Automated Attendance System using Face Recognition

Project Guide:

Mr.Vijay Prakash

Ms. Pooja Jain

Mr. Romil Rawat

Presented By:

Aryan Das (16010BTCS00405)

Ashutosh Sharma (16010BTCS00403)

Falansh Solanki (1601DMTCS0849)

Abstract

- The conventional method of taking attendance is done manually by the teacher or the administrator which requires considerable amount of time and efforts also involving errors and proxy attendance.

- As the number of students are increasing day by day, it is a challenging task for universities or colleges to monitor and maintain the record of the students.

- To overcome these issues, biometric feature like facial recognition can be used which involves the phases such as image acquisition, face detection, feature extraction, face classification, face recognition and eventually marking the attendance.

- The algorithms like Viola-Jones and HOG features along with SVM classifier are used to acquire the desired results. Various real time scenarios are needed to be considered such as scaling, illumination, occlusions and pose.

- The problem of redundancy in manual records and keeping attendance is solved by this system.

Content

- Objective
- Concept
- Working
- Methodology
- Viola Jones Algorithm
- Face Recognition Approach
- System Implementation
- Results and Analysis
- Pros and Cons
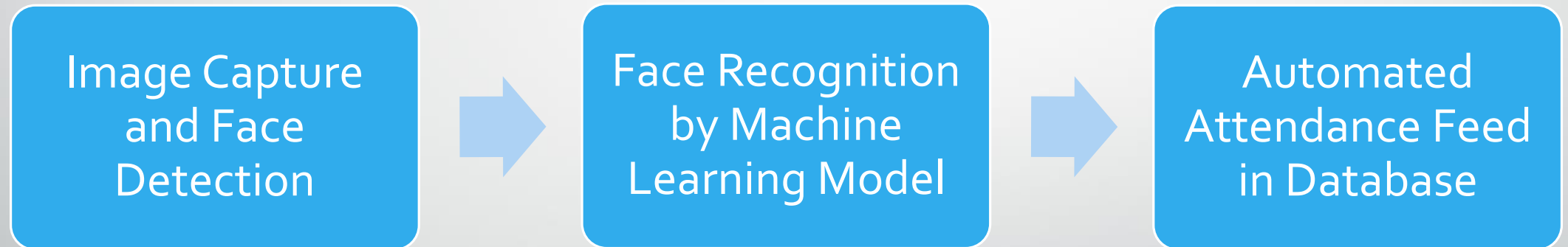- Future Enhancements
- Future Scope and Conclusion

Objective

In this project we aim to build an Attendance marking system with the help of facial recognition owing to the difficulty in the manual as well as other traditional means of attendance system

Concept

Automated Attendance System has been envisioned for the purpose of reducing the errors that occur in the traditional (manual) attendance taking system. The aim is to automate and make a system that is useful to the organization such as an institute. The efficient and accurate method of attendance in the office environment that can replace the old manual methods. This method is secure enough, reliable and available for use. No need for specialized hardware for installing the system in the office. It can be constructed using a camera (preferably CCTV) and computer.

Working of our Web Application

| Image Capture and Face Detection | → | Face Recognition by Machine Learning Model | → | Automated Attendance Feed in Database |

Methodology

- Camera captures the image of a classroom
- The faces are detected and cropped
- Cropped images are processed using Fisher face recognition algorithm
- The students whose faces are recognized are marked as present and the results are transferred to an excel sheet automatically.
- If any student whose face is not recognized, then their attendance can be entered manually.
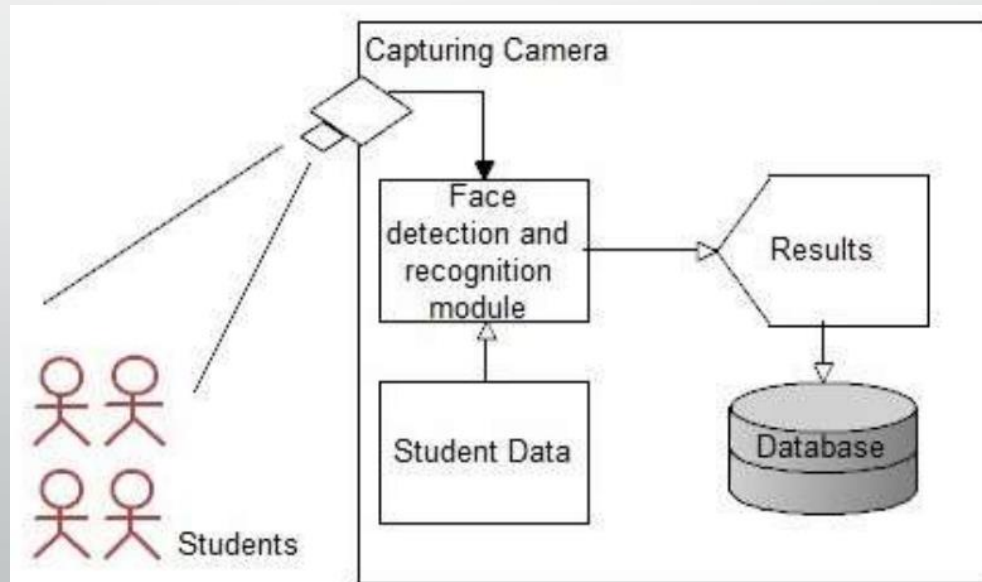
Viola-Jones Algorithm

- This is used for face detection process

- Three basic steps of algorithm

  - Integral image for feature computation

  - Adaboost algorithm for feature selection

  - Cascade classifiers

- These are applied directly by OpenCV library.

Integral Image Feature Computation

- First step of the Viola-Jones face detection algorithm is to turn the input image into an integral image. This is done by making each pixel equal to the entire sum of all pixels above and to the left of the concerned pixel.

- Input Image

  1 1 1

  1 1 1

  1 1 1

- Integral Image

  1 2 3

  2 4 6

  3 6 9
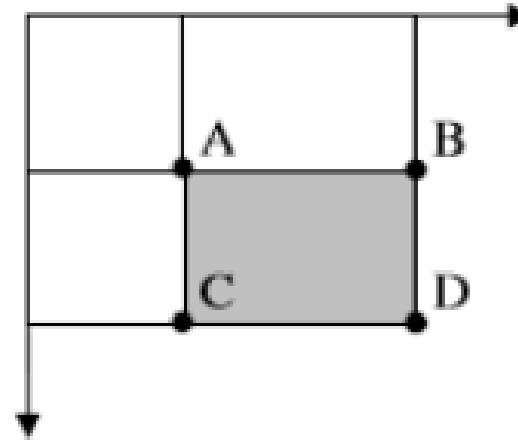
Sum of gray value = D-(B+B) + A

Adaboost Algorithm

- AdaBoost is a machine learning boosting algorithm capable of constructing a strong classifier through a weighted combination of weak classifiers. A weak classifier is mathematically described as:

    h(x,f,p,t)=1 pf(x)>t

    0 else

- Where x is a 24*24 pixel sub-window, f is the applied feature, p the polarity and t the threshold that decides whether x should be classified as a positive (a face) or a negative (a non-face)..

Cascade Classifiers

- Instead of finding faces, the algorithm discards those inputs, which are not faces.
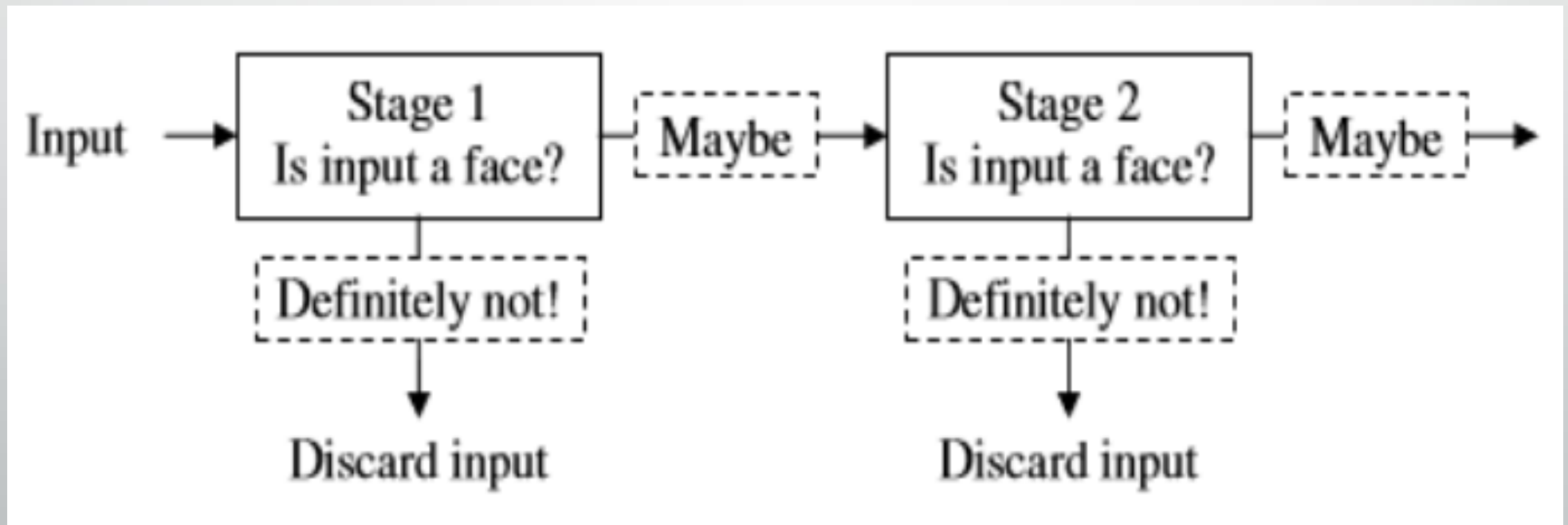
Face Recognition Approach: FisherFace

- Face is a typical multidimensional structure and needs good computational analysis for recognition.

- Many face features make development of facial recognition systems difficult.

- This problem is solved by the method called Principal Component Analysis or so called fisher face approach.

- This approach transforms faces into a small set of essential characteristics, fisherfaces, which are the main components of the initial set of learning images (training set).

- Recognition is done by projecting a new image in the fisherface subspace, after which the person is classified by comparing its position in fisherface space with the position of known individuals.

System Implementation
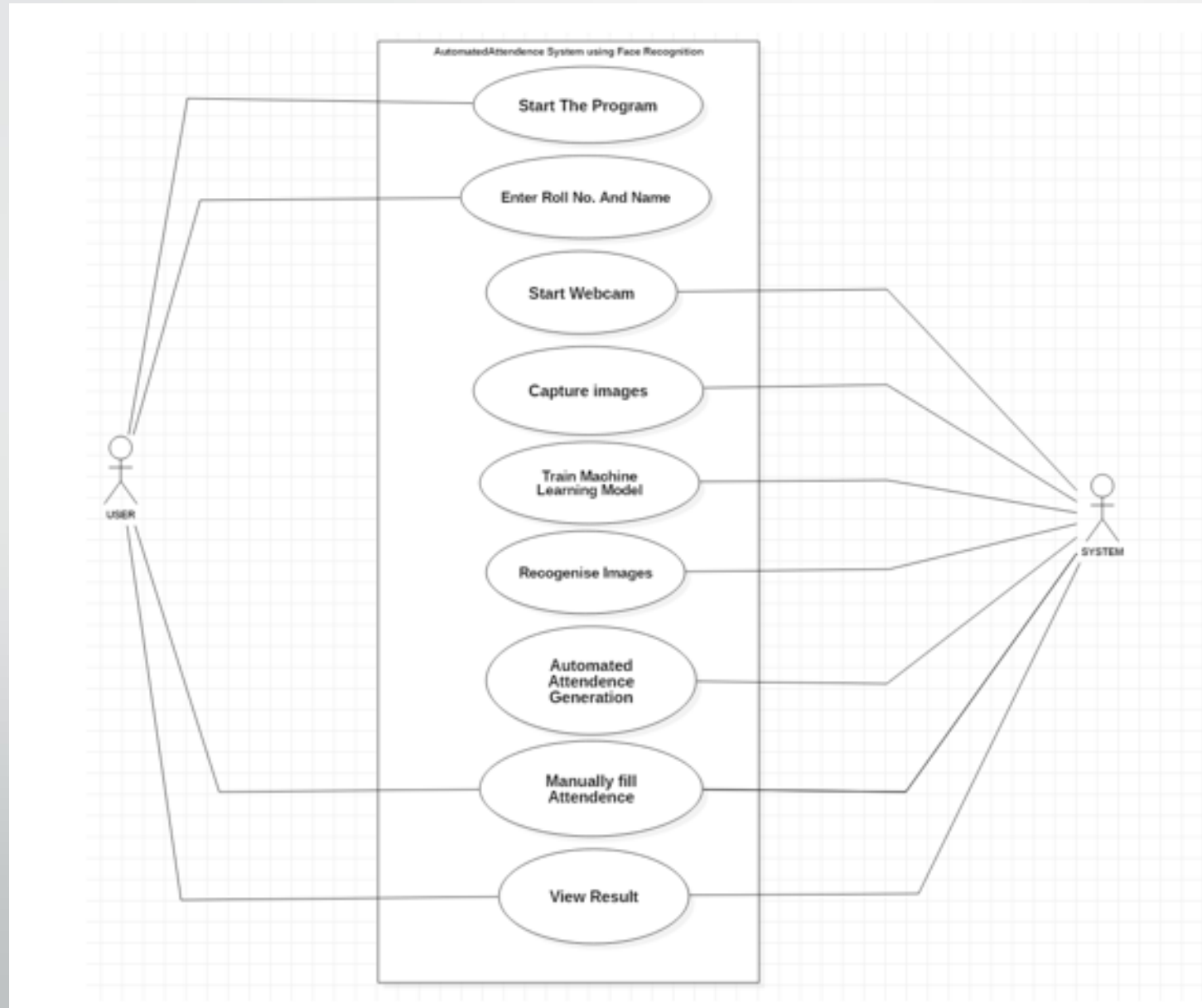
Use Case Diagram

System Implementation
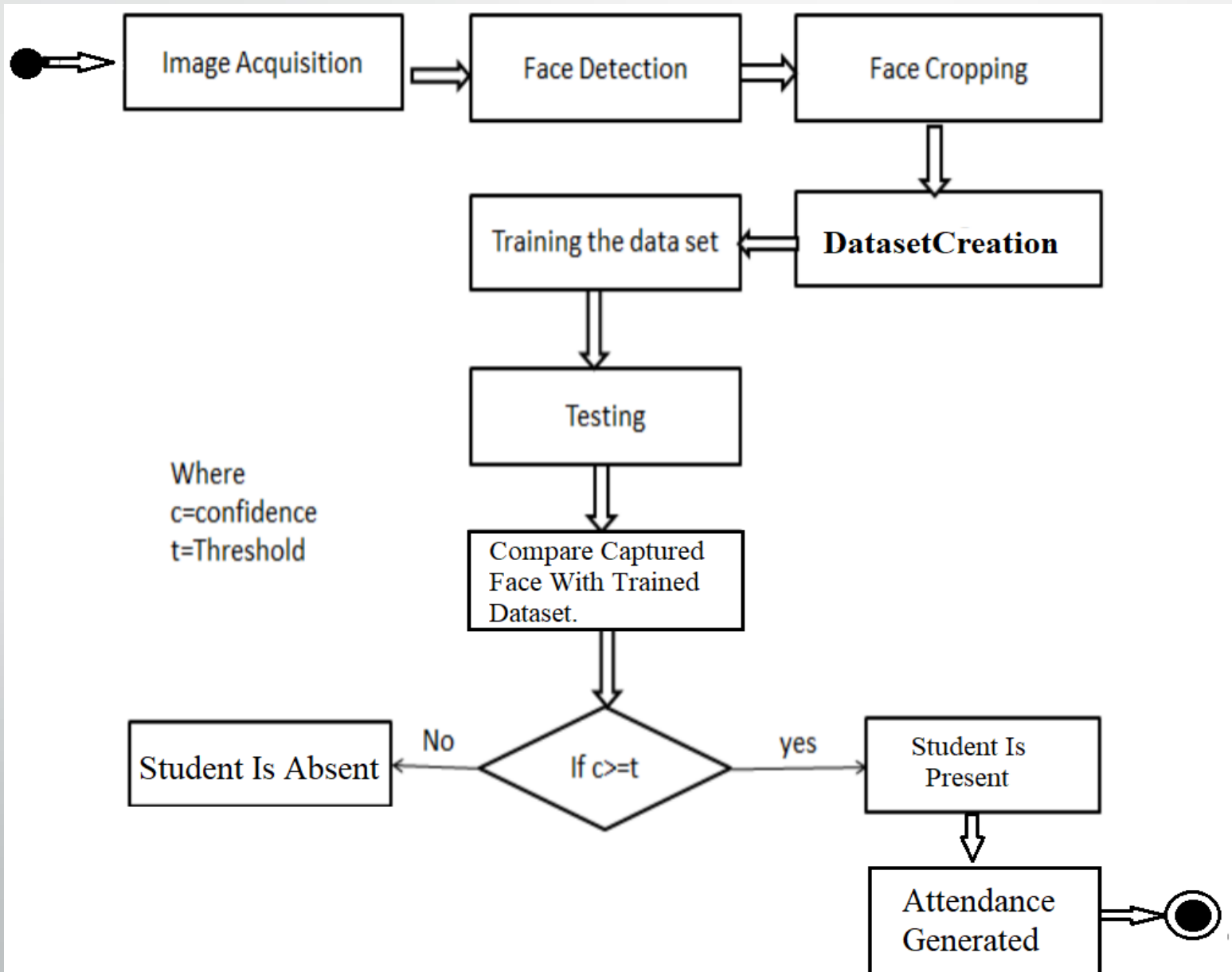
Activity Diagram
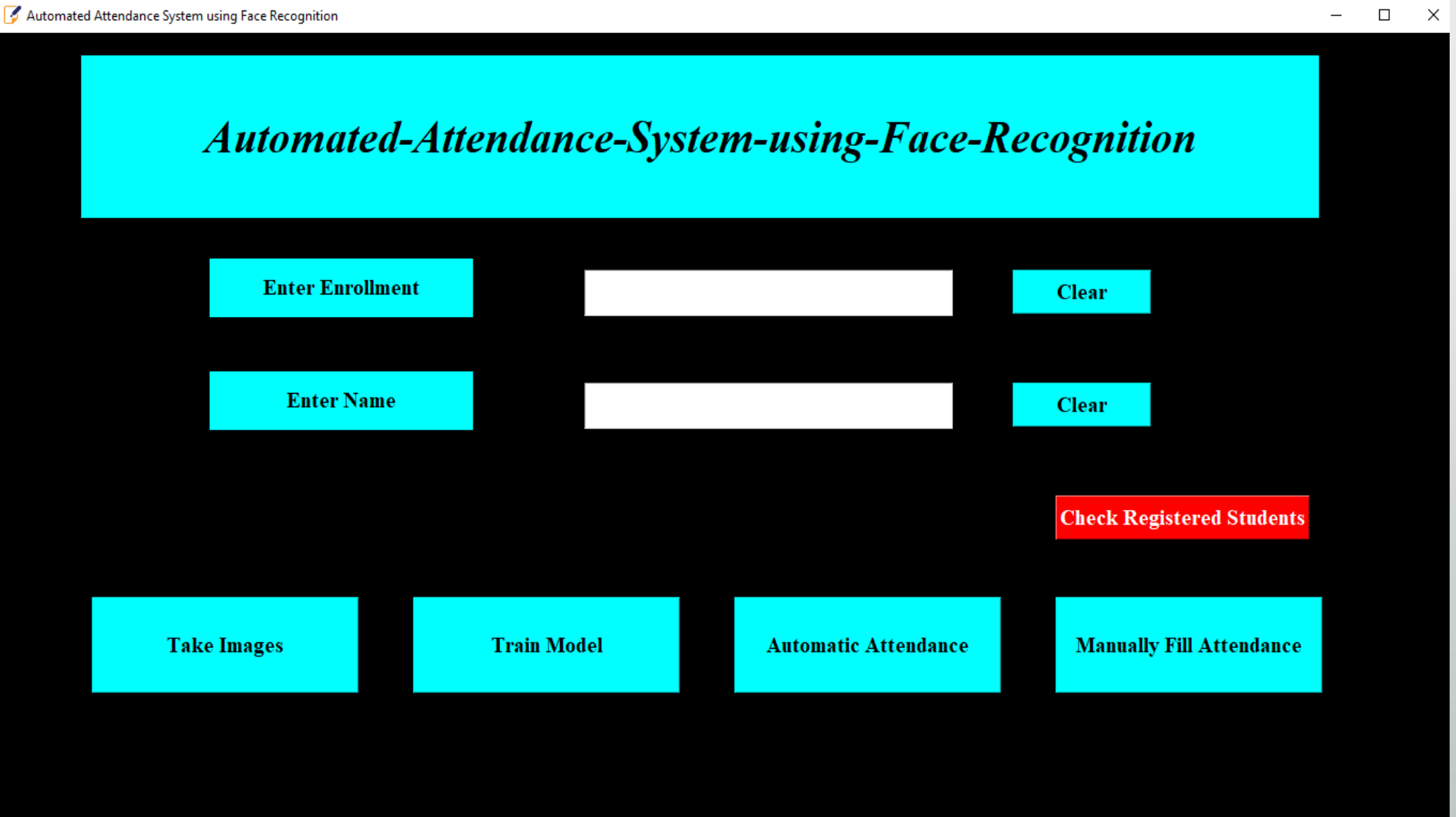
System Implementation
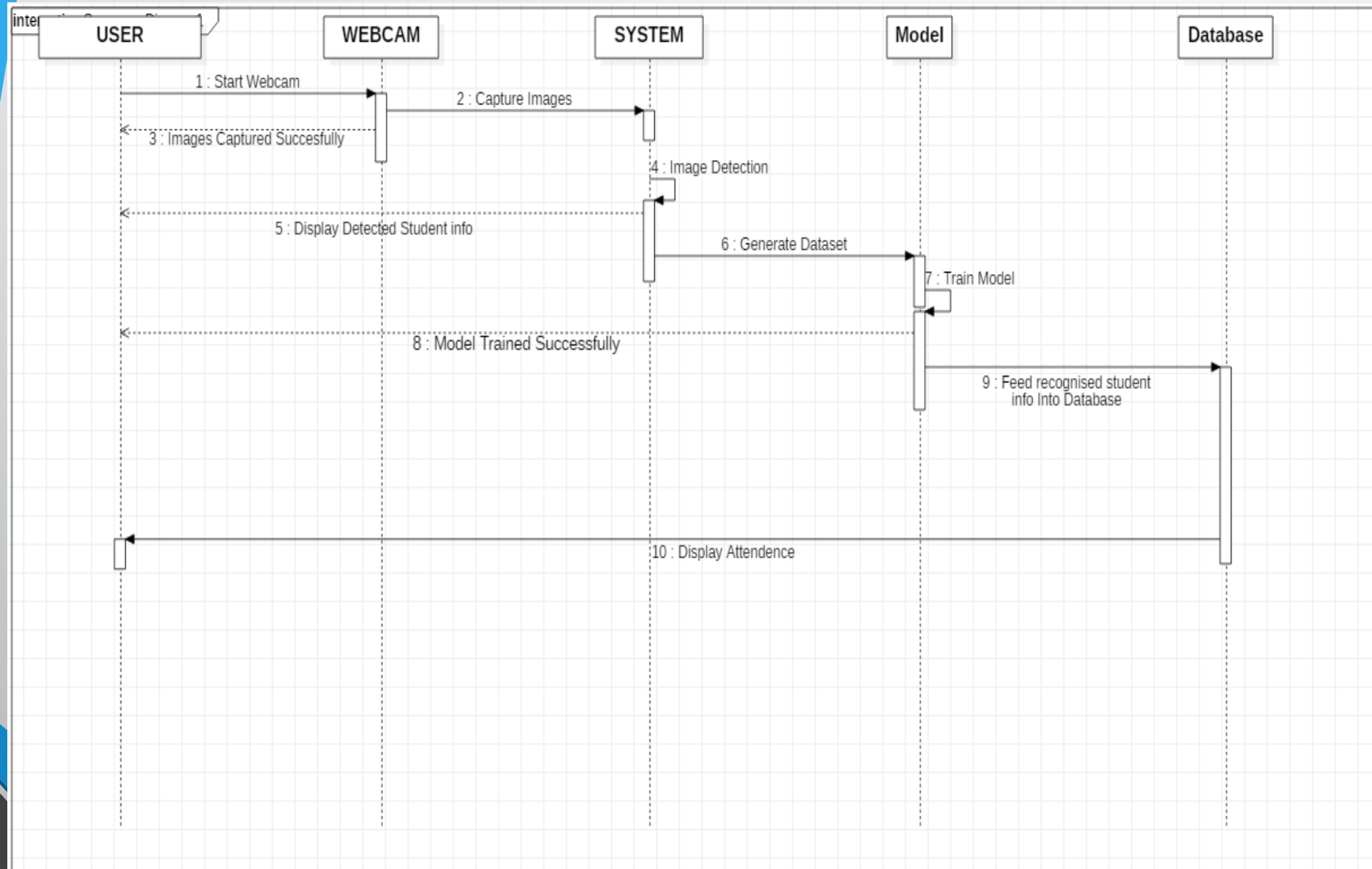
Sequence Diagram

Results and Analysis

- Graphical User Interface

Results and Analysis

- Image Capturing, Face Detection and Image Cropping for the entered Enrollment No & Name
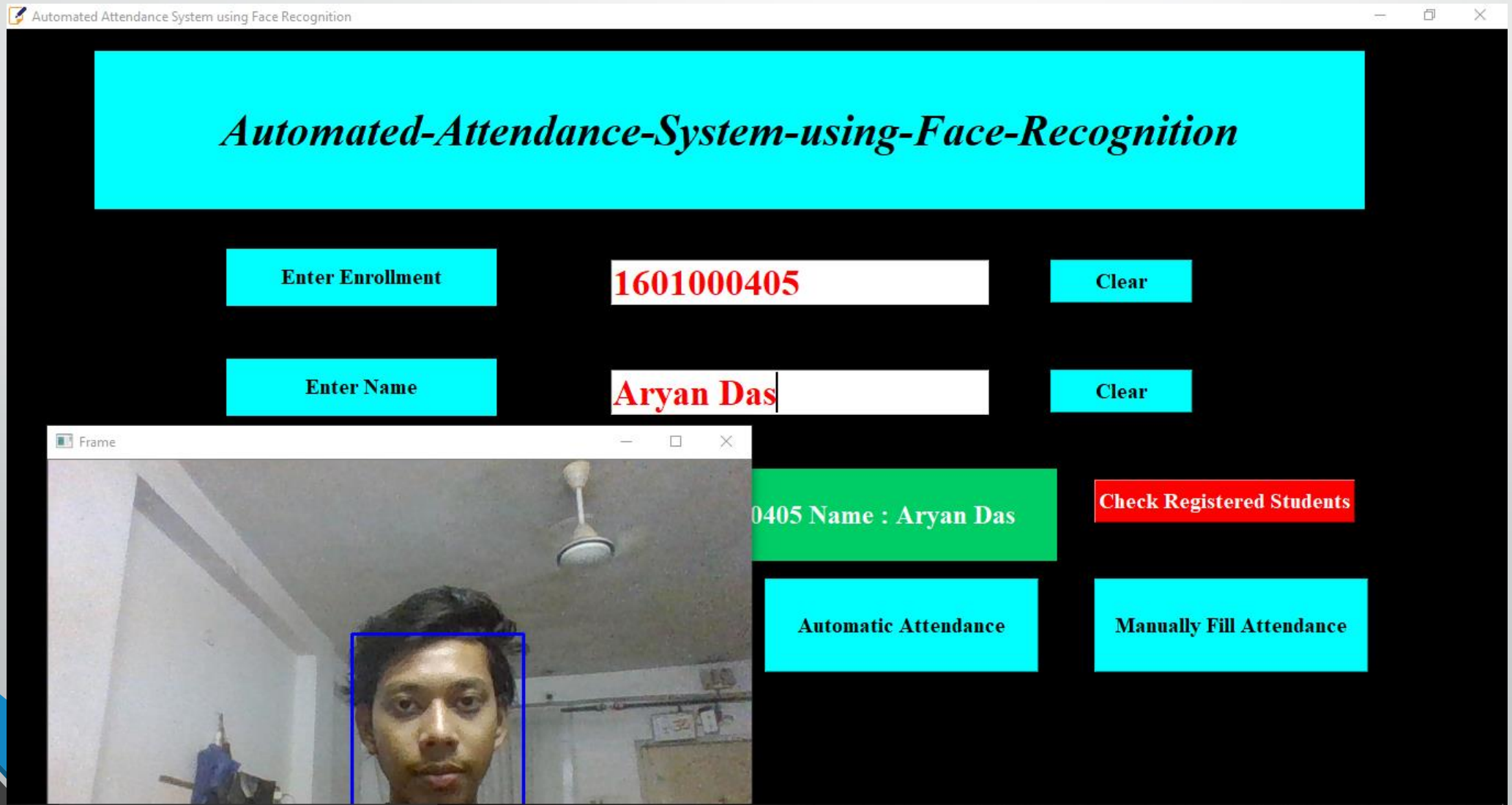
Results and Analysis

- Generated Datasets
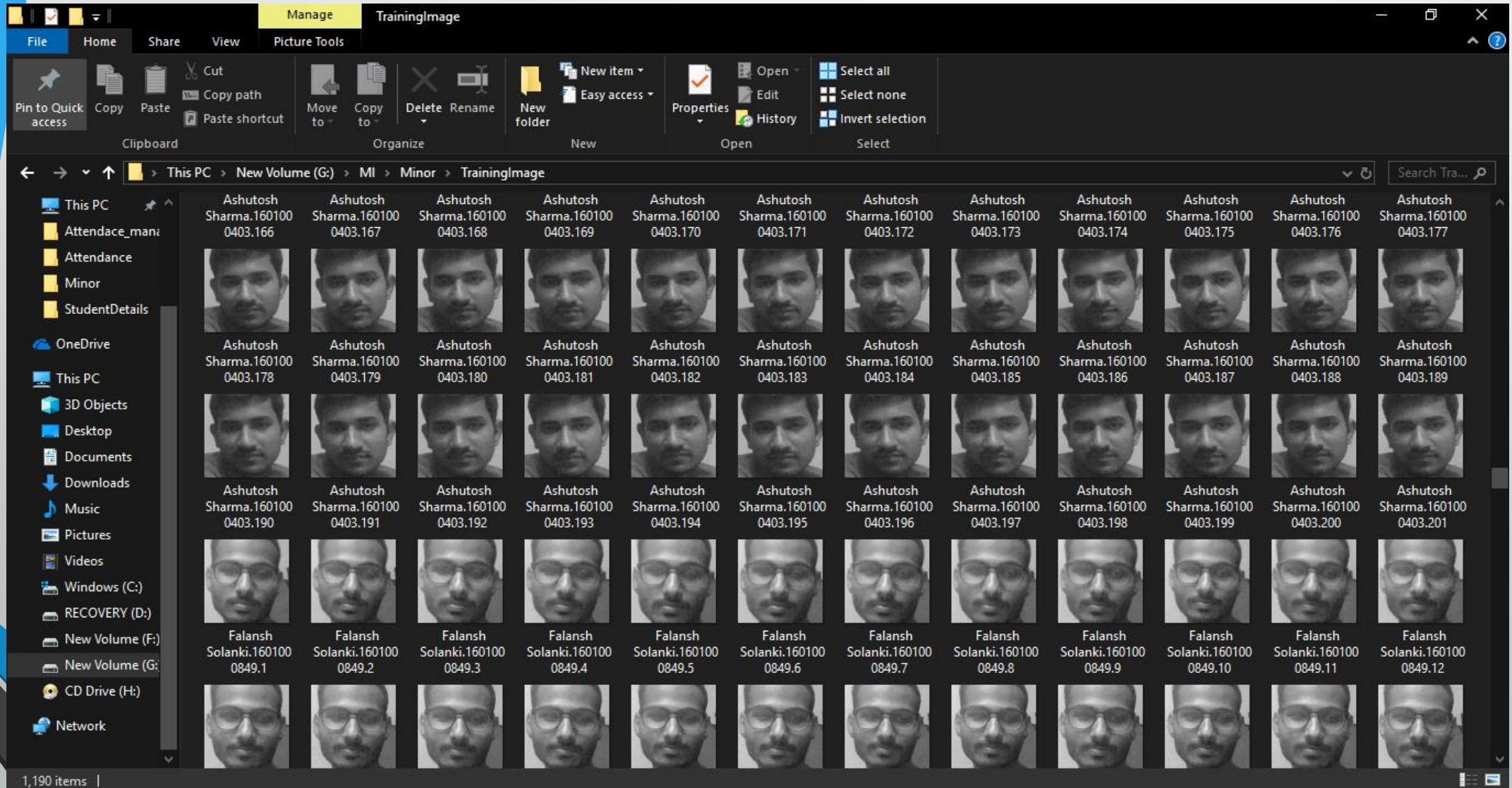
Results and Analysis

- Training the Model on the generated dataset

Results and Analysis

- Automated Attendance Generation

Results and Analysis

- Manual Attendance Addition for Unrecognized faces

Results and Analysis

- Generated Attendance Output in MS Excel

Results and Analysis

- Automated Attendance Feed in Database

Pros and Cons

- Pros
  - Easy integration
  - Simple algorithm
  - Easy to use output format
  - Proxy attendance is eliminated
  - Saves time
- Cons
  - Sensitive to lighting variations
  - Distance required for detection from camera is short
  - Booting Time of Web App is High

Future Enhancement Suggestions

- The speed can be further enhanced .

- The distance limit up to which the camera would be able to recognize faces can be increased.

- The data set used to train the model can be further improvised by adding more samples corresponding to each face. This would increase the accuracy.

Future Scope

The system we have developed has successfully able to accomplish the task of marking the attendance in the classroom automatically and output obtained in an excel sheet as desired in real time. Another important aspect where we can work is towards creating an online data base of the attendance and its automatic updating, keeping in mind growing popularity of internet of things.

Conclusion

In the system we have implemented an attendance system for a lecture, section or laboratory by which lecturer or teaching assistant can record student attendance. Its saves time and effort, especially if it is a lecture with huge number of students.

Thanks!