# FACE RECOGNITION SYSTEM

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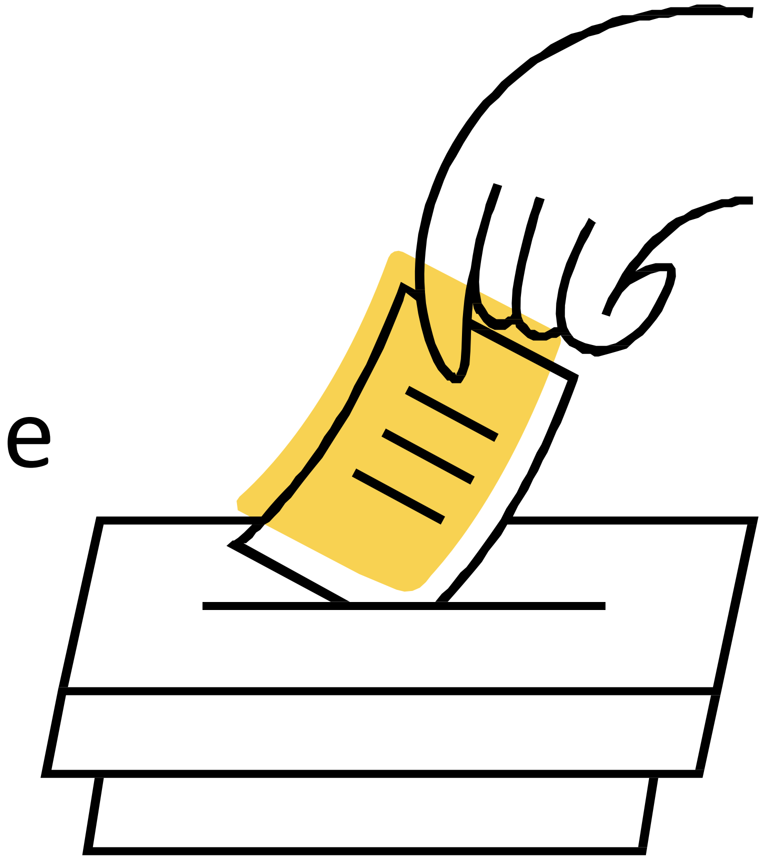
# INTRODUCTION

Face recognition is a popular pattern matching method used to identify individuals based on facial features. It plays a vital role in areas like surveillance, identity verification, and security systems.

Our project automates face recognition from documents, especially PDFs containing faces and voter IDs. Manual matching is slow and error-prone, so we use deep learning to extract faces and link them with nearby electors’ image with respective voter IDs (EPIC) for accurate and efficient verification against a stored dataset.

# PROBLEM DEFINITION

- **Manual Verification is Slow:** Officials spend hours matching faces with IDs from voter lists.
- **Risk of Duplicate Entries:** No easy way to detect if the same person is listed multiple times with slight changes.
- **Voter Fraud:** Fake IDs or impersonation may go undetected due to lack of automated face matching.
- **Human Error:** Mistakes in matching faces to correct voter IDs can lead to incorrect verifications.



# OBJECTIVE

- **Enhance Transparency:** Ensures that official records are validated with high accuracy, increasing public trust.

- **Improve Data Integrity:** Maintains a clean, duplicate-free database of verified citizens or voters.

- **Prevent Voter Fraud:** Detects duplicate faces and mismatched IDs, reducing impersonation or multiple voting.

- **Reduce Human Error:** Minimizes mistakes caused by manual checking of documents.

SECURE

AUTOMATED

# REQUIREMENTS ANALYSIS

| FUNCTIONAL REQUIREMENTS | NON-FUNCTIONAL REQUIREMENTS |
|---|---|
| **Face Detection:** Extract faces from uploaded PDFs. | **Performance:** Fast processing of images and PDFs. |
| **ID Extraction:** Detect and link nearby voter ID to each face. | **Accuracy:** Correct face-ID pairing and match results. |
| **Matching:** Compare extracted faces with saved dataset using similarity. | **Usability:** Easy-to-use interface for all users. |
| **Data Upload:** Allow admins to add new face entries with voter IDs. | **Scalability:** Can handle many faces and large documents. |
| **User Interface:** Simple upload and result view through web app. | **Portability:** Runs on any system with Python support. |

# DATA FLOW DIAGRAM

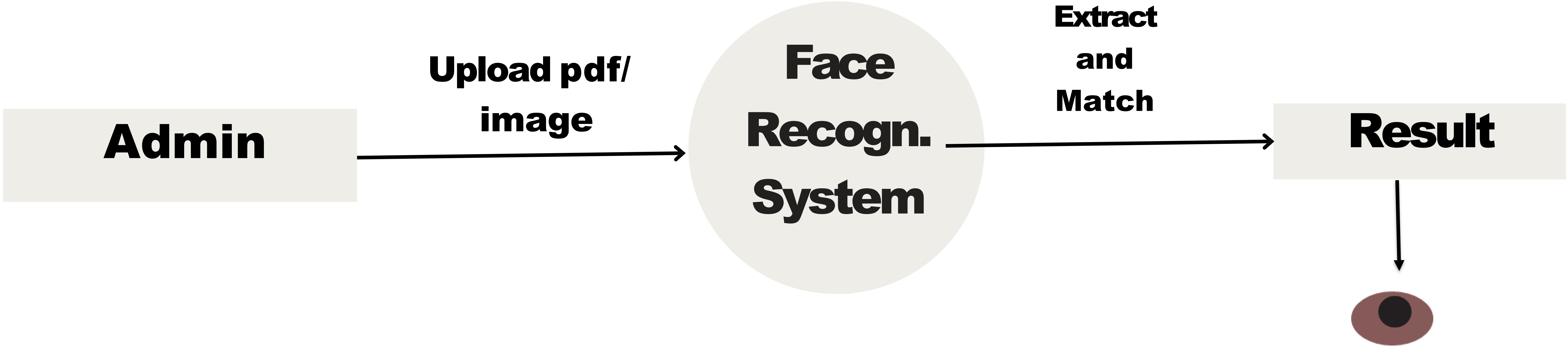


**Fig 1 : Zero Level DFD**

# APPROACH

- **PDF Parsing**: Extracted Voter ID images from uploaded PDF using PyMuPDF.
- **Face Detection**: Used InsightFace to detect and crop faces from each image.
- **Feature Extraction**: Generated face embeddings for accurate identification.
- **Voter ID Extraction**: Applied regex to extract Voter ID numbers from text.
- **Mapping**: Matched each face with the correct Voter ID using order and embeddings.
- **Result Display**: Displayed and stored the final mapped results.

# APPROACH (Development & Deployment)

*Frontend development for voters and admin*

HTML 5

CSS { }

*Integration and testing using Flask and localhost*

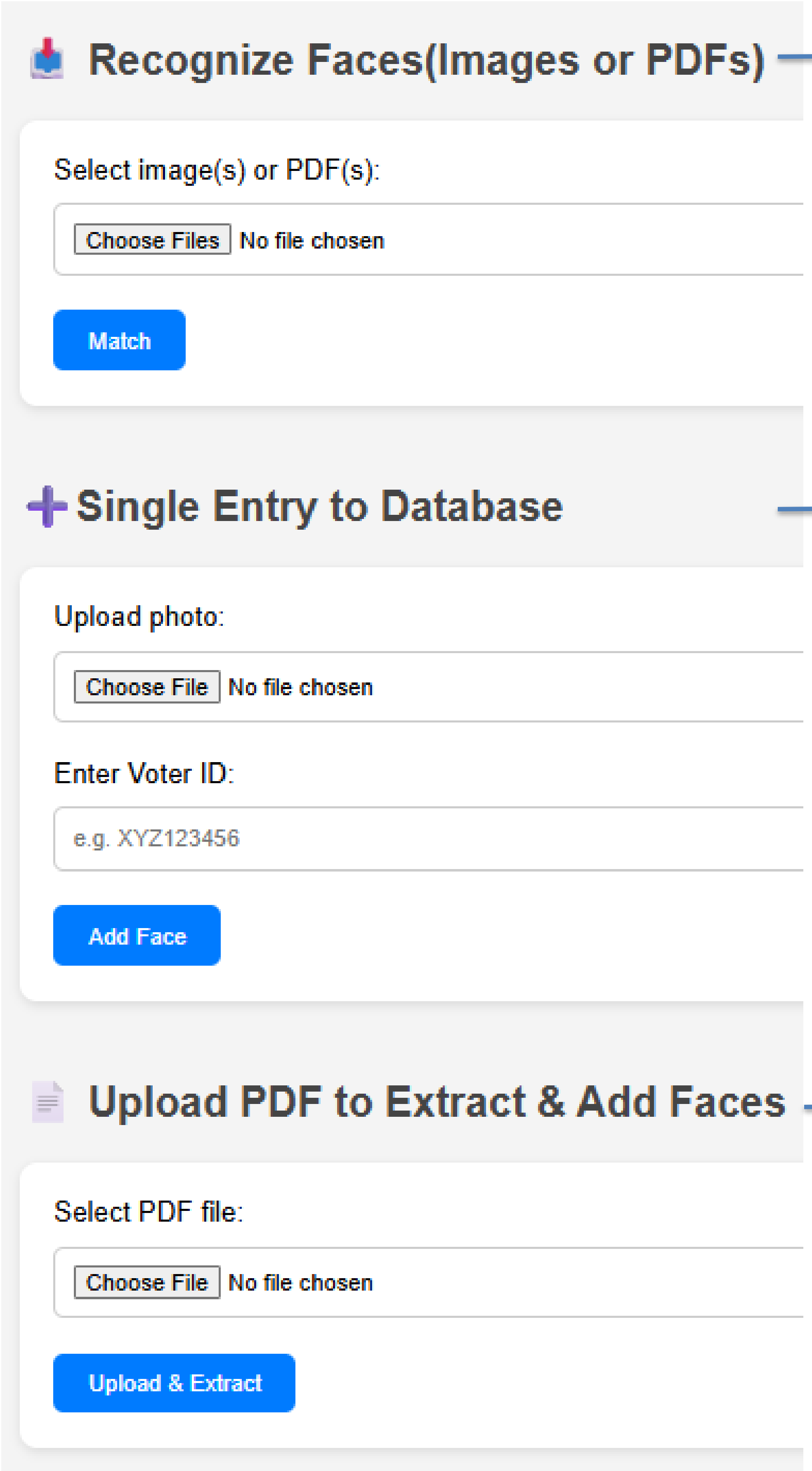
python™

Flask

# IMPLEMENTATION DETAILS

- Built with **Flask** for web-based PDF upload and processing.
- Used **PyMuPDF** to extract images and text from voter list PDFs.
- Applied **InsightFace** for face detection and embedding.
- Extracted **Voter IDs** using regular expressions from nearby text.
- Matched faces using **cosine similarity** and displayed matched results with ID and accuracy.
- **Voter IDs saved** in a CSV file; **unmatched faces** stored in a separate folder.

# PROJECT SNAPSHOTS



### Recognize Faces(Images or PDFs)

Select image(s) or PDF(s):

### ➕Single Entry to Database

Upload photo:

Enter Voter ID:

### Upload PDF to Extract & Add Faces

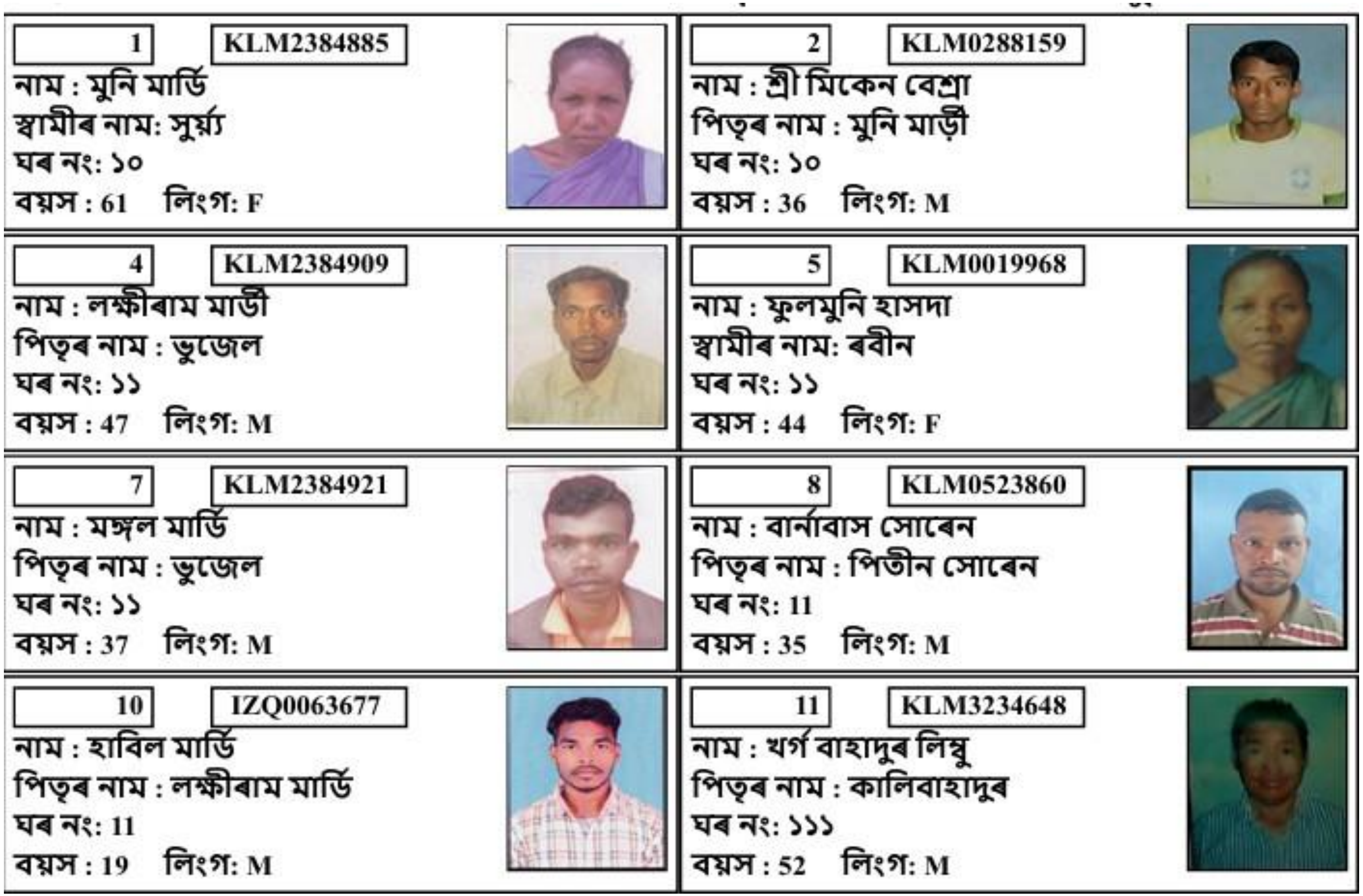
Select PDF file:

Upload images/PDFs to detect faces and display matched Voter IDs with accuracy.

Upload a photo and assign a Voter ID to add a new entry.

Upload a PDF to extract and store faces with Voter IDs.

Interface



1 KLM2384885

নাম : মুনি মার্ডি

স্বামীৰ নাম: সুর্য্য

ঘৰ নং: ১০

বয়স : 61 লিংগ: F

2 KLM0288159

নাম : শ্রী মিকেন বেশ্রা

পিতৃৰ নাম : মুনি মাড়ী

ঘৰ নং: ১০

বয়স : 36 লিংগ: M

4 KLM2384909

নাম : লক্ষীৰাম মার্ডী

পিতৃৰ নাম : ভুজেল

ঘৰ নং: ১১

বয়স : 47 লিংগ: M

5 KLM0019968

নাম : ফুলমুনি হাসদা

স্বামীৰ নাম: ৰবীন

ঘৰ নং: ১১

বয়স : 44 লিংগ: F

7 KLM2384921

নাম : মঙ্গল মার্ডি

পিতৃৰ নাম : ভুজেল

ঘৰ নং: ১১

বয়স : 37 লিংগ: M

8 KLM0523860

নাম : বার্নাবাস সোৰেন

পিতৃৰ নাম : পিতীন সোৰেন

ঘৰ নং: 11

বয়স : 35 লিংগ: M

10 IZQ0063677

নাম : হাবিল মার্ডি

পিতৃৰ নাম : লক্ষীৰাম মার্ডি

ঘৰ নং: 11

বয়স : 19 লিংগ: M

11 KLM3234648

নাম : খর্গ বাহাদুৰ লিম্বু

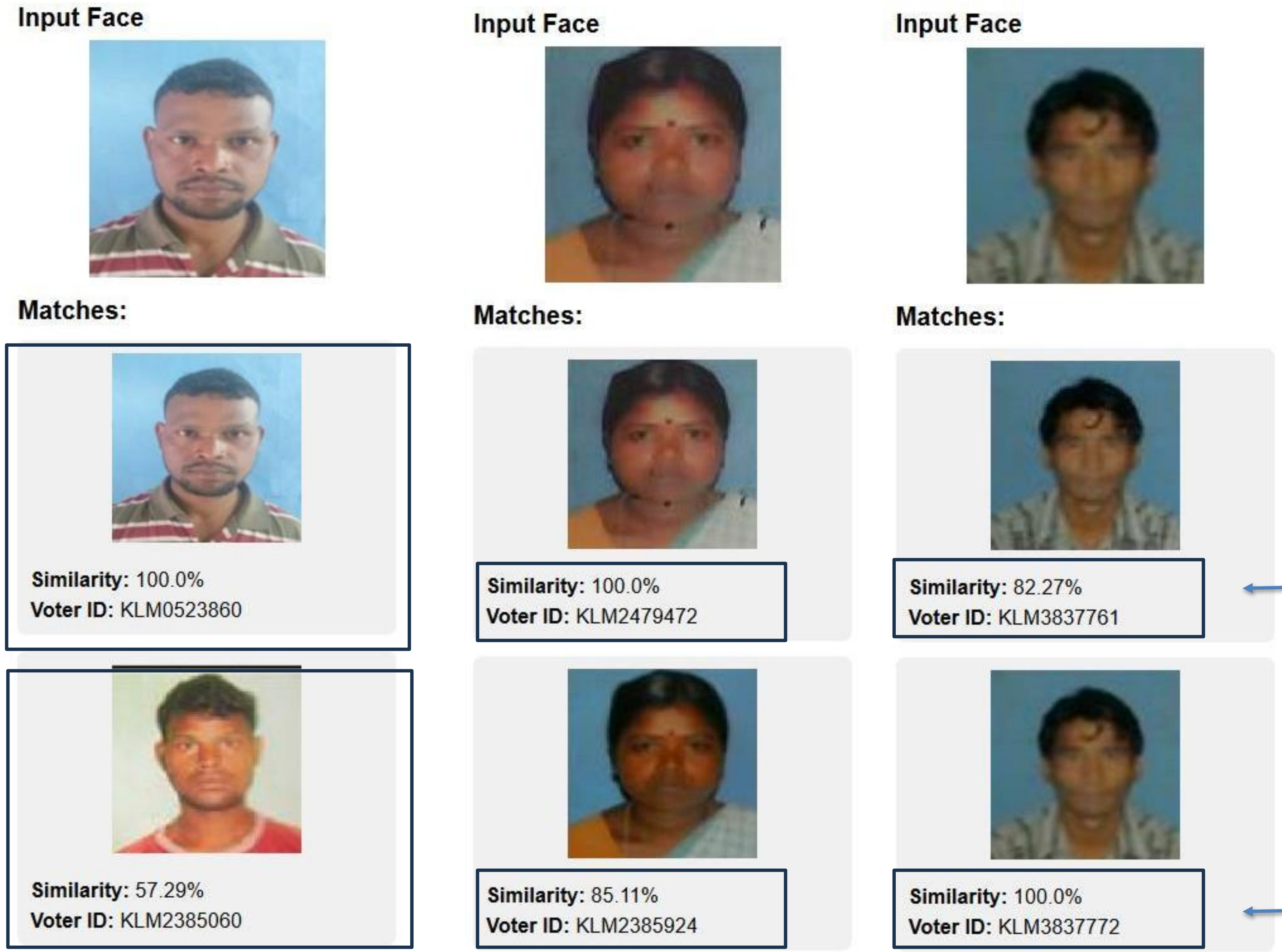
পিতৃৰ নাম : কালিবাহাদুৰ

ঘৰ নং: ১১১

বয়স : 52 লিংগ: M

Input Pdf Format

# PROJECT SNAPSHOTS



Input Face

Matches:

**Similarity:** 100.0%
**Voter ID:** KLM0523860

**Similarity:** 57.29%
**Voter ID:** KLM2385060

Input Face

Matches:

**Similarity:** 100.0%
**Voter ID:** KLM2479472

**Similarity:** 85.11%
**Voter ID:** KLM2385924

Input Face

Matches:

**Similarity:** 82.27%
**Voter ID:** KLM3837761

**Similarity:** 100.0%
**Voter ID:** KLM3837772

High Matching Faces With Different Voter IDs

Same Faces with Different Voter IDs

Fig: Output Image

# FUTURE WORK

- Integrate database (SQLite/MySQL/PostgreSQL) instead of CSV for better storage and security.
- Improve text detection using Tesseract OCR for voter ID accuracy.
- Improve Time and Space Complexity.

# CONCLUSION

- Successfully built a functional face recognition system for documents.
- Automated extraction of faces and voter IDs improves speed and accuracy.
- Can be used in electoral processes, surveys, or ID verification.
- Provides a complete pipeline from input to match result.

# REFERENCES

- **GeeksforGeeks:** – *bit.ly/3IHsIEV*
- **PyMuPDF (fitz):** – *http://bit.ly/45iKHdz*
- **Medium: Facial Analysis with InsightFace** – *http://bit.ly/40yRUUa*

# Thank you!