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ABSTRACT

The **Advance Face Recognition Student Attendance System** is a Python project that leverages OpenCV and Tkinter GUI to create an efficient attendance management system. Key features include real-time face detection, student management (including saving, updating, and deleting student records), training photo samples, taking attendance through face detection, generating attendance reports in Excel files and SQLite databases, and providing a developer page and help desk.

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1.1 Introduction about Face Recognition Student Attendance System

The Face Recognition Student Attendance System is a modern, efficient, and reliable solution designed to automate the process of student attendance in educational institutions. It leverages the power of face recognition technology to identify students and record their attendance.

This system aims to replace traditional methods of attendance tracking, such as manual roll calls or sign-in sheets, which can be time-consuming and prone to errors. By using face recognition technology, the system ensures a high level of accuracy and security, reducing the possibility of attendance fraud.

The Face Recognition Student Attendance System operates by capturing and processing images of students' faces, then comparing them to a database of registered students. The system uses sophisticated algorithms to analyze facial features and match them to the stored data, ensuring that each student's attendance is recorded correctly.

This system not only streamlines the attendance process but also frees up valuable time for educators, allowing them to focus more on teaching and less on administrative tasks. Furthermore, it provides a reliable record of attendance data, which can be useful for tracking student participation and performance over time.

In conclusion, the Face Recognition Student Attendance System represents a significant advancement in educational technology, offering a blend of efficiency, accuracy, and convenience that traditional methods cannot match. As technology continues to evolve, systems like these will undoubtedly play an increasingly important role in educational settings.

1.2 Motivation

The motivation for implementing a Face Recognition Student Attendance System from the need to enhance efficiency, accuracy, and security in educational institutions. Traditional methods of attendance tracking, such as roll calls or sign-in sheets, are time-consuming and disrupt the flow of classes. An automated system significantly reduces the time spent on these tasks, allowing educators to focus more on teaching. The integration of advanced technology like face recognition in everyday processes is a step towards digital transformation in education. It not only modernizes the education system but also familiarizes students with the use of technology, preparing them for the digital future.

1.3 Business Need

Business Need for a Face Recognition Student Attendance System, Manual attendance systems are time-consuming and prone to errors. A face recognition system automates the process, saving time and reducing errors. The system allows for real-time attendance tracking, enabling immediate identification of absentees. Over time, the system can prove to be cost-effective by reducing the manpower and resources required for manual attendance tracking.

1.4 Scope

The scope of a Face Recognition Student Attendance System extends to various areas:

Educational Institutions: The primary application is in schools, colleges, and universities for daily attendance tracking of students.

Examination Centers: The system can be used to verify the identity of students during examinations, preventing impersonation

Data Analysis and Reporting: The system can generate various reports and analytics based on attendance data, useful for administrative decision-making. The scope is not limited to these areas and can be expanded based on the specific needs of the institution and advancements in face recognition technology. It's important to note that the implementation of such a system should comply with privacy laws and regulations, and ethical considerations should be taken into account

1.5 Real world Application

Real-World Applications of a Face Recognition Student Attendance System
- **Automated Attendance**: The system can automate the process of attendance marking, reducing manual effort and errors. It can also save time, allowing more focus on academic activities.
- **Security Enhancement**: By monitoring the entry and exit of students, the system can enhance the security of educational institutions. It can also help in identifying unauthorized individuals.
- **Resource Management**: By tracking the usage of facilities like libraries and laboratories, the system can aid in better resource management and planning.
- **Student Behavior Analysis**: By analyzing attendance patterns, the system can help identify students who may be at risk due to frequent absences. This can enable early intervention and support.
- **Integration with Other Systems**: The attendance data can be integrated with other systems like Learning Management Systems (LMS), Student Information Systems (SIS), etc. This can provide a comprehensive view of student activities and performance.

1.6 Survey of existing System

As we analyzed these research papers and got the major idea that most of them used CNN as their technology. Some of them had limitation and some of them had proper approach. Authors in this proposed a method to automate the attendance system by integrating the face recognition technology using Eigen face database and Principal Component Analysis (PCA) algorithm with MATLAB GUI. The architecture of the system first, captures the student image, pre- process it, applied Eigenface generated database then test the captured face image with Eigenface image. When the similarity distance test scored more than the threshold value of 0.3 then the face was not recognized finally attendance marking, was stored in a Microsoft Excel sheet integrated with the MATLAB GUI. The original face database consists of images for 15 persons each has 10 images with different position and direction.

1.7 Limitation of existing system or Research gap

It is developed for a particular system so we implement this library OpenCV does not provide the same ease of use when compared to MATLAB. OpenCV has a flann library of its own. This causes conflict issues when you try to use OpenCV library with the PCL library.

2. PROBLEM STATEMENT

To develop an automated attendance system using face recognition. Concept In a classroom with large number of students, it is a very tedious and time-consuming task to take the attendance manually. Therefore, we can implement an effective system which will mark the attendance of students automatically by recognizing their faces. The process of this face recognition system is divided into various steps, but the important steps are detection of face and recognition of face. Firstly, to mark the attendance of students, the image of students' faces will be required. This image can be snapped from the camera device, which will be placed in the classroom at a suitable location from where the whole classroom can be covered. This image will act as input to the system. For the effective face detection, the image needs to be enhanced by using some image processing techniques like grayscale conversion of image and histogram equalization. To identify the students sitting on the last rows neatly, the histogram equalization of image needs to be done. Hence, there is a need to develop a real time operating student attendance system which means the identification process must be done within defined time constraints to prevent omission. The extracted features from facial images which represent the identity of the students have to be consistent towards a change in background, illumination, pose and expression. High accuracy and fast computation time will be the evaluation points of the performance.

3. OBJECTIVES

To identify the student faces accurately. To mark the attendance automatically. To reduce the time and the efforts required for manual attendance to provide a valuable attentive system for both teacher and students. It provides flexibility and reduces the time loss. There will be no chance for a proxy. The objective of this project is to develop face recognition based automated student attendance system. Expected achievements in order to fulfill the objectives are:

• To detect the face segment from the video frame.

• To extract the useful features from the face detected.

• To classify the features in order to recognize the face detected.

• To record the attendance of the identified student.

| Image acquisition from video frame | → | Face detection | → | Feature extraction | → | Face recognition | → | Attendance |
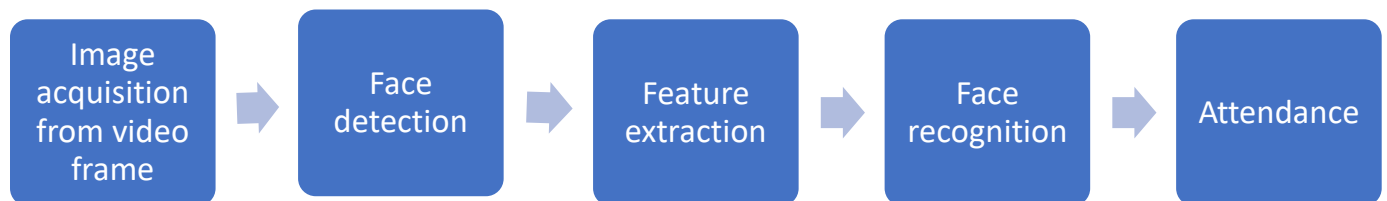
4. PROPOSED SYSTEM

All the students of the class must register themselves by entering the required details and then their images will be captured and stored in the dataset. During each session, faces will be detected from live streaming video of classroom. The faces detected will be compared with images present in the dataset. If match found, attendance will be marked for the respective student. The task of the proposed system is to capture the face of each student and to store it in the database for their attendance. The face of the student needs to be captured in such a manner that all the feature of the students' face needs to be detected, even the seating and the posture of the student need to be recognized. There is no need for the teacher to manually take attendance in the class because the system records a video and through further processing steps the face is being recognized and the attendance database is updated.

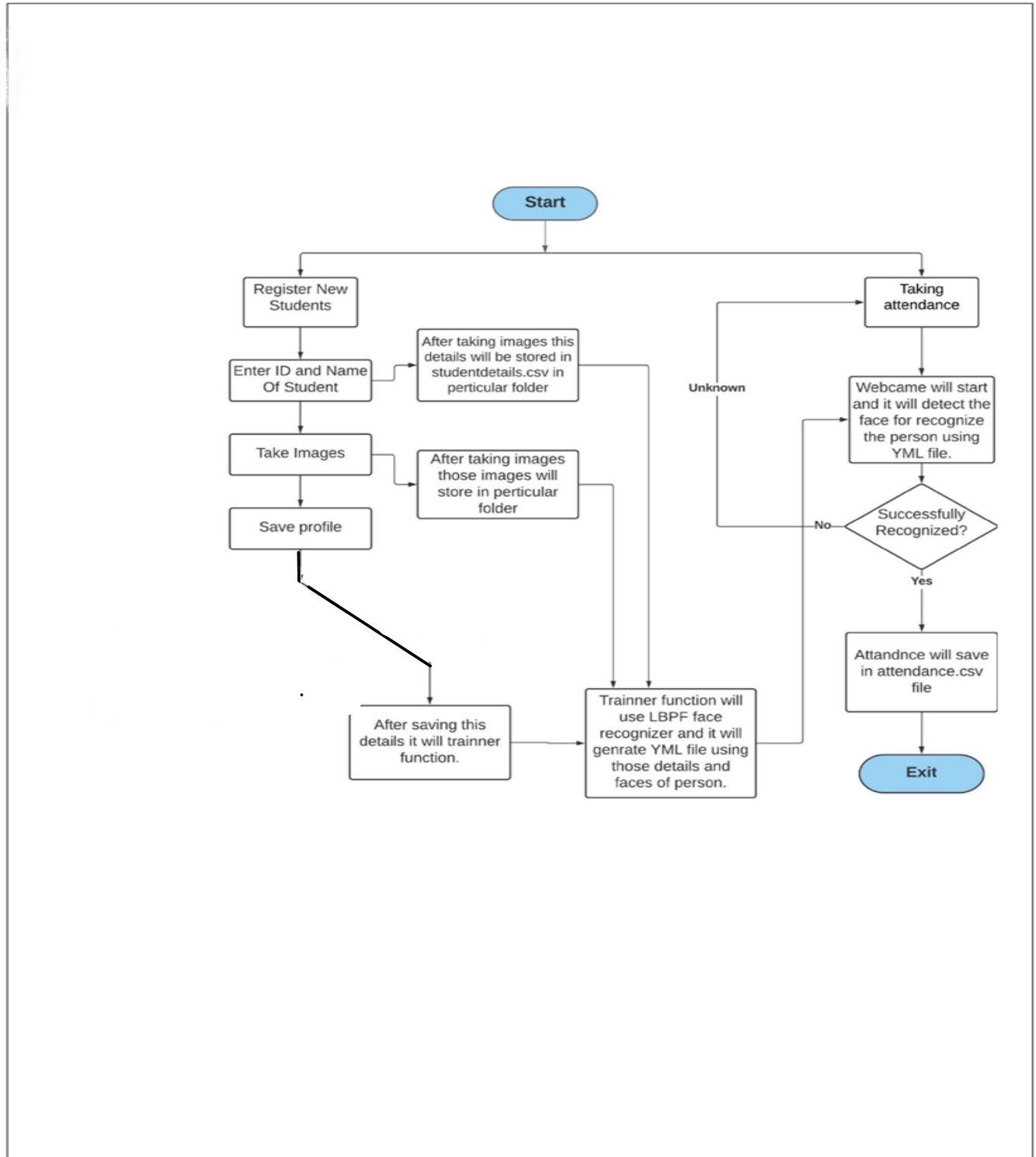## 4.1 Details of Hardware and Software

5.1.1 Hardware requirements

• Laptop with 8 GB RAM or above

• Camera 720p or above

5.1.2 Software requirements

• Visual Studio Code

• Microsoft Office

• Tkinter

5. Design Details

### System Flow / System Architecture

6. Analysis/Framework/Algorithm

Haar Cascade Algorithm : -

The first step is to collect the Haar features. A Haar feature is essentially calculations that are performed on adjacent rectangular regions at a specific location in a detection window. The calculation involves summing the pixel intensities in each region and calculating the differences between the sums. Here are some examples of Haar features below.

(a) Edge Features

(b) Line Features

(c) Four-rectangle features
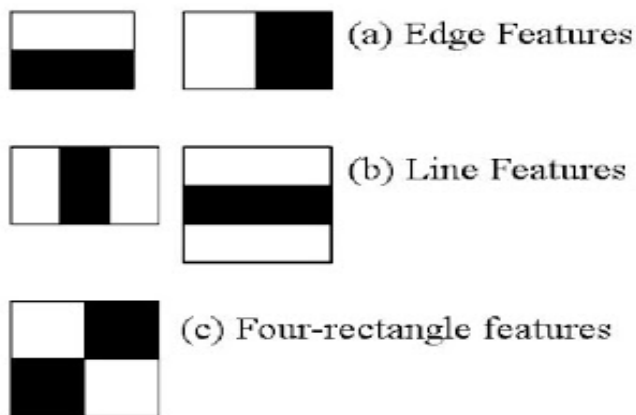
LBPH Algorithm : -

Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number. It has further been determined that when LBP is combined with histograms of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets.
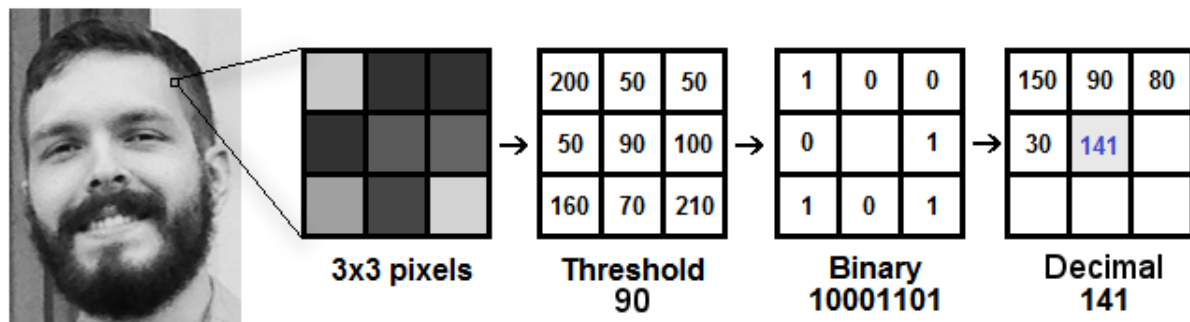
OpenCV Library :-

OpenCV (Open-Source Computer Vision Library) is an open-source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

NumPy package :-

NumPy is a Python package which stands for 'Numerical Python'. It is the core library for scientific computing, which contains a powerful n-dimensional array object, provide tools for integrating C, C++ etc. It is also useful in linear algebra, random number capability etc.

Pandas Library :-

Pandas is a high-level data manipulation tool developed by Wes McKinney. It is built on the NumPy package and its key data structure is called the Data Frame. Data Frames allow you to store and manipulate tabular data in rows of observations and columns of variables.

Tkinter Module :-

Tkinter is the standard GUI library for Python. Python when combined with Tkinter provides a fast and easy way to create GUI applications. Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit

Time Module :-

Python has a module named time to handle time related task. To use functions defined in the module, we need to import the module first.

Date Time Module :-

A date in python is not a date type of its own, but we can import a module named date time work with dates as a date objects
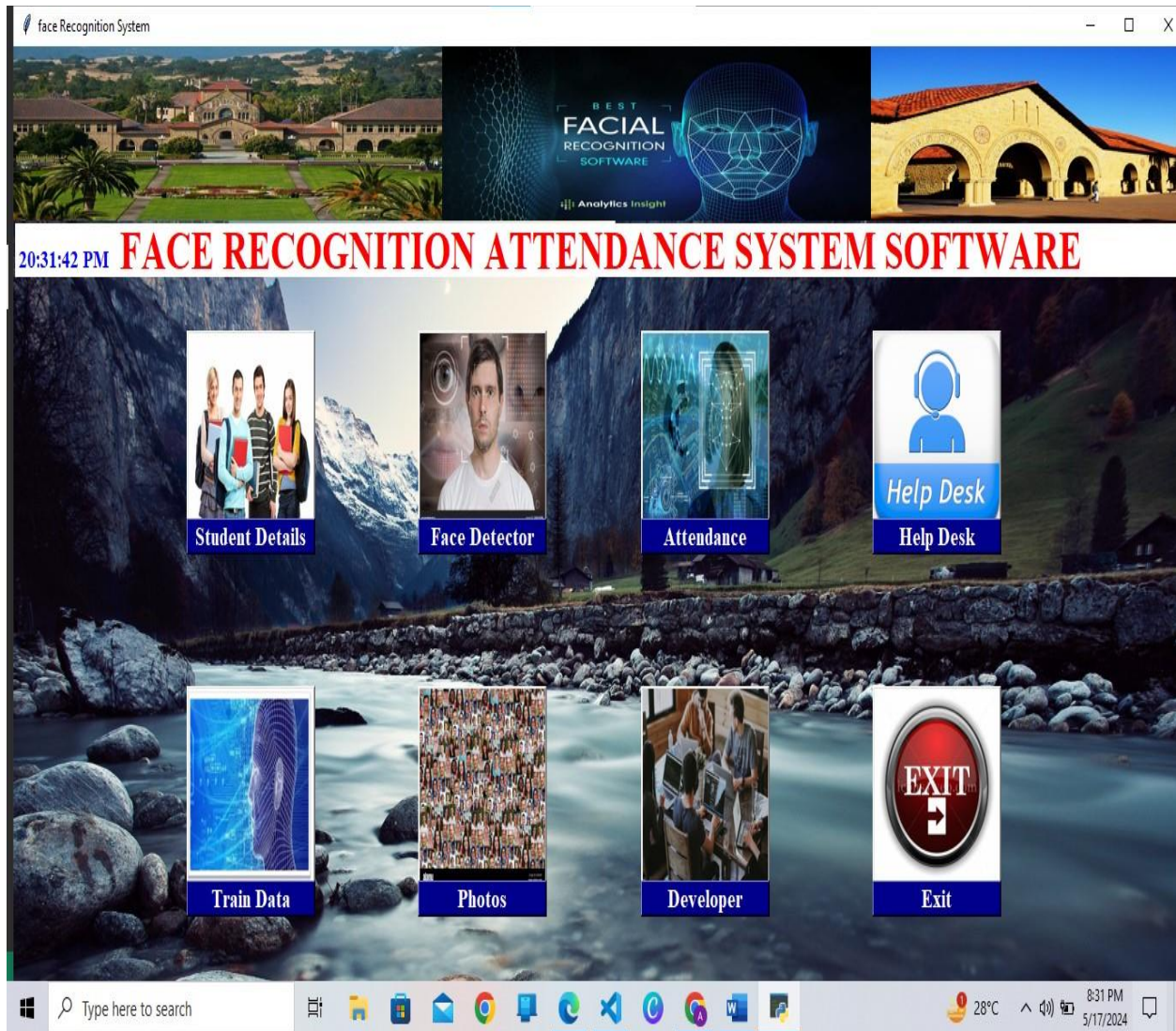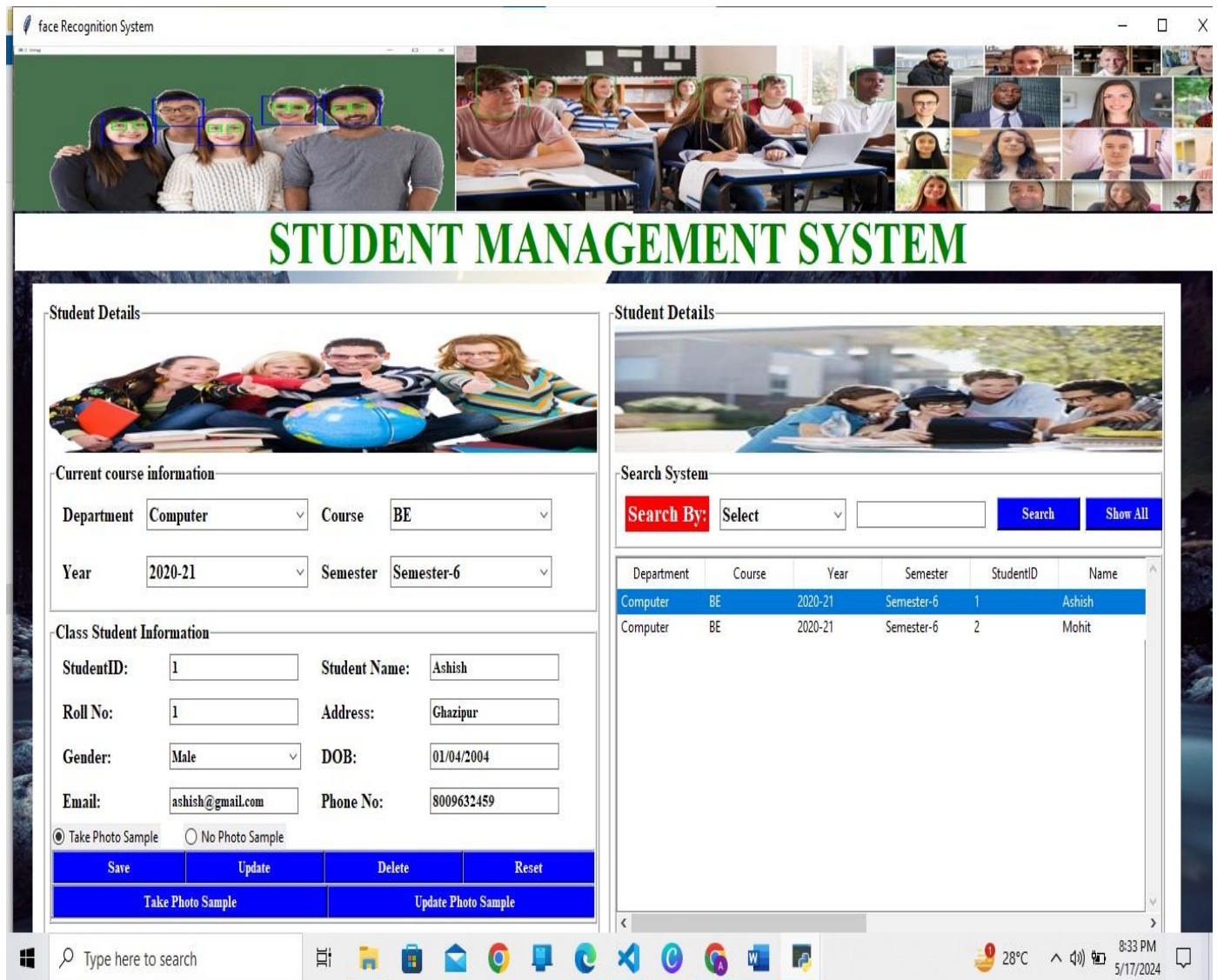
7. RESULT

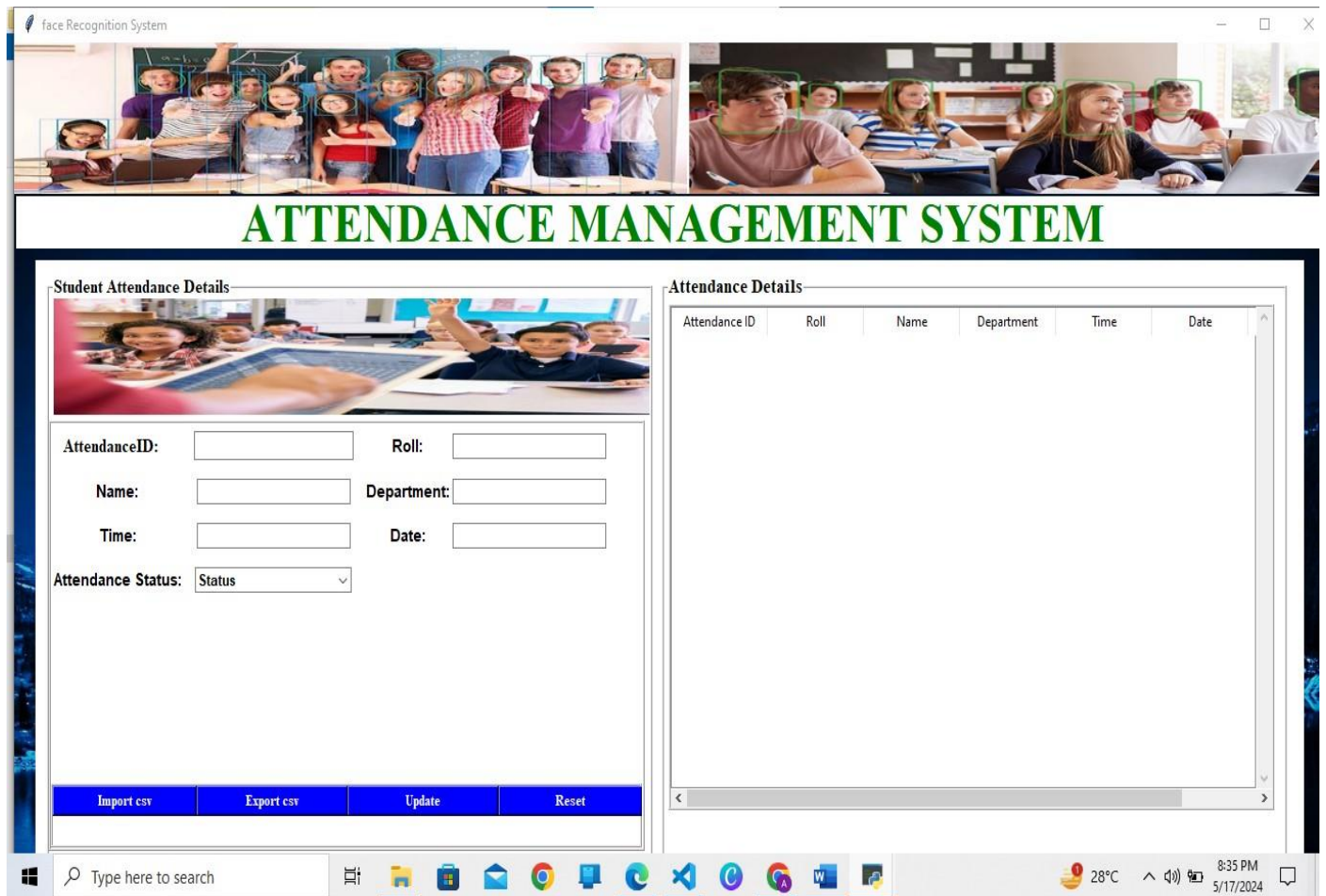

Fig 7.1 Home Page

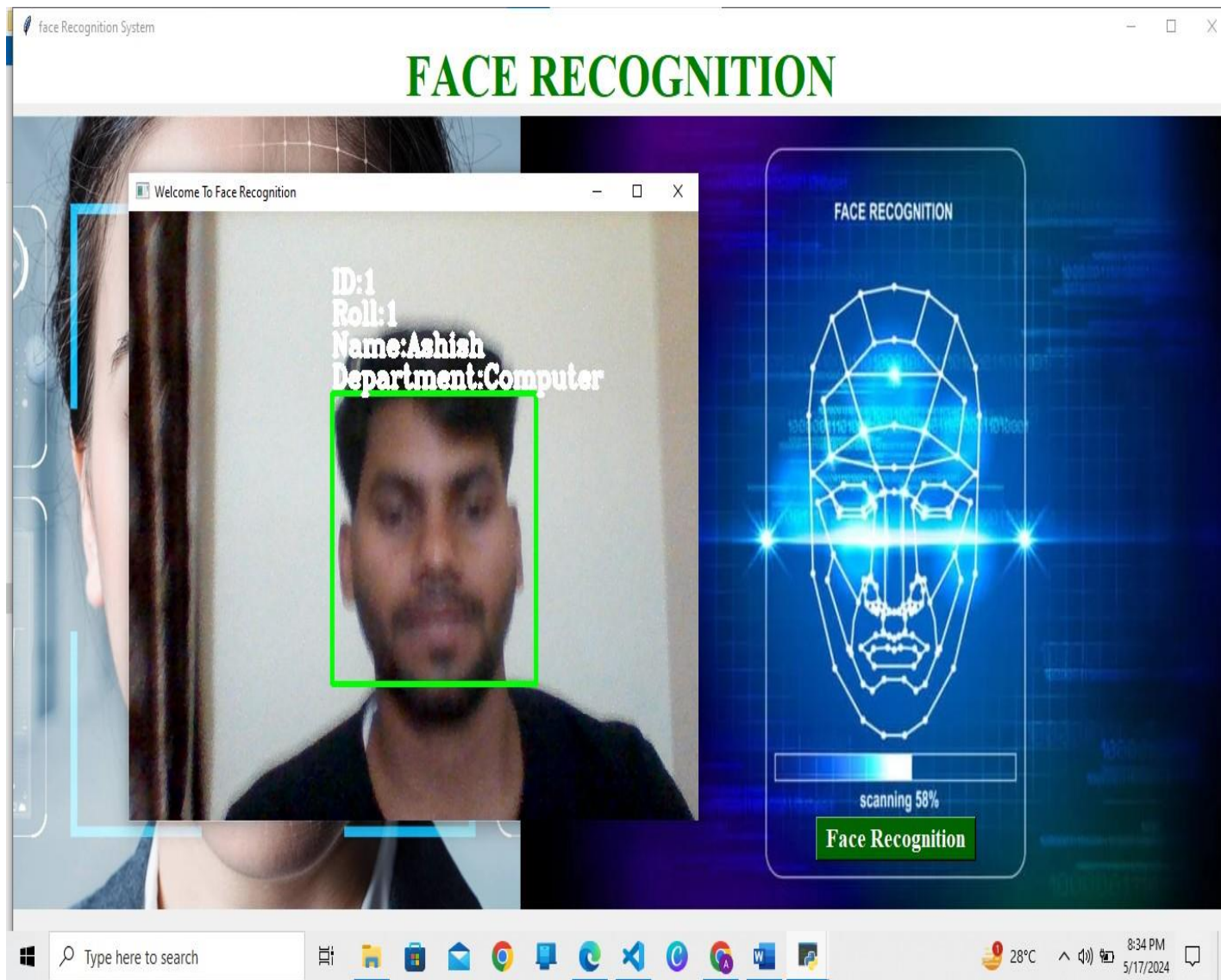**Fig 7.2 Student Information Page**

Fig 7.3 Student Attendance Details

Fig 7.4 Face Recognition
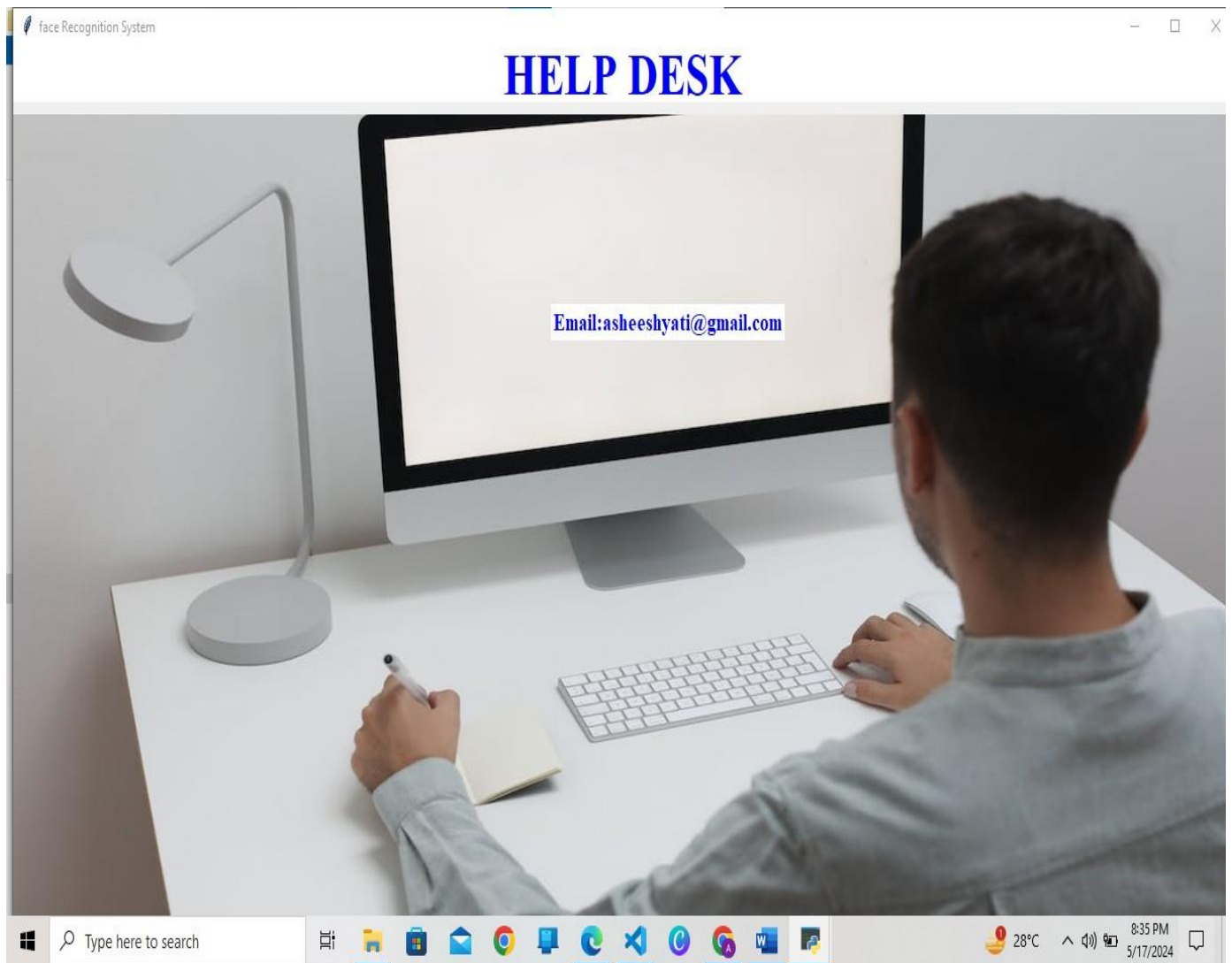
Fig 7.5 Train Data Page

Fig 7.6 Help Page

Fig 7.7 Exit Page

CONCLUSION

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 and computer. In this system we have implemented an attendance system for a lecture, section or laboratory by which lecturer or teaching assistant can record students' attendance. It saves time and effort, especially if it is a lecture with huge number of students. Automated Attendance System has been envisioned for the purpose of reducing the drawbacks in the traditional (manual) system. This attendance system demonstrates the use of image processing techniques in classroom. This system can not only merely help in the attendance system, but also improve the goodwill of an institution.