SECURE ONLINE VOTING SYSTEM USING FACE RECOGNITION

By

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Bachelor of Technology

In

Electronics and Communication Engineering

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY

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Under the guidance of

PROF. KUNTALA DAS

Project submitted in partial fulfilment

Of the

Requirements of the award of the degree of

Bachelor of Technology

In

Electronics and Communication Engineering

(An Affiliated College under MAKAUT)

A Unit of Techno India Group

Date: 16/06/2022

CERTIFICATION

This is to certify that **Mr. Rajdeep Sarkar, Mr. Gunjan Ganguly**, **Mr. Arpan Saha, Mr. Sourav Bhadra** have successfully completed their final year project entitled "**SECURE ONLINE VOTING SYSTEM USING FACE RECOGNITION**" in the year 2022, Under the kind supervision of **Prof. Kuntala Das** for the fulfillment of Bachelor of Technology (B. Tech) Degree from Bengal Institute of Technology under Maulana Abul Kalam Azad University of Technology (MAKAUT).

…….

(Dr. Mousumi Banerjee)
Head of the Department
E.C.E. Department
Bengal Institute of Technology

…….

(Prof. Kuntala Das)
Project Supervisor
Assistant Professor
E.C.E. Department
Bengal Institute of Technology

ACKNOWLEDGEMENT

We take this opportunity to express our profound gratitude and deep regards to our **Prof. Kuntala Das** for her exemplary guidance, monitoring and constant encouragement throughout the preparation of this project report. The blessing, help and guidance given by her time to time shall carry me a long way in the journey of life on which we about to embark.

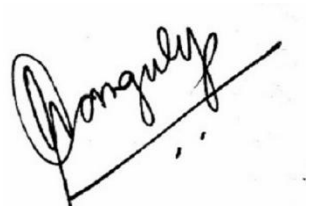
We also take this opportunity to express a deep sense of gratitude to **our HOD, ECE, Dr. Mousumi Banerjee** for her cordial support, valuable information and guidance, which helped using completing this task through various stages.

We also thank our classmates for their cooperation during the period of project report.

Lastly, we thank almighty, our parents, friends for their constant encouragement without which this assignment would not be possible.

Signature of the Group Members.

Rajdeep Sarkar



Arpan Saha

Sourav Bhadra

PREFACE

The word "Vote" means to choose from a list, to elect, or to determine. The main goal of voting is to come up with leaders of the people's choice. Some countries have problems when it comes to voting. Some of the problems involved include ridging votes during elections, insecure or inaccessible polling stations, inadequate polling materials, and also inexperienced personnel.

Nowadays the Internet is accessible to almost everyone. Before the Internet, if you wanted to keep up with the news, you had to walk down to the newsstand when it opened in the morning and buy a local edition reporting what had happened the previous day. But today a click or two is enough to read your local paper and any news source from anywhere in the world, updated up to the minute. Thus an online platform for voting fits in perfectly.

This online voting/polling system seeks to address the above issues. It should be noted that with this system in place, the users, citizens, in this case, shall be given ample time during the voting period. They shall also be trained on how to vote online before the election.

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INTRODUCTION TO ONLINE VOTING SYSTEM

An online voting system is an online voting technique. In this system, people who are registered in the system can cast his/her vote online without going to any physical polling station. There are many voting procedures that are being used for voting purposes, such as ballot paper, EVM machines but all these procedures require more time and more manpower. People also have to wait in long queues which takes a lot of time in the process.

To eliminate all these drawbacks, we provide an online voting system that provides features such as accuracy, convenience, and privacy. Our website will not only save time but also will make a hassle-free user experience. Our online voting system provides a platform with proper instruction where users can register themselves to cast a vote remotely. During the entire process, a lot of verification processes are carried out which makes this entire system secure. This project is a voting system by which any voter can use his/her voting rights from anywhere.

BACKGROUND STUDY

The secure online voting system (SOVS) also known as e-voting is a term encompassing several different types of voting embracing both electronic means of counting votes. Electronic voting technology can include punched cards, optical scan voting systems, and specialized voting kiosks (including self-contained direct-recording electronic voting systems or DRE). It can also involve the transmission of ballots and votes via telephones, private computer networks, or the internet.

Online voting is an electronic way of choosing leaders via a web-driven application.

The advantage of online voting over the common "queue method" is that the voters have the choice of voting in their own free time and there is reduced congestion. It also minimizes errors in vote counting. The individual votes are submitted in a database which can be queried to find out who of the aspirants for a given post has the highest number of votes. This system is geared towards increasing the voting percentage in most countries since it has been noted that with the old voting method (the Queue System), the voter turnout has been a wanting case.

With the system in place also, if high security is applied, cases of false votes shall be reduced. With the "ONLINE VOTING SYSTEM", a voter can use his/her voting right online without any difficulty. He/she has to register as a voter first before being authorized to vote. The registration should be done before the voting date to enable data updates in the database. However, not just anybody can vote. For one to participate in the elections, he/she must have the requirements. For instance, he/she must be a registered citizen i.e. must be 18 and above years old. As already stated, the project 'Online Voting' provides means for fast and convenient voting, and access to this system is limited only to registered voters. Internet voting systems are appealing for several reasons which include; People are getting more used to working with computers to do all sorts of things, namely sensitive operations such as shopping and home banking and they allow people to vote far from where they usually live, helping to reduce absenteeism rate.

SIGNIFICANCE OF STUDY

The main purposes of SOVS include:

Provision of improved voting services to the voters through fast, timely, and convenient voting Checks to ensure that the members who are registered are the only ones to vote. Cases of "Dead People" voting are also minimized.
A secure Online voting system (SOVS) will require being very precise or cost-cutting to produce an effective election management system Therefore crucial points that this (SOVS) emphasizes are listed below:

i. Require less staff during the election.

ii. This system is a lot easier to independently moderate the elections and subsequently, reinforce its transparency and fairness.

ii. Less capital, less effort, and less labor-intensive, as the primary cost and effort will focus primarily on creating, managing, and running a secure online portal.

iv. Increased number of voters as individuals will find it easier and more convenient to vote, especially those abroad.

LITERATURE SURVEY

1) Electronic Voting Machine with Enhanced Security:

Authors: Shashank S Kadam, Ria N Choudhary, Sujay Dandekar, Debjeet Bardhan, Namdeo B Vaidya

Published in: 2018 3rd International Conference on Communication and Electronics Systems (ICCES)

This paper describes the construction and design of voting machine using ATMEGA 32 microcontroller which has security of three extra layers. EVM takes a lot of time for the process of voting using ballot papers. So considering to the amount of time, manpower to be saved for extremely fast and reliable. So here implementation of the system is in such a way that voting secrecy is maintained without using ballot paper. VVPAT is currently used for voting machine which is expensive than EVM. EVM gives 100% proof of tamper, where results are just a click away. But this EVMs can be tampered easily by changing the hardware connections. So this paper proposes a three layered extra security.

Disadvantages: Security risk present.

Limitations: Issue of Compatibility can occur.

2) Biometrically Secured Electronic Voting Machine

Authors: Rahil Rezwan; Huzaifa Ahmed; M. R. N. Biplob; S. M. Shuvo; Md. Abdur Rahman

Published in: 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC)

In this paper, Arduino and Finger print scanner is used to implement the system which identifies each voter, also count votes and avoids fake votes. In this system voter is identified using FPS which detects if a person is a registered or not and also it denies for the voter to cast the second vote.

Disadvantages: Advanced security system can be required for significance of investments and costs to implement.

Limitations: Application should be known to users.

3) Multipurpose platform independent online voting system

Authors: Ajay Nair, Gulabchand K. Gupta

Published in: International Research Journal of Engineering

and Technology (IRJET) Volume: 03 Issue: 10 | Oct-2016

In this system the voter just needs to have a Aadhar card number and a smart phone which can scan the barcode implemented on the system. The user can vote on any location as it is totally online based application. This system creates its own voting ballot. The encryption of vote data is at the user's end and decryption is at the local administrator end. This makes the system more authenticated and secure for voting.

Disadvantages: Risk of fraud can happen.

Limitations: Smartphone is required for this system

OBJECTIVE OF PROJECT

The specific objectives of the project include:

1. Improving the existing/current voting process or approach.
2. Implementing an automated voting system.
3. Validating the system to ensure that only eligible voters are allowed to vote.
4. An increasing number of voters as individuals will find it easier and more convenient to vote, especially those abroad.

PROJECT JUSTIFICATION

The SECURE ONLINE VOTING SYSTEM shall reduce the time spent making long queues at the polling stations during voting. It shall also enable the voters to vote from any part of the globe as explained since this is an online application available on the internet. Cases of vote miscounts shall also be solved since at the backend of this system resides a well-developed database using MYSQL that can provide the correct data once it's correctly queried. Since the voting process shall be open as early as possible, the voters shall have ample time to decide when and whom to vote for.

OLD METHODS OF VOTING

1. Paper-based voting: The voter gets a blank ballot and uses a pen or a marker to indicate he wanted to vote for which candidate. Hand- counted ballots is a time and labor-consuming process, but it is easy to manufacture paper ballots and the ballots can be retained for verifying, this type is still the most common way to vote.

2. Lever voting machine: Lever machine is peculiar equipment, and each lever is assigned for a corresponding candidate. The voter pulls the lever to poll for his favorite candidate. This kind of voting machine can count up the ballots automatically. Because its interface is not user-friendly enough, giving some training to voters is necessary. In recent years, a considerable number of countries have adopted E- voting for their official elections. These countries include; America, Belgium, Japan, and Brazil.

HARDWARE REQUIREMENTS

- CPU: Core i3 or higher, (2133MHZ, minimum recommended)
- Minimum 4GB RAM
- 2 GB free Hard drive space
- Webcam resolution (640×480)
- VRAM (GPU): 512 MB

TECHNOLOGIES USED

✓ Frontend technology

- Html
- CSS
- JavaScript
- JQuery
- Thymeleaf

✓ Backend technology

- Java
- Python
- Open CV
- Spring
- Spring MVC
- Spring boot
- Spring JPA
- Hibernate
- Spring security
- Tomcat server
- MySQL

DESCRIPTION

This project describes the possible way of voting systems that can be done online with some features such as accuracy, convenience, flexibility, and privacy. This website provides guidance with proper video as well as written instructions in a popup. Users have to register themselves with proper documentation id proof on the website. After successful registration, he/she can log in to our website with proper credentials and cast their vote securely and safely upon further verification. Once cast they can log out from this site secure and safe. If someone tries to edit details after registration, he/she has to provide proper supportive documents which will be verified by the administrator further.

The main aim of this project is to cast votes with proper anti-corruption techniques and to minimize errors and be hassle-free.

BLOCK DIAGRAM

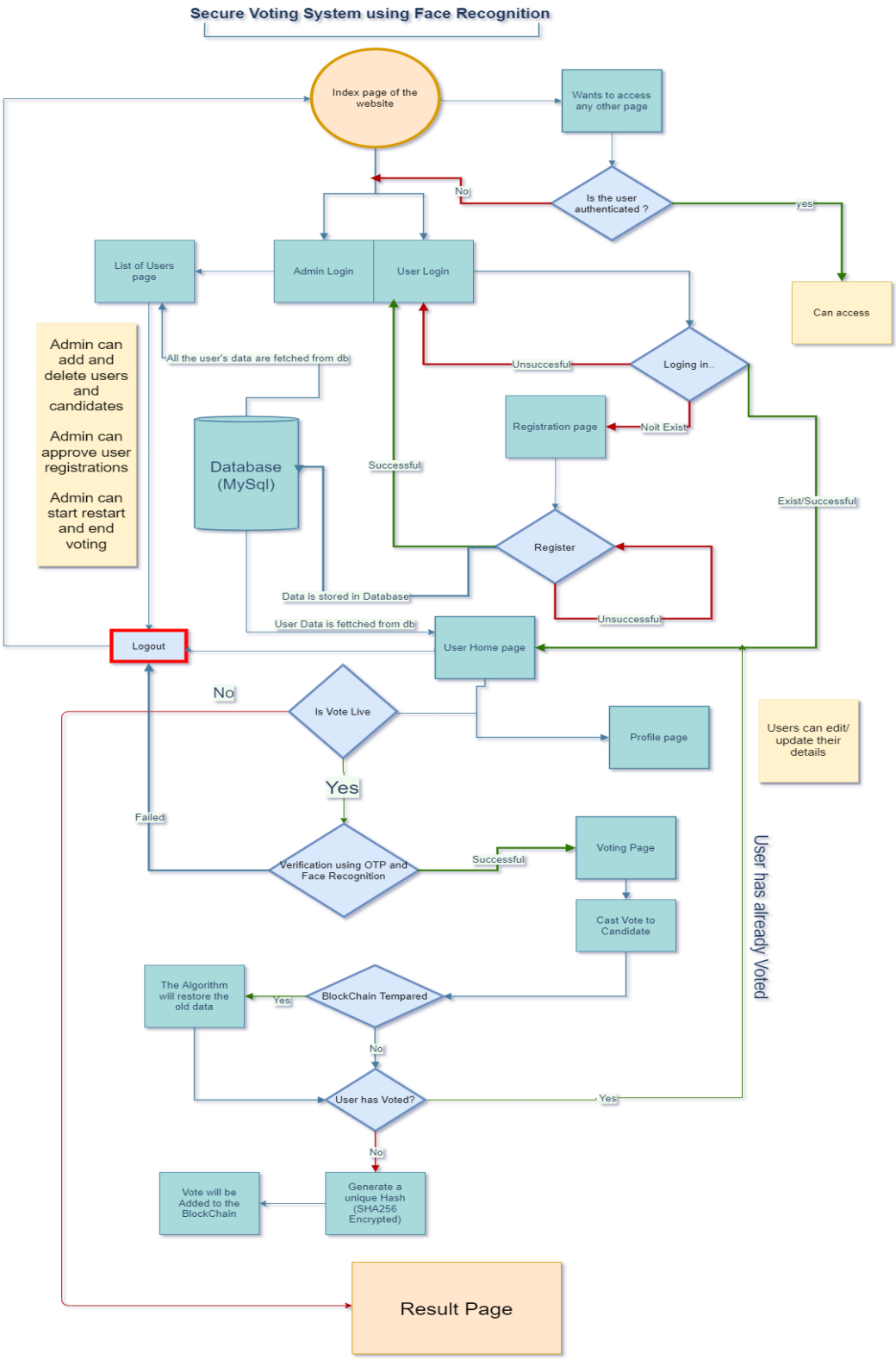


Figure 1

WORKING PROCESS

This website is made with the concern of usability to its users, so a proper guidance with accurate stepwise instructions is provided with a video model as well as text in the screen.
When a user tries to access our website, they will be redirected to the index/home page. On this page, they can get various information about the voting process or how many people vote in India. They can also read our “Mission and Vision” of this entire project. They can even contact us if they have queries or suggestions.

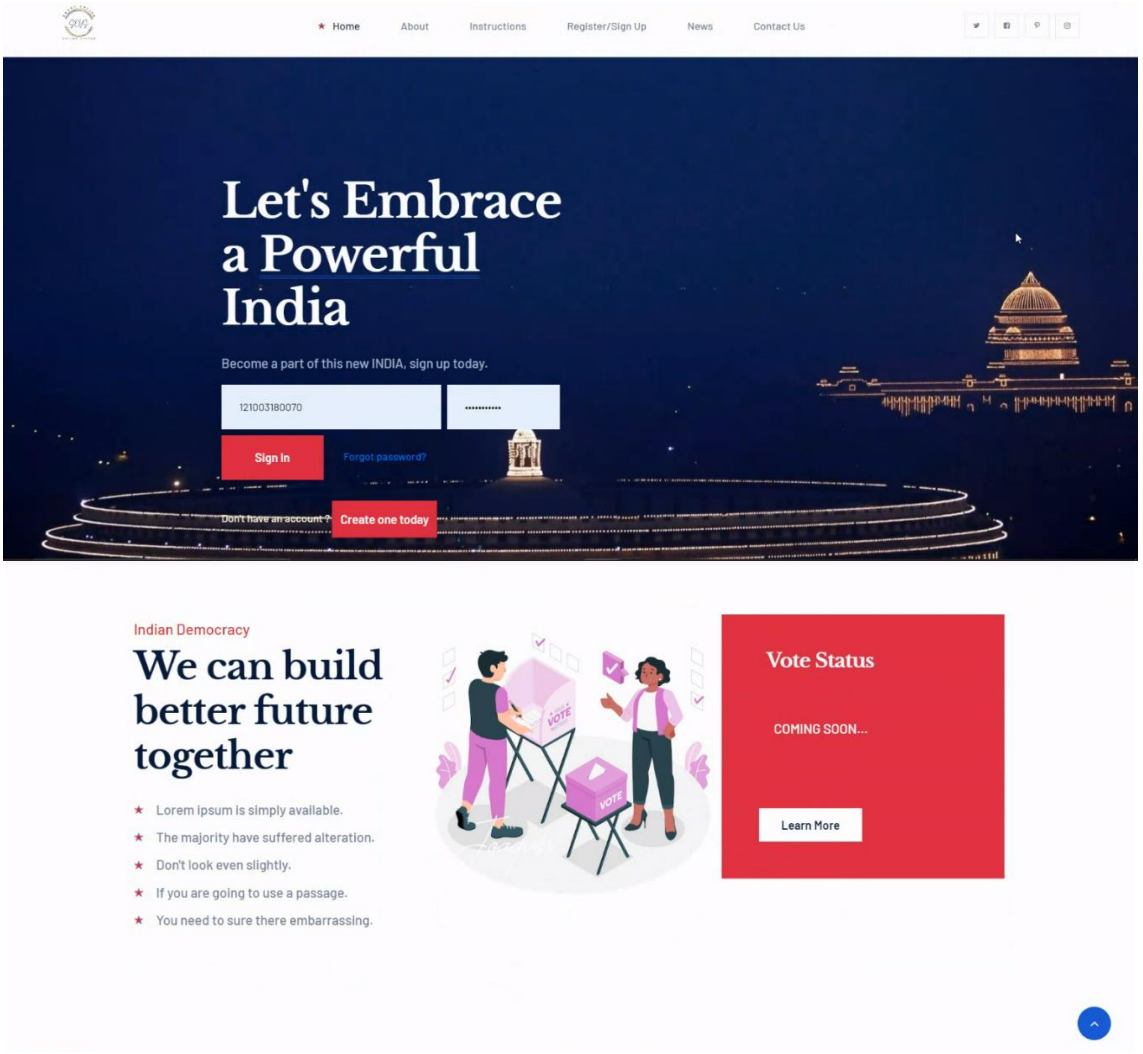


Figure 2

Front-end: We have used HTML, CSS, and JavaScript to create the page.

Back-end: We have used Spring Boot and Spring Security to achieve the feature of not accessing any other page unless the user is registered.

If the user wants to access another page, he will be redirected to the home page if the user is not a registered user. In order to access all the features of our website, the user needs to log in with proper credentials. Upon successful login, they will be redirected to the user's home page.

Back-end: Again, we have used Spring boot and Spring security to achieve the login feature where only registered users can log in with correct credentials.

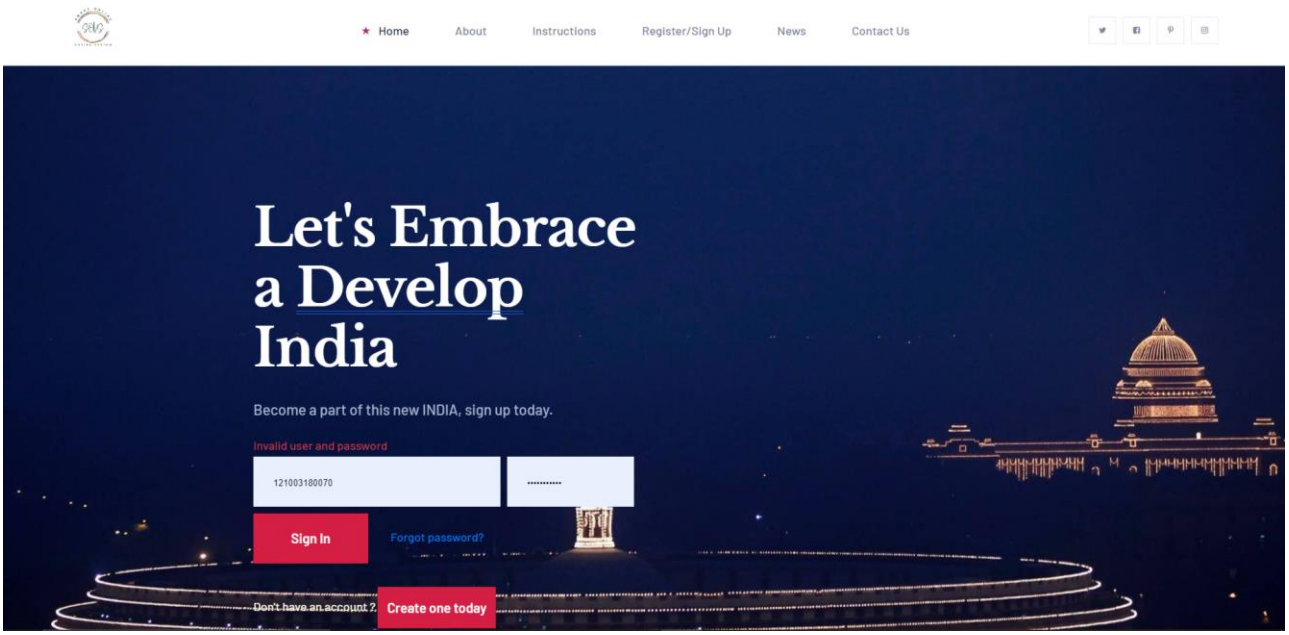


Figure 3

In case the user is not registered, then they can register themselves from the link given on our index page. They need to provide proper documentation and proof in order to successfully register. Upon successful registration, they will be redirected to the index page where they can log in and enjoy the features of our website.

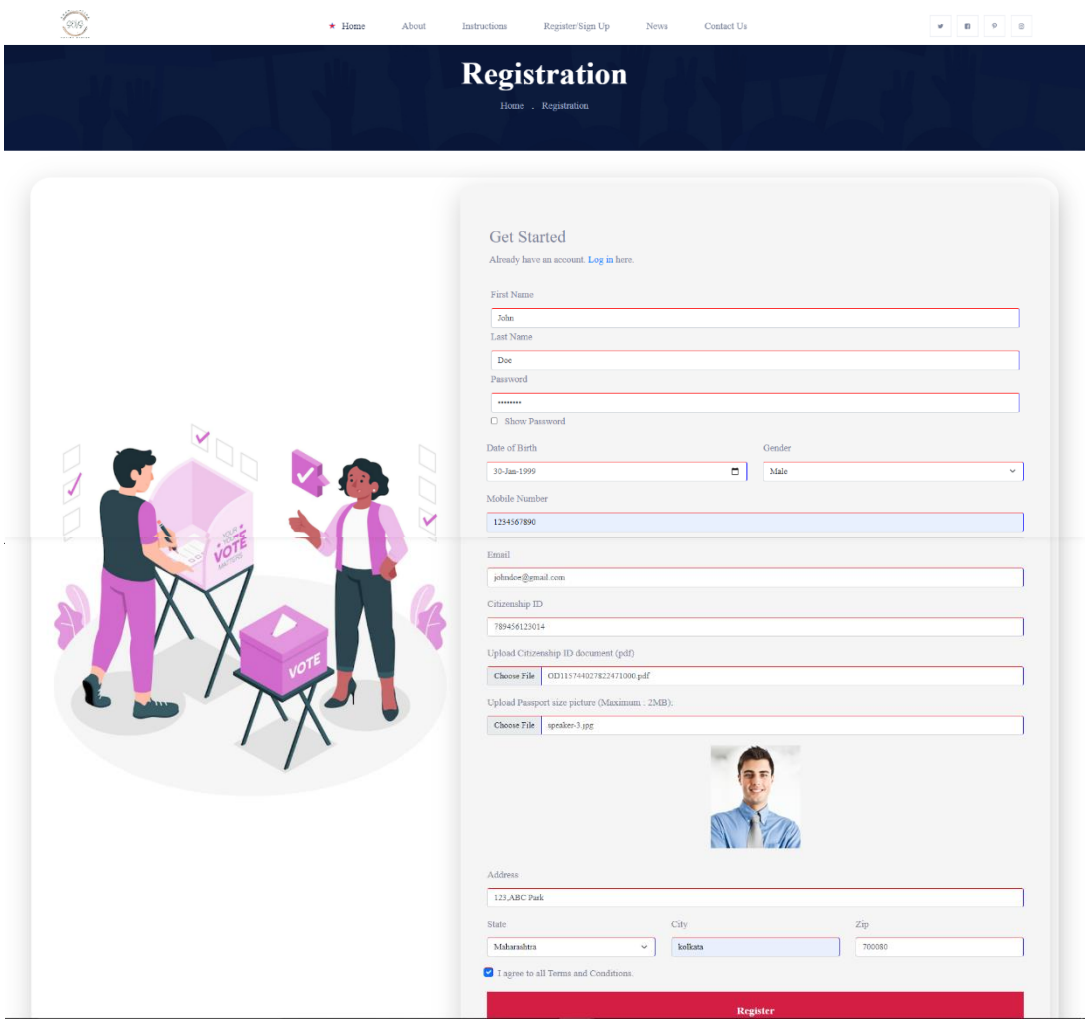


Figure 4

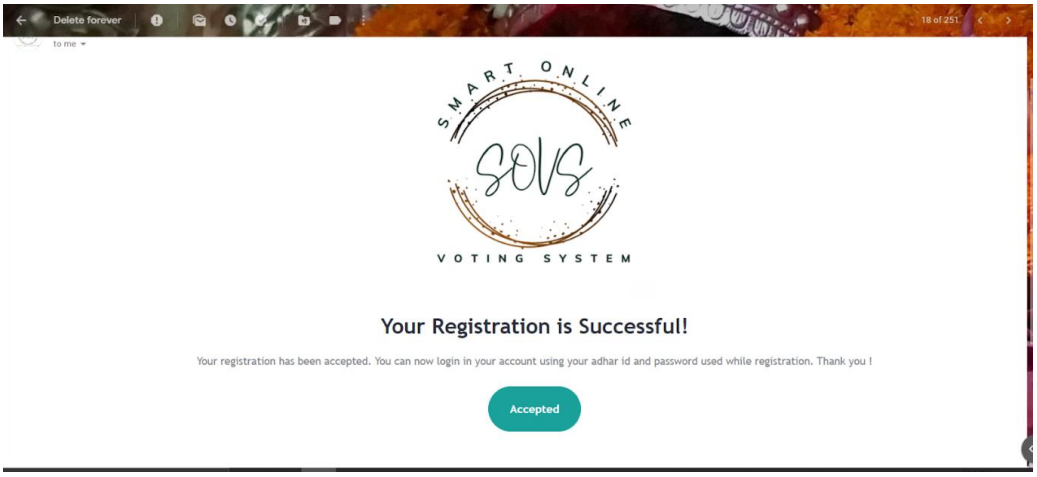


Figure 5

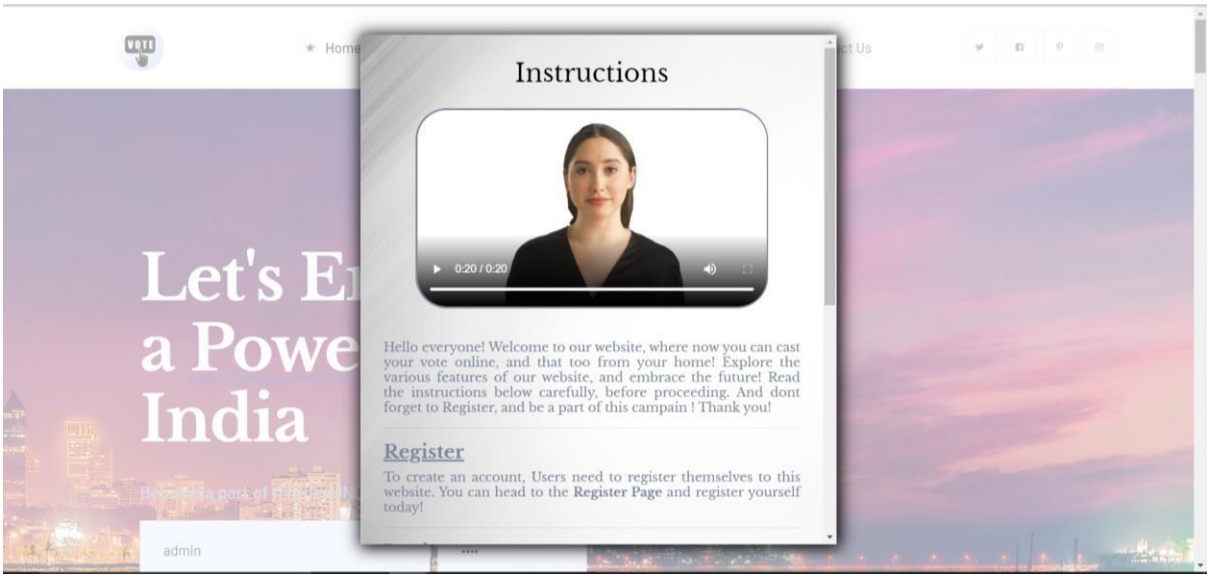


Figure 6

We have also included a User Guide or Instruction menu so that users can understand the various features and functionality of our website. It provides guidance with proper video as well as written instructions in a popup.

Front-end: We have kept many checks on the registration page such as mobile number length, username length, all fields must be filled, no duplicate registration, etc.

Back-end: We have used Spring Boot and Spring security to achieve all the validations and we saved the details in our database if all validations were successful.

ADMIN PORTAL

This is the admin portal where only Admin has access. Here the Admin can view the total number of users, pending requests, total votes poled and much more.
The Admin can start/restart and end voting. The Admin can also view and accept users who have registered. The Admin can add candidates who'll participate in voting.

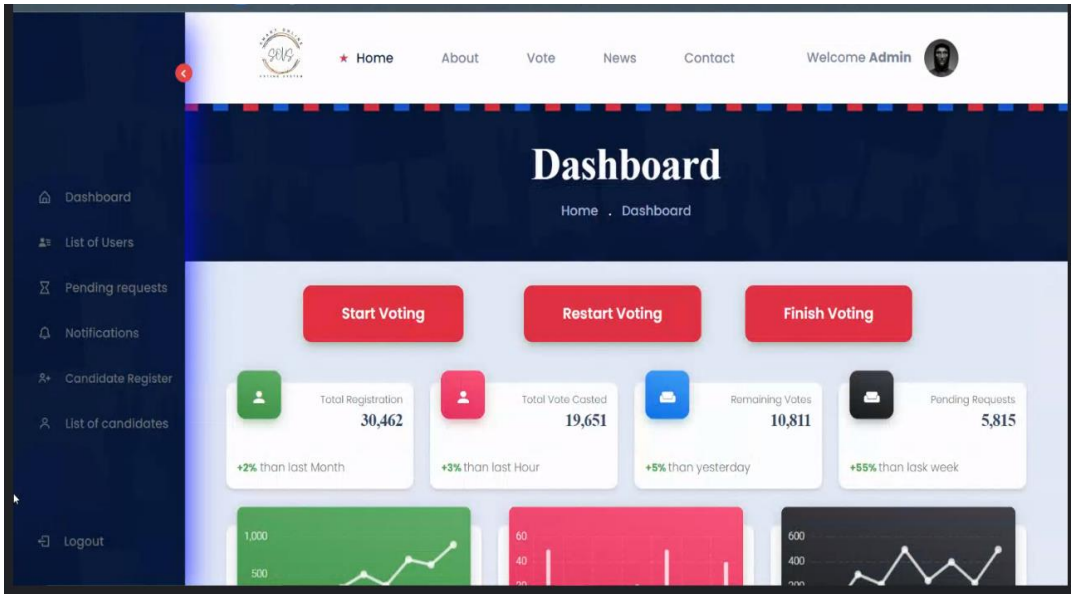


Figure 7

This is a list of users which the Admin can view/delete.

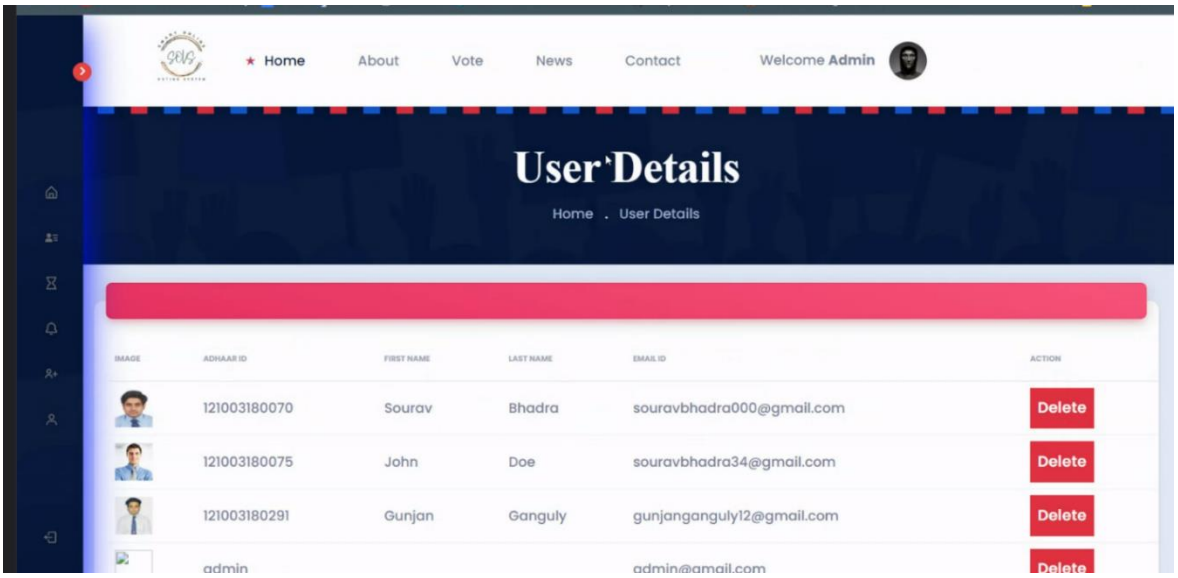


Figure 8

PENDING REQUESTS

Front-end: We have also introduced a Pending Request Section, where new User Registration Requests are queued and will be approved by Admin after successful verification.

Back-end: We have used Spring Boot and Spring security to achieve all the validations and we saved the details in our database if all validations were successful.

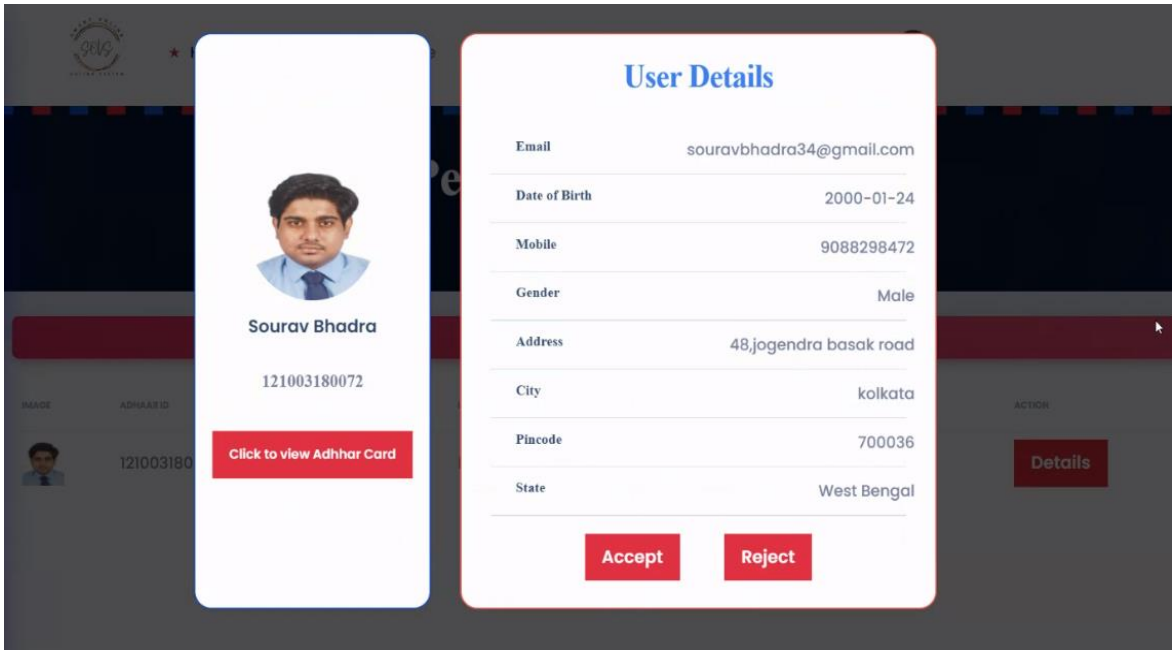


Figure 9

SETTING UP CANDIDATES

Admin can also set the Candidates for election and can view or delete the Candidates if required.

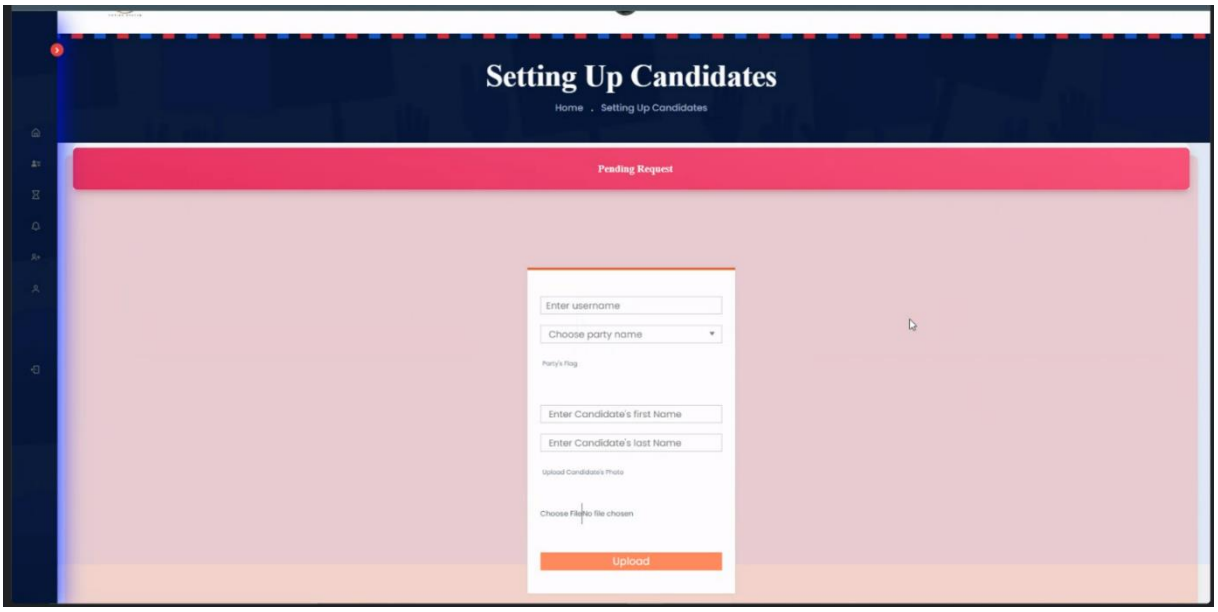


Figure 10

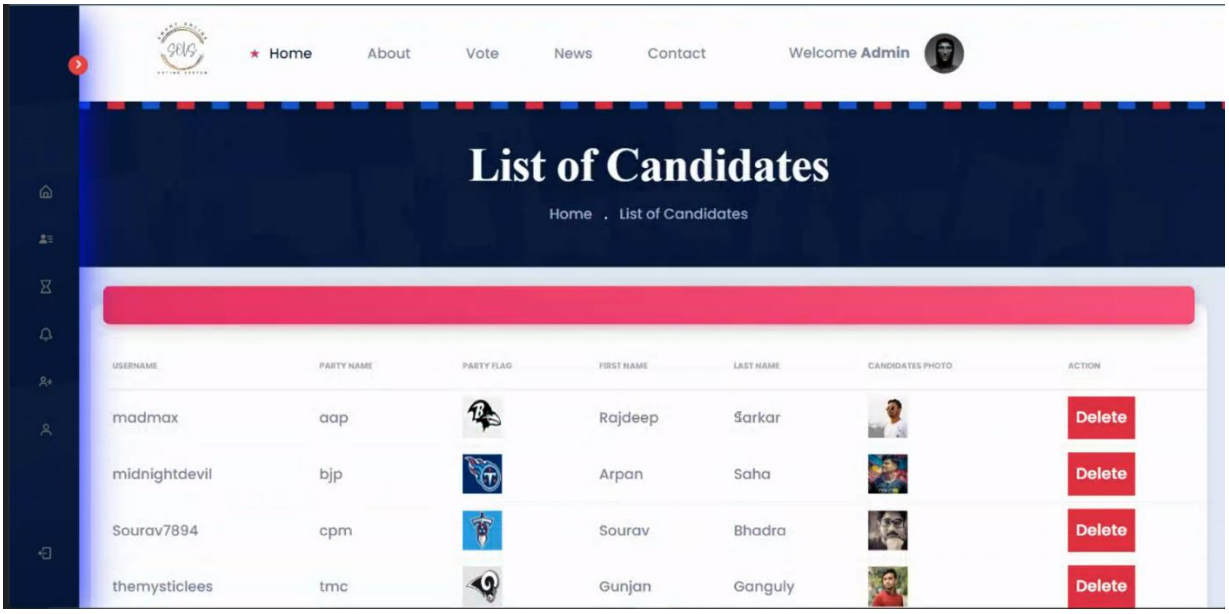


Figure 11

USER SECTION

But if a normal user logs in, they will be redirected to the user's home page which is similar to the index/home page. From here they can visit other web pages. We also have included a user profile page section where the user can view or edit their details such as Address, Phone number, or Password, etc.

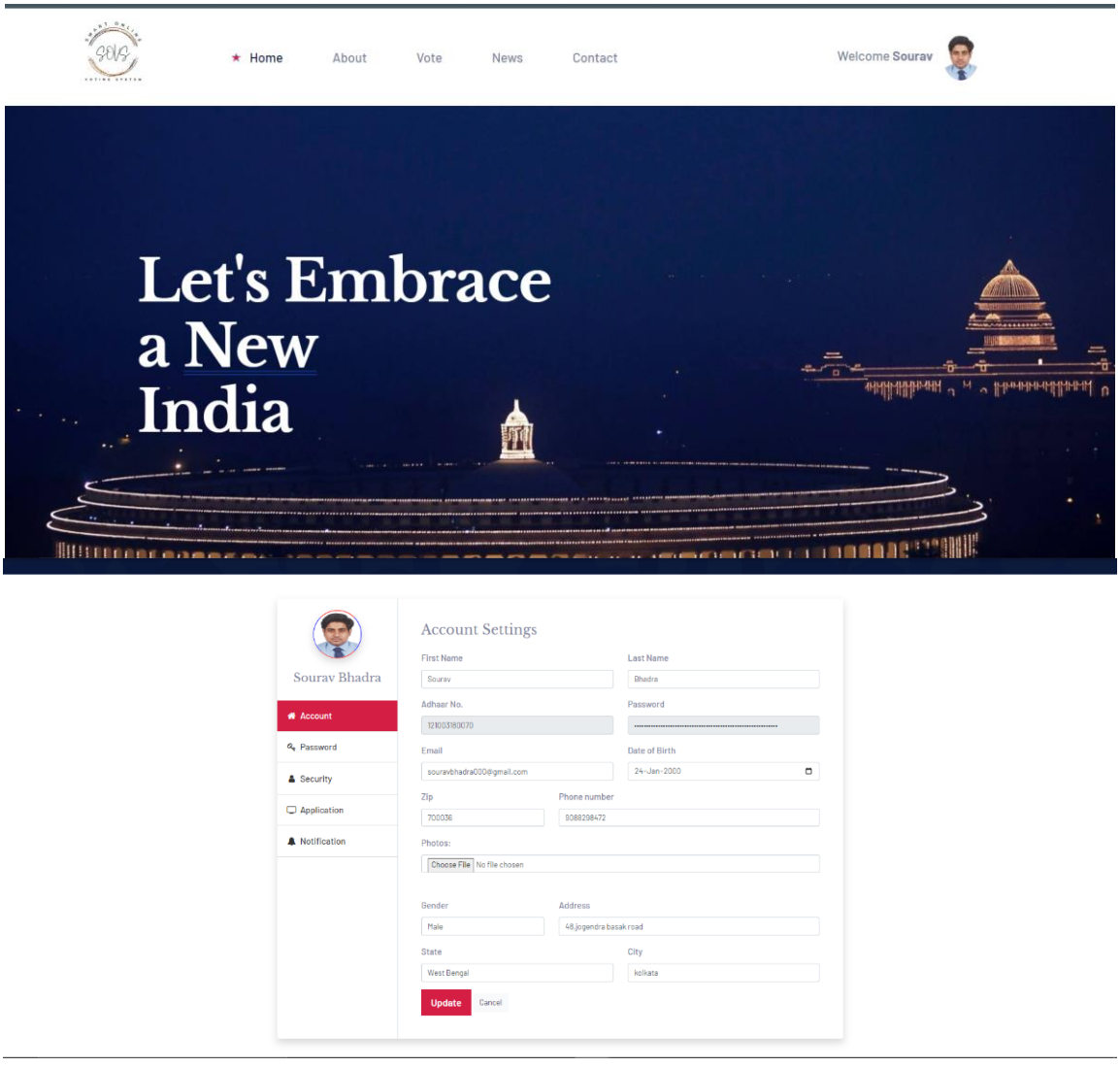


Figure 12

Back-end: We have used Spring Boot and Spring security to achieve this feature where admin and user are redirected to their respective pages.

From the user's home page, the user can cast their vote. In order to do that, they need to visit the voting page. They have to undergo several verifications in order to reach the voting page such as OTP verification and face verification. Upon successful completion of all the verifications, they will redirect to the voting page where they can vote for their favorite candidate.

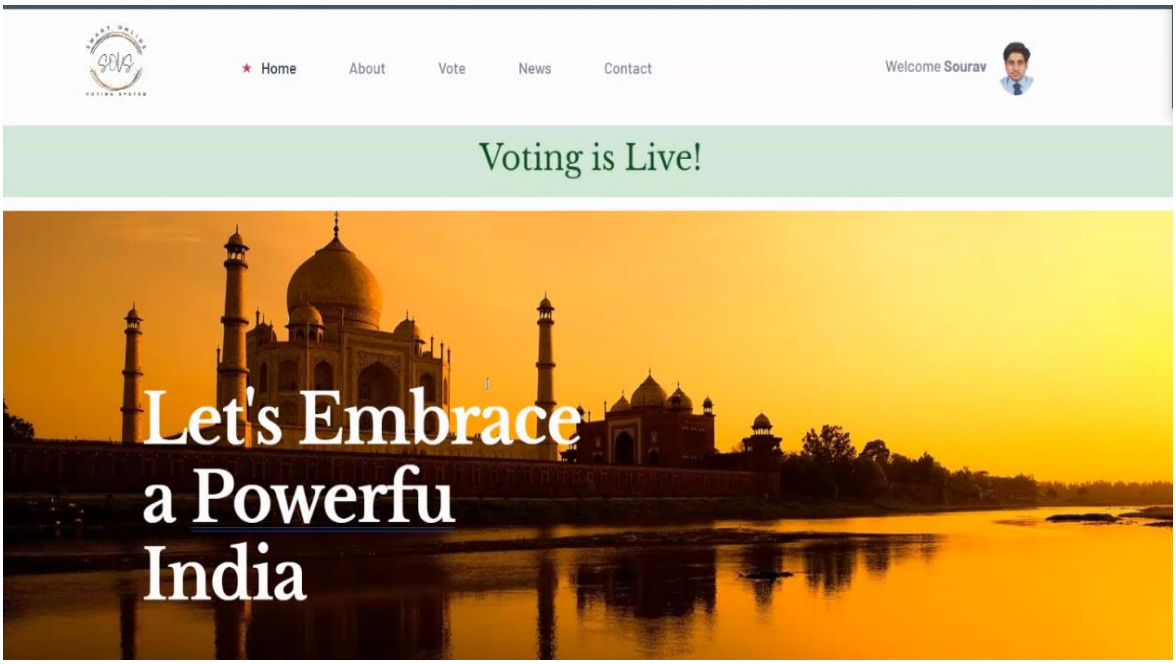


Figure 13

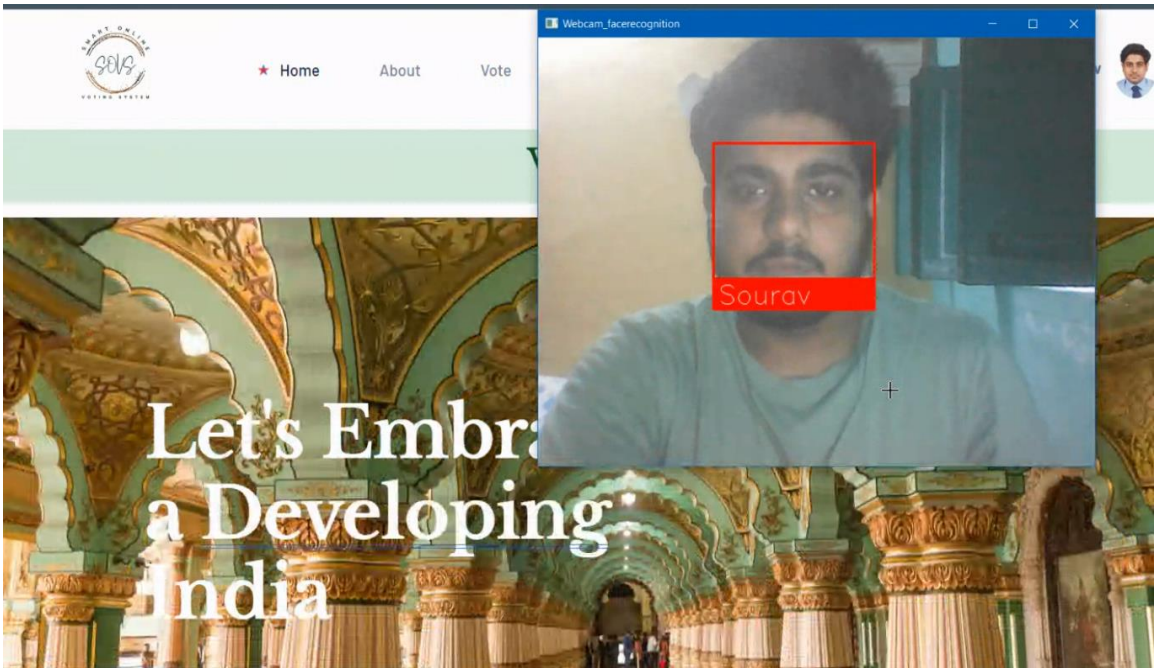


Figure 14

OTP VALIDATION

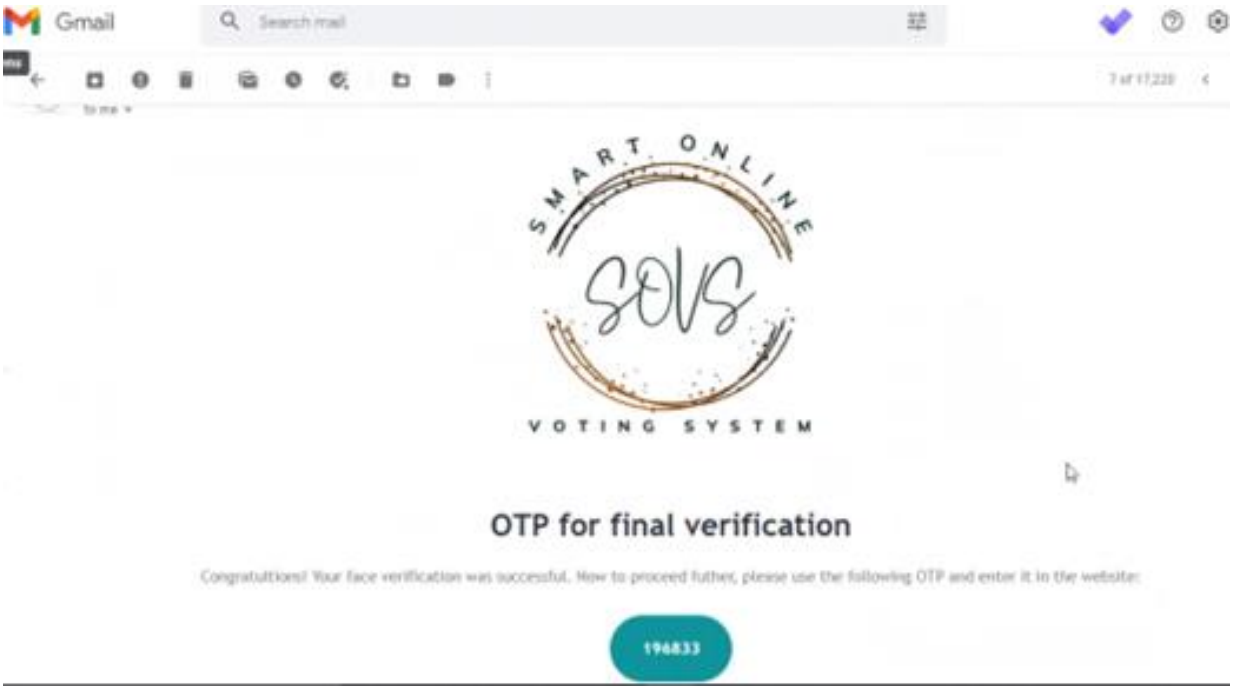


Figure 15

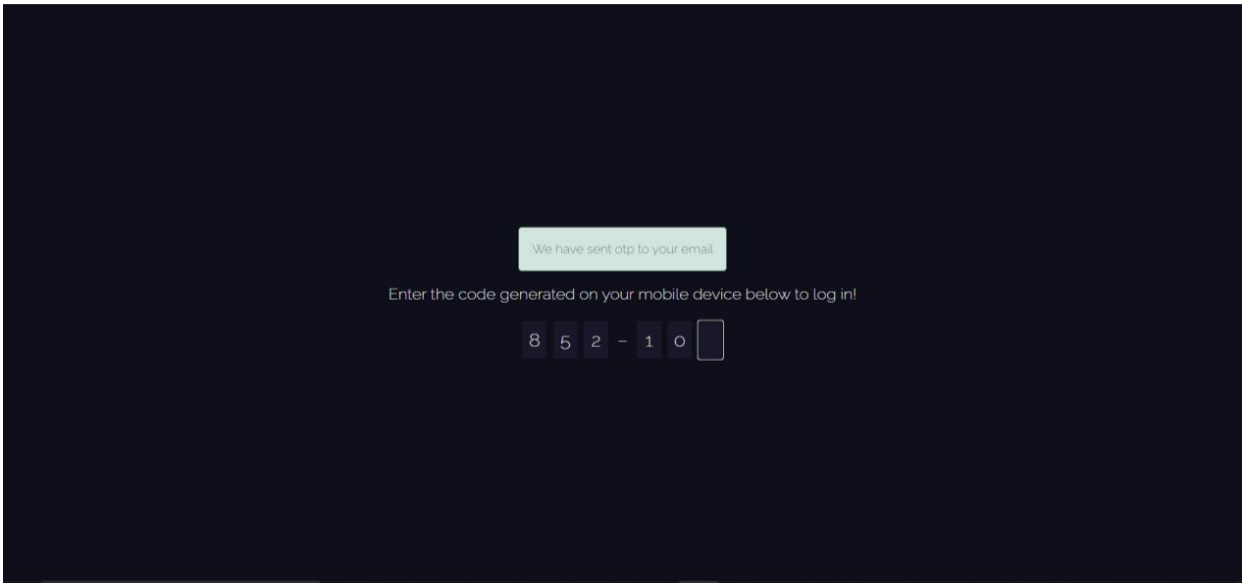


Figure 16

VOTING PAGE

After successful validation user will reach this voting page. Users can vote their favorite candidate.

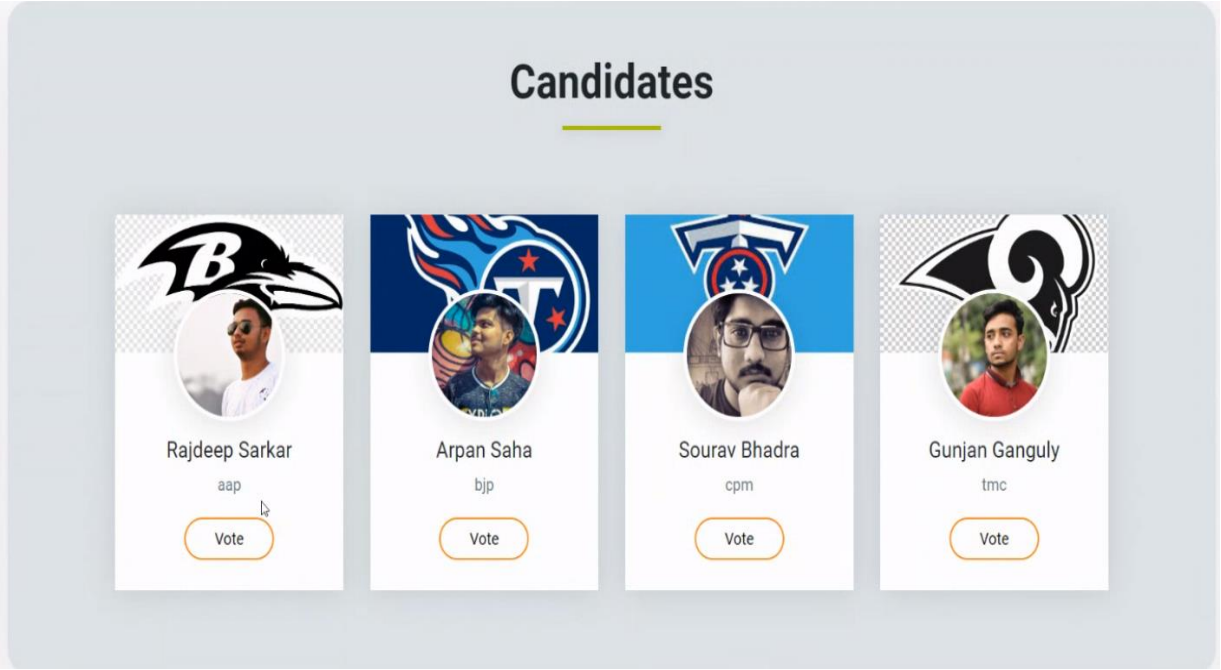


Figure 17

After casting their vote, all the users will receive an email which will contain a hash value which is the encrypted id for their vote.

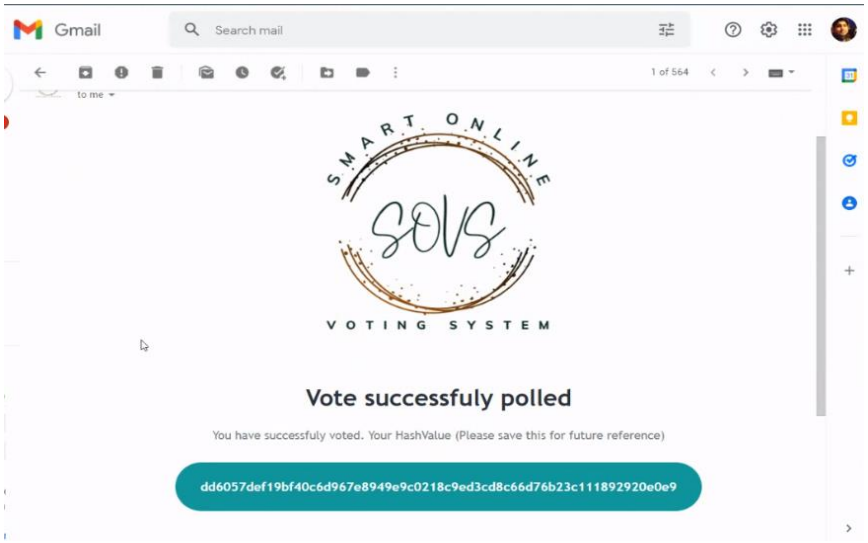


Figure 18

DISPLAYING RESULTS

After voting has ended, users can login and check the results. This page will only be available after voting has ended.

Figure 19

BLOCKCHAIN

Blockchain is basically encrypting the whole data and converting into a hash value and by this it creates a block. As new data comes in, it is entered into a fresh block. Once the block is filled with data, it is chained onto the previous block, which makes the data chained together in chronological order. Now the major problem which blockchain solves is tampering data. BlockChain is not centralized, it stores data in a distributed manner. All the nodes which are connected to that particular blockchain have their own copy of the original data.

To verify and to apply set of conditions into the blockchain, there is a concept of smart contract. A smart contract is a computer code that can be built into the blockchain to facilitate, verify, or negotiate a contract agreement. Smart contracts operate under a set of conditions to which users agree. When those conditions are met, the terms of the agreement are automatically carried out.

Voting with blockchain carries the potential to eliminate election fraud and boost voter turnout, as was tested in the November 2018 midterm elections in West Virginia.

Using blockchain in this way would make votes nearly impossible to tamper with. The blockchain protocol would also maintain transparency in the electoral process, reducing the personnel needed to conduct an election and providing officials with nearly instant results. This would eliminate the need for recounts or any real concern that fraud might threaten the election.

In this project, all the votes are stored in a Blockchain with each vote containing the previous block Hash and current Block Hash.
The smart contract in this project will first check if the blockchain hasn't been tampered.
If the Blockchain is tampered anyhow, the smart contract will automatically restore the previous correct data. Since the data is stored in a decentralized manner, this same data is present in many other nodes. Thus, tampering the data will not break the Blockchain.

After checking and rectifying (if blockchain is tampered) it will generate a hash (Hash value is generated using SHA256 encryption algorithm) for the new data and chain it with the previous block in a chronological order.

At last, the Algorithm automatically checks whether the user has already voted. If the user hasn't voted then he/she will be logged out otherwise the website will first authenticate them and then they will be allowed to cast their vote.

The picture below represents how data will be stored into the blockchain where each block is chained with the previous one:-

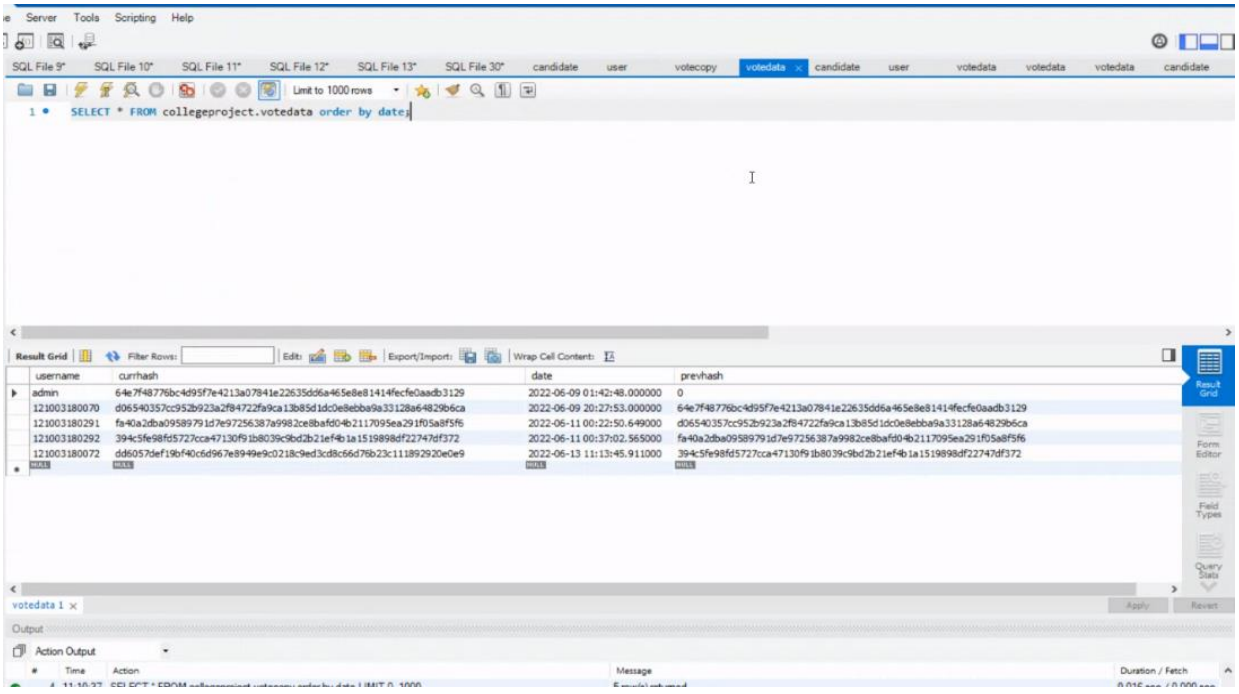
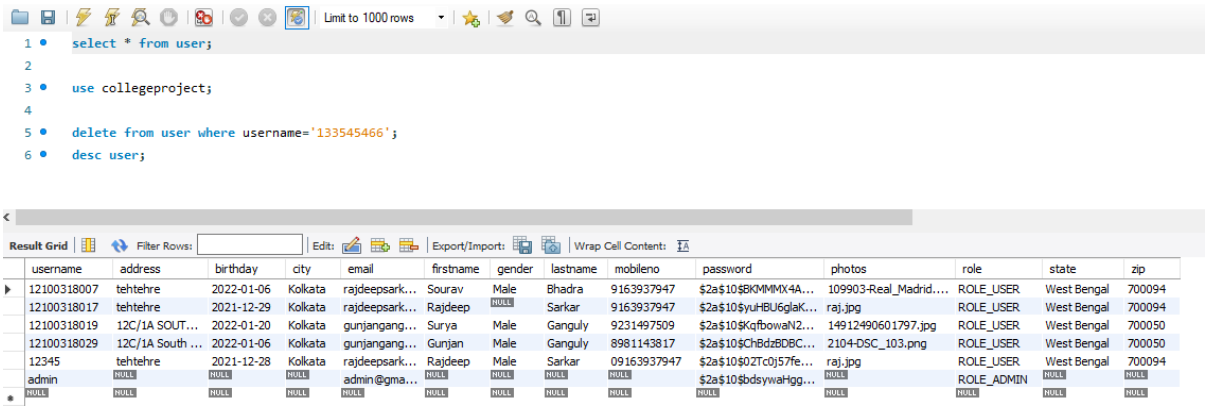


Figure 20

DATABASE CONNECTIVITY

We have used MYSQL as our database to store all the information. We have used various tables to store the information of our users, candidates and pending users (users who are not verified yet). All the sensitive data (such as passwords, etc) is stored in an encrypted format with the help of Spring boot to avoid leakage.



```
1  select * from user;
2
3  use collegeproject;
4
5  delete from user where username='133545466';
6  desc user;
```

Result Grid

username	address	birthday	city	email	firstname	gender	lastname	mobileno	password	photos	role	state	zip
12100318007	tehtehre	2022-01-06	Kolkata	rajdeepsark...	Sourav	Male	Bhadra	9163937947	$2a$10$BKMMMX4A...	109903-Real_Madrid....	ROLE_USER	West Bengal	700094
12100318017	tehtehre	2021-12-29	Kolkata	rajdeepsark...	Rajdeep	NULL	Sarkar	9163937947	$2a$10$yuHBlJ6glaK...	raj.jpg	ROLE_USER	West Bengal	700094
12100318019	12C/1A SOUT...	2022-01-20	Kolkata	gunjangang...	Surya	Male	Ganguly	9231497509	$2a$10$KqfbowaN2...	14912490601797.jpg	ROLE_USER	West Bengal	700050
12100318029	12C/1A South ...	2022-01-06	Kolkata	gunjangang...	Gunjan	Male	Ganguly	8981143817	$2a$10$ChBdzBDBC...	2104-DSC_103.png	ROLE_USER	West Bengal	700050
12345	tehtehre	2021-12-28	Kolkata	rajdeepsark...	Rajdeep	Male	Sarkar	09163937947	$2a$10$0ZTc0j57fe...	raj.jpg	ROLE_USER	West Bengal	700094
admin	NULL	NULL	NULL	admin@gma...	NULL	NULL	NULL	NULL	$2a$10$bdsywaHgg...	NULL	ROLE_ADMIN	NULL	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 21

APPLICATIONS

- One can cast his/her vote from home.
- The vote will be securely cast online in the voting website.
- The system is secure at almost every step with proper verification.
- The system provides time flexibility to its users.
- The system also provides corruption less voting with accuracy.
- This system will also increase the ratio of the total voters to the no. of users who voted since people will get the freedom to cast their votes from their homes.

CONCLUSION

This Online Voting system will manage the Voter's information by which a voter can log in and use his voting rights. The system will incorporate all features of the Voting system. There is a DATABASE that is maintained by the ADMIN in which all the names of voters with complete information are stored. The ADMIN has full access to the data of the users. It can verify the users upon registration or when they update their details. The ADMIN can also delete or update the user's details.

The user who is above 18 years registers his/her information on the database and when he/she wants to vote he/she has to login by his Citizenship id and password and can vote to any party only a single time. With the online voting system, the percentage of people voting may increase. It decreases the cost and time of the voting process.

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