A Mini Project Report on

Facial Recognition Attendance System

T.E. - I.T Engineering

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CERTIFICATE

This to certify that the Mini Project report on **Facial Recognition Attendance System** has been submitted by **Yash Umredkar(20104012)**, **Aryan Sankholkar(20104010) and Shruti Pinjarkar(20104016)** who are Bonafede students of A. P. Shah Institute of Technology, Thane, Mumbai, as a partial fulfillment of the requirement for the degree in **Information Technology**, during the academic year **2022-23** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

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ABSTRACT

Facial recognition technology has gained popularity in recent years, and one application of this technology is in attendance management for students and staff. This system utilizes algorithms to detect faces of individuals and match them against a pre-existing database to verify attendance. The facial recognition attendance system offers several benefits over traditional methods of attendance taking. It eliminates the need for manual processes, saving significant time and effort for administrative staff. The system can be implemented in large classrooms or lecture halls, where it can quickly scan faces and record attendance data with high accuracy. The system also ensures that the individual present at the time of attendance is the correct student or staff member, reducing the possibility of proxy or impersonation attendance. This ultimately results in improved security and accountability in academic institutions. However, the implementation of facial recognition systems is not without its challenges. Concerns about privacy and security of personal data are essential considerations to ensure that the technology is ethically sound. Furthermore, the system may experience technical issues, such as difficulties detecting faces under certain lighting conditions, which may affect its accuracy and reliability. In conclusion, while facial recognition attendance systems offer several advantages in managing attendance, it is essential to consider ethical implications, technical limitations and ensure that its implementation complies with data protection and privacy laws.

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Chapter 1

Introduction:

The Facial Recognition Attendance System by face detection is a modern method of attendance management that is gaining popularity in several industries such as education, healthcare, and logistics. Face recognition technology is a secure, accurate, and fast method of attendance management that utilizes artificial intelligence to recognize individual faces based on unique features such as shapes, wrinkles, and other facial characteristics. This report aims to provide an overview of the benefits and challenges of implementing smart attendance systems by face detection.

Benefits of Facial Recognition Attendance System by Face Detection:

Secure and Accurate:

Facial Recognition Attendance System is more secure than the traditional attendance management system as it is based on biometric authentication, which is a unique identification method that is specific to each individual. The face recognition technology is a reliable method of identification as it is more difficult to fake or replicate compared to traditional methods such as id cards, pins, or passwords. Furthermore, facial recognition technology is also accurate as it can eliminate situations such as proxy attendance or cheating, which are common in traditional attendance systems.

Time-efficient:

Facial recognition attendance system by face detection can save time and reduce the workload on the administration as it can be automated, making it faster and efficient. The system can identify the students within seconds, making it possible to take attendance quickly and without distractions.

Remote Access:

Facial recognition attendance system can be accessed remotely, which means that the administration can monitor attendance from any location, provided they have an internet connection.

Challenges of Facial recognition attendance system :

Privacy and Data Protection:

The facial recognition technology used in the Smart attendance system by face detection collects and stores personal data, which raises privacy and data protection issues. There is a possibility of misuse or hacking, which may result in a breach of privacy and leakage of confidential information.

Cost:

The implementation of Smart attendance system by face detection can be expensive, especially for small institutions, and this may raise issues of cost-effectiveness.

Underdevelopment:

Despite the vast benefits of Facial recognition attendance system , the technology is still developing and evolving, which means that it may not be fully reliable, accurate, or efficient in some situations.

1.1 Purpose :

The purpose of implementing a facial recognition attendance system for students and staff is to automate the attendance process, reduce errors, and improve efficiency. It can also help to prevent proxy attendance, which is a significant problem in many educational institutions and organizations. Additionally, it can provide real-time attendance data to teachers and administrators, enabling them to monitor attendance trends and take appropriate action**.**

1.2 Problem Statement:

To design, develop, and implement an automated attendance tracking system using Haar Cascade Algorithm.

1.3 Objectives:

•To simplify and automate the process of recording and tracking students attendance through face recognition technology.

•To reduce manual process errors by providing automated and a reliable attendance system which uses a face recognition algorithm.

•To increase privacy and security which students cannot while presenting themselves or their friend while they are absent.

•To be cost effective as there is no use of hardware.

1.4 Scope :

The scope of a facial recognition attendance system for students and staff is vast and can be applied to various educational institutions and organizations. Here are some possible applications of the objectives mentioned above:

Educational institutions: Facial recognition attendance systems can be implemented in schools, colleges, and universities to automate the attendance process, reduce errors, and prevent proxy attendance.

Organizations: Facial recognition attendance systems can be implemented in organizations to streamline the attendance process and reduce administrative burden.

Real-time data: The real-time attendance data provided by the facial recognition attendance system can enable teachers and administrators to monitor attendance trends and take appropriate action.

Accuracy and reliability: The accuracy and reliability of the facial recognition attendance system can help to prevent errors and ensure that attendance records are accurate.

Efficiency: The facial recognition attendance system can increase efficiency by automating the attendance process and reducing administrative burden

Chapter 2

Literature Review

Table2.1.Literature Review

Sr.no	Title	Author(s)	Year	Algorithms	Limitations	Result
1.	Face Recognition System	S.Gracline Jasmine	2019	-PCA Algorithm -KLT Algorithm	Can't recognize faces under Poor lighting conditions	The face recognition system is working well and is performing well
2.	Face Recognition and Identification using Deep Learning Approach	KH Teoh, RC Ismail1 and SZM Naziri,	2020	-CNN -OpenCV	When the distance is close or less than 60cm, the proposed system can barely detect the face	A face recognition and identification system is designed and developed using deep learning approach
3.	Facial Recognition A Literature Review	A.S. Tolba A.H. El-Baz, and A.A. El-Harby	2005	-SVM based Algorithm -PCA Algorithm	While the face images in this database were taken with 3 different lighting (left, center, right) the precise positions of the light sources are not specified	The method resulted in a 97.9% recognition rate with an average processing time of 0.22 seconds for a face pattern with 40 classes

Chapter 3

Proposed System:

Facial recognition attendance system is the next generation of attendance tracking systems, which is becoming increasingly popular these days due to its convenience and accuracy. Here's a proposed system for facial recognition attendance:

1. Hardware components: The system requires a high-resolution camera, an image processing unit, and a computer with the necessary interface to support the software.

2. User Registration: Each student must register their face into the system by taking a photo via the camera or importing the image into the system. The system should capture multiple images of each student's face from different angles, ensuring a more accurate identification process.

3. Attendance tracking: The system captures the image of individuals at the entry point and compares it with the stored data in the database. If there is a match, the system records the time and attendance of the individual.

4. Reporting and analysis: The system should generate reports of attendance data of Students.

Proposed system involves a process where the admin first registers the students, captures their images, and trains the dataset using a Haar Cascade algorithm. After training, proposed system can detect a particular student's face and mark their attendance in the database during the face recognition process.

3.1 Features and Functionality-

A facial recognition attendance system is a type of biometric system that uses facial recognition technology to record student attendance. It can offer several features and functionalities, including:

1. Face Detection and Recognition: Proposed system uses cameras to detect and recognize student faces. Haar Cascade algorithm identifies the specific features of a face, such as the eyes, nose, and mouth, and uses those features to detect the face.

2. Secure Data Storage: Attendance data is stored in a secure database, which can only be accessed by authorized personnel. This ensures the confidentiality of student information.

3. User-Friendly Interface: The system typically has a user-friendly interface, making it easy for admin to use and navigate.

4. Accuracy: Facial recognition technology highly reduces the chances of fraudulent attendance recording, such as "buddy punching" where one student records attendance for another.

5. Efficient: As proposed system reduces paper work or manual marking of attendance, it is very efficient in terms of time saving.

Chapter 4

Requirement Analysis

Importance of Requirements Gathering:

The process of requirements gathering is critical for developing a successful facial recognition attendance system. It involves identifying and documenting the needs and expectations of stakeholders and users to ensure that the system meets their requirements. Gathering requirements helps to avoid misunderstandings and miscommunication, reduces the risk of project failure, and improves the overall quality of the system.

Need Analysis:

The need for a facial recognition attendance system arises from the desire to automate and streamline attendance tracking in organizations. This technology can improve accuracy, efficiency, and security compared to traditional methods such as paper-based systems or swipe cards. The system can also provide real-time data and analytics, which can be used to optimize attendance management and improve decision-making.

Key Requirements:

The following are the key requirements for a facial recognition attendance system:

High-Quality Camera: A high-quality camera is essential to capture clear and accurate images of the student faces. The camera should have sufficient resolution, good lighting, and a wide-angle lens to capture faces from different angles.

Reliable Face Detection and Recognition: The facial recognition attendance system should have an accurate face detection and recognition algorithm to identify student faces. The algorithm should work well in different lighting conditions.

User-Friendly Interface: The system should have a user-friendly interface that is easy to use and navigate. The system should have an intuitive design that allows admins to quickly mark student attendance.

Robust Database: The attendance system should maintain a robust database of student records, including their names, images, and attendance history. The database should be secure, scalable, and easily accessible.

Functional Requirements:

1.Correctness: The system should have a high level of accuracy in face detection and recognition. It should be able to identify and match student faces with their records in the database without errors.

2.Speed and Performance: The system should be fast and efficient, capable of processing facial recognition in real-time to quickly mark attendance and minimize delays.

3.Ease of Use: The system should be user-friendly, easy to operate. It should not require significant training or technical expertise to use.

4.Reporting: The system should generate reports on student attendance. This information can be used for tracking attendance, assessing student performance, and making administrative decisions.

5.Security and Privacy: The system should be designed to protect students' privacy and security. The data collected should be stored securely and used only for attendance purposes.

Chapter 5

5.1 Use Case Diagram:

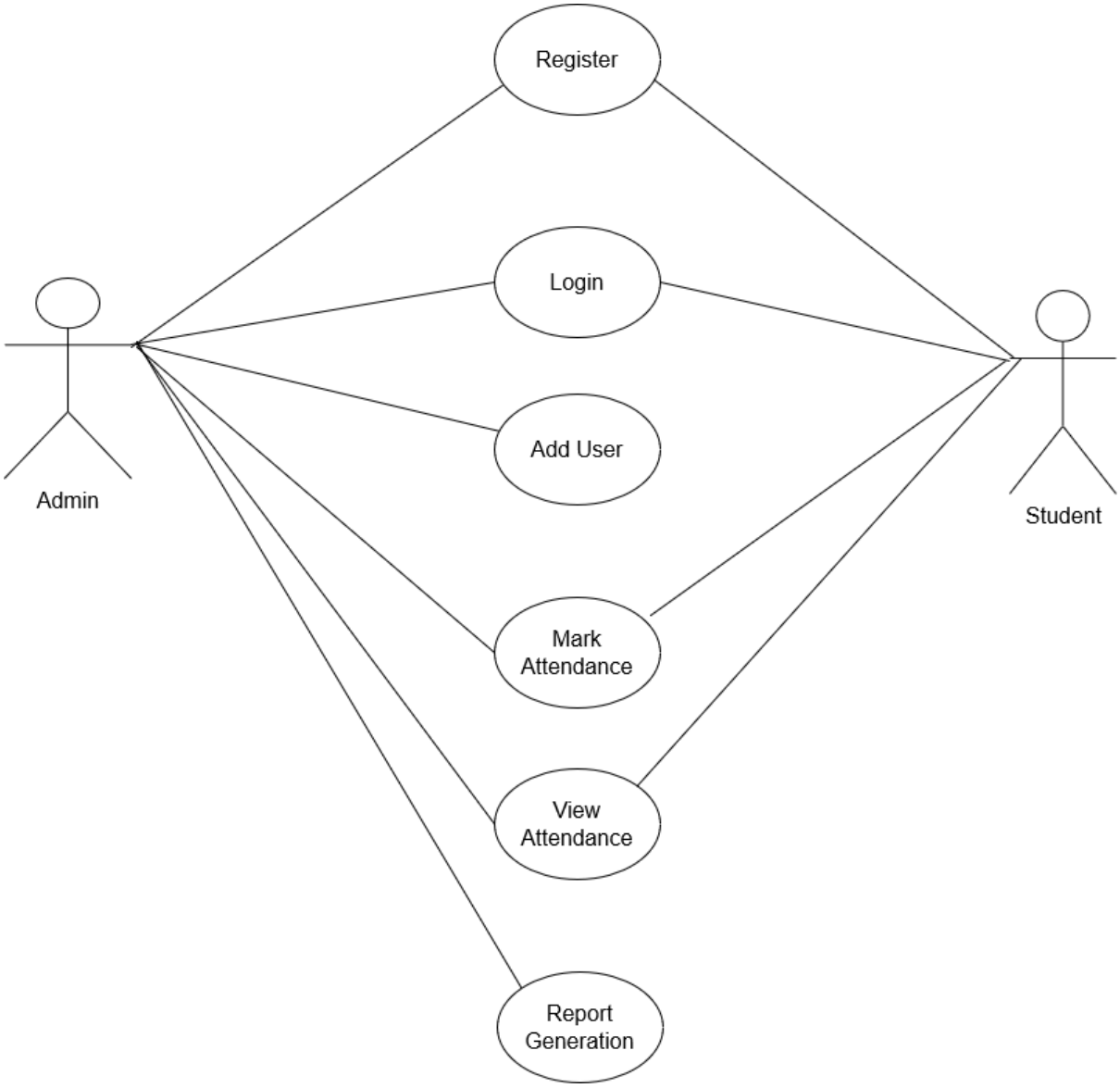

Fig5.1.Use Case Diagram

5.2 DFD(Data flow diagram)-

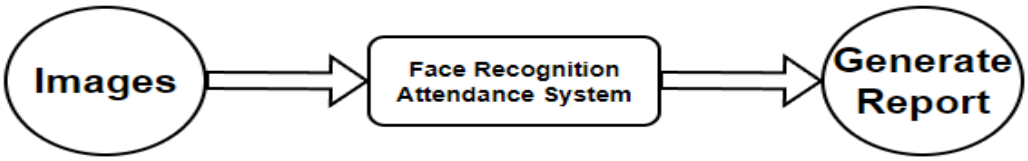

Fig5.2.1.DFD Level 0

Fig5.2.2.DFD Level 1

5.3 System Architecture:

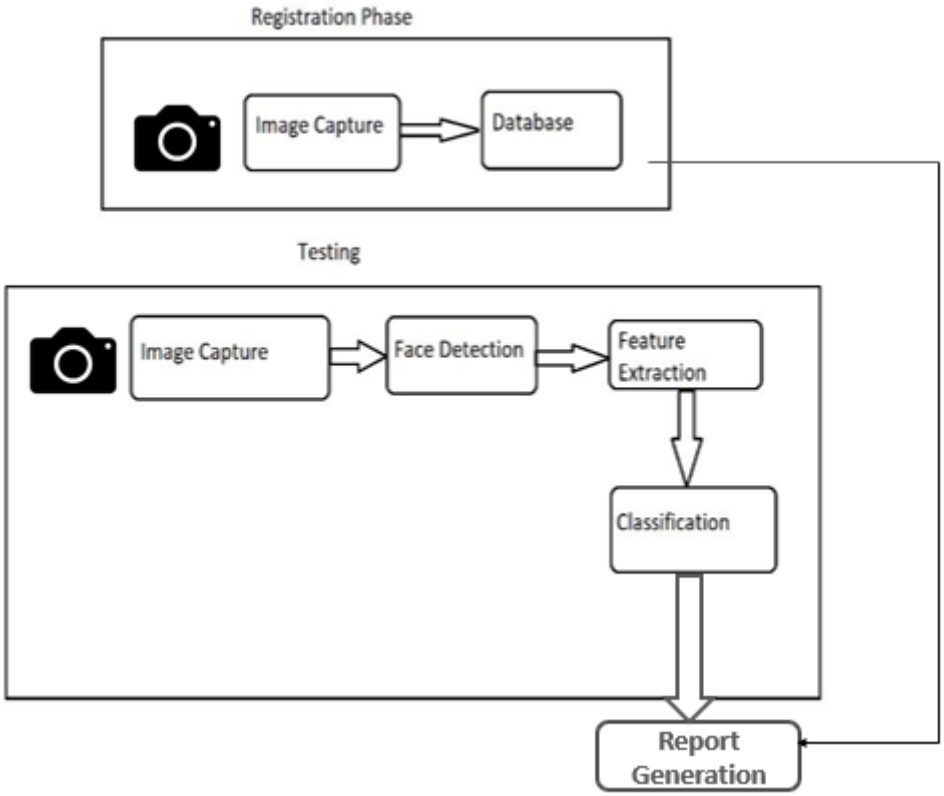

Fig5.3.1.System Architecture

Chapter 6

Technical Specification :

Python:

Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. It supports multiple programming paradigms, including structured, object-oriented and functional programming.

MySQL Database:

MySQL is a popular open-source relational database management system (RDBMS) that is widely used to store, organize and manage large amounts of data. It is a software program that allows users to create, modify, and interact with databases.

Tkinter:

Tkinter is a standard Python library for creating Graphical User Interfaces (GUIs). It provides a set of tools for building windows, frames, buttons, text boxes, and other GUI components in Python programs.

Chapter 7

Project Scheduling :

Table7.1.Project Scheduling

Sr.No.	Group Members	Time Duration	Work Done
1.	Yash Umredkar Aryan Sankholkar Shruti Pinjarkar	1st week of January	Implementing 1st module/ functionality: Hardware System configuration and setup.
		2nd week of January	Testing 1st module: Hardware System functionality testing
2.	Yash Umredkar Aryan Sankholkar Shruti Pinjarkar	3rd week of January	Implementing 2nd module/functionality: GUI design , Database setup, Selection of Algorithm.
3.	Yash Umredkar Aryan Sankholkar Shruti Pinjarkar	By the end of March Month	Implementing 3rd module/functionality: Integration of Hardware System with database and training and testing the dataset. Testing the whole proposed system.

Chapter 8:

Algorithm Used:

Haar Cascade: Haar Cascade is a machine learning-based approach for object detection and is widely used in facial recognition technology. In proposed system, Haar Cascade is used to detect faces in real-time using the camera input.

The Haar Cascade algorithm works by scanning an image with a sliding window. At each position of the sliding window, the algorithm applies a Haar-like feature descriptor to extract relevant facial features such as edges, corners, and color gradients. These features are then used by the algorithm to determine whether the region of the image under consideration contains a face or not. Once the algorithm detects a face, it is cropped and passed on to the next stage, which compares the recently trained images against the stored images in the "data_img" file for recognition and marking attendance.

Steps involved in Proposed System:

1.Login with Admin Account

2.Register the required number of Students with their details.

3.Capture the images(dataset) of each student.

4.Train the images or dataset of the students.

5.Use the in-built face detector to recognize the faces which automatically detects the faces the mark the attendance accordingly.

Chapter 9:

Result and Discussion:

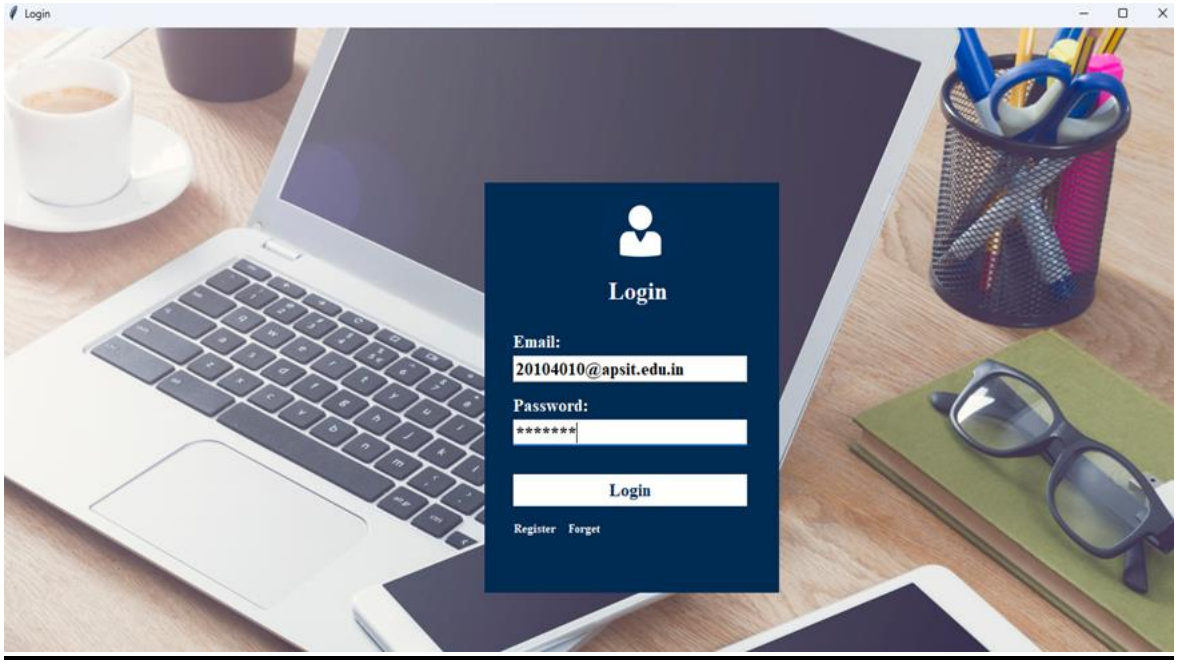

Fig1.Login Page

Fig2.Main Page

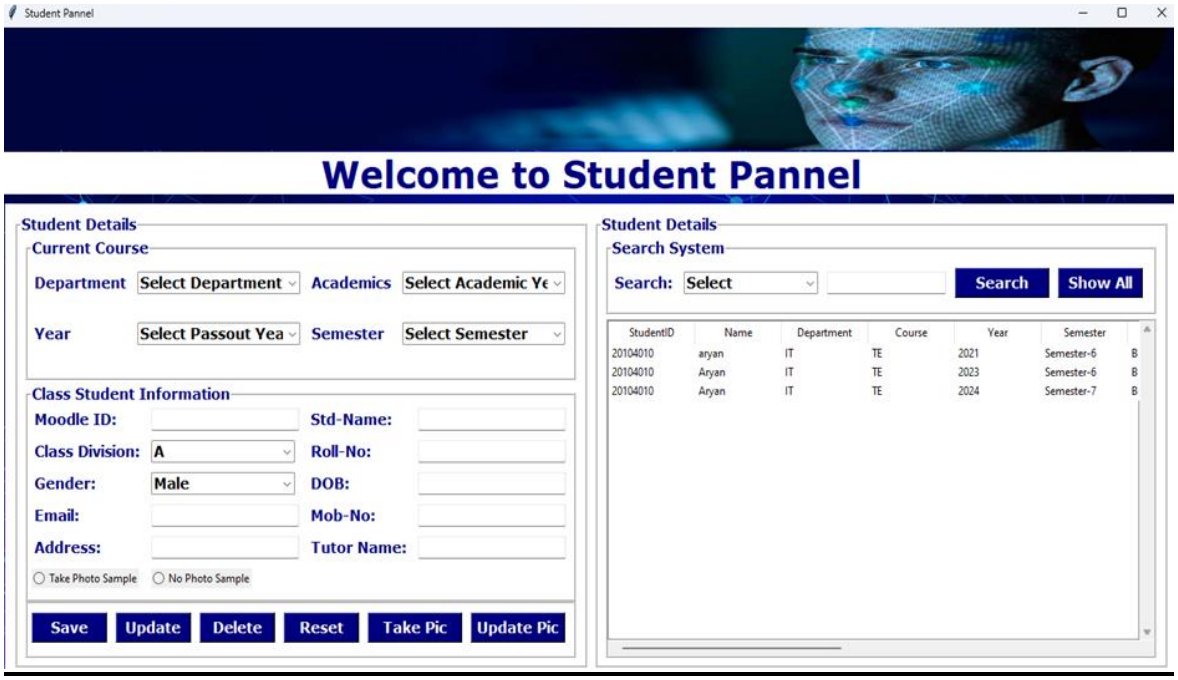

Fig3.Student Panel

Fig4.Data Training Panel

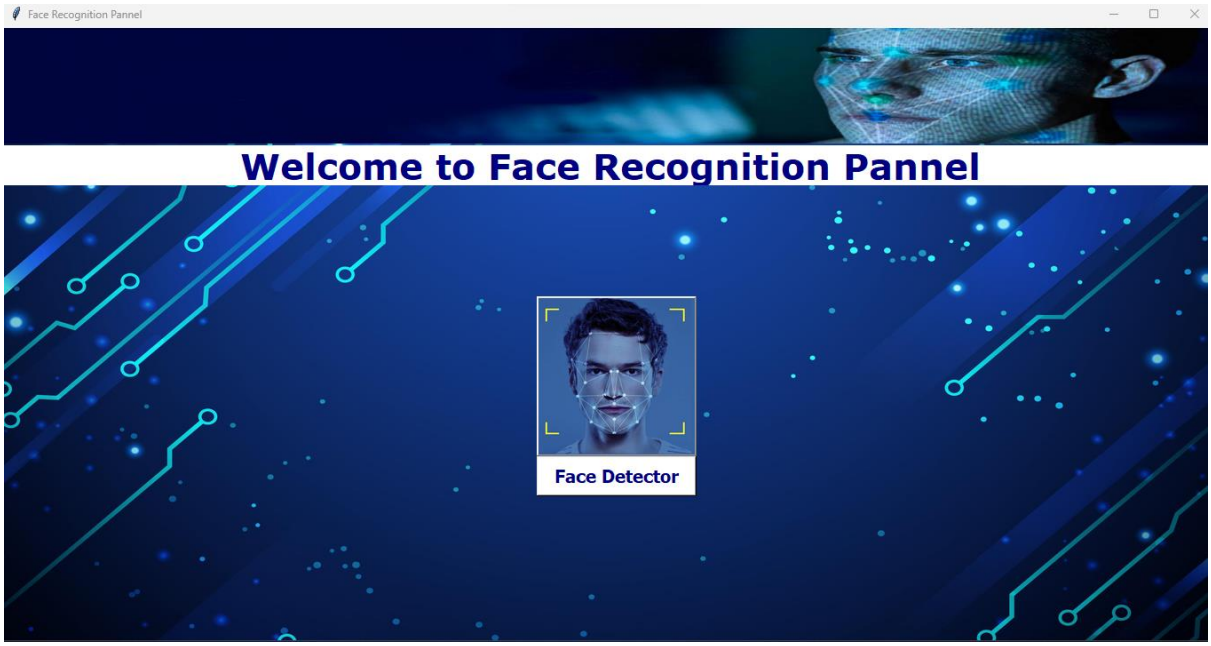

Fig5.Face Recognition Panel

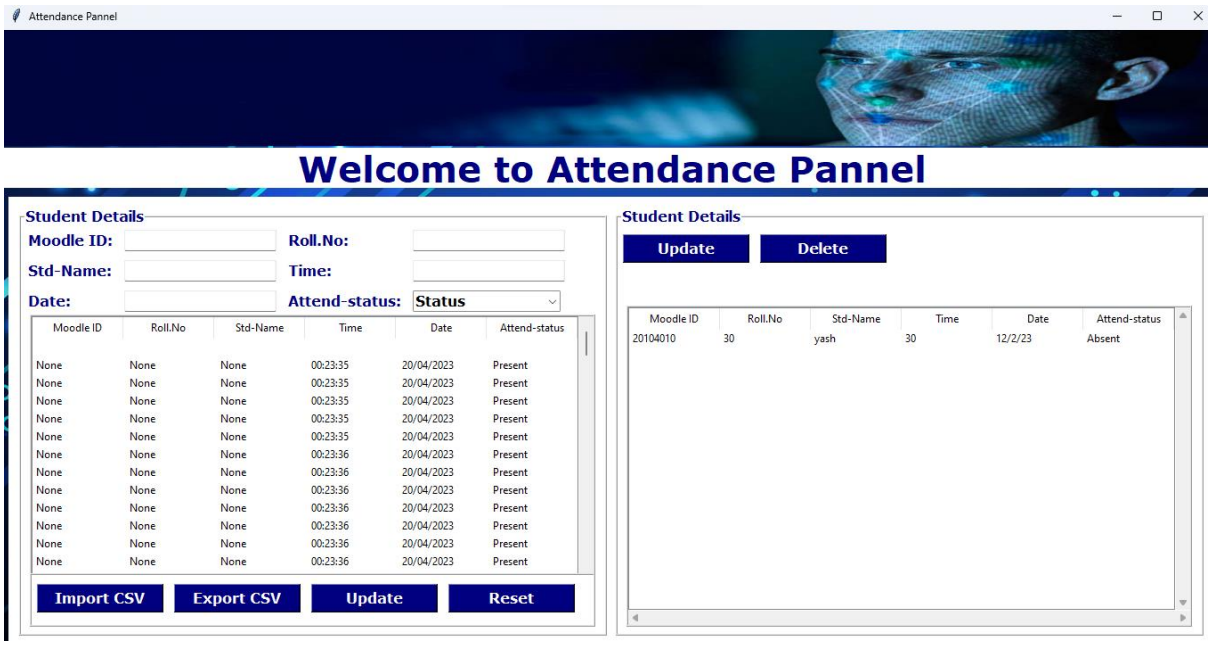

Fig6.Report Generation

Chapter 10:

Conclusion and Future Scope:

Proposed system was developed to track student attendance using facial recognition technology. The system captures 100 images of each student and uses them to train the dataset, which is stored in a separate file. Real-time face recognition is used to mark attendance, and the system is capable of importing and exporting CSV files for report generation. Facial Recognition Attendance System appears to be a functional and effective solution for tracking student attendance, and has the potential to streamline attendance tracking.

Future Scope:

To improve attendance tracking and efficiency, the proposed system can be integrated with other academic systems and offer a mobile application and multi-user support. Further development in facial recognition technology can enhance the system's accuracy and reliability. These features will streamline attendance tracking, making it more accessible and convenient for students and faculty members.

Chapter 11

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