MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

"Attendance Monitoring System using Facial Recognition"

A Project Report
Submitted by:

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Under the Guidance of:

Name of Guide: **Mrs. Y.U. Kadam**
Designation: **Lecturer in Computer Technology**

In partial fulfillment for the award of Diploma Engineering
In the course Computer Technology

Department of Computer Technology
K. K. WAGH POLYTECHNIC, NASHIK
Academic Year 2023-24

K. K. WAGH POLYTECHNIC

Hirabai HaridasVidya nagari, Amrut Dham, Panchavati, Nashik-422003, Maharashtra

Certificate

This is certify that :

Name of Student	Class	Enrolment No.	Exam Seat No.
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From the institute - K. K. Wagh Polytechnic, Nashik has completed the Project (Capstone Project Planning and Execution (CPE)) for their final year having title **Attendance Monitoring System using Facial Recognition** during the Academic Year 2023-24 in the partial fulfillment of Diploma in Computer Technology. The project is completed in a group consisting of 3 persons under the guidance of the Faculty Guide.

Date :   / /2024
Place : Nashik

Mrs. Y.U.Kadam   Prof. G. B. Katkade
Internal Faculty Guide   *HOD-Computer Technology*

Seal of
Institute

Prof. P. T. Kadave
Principal

Achievement/ Participation Certificates :

- **Certificate for publishing research paper**

- **Certificate of participation in project competition organized by RSM polytechnic , Nashik.**

Certificate 1

Maratha Vidya Prasarak Samaj's

Rajarshi Shahu Maharaj Polytechnic, Nashik

Udoji Maratha Boarding Campus Near pumping station, Gangapur road, Nashik - 13
Affiliated to MSBTE Mumbai, Approved by AICTE New Delhi, DTE Mumbai and Govt. of Maharashtra, Mumbai

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TECHNOVATION 2k24
DEPARTMENT OF INFORMATION TECHNOLOGY
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Mr. / Ms. Sejal Prakash Pathak

of K. K. Wagh Polytechnic, Nashik for

participating in Project Competition during TECHNOVATION 2k24 a
State Level Competition organized by MVPS's RAJARSHI SHAHU
MAHARAJ POLYTECHNIC, Nashik held on 19th March 2024

PROF. S. S. TILE
EVENT CO-ORDINATOR

PROF. M. B. PATIL
HOD-IF

PROF. PRASHANT PATIL
PRINCIPAL

Certificate 2

Maratha Vidya Prasarak Samaj's

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This Certificate is awarded to

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participating in Project Competition during TECHNOVATION 2k24 a
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MAHARAJ POLYTECHNIC, Nashik held on 19th March 2024

PROF. S. S. TILE
EVENT CO-ORDINATOR

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HOD-IF

PROF. PRASHANT PATIL
PRINCIPAL

V

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Names of Students	Class
1)Aditya Suryawanshi	TYCM-Win
2) Sejal Pathak	TYCM-Win
3) Sakina Modi	TYCM-Win

K. K. Wagh Polytechnic, Nashik

Department of Computer Technology

Vision & Mission

Institute Vision : -Strive to empower students with Quality Technical Education.

Institute Mission :- Committed to develop students as Competent and Socially Responsible Diploma Engineers by inculcating learning to learn skills, values and ethics, entrepreneurial attitude, safe and eco-friendly outlook and innovative thinking to fulfill aspirations of all the stakeholders and contribute in the development of Organization, Society and Nation.

Department Vision :-To impart quality technical education for development of technocrats.

Department Mission :-

M1- To provide quality in education and facilities for students to help them to achieve higher academic career growths.

M2- To impart education to meet the requirements of the industry and society by technological solutions.

M3- Develop technical & soft skill through co–curricular and extra-curricular activities for improving personality.

Program Educational Objectives:-

PEO1: Provide socially responsible, environment friendly solutions to Computer engineering related broad-based problems adapting professional ethics.

PEO2: Adapt state-of-the-art Computer engineering broad-based technologies to work in multi-disciplinary work environments.

PEO3: Solve broad-based problems individually and as a team member communicating effectively in the world of work.

Program Specific Outcome:-(Version – 1.2)

PSO 1: **Computer Software and Hardware Usage:** Use state-of-the-art technologies for operation and application of computer software and hardware.

PSO 2: **Computer Engineering Maintenance:** Maintain computer engineering related software and hardware systems.

Program Outcomes:-

PO1. Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

PO2. Problem analysis: Identify and analyses well-defined engineering problems using codified standard methods.

PO3. Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

PO4. Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5. Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO6. Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7. Life-long learning: Ability to analyses individual needs and engage in updating in the context of technological changes.

ABSTRACT

In today's educational landscape, ensuring the regularity of student attendance remains a paramount concern. Traditional methods of marking attendance, such as roll call and paper signatures, have proven to be time-consuming and cumbersome. Recognizing the need for a more efficient solution, we have embarked on a project to develop an "Attendance Monitoring System Using Facial Recognition" using Tkinter and Visual Studio. Our innovative application harnesses the power of face identification, streamlining the attendance tracking process and reducing paper usage. Moreover, it addresses the persistent issue of fake attendance by employing facial recognition as a biometric authentication method. This system is tailored for educational institutions where accurate attendance monitoring is of paramount importance. The proposed system, designed for the Desktop platform and powered by Tkinter library, relies on sophisticated algorithms that compare encoded facial values from a database with real-time images captured by the system. This project represents a leap forward in attendance management, aligning technology with educational needs. By automating attendance and enhancing accuracy, it promises to make a significant impact on the educational landscape.

Keywords: Python 3.8 , MySQL ,Tkinter

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CHAPTER 1
INTRODUCTION

1.1 Introduction

The Attendance System using Face – Recognition is a replacement way method for the traditional way of marking attendance. The proposed system is Android, Machine Learning based system.. This system can be implemented on a single faculty system of a particular institute. This system is proposed to be based on biometrics .i.e. Face Authentication. Since there is presence of biometrics, this system completely eliminates the chances of fake attendance which is a problem with the traditional methods of attendance. The Attendance management is the significant process that were carry out in every institute to monitor the performance of the student. Every institute does this in its own way. Some of there institute use the old paper or file-based system and some have adopted strategies of automated attendance system using some biometric technique. A facial recognition system is a computerized software which is suited for determining or validating a person by performing comparisons on patterns based on their facial appearances. Here, the teacher will be the super user (Administrator). Teacher will be able to manage the data of the students stored in the database. Data includes attendance, performance in practicals, rating of student,etc. After the completion of theory sessions the teacher would just scan multiple students and assign the attendance of present students in just one tap! Administrator would also be able to scan the face of a particular student and read its data.

1.2 Literature Survey

The existing automatic attendance management systems utilize various technologies such as RFID and face recognition algorithms. However, each system has its limitations and challenges that need to be addressed for improved accuracy and efficiency. In the proposed system, real-time computer vision algorithms are integrated to enhance the accuracy and reliability of attendance management. By employing face detection algorithms in real-time, the system aims to accurately identify and mark attendance for students in classrooms. However, it's crucial to address challenges such as variations in illumination, rotation, and scaling of faces to ensure robust performance across different scenarios. Additionally, the utilization of RFID technology offers another avenue for automatic attendance management. RFID has seen significant advancements and research, providing opportunities for enhanced applications in attendance tracking. As new applications and research areas emerge, there is potential for further innovation and improvement in RFID-based attendance systems. Furthermore, integrating machine learning into face recognition-based attendance systems can address the complexities associated with recognizing faces in various real-time scenarios. By leveraging machine learning algorithms, the system can improve face detection rates and enhance the accuracy of attendance marking. To overcome challenges such as estimating attendance precisely and improving face detection rates, it's essential to refine the algorithms used in the face recognition-based attendance system. By integrating data from multiple face recognition results and employing advanced algorithms, the system can provide more accurate attendance records.

In conclusion, by extending and integrating real-time computer vision algorithms, RFID technology, and machine learning into attendance management systems, it's possible to overcome existing challenges and achieve higher accuracy and efficiency in marking attendance. Continued research and development in these areas will contribute to further advancements in automatic attendance management systems.

1.3   Existing System

- **Traditional Manual Methods:**
  Roll Call: In the past, attendance was often taken manually through roll call, where teachers called out the names of students, and students responded with their presence.

- **Signature Sheets:** Another traditional method involved students signing an attendance sheet to confirm their presence.

- **Barcode/RFID-Based Systems:**
  Some educational institutions have adopted barcode or RFID-based attendance systems where students carry identification cards that are scanned to record attendance.

- **Biometric Systems:**
  Fingerprint Scanners: Certain systems use fingerprint scanning technology for attendance tracking, where students place their fingers on a biometric scanner.
  Iris Recognition: Some advanced systems employ iris recognition for attendance verification based on unique patterns in the iris.

- **Facial Recognition Systems:**
  The proposed system is in line with the more recent trend of using facial recognition technology for attendance monitoring. This technology has advantages such as speed, accuracy, and the ability to eliminate the chances of fake attendance.

- **Online Attendance Systems:**
  With the increasing use of online platforms for education, some systems allow students to mark their attendance through web or mobile applications.

1.4 Proposed System

The Proposed system uses real time face detection algorithms. Since there is presence of biometrics, this system completely eliminates the chances of fake attendance which is a problem with the traditional methods of attendance. The two methods of calling out the roll call or by taking the student signature on the paper were time consuming and difficult. This problem is solved by the attendance monitoring system, i.e. as facial recognition is included teachers can directly mark attendance of students in a group. A facial recognition system is a computerized software which is suited for determining or validating a person by performing comparisons on patterns based on their facial appearances. The images of the students will be stored in a database.

The system camera will open and it will detect faces. Then the system will encode the all the images present in the database as well as the faces detected in the frame. The measurements of the face that were detected in frame will get compared with the measurements of the faces present in the database. Using algorithms system will find the person in database of known people who has closest measurements to the image that were detected by the camera. After finding the perfect match, system will retrieve the name, attendance, performance and rating of the detected student

CHAPTER 2
ANALYSIS AND FEASIBILITY

2.1 Technical Feasibility:

- Requires expertise in Android app development (Java/Kotlin) and TensorFlow machine learning.
- The development team should be skilled in image processing for face detection and recognition.
- A suitable smartphone camera with adequate resolution is necessary for accurate facial capture.

2.2 Economic Feasibility:

- The project budget should consider the cost of development tools (e.g., software licenses) alongside development costs.
- Economic feasibility can be improved by evaluating the cost of in-house development versus outsourcing or utilizing pre-trained facial recognition models (if available).

2.3 Operational Feasibility:

- Training should address potential security concerns regarding student data privacy and facial recognition technology.
- The system should offer options for handling situations where facial recognition fails (e.g., poor lighting, student absence due to illness).

2.4 Schedule Feasibility:

- The project timeline should account for potential delays due to unforeseen technical challenges or user feedback during testing.
- A phased rollout to a pilot group of students and teachers can help identify and address any integration issues before full implementation.

CHAPTER 3
PROJECT REQUIREMENT

3.1 Proposed Project

The primary goal of the proposed project is to implement an automated attendance monitoring system using facial recognition technology. The system aims to eliminate the shortcomings of traditional attendance methods and provide a more efficient and secure solution for educational institutions. At its core, the system utilizes advanced facial recognition technology, a computerized software capable of determining or validating an individual by analyzing patterns based on their facial appearances. In addition to attendance tracking, the system offers a comprehensive database management system. Student information, including attendance records stored in a structured manner, enabling easy retrieval and management. Security and privacy measures are integral to the design, ensuring that only authorized personnel have access to sensitive information, addressing concerns related to data security and privacy.

3.2 Area of Implementation

1. Educational Institutions:
Schools, colleges, and universities can benefit from the system to streamline the attendance tracking process for both students and faculty. It provides a modern alternative to traditional roll call methods, reducing the time spent on manual attendance marking.

2. Training Centers and Workshops:
Training centers and workshops that conduct short-term courses or specialized training sessions can implement the facial recognition attendance system to ensure accurate and efficient attendance tracking for participants.

3. Corporate Offices:
Companies and organizations can adopt this system for employee attendance monitoring. The automated and secure nature of facial recognition adds an extra layer of accuracy and reliability to workforce management.

4. Research Institutions:
Research institutions and laboratories with controlled access points can utilize the system to monitor attendance, ensuring that only authorized personnel have access to sensitive research areas.

5. Secure Facilities:
Facilities requiring heightened security measures, such as government offices, can implement the facial recognition system for access control and attendance monitoring purposes, enhancing overall security protocols.

3.3 System Requirements Specifications (SRS) of the Project

The system will include real-time face detection algorithms, biometric authentication through facial recognition, database management, and automated attendance marking. It aims to eliminate the shortcomings of traditional attendance methods by leveraging advanced technology. The system shall have user authentication mechanisms for administrators, teachers, and other authorized personnel. The system shall maintain a centralized database to store student information, including images, attendance records, performance metrics, and ratings. The system shall employ real-time face detection algorithms to capture frames and identify faces in a given frame. The system shall automatically mark attendance by identifying the student with the closest facial measurements in real-time.

Functional Requirements

Sr.No	Functions	Input	Process	Output
1	Face Recognition	Video frame/Image	Facial recognition algorithm	Recognized person's ID
2	Attendance Marking	Recognized person's ID, Date, Time	Check against user database and attendance records	Attendance marked
3	User Management	User data (name, ID, etc.)	Add, remove, update user information in database	User data added/removed/updated
4	Reporting	Date range	Retrieve attendance data from database	Attendance report

Table no: 3.1

Non Functional Requirements

Sr.No	Properties	Description
1	Accuracy	The system should have a high accuracy rate in facial recognition to minimize misidentification.
2	Availability	The system should be available for use most of the time with minimal downtime.
3	Performance	The system should be able to process attendance data efficiently and respond to user requests in a timely manner.
4	Scalability	The system should be scalable to accommodate a growing number of users and attendance records.
5	Security	The system should have security measures in place to protect user data (e.g., facial images, attendance records) from unauthorized access and

		tampering.
6	Usability	The system should be user-friendly and easy to operate for authorized personnel.
7	Reliability	The system should function consistently and reliably with minimal errors or failures.
8	Maintainabilit y	The system should be easy to maintain and troubleshoot.

Table no: 3.2

3.4 Hardware Requirements

a) **Project Development-**

1. Cameras:
High-resolution cameras capable of capturing clear facial images in various lighting conditions.

2. Computer System:
Processor: Quad-core or higher, capable of handling real-time image processing.
RAM: 8 GB or more for efficient data processing.
Storage: Sufficient storage space for the database and system files.

3. Graphics Processing Unit (GPU):
A dedicated GPU may be beneficial for faster image processing, especially during real-time face detection.

4. Database Server:
Dedicated server for hosting the centralized database.

b) **Project Operations-**

1. Cameras:
High-resolution cameras strategically placed in areas where attendance monitoring is required.
Recommended minimum resolution for facial recognition purposes.

2. Server:
Processor: Quad-core or higher for efficient real-time face detection and attendance marking.
RAM: 16 GB or more to handle concurrent requests and database operations.
Storage: SSD storage for faster data retrieval and processing.

3. Database Server:
Processor: Multi-core processor suitable for handling database queries and concurrent connections.

4. User Devices:

Devices for end-users, such as teachers or administrators, to interact with the system for attendance monitoring.

3.5 Software Requirements

a) Project Development-

1. Operating System:
Development Server:
Linux (Ubuntu, CentOS) or Windows Server, based on developer preferences and software compatibility.
Ensure compatibility with chosen facial recognition algorithms and libraries.
2. Integrated Development Environment (IDE):
A suitable IDE for coding and development, such as-
Visual Studio Code
3. Database Management System:
MySQL Workbench
4. Libraries:
Open-source or commercial libraries such as:
OpenCV, tkinter, pillow, numpy,etc

b) Project Operations-

1. Operating System:
Server Operating System:
Linux (Ubuntu, CentOS) or Windows Server for hosting the application.
2. Facial Recognition Software:
The deployed system should include the facial recognition software developed during the project.
3. Database Management System:
The operational server should have a production-grade database system, such as: MySQL
4. Application Runtime Environment:
Runtime environments suitable for the developed application, such as:
Python runtime for Python-based applications.

CHAPTER 4
PROJECT DESIGN & IMPLEMENTATION

A smart attendance system automates attendance tracking using facial recognition. It captures faces (video/image), identifies users through facial recognition algorithms, and marks attendance if a match is found in the user database. The system offers functionalities like user management, reporting, and prioritizes accuracy, security, and scalability.
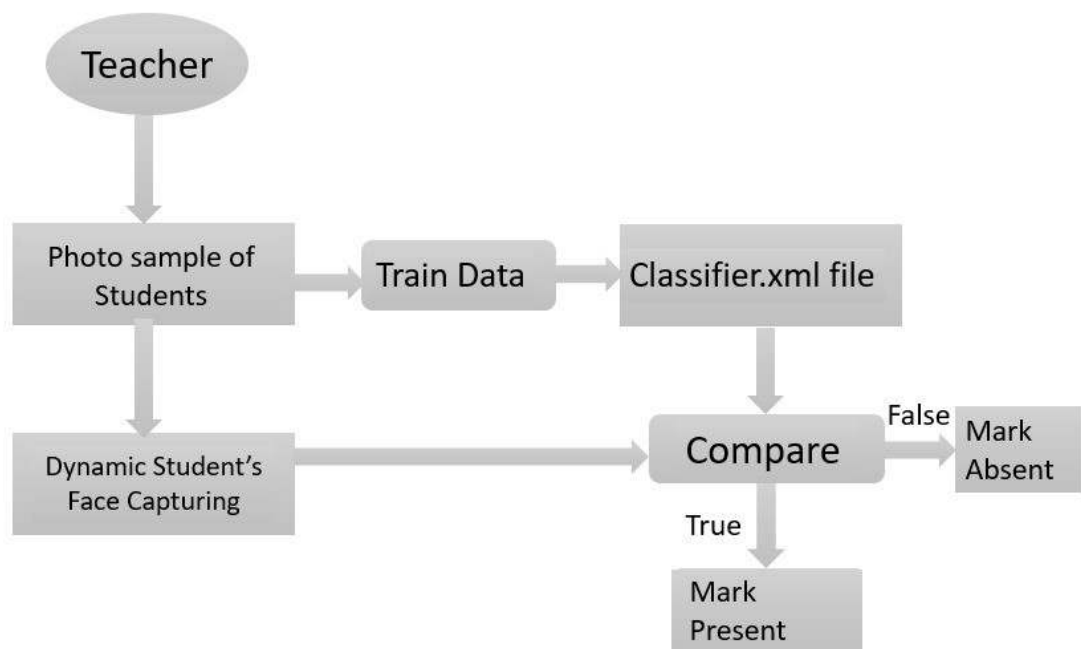
4.1 Context Level diagram and description

Fig [4.1] System Architecture Block diagram

The teacher is the administrator of the system.
There will be an option for the teachers to take photo samples of the students. These photo samples will be trained by using the "Train Data" module of the system. It will save the extracted features into a classifier.xml file. These features will then be compared with the features of faces captured dynamically in video frames. The student whose facial features matches with highest confidence will be marked as "present".

4.2 Database Designs

For this system, **MySQL** database is used for storing the data of students. The schema contains fields such as : Dep, Course, Year, Student_id, Name, Division, Roll, Email, Phone & Photo Sample. This database is manipulated dynamically through the Python application.
The mysql-connector is used for connecting the database with the application

```
import mysql.connector
```

Sample of actual Database:

Dep	Course	Year	Student_id	Name	Division	Roll	Email	Phone	PhotoSample
-	-	-	-	-	-	-	-	-	-

Fig [4.1] System Database

4.3 Components Design

1] ER Diagram
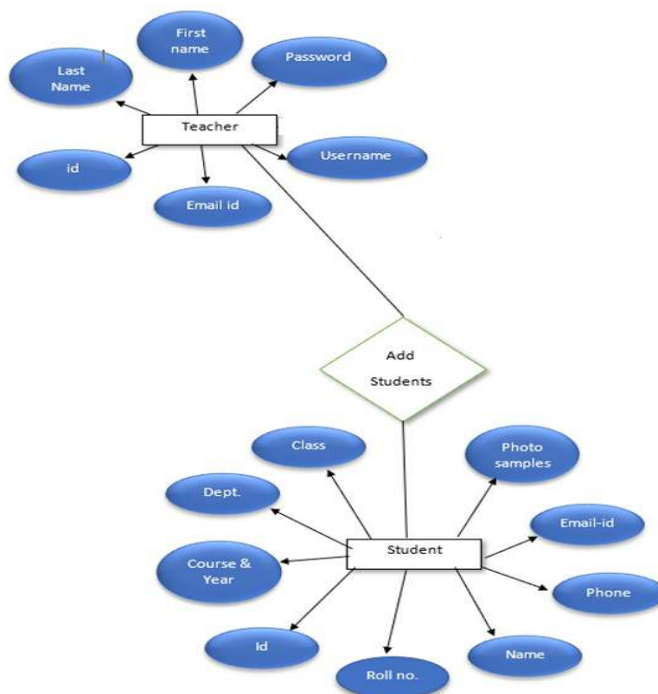
Fig [4.3] E-R Diagram

The entities are : Teacher, Student and Attendance, the most important factors of this system. The teacher could have first name, last name, id, username, password and email id. The student has various fields like dep, class, photo samples, course and year, phone, email id, id, roll no & name. The attendance part is carried out by the teacher (admin), he/she takes the attendance of the student which may be specific for different subjects.

4.4 Data Flow Diagram:-

DFDs:

The purpose of Data Flow Diagrams (DFDs) lies in their ability to visually represent the flow of data within a system, serving as a powerful tool in system analysis and design. DFDs provide a clear and intuitive way to illustrate how data moves between processes, data stores, and external entities, facilitating communication among stakeholders involved in the development or understanding of a system. By representing processes, data stores, and data flows, DFDs assist in identifying and defining the essential components of a system and their interactions.

Data Flow Diagram (Level 0)
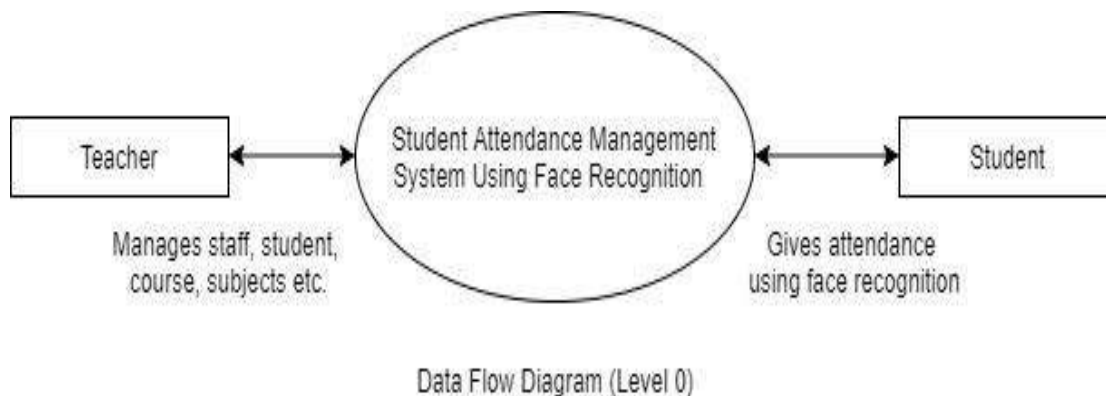
Fig [4.4] DFD LEVEL 0

In the Level 0 Data Flow Diagram (DFD) for the Student Attendance Management System using face recognition, the system is depicted as the central hub through which data flows between two primary actors: the teacher and the student. On the left side of the diagram, we have the teacher, who serves as the administrator and data manager. The teacher's role involves managing student data, which includes performance records and ratings. On the right side of the diagram, we have the student, who interacts directly with the system to mark their attendance using the face recognition feature.
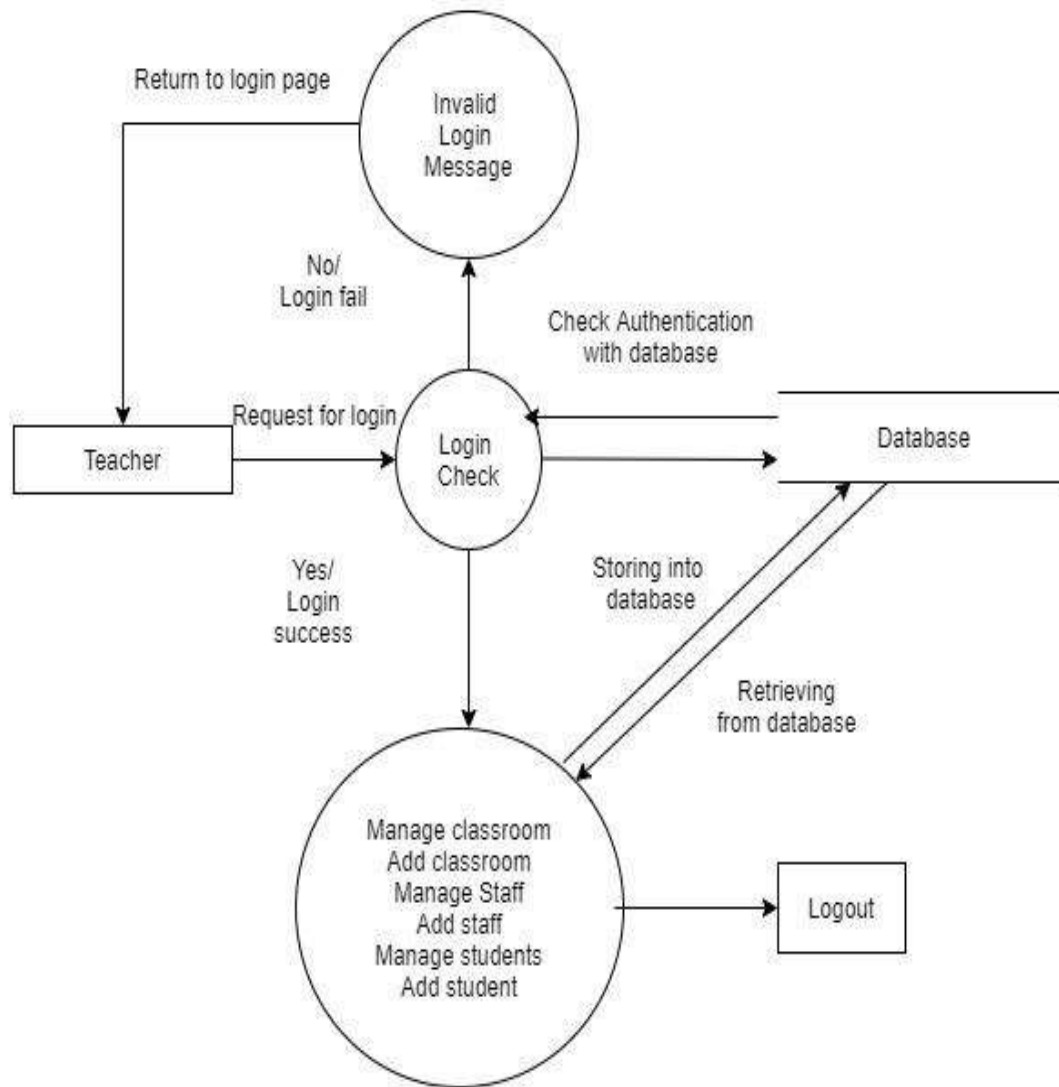
Data Flow Diagram of Admin (Level 1)

Fig [4.5] DFD LEVEL 1

The "Login Check Process" is responsible for verifying user login credentials, ensuring secure access to the system. Once logged in, users can interact with the system, with their actions being recorded and processed in the "Database (Student Information)." This component stores and manages student data. Meanwhile, the "Logout Process" offers users a secure way to exit the system when their interactions are complete.
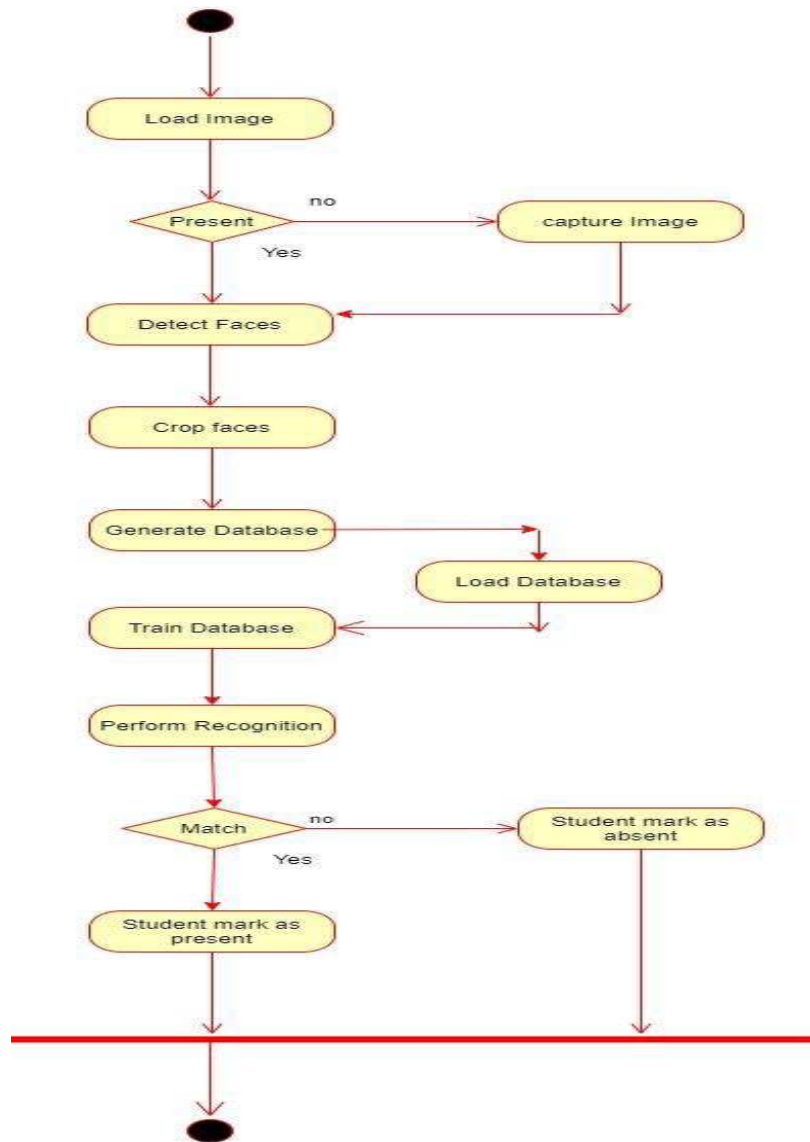
4.5 UML Diagram

Fig [4.6] **UML Diagram**

The process begins with loading the image of user for further manipulation. If the image is not present already, capture it from the photo samples. Detect the human faces from the image using harcascade classifier, crop the faces, convert them into gray scale, and then extract features from the gray scale images. Database of these images is created, this database will be trained to perform face recognition. The student whose face is matched dynamically with the features stored in classifier.xml file, will be marked as "present".

4.6 Module Design and details of implementation

Module 1 : Login Page

Purpose:
The login page acts as an entry point for the Administrator to access the system. Only if the admin contains valid credentials, he/she will be authorized to access the home page.

Fig [4.7] Login Page

Inputs
- Valid username and password

Outputs
- Redirect to the home page

Algorithm followed

1] Setting the title to the page.
- Use the Label() function to set title to the page, it takes bg_img,title, font,fg,bg,compound as parameters.

2] Loading the background image.
- Here, we open the image,resize it, and then the image is set as background.

3] Displaying the background image.
- Using the ImageTk.PhotoImage() the image works as background

4] Applying the login template.
- Here, the same procedure is followed as that of setting the background image.

- Additionally, the input fields are used for username and passwords.

5] Adding entry fields.
- The input fields are added to the login template using the ttk.Entry() function.

6] Implement login function for verifying credentials.
- The credentials entered in the input fields are then compared with the stored ones for verification.

Module 2 : Home Page

Purpose:
The home page helps administrator to have multiple options for manipulating the student database and marking the attendance of the students. It has different sub-modules such as "Student Details", "Detect faces", "Attendance", "Train Data", & "Photos"
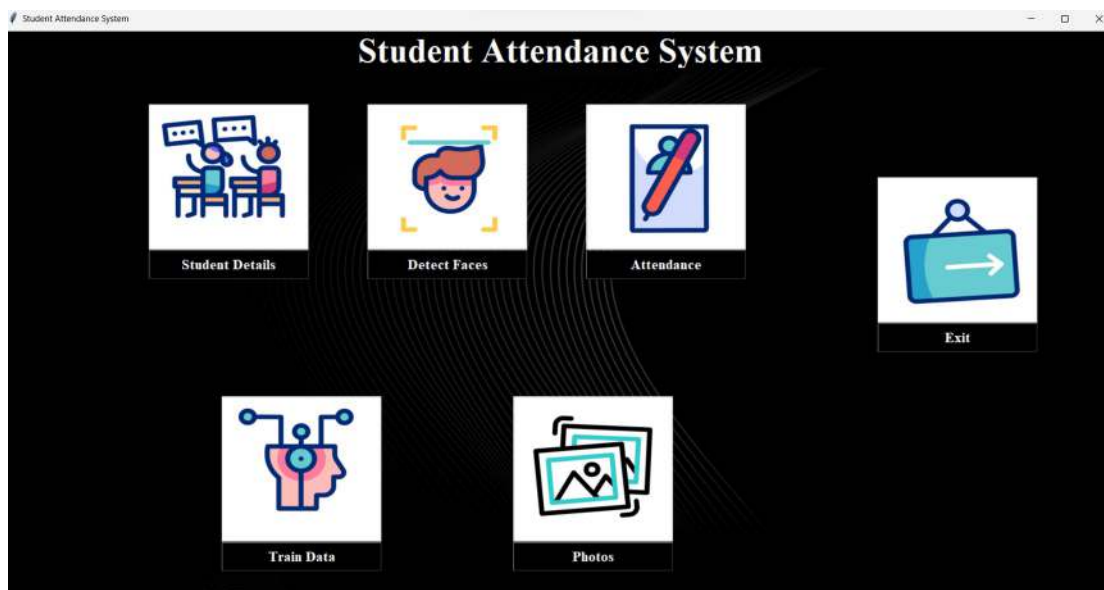
Fig [4.8] System's home page

Inputs:
- Administrator's request to view, edit, or manage student details.
- Selection criteria (e.g., student ID, course) for filtering student information.
- Captured or uploaded images for facial detection.
- Administrator's request to initiate facial detection.
- New facial data for training the system.
- Administrator's request to initiate training.
- Administrator's request to view or manage photos.
- Selection criteria (e.g., student ID) for filtering photos.

Outputs:

- Display of student details based on the specified criteria.
- Option to edit or update student information.
- Display of student details based on the specified criteria.
- Option to edit or update student information.
- Recorded attendance data.
- Updated facial recognition model.
- Confirmation of successful training.
- Display of photos based on the specified criteria.

Algorithm   followed

1] Defining the geometry (height & width) of the home page window.
- The width and height of the main window is defined using the geometry() function.

2] Setting the title to the page.
- Use the Label() function to set title to the page, it takes bg_img,title, font,fg,bg,compound as parameters.

3] Loading the background image.
- Here, we open the image,resize it, and then the image is set as background.

4] Displaying the background image.
- Using the ImageTk.PhotoImage() the image works as background.

5] Placing the buttons for: student details, detect faces, attendance, train data, photos and exit.
- The buttons to navigate through different modules are set using the Button() function. It takes bg_img,text,cursor,command and font as parameters.

6] Assign the onclick events to every button w.r.t to their windows.
- The onclick events are assigned to the buttons are using "command" attribute

Module 3: Student Details Management

Purpose: It comprises of all the student details stored in Database. Administrator will be able to manipulate the data of the students by using various entry fields and dropdown lists. The details like: Department, Course, Year, ID, Name,Division, Roll No, Email, Phone Number can be manipulated by the administrator.Here the teacher can also add,update or delete the data from database.

Fig [4.9] Student Details

Inputs:

- **Selection Criteria:**
- The administrator can input selection criteria to filter and view specific student details. This could include options like selecting a department, course, year, or other relevant filters.
- **Data Manipulation:**
- Input for adding, updating, or deleting student details. This may involve entering information into various entry fields such as Department, Course, Year, ID, Name, Division, Roll No, Email, and Phone Number.
- **Search Input:**
- The administrator can input search criteria (e.g., student ID, name) to quickly locate specific student details within the database.

Outputs:

- **Display of Student Details:**
- Upon entering selection criteria, the system displays student details based on the specified filters. This includes information like Department, Course, Year, ID, Name, Division, Roll No, Email, and Phone Number
- **Confirmation Messages:**
- After adding, updating, or deleting student details, the system provides confirmation messages indicating the success or failure of the operation. For example, "Student details updated successfully" or "Error: Unable to delete student record."
- **Visual Representation:**
- Visual representation of student details in a structured format, such as a table or list. This allows the administrator to easily review and manage the displayed information
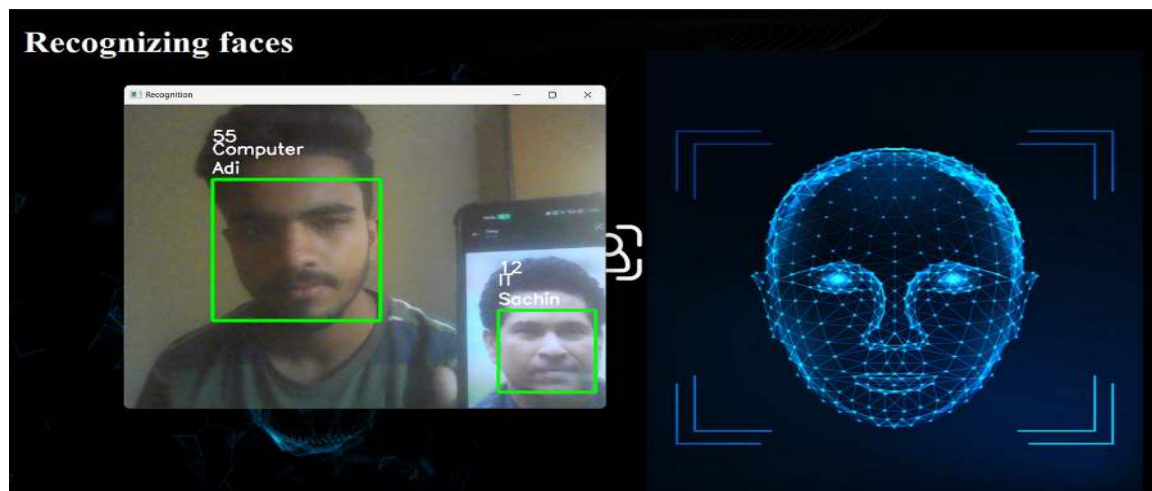
Algorithm followed:

1] Setting the title to the page.
- Use the Label() function to set title to the page, it takes bg_img, title, font, fg, bg, compound as parameters.

2] Loading the background image.
- Here, we open the image,resize it, and then the image is set as background.

3] Displaying the background image.
- Using the ImageTk.PhotoImage() the image works as background.

4] Creating a frame.
- A frame is necessary to divide the functionality from the rest of GUI background.
- It is created using the Frame() which takes bg_img,border and bg as parameters.

5] Dividing the frame into left one and right one.
- The main frame is divided into left and right frame.
- The left frame consists of entry fields and right frame consists of database table.

6] Designing the entry fields , drop down menus and radio buttons.
- From the fields in the left frame, the input is used to manipulate the data in the database.

7] Designing the database schema.
- The database schema is structured for reviewing the data of the students stored in the database

8] Connect the MySQL database with this schema.
- The mysql connector is used to establish a connection to the database.

<u>**Module 4: Detect Faces**</u>

Here the faces of students will be dynamically compared and recognized with the features already stored in the classifier.xml file.

Fig [4.10.1] Face recognizing page

Inputs:

Image Input:

The system takes input in the form of images containing faces that need to be detected and recognized. These images could be captured through a camera, uploaded from a file, or obtained from a live video stream.

Classifier Model:

The pre-trained classifier model (classifier.xml) is an input that contains features and patterns necessary for face detection and recognition. This model serves as the reference for comparing and matching faces.

Outputs:

Detected Faces:

The system outputs the coordinates or bounding boxes of the detected faces within the input image. Each detected face is marked with its position.

Recognition Results:

For each detected face, the system outputs the recognition results, indicating whether the face matches any stored features in the classifier model. This may include the identity or a confidence score.

Visual Representation:

The system provides a visual representation of the input image with marked bounding boxes around the detected faces, enhancing user understanding.

Alerts or Notifications:

If there are issues with face detection or recognition, the system may output alerts or notifications to inform administrators or users about potential problems.

Fig [4.10.2] Face recognizing page

Algorithm followed:

1] Setting the title to the page.
- Use the Label() function to set title to the page, it takes bg_img, title, font, fg, bg, compound as parameters.

2] Loading the background image.
- Here, we open the image,resize it, and then the image is set as background.

3] Displaying the background image.
- Using the ImageTk.PhotoImage() the image works as background.

4] Capture the video frames runtime.
- The video frames are captured using the VideoCapture().
- 0 is used as parameter when we want to use the default camera of the system.

5] Load the known faces (classifier.xml)
- The known encodings and known ids are stored in lists from the classifier.xml using the for loop, self.known_encodings.append(encoding) & self.known_ids.append(face_id).

6] Extract the face encodings from the video frames.
- The face locations and encodings are captured from the real time video frames using,
- face_recognition.face_locations(img)   & face_recognition.face_encodings(img,face_locations)

7] Compare these encodings with the ones stored in the classifier.xml file.
- The encodings are compared using the if loop, (if it matches..then)
- first_match_index = matches.index(True)

8] If they match, show the id, name and dept of the respective student and if they didn't match, show "unknown".
- If the ids are matched, show the green rectangle and the details.
- cv2.putText(img, id, (left, top - 10), cv2.FONT_HERSHEY_SIMPLEX, 0.8, (255, 255, 255), 2)
- The HOG (Histogram of gradients) and SVM(Support Vector Machine) algorithms are used for the facial recognitions purpose.
- HOG has been widely used in facial recognition systems due to its effectiveness in capturing local texture patterns and its robustness to changes in illumination and facial expression.
- Support Vector Machine (SVM) is a supervised machine learning algorithm used for classification and regression tasks. It is widely used in various fields such as pattern recognition, image classification, text categorization, and bioinformatics.

Module 5: Training Dataset

Here the features from uploaded photo samples will be extracted and stored into the classifier.xml file. This classifier.xml file serves as the reference model for subsequent face detection and recognition tasks. The primary goal is to ensure that the system can accurately identify and match facial features during real-time operations.

Fig [4.11] Training Dataset

Inputs :
- The system takes input in the form of images that serve as training samples. These images contain the facial features that need to be extracted and used for training the classifier.
- The administrator provides a set of high-quality image samples representing different individuals, ensuring diverse facial features and expressions.
- The system receives additional training image samples after a few months to keep the classifier updated.
- An administrator initiates a request to view the status of the training process.

Outputs:
- The primary output is an updated classifier.xml file containing the newly extracted features from the training image samples. This file is crucial for face detection and recognition in subsequent modules.
- The system outputs a message indicating the successful completion of the training process. This message may include relevant statistics, such as the number of features extracted.

- The system processes the training image samples, extracts facial features, and updates the classifier.xml file with the newly learned patterns.
- The system re-trains the classifier, incorporating features from the new samples, and updates the classifier.xml file accordingly.
- The system provides a training completion message, indicating that the classifier has been successfully updated based on the provided image samples.

Algorithm followed

1] Setting the title to the page.
- Use the Label() function to set title to the page, it takes bg_img, title, font, fg, bg, compound as parameters.

2] Loading the background image.
- Here, we open the image,resize it, and then the image is set as background.

3] Displaying the background image.
- Using the ImageTk.PhotoImage() the image works as background.

4] Place processing icon in the center.
- The icon is set as same as that of background image using the ImageTk.PhotoImage() function.

5] Navigate to the folder where the dataset of photo samples of the students is stored.
- This folder consists of all the photo samples (500) taken in the student module for further training.
- path = [os.path.join(data_dir, file) for file in os.listdir(data_dir)]

6] Load the image file.
- The image file from the dataset of photo samples is loaded, by using:
- image = face_recognition.load_image_file(image_path)

7] Generate the encodings from that image.
- The array of encodings to be stored in the xml file is generated here using,
- image = face_recognition.load_image_file(image_path)

8] Store the image encodings into the "classifier.xml" file with the name relating to the ids.
- encodings_elem = ET.SubElement(root, "encodings")
- ids_elem = ET.SubElement(root, "ids")
- encoding_elem.text = ",".join(map(str, encoding.tolist()))

Module 6: Attendance

After the face recognition, as per the "id" of matched face is used to retrieve some part of data from database "face_recognizer.student", in the attendance module, there is separate table "face_recognizer.attendancetb". Here the attendance of the student will be marked, the "In Timing" and "Out Timing" specifies the attendance of the student.

Fig [4.12] Attendance Management

Inputs:

Student ID (id):
Input from the face recognition process, the ID of the recognized student.

Outputs:

In Timing:
The time when the student arrives and their attendance is marked.
Out Timing:
The time when the student leaves and their attendance is marked (if applicable).

Algorithm Followed

1] Setting the title to the page.
  - Use the Label() function to set title to the page, it takes bg_img, title, font, fg, bg, compound as parameters.
2] Loading the background image.

- Here, we open the image,resize it, and then the image is set as background.

3] Displaying the background image.
- Using the ImageTk.PhotoImage() the image works as background.

4] Creating a frame.
- A frame is necessary to divide the functionality from the rest of GUI background.
- It is created using the Frame() which takes bg_img,border and bg as parameters.

5] Dividing the frame into left one and right one.
- The main frame is divided into left and right frame.
- The left frame consists of entry fields and right frame consists of database table.

6] Designing the entry fields , drop down menus and radio buttons.
- From the fields in the left frame, the input is used to manipulate the data in the database.

7] Designing the database schema.
- The database schema is structured for reviewing the data of the students stored in the database

8] Connect the MySQL database with this schema.
- The mysql connector is used to establish a connection to the database.
- Using the connection object (conn) the cursor is created which then fires queries to the database.

9] Resetting timings of attendance (IN ~ OUT).
- It is necessary to reset the timings so that new attendance will be taken on the next day.
- For eg; self.var_id.set("")

10] Exporting .csv file of attendance.
- The CSV file is opened using: with open(csv_file_path, 'w', newline='') as csv_file
- The data is written into the csv file, csv_writer = csv.writer(csv_file, delimiter=';')

1)Facial Recognition Interface:
- Upon accessing the system, users (teachers or administrators) are presented with an interface that prompts them to initiate the facial recognition process.
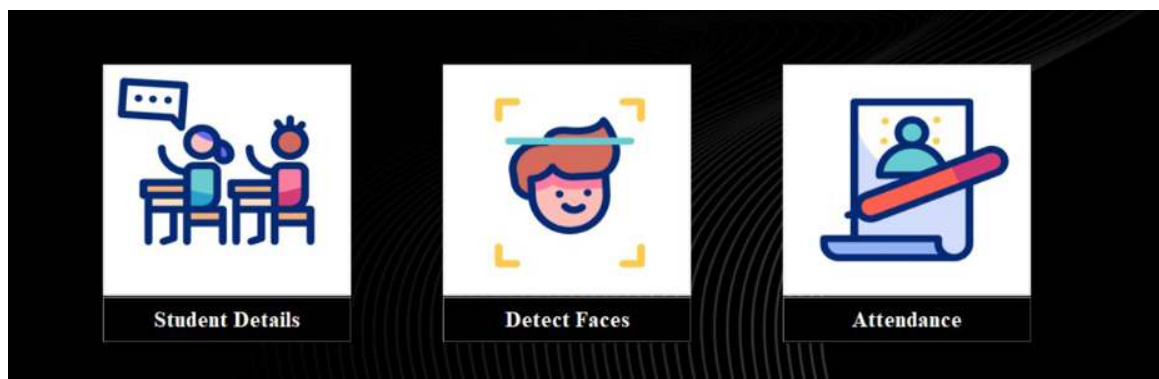- The interface includes option "Detect Faces".

Fig [4.13] Facial Recognition Interface

2) Camera Integration:

- The system integrates with the device's camera to capture images for facial recognition.
- Users may be prompted to align their faces within a designated frame for optimal recognition.
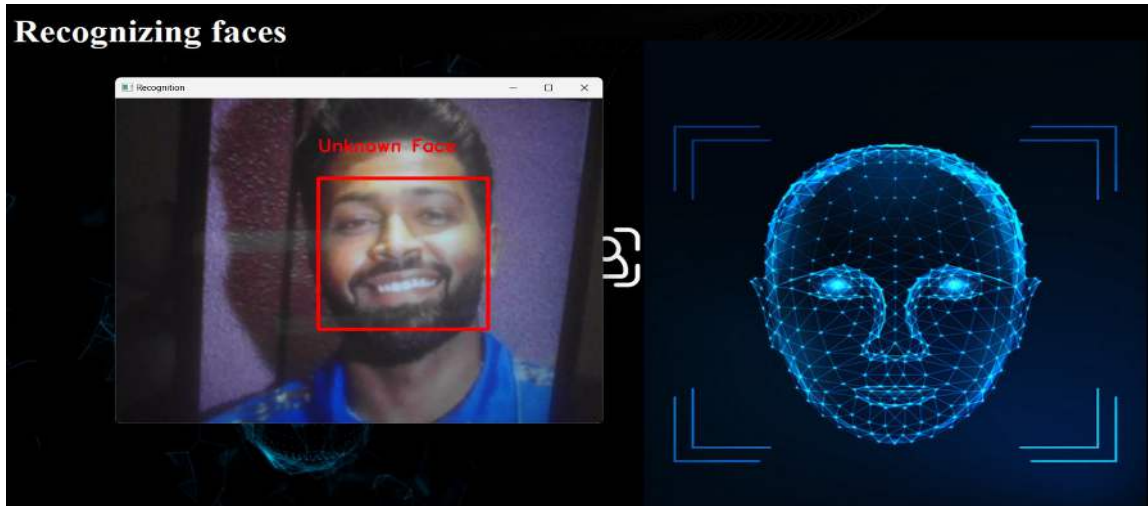

Fig [4.14] Camera Integration

- **Output design**

  The output design focuses on how the system presents information to users based on input. Here are the key elements of the output design:-

1)   Attendance Status:

After facial recognition, the system provides immediate feedback on attendance status. The attendance is marked in the "attendancetb" table stored in the database with in and out timings.
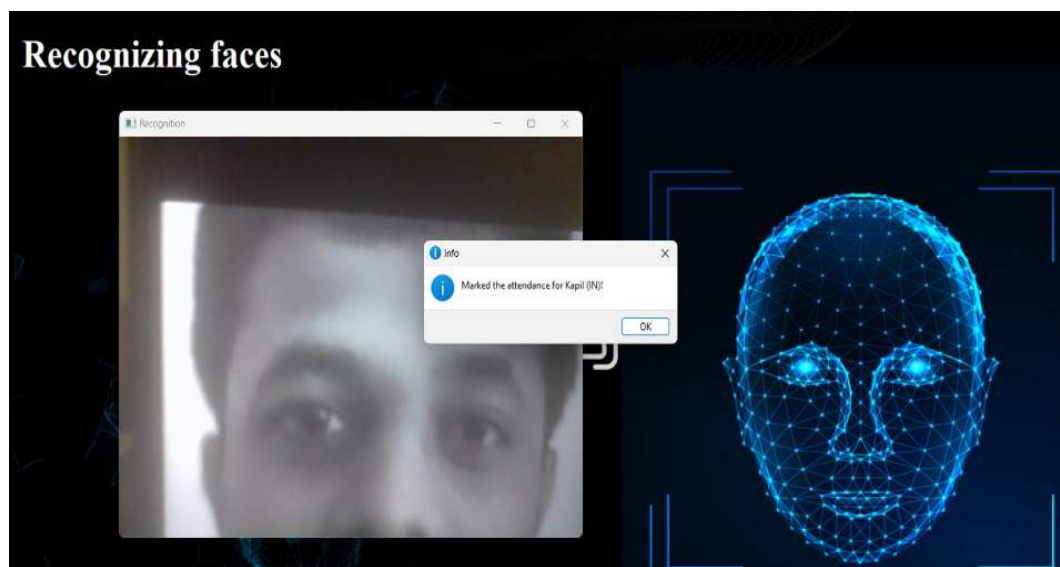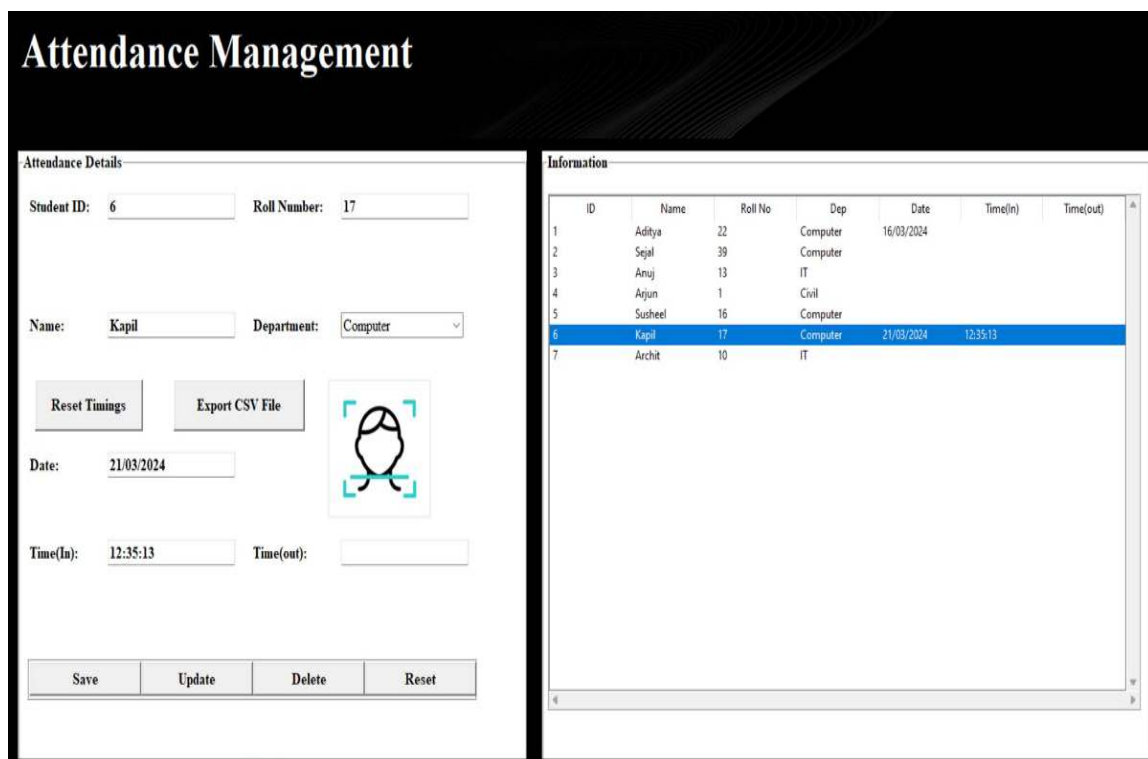
Fig [4.15] Attendance Status

2) Dynamically changed student Information:

Upon successful recognition, the system changes relevant student's information from the database in runtime.

Fig [4.16] Dynamically changed student Information

The input and output designs of the user interface are crucial for ensuring a seamless and intuitive experience for users interacting with the Attendance System using Face Recognition. By incorporating elements such as facial recognition interfaces, real-time feedback, and user controls, the system aims to streamline attendance management processes and enhance user satisfaction.

CHAPTER 5
RESULT AND OUTPUT OF THE PROJECT

- **Adding new student data:**

Fig [5.1] Adding new student data

The student details management interface provides administrators with a comprehensive toolset for maintaining accurate and up-to-date student records. By offering intuitive entry fields, dropdown lists, and operations such as add, update, and delete, administrators can efficiently manage student information, facilitating effective communication and administrative tasks within the educational institution.

Fig [5.2] Record Database

In the backend the MySQL database also shows the effect when the admin manipulates student data from the attendance system.

- **Uploading Photo Samples:**

Fig [5.3] Uploading Photo Samples

It takes 500 photo samples for a single student. The more photos are captured the more accuracy it provides during the facial recognition.
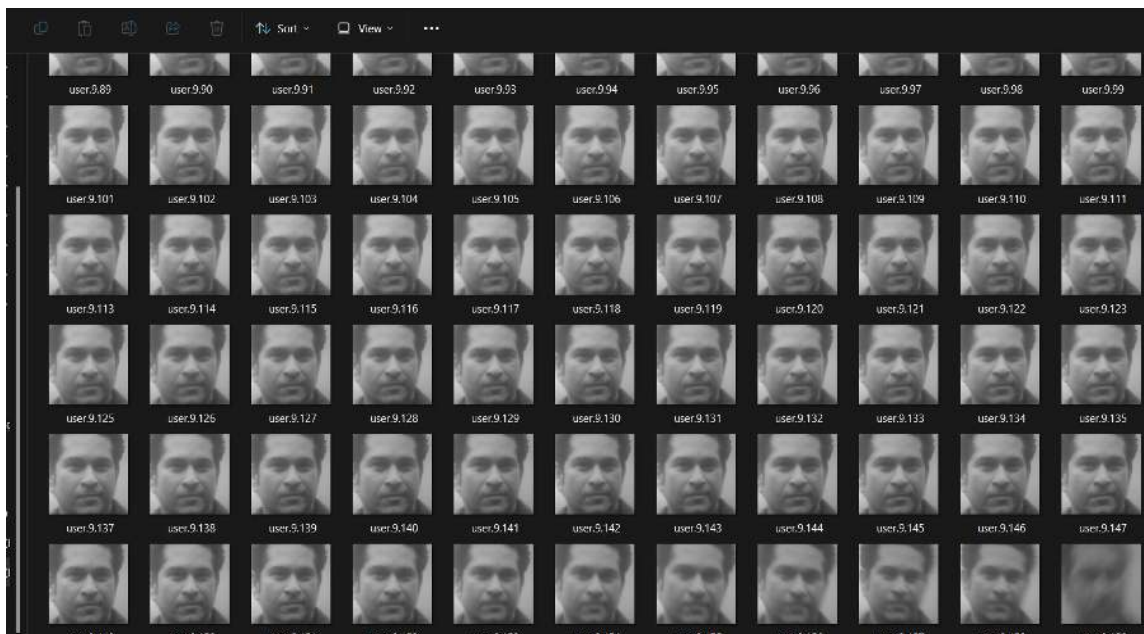
Fig [5.4] Saved Photo Samples

The photo samples are then stored in the "Data" folder, with the respective IDs of the student. These photo samples are then trained for feature extraction.

- **Training the Data:**

Fig [5.5] Training the Data

The photo samples which were stored in the "Data" folder, are now trained for feature extraction. This helps in facial recognition process so that these can be compared with the ones captured in run time.
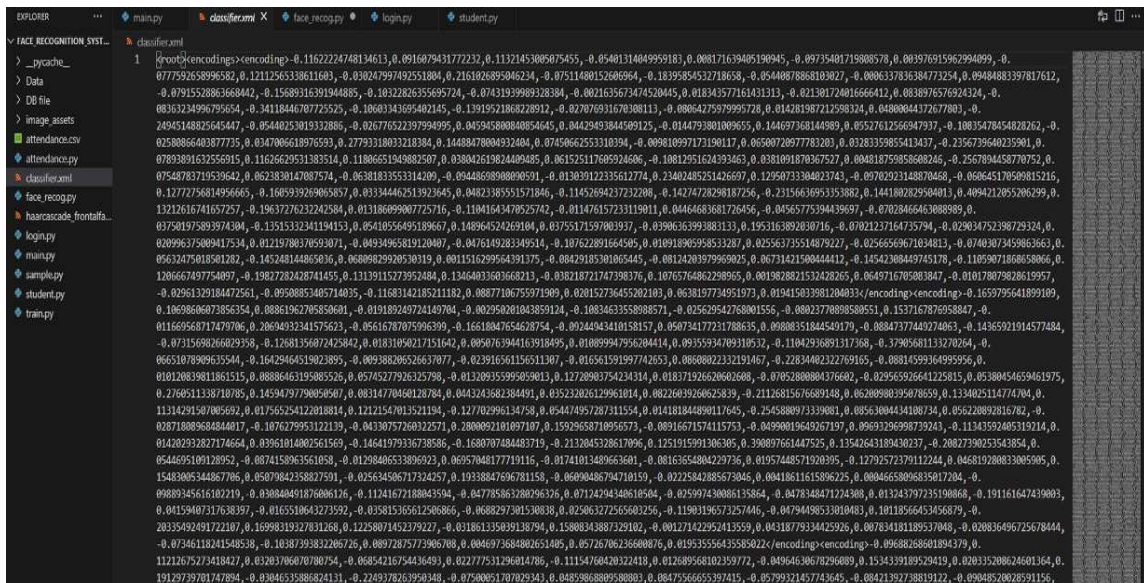
Fig [5.6] classifier.xml file

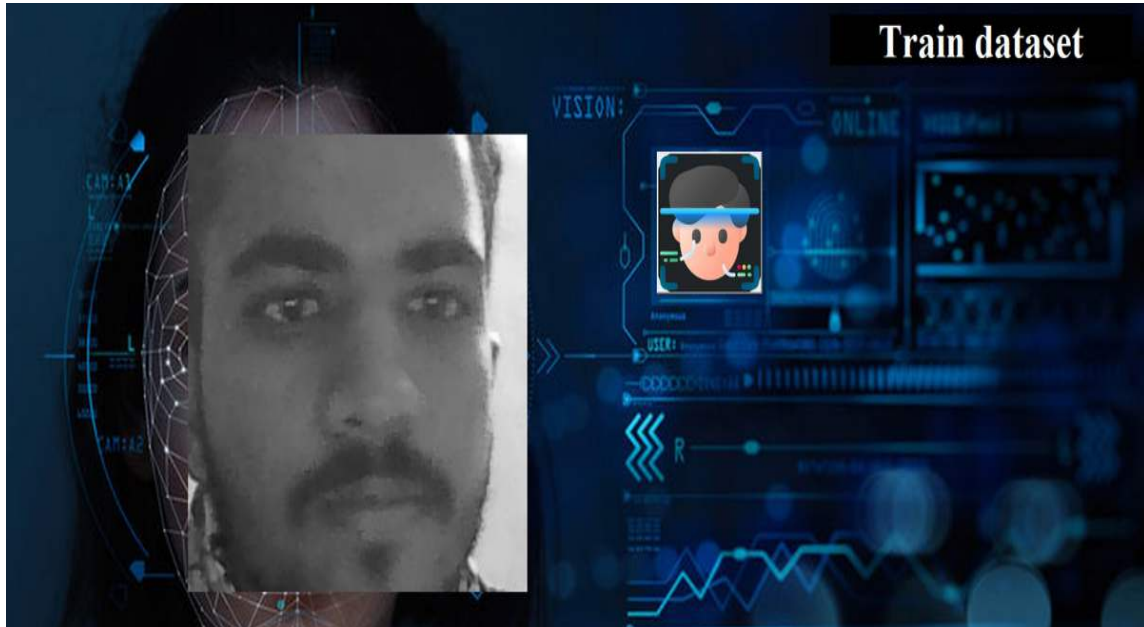The features are extracted, i.e. it appends the classifier.xml file with a multidimensional array of encoded features. These arrays are called as "known encodings", later these are compared with the new encodings.

- **Facial Recognition:**
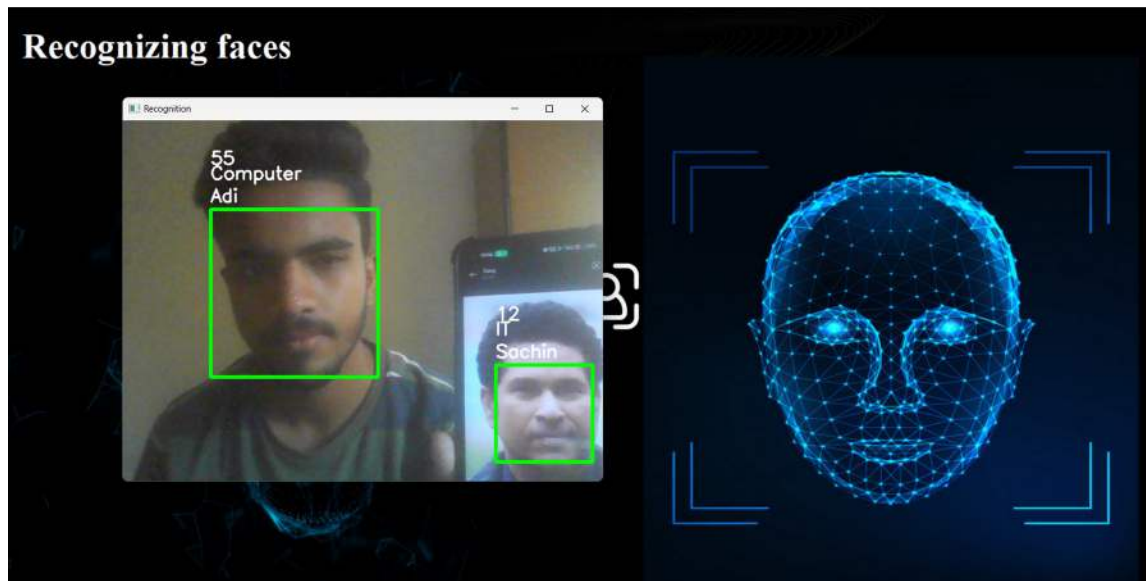
Fig [5.7] Recognizing Faces

Here , the known encodings for classifier.xml are compared with the dynamically captured video frames. It retrieves the roll no, dept and name of the student from the database whose features match with video frame images with the tolerance of "0.4".

Fig [5.8] Attendance Management

After recognition, the IN/OUT timings are updated in the "attendancetb" table stored in the database "face_recognizer".

CHAPTER 6
SOFTWARE TESTING

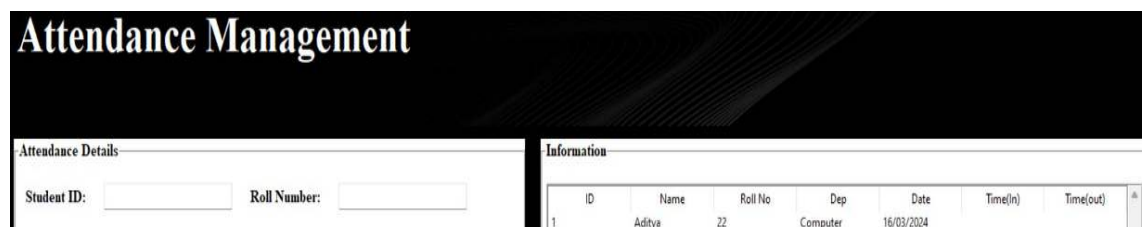**6.1 Test Cases of User Login Module:** The test cases for the User Login Module focus on verifying the functionality and security of the login process. They include scenarios to validate the correct handling of valid and invalid credentials, authentication mechanisms, session management, and password encryption.

Test Case ID	Description	Steps	Expected Result	Pass/Fail Criteria
TC_001	Successful Login	1. Launch application and navigate to login page. 2. Verify Username and Password fields and Login button are present. 3. Enter a valid registered username and password. 4. Click Login button.	User successfully logged in and redirected to the intended application area.	User logs in and accesses the application.
TC_002	Invalid Username	1. Follow steps 1 & 2 from TC_001. 2. Enter an invalid username that does not exist. 3. Enter a valid password. 4. Click Login button.	Error message displayed indicating invalid username.	Error message for invalid username shown.
TC_003	Invalid Password	1. Follow steps 1 & 2 from TC_001. 2. Enter a valid username. 3. Enter an incorrect password. 4. Click Login button.	Error message displayed indicating invalid password.	Error message for invalid password shown.
TC_004	Blank Username and Password	1. Follow steps 1 & 2 from TC_001. 2. Leave both Username and Password fields blank. 3. Click Login button.	Error message displayed indicating missing username and/or password.	Error message for missing credentials shown.
TC_005	Blank Username	1. Follow steps 1 & 2 from TC_001. 2. Leave Username field blank. 3. Enter a valid password. 4. Click Login button.	Error message displayed indicating missing username.	Error message for missing username shown.

6.2 Test Cases of Home Page module: The test cases for the User Login Module focus on verifying the functionality and security of the login process. They include scenarios to validate the correct handling of valid and invalid credentials, authentication mechanisms, session management, and password encryption.

Test Case ID	Description	Steps	Expected Result	Pass/Fail Criteria
TC_001	Access Student Details	1. Successfully log in. 2. Navigate to the "Student Details" sub-module 3. Verify that student list or details can be viewed.	Student details are correctly displayed and accessible.	Correct display and access to student details.
TC_002	Add New Student	1. Navigate to the "Student Details" sub-module. 2. Click on "Add New Student" button. 3. Enter the details of the new student and save.	New student details are saved and displayed in the student list.	Successful addition of a new student.
TC_003	Edit Student Details	1. Navigate to a student's details. 2. Click on "Edit" button. 3. Modify the details and save changes.	The changes are saved and reflected in the student's details.	Successful modification of student details.
TC_004	Record Attendance through Face Detection	1. Use the "Detect Faces" function with known student faces. 2. Verify that the attendance is marked for the detected faces.	Attendance for the detected student faces is correctly marked and recorded.	Correct marking and recording of attendance.
TC_005	Upload and Manage Photos	1. Navigate to the "Photos" sub-module. 2. Upload new photos. 3. Verify that uploaded photos are correctly categorized and accessible.	Photos are uploaded successfully and are correctly categorized under respective student profiles or identification tags.	Successful photo upload and categorization.

6.3 Test Cases of Student Details Management: These test cases ensure comprehensive coverage of the Student Details Management module, focusing on functionality, data integrity, user interaction, and error handling to maintain a robust and user-friendly system.

Test Case ID	Description	Steps	Expected Result	Pass/Fail Criteria
TC_001	Successful Data Retrieval	1. Log in as an administrator. 2. Navigate to the Student Details Management section. 3. Select a department and course. 4. Click on the 'Retrieve' button.	Correct student details corresponding to the selected department and course are displayed.	Correct data is displayed.
TC_002	Add New Student Record	1. Log in as an administrator. 2. Navigate to the Student Details Management section. 3. Click on 'Add New Student'. 4. Enter all required student details. 5. Click 'Save'.	New student record is successfully added and confirmation message is displayed.	New student data added and confirmation received.
TC_003	Update Existing Student Record	1. Log in as an administrator. 2. Navigate to the Student Details Management section. 3. Select an existing student record. 4. Update the necessary fields. 5. Click 'Update'.	The selected student record is updated with new details and a confirmation message is displayed.	Student record updated and confirmation received.
TC_004	Delete Student Record	1. Log in as an administrator. 2. Navigate to the Student Details Management section. 3. Select an existing student record. 4. Click 'Delete'. 5. Confirm deletion.	The selected student record is deleted and a confirmation message is displayed.	Student record deleted and confirmation received.
TC_005	Invalid Data Entry in Fields	1. Log in as an administrator. 2. Navigate to 'Add New Student' or 'Update' form. 3. Enter invalid data in one or	Error message(s) displayed indicating invalid data in the specified fields.	Error message(s) for invalid data shown.

		more fields. 4. Click 'Save' or 'Update'.		

6.4 Test Cases of <u>Detect Faces Module</u>: These test cases aim to ensure that the face detection module works accurately under various conditions and can handle errors gracefully.

Test Case ID	Description	Steps	Expected Result	Pass/Fail Criteria
TC_001	Successful Face Detection	1. Launch the application and navigate to the face detection feature. 2. Allow access to the camera. 3. Present a registered user's face to the camera.	The system successfully detects and recognizes the face, matching it with the stored features in classifier.xml.	Face is detected and correctly identified.
TC_002	Face Not Registered	1. Launch the application and navigate to the face detection feature. 2. Allow access to the camera. 3. Present an unregistered user's face to the camera.	Error message or indication that the face is not recognized or registered.	Error message or non-recognition indication shown.
TC_003	No Face Presented	1. Launch the application and navigate to the face detection feature. 2. Allow access to the camera. 3. Do not present any face to the camera.	Error message or indication that no face is detected.	Error message for no face detection shown.
TC_004	Multiple Faces	1. Launch the application and navigate to the face detection feature. 2. Allow access to the camera. 3. Present multiple faces to the camera at once	The system either recognizes all faces presented or displays an error if unable to process multiple faces.	All faces detected and identified, or appropriate error shown.
TC_005	Face Detection under Poor Lighting	1. Launch the application and navigate to the face detection feature. 2. Allow access to the camera. 3. Present a registered user's face under poor lighting.	System struggles with face detection, potentially showing an error message or taking longer to recognize.	System behavior under poor lighting conditions noted

6.5 Test Cases of Training Dataset: These test cases are designed to cover various scenarios that could affect the reliability and accuracy of the facial recognition system's training phase. Ensuring that the system can handle these cases effectively is crucial for its overall performance and usability in real-world applications.

Test Case ID	Description	Steps	Expected Result	Pass/Fail Criteria
TC_001	Successful Feature Extraction	1. Navigate to the feature extraction module. 2. Upload a valid photo sample. 3. Initiate the feature extraction process.	Features are successfully extracted from the photo sample and stored in **classifier.xml**.	Features correctly extracted and stored.
TC_002	Invalid Photo Format	1. Navigate to the feature extraction module. 2. Upload a photo in an unsupported format. 3. Attempt to initiate the feature extraction process.	Error message displayed indicating unsupported photo format.	Error message for unsupported format shown.
TC_003	Corrupted Photo Sample	1. Navigate to the feature extraction module. 2. Upload a corrupted photo file. 3. Attempt to initiate the feature extraction process.	Error message displayed indicating the photo cannot be processed.	Error message for corrupted photo shown.
TC_004	Missing Photo Sample	1. Navigate to the feature extraction module. 2. Attempt to initiate the feature extraction process without uploading a photo.	Error message displayed indicating no photo sample was uploaded.	Error message for missing photo shown.
TC_005	Classifier File Update With New Data	1. Navigate to the feature extraction module. 2. Upload a valid new photo sample. 3. Initiate the feature extraction process. 4. Check the classifier.xml file.	New features are added to **classifier.xml** without overwriting existing data.	Classifier file correctly updated.

6.6 Test Cases of Attendance: These test cases focus on the critical aspects of the Attendance module, ensuring not only that the face recognition and attendance marking features function correctly but also that the system handles errors and edge cases appropriately.

Test Case ID	Description	Steps	Expected Result	Pass/Fail Criteria
TC_001	Successful Attendance Marking	1. Initiate attendance process. 2. Present a registered student's face in front of the camera. 3. Validate face recognition and data retrieval 4. Mark "In Timing".	Attendance marked with accurate "In Timing" for the recognized student.	Correct attendance record entry.
TC_002	Unregistered Student	1. Initiate attendance process. 2. Present an unregistered student's face in front of the camera. 3. Attempt to validate face recognition.	Error message or indication that the face is not recognized/registered.	Appropriate handling of unregistered faces.
TC_003	Marking Out Timing	1. Ensure a student's attendance has been marked "In". 2. Present the same student's face at end of the day. 3. Mark "Out Timing".	"Out Timing" accurately marked and recorded in the system.	Correct "Out Timing" record entry.
TC_004	Incorrect Face Recognition	1. Initiate attendance process. 2. Present a slightly obscured or angled face of a registered student. 3. Attempt face recognition.	System prompts for clearer or direct face positioning or fails to recognize the face.	System accurately handles recognition errors.
TC_005	System Error during Data Retrieval	1. Initiate attendance process. 2. Present a registered student's face. 3. Simulate a database retrieval error.	System displays an error message indicating an issue with data retrieval.	Error is clearly communicated.

CHAPTER 7
COSTING

7.1 PROJECT ESTIMATE

COCOMO Model
A popular method for estimating software costs is called the Constructive Cost Model (COCOMO), which was created by Barry Boehm. It offers an organized method for determining the amount of work, time, and money needed to develop software projects. To determine the effort and cost estimations, COCOMO takes into account a variety of variables and project features. COCOMO is available in three versions: Basic, Intermediate, and Advanced

Step 1: Measure the size in terms of the amount of functionality in a system. Function points are computed by first calculating an unadjusted function point count (UFC).

Table no. 7.1 Unadjusted Function Count(UFC)

Sr. no.	Function points	Number	Description
1	User inputs	2	Real Time Image Capturing, Student Details
2	User outputs	2	Recognized Face, Marked Attendance
3	User requests	0	-
4	Internal Files	41	Dataset

Step 2: Multiply each number by a weight factor according to complexity of the parameter, associated with that number.

Complexity considered is <u>average.</u>

Table no. 7.2 Complexity Average

Sr. no.	Function points	Number	Weight Factor	Multiplication
1	User inputs	2	4	8
2	User outputs	2	5	10
3	User requests	0	4	0
4	Internal Files	41	10	410

Step 3: Calculate the total UFP (Unadjusted function points) by adding the multiplication column in above table

UFP = 8+10+0+410

  = 42

Step 4: Calculate the total TCF (Technical Complexity Factor) by giving a value between 0 and 5

Table no. 7.3 Technical Complexity Factor(TCF)

Sr no.	Technical Complexity Factor	Value
1	Data communication	5
2	Distributed Data Processing	5
3	Performance criteria	4
4	Heavily Utilized Hardware	0
5	High Transaction Rates	1
8	End user efficiency	4
9	Complex Computations	1
10	Reusability	4
11	Ease of Installation	5
12	Ease of Operation	5
13	Portability	4
14	Maintainability	4

Step 5: Sum the resulting numbers to obtain DI (degree of influence) by adding the value column in above table

DI = 42

Step 6: TCF (Technical Complexity Factor) by given formula

TCF = 0.65+0.01*DI

   = 0.65+0.01*42

   = 1.07

Step 7: Calculate FP (Function Points) using the given formula

FP = UFP*TCF

   = 49*1.07

   = 52.43

Step 8: To find KLOC (Lines of code) using language factor and FP

Language factor of php = 48

KLOC= Language factor * FP

   = 48*52.43

   = 2.51

Step 9: To calculate the effort and nominal development time using given formula and constants

Effort = $a_1*(KLOC)^{a_2}$ PM
Tdev $= b_1*(Effort)^{b_2}$ Months

Development mode considered is <u>Organic.</u>
Values of the constants in the Organic Development mode:
a_1=2.4 a_2=1.05 b_1=2.5 b_2=0.38

Effort = $2.4*(2.51)^{\wedge 1.05}$
    = 6.30 PM

Tdev $= 2.5*(6.30)^{\wedge 0.38}$
    = 5.03 Months

Step 10: Calculate the cost required to develop product by multiplying development time and average salary of engineers
Average salary is 3000
Cost required to develop the product = 5.03 * 3000
              = 15090

Hence the total cost required to develop the product is ₹15,090/-

CHAPTER 8
APPLICATIONS

1) Educational Institutions:
- In schools, colleges, and universities, facial recognition attendance systems streamline the process of tracking student attendance. Teachers no longer need to manually take attendance, reducing administrative burden and saving time.
- These systems ensure accuracy by verifying each student's identity through facial recognition, minimizing the possibility of errors or fraudulent attendance entries.

2) Corporate Offices:
- Facial recognition attendance systems enhance security and efficiency in corporate environments by accurately tracking employee attendance.
- Employees can quickly and securely clock in and out using facial recognition technology, eliminating the need for traditional timekeeping methods like punch cards or biometric scanners.

3) Public Events:
- Facial recognition attendance systems are increasingly being used at public events such as conferences, concerts, and sports matches to manage attendee registration and access control.
- These systems streamline the check-in process, reducing wait times and improving overall attendee experience.
- By accurately identifying attendees through facial recognition, event organizers can prevent unauthorized access and enhance security measures.

4) Government Institutions:
- Facial recognition attendance systems offer government agencies an efficient way to monitor employee attendance and productivity.
- By automating the attendance tracking process, these systems reduce administrative overhead and improve resource utilization within government departments.

CHAPTER 9
FUTURE SCOPE

The future scope for facial recognition attendance systems is promising, with ongoing advancements in technology and increasing demand for efficient and secure workforce management solutions

1) Enhanced Accuracy and Reliability:
Continued research and development efforts aim to improve the accuracy and reliability of facial recognition algorithms, particularly in challenging conditions such as low lighting, occlusions, and varying facial expressions.

2) Edge Computing and IoT Integration:
Integration with edge computing and Internet of Things (IoT) devices enables facial recognition attendance systems to operate autonomously and efficiently process data in real-time.
Edge computing facilitates faster decision-making and response times by processing data locally on edge devices, reducing latency and bandwidth requirements.

3) Personalized User Experiences:
Future facial recognition attendance systems may offer personalized user experiences tailored to individual preferences and requirements.
Customizable interfaces, adaptive features, and intelligent recommendations enhance user satisfaction and engagement, leading to increased adoption and usage.

4) Biometric Data Analytics and Insights:
Advanced analytics capabilities enable facial recognition attendance systems to generate actionable insights and predictive analytics based on biometric data.
Data-driven decision-making and trend analysis help organizations optimize workforce management strategies, improve operational efficiency, and enhance employee productivity.

CHAPTER 10
CONCLUSION

In conclusion, our project marks a significant breakthrough in attendance monitoring systems, overcoming existing limitations while offering a superior solution at an affordable cost. Through the integration of facial recognition technology, we have developed a robust system capable of accurately tracking attendance with unparalleled efficiency and reliability.

By leveraging the power of facial recognition, our system eliminates the need for manual attendance taking, reducing administrative burden and potential errors. This not only enhances the overall efficiency of attendance management but also ensures a higher level of security and accountability within educational or organizational settings.

Our approach involves the seamless integration of facial recognition technology with sophisticated data processing algorithms, allowing for real-time identification and recording of individuals' attendance. Moreover, the system's adaptability and machine learning capabilities enable it to continually refine its accuracy and performance over time.

With our proposed system, we anticipate not only precise attendance monitoring but also the generation of comprehensive attendance reports and analytics. This innovation promises to streamline the attendance tracking process, promote fairness and transparency, and ultimately contribute to more effective and efficient management practices in educational institutions, workplaces, and beyond.

CHAPTER 11
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CHAPTER 12
PUBLISHED PAPERS

Paper Published:

Table No 12.1: paper Published

Sr. No.	Title of Paper	Impact Factor	Date of publication	Venue	Remark
1	Attendance Monitoring System using Facial Recognition	State Level	12th March 2024	ijsrem.com	Certificate

Project Competition:

Table No 12.2: Project Competition

Sr. No.	Event Name	Name of College	Date	Award/ Participation	Remark
1.	Technovation 2k24	Raharshi Shahu Maharaj Polytechnic	19/03/2024	Participation	Certificate

"Attendance Monitoring System using Facial Recognition."

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Abstract - Efficient and reliable attendance monitoring remains crucial in today's educational landscape, facing new challenges alongside traditional concerns. Existing methods, like roll calls and paper-based systems, prove time-consuming and inefficient. To address these limitations and promote environmental sustainability, we propose an "Attendance Monitoring System using Facial Recognition" developed with Tkinter.This innovative application levecrages facial identification technology to streamline the attendance process. It not only enhances efficiency but also contributes to environmental responsibility by minimizing paper usage. Furthermore, the system incorporates facial recognition as a biometric authentication method, combating the issue of attendance manipulation. This technology is particularly well-suited for educational institutions where accurate attendance data is essential. This project represents a significant advancement in attendance management, bridging the gap between technological innovation and educational needs. By automating the process and ensuring accuracy, this system has the potential to positively impact the educational landscape.

keywords:

1. *Python 3.8*
2. *MySQL*
3. *Tkinter*

1.Introduction-

The Attendance System using Face – Recognition is a replacement way method for the traditional way of marking attendance. The proposed system is Desktop application, Machine Learning based system.. This system can be implemented on a single faculty system of a particular institute. This system is proposed to be based on biometrics .i.e. Face Authentication. Since there is presence of biometrics, this system completely eliminates the chances of fake attendance which is a problem with the traditional methods of attendance.

The Attendance management is the significant process that were carry out in every institute to monitor the performance of the student. Every institute does this in its own way. Some of there institute use the old paper or file-based system and some have adopted strategies of automated attendance system using some biometric technique. A facial recognition system is a computerized software which is suited for determining or validating a person by performing comparisons on patterns based on their facial appearances.

Here, the teacher will be the super user (Administrator). Teacher will be able to manage the data of the students stored in the database. Data includes attendance, performance in practicals, rating of student,etc. After the completion of theory sessions the teacher would just scan multiple students and assign the

attendance of present students in just one tap! Administrator would also be able to scan the face of a particular student and read its data.

2.Literature Survey-

Using real time computer vision algorithms in automatic attendance management systems This system introduces a new approach in automatic attendance management systems, extended with computer vision algorithms. The Proposed system uses real time face detection algorithms.

Automatic Control of students' attendance in Classrooms Using RFID Radio frequency identification (RFID) is one of the automatic identification technologies more in vogue nowadays. There is a wide research and development in this area trying to take maximum advantage of this technology, and in coming years many new applications and research areas will continue to appear.

Face Recognition based Attendance Management System using Machine Learning is the most arduous task in any organization is attendance marking. We proposed an automated attendance management system which tackles the predicament of recognition of faces in biometric systems subject to different real time scenarios such as illumination, rotation and scaling.

Face Recognition-based Lecture Attendance System proposed a system that takes the attendance of students for classroom lecture. The system takes attendance automatically using face recognition. However, it is difficult to estimate the attendance precisely using each result of face recognition independently because the face detection rate is not sufficiently high.

3.Problem Definition

Educational institutions struggle with time-consuming and inaccurate attendance methods like roll call and paper signatures. These practices waste faculty time, lead to unreliable data, and harm the environment with paper usage. To address these problems, we propose an "Attendance Monitoring System Using Facial Recognition". This application automates attendance marking by capturing student faces, comparing them to a database using facial

recognition, and automatically marking attendance. This not only saves time and resources but also improves accuracy and security, making it a leap forward in attendance management and a significant contribution to the educational landscape

4.Proposed Working
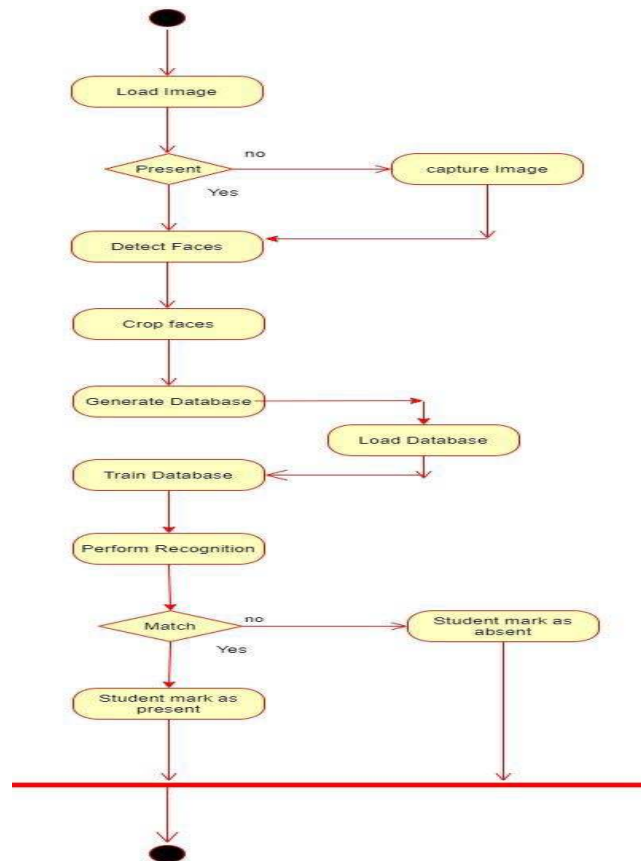
The propsed working for the project "Attendance monitoring system using facial recognition" is likely for an attendance marking application. It starts by loading an image, potentially from a database. The system then determines if a face is present. If a face is detected, it is cropped and sent to a database for training or recognition. If no face is detected, the system might record the student as absent. This process suggests that the system is designed to automatically mark attendance based on facial recognition, potentially improving efficiency and accuracy compared to traditional methods

5. Result-

Train dataset
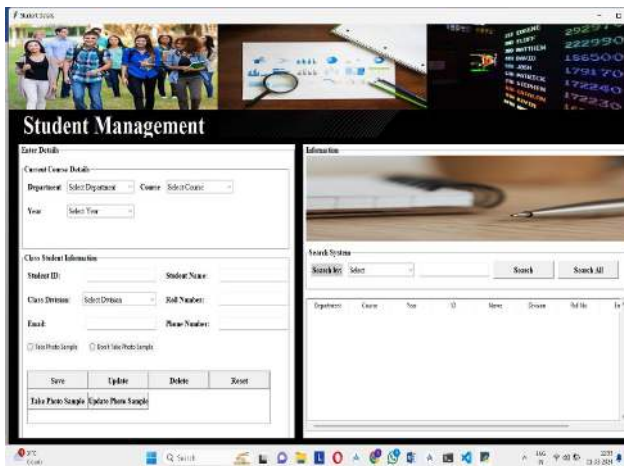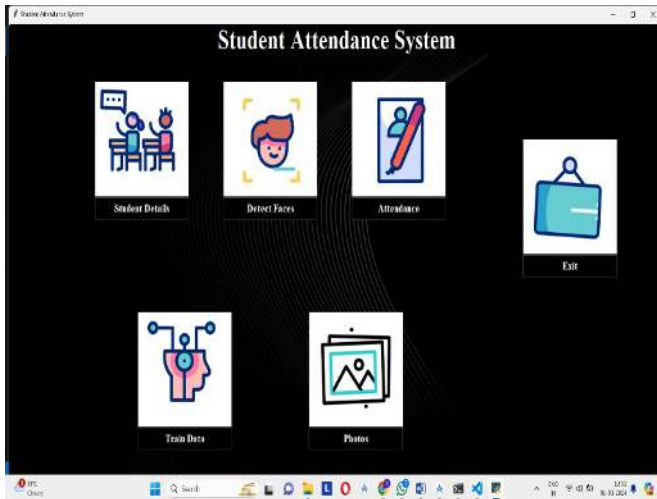
6.Conclusion-

The "Attendance Monitoring System using Facial Recognition" project presents an innovative and efficient solution to the perennial challenges faced by educational institutions when it comes to monitoring and recording student attendance. By leveraging cutting-edge technology and machine learning capabilities, this system not only streamlines attendance tracking but also enhances security and reduces environmental impact.

Through our feasibility analysis, we have determined that this project is both technically and economically feasible. The benefits of implementing this system include improved accuracy, reduced administrative workload, and a positive impact on the environment by minimizing paper usage.

It's important to emphasize that the successful development and implementation of this system will significantly contribute to educational institutions' operational efficiency and effectiveness. It aligns with the ever-evolving educational landscape, providing a robust solution to the persistent issue of attendance management.

7. Acknowledgement

lab technicians to help, it has been our endeavor to through out our work to cover the entire project work.We also thankful to our parents who providing their wishful support for our project completion successfully.Lastly we thanks to our all friends and the people who are directly or indirectly related to our project work.

8. References

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