FACE RECOGNITION ATTENDANCE SYSTEM

TEAM - 11

FINAL REVIEW

TEAM MEMBERS

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PROJECT GUIDE

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PROBLEM STATEMENT

Current attendance systems, relying on manual methods like paper-based records and outdated technologies such as punch cards or RFID tags, are prone to significant inefficiencies. These methods are often error-prone and can be easily manipulated, leading to inaccuracies.ID cards or RFID tags can be lost, damaged, or misused by others. This results in unreliable attendance tracking and frequent data inaccuracies. An efficient, automated solution is needed to address these limitations.

EXISTING SYSTEM

Attendance System	Advantages	Disadvantages
Manual Attendance Marking	**Simplicity**: No need for special equipment, only pen and paper. **Customizable**: Easily adapted to various attendance policies.	**Error-prone:** High risk of human error or tampering (proxy attendance). **Inefficient**: Difficult to track and analyze for large attendance data

EXISTING SYSTEM

Attendance System	Advantages	Disadvantages
Biometric Attendance Marking		
Fingerprintbased	**Highly Accurate**: Unique fingerprint ensures authenticity. **Fast**: Quick scanning process.	**Hygiene Issues**: Frequent contact with devices can lead to hygiene concerns. **False Negatives**: Dirty or wet fingers can cause false rejections. **Expensive**: Requires specialized equipment for scanning and software integration. **Proxy Attendance**: Making fake fingerprint leads to false entries

EXISTING SYSTEM

Attendance System	Advantages	Disadvantages
Facial Recognition	**Contactless**: No physical contact required, making it hygienic. **Convenient**: Fast and automatic marking once the face is detected. High **Accuracy**: Advanced algorithms can detect faces even in different lighting conditions.	**Environmental Limitations**: Poor lighting or extreme angles may affect recognition. **Privacy Concerns**: Storing facial data raises privacy and security issues. False **Positives/Negatives**: Can have difficulty distinguishing between similar faces or detecting masks/hats.
Iris/Retina Scan	**Highly Secure**: Iris or retina patterns are more unique than fingerprints. **Contactless**: Eliminates hygiene concerns.	**Expensive:**Requires advanced, costly hardware. **User Discomfort:** Some users may find it uncomfortable to scan their eyes.

EXISTING SYSTEM

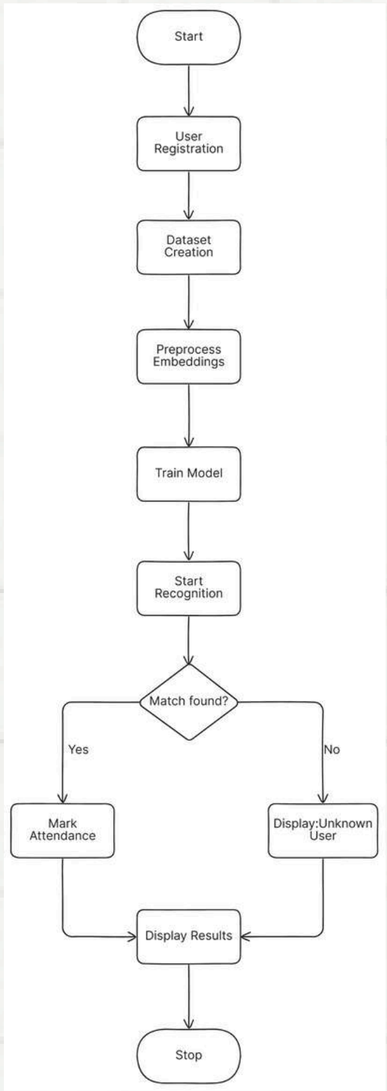
Attendance System	Advantages	Disadvantages
RFID-based Attendance		
Card Swipe	**Low Cost:** Simple technology that's widely available. **Easy to Implement:** Simple setup process. **Reliable:** Can handle a large number of users with minimal error	**Lost or Damaged Cards**: Users may lose their RFID cards, and they can be easily damaged. **Proxy Attendance:** Cards can be shared, leading to buddy punching. **Maintenance:** Readers may require regular maintenance.

EXISTING SYSTEM

Attendance System	Advantages	Disadvantages
QR Code-based Attendance	**Easy to Implement**: Users only need a smartphone and a QR code scanner. **Contactless:** No physical contact, making it hygienic. **Low Cost:** No need for specialized hardware except a smartphone camera.	**Dependence on Smartphones:** Users without smartphones are excluded. **Cheating**: QR codes can be shared or replicated. **Slower for Large Groups:** Scanning QR codes for large groups can take time.
OTP-based Attendance	**Secure:** Each login is authenticated with a one-time password. **No Specialized Equipment:** Users only need access to a phone or email.	**Manual Entry**: Requires users to enter an OTP, which can be slower than other methods. **Dependence on Connectivity**: Requires network access to receive OTPs. **Potential Delays**: Delay in OTP delivery can slow down attendance marking

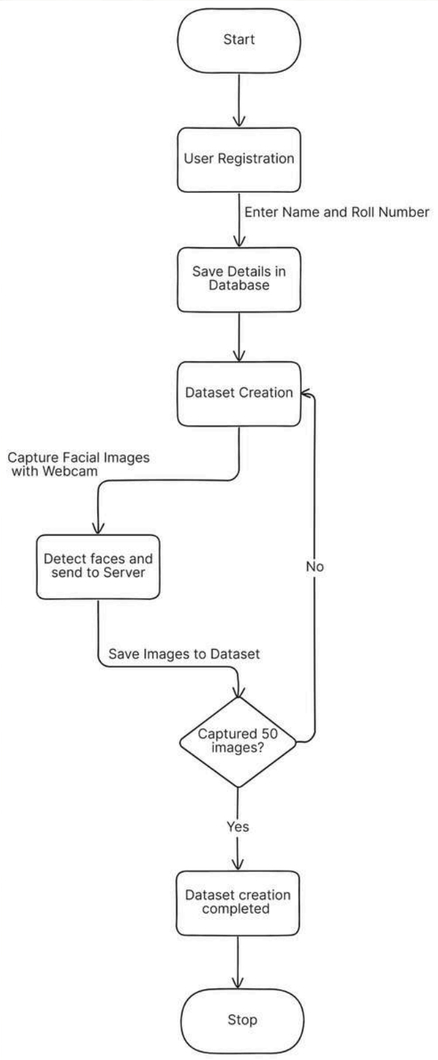
PROPOSED SYSTEM FLOWCHART

OVERALL ARCHITECTURE



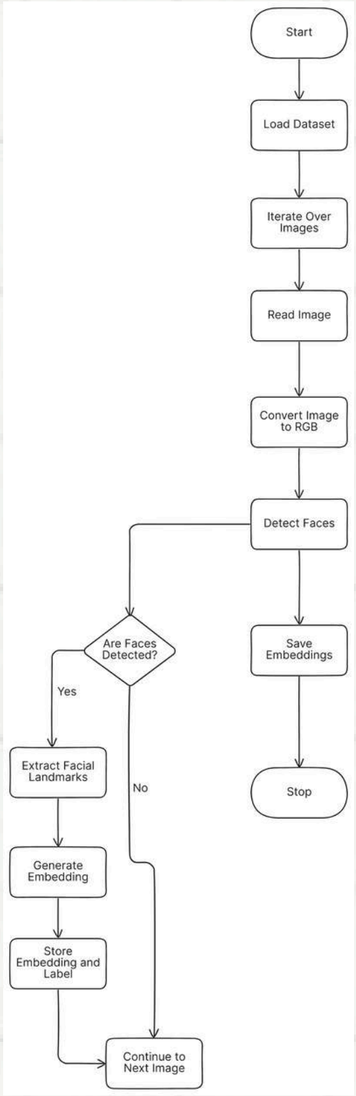
PROPOSED SYSTEM FLOWCHART

DATASET CREATION



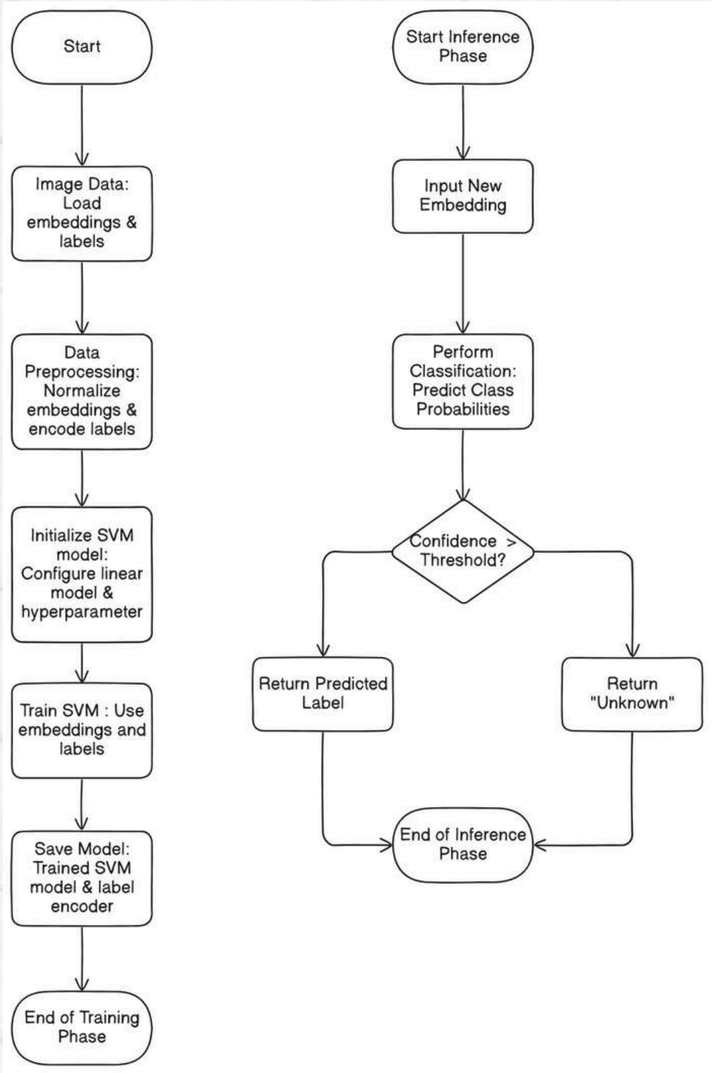
PROPOSED SYSTEM FLOWCHART

PREPROCESS IMAGE TO EMBEDDINGS



PROPOSED SYSTEM FLOWCHART

SVM ARCHITECTURE



ALGORITHMS USED:

Face Detection : BlazeFace in Tensorflow.js

Image preprocessing : OpenCV

Face Shape Predictor : Dlib’s 68 Landmark Predictor

Face Embedding Extraction : Dlib’s ResNet-based Face Recognition Model

Face Recognition : Support Vector Machine (SVM) Classifier

Frontend : HTML,CSS,JS

Backend : Python flask

Database : MYSQL

PROPOSED SYSTEM

MODULES

- User Interface Module
- Create Dataset
- Preprocess Embeddings
- Train Model
- Start Recognition
- View Attendance
- View Registered Students
- Export Attendance

1.USER INTERFACE MODULE

Purpose:

The starting point of the application, acting as a navigation hub for all the functionalities.

Description:

- The home page provides an intuitive and user-friendly interface, allowing users to navigate through various features such as dataset creation, preprocessing embeddings, training the model, and recognizing faces.
- Each functionality is displayed as a card with an icon and description for easy identification.
- Designed using Bootstrap for responsiveness and visual appeal.
- Accessible actions include: Create Dataset, Preprocess Embeddings, Train Model, Start Recognition, View Attendance, View Registered Students, Export Attendance.

2.CREATE DATASET MODULE

Purpose:

Enables registration of new students by capturing their facial images.

Description:

- This module provides a form where the user inputs their name and roll number.
- Upon submission, the frontend captures multiple images of the user via the webcam to create a dataset and the images are stored in a designated server directory, categorized by the user's unique roll number.

Key Features:

- Ensures that all required fields (name and roll number) are filled before submission.
- Captures images in a systematic format for easy labeling.
- Uses webcam integration for real-time image capture.

Technologies Used:

- HTML,Bootstrap and JS for the frontend form.Tensorflow.js for for face detection.
- Flask or similar backend frameworks for processing data and opencv for processing images

3.PREPROCESS EMBEDDINGS MODULE

Purpose:

Processes the collected facial images to generate embeddings, a prerequisite for model training.

Description:

- This module prepares the dataset by using a pre-trained deep learning model (Dlib) to extract numerical embeddings from the captured images.
- These embeddings represent the unique features of each individual's face and are saved for model training.

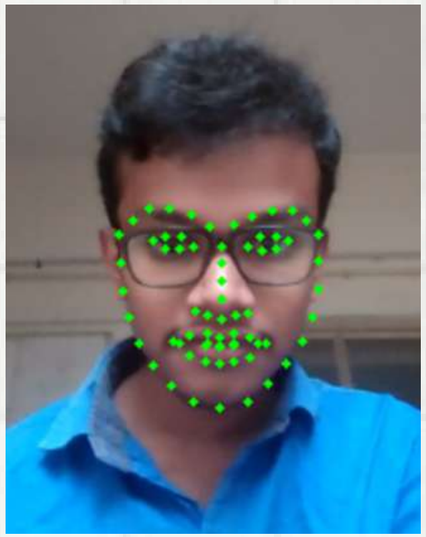
Key Features:

- Automates the conversion of raw images to embeddings.
- Ensures embeddings are labeled correctly for training.

Backend Functionality:

- Reads images from the dataset directory.
- Extracts embeddings using a face detection and feature extraction library.
- Saves embeddings in a structured format (pickle file).

3.PREPROCESS EMBEDDINGS MODULE



Landmark detection

```
Face detected at coordinates: [(259, 152) (366, 259)]
Facial Embedding for the detected face:
[-1.50715292e-01  3.84755135e-02  1.00359833e-02 -3.76454368e-02
 -3.10813691e-02 -5.46200722e-02 -1.44578405e-02 -1.37533933e-01
  1.84284508e-01 -5.46878465e-02  2.18457416e-01 -2.93429419e-02
 -1.76254913e-01 -1.67039037e-01  7.57173374e-02  1.15311220e-01
 -1.68847203e-01 -1.76148087e-01  7.57074729e-02 -8.00334588e-02
  5.34539782e-02 -7.44607002e-02  8.28164443e-02  1.06553420e-01
 -2.13236541e-01 -3.86804521e-01 -1.31740630e-01 -1.55580133e-01
  2.25274824e-02 -4.51006927e-02 -4.52773459e-03  1.46005899e-01
 -1.65447325e-01  2.67059617e-02  3.58228572e-04  1.81456417e-01
 -1.10534132e-02 -2.81990878e-02  2.41913840e-01 -6.80815578e-02
 -1.69250667e-01 -5.20609394e-02 -7.63168000e-03  2.43415684e-01
  1.74660683e-01 -1.58716086e-02  3.66955698e-02  2.04925202e-02
  5.54887988e-02 -1.38514549e-01  9.53798369e-02  1.47767022e-01
  1.25536531e-01  8.90141353e-03  5.07338420e-02 -1.47147506e-01
 -5.10001369e-03  3.80177759e-02 -1.78851113e-01  4.23197821e-03
 -1.60479359e-02 -1.27115130e-01  4.79880907e-03  2.51281913e-03
  2.79093713e-01  1.49635002e-01 -1.01308115e-01 -1.12187795e-01
  1.92550883e-01 -1.18411928e-01 -3.78707759e-02  3.67796198e-02
 -1.83305681e-01 -1.92736894e-01 -2.98490316e-01  7.10520968e-02
  3.12992841e-01  6.55961186e-02 -2.00513795e-01  9.30104107e-02
 -5.43954261e-02 -1.27210692e-02  6.67946115e-02  8.92598778e-02
 -1.02134250e-01  3.09961308e-02 -1.64364234e-01  4.10802588e-02
  1.80671379e-01 -3.99403535e-02 -7.79513568e-02  1.88885972e-01
 -4.75573391e-02  1.07724831e-01  6.25487268e-02  1.58871412e-02
 -1.39401825e-02  5.18190749e-02 -1.22513965e-01  1.67848691e-02
  1.14209607e-01 -6.45740032e-02 -2.33202707e-03  1.32761568e-01
 -1.76444471e-01  6.43958449e-02  3.08084637e-02 -9.51272156e-03
 -3.83866206e-02  6.46932051e-02 -1.96628645e-01 -8.88842344e-02
  1.29409403e-01 -2.97453046e-01  2.26260573e-01  1.63978219e-01
  9.57835559e-03  1.83093503e-01  8.73438045e-02  5.94494008e-02
  1.71391964e-02 -6.02574274e-02 -1.44731939e-01  2.91451551e-02
  1.17011547e-01  2.31384262e-02  5.01020923e-02  1.00425139e-01]
```

Embedding Generation

```
b'\x80\x04\x95\xbd\x04\x00\x00\x00\x00\x
x94\x8c\x07ndarray\x94\x93\x94K\x00\x85\
\x8c\x01<\x94NNNJ\xff\xff\xff\xffJ\xff\x
xfb\xc6\xd7\x9eY\x92?\x1e\x8a\x02}"O\x82
1jj\xd9Z_\xcc?\x99\r2\xc9\xc8Y\x88\xbfA\
9\xd9\x03\xad\xc0\x90\xbd\xbf\xc1\x8b\xb
\xa2?;\xdfO\x8d\x97n\xc2\xbf\x19\x1c%\xa
ad\xbf\x83\xdd\xb0mQf\xa3?\x81\x04\xc5\x
c\x91\xa9\xbf\x92?\x18x\xee=\xc8?\x19\xf
xfa\xd1?\xe8\xde\xc3%\xc7\x9d\xc2?\xc7.Q
```

Storing Embeddings in pickle file

4.TRAIN MODEL MODULE

Purpose:
Trains a machine learning classifier using the preprocessed embeddings.

Description:

- Uses the embeddings generated in the preprocessing step to train a classification model Support Vector Machine (SVM).
- The trained model is capable of distinguishing between individuals in the dataset.

Key Features:

- Automates the training process.
- Saves the trained model for real-time recognition.

Backend Functionality:

- Loads embeddings and their labels.
- Splits the data into training and testing sets for evaluation.
- Trains the classifier and evaluates its performance (e.g., accuracy or precision).

5.FACE RECOGNITION MODULE

Purpose:

Identifies registered users in real-time using a live webcam feed and records their attendance.

Description:

- Streams live webcam footage, detects faces, matches them with registered users, and records attendance with timestamps for recognized faces.

Key Features:

- Real-time recognition with visual feedback.
- Automatic recording of attendance upon successful recognition

Frontend Functionality:

- Detect faces in the webcam using blazeface model.
- Captures images and send to backend for processing.

Backend Functionality:

- Uses the trained model to predict the identity of detected faces.
- Records attendance in the database or a file.

6.ATTENDANCE RECORDS MODULE

Purpose:

Provides a tabular view of attendance records for all users.

Description:

- Displays the list of all attendance entries with the user’s name and timestamp.
- Features a table for easy viewing of large datasets.
- Allows users to navigate back to the home page for further actions.

Backend Functionality:

- Queries the attendance database or file for records.
- Renders the data dynamically using Flask and Jinja2 templates.

7.REGISTERED STUDENTS MODULE

Purpose:

Displays a list of all students registered in the system.

Description:

- Provides a table with student details, including serial number, name, roll number, and registration date.
- Ensures users can view all individuals whose datasets have been created.
- Features a "Back to Home" button for navigation.

Backend Functionality:

- Fetches and displays student data from the database or a directory structure.

8.EXPORT ATTENDANCE MODULE

Purpose:

Allows exporting of attendance data as a CSV file for reporting or integration.

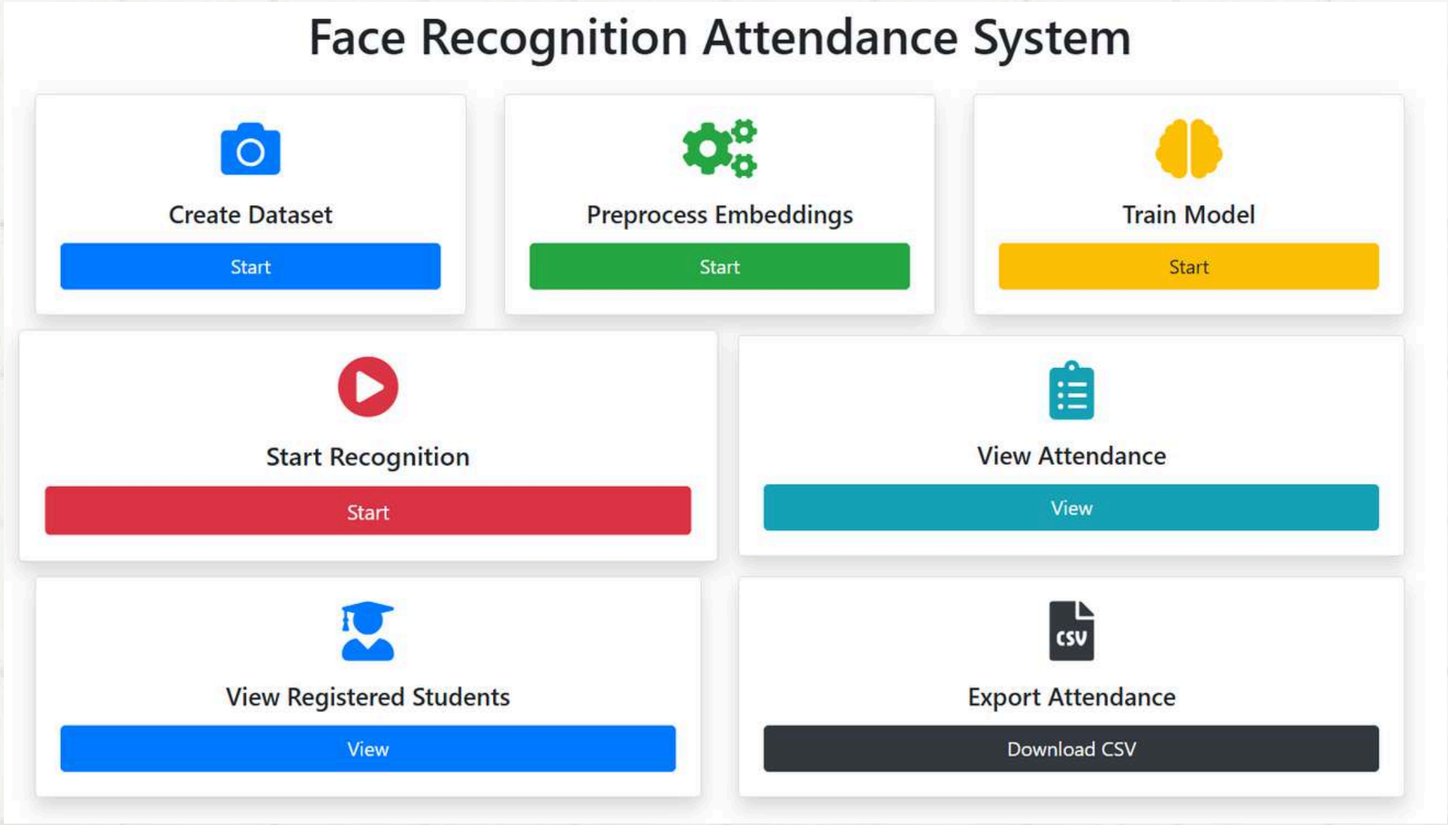
Description:

- Features a "Download CSV" button to export attendance data.
- Generates a structured CSV file with columns for Name, Roll Number, and Timestamp.

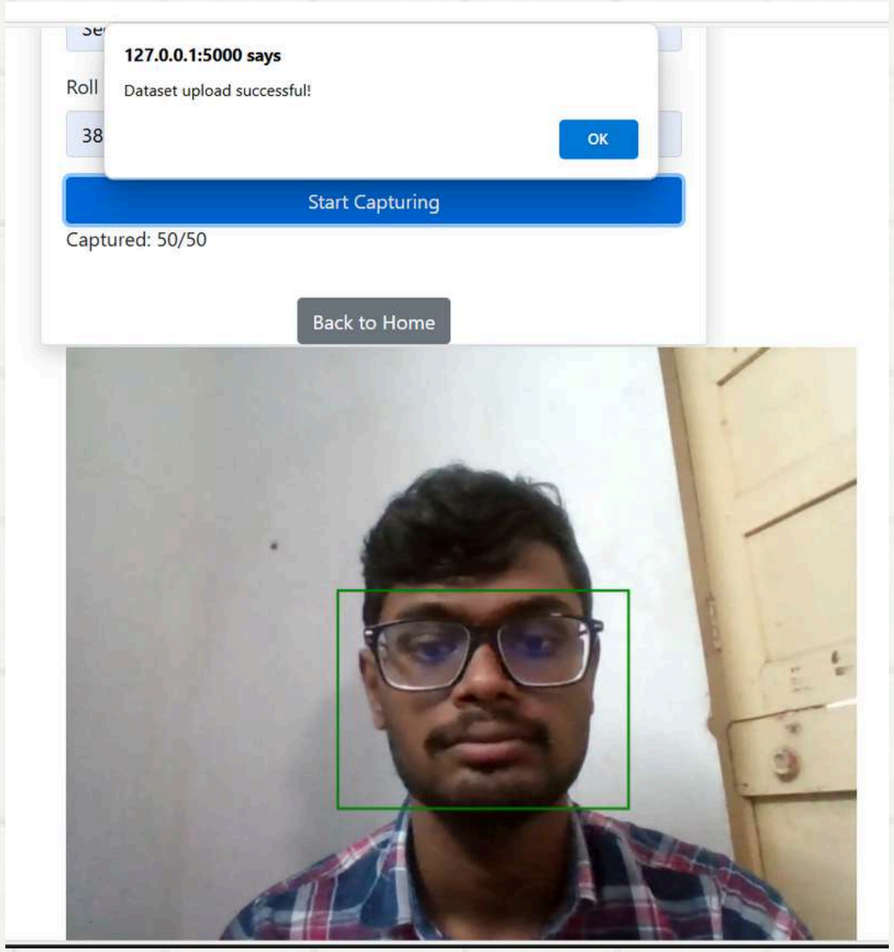
Backend Functionality:

- Reads attendance records from the database.
- Formats the data into CSV format using libraries like CSV.
- Provides the file for download.

OUTPUT



Home Page



Dataset Creation

OUTPUT

C:\Windows\System32\cmd.e

```
INFO:root:Processing image 61/150: dataset\Sedhu Ram\image_18.png
INFO:root:Processing image 62/150: dataset\Sedhu Ram\image_19.png
INFO:root:Processing image 63/150: dataset\Sedhu Ram\image_2.png
INFO:root:Processing image 64/150: dataset\Sedhu Ram\image_20.png
INFO:root:Processing image 65/150: dataset\Sedhu Ram\image_21.png
INFO:root:Processing image 66/150: dataset\Sedhu Ram\image_22.png
INFO:root:Processing image 67/150: dataset\Sedhu Ram\image_23.png
INFO:root:Processing image 68/150: dataset\Sedhu Ram\image_24.png
INFO:root:Processing image 69/150: dataset\Sedhu Ram\image_25.png
INFO:root:Processing image 70/150: dataset\Sedhu Ram\image_26.png
INFO:root:Processing image 71/150: dataset\Sedhu Ram\image_27.png
INFO:root:Processing image 72/150: dataset\Sedhu Ram\image_28.png
INFO:root:Processing image 73/150: dataset\Sedhu Ram\image_29.png
INFO:root:Processing image 74/150: dataset\Sedhu Ram\image_3.png
INFO:root:Processing image 75/150: dataset\Sedhu Ram\image_30.png
INFO:root:Processing image 76/150: dataset\Sedhu Ram\image_31.png
INFO:root:Processing image 77/150: dataset\Sedhu Ram\image_32.png
INFO:root:Processing image 78/150: dataset\Sedhu Ram\image_33.png
INFO:root:Processing image 79/150: dataset\Sedhu Ram\image_34.png
INFO:root:Processing image 80/150: dataset\Sedhu Ram\image_35.png
INFO:root:Processing image 81/150: dataset\Sedhu Ram\image_36.png
INFO:root:Processing image 82/150: dataset\Sedhu Ram\image_37.png
INFO:root:Processing image 83/150: dataset\Sedhu Ram\image_38.png
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INFO:root:Processing image 92/150: dataset\Sedhu Ram\image_46.png
INFO:root:Processing image 93/150: dataset\Sedhu Ram\image_47.png
INFO:root:Processing image 94/150: dataset\Sedhu Ram\image_48.png
```
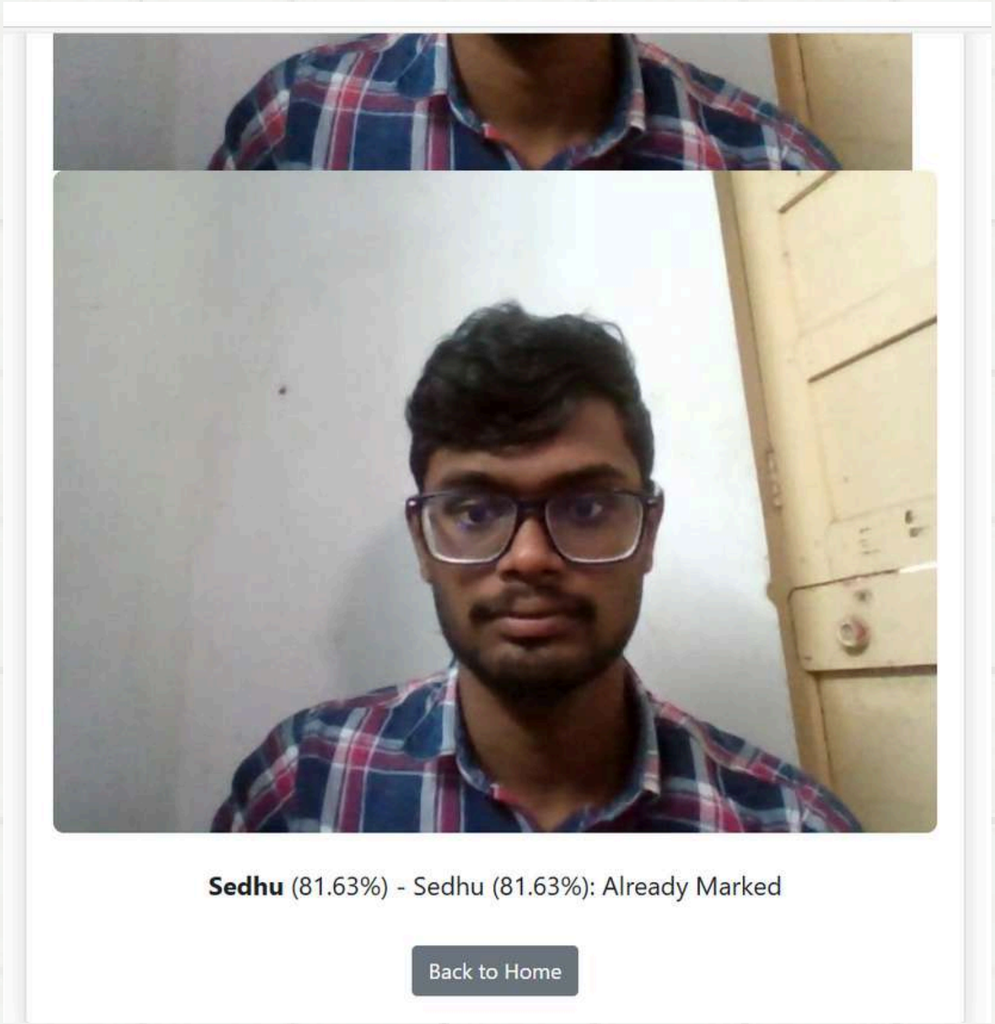
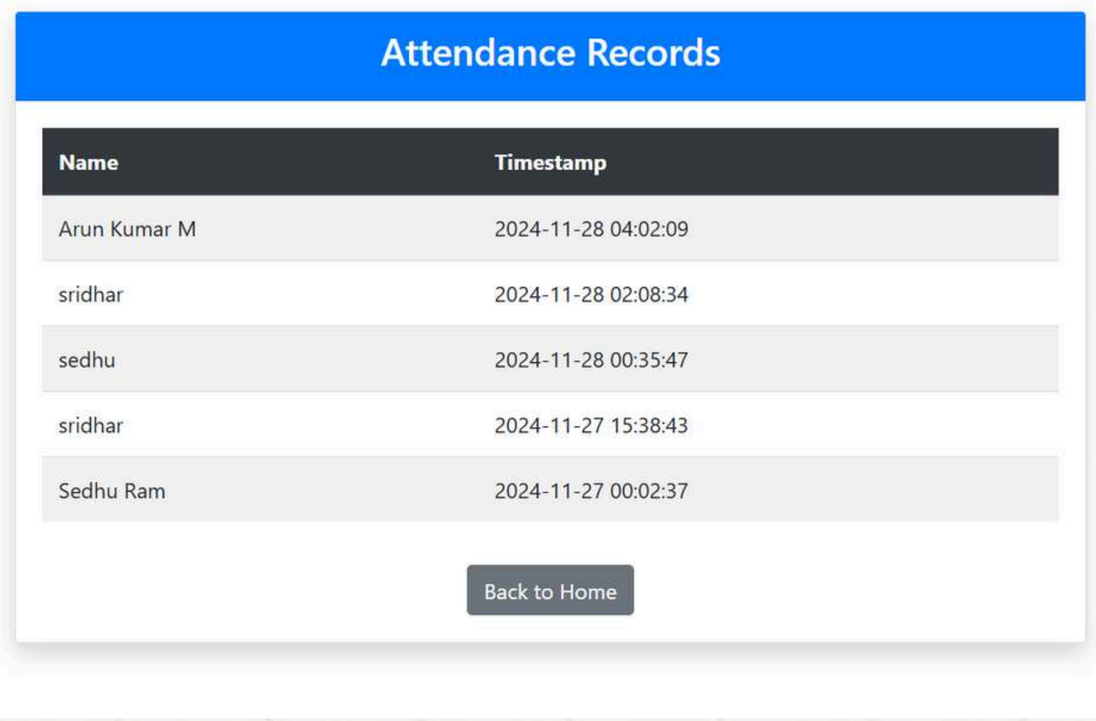

Preprocessing Embedding



Face Recognition and Attendance Marking

OUTPUT



Attendance Records

Name	Timestamp
Arun Kumar M	2024-11-28 04:02:09
sridhar	2024-11-28 02:08:34
sedhu	2024-11-28 00:35:47
sridhar	2024-11-27 15:38:43
Sedhu Ram	2024-11-27 00:02:37

Back to Home

Attendance Records

```
Training the SVM model...

Accuracy: 0.98

Classification Report:
                precision    recall  f1-score   support

      Abilash V       1.00      1.00      1.00        10
     Arunkumar M       0.91      1.00      0.95        10
     Arunkumar S       0.91      1.00      0.95        10
         Guru M        1.00      1.00      1.00        10
Jebin kamalesh I       1.00      1.00      1.00        10
     Logeshwaran       1.00      1.00      1.00        10
        Rakesh R       1.00      1.00      1.00        10
   Saravanakumar       1.00      1.00      1.00        10
     Sedhu Ram P       1.00      0.90      0.95        10
        Sridhar        1.00      1.00      1.00         9
   Tamizharasu M       1.00      1.00      1.00        10
      VIGNESH s        1.00      0.89      0.94         9
  Vijaya gopal A       1.00      1.00      1.00        10

       accuracy                           0.98       128
      macro avg       0.99      0.98      0.98       128
   weighted avg       0.99      0.98      0.98       128
```

Accuracy

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Thank you