E-VOTING PORTAL

MINI-PROJECT REPORT

Submitted in partial fulfillment of the requirements of the degree

BACHELOR OF ENGINEERING IN

INFORMATION TECHNOLOGY

By

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CERTIFICATE

This is to certify that the Mini Project entitled **"E-VOTING PORTAL"** is a bonafide work of **ASHMIT RAWAT(08) , DHRUV DHANDUKIYA(26) , PRATIK BIYANI(16) , HARDIK AGARWAL(02)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **" Bachelor of Engineering "** in **" Information Technology Engineering ".**

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Mini Project Approval

This Mini Project entitled **" E-VOTING PORTAL "** by **ASHMIT RAWAT(08) , DHRUV DHANDUKIYA(26), PRATIK BIYANI(16) , HARDIK AGARWAL(02)** is approved for the degree of **Bachelor of Engineering** in **Information Technology Engineering.**

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Date:

Place: Mumbai

ACKNOWLEDGEMENT

This project has consumed a significant amount of time and resources, and we would like to thank everyone who has contributed to its success. We would like to express our deepest gratitude to the project head, **Dr. Arun Kulkarni** for his time, patience and direction, as well as for inspiring us throughout. Without their guidance and support, this project would not have been possible. Their expertise, insights, and encouragement were invaluable in helping us navigate the various challenges and complexities of this project.

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The team consisted of the following members:

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ABSTRACT

E-Voting Portal is a modern digital voting platform developed using Python, Tkinter, and SQLite3, Flask, representing a groundbreaking step toward secure and inclusive democratic participation. This project is designed to increase voter engagement, boost transparency, and build trust in elections through a streamlined and highly secure process. With its accessible interface and intelligent design, the system reimagines how votes are cast and counted, transforming traditional voting into a digital-first experience that strengthens democracy for the future.

In traditional voting systems, challenges such as long queues, manual errors in vote counting, lack of accessibility, and security vulnerabilities often hinder smooth electoral processes. These issues contribute to reduced voter turnout, mistrust in results, and delays in result declaration. The need for a more efficient, secure, and transparent voting solution has become critical in today's digital age.

The Login System incorporates multi-factor authentication, including CAPTCHA and optional facial recognition, to prevent unauthorized access and ensure data integrity. The voting process is conducted through an accessible GUI that allows users to cast votes confidently with features like countdown timers and vote confirmation prompts, encouraging timely and intentional participation.

For administrators, the portal provides tools for live monitoring, real-time vote count display, pausing or terminating elections, and the ability to view and download the voter list for official records. These features ensure full control and visibility throughout the election lifecycle.

Once voting concludes, the portal automatically tallies the results and presents them using graphical representations (via Python libraries such as matplotlib) and statistical summaries, ensuring clarity and transparency. Once published, results are made immutable, eliminating any scope for tampering.

The super admin role is equipped with the authority to officially declare and publish the results, making the system scalable for formal institutional and organizational use.

By addressing core issues of manual voting and implementing intelligent design and security measures, the E-Voting Portal offers a future-ready platform that makes elections more accessible, reliable, and trustworthy for all stakeholders.

INTRODUCTION

1. Introduction

This e-voting system is developed as a secure and efficient platform to facilitate electronic voting using Python, Tkinter, Flask, and SQLite3. The system provides a user-friendly interface designed to simplify the voting process while ensuring data security and accuracy. The project integrates SQL as the backend database to store information about administrators and users, offering reliable data management and protection.

Python's Tkinter library is used to design the graphical user interface (GUI), allowing voters to register, log in, and cast their votes with ease. Administrators have access to additional controls to manage the election process, verify users, and monitor the final voting results. Key features of the system include a secure login process, CAPTCHA verification to prevent automated access, real-time face recognition for biometric authentication, and a robust database handling mechanism.

This project aims to provide a practical solution for conducting elections in small-scale organizations, focusing on usability, transparency, and scalability. It simulates real-world voting scenarios with features like data visualization to analyze voting trends, ensuring that each vote is recorded accurately and securely. The system serves as a valuable tool for educational or institutional use by combining modern authentication techniques with clear and intuitive interfaces.

2. Motivation

The motivation for this project arises from the urgent need to address the limitations of traditional voting systems. Voting methods that rely on physical ballots face significant challenges, including long wait times, restricted access to polling stations, and limited voting windows. These factors, especially for individuals with disabilities, those in remote areas, or younger generations, contribute to low voter turnout and can lead to disenfranchisement. Furthermore, concerns about ballot manipulation and fraud undermine trust in electoral outcomes. By offering a secure, transparent, and user-friendly online platform, this project seeks to modernize voting, ensuring higher accessibility, enhanced security, and increased public confidence in the electoral process.

This project introduces technology that can potentially revolutionize elections by removing the barriers of time and location, thus encouraging broader participation while maintaining the integrity of the vote.[3]

3. Problem statement and objectives

Traditional voting methods face multiple hurdles that impact voter participation and trust. One of the key issues is low voter turnout, particularly among younger generations who find it inconvenient to vote due to long lines, limited voting hours, and physical location constraints. This discourages them from participating in elections, weakening democratic engagement.

Accessibility limitations are another concern, particularly for individuals with disabilities, those in remote areas, or people with limited mobility. These individuals may find it difficult or impossible to physically reach polling stations, further lowering voter turnout.

In addition, security concerns related to voter fraud and ballot manipulation have eroded public trust in the electoral process. Instances of potential tampering with paper ballots, mismanagement of voting data, or the risk of human error can make voters skeptical about the fairness of elections. These issues can result in contested results and a lack of confidence in the integrity of the voting system. Our project, the e-voting portal, seeks to modernize the voting process by tackling these challenges head-on. By transitioning to an online platform, we provide a secure, accessible, and transparent voting solution that not only improves voter participation but also enhances the trustworthiness of the election process. The system ensures secure ballot casting, real-time vote monitoring, and tamper-proof result declaration, making it an ideal solution for a more reliable, inclusive, and future-ready electoral process.[4]

4. Organization of the report

Introduction

Traditional voting methods, such as paper ballots and Electronic Voting Machines (EVMs), face issues like accessibility barriers, manual errors, logistical challenges, and security concerns. These problems often reduce participation and limit transparency. Our project, the E-Voting Portal, addresses these limitations by providing a secure, efficient, and user-friendly online voting platform.

Problem Statement

Conventional voting systems require physical presence, are time-consuming, and often lack transparency. Long queues, inaccessible polling stations, and human errors discourage participation. Additionally, current systems do not support real-time tracking or remote monitoring, highlighting the need for a secure and scalable digital alternative.

Existing Solutions and Limitations

Though EVMs improved speed and efficiency, they still rely on physical infrastructure and raise concerns about tampering and reliability. Many digital attempts lack secure authentication, live monitoring, or feedback mechanisms, making them unsuitable for widespread adoption.

Proposed Solution – E-Voting Portal

Our portal, developed using Python, Tkinter, and SQL, offers a secure and intelligent voting experience. It includes multi-factor login with CAPTCHA and optional face recognition for verifying users. Role-based access enables separate dashboards for voters, admins, and super admins. Voters interact with a clean UI that includes vote confirmation and countdown timers. Admins can pause or end elections, monitor live vote counts, and download voter lists. Once declared, results are locked, ensuring full transparency and tamper-proof records.**Conclusion**

The E-Voting Portal reimagines voting by addressing the drawbacks of traditional systems with a secure and transparent digital solution. It promotes participation, simplifies election management, and builds trust, making it ideal for institutions and organizations looking to modernize democratic processes.

SURVEY AND ANALYSIS

1. Survey of existing system

Electronic Voting Machines (EVMs):

- Introduction: India transitioned from paper ballots to Electronic Voting Machines (EVMs) in a phased manner, starting in the 1990s, to combat issues like ballot stuffing, tampering, and long counting processes. By 2004, EVMs were used nationwide in general elections.
- Functionality: EVMs are standalone machines that record votes electronically. They consist of two units: the Control Unit (operated by the polling officer) and the Ballot Unit (used by the voter). The voter presses a button corresponding to the candidate of their choice.[2]
- **Advantages:**
- Speed: EVMs greatly reduce the time taken for counting votes.
- Fraud Prevention: EVMs are standalone, non-networked devices, reducing the chances of tampering or hacking remotely.
- Cost-Effectiveness: Once procured, EVMs reduce the recurring costs associated with paper ballots. [2]

2. Limitation of existing system or research gap

- **Low voter turnout**

Traditional voting methods often suffer from low voter turnout, especially among younger generations and those who find it difficult to navigate physical polling locations.

- **Accessibility limitations**

Individuals with disabilities, those living in remote areas, or those with limited mobility may face significant barriers to accessing polling stations

- **Security concerns**

Concerns about voter fraud and the potential for manipulation of ballots can undermine public confidence in the integrity of elections.[1]

3. Mini project contribution

1. **Secure Login**
   Implements multi-factor authentication (MFA) using password, CAPTCHA, and facial recognition to ensure only verified users access the system. Sessions are managed securely using Python, guarding against unauthorized access and data breaches.

2. **Role-Based Access Control (RBAC)**
   Access is granted based on user roles such as voter, admin, or auditor. Python's logic checks and SQL queries ensure that each role performs only the actions it is permitted to, preserving system integrity and security.

3. **Eligibility Verification**
   Verifies each voter's identity and eligibility using real-time queries against an SQL-based voter database, supported by ID verification. This process ensures only legitimate users can vote, effectively preventing impersonation or fraudulent activity.

4. **Simple & Intuitive UI**
   Built using Python's Tkinter library, the interface is user-friendly, with clear instructions, responsive buttons, accessibility features, and robust error handling—enabling users from all backgrounds to navigate the system effortlessly.

5. **Ballot Preview**
   Before submitting, voters are shown a preview of their selections in a confirmation window. This minimizes accidental errors and ensures a transparent and confident voting experience for every participant.

6. **Live Voting Stats**
   Election progress is monitored through live updates on turnout and participation rates using data fetched from SQL and displayed using Python-based visualization tools. Only non-sensitive data is shown, preserving anonymity.

7. **Result Declaration**
   The system automatically calculates and publishes results using real-time vote counts. Visual outputs like graphs and charts ensure clarity, while final results are secured against post-announcement modifications.

PROPOSAL

1. Proposed system

The E-Voting Portal is an innovative platform developed using Python to enhance democratic participation by offering a secure, accessible, and user-friendly digital voting experience.

Core Functionalities from our project include:

User Authentication:

Voters and administrators log in using a User ID, password, CAPTCHA, and facial recognition for added security. All credentials are verified using encrypted protocols to ensure legitimate access.

Admin Management:

Admins manage the voting ecosystem, monitor real-time vote progress, oversee election control (pause/terminate), and view registered voter data from the SQL database. Admin tools are designed for streamlined election supervision.

Secure Voting:

Voters cast their votes through a secure Tkinter-based interface with time constraints, confirmation dialogues, and a simplified layout. Post-voting feedback is collected to assess voter satisfaction and system efficiency.

Results Transparency:

Votes are automatically counted and displayed in real-time using Python's data visualization tools such as Matplotlib. Results are presented in both graphical and numerical formats and cannot be modified after announcement.

Super Admin Role:

Super admins are responsible for finalizing and declaring election outcomes on the set announcement date, providing a reliable and centralized control over result validation and official closure.

The E-Voting Portal seeks to increase voter participation, ensure process integrity, and inspire public trust in digital elections—paving the way for modern, transparent, and efficient democratic systems.[4]

2. Architecture / Framework

The architecture of the E-Voting Portal follows a three-tier model:

1. **Presentation Layer:**

   The user interface is developed using Python’s Tkinter library, providing an intuitive, interactive, and user-friendly experience. This layer manages all user interactions such as login, facial authentication, voting, and displaying results, ensuring clear communication of data to both voters and administrators.

2. **Business Logic Layer:**

   The core system logic is implemented in Python, handling operations like user authentication, CAPTCHA and face recognition validation, vote casting, and election process control. This layer serves as the bridge between the interface and the database, processing user actions in compliance with system logic and organizational rules.

3. **Data Layer:**

   SQL (using either SQLite or MySQL) is used for secure and efficient database management, storing user credentials, vote entries, and administrative data. The data layer ensures reliable access and integrity of all election-related information, supporting auditing and management functionality.

   This architecture supports modular development, simplifying maintenance and future scalability. It also improves security by clearly separating responsibilities between the layers, safeguarding sensitive voter data and ensuring accuracy and transparency in the voting process.[2]

3. User Flow:

User Roles:

1. Voter: Secure login using User ID, Password, and CAPTCHA. Future integration of Face Recognition for enhanced security. Cast vote via an intuitive interface.
2. Admin: Login via dedicated Admin Login Page. Perform system monitoring during elections. View live vote counts. Terminate elections when needed.
3. Super Admin: Full system access including Admin features. Announces election results post verification.

System Flow:

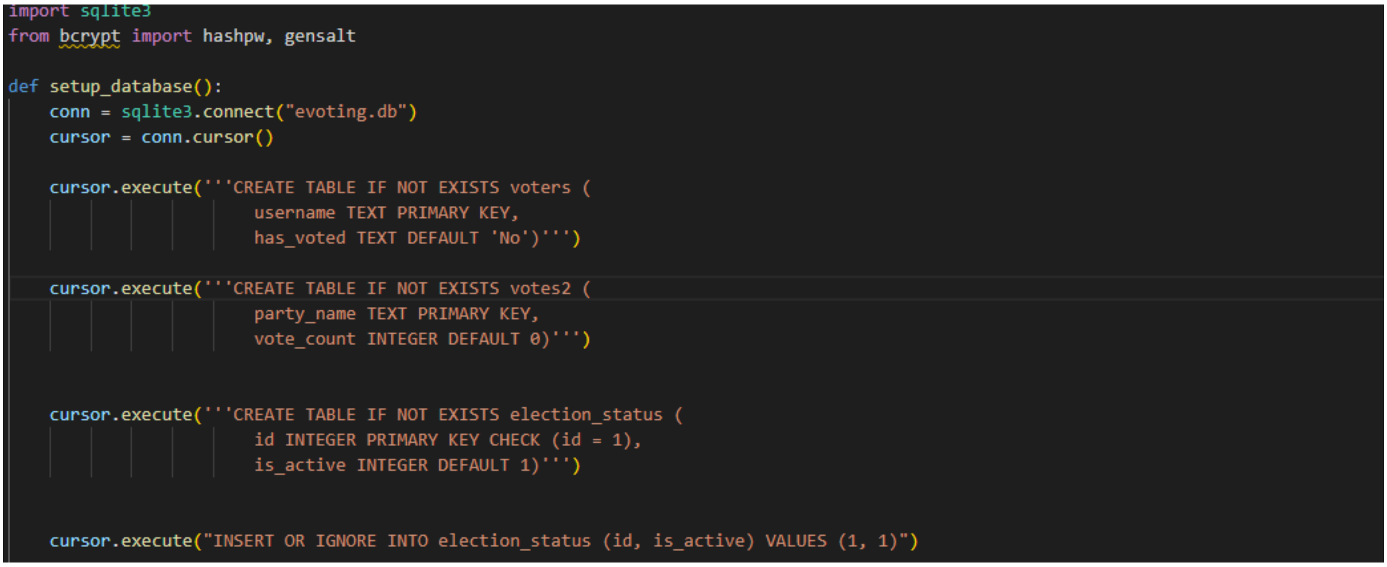
Step 1: Login
Step 2: Voting Process

Step 3: System Monitoring
Step 4: Result Processing and Verification

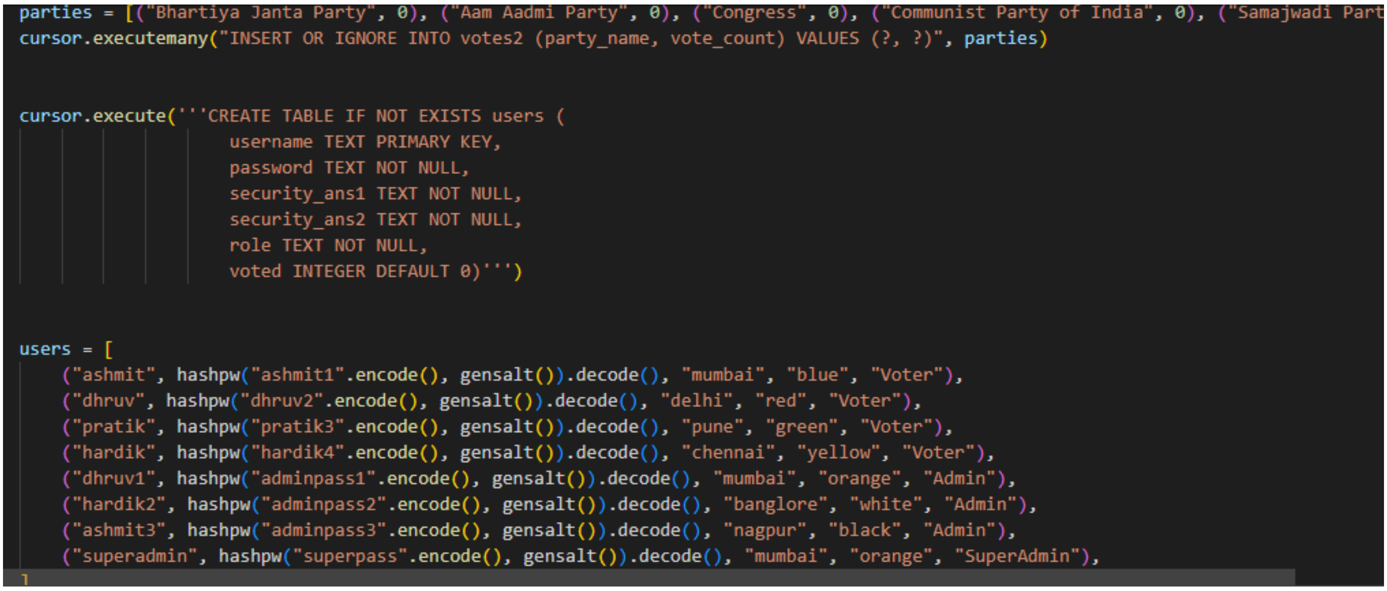
Key Features:

- **Face Authentication** (Fig 3.5.9) – Adds a layer of security for login.
- **Result Page** (Fig 3.5.7) – Displays outcome with graphical/statistical representation.
- **Twilio Integration** (Fig 3.5.8) – Sends notifications/messages to users.
- **News Page** (Fig 3.5.10) – Displays election-related updates or announcements.

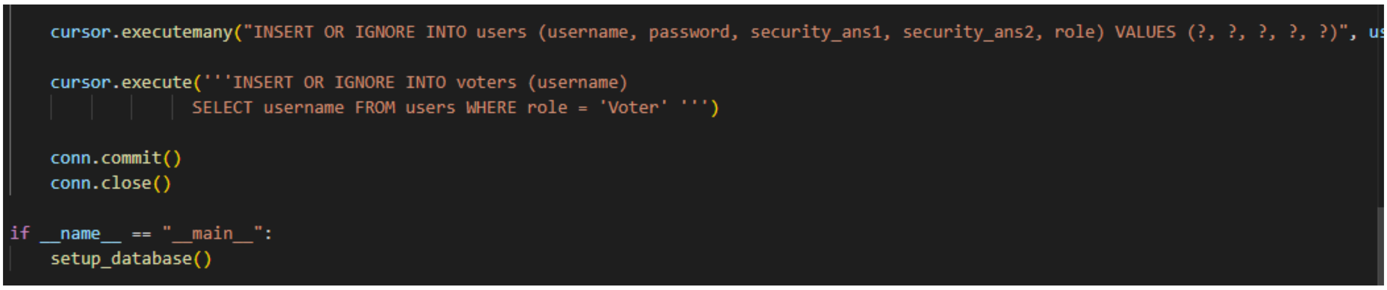
4. DATABASE STRUCTURE



```
import sqlite3
from bcrypt import hashpw, gensalt

def setup_database():
    conn = sqlite3.connect("evoting.db")
    cursor = conn.cursor()

    cursor.execute('''CREATE TABLE IF NOT EXISTS voters (
                      username TEXT PRIMARY KEY,
                      has_voted TEXT DEFAULT 'No')''')

    cursor.execute('''CREATE TABLE IF NOT EXISTS votes2 (
                      party_name TEXT PRIMARY KEY,
                      vote_count INTEGER DEFAULT 0)''')


    cursor.execute('''CREATE TABLE IF NOT EXISTS election_status (
                      id INTEGER PRIMARY KEY CHECK (id = 1),
                      is_active INTEGER DEFAULT 1)''')


    cursor.execute("INSERT OR IGNORE INTO election_status (id, is_active) VALUES (1, 1)")
```



```
parties = [("Bhartiya Janta Party", 0), ("Aam Aadmi Party", 0), ("Congress", 0), ("Communist Party of India", 0), ("Samajwadi Part
cursor.executemany("INSERT OR IGNORE INTO votes2 (party_name, vote_count) VALUES (?, ?)", parties)


cursor.execute('''CREATE TABLE IF NOT EXISTS users (
                  username TEXT PRIMARY KEY,
                  password TEXT NOT NULL,
                  security_ans1 TEXT NOT NULL,
                  security_ans2 TEXT NOT NULL,
                  role TEXT NOT NULL,
                  voted INTEGER DEFAULT 0)''')


users = [
    ("ashmit", hashpw("ashmit1".encode(), gensalt()).decode(), "mumbai", "blue", "Voter"),
    ("dhruv", hashpw("dhruv2".encode(), gensalt()).decode(), "delhi", "red", "Voter"),
    ("pratik", hashpw("pratik3".encode(), gensalt()).decode(), "pune", "green", "Voter"),
    ("hardik", hashpw("hardik4".encode(), gensalt()).decode(), "chennai", "yellow", "Voter"),
    ("dhruv1", hashpw("adminpass1".encode(), gensalt()).decode(), "mumbai", "orange", "Admin"),
    ("hardik2", hashpw("adminpass2".encode(), gensalt()).decode(), "banglore", "white", "Admin"),
    ("ashmit3", hashpw("adminpass3".encode(), gensalt()).decode(), "nagpur", "black", "Admin"),
    ("superadmin", hashpw("superpass".encode(), gensalt()).decode(), "mumbai", "orange", "SuperAdmin"),
]
```

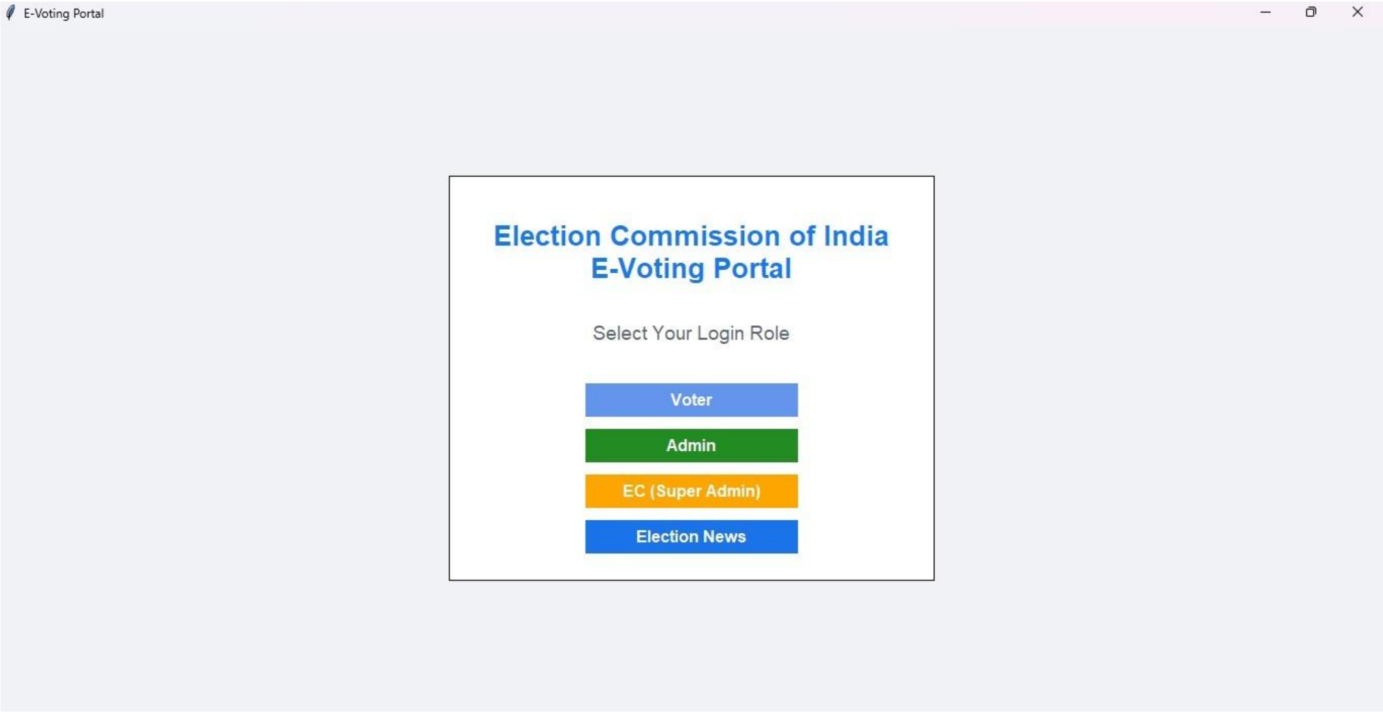


```
    cursor.executemany("INSERT OR IGNORE INTO users (username, password, security_ans1, security_ans2, role) VALUES (?, ?, ?, ?, ?)", us

    cursor.execute('''INSERT OR IGNORE INTO voters (username)
                   SELECT username FROM users WHERE role = 'Voter' ''')

    conn.commit()
    conn.close()

if __name__ == "__main__":
    setup_database()
```

3.4 These images show the Database Structure

5. RESULTS

Figure **3.5.1** shows **The Landing Page** which has features such as role-based login options (Voter, Admin, Superadmin) and displays election news. It includes navigation buttons for users to access different parts of the application.



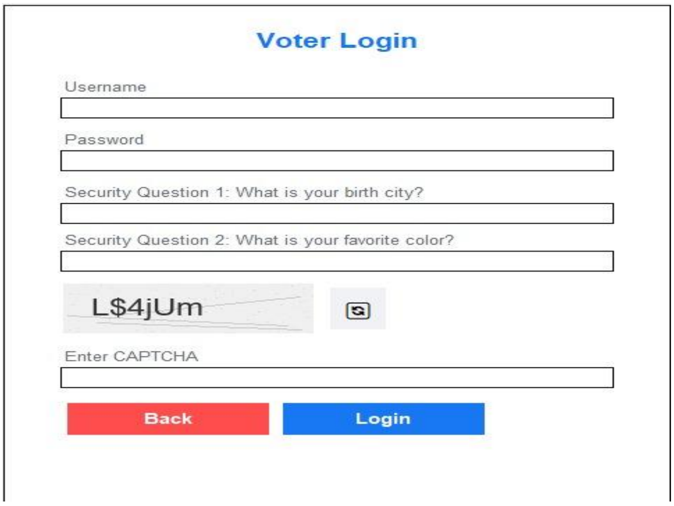
E-Voting Portal

Election Commission of India
E-Voting Portal

Select Your Login Role

Figure 3.5.1 landing page

Figure **3.5.2** shows **The Voter Login Page** which includes fields for username, password, security questions, and captcha to ensure secure authentication. Users must complete all fields to access their voter dashboard.

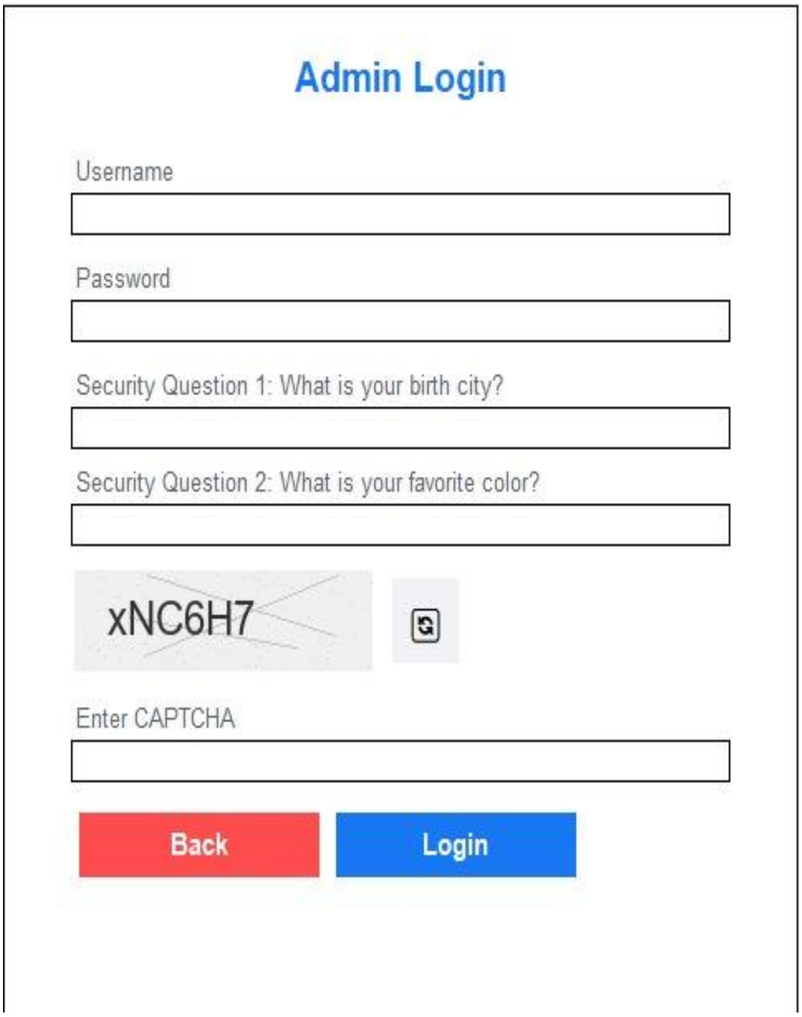


Voter Login

Username
Password
Security Question 1: What is your birth city?
Security Question 2: What is your favorite color?
L$4jUm
Enter CAPTCHA
Back
Login

Figure 3.5.2 Voter Login Page

Figure **3.5.3** shows **The Admin Login Page** which requires a username, password, security questions, and captcha for secure authentication. Admins must complete all fields to access administrative controls and manage election processes.



Admin Login

Username

Password

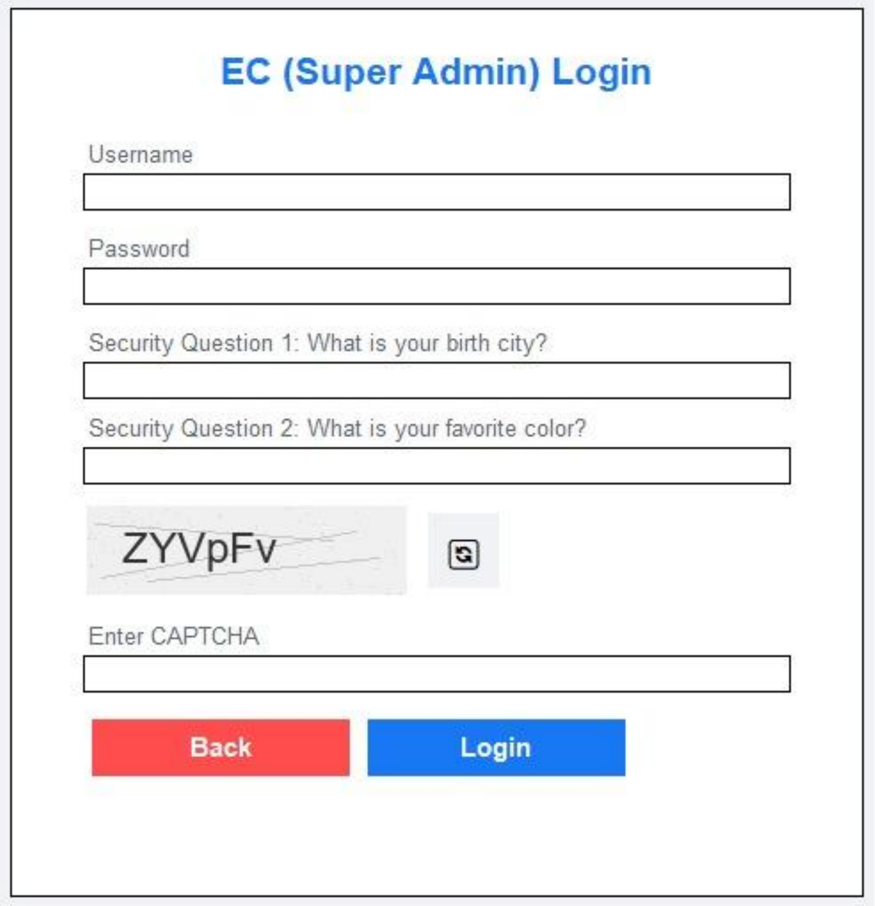
Security Question 1: What is your birth city?

Security Question 2: What is your favorite color?

Enter CAPTCHA

Figure 3.5.3 Admin Login Page

Figure **3.5.4** shows **The Super Admin Login Page** which has features such as fields for username, password, security questions, and captcha. It ensures secure access to advanced settings and full system control for super admins.



EC (Super Admin) Login

Username

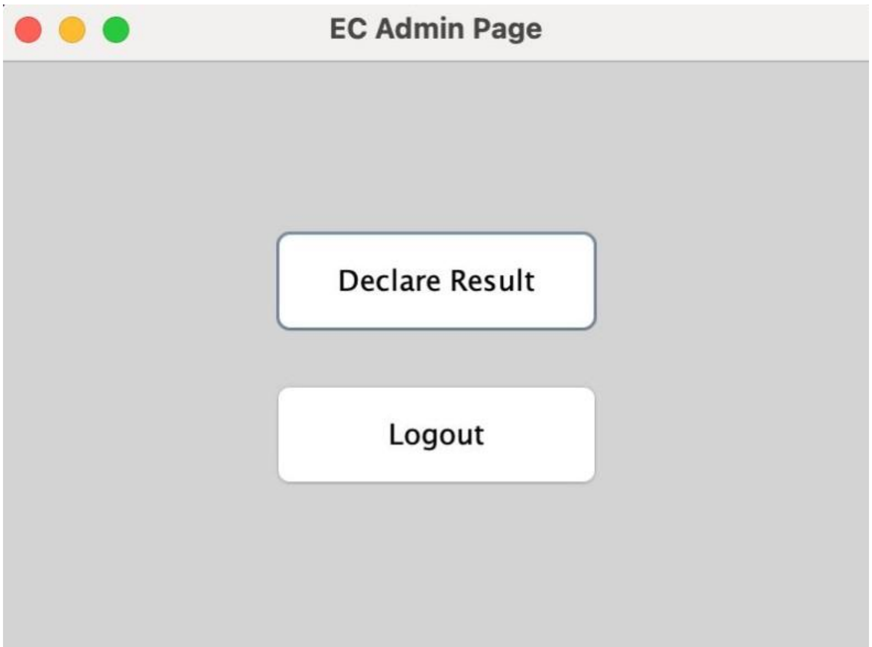
Password

Security Question 1: What is your birth city?

Security Question 2: What is your favorite color?

Enter CAPTCHA

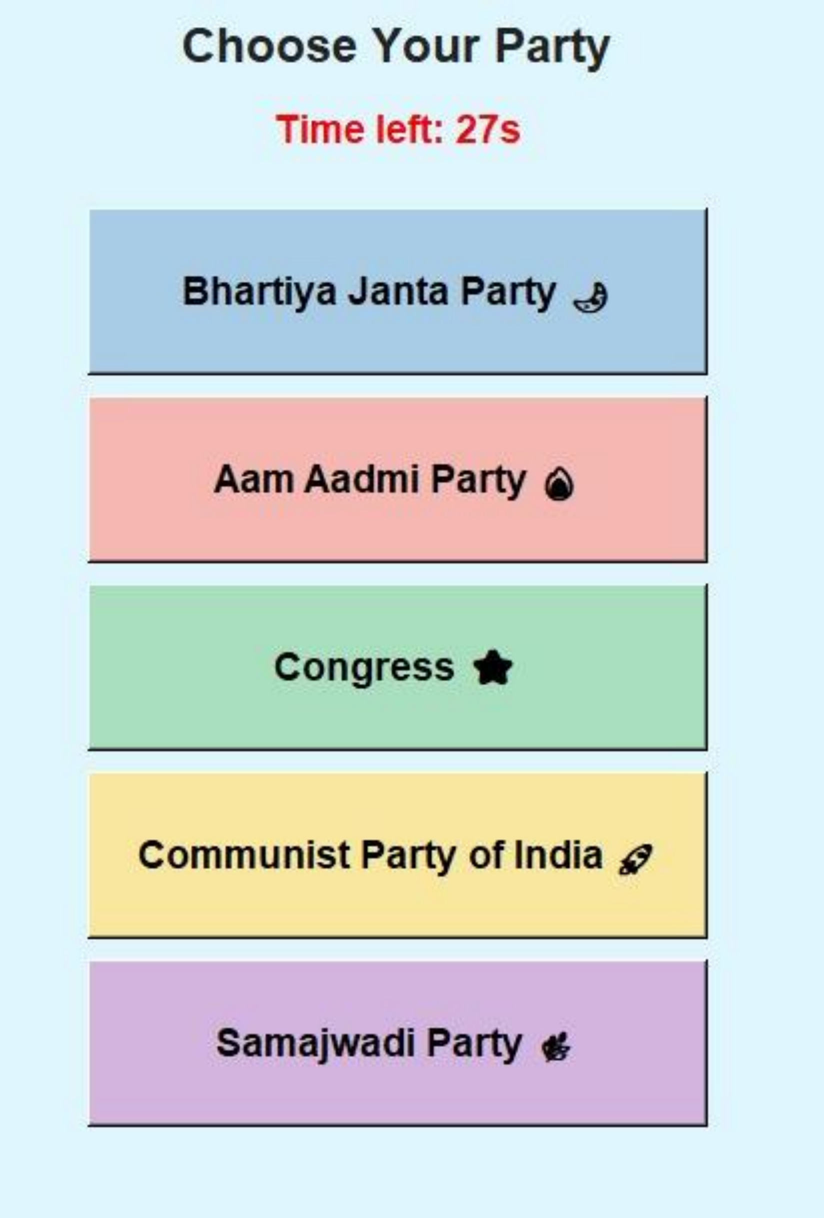
Figure 3.5.4 Login Page



EC Admin Page

Figure 3.5.5 Declaration Page

Figure **3.5.6** shows **The Voting Page** which displays party names for selection. After voting, users receive a confirmation message on WhatsApp, ensuring their vote is successfully recorded and acknowledged.



Choose Your Party

Time left: 27s

Bhartiya Janta Party

Aam Aadmi Party

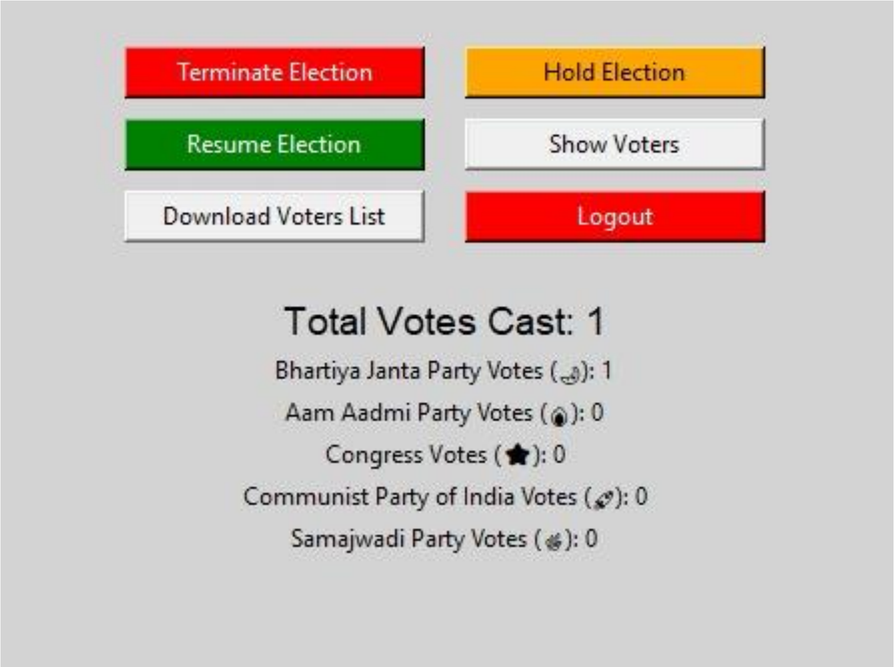
Congress

Communist Party of India

Samajwadi Party

Figure 3.5.6 Voting Page

Figure **3.5.7** shows **The Admin Dashboard** which allows actions like terminating, holding, or resuming elections, viewing voters, and downloading the voter list. It also includes a logout button for secure session termination.



Total Votes Cast: 1

Bhartiya Janta Party Votes (✋): 1

Aam Aadmi Party Votes (🧹): 0

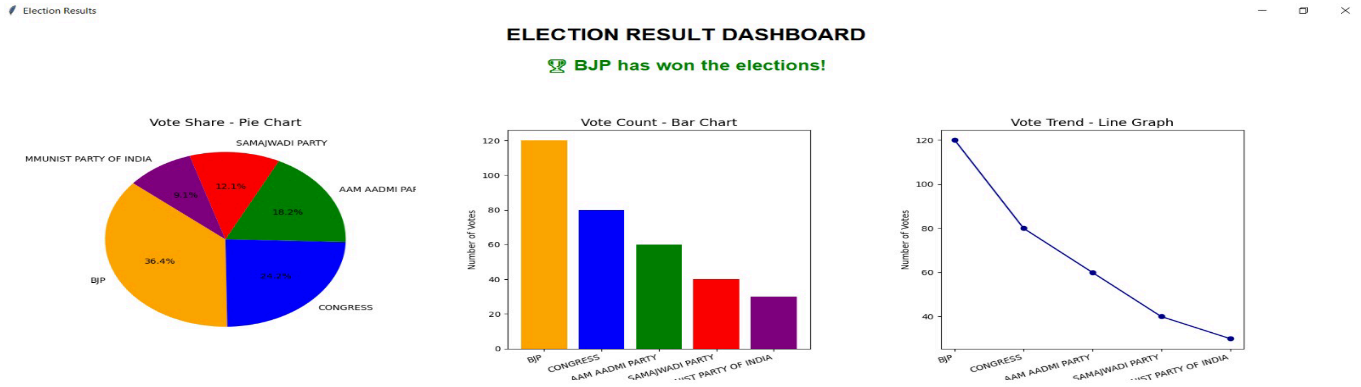
Congress Votes (★): 0

Communist Party of India Votes (⚒): 0

Samajwadi Party Votes (🚲): 0

Figure 3.5.7 Election Control Panel

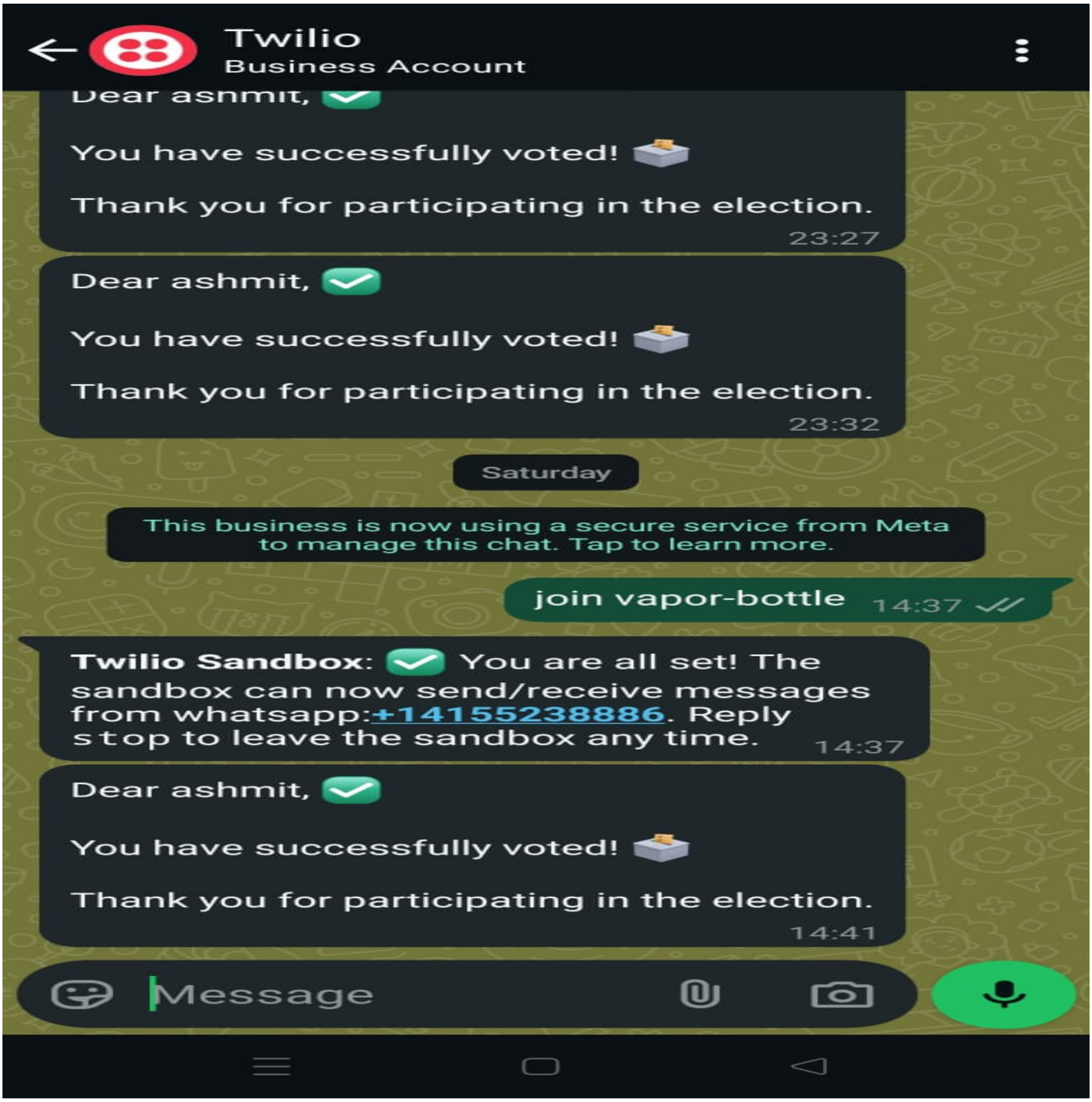
Figure **3.5.8** shows The screen is titled "**Election Results**" at the top, with two types of data visualizations below. On the left, a pie chart labeled "Votes Distribution" displays different categories or groups (e.g.,BJP, CONGRESS, etc.) in distinct colors. On the right, a bar chart titled "Votes per Party" shows a comparison of vote counts across various categories. Below these charts, two buttons— "Download Results" and "Exit"— allow the user to either save the data or exit the results page.



ELECTION RESULT DASHBOARD

🏆 BJP has won the elections!

Figure 3.5.8 Election Result page



Twilio

Business Account

Dear ashmit, ✅

You have successfully voted! 🗳️

Thank you for participating in the election.

23:27

Dear ashmit, ✅

You have successfully voted! 🗳️

Thank you for participating in the election.

23:32

Saturday

This business is now using a secure service from Meta to manage this chat. Tap to learn more.

join vapor-bottle 14:37

Twilio Sandbox: ✅ You are all set! The sandbox can now send/receive messages from whatsapp:+14155238886. Reply stop to leave the sandbox any time. 14:37

Dear ashmit, ✅

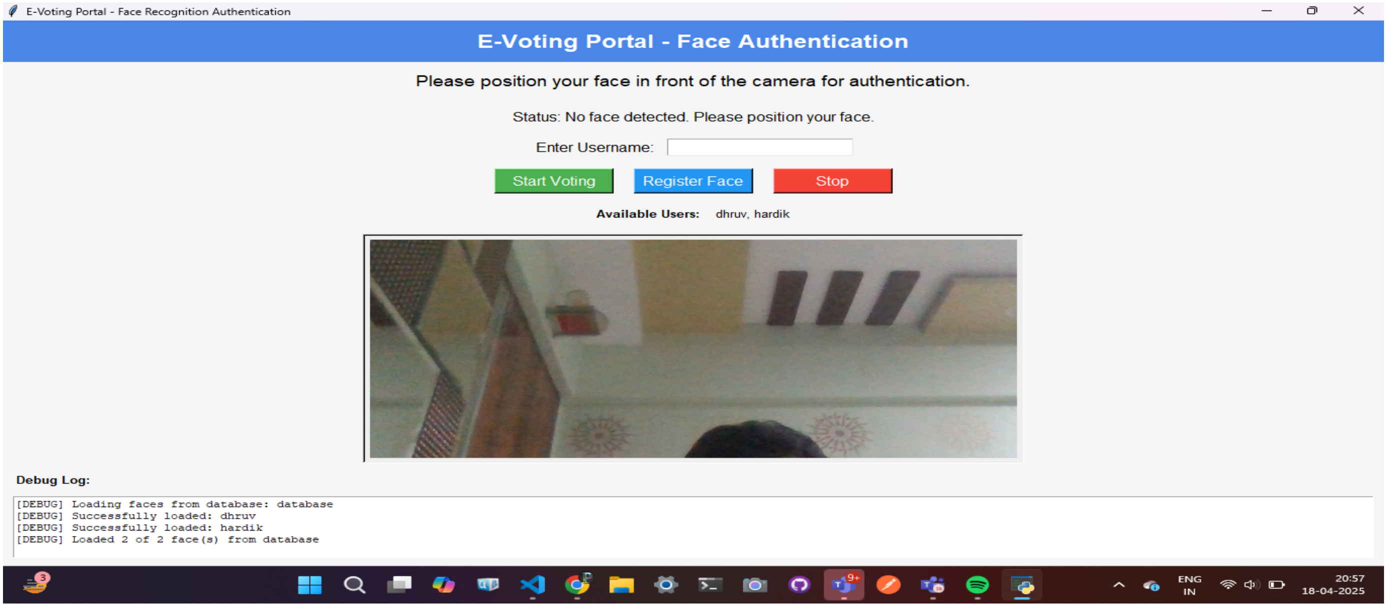
You have successfully voted! 🗳️

Thank you for participating in the election.

14:41

Figure 3.5.9 Twilio Message

Figure **3.5.10** shows **The Face Authentication Page** that utilizes OpenCV and a pre-trained machine learning model to verify users through facial recognition. It captures and processes live images, ensuring secure and accurate authentication. This page enhances security by providing a reliable alternative to traditional login methods, offering a seamless, efficient way to authenticate users based on their unique facial features.



E-Voting Portal - Face Recognition Authentication

E-Voting Portal - Face Authentication

Please position your face in front of the camera for authentication.

Status: No face detected. Please position your face.

Enter Username:

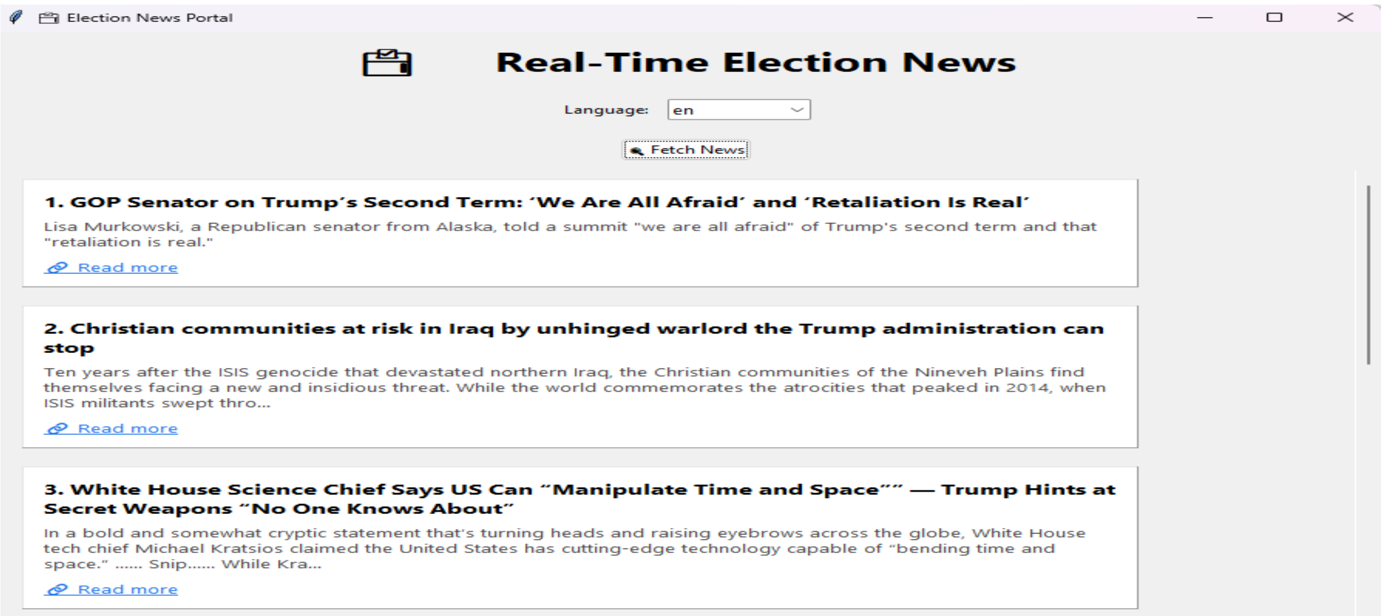
Available Users: dhruv, hardik

Debug Log:

```
[DEBUG] Loading faces from database: database
[DEBUG] Successfully loaded: dhruv
[DEBUG] Successfully loaded: hardik
[DEBUG] Loaded 2 of 2 face(s) from database
```

Figure 3.5.10 Face Authentication

Figure **3.5.11 shows The News Page** which displays the latest election updates, fetched dynamically from APIs in multiple languages. Users can access timely news in their preferred language, ensuring broad accessibility and real-time information.



Election News Portal

Real-Time Election News

Language: en

1. GOP Senator on Trump's Second Term: 'We Are All Afraid' and 'Retaliation Is Real'

Lisa Murkowski, a Republican senator from Alaska, told a summit "we are all afraid" of Trump's second term and that "retaliation is real."

Read more

2. Christian communities at risk in Iraq by unhinged warlord the Trump administration can stop

Ten years after the ISIS genocide that devastated northern Iraq, the Christian communities of the Nineveh Plains find themselves facing a new and insidious threat. While the world commemorates the atrocities that peaked in 2014, when ISIS militants swept thro...

Read more

3. White House Science Chief Says US Can "Manipulate Time and Space"" — Trump Hints at Secret Weapons "No One Knows About"

In a bold and somewhat cryptic statement that's turning heads and raising eyebrows across the globe, White House tech chief Michael Kratsios claimed the United States has cutting-edge technology capable of "bending time and space." ...... Snip...... While Kra...

Read more

Figure 3.5.11 News Page

3.7 CONCLUSION AND FUTURE WORK:

Our e-voting system represents a pivotal advancement in the evolution of democratic participation. By delivering a secure, accessible, and user-friendly digital voting platform, we aim to redefine how citizens interact with the electoral process. Through thoughtful design and robust technological infrastructure, this system is built to increase voter turnout, reinforce transparency, and strengthen the public's trust in democratic institutions. As societies become increasingly digitized, it is imperative that our democratic systems evolve in tandem—our platform provides a timely, scalable, and resilient solution that meets the needs of modern voters.

The development of this system not only addresses the logistical and security challenges of traditional voting but also opens the door to more inclusive civic engagement. Individuals who previously faced barriers to voting—such as those with disabilities, those living abroad, or individuals in remote areas—can now participate more easily and confidently. Furthermore, the system's transparency mechanisms and audit trails help dispel doubts about election integrity, fostering a stronger connection between citizens and their governments. The ripple effect of such trust can have long-term impacts on national stability and democratic health.

Looking ahead, our commitment to continuous improvement remains unwavering. We plan to iterate on this platform through rigorous user testing, ongoing security assessments, and active integration of user feedback. Future enhancements will include support for multilingual interfaces, advanced biometric verification, blockchain-based vote tracking, and AI-driven fraud detection. We also aim to collaborate with governmental and non-governmental organizations to adapt the platform for different electoral environments around the world.

In conclusion, the e-voting system we have developed is more than just a technological solution—it is a forward-thinking framework for civic empowerment and democratic resilience. As we continue to refine and expand the system, our mission remains clear: to make the electoral process more inclusive, transparent, and secure, ensuring that every voice can be heard and every vote can count, now and in the future.

3.7 REFERENCES

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