more rigid rapidly rotating disks, commonly known as platters, coated with magnetic material. The platters are paired with magnetic heads, usually arranged on a moving actuator arm, which reads and writes data to the platter surfaces. Data is accessed in a random-access manner, meaning that individual blocks of data can be stored or retrieved in any order and not only sequentially. HDDs are a type ofen on volatile storage, retaining stored data even when powered off. 32 GB or higher is recommended for the proposed system.

Fig 4.4: Hard Disk

4. Memory (RAM): Random-access memory (RAM) is a form of computer data storage that stores data and machine code currently being used. A random- access memory device allows data items to be read or written in almost the same amount of time irrespective of the physical location of data inside the memory. In today's technology, random-access memory takes the form of integrated chips. RAM is normally associated with volatile types of memory (such as DRAM modules), where stored information is lost if power is removed, although non- volatile RAM has also been developed. A minimum of 4 GB RAM is recommended for the proposed system.

Fig 4.5: RAM

4.6 Software Requirements

The software requirements are description of 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 client‘s point of view.

Operating system	:	Windows OS 7+
Coding Language	:	Python
IDE	:	Pycharm IDE
GUI	:	Flask

1.PyCharm: Py Charm is the most popular IDE for Python, and includes great features such as excellent code completion and inspection with advanced debugger and support for web programming and various frameworks. The intelligent code editor provided by PyCharm enables programmers to write high quality Python code. The editor enables programmers to read code easily through colour schemes, insert indents on new lines automatically, pick the appropriate coding style, and avail context-aware code completion suggestions.

At the same time, the programmers can also use the editor to expand a code block to an expression or logical block, avail code snippets, format the code base, identify errors and misspellings, detect duplicate code, and auto-generate code. PyCharm offers some of the best features to its users and developers in the following aspects

- Code completion and inspection
- Advanced debugging
- Support for web programming and frameworks such as Django and Flask

Fig 4.6: Pycharm image

2. Python: It is an object-oriented, high-level programming language with integrated dynamic semantics primarily for web and app development. It is extremely attractive in the field of Rapid Application Development because it offers dynamic typing and dynamic binding options. Python is relatively simple, so it's easy to learn since it requires a unique syntax that focuses on readability. Developers can read and translate Python code much easier than other languages. In turn, this reduces the cost of program maintenance and development because it allows teams to work collaboratively without significant language and experience barriers. Additionally, Python supports the use of modules and a package, which means that programs can be designed in a modular style and code can be reused across a variety of projects.

Fig 4.7: Python Icon

5.Flask Framework: Web Application Framework or simply Web Framework represents a collection of libraries and modules that enables a web application developer to write applications without having to bother about low-level details such as protocols, thread management etc. Flask is a web application framework written in Python. It is developed by Armin Ronacher, who leads an international group of Python enthusiasts named Pocco. Flask is based on the Werkzeug WSGI toolkit and Jinja2 template engine. Both are Pocco projects. Web Server Gateway Interface (WSGI) has been adopted as a standard for Python web application development. WSGI is a specification for a universal interface between the web server and the web applications.

werkzeug is a WSGI toolkit, which implements requests, response objects, and other utility functions. This enables building a web framework on top of it. The Flask framework uses Werkzeug as one of its bases.

Jinja2 is a popular templating engine for Python. A web templating system combines a template with a certain data source to render dynamic web pages.
Flask is often referred to as a micro framework. It aims to keep the core of an application simple yet extensible. Flask does not have built-in abstraction layer for database handling, nor does it have form a validation support. Instead, Flask supports the extensions to add such functionality to the application.

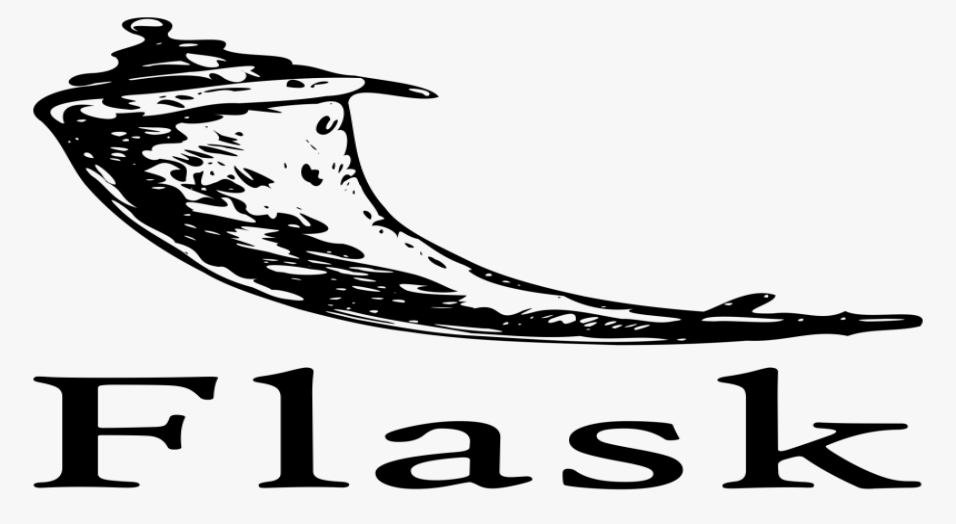

Fig 4.8: Flask Python Logo

CHAPTER 5

SYSTEM ANALYSIS AND DESIGN

Systems development is a systematic process which includes phases such as planning, analysis, design, deployment, and maintenance. System Analysis is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components. System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose. Analysis specifies what the system should do.

System Design is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently. System Design focuses on how to accomplish the objective of the system.

5.1 UML DIAGRAMS:

UML represents Unified Modelling Language. UML is an institutionalized universally useful showing dialect in the subject of article situated programming designing. The fashionable is overseen, and become made by way of, the Object management Group.

The goal is for UML to become a regular dialect for making fashions of item arranged PC programming. In its gift frame UML is contained two noteworthy components: a Meta-show and documentation. Later on, a few type of method or system can also likewise be brought to; or related with, UML. The Unified Modeling Language is a popular dialect for indicating, Visualization, Constructing and archiving the curios of programming framework, and for business demonstrating and different non-programming frameworks. The UML speaks to an accumulation of first-rate building practices which have verified fruitful in the showing of full-size and complicated frameworks. The UML is a essential piece of creating gadgets located programming and the product development method. The UML makes use of commonly graphical documentations to specific the plan of programming ventures.

USE CASE DIAGRAM:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

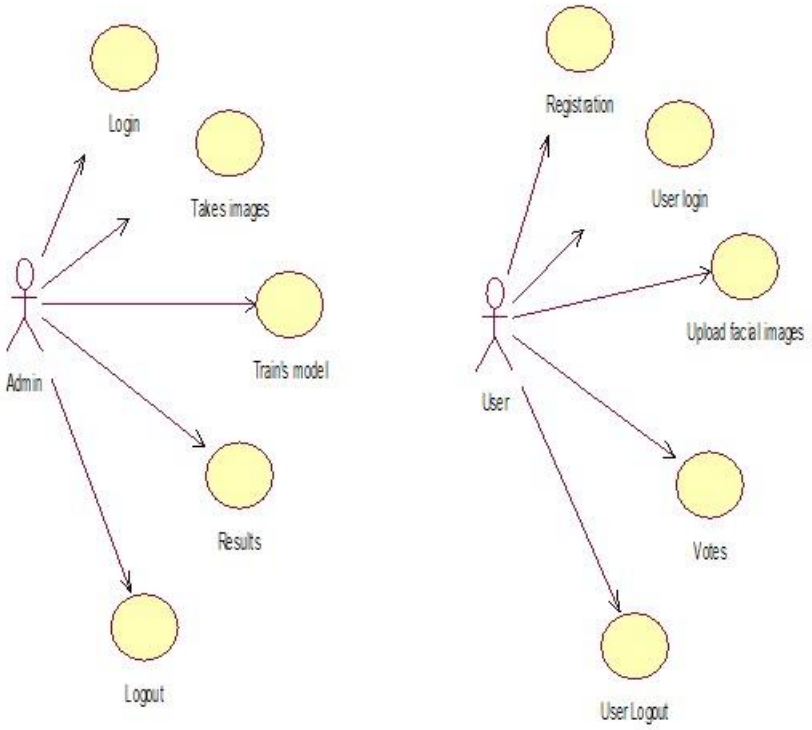

Fig 5.1: Usecase Diagram

CLASS DIAGRAM

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.

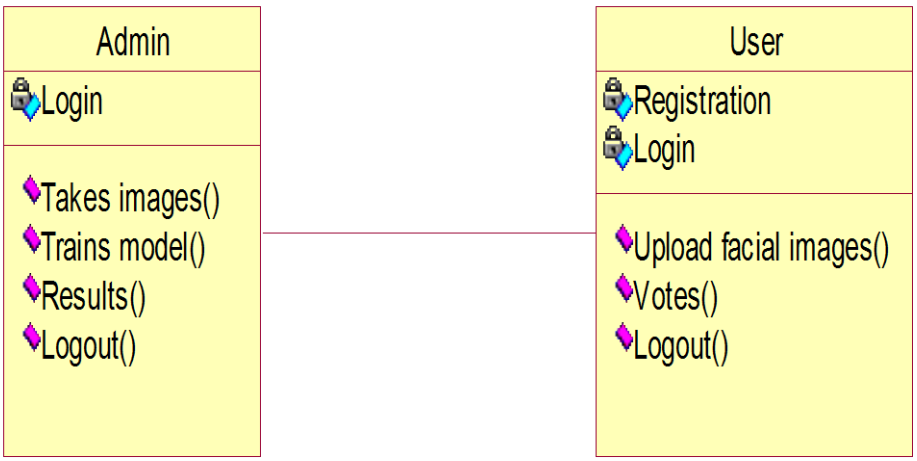

Fig 5.2: Class Diagram

SEQUENCE DIAGRAM:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.

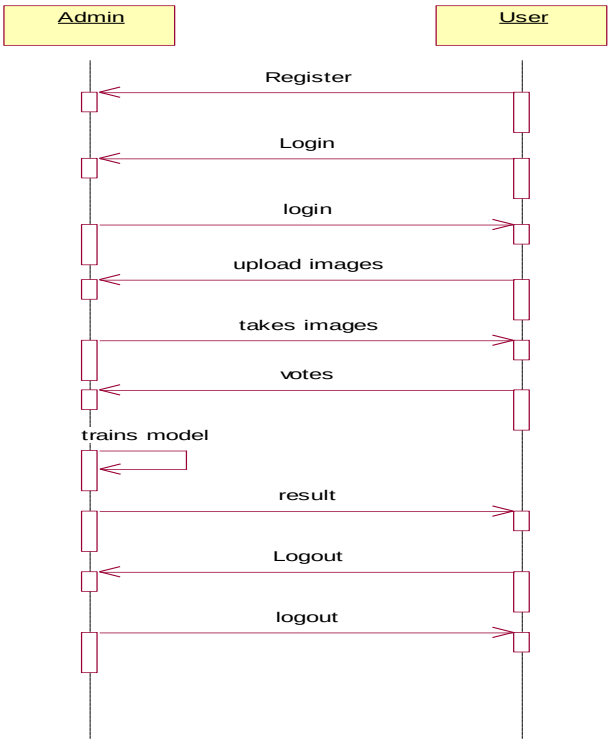

Fig 5.3: Sequence Diagram

COLLABORATION DIAGRAM:

In collaboration diagram the method call sequence is indicated by some numbering technique as shown below. The number indicates how the methods are called one after another. We have taken the same order management system to describe the collaboration diagram. The method calls are similar to that of a sequence diagram. But the difference is that the sequence diagram does not describe the object organization where as the collaboration diagram shows the object organization.

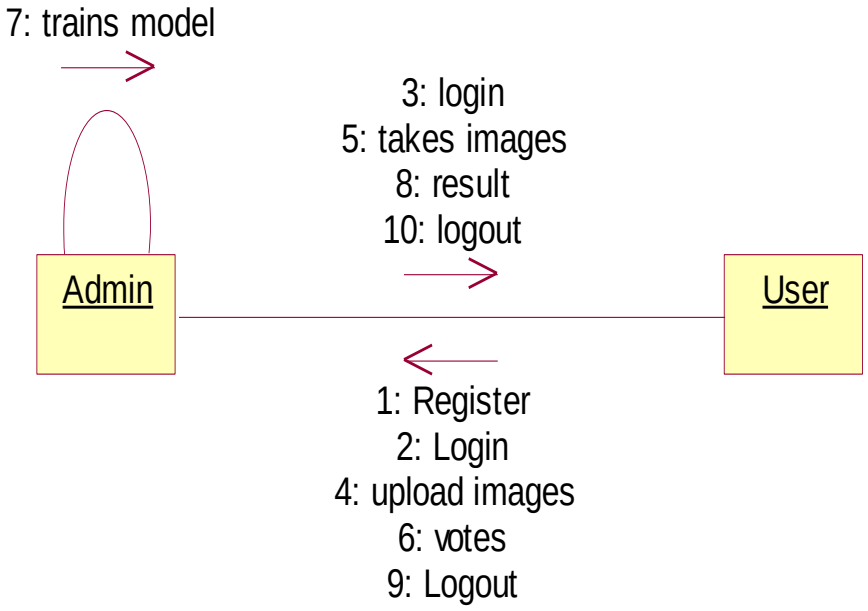

Fig 5.4: Collaboration Diagram

ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

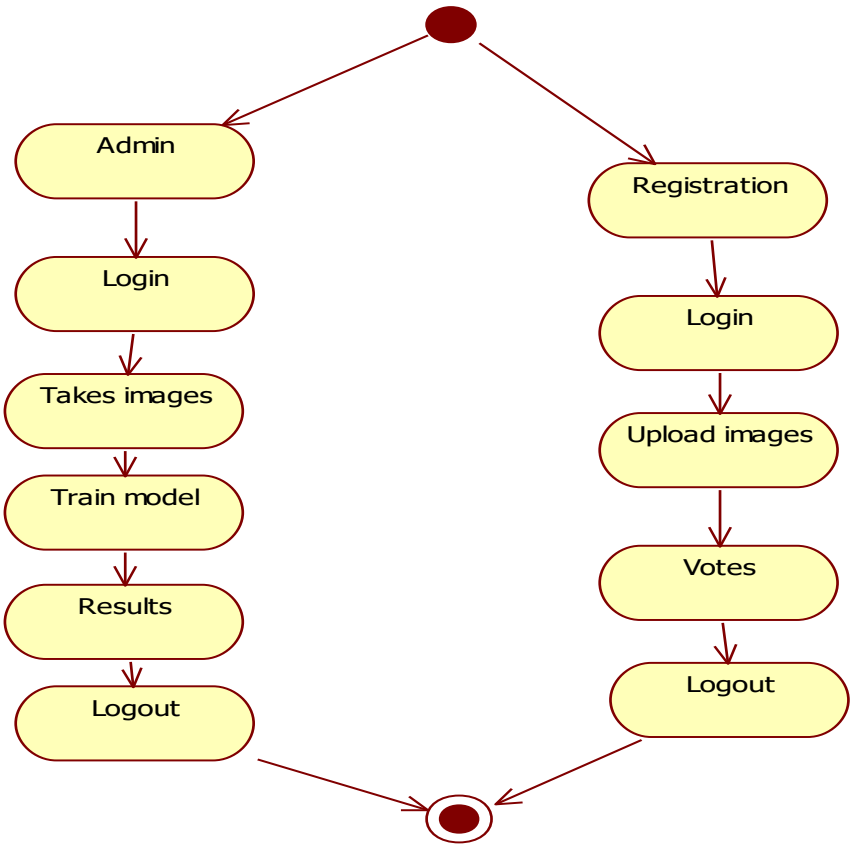

Fig 5.5: Activity Diagram

5.1.1 Usage of UML in Project

As the strategic value of software increases for many companies, the industry looks for techniques to automate the production of software and to improve quality and reduce cost and time to the market. These techniques include component technology, visual programming, patterns and frameworks. Additionally, the development for the World Wide Web, while making somethings simpler, has exacerbated these architectural problems. The UML was designed to respond to these needs. Simply, systems design refers to the process of defining the architecture, components, modules, interfaces and data for a system to satisfy specified requirements which can bed one easily through UML diagrams.

5.2 System Architecture

Architecture diagrams can help system designers and developers visualize the high-level, overall structure of their system or application for the purpose of ensuring the system meets their users' needs. They can also be used to describe patterns that are

used throughout the design. It's somewhat like a blueprint that can be used as a guide for the convenience of discussing, improving, and following among a team.

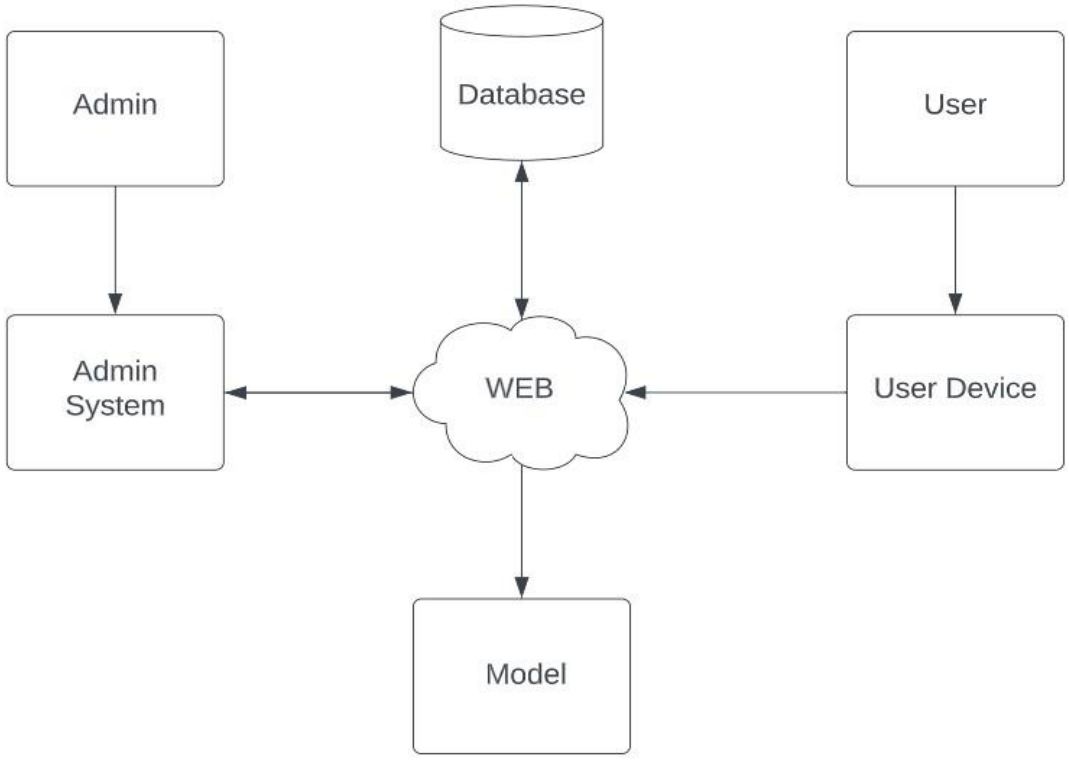

Fig 5.6: System Architecture

5.3 Flowchart

A flowchart is simply a graphical representation of steps. It shows steps in sequential order and is widely used in presenting the flow of algorithms, workflow or processes. Typically, a flowchart shows the steps as boxes of various kinds, and their order by connecting them with arrows. It originated from computer science as a tool for representing algorithms and programming logic but had extended to use in all other kinds of processes. Nowadays, flowcharts play an extremely important role in displaying information and assisting reasoning. They help us visualize complex processes, or make explicit the structure of problems and tasks. A flowchart can also be used to define a process or project to be implemented.

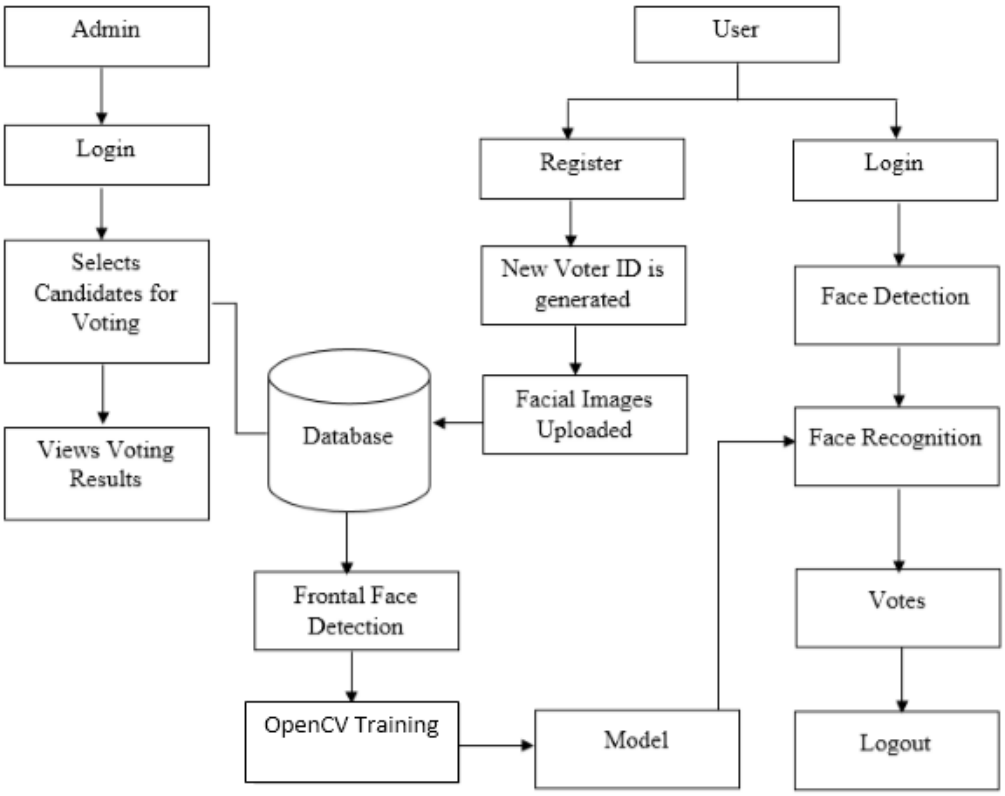

Fig 5.7: Flowchart of the system

CHAPTER 6

IMPLEMENTATION

In this project we are working with two different- different security levels

Level1: - Username and Pin Number

At the time of voter registration user will create the Username and Pin Number. The entered Username and pin number is verified from the database provide.

Level2: - Face recognition with respective Voters pin number.

In this level, Through OpenCV and Local Binary Patterns Histograms algorithm is used to verify the voters with the images captured at the time of registration of a voter.

Advantages

- Email Verification at the time of registration.
- Voter can cast their vote only once.
- Voter can update their details and it can be successful by email verification only.

The two modules that make up the proposed system are the admin login, user registration and login, and user application.

- The first module is referred as admin login, where an admin can be authorized through credentials. Administrator has access to add nominee to particular post. At voting time and after completion of voting, administrator can view the results of the nominees.

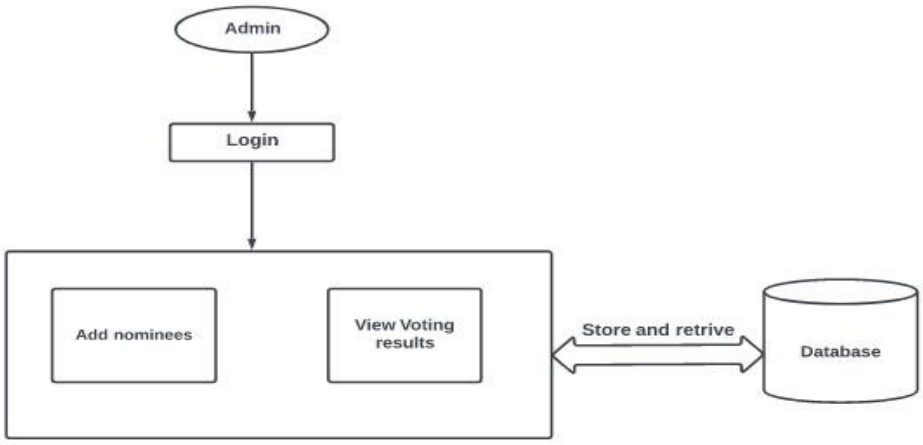

Fig 6.1: Block diagram of Admin

- Second module is referred as user registration and login, where a new user has to register by filling details. Then after email authentication can be held to verify the user. After verification, system captures the voters face(200 images) through system camera. Then an existing voter can login through their credentials which has been created at the time of registration and after entering credentials, system camera is going to capture and compares with the existed images which was captured at the time of registration. If it matches, then only an user can cast their vote for once. Here for face recognition and capturing images, we are using OpenCV and Local Binary Patterns Histograms.

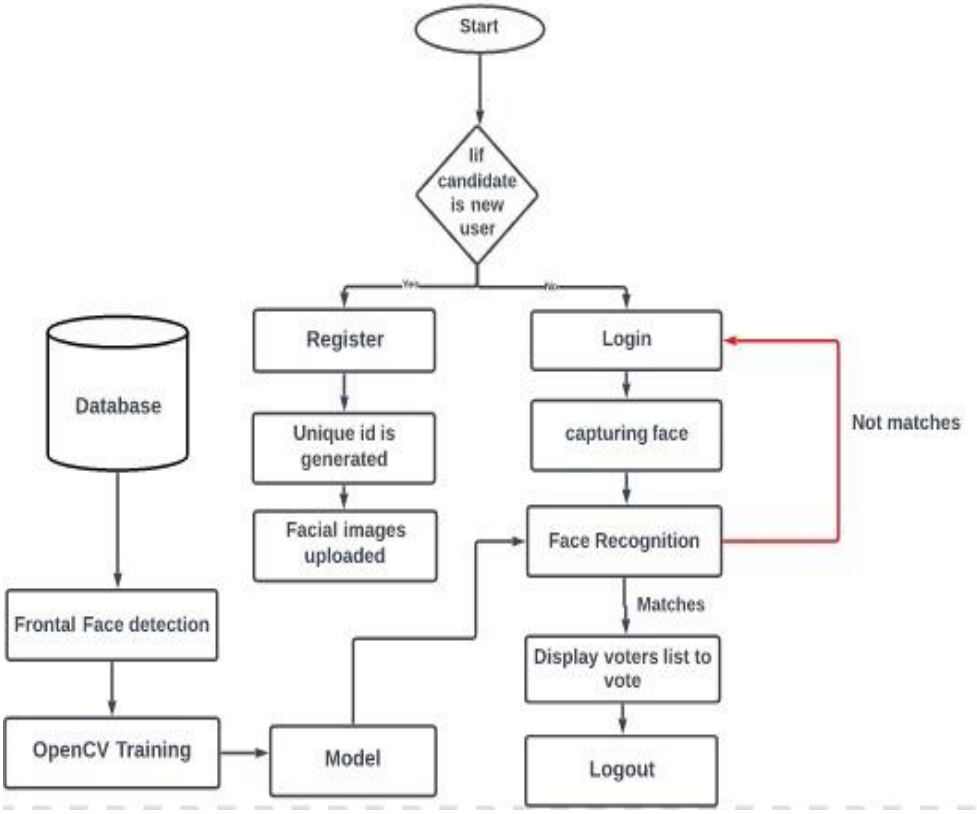

Fig 6.2: Block Diagram of User

- Additionally, one more feature is added to this project. If an existing voter wants to update the details then voter can update by opening update page. But voter wants to update the details successfully then email verification has to be done successfully as same as registration process. So only authorized user can update their details in the database successfully.

Working Flow of the System

i). Each new user must first register for voting by providing their information. Registration is therefore the first thing we do.

ii). Before capturing the voter images, email verification can be held to verify details. After authenticating successfully, system allow voter for captures the images by saving with pin number generated by the voter. Now registration of voter is successfully completed.

iii). At the time of election, we will use two levels of security first one is username and pin Number verification and second one is face recognition.

iv). System will check username and password entered by the voter is correct or not.

v). If username and password is correct then system allow to on web cam then the face capturing through web cam will compares with the respective image captured at the time registration.

vi). If the image matches then voter is allowed to cast a vote. If not voter is not allowed

vii). On the voting page, nominees images can be displayed and these nominees can be added by administrator. So voter can cast their vote by selecting any one of them.

viii). As soon as voter will give vote then voter is not allowed to vote more than once. so we can say that a voter can give only one vote.

6.1 Datasets

Machine Learning depends heavily on data. It‘s the most crucial aspect that makes algorithm training possible. It uses historical data and information to gain experiences. The better the collection of the dataset, the better will be the accuracy.

At the time of voter registration system going to capture 200 images through webcam and that is going to store in the folder with generated pin. This dataset can be used to train the model.

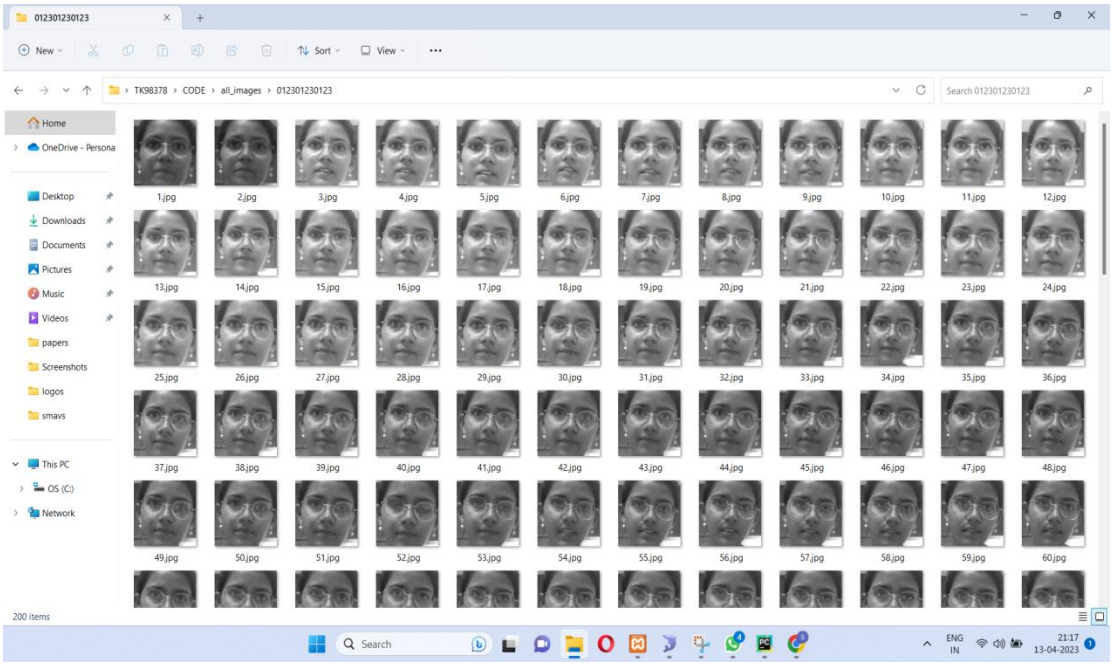

Fig 6.3: Dataset Collection

6.2 Data Pre-Processing

Data Pre-Processing is a Data Mining method that entails converting raw data into a format that can be understood. Real-world data is frequently inadequate, inconsistent, and/or lacking in specific activities or trends, as well as including numerous inaccuracies. This might result in low-quality data collection and, as a result, low-quality models based on that data. Preprocessing data is a method of resolving such problems. Machines do not comprehend free text, image, or video data; instead, they comprehend 1s and 0s. So putting on a slideshow of all our photographs and expecting our machine learning model to learn from it is probably not going to be adequate. Data Pre-processing is the step in any Machine Learning process in which the data is changed, or encoded, to make it easier for the machine to parse it. In other words, the algorithm can now easily interpret the data's features. Data Pre-processing can be done in four different ways. Data cleaning/cleaning, data integration, data transformation, and data reduction are the four categories.

6.2.1 Data Cleaning:

Data in the real world is frequently incomplete, noisy, and inconsistent. Many bits of the data may be irrelevant or missing. Data cleaning is carried out to handle this aspect. Data cleaning methods aim to fill in missing values, smooth out noise while identifying outliers, and fix data discrepancies. Unclean data can confuse data

and the model. Therefore, running the data through various Data Cleaning/Cleansing methods is an important Data Pre-processing step.

6.2.2 Data Integration:

It is involved in a data analysis task that combines data from multiple sources into a coherent data store. These sources may include multiple databases. Do you think how data can be matched up?? For a data analyst in one database, he finds Customer_ID and in another he finds cust_id, How can he sure about them and say these two belong to the same entity.

6.2.3 Data Reduction :

Because data mining is a methodology for dealing with large amounts of data. When dealing with large amounts of data, analysis becomes more difficult. We employ a data reduction technique to get rid of this. Its goal is to improve storage efficiency while lowering data storage and analysis expenses.

Dimensionality Reduction

A huge number of features may be found in most real-world datasets. Consider an image processing problem: there could be hundreds of features, also known as dimensions, to deal with. As the name suggests, dimensionality reduction seeks to minimize the number of features but not just by selecting a sample of features from the feature set, which is something else entirely Feature Subset Selection or feature selection.

CHAPTER 7

TESTING

Software testing is an investigation conducted to provide stakeholders with information about the quality of the software product or service under test. Software testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation. Test techniques include the process of executing a program or application with the intent of finding software bugs (errors or other defects), and verifying that the software product is fit for use.

Software testing involves the execution of a software component or system component to evaluate one or more properties of interest. In general, these properties indicate the extent to which the component or system under test:

- Meets the requirements that guided its design and development,
- Responds correctly to all kinds of inputs,
- Performs its functions within an acceptable time,
- It is sufficiently usable,
- Can be installed and run in its intended environments, and
- Achieves the general result its stakeholder‘s desire.

7.1 Functionality Testing

- Database connection is successfully established.
- The flow of the application from one page to another is correct, accurate and quick.
- All the forms included in the application are working as expected.
- Proper alert messages are displayed in case of wrong inputs.
- After every action on the application the appropriate data is fetched from the backend.

7.2 Usability Testing

- The application enables smooth navigation, hence gives a user-friendly experience.
- The inputs taken from the user are via dropdown hence correct inputs are provided to the system.

- Wrong inputs given by the system are handled effectively.
- The content provided by the application is verified and is taken by the trusted sources.
- The datasets trained for prediction of the crop yield are accurate and balanced.

7.3 Interface Testing

- The application connects correctly with the server. In case of failure an appropriate message is displayed.
- Interruptions by the server or by the user are handled efficiently.
- If the user enters wrong credentials or invalid email id, the application handles it efficiently by displaying appropriate messages.
- The interaction with the user is smooth and easy.

7.4 Performance Testing

- It works fine with moderate internet speed.
- The connection is secured and user details are stored in a secured manner.
- The switch from one screen to another is quick and smooth.
- The inputs from users are taken correctly and response is recorded quickly.

7.5 Unit Testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs.

All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform Crop Yield Prediction and Fertilizer Analysis Using Machine Learning basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

7.6 Integration Testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more

concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

7.7 System Testing

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

7.8 White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

CHAPTER 8

RESULTS

In the final implementation of the application the first screen the user can view is the Home page that contain four functionalities User Registration, User Login, Administrator Login, and Update User Details.

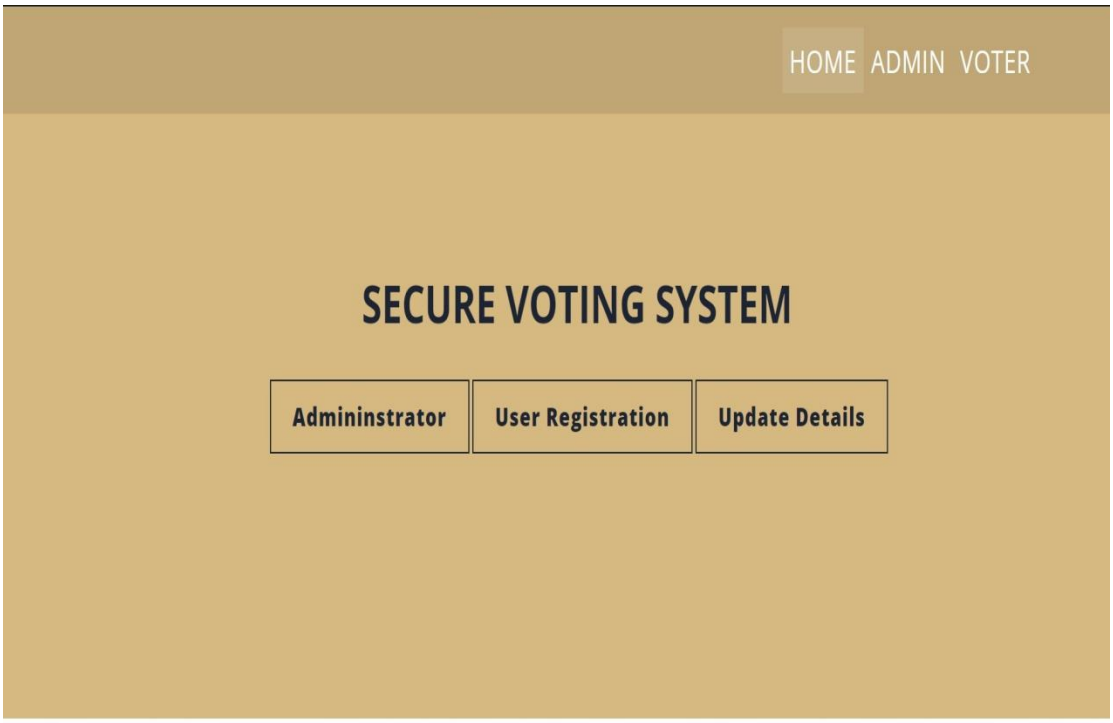

Fig 8.1: Home Page

The above figure represents the Initial web page of the system that has four functionalities that are User Registration, User Login, Administrator Login, and Update User Details. On selecting the required one we get the new webpage and required to give the inputs.

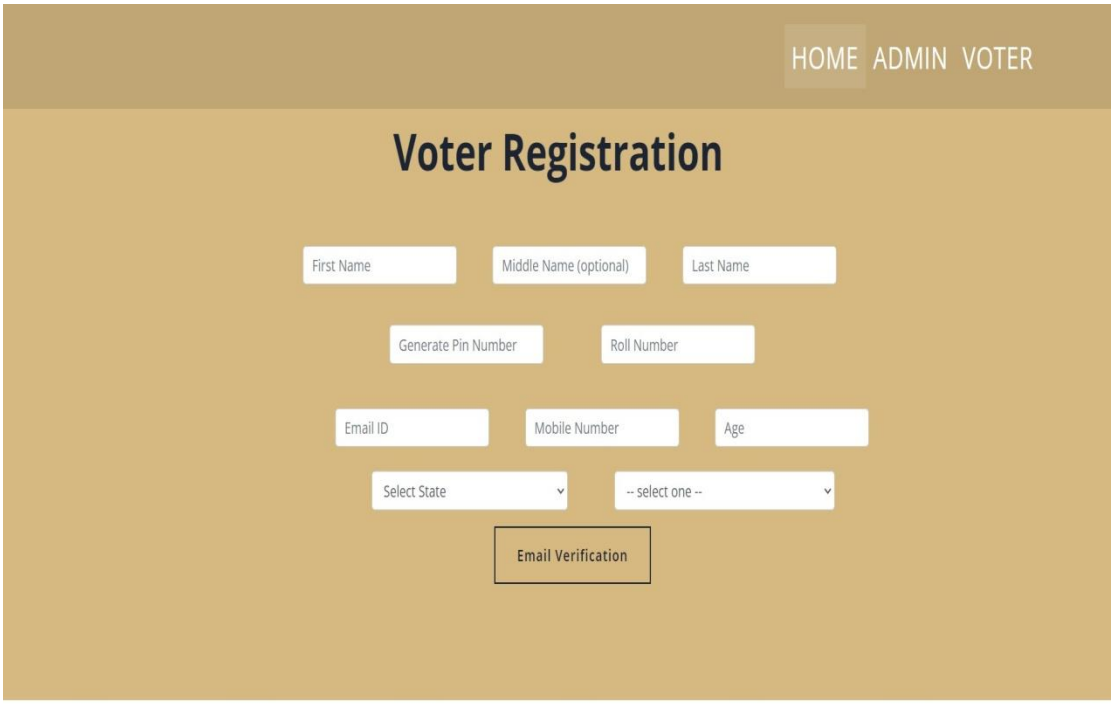

Fig 8.2 : Voter Registration Page

The above page represents the initial page of the voter registration. Here we are required to give inputs of First Name, Middle Name(optional), Last Name, Generated Pin Number, Roll Number, EmailID, Mobile Number, Age, Select State, and District.

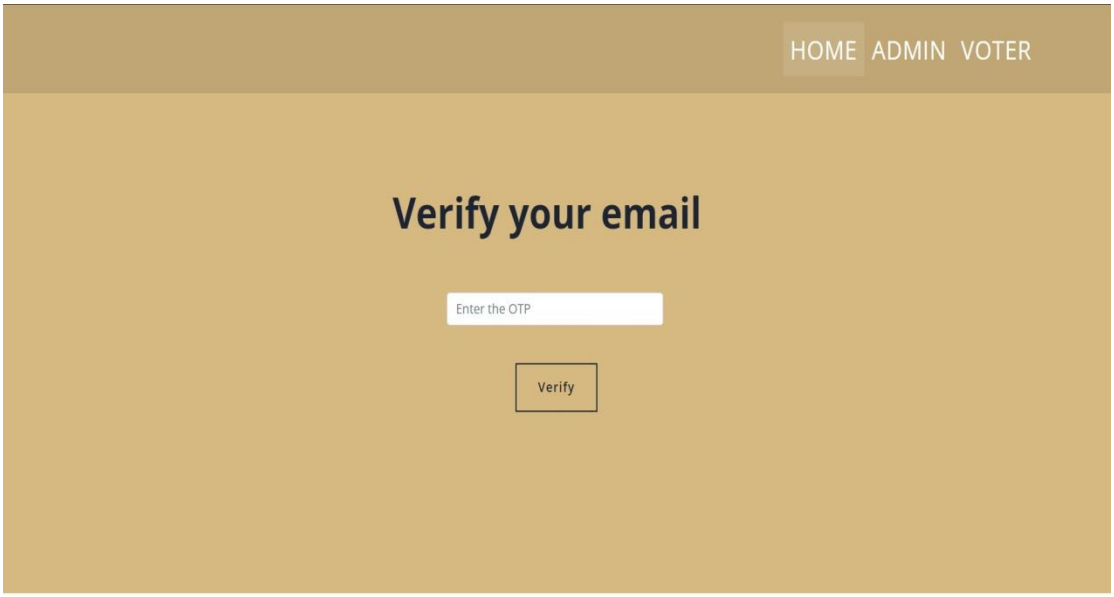

Fig 8.3: Email Verification Page

The above page is the second page of voter registration. Here we need to enter the OTP which is sent to the registered emailID.

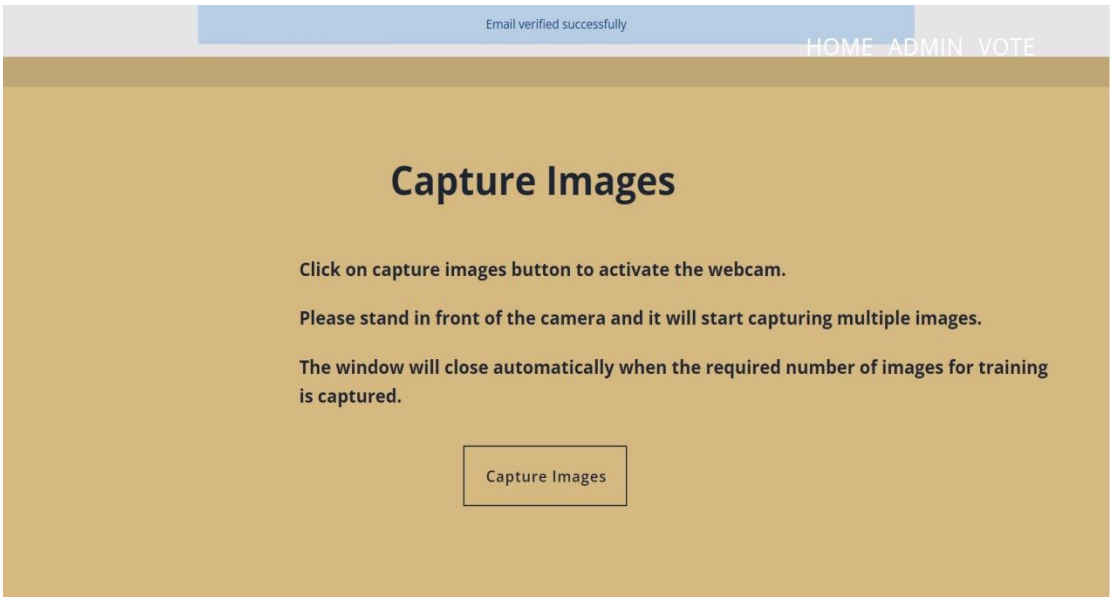

Fig 8.4: Face Capturing Page at the time of Registration

The above page is the third page of voter registration. Images of the voter can be taken through system camera by clicking on Capture Images.

Fig 8.5: Voter Login Page

The above page is the initial page of voter login. Here we are required to give inputs of First Name and generated pin.

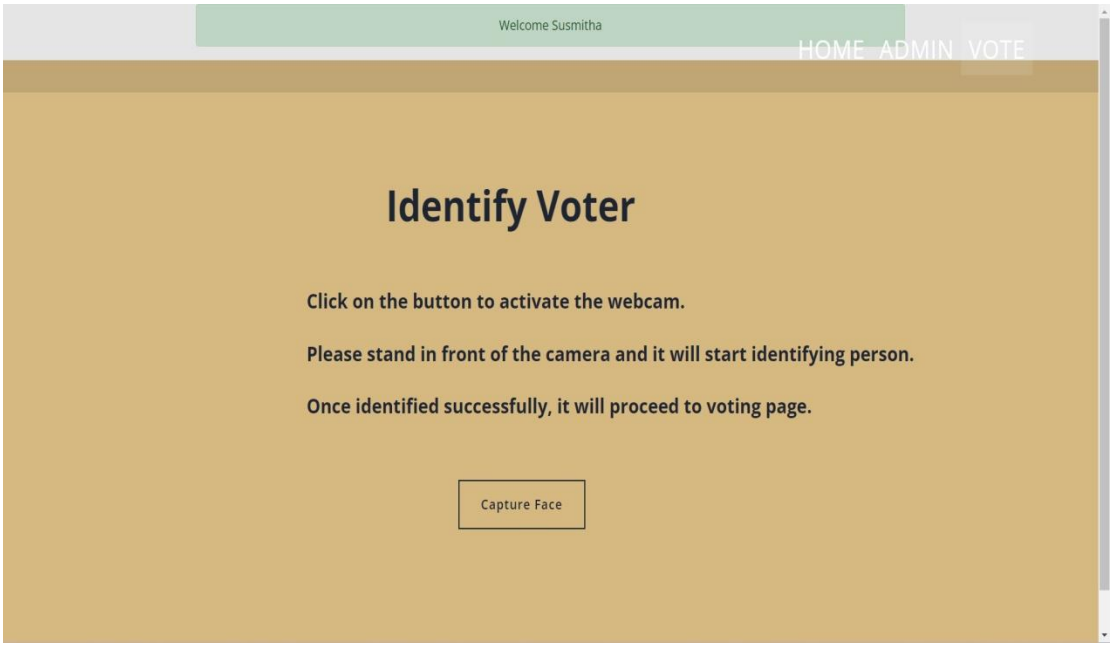

Fig 8.6: Verify the Voter page at the time of Voter Login

The above page is second page of voter login. Here voter will verify that the voter is authorized or not by clicking on Capture Face.

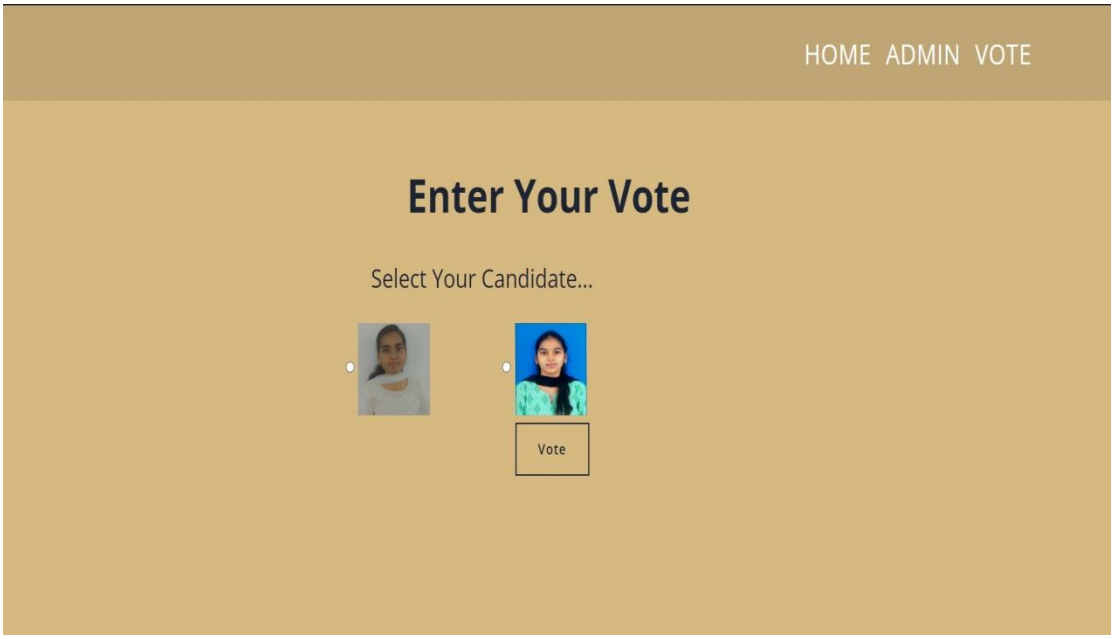

Fig 8.7: Voting Page

The above page is the third page of voter login. Here voter will select any of the candidate and click on Vote button.

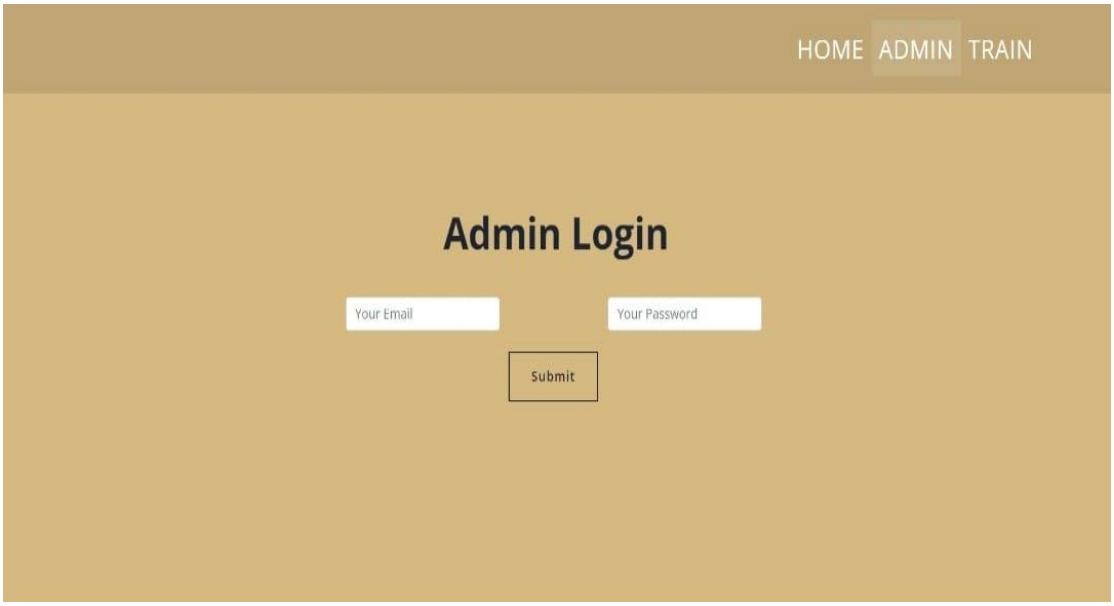

Fig 8.8: Admin Login Page

The above page is the initial page of administrator login. Here admin credentials has to be filled and click on Submit button.

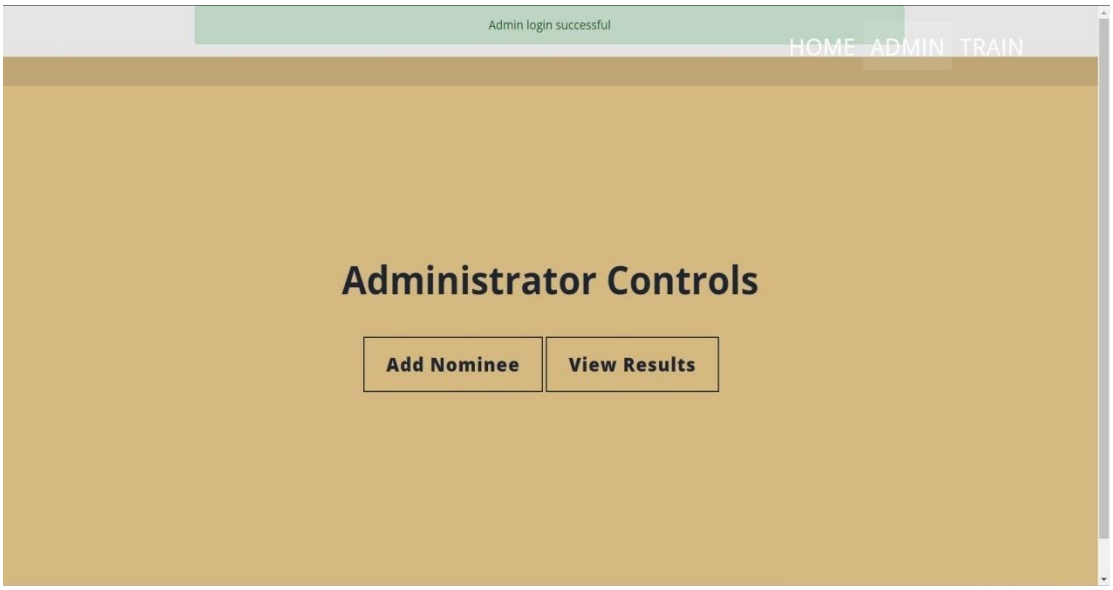

Fig 8.9: Admin Dashboard

The above page is second page of administrator login. Here displays the controls of the administrator.

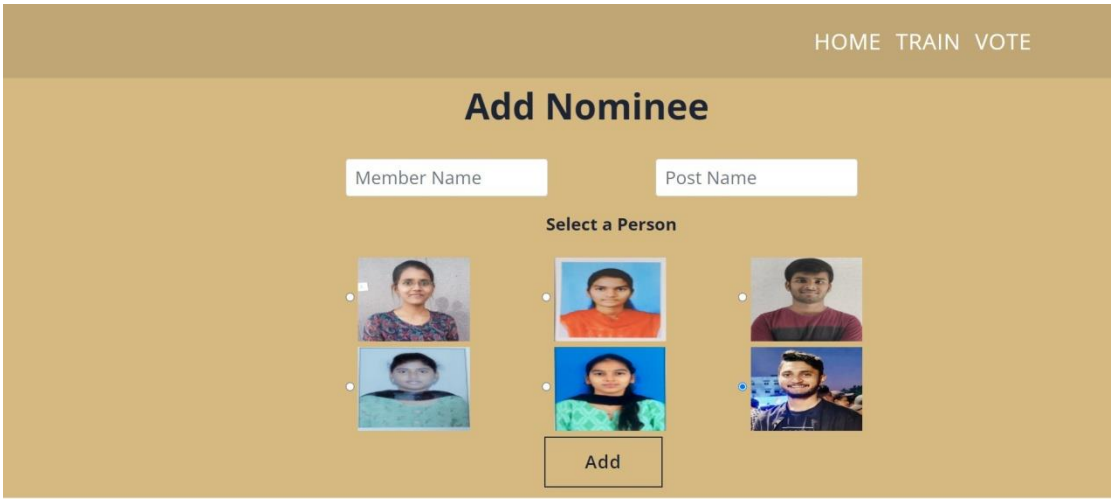

Fig 8.10: Nominee Selection Page

The above page is the third page of administrator login. Here administrator will add the nominee by filling the fields Member Name and Post Name.

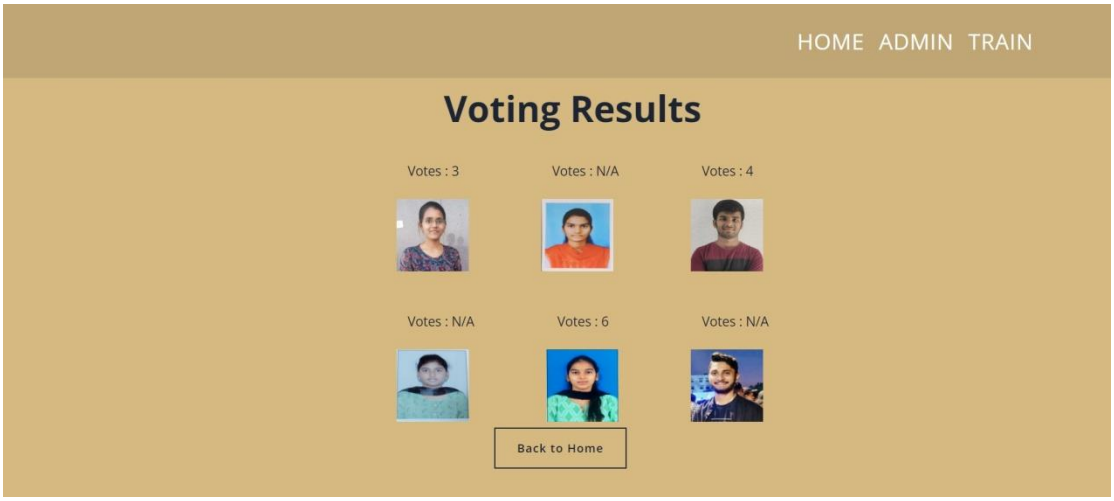

Fig 8.11: Results Page

The above page is third page of administrator login. Here administrator can see the voting results.

CONCLUSION

As we can see, the current voting system has numerous flaws, including a long process that takes a lot of time, is not safe, allows for fake voting, and has no security level. The proposed method can address the issues and limitations of the current system, which will ultimately reduce bogus and false votes. This is because its difficult for the hackers to do marphing the face in live and offers a secure and comfortable voting environment. Using this method, voters can cast their ballots at the closest polling place or even from home if they are familiar with how the technology operates and understand its fundamentals. In our proposed system we are developing a user friendly web interface where users can easily interact with it to vote.

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SECURE VOTING SYSTEM THROUGH FACE RECOGNITION

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Abstract:

Now-a-days in India there are two types of methods are used for voting. The first method is secret ballot paper, in which lots of paper are used and second method is EVM(Electronic Voting Machine) which is used since 2003 but both of those methods have some limitations. There is a necessity for a method for online voting that is more secure than the existing system. In our proposed system we introduce a secure way for online voting by using face recognition system which is used to authenticate a person. And also the tallying of the votes will be done automatically, thus saving a huge time and enabling administrator to announce the result to announce the result within a very short period.

Keywords: Smart Voting, ballot paper, Face Recognition, Authentication, EVM.

Introduction:

Every person in our nation has the fundamental right to vote. The "right to vote" belongs to everyone. But for a variety of reasons, not everyone is making use of their rights. Voting takes place at different levels, including municipal, state, and national elections. Therefore, we use technology to improve the technique of voting through face recognition in order to make it simple to vote and to boost the voting percentage.

So we are developing an effective solution to this as secure voting system through face recognition. It will enables voters to vote securely. In this we employ the LBPH method (Linear Binary Pattern Histograms). The face is photographed and trained for use in this algorithm. During training, at this phase, the faces are turned first into grayscale images, then the points or pixels.

Computers can be programmed to use prior knowledge to optimize Performance criteria using machine learning (ML). We have a model that has been developed up to a certain point, and learning is the application of a computer program to optimize the model's parameters using training data or prior knowledge. The model may be descriptive to learn from the data or predictive to make future predictions. By

learning to represent the world as a layered hierarchy of concepts, with each concept defined in relation to simpler concepts and more abstract representations computed in terms of less abstract ones, deep learning is a specific type of machine learning that reaches considerable power and flexibility.

The practice of recognizing or confirming a person's identification by their face is known as face recognition. It records patterns based on a person's face characteristics, analyses them, and compares the results. In order to identify and locate human faces in images and videos, the face detection method is a necessary first step. Based on the subject's facial traits, the face capture procedure converts analogue information (a face) into a collection of digital information (data or vectors). By using a face match, you may determine whether two faces belong to the same person or not.

A computer vision is a machine learning software library called OpenCV is available for free use. A standard infrastructure for computer vision applications was created with OpenCV in order to speed up the incorporation of artificial intelligence into products. More than 2500 optimized algorithms are available in the collection, including a wide range of both traditional and cutting-edge computer vision and machine learning techniques. These algorithms can be used to find similar images from an image database, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch together images to produce high-resolution images of entire scenes, and remove red eyes from photographs taken.

The LBPH algorithm, which is used to improve the performance of face recognition results, combines the Local Binary Pattern (LBP) and Histogram Oriented Gradients (HOG) techniques. The performance and precision of LBPH, which can identify a person's face from both the front and the side, are well known.
In this algorithm, the face is captured and trained. At this stage during training, first the faces are converted into gray scale images and then the points or pixels obtained through the gray images are then converted into Histograms and these histograms contains some values and these values are converted into a single value i.e., from binary digits to a decimal number.

A secure Voting System is Proposed of having Objectives like Face recognition is implemented while voter is going to cast their vote, Email verification is implemented while new user is registering, and Fake votes can be reduced, and only one time an user can cast their vote.

Literature survey:

Jehovah Jireh Arputhamoni and Gnana Saravanan[1], have proposed that different biometrics they are Iris Detection in Voting System, Voting System using Fingerprint Recognition, Smart Voting. Since the suggested concept is a totally web-based system, its fundamental features such as database construction and picture processing capabilities—determine the system's software requirements. The face and fingerprints of the voter will be taken with the use of a laptop, PC, or mobile camera. Using the CNN technique, fingerprints may be compared with images stored in a database and the captured image can be recognised using the Haar Cascade algorithm. The technology is distinctive and effective because of the CNN algorithm used. Prior to voting, it ensures that the voter is verified. Smart voting is a better way to vote since the planned technology makes the election process less time-consuming, less expensive, and hassle-free. We can use a single biometric authentication method rather than using two.

Aman Kumar and Vishwash Kumar[2], have clearly explained about three different-different working security levels in smart voting system. The level 1 Unique Id Number (UID) registration mechanism will ask the user for a single unique id at that time. So through the unique id verification from database the voter can enter to next security level. The voter must input their voter id number at level 2 Election Commission id card number, where it will be checked against the database. If the voter's face matches the image saved in the database at level 3 facial recognition with their unique voter ID number, they can cast their ballot. In India, every new user must first register to vote. At the moment of registration, the system takes a picture of the user's face and stores it in the server database. The benefits of these security levels include more convenience, lack of corruption, swiftness, and speed. We chose these security settings, however the method for face recognition is different.

Nilam Choudary, Shikar Agarwal and Geerija Lavania[3], have proposed an effective voting system using three different face recognition algorithms. Eigenfaces does facial recognition using eigenvectors, and Principal Component Analysis (PCA) is used to determine eigen values.By reducing common features, PCA reduces dimensionality and generates eigen space. The eigenface approach has been extended to include Fisher faces. Linear Discriminant Analysis (LDA), performed in conjunction with PCA, aids in identifying the classification-related directions. Rapid picture comparison and similarity-invariant representation are made possible by Speed Up Robust Features (SURF). The training data set in this study includes 2316 photos as well as 4 additional samples for each image, for a total of 9264 images. Future research will use extensive training data sets to apply crucial techniques like CNN.

XueMei Zhao, ChengBing Wei[4] An easy approach to the face recognition problem is the Local Binary Pattern Histogram (LBPH) algorithm, which can identify both the front and side faces. The pixel neighbourhood grey median-based modified LBPH algorithm (MLBPH) is suggested. After the feature value is extracted by the subblocks and the statistical histogram is established to form the MLBPH feature dictionary, which is used to recognise the human face identity in comparison to the test image, the grey value of the pixel is replaced by the median value of its neighbourhood sampling value. The Eigenfaces, Fisherfaces, and Local Binary Pattern Histogram (LBPH) face recognition algorithms are all included in the free and open-source computer vision package known as OpenCV. The LBPH algorithm is more flexible than the other two algorithms in that it can distinguish between the front and side faces in addition to the front face. The information acquisition module, feature extraction module, classification module, and training classifier database module are the four key components of a face recognition system. In the classification module, test samples are classified using a classifier that has been database-trained in order to ascertain the samples' identities. A Haar cascade classifier is available in OpenCV and can be used to find faces. The LBP characteristic spectrum histogram serves as the feature vector for classification in the LBPH method.

Shubham Shinde, Manas Shende, Jeet Shah, Harshdeep Shelar[5] This project's software architecture is client-server. Our system requires a person to register with his fingerprint and face image first. The Google Firebase Real-time Database contains data about voters, candidates, constituencies, and votes. A GUI will collect the login information and the voter's face image at the client-side, where a fingerprint device will take the voter's fingerprint and a neighbour) classifier will take the login information. The following 4 steps make up the entire facial recognition process: 1. Face recognition in images 2. Isolation and face projection Third, Face Coding 4. Facial recognition. By applying the HOG (Histogram of Oriented Gradients) algorithm, faces in the image can be found. The faces, including the eyes, lips, and other features, are next flawlessly warped in the frame. Accurate face alignment improves performance during both training and testing. The final stage is to locate the person in our database whose measurements are most similar to those in the test photograph. Using a KNN (k-nearest neighbour) classifier, the image is classified.

Proposed System:

In this project we are working with two different- different security levels Level1: - Username and Pin Number

At the time of voter registration user will create the Username and Pin Number. The entered Username and pin number is verified from the database provide.

Level2: - Face recognition with respective Voters pin number.

In this level, Through OpenCV and Local Binary Patterns Histograms algorithm is used to verify the voters with the images captured at the time of registration of a voter.

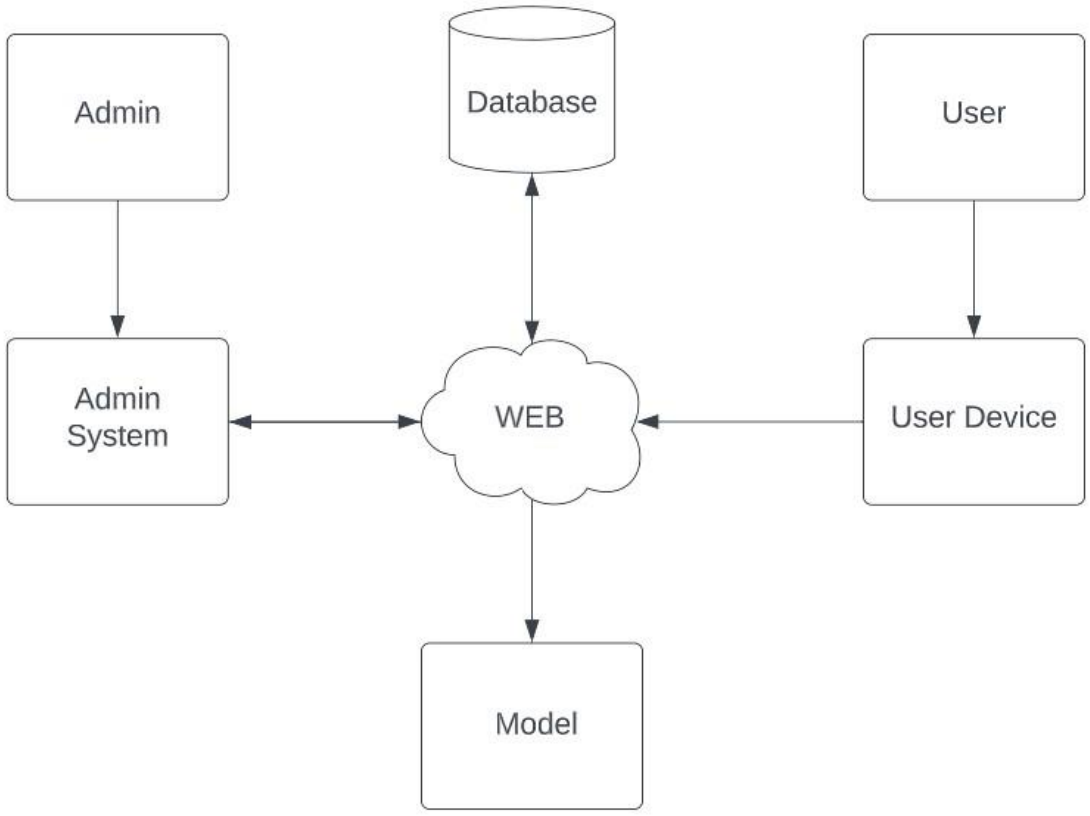

Fig: System Architecture

The two modules that make up the proposed system are the admin login, user registration and login, and user application.

The first module is referred as admin login, where an admin can be authorized through credentials. Administrator has access to add nominee to particular post. At voting time and after completion of voting, administrator can view the results of the nominees.

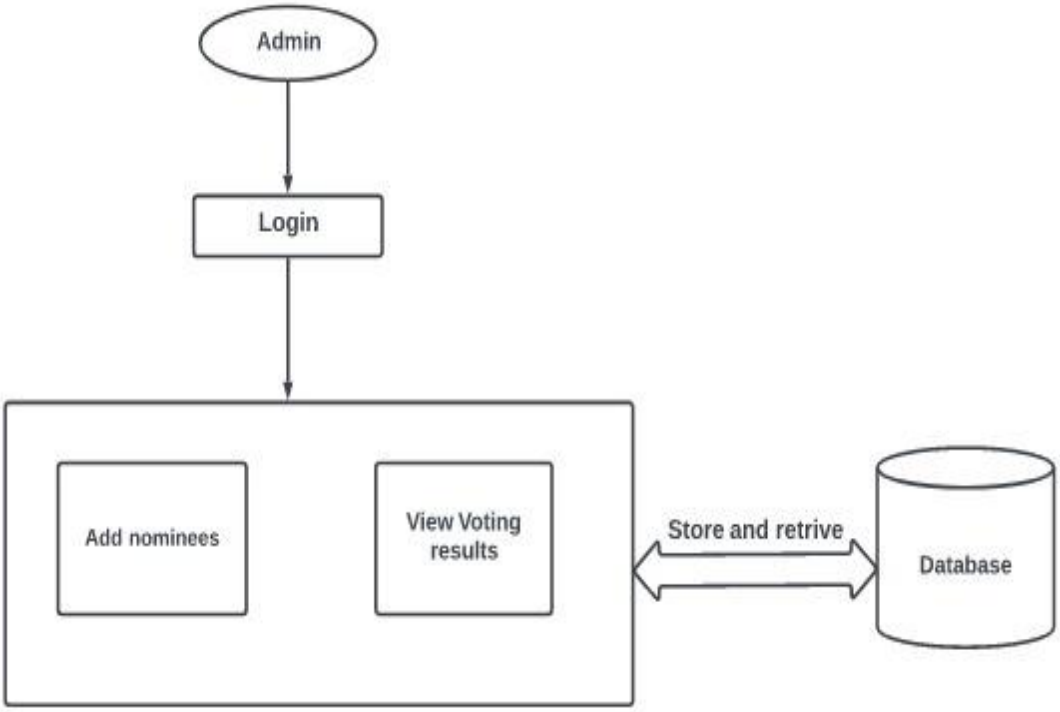

Fig: Work Flow of an Admin

Second module is referred as user registration and login, where a new user has to register by filling details. Then after email authentication can be held to verify the user. After verification, system captures the voters face(200 images) through system camera. Then an existing voter can login through their credentials which has been created at the time of registration and after entering credentials, system camera is going to capture and compares with the existed images which was captured at the time of registration. If it matches, then only an user can cast their vote for once. Here for face recognition and capturing images, we are using OpenCV and Local Binary Patterns Histograms.

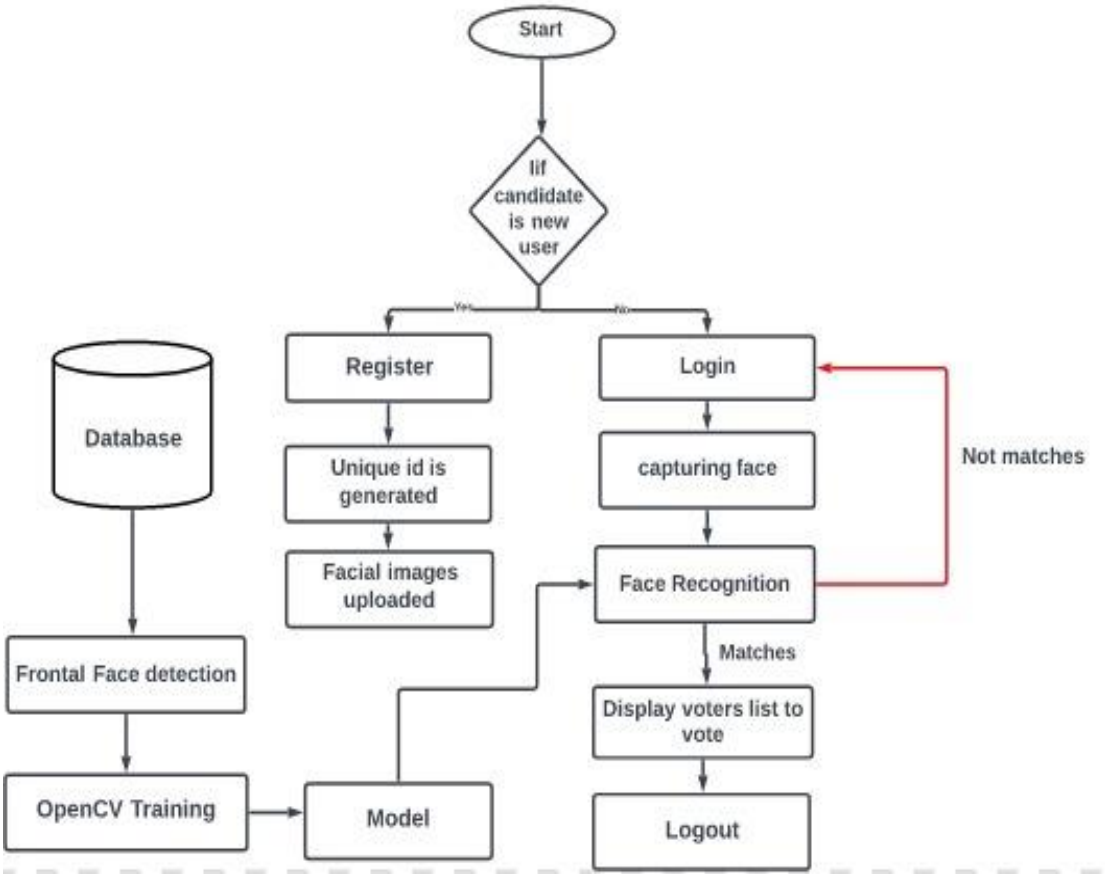

Fig: Work Flow of an User

Additionally, one more feature is added to this project. If an existing voter wants to update the details then voter can update by opening update page. But voter wants to update the details successfully then email verification has to be done successfully as same as registration process. So only authorized user can update their details in the database successfully.

Working Flow of the System

i). Each new user must first register for voting by providing their information. Registration is therefore the first thing we do.

ii). Before capturing the voter images, email verification can be held to verify details. After authenticating successfully, system allow voter for captures the images by saving with pin number generated by the voter. Now registration of voter is successfully completed.

iii). At the time of election, we will use two levels of security first one is username and pin Number verification and second one is face recognition.

iv). System will check username and password entered by the voter is correct or not.

v). If username and password is correct then system allow to on web cam then the face capturing through web cam will compares with the respective image captured at the time registration.

vi). If the image matches then voter is allowed to cast a vote. If not voter is not allowed

vii). On the voting page, nominees images can be displayed and these nominees can be added by administrator. So voter can cast their vote by selecting any one of them.

viii). As soon as voter will give vote then voter is not allowed to vote more than once. so we can say that a voter can give only one vote.

Methodology

You can see that each image is represented using a matrix format, which consists of rows and columns. The fundamental unit of an image is the pixel. An image is made up of a set of pixels. Each of these is a little square. By placing them side by side, we can construct the full image. A single pixel is the lowest unit of information that may be found in an image. Pixels in every image have values ranging from 0 to 255.

Each pixel is composed of Three values are R, G, and B, which are the basic colours red, green, and blue. The combination of these three basic colours will create all these colours here in the image so we conclude that a single pixel has three channels, one channel for each one of the basic colours.

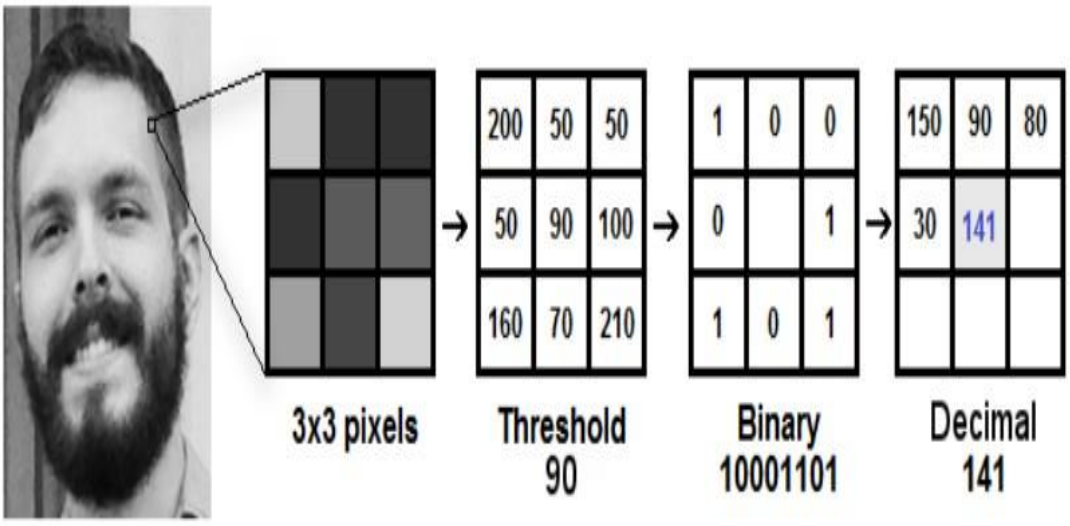

Fig: Working of LBPH Algorithm

Computer Vision is a field of deep learning that enables machines to see, identify and process images like humans. Images and text are both seen and processed by machines using numbers. The pixel intensity for each number corresponds to that specific position. The pixel values for a grayscale image, where each pixel only has one value—the intensity of the black colour at that location—are displayed in the image above. Every project using computer vision needs to be able to read and write images. Additionally, the OpenCV package greatly simplifies this function. Thresholding is a technique for segmenting images. It updates itself based on a comparison between pixel values and a threshold value. There are numerous thresholding variations supported by OpenCV.

Results and analysis:

Fig: Home Page

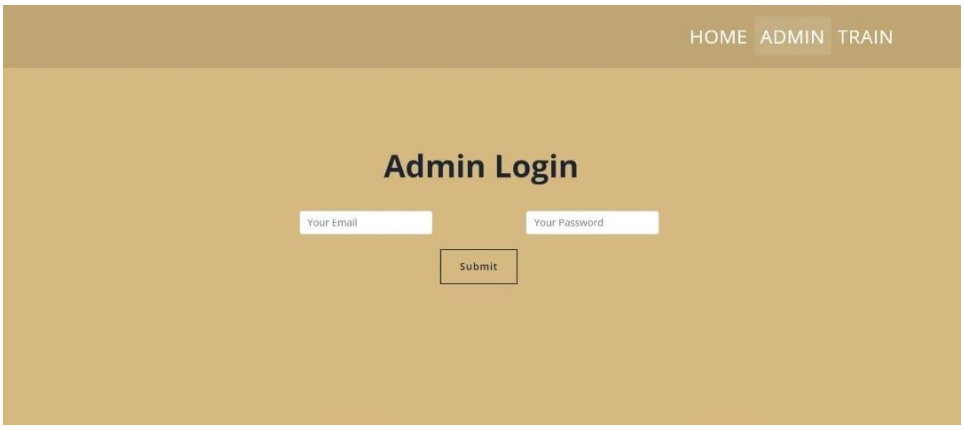

Fig: Admin Login Page

Fig: Admin Dashboard

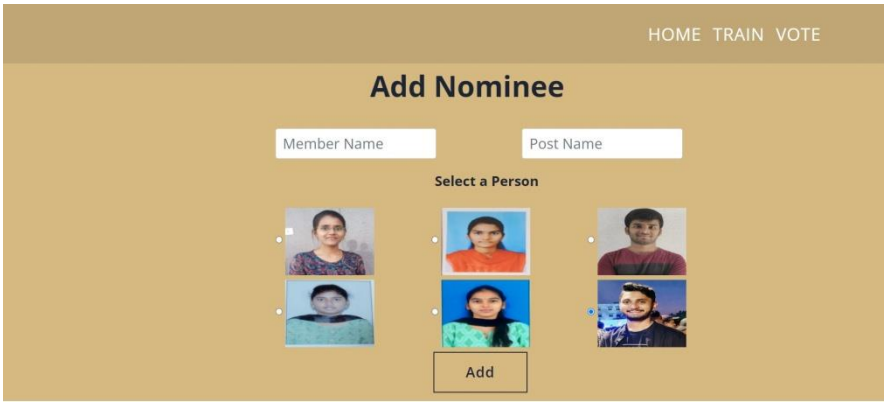

Fig: Add Nominee Page

Fig: Voter Registration page

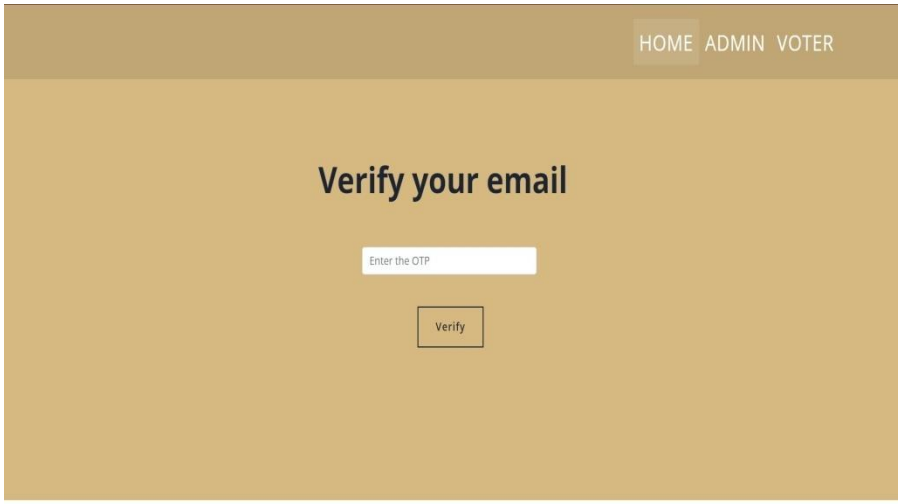

Fig: Email Verification page

Fig: Voter Login page

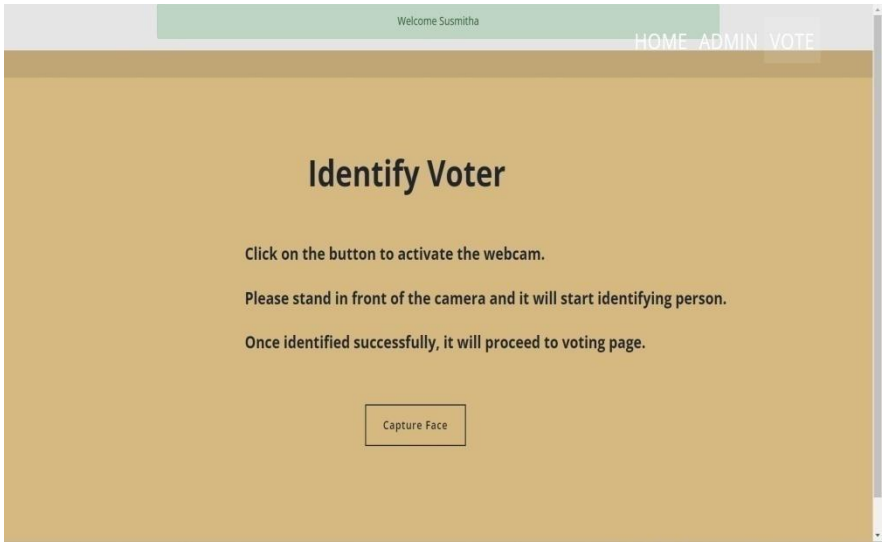

Fig: Face Verification page

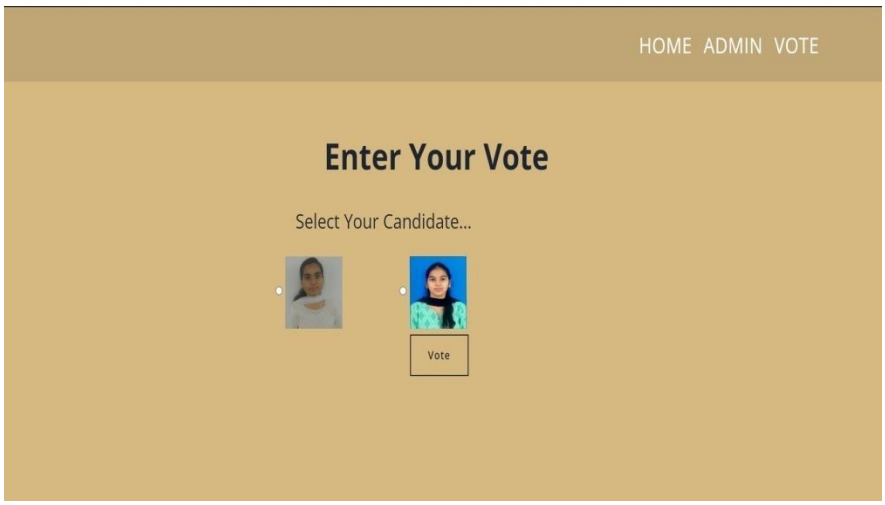

Fig: Voting Page

Conclusion

As we can see, the current voting system has numerous flaws, including a long process that takes a lot of time, is not safe, allows for fake voting, and has no security level. The proposed method can address the issues and limitations of the current system, which will ultimately reduce bogus and false votes. This is because its difficult for the hackers to do marphing the face in live and offers a secure and comfortable voting environment. Using this method, voters can cast their ballots at the closest polling place or even from home if they are familiar with how the technology operates and understand its fundamentals. In our proposed system we are developing a user friendly web interface where users can easily interact with it to vote.

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