

Project Mid Term Progress on
Attendance System Using Facial Recognition



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Abstract

An attendance system using facial recognition involves using a camera or other visual input device to capture images of individuals as they enter a building or location. These images are then processed using facial recognition software, which compares the captured images to a database of known individuals to identify and confirm the identity of the person. Once the individual has been identified, their attendance is recorded and logged in the system. This system can be used to automatically track attendance for meetings, events, or classes, eliminating the need for manual sign-in sheets or other manual processes. It can also be used to enhance security by only allowing access to authorized individuals. Overall, an attendance system using facial recognition can provide a convenient and efficient way to track attendance and ensure the security of a location.

Keywords: Web application, Face Detection System, Face Recognition, Image Processing, Database of known individuals.

Table of Contents

Chapter 1	1
1. Introduction.....	1
1.1 Problem statement	1
1.2 Objective	1
1.3 Aim.....	2
1.4 Motivation	3
1.5 Scope	3
1.6 Application	4
Chapter 2	6
2. Literature Review	6
Chapter 3.....	9
3. System Design	9
3.1 Block diagram of system.....	9
3.2 Use Case Diagram.....	11
3.3 Class Diagram	11
3.4 Experimental Tools and Setup	12
3.4.1 Django.....	12
3.4.2 PostgreSQL	13
3.4.3 Open-CV	13
Chapter 4.....	14
4. Implementation and Discussion.....	14
4.1 Tasks Implemented	14
4.2 Output Obtained	14
4.3 Tasks to be Implemented.....	14
Chapter 5.....	15
5. Conclusion	15
Bibliography	16

LIST OF FIGURE

FIGURE 1: ASUFR SYSTEM DIAGRAM	10
FIGURE 2: ASUFR USE CASE DIAGRAM	11
FIGURE 3: ASUFR CLASS DIAGRAM.....	12

Abbreviations

ASUFR: Attendance System Using Facial Recognition

AI: Artificial Intelligent

UI: User Interface

SVM: Support Vector Machine

OpenCV: Open Computer Vision

SQL: Structured Query Language

MySQL: My Structured Query Language

Chapter 1

1. Introduction

Attendance system using facial recognition (ASUFR) is a web application that allows an organization to track and monitor employee attendance using facial recognition technology. This system utilizes a webcam or other camera device to capture an employee's image, which is then compared to a database of images to verify their identity. Once the employee's identity is confirmed, the system records their attendance in real-time. This attendance system offers a convenient and efficient way to track employee attendance, as it eliminates the need for manual tracking methods such as sign-in sheets or card swipes. It also adds an extra layer of security, as it ensures that only authorized employees are able to mark their attendance. This attendance system is particularly useful for organizations with a large number of employees, as it can save time and resources that would otherwise be spent on manual attendance tracking.

1.1 Problem statement

The current attendance system at XYZ company relies on employees manually signing in and out of the office using a physical attendance sheet or a centralized computer system. This process is time-consuming and prone to errors, as employees may forget to sign in or out, or may sign in for a colleague who is absent.

To improve the attendance system, the company would like to implement a facial recognition system that automatically tracks employee attendance by detecting their face as they enter and exit the office. The system should be able to accurately identify individual employees and record their attendance in real-time.

1.2 Objective

The main objectives of the facial recognition attendance system are as follows:

- To accurately identify individual employees and record their attendance in real-time. Employees will become more diligent about attending office. This is because employee's attendance can only be taken personally, and any absentees will be detected by the system. This not only trains employees to be punctual but also avoids immoral ethics such as signing attendance for their friends.
- To reduce the time and effort required for employees to sign in and out of the office.
- To eliminate errors and discrepancies in the attendance records.
- To provide an efficient and secure attendance tracking system.

1.3 Aim

The aim of an attendance system using face recognition is to accurately and efficiently track employee attendance by using facial recognition technology to confirm the identity of an individual. This system can be used to streamline the process of taking attendance, reduce errors and manual effort, and ensure that attendance records are accurate and up-to-date.

Some potential benefits of using a face recognition attendance system include:

- Increased accuracy: By using facial recognition technology, the attendance system can accurately confirm the identity of an individual, reducing the risk of errors or fraudulent attendance.
- Enhanced security: The system can be configured to only allow access to authorized individuals, providing an additional layer of security and preventing unauthorized access to the workplace.
- Increased efficiency: The system can automate the process of taking attendance, reducing the time and effort required to manually track employee attendance.
- Better record-keeping: The system can automatically record attendance data in real-time, providing an accurate and up-to-date record of employee attendance.

Overall, the aim of an attendance system using face recognition is to provide a reliable and efficient way to track employee attendance and improve the accuracy and security of attendance records.

1.4 Motivation

There are several potential motivations for using a face recognition system for attendance tracking:

- **Accuracy:** Face recognition systems can be highly accurate, especially when combined with other biometric data such as a fingerprint or iris scan. This can be particularly useful in situations where it is important to accurately track attendance, such as in a school or at a conference.
- **Convenience:** Face recognition systems can be quick and easy to use, as they do not require individuals to manually sign in or out. This can save time and make the attendance tracking process more efficient.
- **Security:** Face recognition systems can provide an additional layer of security, as they can help to ensure that only authorized individuals are able to access certain areas or events. This can be particularly useful in settings where security is a concern, such as at a government facility or a secure conference.
- **Data collection and analysis:** Using a face recognition system for attendance tracking can also allow for the collection and analysis of attendance data, which can be useful for understanding patterns of attendance and identifying trends. This information can be used to improve the efficiency and effectiveness of attendance tracking processes.
- **Cost-effectiveness:** In addition to the benefits outlined above, an attendance system using a face recognition system may also be cost-effective, as it can reduce the need for manual attendance tracking processes and eliminate the need for physical sign-in sheets or badges.

1.5 Scope

The scope of an attendance system using a face recognition system may include the following elements:

- **Hardware:** This may include the hardware required to capture and process face recognition data, such as cameras, scanners, and servers.
- **Software:** This may include the software required to operate the face recognition system, such as the face recognition software itself, as well as any additional software required to manage and analyze the attendance data.
- **Integration:** The attendance system may need to be integrated with other systems, such as a payroll system or an employee management system, in order to accurately track and record attendance data.
- **Training:** Users of the attendance system, such as employees or students, may need to be trained on how to use the system in order to ensure accurate and efficient attendance tracking.
- **Maintenance:** The attendance system will likely require ongoing maintenance in order to ensure that it is functioning correctly and accurately tracking attendance.
- **Data management:** The attendance system will generate a large amount of data, which will need to be managed and stored securely.
- **Reporting:** The attendance system may need to generate reports on attendance data, such as attendance rates or patterns of attendance, in order to provide useful insights and inform decision-making.

1.6 Application

There are many potential applications for an attendance system using a face recognition system, including:

- **Schools:** An attendance system using a face recognition system can be used in schools to track the attendance of students and staff. This can help administrators to monitor attendance rates and identify patterns of absenteeism.
- **Conferences:** An attendance system using a face recognition system can be used at conferences to track the attendance of attendees. This can help organizers to ensure that only authorized individuals are able to access the conference and to track attendance data for analysis.

- Government agencies: An attendance system using a face recognition system can be used in government agencies to track the attendance of employees and contractors. This can help to ensure that only authorized individuals are able to access certain areas and to accurately track attendance data.
- Corporate offices: An attendance system using a face recognition system can be used in corporate offices to track the attendance of employees. This can help to streamline attendance tracking processes and improve efficiency.
- Event venues: An attendance system using a face recognition system can be used at event venues, such as concert halls or sports arenas, to track the attendance of attendees. This can help organizers to ensure that only authorized individuals are able to access the event and to track attendance data for analysis.

Chapter 2

2. Literature Review

Plenty of research has been conducted so far on the various available methods for implementation of an effective attendance monitoring system. These methods vary in terms of the types of input method used, the types of data processing employed and the controllers used to implement the systems. In this section we will be looking for the various available solution with the advantages and disadvantages of each system. First system, “Attendance System Using NFC Technology with Embedded Camera on Mobile Device” (Bhise, Khichi, Korde, Lokare, 2015). Near field communication is a type of short distance wireless communication that takes place between two devices, one active and the other passive. The two devices are basically inductor coils which can respond to an electromagnetic induction. The active device is utilized to produce an electromagnetic field of a given radius and strength. Which used to implement an attendance system. In a school setting for example, students can be given NFC tags that are uniquely programmed with their unique identification numbers. Upon attending the classes, the lecturers bring the NFC readers and a student is required to swipe their NFC tags near the reader, say the lecturers’ phone. This information is then transmitted to the school database to mark the attendance of the student. However, this system is vulnerable to impersonation where one person can sign in for someone else. The other related systems that use biometrics (Fingerprint recognition RFID, etc.) to identify end user are time management systems used in many colleges, institutions and schools. However, these systems introduce further privacy concerns. These systems are also subject to physical damage from their users. Therefore, they need additional maintenance costs. The idea proposed by us, Removes physical access from anyone to the automated system. the camera will take an image and starts the process of face detection using the techniques and methods. After this the program will automatically make a folder in the database having the employees to be recognized. The already placed images of each employee is taken and used from database for image recognition. The images will be fetched and compared with each of the entry

in the database and hence will be checked whether the employee is present in the organization or not. If there is no match the program will move on to the next picture. [1]

Aadhaar Based Biometric Attendance System Using Wireless Fingerprint Terminals. Narra Dhanalakshmi; Saketi Goutham Kumar; Y Padma Sai. Published in: 2017 IEEE 7th International Advance Computing Conference (IACC) In this paper, two different approaches are proposed to authenticate the captured fingerprint in the process of verification. The first approach uses data base which is created by the organization itself and the second approach uses the Aadhaar Central Identification Repository (CIDR). Wireless fingerprint terminals are used to capture and store the attendance records of the students in the device data base and updating them to the server data base. SMS Alerts are sent to students and their parents in case of their irregularity, absence or shortage of attendance. Limitation: Aadhar Data may not be available and also fingerprint bases system has its own drawbacks. [2]

A web enabled secured system for attendance monitoring and real time location tracking using Biometric and Radio Frequency Identification (RFID) technology. Srinidhi MB ; Romil Roy Published in: 2015 International Conference on Computer Communication and Informatics (ICCCI) The main idea of this paper is to built a safe and secure web based attendance monitoring system using Biometrics and Radio Frequency Identification (RFID) Technology based on multi-tier architecture, for both computers and smartphones. Limitation: Students can exchange their RFID cards. [3]

Real-Time Online Attendance System Based on Fingerprint and GPS in the Smartphone. Lia Kamelia; Eki Ahmad Dzaki Hamidi; Wahvudin Darmalaksana; Afrit Nugraha Published in: 2018 4th International Conference on Wireless and Telematics (ICWT) The purpose of the research is to develop an online presence system which is a combination of fingerprint modules and GPS. The ZFM-20 fingerprint module is used as the system's main input as well as a security tool as an entrance to get access to the entire system. To determine the user's location and sends it to the smartphone, GPS Module is used. Arduino module present in the system will send a text message to the parties concerned about the user's location

data automatically. Limitation: It is a fingerprint-based system and has its own disadvantages. [4]

Chapter 3

3. System Design

System design will be concerned with the computer-oriented design of the system. System design (sometimes also called Top-Level Design) is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. The Attendance System Using Facial Recognition (ASUFR) is designed to automate the attendance process in an organization using facial recognition technology. The system has two types of users: employees and admins. Employees can have their attendance marked by the system, while admins have additional privileges such as managing employees, registering new employees, and training the facial recognition model.

3.1 Block diagram of system

The ASUFR system can be designed using a client-server architecture. The server-side handles the core functionalities, while the client-side provides user interfaces for both employees and admins.

The system can be divided into the following components:

- I. Client-side Interface for Employees:
 - Facial Recognition UI: This interface displays the camera feed and performs real-time face detection and recognition for employees.
- II. Client-side Interface for Admin:
 - Employee Management UI: This interface enables admins to manage employee information, including adding new employees, updating employee details, and viewing employee records.
 - Training UI: Admins can use this interface to initiate the training process for the facial recognition model using new employee data.
- III. Server-side Components:
 - Facial Recognition Module: This module performs real-time face detection and recognition using OpenCV and deep learning-based face recognition models. It communicates with the client-side Facial Recognition UI.

- **Attendance Management Module:** This module handles the attendance marking process, storing attendance records, and generating reports. It interacts with the client-side Attendance Marking UI and the Employee Management Module.
- **Employee Management Module:** This module manages employee information, including adding new employees. It interacts with the client-side Employee Management UI and the Attendance Management Module.
- **Training Module:** This module trains the facial recognition model using new employee data. It receives training data from the client-side Training UI and updates the face recognition model.

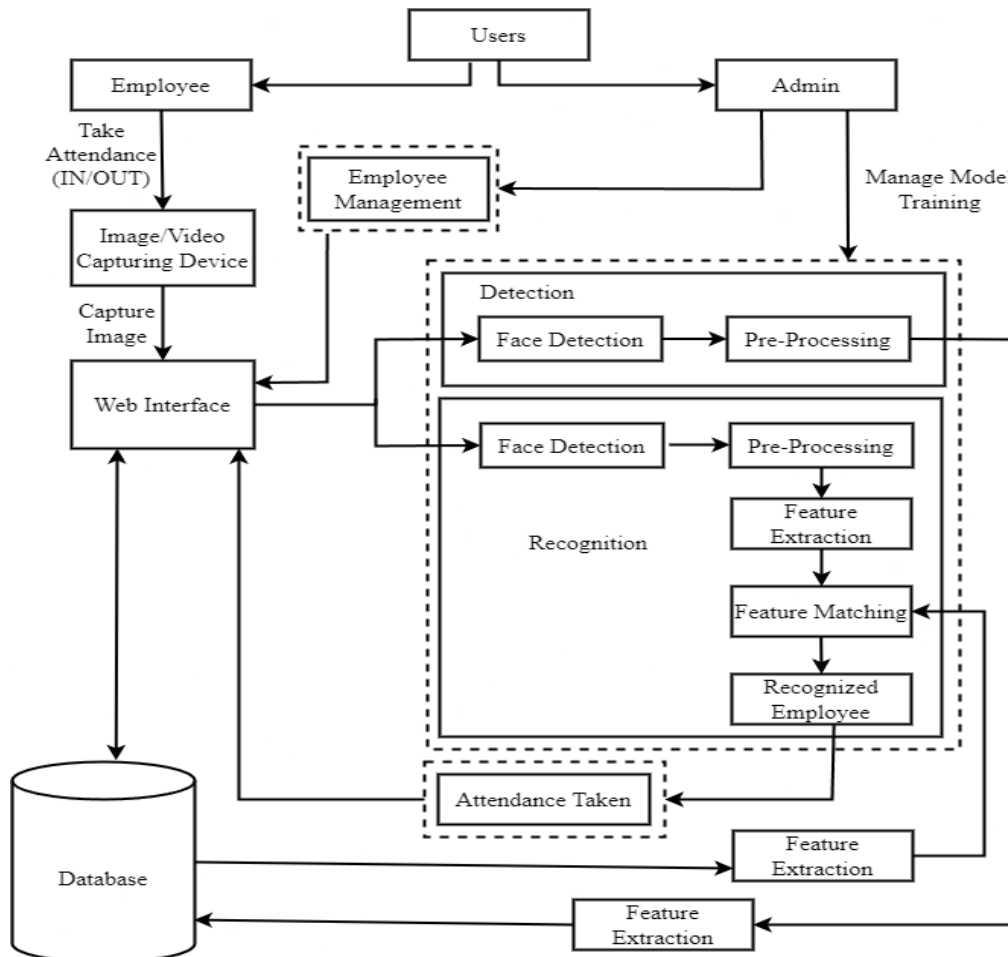


figure 1: ASUFR System Diagram

3.2 Use Case Diagram

The use case diagram provides an overview of the main interactions and functionalities of the system from the perspective of the admin and employee roles.

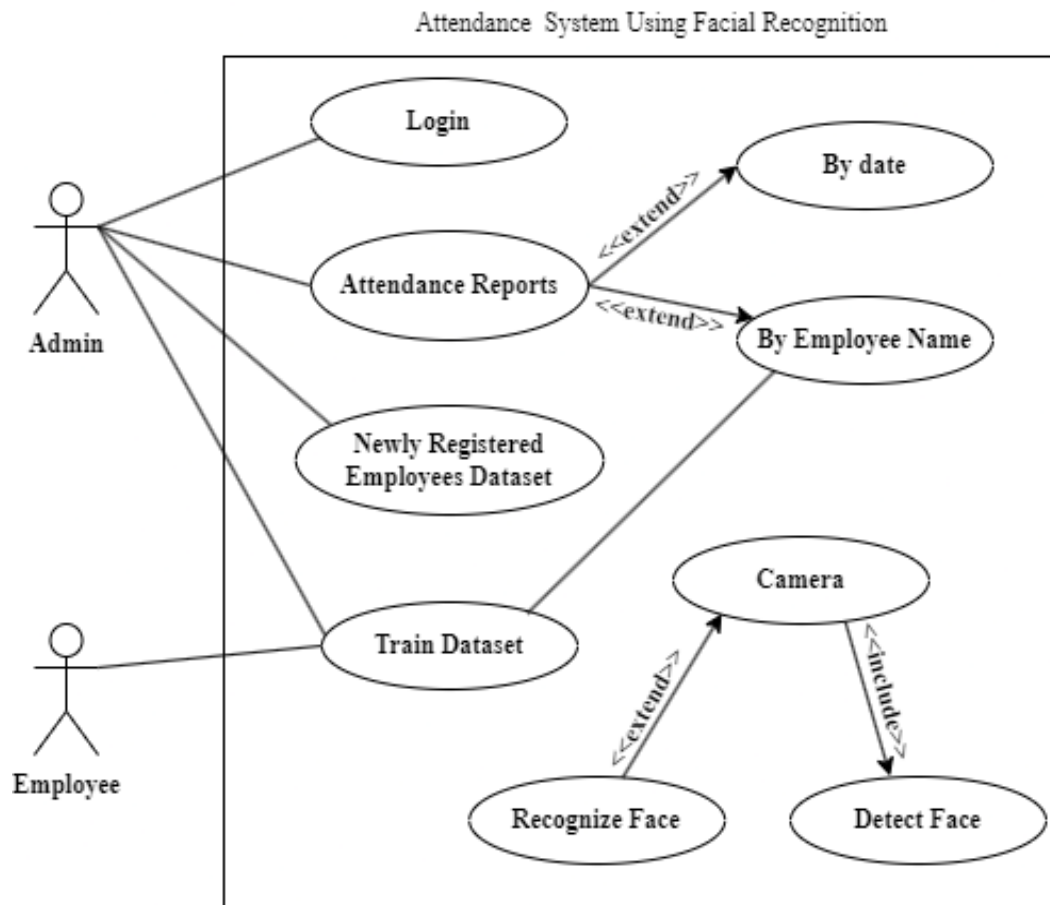


figure 2: ASUFR Use Case Diagram

3.3 Class Diagram

The initial phase of the project involved designing a class diagram to outline the key classes and their relationships. The class diagram provided a visual representation of the system's structure, including the Attendance, Employee, Facial detection, and Registration classes. This diagram serves as a blueprint for the implementation of the system.

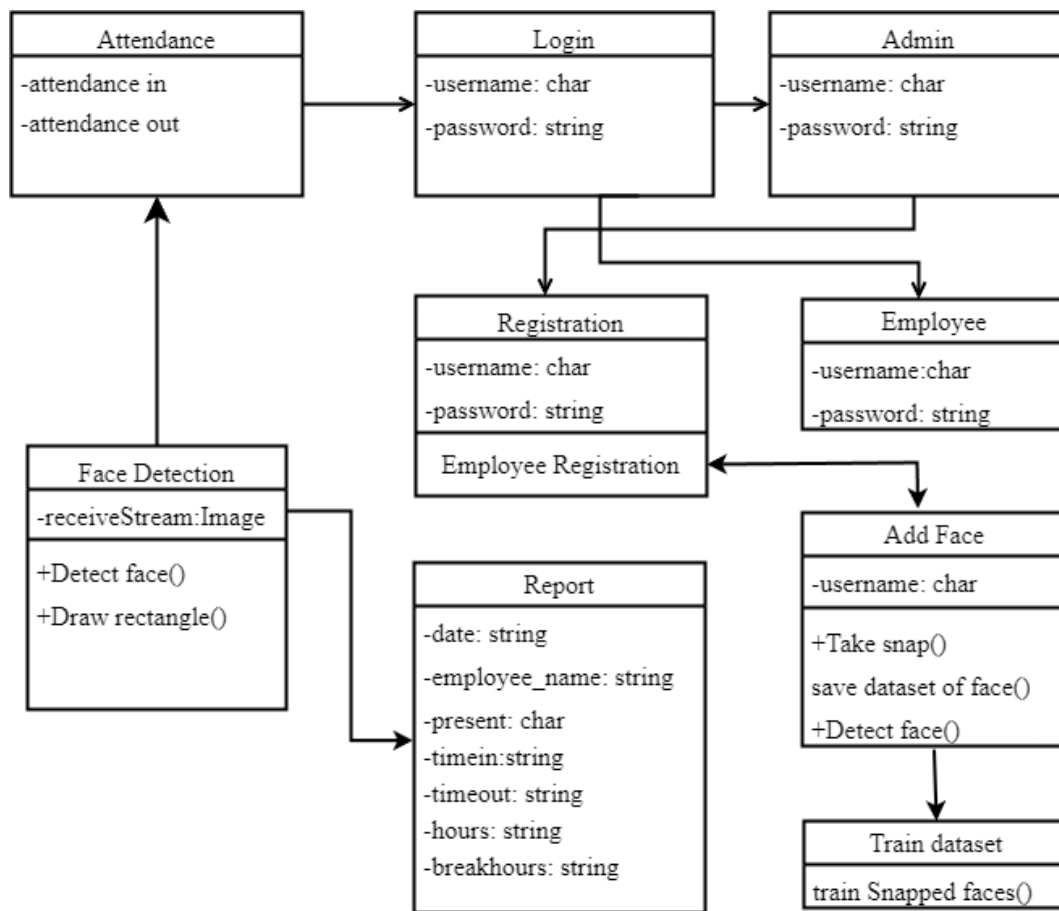


figure 3: ASUFR Class Diagram

3.4 Experimental Tools and Setup

3.4.1 Django

Django is a comprehensive Python web framework known for its rapid development capabilities and elegant, practical design. It was created by experienced developers and takes care of the majority of the difficulties associated with web server management. It is also capable of handling CPU-intensive tasks more efficiently than other frameworks like Node.js, Express.js, and Go. In this project, we will utilize Django to build APIs for interacting with our database as well as both mobile and web applications.

3.4.2 PostgreSQL

PostgreSQL, also referred to as Postgres, is a free and open-source relational database management system that prioritizes extensibility and adherence to SQL standards. It is superior to other SQL databases like MySQL and CouchDB due to its compatibility with a variety of programming languages, including Python, Java, JavaScript, C/C++, and Ruby, as well as its support for geospatial data. Thus, making it a popular choice among developers and data professionals. In this project, we will be using PostgreSQL as the database for our system to manage information related to plant species' profiles, feedback from the users and other geospatial data.

3.4.3 Open-CV

OpenCV is the huge open-source library for computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify image pattern and its various features we use vector space and perform mathematical operations on these features. The first OpenCV version was 1.0. OpenCV is released under a BSD license and hence it's free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, MacOS, iOS and Android. When OpenCV was designed the main focus was real-time applications for computational efficiency. OpenCV enables us to do even more complex tasks relatively easy.

Chapter 4

4. Implementation and Discussion

4.1 Tasks Implemented

The following tasks are implemented for the project:

- The basic design layout (web front-end part) and functionality of the project have been completed.
- The web front-end can now communicate with the back-end and model server, enabling features such as signing in, register new employees, train data model.
- Most of the back-end features, such as creating new employees, logging in, using authentication features, detection and recognition of the employees, updating the attendance.
- The admin portal for managing the database and its information, including employee's information, and attendance report.

4.2 Output Obtained

The following output is obtained as the result of the above-mentioned task:

- Registered employee and admin can login via login UI.
- Admin can register new employees and train the datasets
- Admin can generate the report based on date and employee name.
- Employees can take attendance (IN/OUT) via UI.

4.3 Tasks to be Implemented

The following tasks are yet to be implemented:

- Employees time shifting.
- Employees leave application portal.
- Report printing.
- Data train for the individual employees separately and displaying on screen.

Chapter 5

5. Conclusion

In this mid-term report, significant progress has been made in the development of an attendance system using facial recognition for employees. The project aims to provide a reliable, efficient, and secure solution for managing attendance records within an organization.

Following the design phase, the development of the attendance system began. The implementation focused on integrating facial recognition technology to accurately identify employees and mark their attendance. The Facial Detection module was designed to handle the facial recognition tasks, while the Registration module served as a storage facility for employee data. The Attendance module was responsible for coordinating the overall functionality of the system. It facilitated the marking of attendance using facial images and provided a method to generate attendance reports. These features were implemented to enhance efficiency and streamline attendance management.

As the project progresses, it is crucial to address privacy and data security concerns related to facial recognition. Strong data protection measures, including encryption and access controls, will be implemented to safeguard employee facial data and attendance records. Compliance with applicable regulations will be ensured to maintain employee trust and meet legal requirements.

In conclusion, the mid-term progress of the attendance system using facial recognition is promising. The system's design and implementation have laid a solid foundation for achieving the project's objectives of accurate attendance management, improved efficiency, and enhanced security. Moving forward, further development and testing will be conducted to refine the system and address any potential challenges.

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