

A Major Project Final Presentation  
on

**“Digital Voting System using  
Biometrics”**

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# Outline

- Introduction
- Problem Statement
- Objectives
- Literature Review
- Methodology
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# Introduction

- Nepal's current voting system is paper-based and has remained largely unchanged since 1959.
- The manual process of paper-based voting is time-consuming, prone to manipulation, and involves significant human labor.
- The lack of a digital voting system leaves room for rigging, vandalism of voting booths, alteration of vote counting, and manipulation during transportation.
- The use of traditional ballot paper-based voting is outdated, inefficient, and costly in terms of time, money, and manpower.
- The proposed digital voting system using biometrics aims to address these challenges by introducing a user-friendly and efficient method for elections, particularly in rural areas.

# Problem Statement

- The traditional ballot paper-based voting system in Nepal is inefficient, time-consuming, and prone to human errors.
- Voting booths can be compromised through bribery or other means, compromising the integrity of the election.
- Transportation and counting of votes can be tampered with, leading to potential manipulation of the election results.

# Objectives

- To develop a voting system with two factor authentication using biometrics recognition.
- To develop a server system which will efficiently integrate all the components and have functionality of voter and candidate registration.

# Literature Review

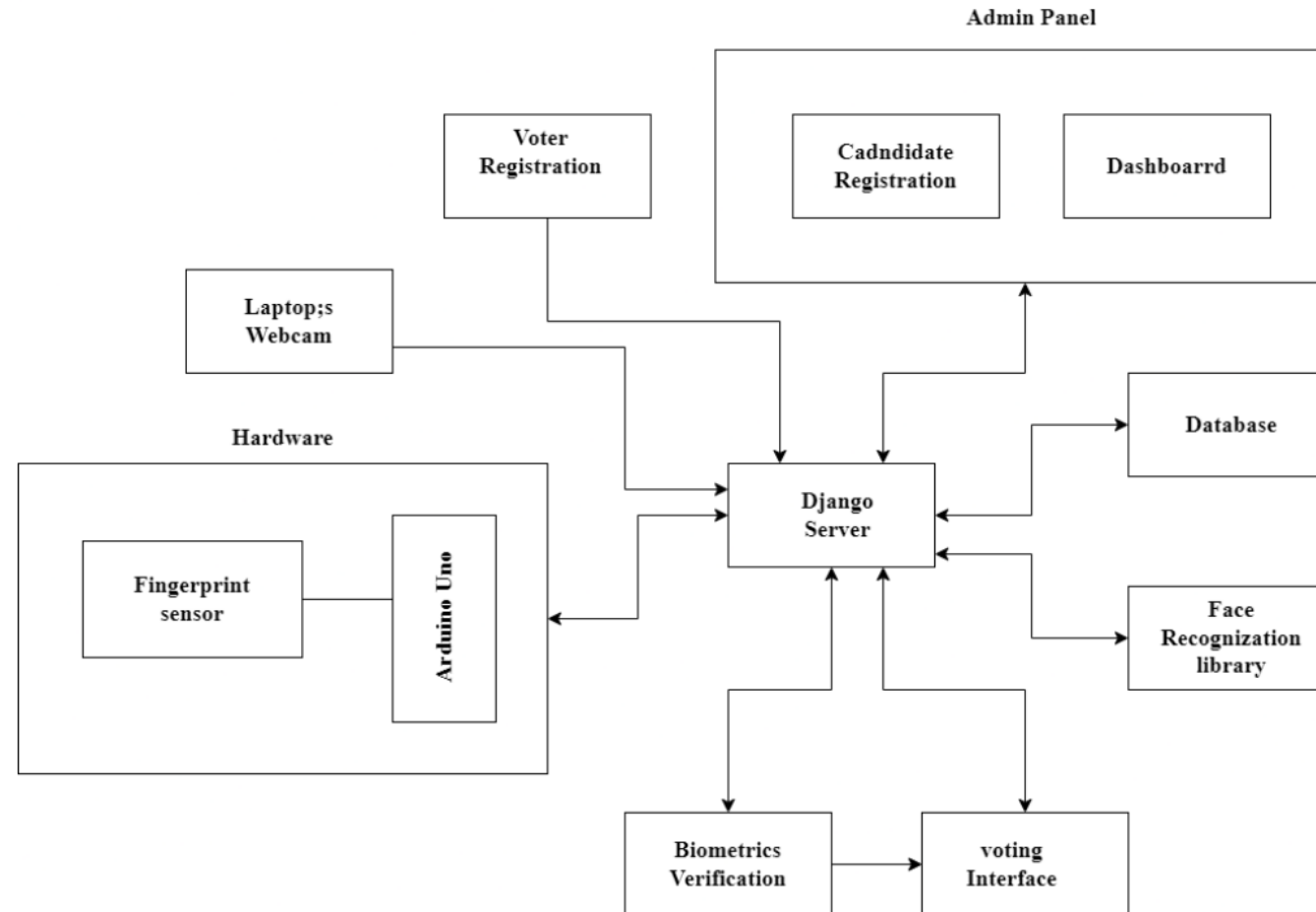
S.N	Research Paper	Authors	Findings
1.	Mobile voting using Global System for Mobile Communication (GSM) technology and authentication using fingerprinting biometrics and wireless networks	<ul style="list-style-type: none"><li>• Pallav, S.</li><li>• Dhanalakshmi, S.</li><li>• Aiswarya, S.</li></ul>	Integration of electronic voting with mobile infrastructure enhances voter authentication using fingerprinting technology and maintains voter privacy.
2.	Analysis of a Plurality Voting-based Combination of Classifiers	<ul style="list-style-type: none"><li>• Mu, X.</li><li>• Watta, P.</li><li>• Hassoun, M.H.</li></ul>	Voting strategy utilizing face recognition achieves high detection and identification rates with low false acceptance rates.
3.	Fingerprints patterns in population - a forensic study	Sharma, D. (Dr. K. Sharma)	Fingerprints are considered the best method for human identification.

# Literature Review

S.N	Research Paper	Authors	Findings
4.	Scalable Solutions: Implementing Face Recognition and Fingerprint Voting Systems for Large-Scale Elections	Thompson, S.	Biometric voting systems utilizing face recognition and fingerprint technology require scalable infrastructure for seamless operation during nationwide or high-volume elections.
5.	Advancements in Biometric Voting: Face Recognition and Fingerprint Technology	Johnson, E.	Recent advancements in biometric voting systems, particularly in face recognition and fingerprint technology, improve the voting process.

# Methodology

## 1) System Block Diagram





# Methodology

## 2) Fingerprint recognition pipeline

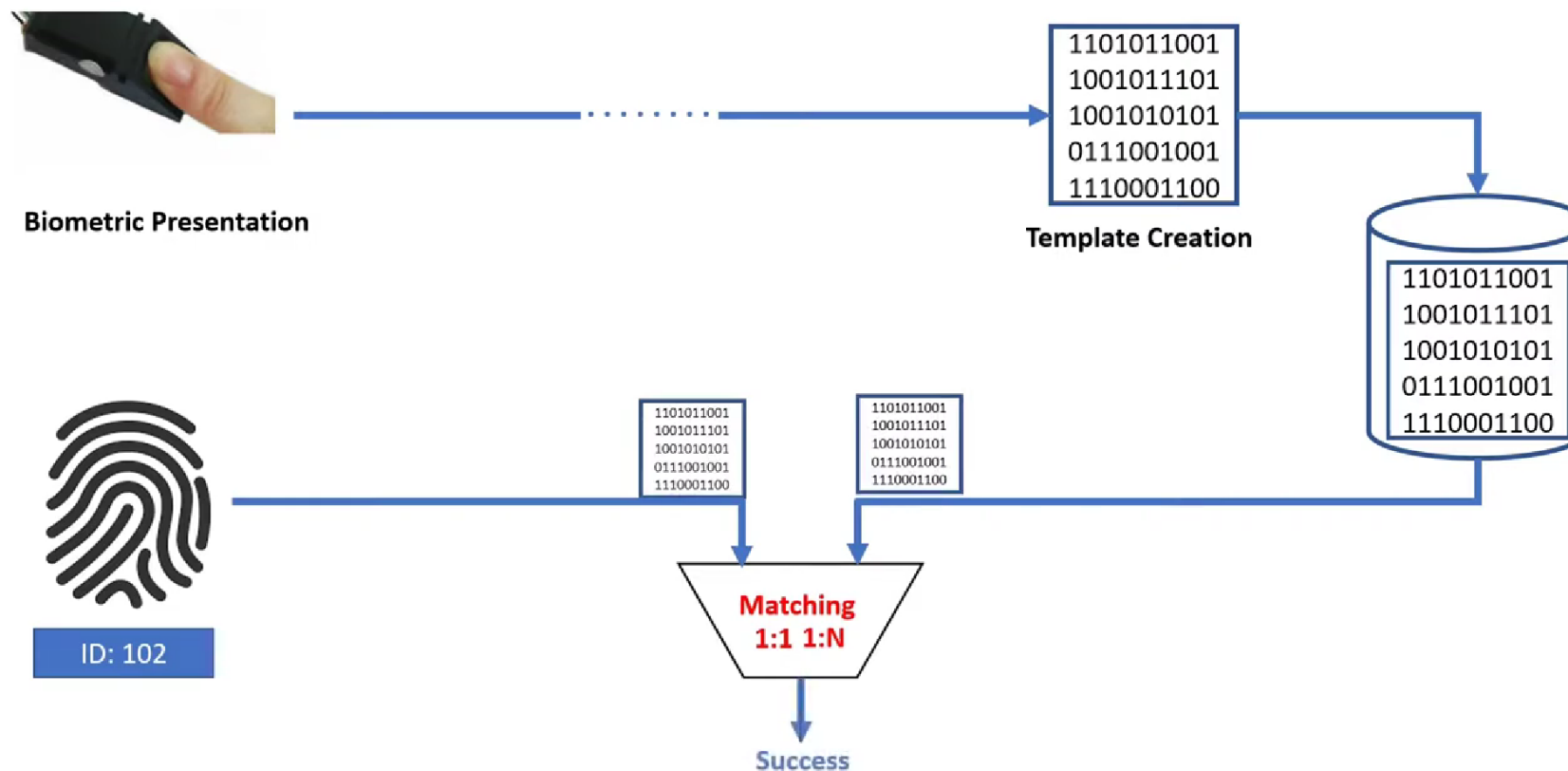
### a) Fingerprint Enrollment



# Methodology

## 2) Fingerprint recognition pipeline

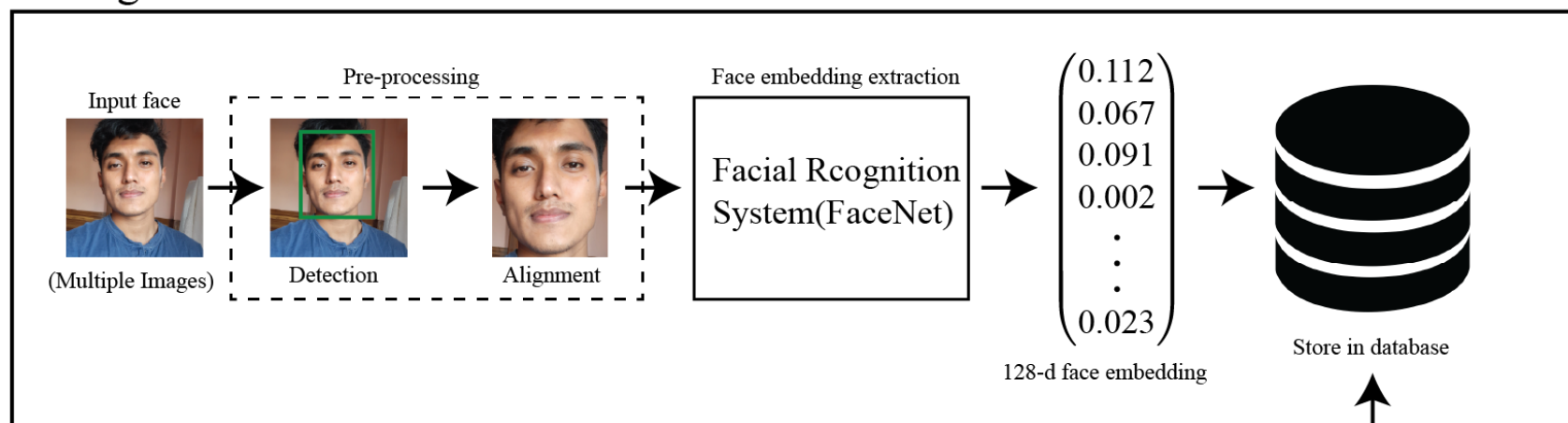
### a) Fingerprint Matching



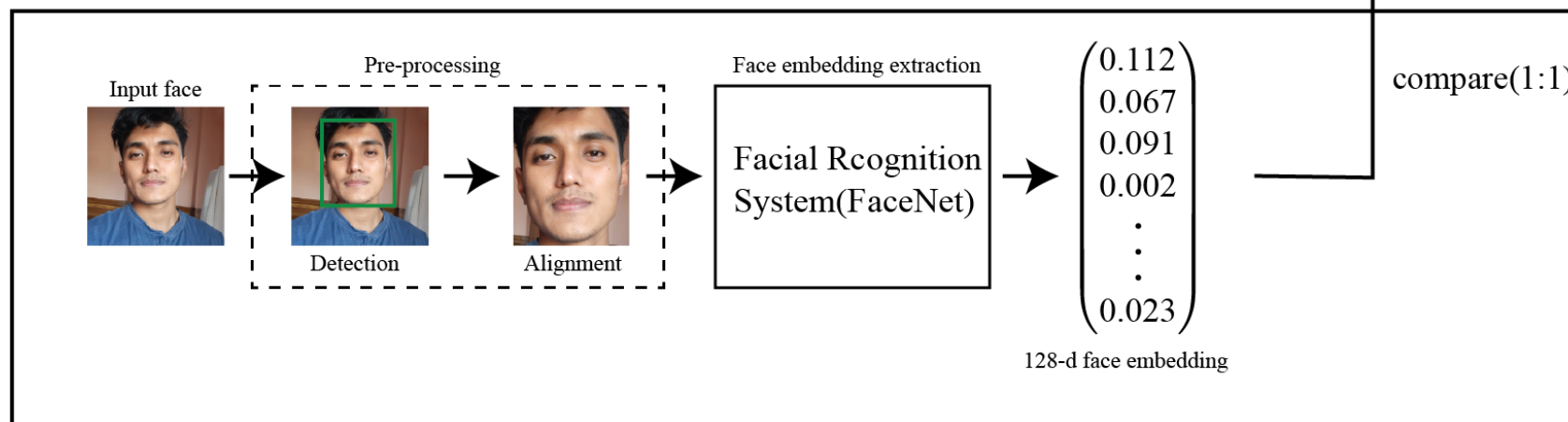
# Methodology

## 2) Face recognition pipeline

### Registration Process



### Recognition Process



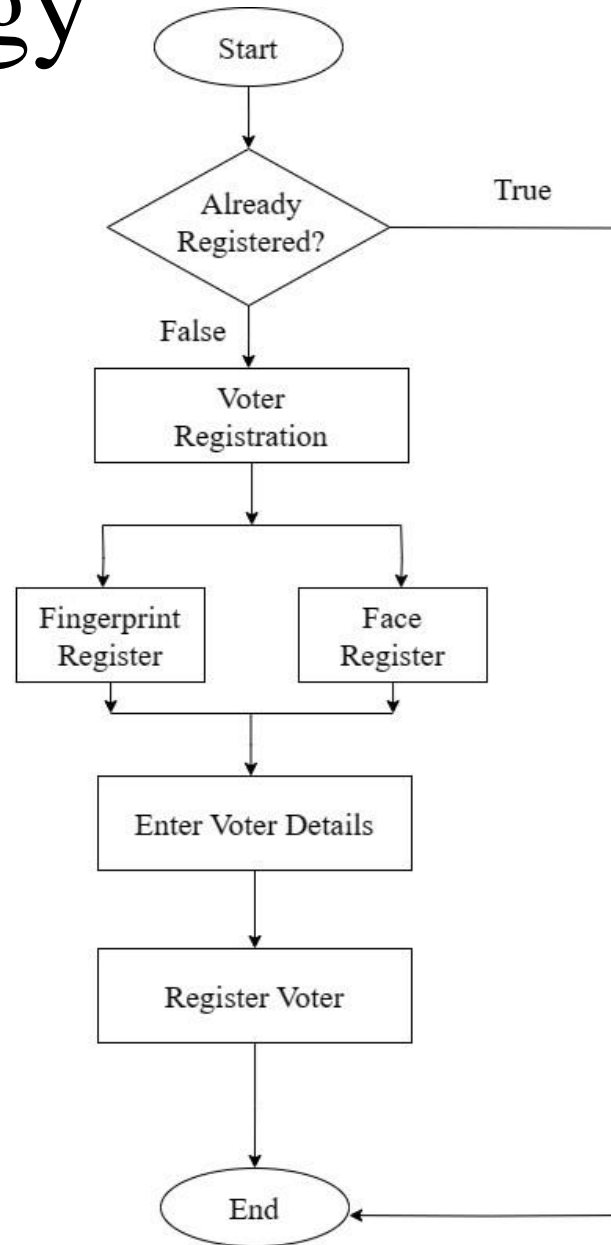
# Methodology

## 3) Voting Process

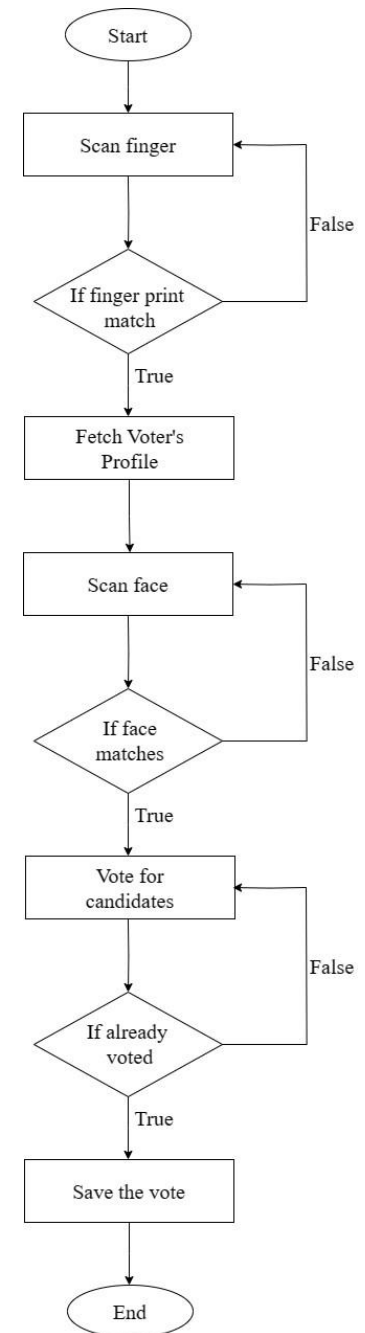
- After user is verified they will cast votes in the voting machine.
- For this project votes will be entered through buttons available in the system.
- The voting count will be update for different candidates.
- Flags will be update in voter's database to check whether they have voted for particular candidate or not.

# Methodology

## a) Registration



## a) Voting



# Methodology

- Django Server Backbone: Controls data flow, ensures integrity, and implements security measures.
- Django REST Framework: Enables seamless front-end and back-end communication via RESTful APIs.
- Token-Based Authentication: Uses JWT for secure user authentication and access control.
- JSON Data Formatting: Organizes biometric data efficiently and ensures compatibility across platforms.
- Security Measures: Implements CORS to control backend resource access and mitigate security risks.
- Session and Token Management: Manages user sessions and token expiration for secure access.
- Efficient Data Exchange: Utilizes JSON for fast and secure communication between server and client.
- Reliability and Scalability: Integrates Django tools for reliable and scalable system operation.

# Epilogue

## **Output:**

- The project delivers a digital voting system with two-factor authentication (facial and fingerprint recognition).
- Users register biometric data, while the admin registers candidates.
- During voting, users authenticate via biometrics before casting their votes.
- Admin can publish overall vote count for each candidate.

## **Discussion:**

- Originally planned as a fully equipped voting box, budget constraints led to software-focused adjustments.
- Components like ESP32 Camera were replaced with laptop webcams, and physical buttons with a web application interface.
- Despite last-minute changes, core functionality remained intact, achieving project goals.

# Epilogue

## **Future Enhancements:**

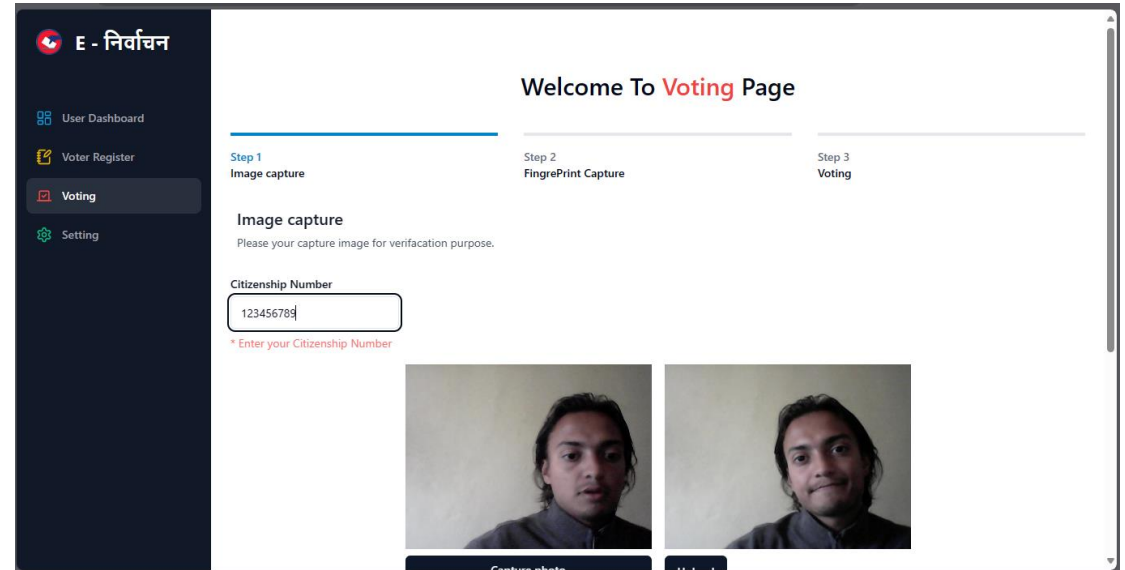
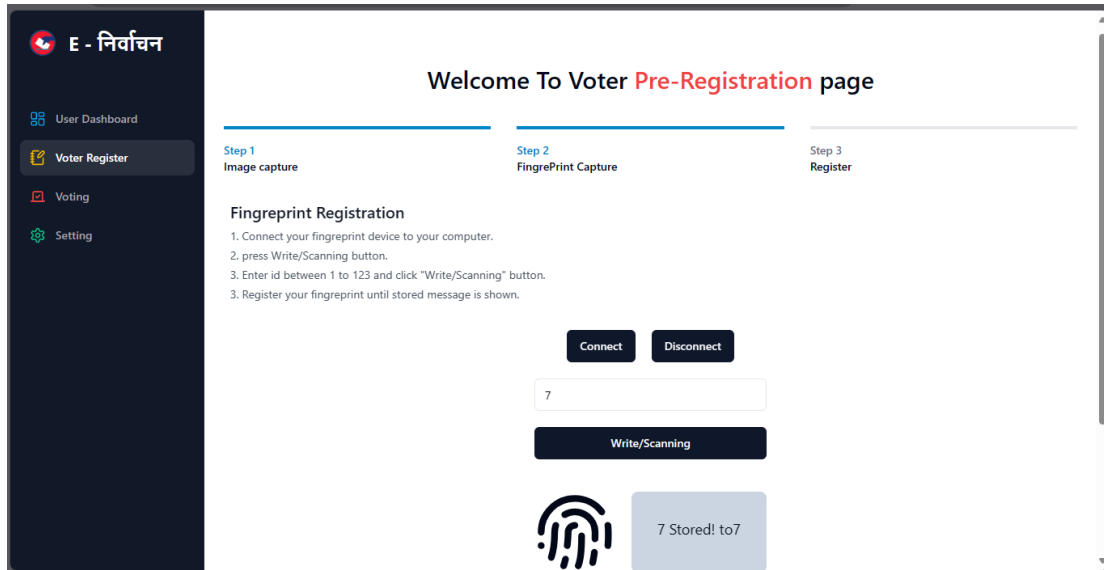
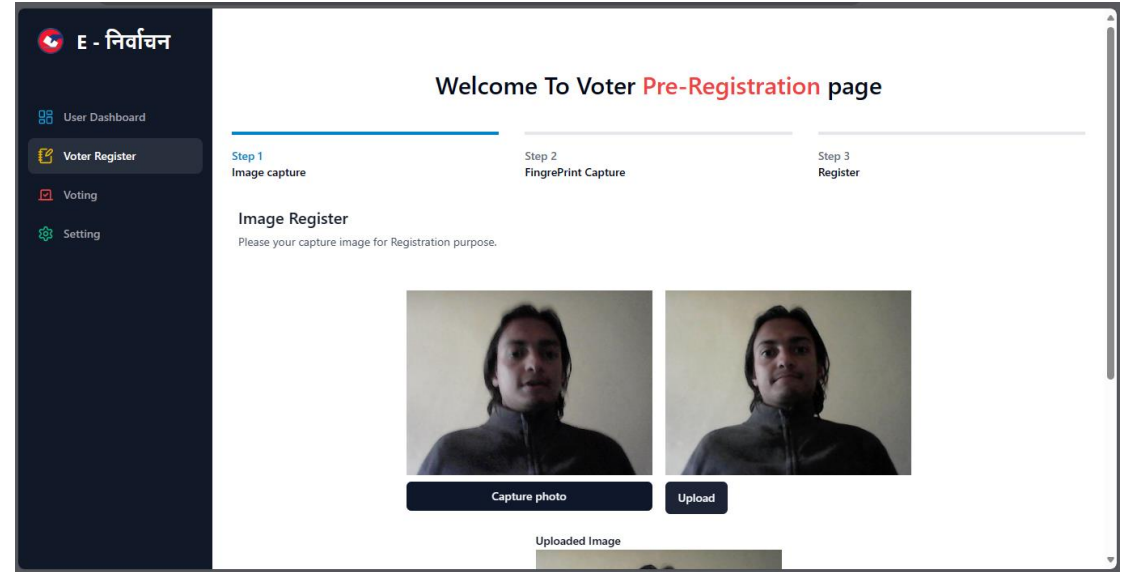
- The system allows for future enhancements, including full conversion to a software-based voting system accessible from any device.
- Integration of blockchain technology can enhance security and credibility.
- Dual-factor authentication can be adjusted based on availability, offering flexibility in authentication methods.
- Options for physical voting box implementation cater to rural areas with limited internet access.

## **Conclusion:**

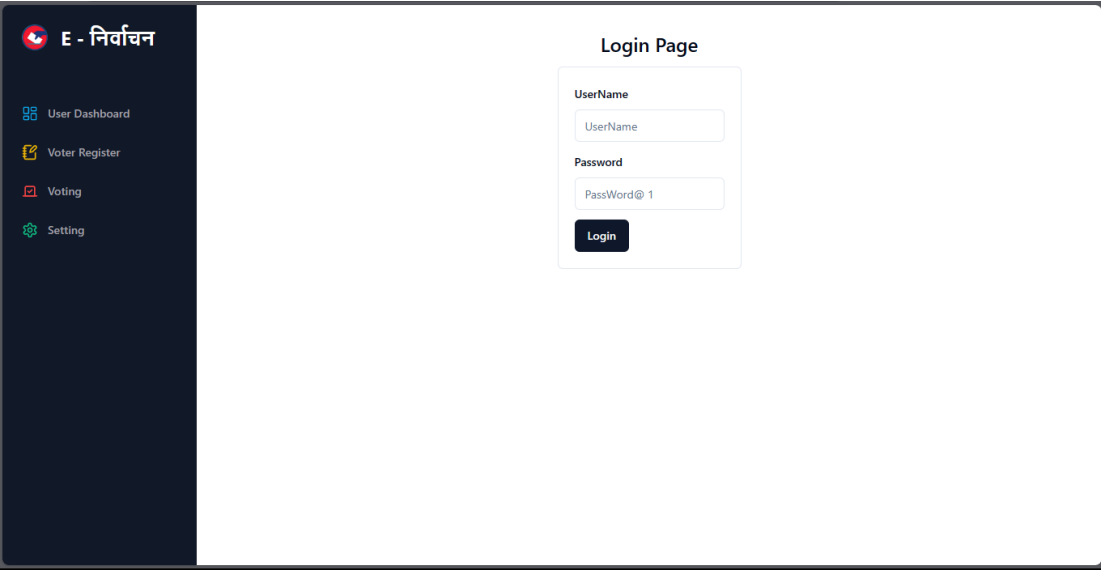
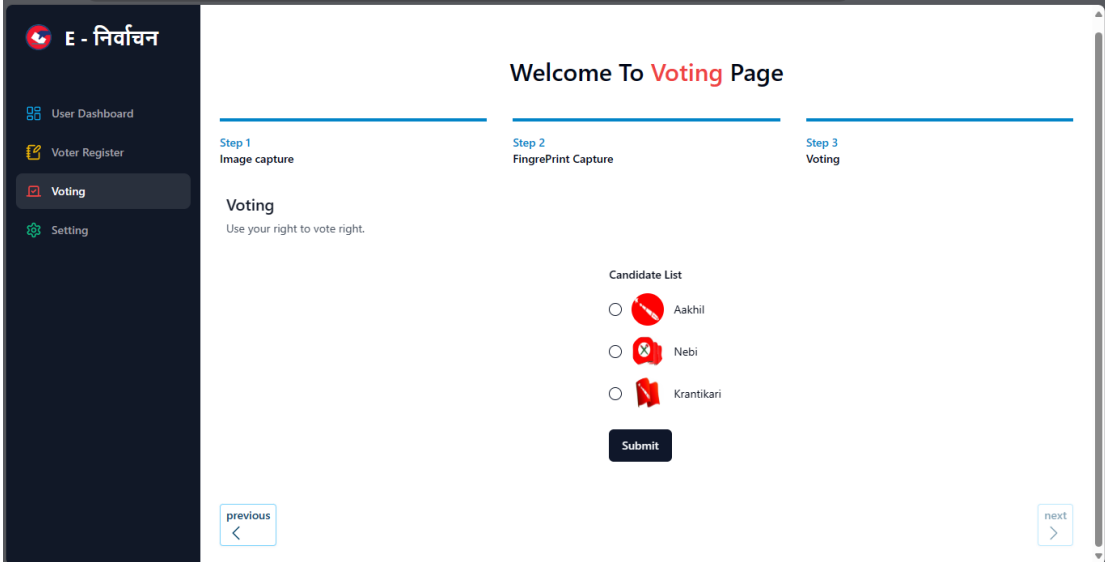
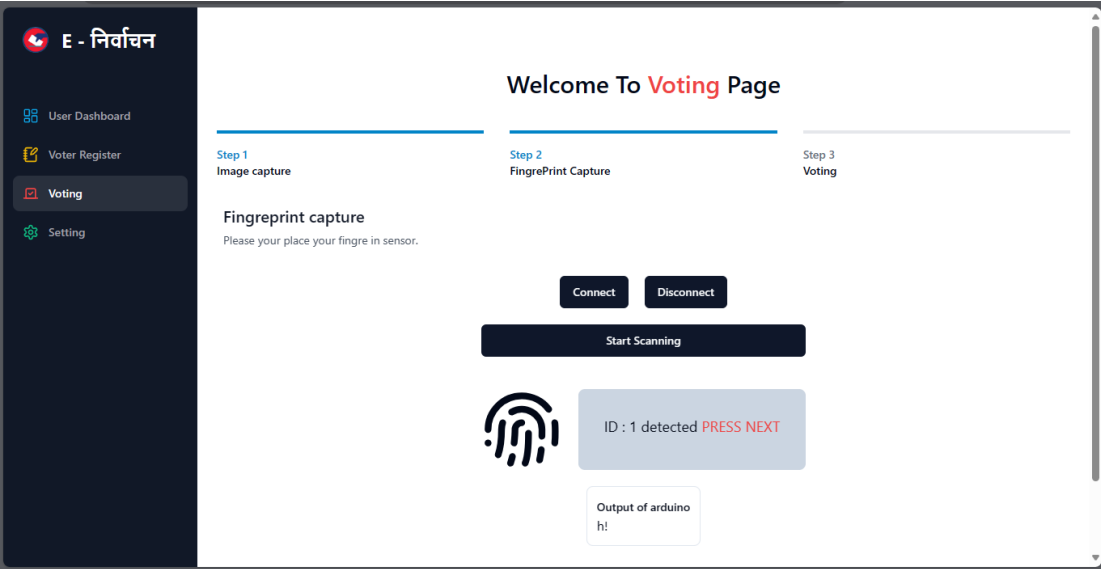
- The implemented digital voting system advances voting security through two-factor authentication.
- It aims to democratize voting by considering remote voting options and enhancing accessibility.
- Despite initial challenges, the system achieves its core objectives and presents opportunities for further improvement and modernization in Nepal's electoral procedures.



# Appendix



# Appendix



# Appendix

This screenshot shows the MongoDB Compass interface for the 'majordb' database on localhost:27017. The left sidebar lists the databases: admin, config, e-commerce, local, major, and majordb. The main panel displays a summary of collections:

Collection	Storage size	Documents	Avg. document size	Indexes	Total index size
admin	20.48 kB	1	145.00 B	1	36.86 kB
candidates	8.19 kB	0	0 B	1	12.29 kB
users	8.19 kB	1	1.77 kB	1	12.29 kB
votes	8.19 kB	0	0 B	1	12.29 kB

This screenshot shows the MongoDB Compass interface for the 'majordb.admin' collection. The left sidebar lists the databases: admin, config, e-commerce, local, major, and majordb. The main panel displays the details of the 'admin' collection, including a list of documents:

Document
<pre>{   "_id": ObjectId("65e36d862c61e94b445864e8"),   "username": "admin",   "password": "pbkdf2_sha256\$680000\$5xQ43vn5eFwYJ6ekHhrJf\$ymCteAx8g50FupEsec1CT08M/8..." }</pre>
<pre>{   "_id": ObjectId("65e415e4328f6632156d13b5"),   "username": "suresh",   "password": "pbkdf2_sha256\$680000\$CTGcTyhhDShNgbr1rQEpoVH5hnjt/Ua2tJNFGsWq1ePRV2yKZb..." }</pre>

THANK YOU!