BIOTRACK ATTENDANCE AND USER MANAGEMENT SYSTEM USING DJANGO, DEEP LEARNING AND SQLite3

DISCIPLINE:

BS COMPUTER SCIENCE

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ABDUL WALI KHAN UNIVERSITY MARDAN
(SESSION 2021-2025)

PROJECT APPROVAL

It is to certify that this project is approved and recommended as partial fulfillment for the award of Bachelor Degree in Computer Science, from Abdul Wali Khan University, Mardan.

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UNDERTAKING

I certify that project work titled *"BIOTRACK ATTENDANCE AND USER MANAGEMENT SYSTEM USING DJANGO, DEEP LEARNING AND SQLite3"* is our own work. None of the work included in this project has ever been used to support a submission for another award or qualification, either at this institution or elsewhere.

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(Muhammad Dawood)

DEDICATION

"Every challenging task needs individual work and wisdom from elders, particularly those who are dear to us.

Father & Mother,

Their devotion, love, support, and unceasing, endless prayers have helped me succeed and honor.

I am grateful to all the hardworking and respected teachers who have played a significant role in my journey. Their dedication and guidance have been invaluable in shaping my accomplishments."

(MUHAMMAD DAWOOD)

PROJECT ABSTRACT

In today organization, to maintain the accurate record of employee attendance and leave record is very important for fast HR management. Previous methods like manual entry, finger print and RFID-based attendance are time consuming, overhead on administrates and inaccurate. This present smart intelligent face recognition attendance and user management system using Deep Learning, computer vision and web technology to automate employee attendance with less human interactions.

This system use DeepFace with FaceNet (FaceNet512) is the primary model to recognition face, analyze face attribute and extract embedding from it and OpenCv and SSD are the secondary model so that the system doesn't miss any employee embedding and avoid time complexity. Yolov8n for real time single and multi-face detection in a single frame. During Registration and marking attendance live image are need to mark attendance and make registration. After registration and admin approval automatically, dashboard is created for employee where he can login through face recognition. This system automatically assigns unique id to each employee based on their designation and department like IT-SOF-0001 to avoid duplication and maintain consistency.

This system includes leave management allow employee to apply for leave from employee dashboard. Admin can approve or reject application based on the reason and leave balance. After reject or accept employee can download the leave application in pdf with authority sign and stamp.

Overall, this system not only provide automatic attendance to automate HR repetitive task but also enhance security to avoid brute force and temporary block the user ip address. Provide real time employee attendance monitoring. By using the AI technology to solve real world administrative problem.

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CHAPTER 1

INTRODUCTION

This web-based project offers an easy and intuitive interface that makes it simple for Employee to make attendance using CCTV/webcam through face recognition and manage user easily. The growing of digital technology has make changing in different organizations and industries, providing the need for fast and user-friendly systems. This we based project focuses on design and implementation of a comprehensive Face Recognition Attendance and user management system that handle both users and admin.

This web-based project is built in Deepface which deep learning framework with rich backend Deep Learning models like opencv, skip, ssd etc. and also display face expression like gender, age and race during registration and marking attendance, Yolov8 which is object detection model that detect 119 objects in a single frame and Django is backend scripting programming language which allow users to make dynamic web-based projects for transmitting data between server and user. Python framework Django is used to make the web pages, which are hosted on Django provided Django Development Server. Meanwhile MySQL database is used to store all of the data that can be seen by the admin. There are user and admin side of this project.

On the User/client side, this system offers an easy/simple registration by providing personal information with profile picture which allows them to enter the employee dashboard using facial recognition where they can view his current, monthly attendance record, record of leave with status and pdf downloadable application in case of accept or reject application and also can apply for sick, annual and casual leave. Users can also see information about himself like name, id, designation, date of registration etc.

On the administrative/admin end, the system provides tools for managing leaves, accepting user registration request. Administrators/admins have authority/access to a centralized/main dashboard where administrators/admin can check/monitor employee's attendance, view total number of users, leave management. Additionally, admin can see all the users register user and can edit and remove user information. Additionally, he can manage leaves where he can accept or reject the

leave application of the users. Additionally, the admin can see the attendance record of the all employs which are register and also, he you can export the attendance record in csv. Admin can also change the number of leaves and attendance time. After that attendance time all the user who not detected by camera will be automatically mark absent.

By summarizing, our project provides meaningful help to the field of industry attendance providing a practical solution that enhances the employees experience streamlines, administrative tasks, and promotes operational efficiency within the industry by using Advance AI technology.

1.1 Problem Description

This section discusses the limitations/disadvantages and a situation where user become stuck in manual procedures in industry administrations/managements. These include difficulties/problems while taking the attendance of the all employees and there are no up to dates/real-time updates about industry if there are any employees available or not. This method/procedure is time consuming/taking and full of complete effort/struggle as well. Other challenges/problems include, employee's management/handling and computerization of all activities/actions of industry/organization. In-person processes/procedures sometimes include tedious/boring work, lack/less of transparency/clearness, possible slips/slides, following users' and staffs' data in real time.

To overcome these problems, in different industry provides a digital/computerized method. The system's goal/object in designing/plaining a web-based application is to simplify and enhance several operations and elements of Industry. It seeks automated attendance, simplify apply for leave, and analysis the attendance of employees, handling employees and other industry activities. Our main focus is to solve/answer the constraints/limitations of manual/physical methods by putting a computerized system that improves preciseness, lessens administrative burden, and guarantees conveniences in managing industry. The system ultimate goal is to manage attendance operations more effectively and efficiently, which will benefit both admin and employee.

Our problem provides a clear scope and objectives for the creation and execution of the attendance management system by identifying the obstacles and stressing the necessity of an automated system.

1.2 Scope of the Study

In this section, the scope of the project is specified. It outlines features and functionalities offered the User Management, including Leave management, Current Attendance status, Attendance analysis details, automatic marking absent, apply for leave, leave status, employees management and any other essential aspects related to the University and industry.

1.3 Aims and Objectives

Consider an Attendance Management System, to give an example. What can it mean to us?

a) **Improving Efficiency:** The tool makes the routine, school life easier, reduces physical activity, and saves time. Automatic attendance: no scanning or flipping cards or paper lists, attendance is recorded automatically.

b) **User-Friendly Interface:** This system design must be intuitive, simple and responsive interface for employee to navigate seamlessly, thus enhancing overall attendance experience. The interface must enable users to find their intended information without any effort and difficulty.

c) **Real-Time Availability Updates:** The system is adapted to the type of life when the time of classes changes and the plans of students may change every moment. It is designed in a way that handles last minute changes and abrupt timetable revisions without causing hitch in attendance monitoring.

d) **Personalized Leave Management:** The system must include features that allow employees to specify the type of leave (e.g., sick, annual, casual leave), select relevant reasons or amenities if applicable, and submit special requests for leave

e) **Access to Information:** On a desktop, and on a mobile phone, you can find out which people are checked in and who is behind. There is no longer any need of walking to the front office or pestering the instructor.

f) **Reducing Administrative Load:** The system intends to overcome the administrative load caused by manual operations. Administrators can increase productivity by concentrating on more strategic and valuable tasks by computerizing.

g) **Transparent and Streamlined Processes:** The system's goal is to increase operational transparency in Attendance management system. Administrators and user may follow progress on various activities and get all pertinent information on an easily navigable platform.

h) **Overall Improvement of Attendance Management:** This system improves the management of Attendance by conferring the challenges of manual processes. Any organizational (or class) operation goes through much smoother when it is supported by clear and automated operating tools.

A useful attendance management system must define each objective with precision, measure results and maintain a tight control concerning the real meaning of success. By clarifying these objectives, the system also has its roadmap, which is that the desired outcome is indeed provided.

1.4 Project significance

The significance of this attendance management system is the role that it plays in enabling instructors and administrators to monitor attendance records as well as non-attendance. On real-time data, they can keep abreast with absences, chase up students, and even adjust class policy on a whim. Below are the key points that highlight the importance of the project:

a) Enhanced User Experience:
By offering an intuitive online platform, this system improves the overall experience for employees. Features such as face recognition attendance marking, attendance history analysis, and easy access to employee's attendance records help improve satisfaction and streamline interaction with the attendance system.

b) Operational Transparency:

Real-time updates provide transparency by showing accurate attendance data, leave management and attendance statuses to both user and admin. This enhances trust and reduces misunderstandings. It ensures **accurate and reliable reporting**, which minimizes human error and reduces the possibility of data manipulation.

c) Effective Management:
This system is useful in the management of attendance data by attendance managers and

administrators to easily create reports and advice trends as well as allocate the resources according to attendance figures. The centralized database will quicken the process of data retrieval thus lessening the amount of manual work, enhanced decision, and use of resources.

d) Simplified Attendance Process:
The system makes the process of attendance marking and tracking simpler. It does away with the necessity of: saving time to users and admins by means of paper-based registers or manual entry. It facilitates as well: automatic notifications of unusual or tardy attendance, or no shows so prompt action can be taken intervention.

Overall, attendance management system helps to increase efficiency of administration and broadly enhance performance. is employee-based engagement, offers reliable monitoring and assists institutions to perform data-driven decisions. It is advantageous in that it streamlines the attendance processes of employees and administrators. enhancing responsibility, and exporting the general process of the educational management experience.

1.5 Limitations of the Study

This section summarizes the limits and limitations the project may have to deal with, in order to set up healthy anticipations and clarity about issues that could possibly influence the outcome and the success of the attendance management solution.

a) Technical Constraints:
Possible technical constraints of the project are incompatibility with devices, reliance on internet bandwidths, or shortages in server bases. Those issues may influence. the performance of the system, accessibility and responsiveness of the system in real-time attendance.

b) Scalability:
The system can be suitable to medium staff institutions (of up to **500-1000 employees**) due to being run on **CPU** rather than **GPU**, and possibly not scaling well to large deployments and without developing further Its current implementation cannot necessarily cope with the requirements of very Projects in large organization and universities with thousands of employees.

c) User Adoption:
The success of the system is rather scarce with user acceptance and adaptability. Failure to embrace and embrace the change, the digital illiteracy of some staff or employees, or poor training may inhibit its effective adoption and eventual use.

d) Limited Scope:
The system can simply offer the basic attendance facility of note taking attendance. recording, tracking and generating reports. It can even be non-advanced in terms of features such as real-time location tracking. Moreover, it might not handle other academic work that involves grading, schedules and examinations and to handle other organization works, things like to upload the

record. rather than handing in and demonstrate working progress. These limitations have been reduced by addressing them, therefore, giving the study a realistic view on the facial the capabilities of recognition attendance and user management system. It is assistive to the stakeholders see the possible difficulties, and interpret the findings, outcomes and recommendations in the setting of the restrictions recognized.

CHAPTER 2

LITERATURE REVIEW

The section gives an in-depth review on face recognition attendance and user management systems, including what they are, what they do, and how they are significant in various school or school related settings. It investigates the contribution of such systems in simplifying facilitate administrative processes, enhance efficiency, enhance communication and give better experience on employee and staff level. It also reviews typical modules and functionality available within attendance systems that include attendance tracking, employee detail management, reporting, analytics and reporting.

2.1 Identification of Relevant Sources

The initial activity of an attendance management system literature review project is to find research studies related to the topics of interest involves determining and evaluating information that is credible and relevant information sources.

These sources can consist of scholarly journals, research articles, theses and dissertations, technical reports, books, and Internet scholarly databases. There is the aim to collect the data regarding the attendance management system and database-specific. interface handling, interface design, mobile/ web, automation in education technology.

This will be done by using verified and academic sources to make the work real and reliable. collected data. After identification of relevant sources, they are filtered on the basis of relevancy to the research topic.

The chosen works must contain insights, methods, conceptualizations, and implementations that can be useful and be applicable based on the objectives of this project. The literature review provides accurate and up to date findings because it focuses on particular spheres of study and employs authoritative sources. The critical assessment will benefit the development of the theoretical framework of the project, better decision-making and development of gaps or opportunities in the future.

2.2 Analysis and Review of Existing Studies

The purpose of this analysis would be to determine the contemporary research environment regarding attendance

The management systems, as well as associated technologies. Consistent themes and trends in literature can be identified in the review, these include the abandonment of manual systems to automated ones, application of biometrics like face recognition technology, and data use in cloud. storage, real-time analysis. Such trends put a broader context and basis on the ground. coming up with a better attendance system.

Besides, the literature review involves also critical analysis of past research underlining. its merits as well as demerits. This assists in the realization of the dependability and quality of the previous ones labors and enlightens any methodolgical shortcoming or data discrepancies.

Through evaluation and critique of the past studies, the researchers are then able to tune the manner in which they are planning to execute their project by addressing gaps not covered by other studies. knowledge shortages, and prevention of copying the old errors. This is informed knowledge of the research environment and it is crucial in influencing direction and methodology of the present study

2.3 Synthesis of Information

It is necessary to synthesize the data collected through different sources in order to create a coherent picture in the context of the presentations. coherent narrative. This can be done through incorporation and coordination of knowledge in various sources according to their relevance to the project of attendance management and user system.

Researchers adopt a structured approach by extracting key concepts, statistics, methodologies, and conclusions from each source. These elements are then grouped based on common themes such as system features, implementation challenges, data accuracy, and user engagement.

Typical thematic categories may include:

- Types of attendance systems (manual, RFID, biometric, mobile-based)
- Data management techniques
- User interface design for users and admin
- Reporting and analytics tools
- Security and privacy concerns

This synthesis not only summarizes existing research but also highlights connections, inconsistencies, and research gaps. It helps construct a clear understanding of the current state of

attendance system development and sets the foundation for the current project's design and innovation.

2.4 Integration with Project Objectives

It is critical to align the findings from the literature with the goals and scope of the current attendance management project. This integration establishes how past research supports or informs the current project and shows the relevance of each reviewed topic to the objectives.

Key insights from literature—such as the benefits of centralized databases, ease of real-time attendance tracking, and the importance of user-friendly design—directly contribute to achieving project goals like automation, transparency, and improved user experience.

By drawing these connections, researchers validate the significance of their work and ensure that the project is grounded in existing knowledge while also advancing the field through innovation.

2.5 Challenges in Attendance Management

The development and implementation of an attendance management system come with several challenges. Identifying these obstacles allows the project to proactively address them through effective design and planning.

a) Accuracy and Integrity of Attendance Data:
Ensuring that attendance data is not tampered with and accurately reflects employee's presence is a key concern, especially in manual systems.

b) Real-Time Monitoring:
Traditional systems fail to provide real-time updates. A modern attendance system should support live data syncing and instant reporting.

c) User Adoption and Resistance:
The user (employee or staff) can have resistance to new technology based on the lack of training or comfort level with the new technology. software, having an influence on system implementation.

d) Integration to other available systems:

Interoperability with currently existing institutional software like employee databases, employee the marriage of HR tools and this kind of assessment may present integration issues

e) Scalability:

A attendance system designed to fit a mid-size organization might not scale up on the large organization organizations or organizations of several branches. To address these issues, attendance management system must provide simple and convenient administrative interfaces, data security and protection, automated reporting facility, mobile support, and so on. integration flexibility. That will result in improved precision, level of transparency and user satisfaction and at the same time minimizing administrative work.

CHAPTER 3

FEASIBILITY STUDY

Feasibility study is assessment of the possibility of a proposed project considering its cost, resource and proposed functionality. It is an important point of project development cycle, making sure that the time, efforts and budget are not depleted without ever reaching or sustaining what is impossible initiative. To this Facial recognition attendance and user management system, a detailed A feasibility analysis was done to make sure that it will be successful in a number of areas. This assessment indicates or rather establishes that, the system is able to be well developed and implemented presented tools, technology and within set limitations. The project took into consideration three types of feasibility:

Three main types of feasibility were considered for the project:

- **Technical Feasibility**
- **Economic Feasibility**
- **Operational Feasibility**

3.1 Technical Feasibility

Technical feasibility will analyze the technological resources at disposal and find out whether it can be adequate to aid in the design and development of the facial recognition and user management system. This involves evaluating the compatibility of available hardware, and software, selected programs, and programming languages, and database system.

In this project:

- A **Django Development server** is used for hosting the application.
- **Python(Djabgo)** framework is used for the backend programming language due open-source nature, most widely using and support, and flexibility.
- **DeepFace** is a Deep learning framework are used for face recognition and face analysis.
- **Yolov8** is used to detect face in image by using camera frame for fast and easily marking attendance. It also box the face lively for the system.
- **MySQL** server is used to store the user data in the database system, ensuring efficient data storage and retrieval.
- The user side interface is create with the help of **HTML, CSS, and JavaScript**, which are also open-source and easily integrable.

In addition, **technical security measures** are a vital aspect of the feasibility study. Since the system deals with sensitive data such as employee details, marking attendance, and leave, it must be designed with strong authentication protocols and secure data encryption practices. The

feasibility study confirms that the selected technologies are capable of implementing such measures effectively.

Thus, the facial recognition attendance and user management system is considered **technically feasible** and compatible with the current infrastructure and project requirements.

3.2 Economic Feasibility

Economic feasibility is assessed based on financial attributes of work and thus the process of developing and implementing the facial recognition and user management system will be cost-saving. justifiable.. This includes analyzing:

- Initial development and setup costs
- Long-term operational and maintenance expenses
- Expected cost savings and efficiency improvements post-deployment

The use of **free and open-source technologies** such as Django, MySQL, Deepface, Yolo and Django Development Server significantly reduces the initial investment. No expensive licensing fees are required, making the project budget-friendly.

3.3 Operational Feasibility

Operational Feasibility

The system is designed with a user-friendly interface that simplifies complex tasks such as:

- Marking and tracking attendance
- Managing attendance records and reports
- Handling leaves requests and approvals
- Monitoring employee and attendance trends

Minimal training is required for staff, and users with basic computer knowledge should be able to operate the system comfortably. The streamlined design also ensures quick adoption and minimal disruption to ongoing academic or organizational operations.

Moreover, by automating routine attendance-related tasks, the system aims to:

- Enhance overall productivity
- Reduce manual errors
- Save time

CHAPTER 4

SYSTEM REQUIREMENTS AND ANALYSIS

This phase of the facial recognition attendance and user management system aims to identify and specify the system's functional and non-functional requirements. This chapter emphasizes understanding stakeholder expectations, defining the project's scope, and selecting key features and functionalities the system should offer.

The requirement analysis process involves gathering and documenting specific needs and expectations of Employee's and administrators involved in attendance tracking. By performing a comprehensive analysis and understanding current challenges in attendance recording, the project team can develop a system that addresses these issues effectively.

4.1 Functional Requirements

Functional requirements define the specific behaviors and capabilities the attendance management system must exhibit. These are the essential functions the system should perform:

4.1.1 User Attendance Management

Efficient tracking of employee's attendance is essential for educational institutions and organization. This section outlines how the system should manage employee attendance:

a) Attendance Recording

- Admins can record employee's attendance on a daily basis.
- The system should support multiple status types such as **Present, Absent,** and **Leave**.
- Allow both **bulk** and **individual** attendance marking.
- Provide an **intuitive and responsive interface** for teachers and admins to easily mark and submit attendance.

b) Attendance Status Tracking

- Employees and admins can view attendance records in a clear, **tabulated format**.
- Offer **monthly and overall summaries**, as well as detailed attendance reports.
- Include an **alert system** to notify users of absenteeism patterns or when attendance falls below defined thresholds.

c) Absent system Integration

- Integrate the automatic marking system to mark employee when they come late or not come.
- Display absent attendance with the details like date and time.

4.1.2 User Management

This module manages user roles and controls access to various system features for administrators and employee.

a) Role-Based Access Control

- The system defines two primary roles: **Admin** and **Employee**.
- **Admin** users can manage system settings, users, attendance management, absent and leave management.
- **Employees** can view their personal attendance records, leave records, profile information and apply for leave.

b) User Registration and Profile Management

- Admins have the authority to **add** when user make registration request and system will be assigning a unique id to employee based on designation and department, **update, or remove** users record.
- Employees are assigned **individual profile pages** with relevant information.
- All user data is **securely stored**, and modifications can only be made by **authorized personnel**.
-

4.1.3 Leave Management

System provides an easy way for employee to apply for leave by default system assign 10 sick and annual leave to each employee for every year. The leave limits will be refreshed automatically after a year or in the month of January. Admin having authority to changes these limits from setting.

4.1.4 Reporting and Analytics

Providing insights is crucial for improving attendance behavior.

a) Attendance Reports

- Provide Daily attendance, total present, total absents, show percentage of each employee attendance and total leave, present, absent of each employee.
- Export reports in PDF or Excel formats.

b) Insights and Trends

- Show attendance percentage.
- Highlight employee with poor or exceptional attendance.

4.1.5 Notifications and Alerts

Real-time communication improves transparency and accountability.

a) Attendance Alerts

- Notify employee on their dashboard in case of absence.

4.2 Non-Functional Requirements

Non-functional requirements determine the system's quality attributes. These include:

4.2.1 Usability

- The user interface must be user-friendly and intuitive.
- Clear instructions and real-time feedback should be provided.
- Responsive design to support both desktop and mobile devices.

4.2.2 Security

- Role-based access to prevent unauthorized actions.
- Password encryption and secure data storage.
- Advance Brute force attack protection by blocking user ip address temporary after 3 fail attempts.

- Regular vulnerability assessments and updates.

4.2.3 Reliability

- Automatic data backups and recovery options.
- System should ensure high availability with minimal downtime.
- Handle errors gracefully with user-friendly error messages.

4.2.4 Performance

- The system should respond quickly to user input.
- Handle large volumes of attendance data without delay.
- Optimize performance to ensure smooth reporting and analytics.

4.2.5 Maintainability

- Codebase should be modular and well-documented.
- Support for future upgrades and enhancements.
- Easy bug tracking and resolution.

4.2.6 Scalability

- Should handle increasing numbers of employees.
- Support for multiple institutions or departments if needed.

4.3 Requirement Specification

The following modules define the core structure of the Attendance Management System:

4.3.1 Employee Module

Employee can log in using face recognition technology to view their attendance history, subject-wise breakdown, and receive notifications.

4.3.2 Admin Module

Admins control the entire system, including user accounts, attendance, leave setting and overall analytics.

4.3.4 Leave Module

Stores all employee leave information including employee id, designation, department, name, leave duration, attachment like medical report for leave.

4.3.5 Attendance Module

Handles attendance recording in tabular form with absent, present leave and can easily to expert in csv or excel format.

4.3.6 Settings Module

Admins can manage system settings, employee information, leave limits, absent time and default configurations.

4.4 Hardware Requirements

Recommended hardware configuration for running the system:

- **Processor:** Minimum Dual Core (Core i3 or above preferred)
- **Processor Speed:** 2.0 GHz or higher
- **Memory Required:** 500 MB minimum
- **RAM:** Minimum 2 GB (4 GB recommended)
- **Hard Disk Drive:** Minimum 20 GB
- **Network Card:** Required for cloud-based or LAN usage

4.5 Software Requirements

The facial recognition attendance and user management system is implemented using several open-source technologies. These technologies were chosen for their ease of use, wide community support, and suitability for building dynamic, scalable, and responsive web-based applications. The following technologies have been utilized:

4.5.1 HTML (HTML5)

HTML (HyperText Markup Language) is used to structure web documents. Our system uses **HTML5**, the latest version, which allows us to develop web pages with enhanced features and semantic elements. It is responsible for formatting and providing the basic structure of the content, such as attendance forms, employee information layouts, and system dashboards.

4.5.2 CSS (CSS3)

CSS (Cascading Style Sheets) is an application that improves the display of HTML attributes. We also use CSS3 to apply visual designs of fonts, color, layouts and positioning. This means that the Attendance Management System will possess a clear, sleek, and responsive design in terms of user interface among the employees and the administrators.

4.5.3 Bootstrap

Bootstrap is a front-end development framework based on HTML, CSS and JavaScript used in generating responsive web interfaces. It includes components pre-done style of buttons, forms and so on. borders, tables, and navigation bars, with which we cognize to create an aesthetically appealing and responsive to mobile devices web site. attendance system. With Bootstrap, layout is simplified and the system becomes functional. The design will look good on all device sizes.

4.5.4 JavaScript

JavaScript adds interactivity to web pages. In our facial recognition attendance and user management system, **JavaScript** is used to enhance user interaction, validate forms, display dynamic content such as real-time attendance summaries, and implement interactive elements like drop-down menus and calendar widgets.

4.5.5 DeepFace and Yolov8n

DeepFace is a facial recognition system developed facebook AI team with rich of neural networks models like **opencv, ssd, skip, mntcp** etc. to used for face recognition and face analysis like **age,**

gender, race and emotion. This system is train on **Facebook Internal Dataset, CASIA-WebFace, MS-Celeb-1M and VGGFace2** datasets.

Yolov8n is the part of Yolov8 family which are the objection detection models build by Ultralytics. This model detects 120 objects in a single frame of image. This model train on **COCO, VOC and ImageNet** dataset.

4.5.6 Python Django

Python Django is used as the server-side scripting language. It handles the business logic of the Facial recognition attendance and user management, such as processing attendance submissions, performing authentication (login/logout), and interacting with the database to fetch or store employee, staff member and attendance data dynamically.

4.5.7 Django Development Server

We use the **Django Development Server**, which built in Django server for local development and hosting of the system. Django Development Server as the backbone for delivering our Django-based facial recognition attendance management and user management application to users. Django Development Server making it ideal for developing and testing locally.

4.5.8 Microsoft Visual Studio Code

Visual Studio Code (VS Code) is the primary code editor used for developing this system. It supports all the languages involved (HTML, CSS, JavaScript, Django), offers syntax highlighting, code suggestions, debugging tools, and integrates well with version control systems like Git, making development faster and more efficient.

4.5.9 MySQL Database Server

MySQL is the database used to store and manage structured data for the system. This includes:

- admin and employee records
- Attendance record

- Attendance logs
- Login credentials and user roles

MySQL provides a secure, scalable, and reliable way to store and retrieve attendance-related data in real time.

CHAPTER 5

METHODOLOGY

A logical step by step approach to achieve the goals and objectives of the project was adopted. The study topic chosen involves the two-part process of Facial Recognition Attendance and User Management System, a topic that required an extensive and comprehensive literature review and research for the collection of information. critical needs of interested parties, Employees and HR personnel, etc. In order to realize the daily attendance-related activities and peculiarities needed in the attendance management system, a few interviews and discussions were carried out with administrative personnel, faculty and the IT professionals. Input and observations collected were then followed by analysis phase to obtain crucial information in developing the system. Such technologies as Django, DeepFace, Yolov8n, MySQL can be the basis of the project. which used backend, the Django Development Server, in its system development process.

5.1 Proposed Process Model

A process model describes the way tasks and activities should be undertaken with the objective of accomplishing certain project goals. The models assist in modeling and explaining a regulated course of actions which are executed on a regular basis. A process model attempts to give a visual and conceptual description of a systems or software development process. Software and system development involves a number of process models. Others are either sequential, or iterative and incremental. Agile process models have become popular lately, because they can easily respond to the altering requirements.

5.2 Waterfall Model

Waterfall model has been the most conventional and accepted method of software engineering. It offers a step-by-step and orderly method to develop a system in which every phase is required. over before the other one is completed- just the same as the water on its descent over the waterfall. reaches up. The model would apply in projects whose needs are clear and unlikely to change.

change significantly. The development stage in the Waterfall Model is split up into discrete phases, each of which is based on the output of the phase that comes earlier.
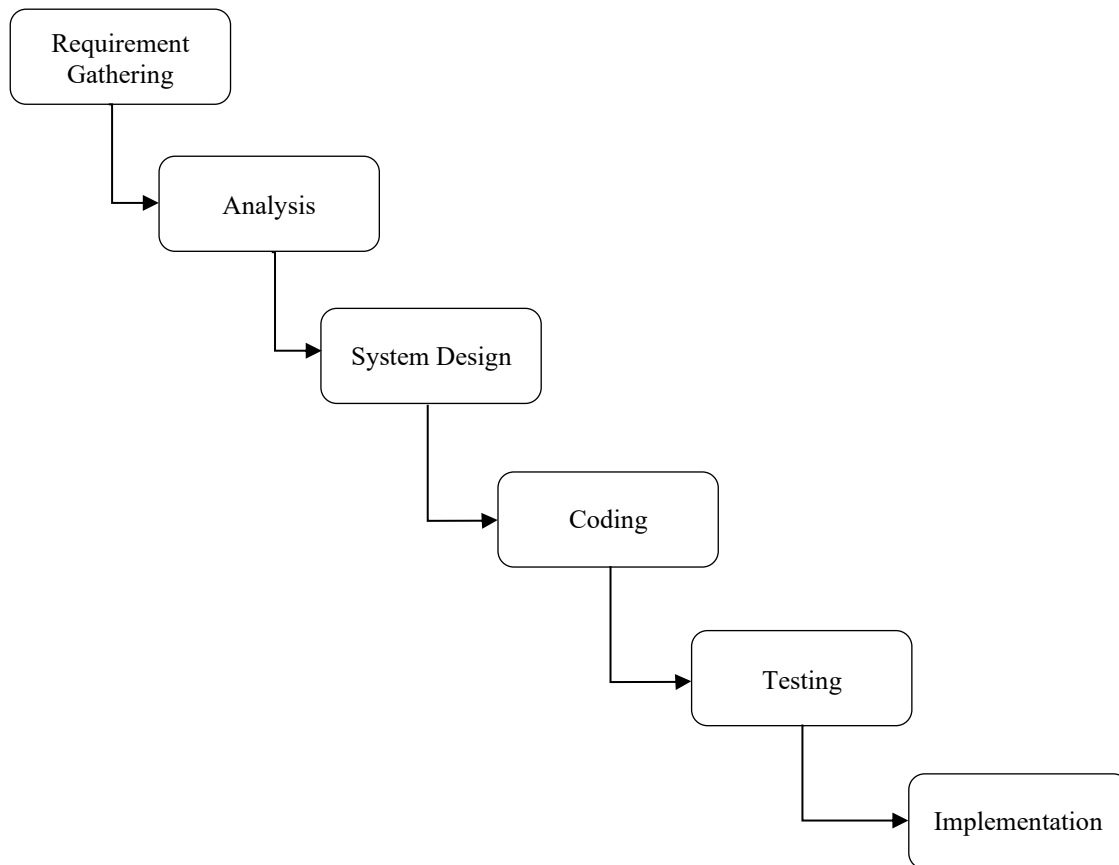
Fig 5.1: Waterfall Model

5.2.1 Phases of the Waterfall Model

The development process in the Waterfall Model progresses through the following phases:

- **Requirement Gathering**
- **Analysis**
- **System Design**
- **Coding**
- **Testing**
- **Implementation**
- **Maintenance**

5.2.1.1 Requirement Gathering

In this phase, all the necessary requirements for developing the Attendance Management System are collected from stakeholders such as school administrators, Employees, and HR officers. Surveys, interviews, and questionnaires are used to understand what functionalities are needed. These requirements are then documented in the **System Requirement Specification (SRS)**. This document defines **what** the system will do—not **how** it will do it.

5.2.1.2 Analysis

The gathered requirements are analyzed to understand the system's scope and feasibility. During this phase, technical and financial feasibility is assessed to determine if the system can be realistically developed with the available resources. This step ensures that all system goals are clearly defined before moving to the design stage.

5.2.1.3 System Design

The system design phase involves transforming the requirements in the SRS into a detailed system architecture. This includes designing data flow diagrams, database structures for storing attendance records, user roles (admin, employee), and interface layouts. The technical specifications for development are finalized in this stage.

5.2.1.4 Coding

Here, the actual development of the Attendance Management System begins. Developers write code using the appropriate programming languages and frameworks based on the design specifications. The backend (Django, DeepFace, Yolov8n and MySQL) handles logic and data storage, while the frontend provides user interaction.

5.2.1.5 Testing

In this phase, the developed system is tested thoroughly to identify and resolve any bugs or issues. Unit testing, integration testing, and system testing are performed to ensure the system functions correctly and meets user expectations. Test cases include checking accurate attendance recording using face recognition, face analysis, boxing the face, user login/logout, and report generation.

5.2.1.6 Implementation and Maintenance

After successful testing, the system is deployed for real-world use in schools or organizations. Users (employee, admins) are trained to use the system. Implementation can be done in phases or rolled out all at once. Post-deployment, the system is monitored, and maintenance activities like bug fixes, updates, or new feature additions are carried out as needed.

CHAPTER 6

ENTITY- RELATIONSHIP DIAGRAMS

6.1 Entity

An entity is anything within the system on which we need to deliver the information and maintain data. Places, people, things, and activities that database may connect with are examples of components. Entity is an object or concept about which we store data or information. Entities are represented as tables in databases. They are frequently perceptible ideas that are both dynamic and static. In our project, several entities can be identified, each with its own attributes.

Here are some common entities in BioTrack Attendance and user management system Using Django, Deep Learning and MySQL
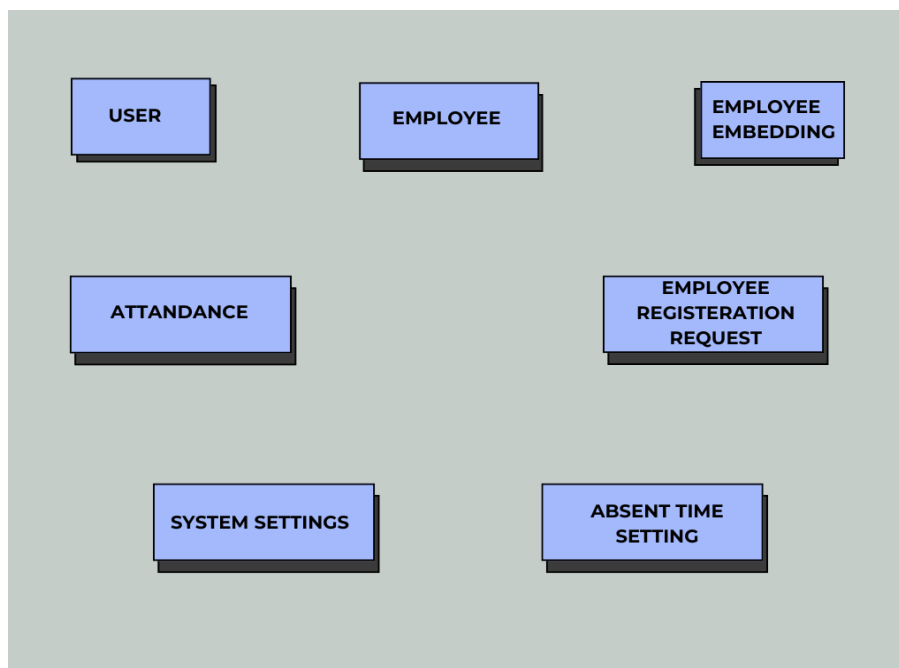
Fig 6.1: Entities

6.2 Logical ERD
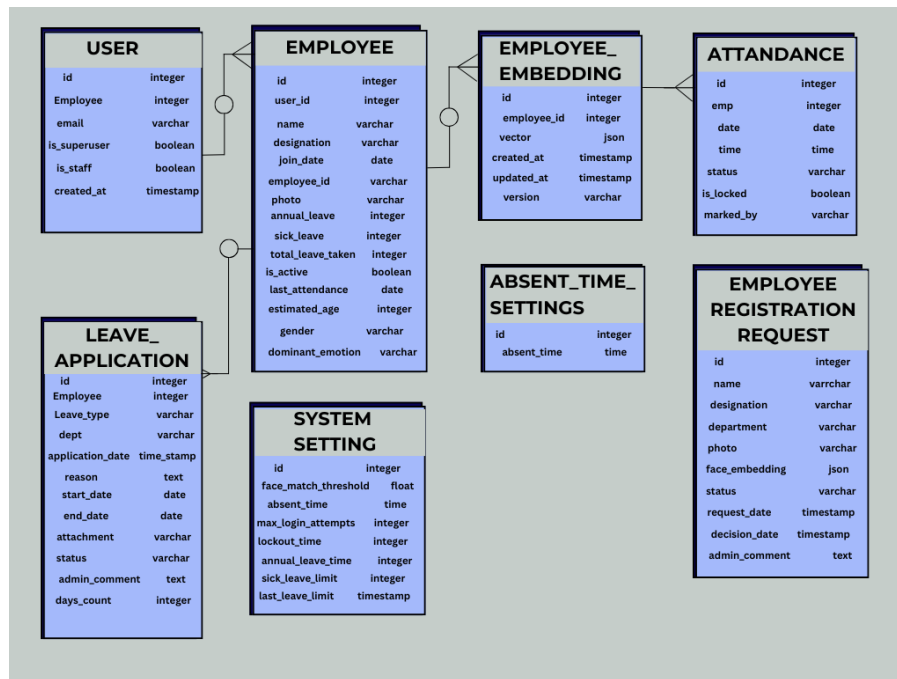
Fig 6.1: Logical ERD

In this ERD, the relationships between entities are represented using lines and symbols. For example, the "User" and "Employee" entities have one-to-many relationship, where a single admin can be managing multiple employees which are link through user_id which is a foreign key. Employee to Employee-Embedding also represent one-to-many relationship, each employee having multi face embedding over time and environment. Employee to Attendance represent one-to-many relation mean each employee can have multi attendance record. Employee-to-Leave application can also have one-to-many a single employee can submit multiple leave applications. Where Employee_Registration_Request, System_Settings and Absent_time are independent tables.

6.3 DFD Diagram
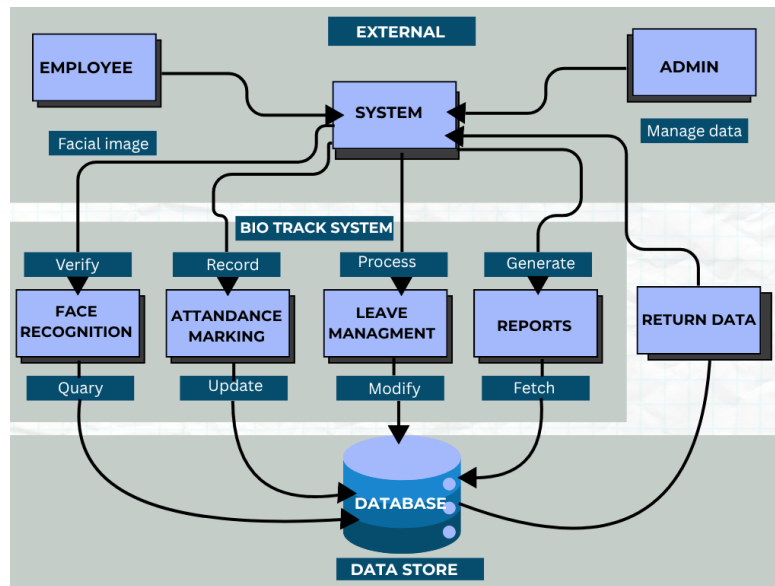
Fig 6.2: DFD Diagram

6.4 Use Case Diagram

Unless you have never studied software engineering, chances are you have heard about Unified Modeling Language (UML). The UML diagrams provide us with visual means to plot systems and software. Consider it as making notes on sketching: such diagrams are used by engineers to understand design, code structure, and how an elaborate system is to be implemented. And they are also a workflow and business process modeling tool. The most brilliant thing is that a UML diagram summarizes a lot of information in one clear line. It is based on the standardized algorithm of writing a system model and following conceptual ideas. Consider, say a use case diagram. This kind of diagram brings out the communication between actors; this may be the users or other systems and the use cases that represent what the system must do. That is, a use case diagram depicts functionality of a system and illustrates the relationships among various use cases so that all involved persons can have a bird view of the situation at hand within a short period.
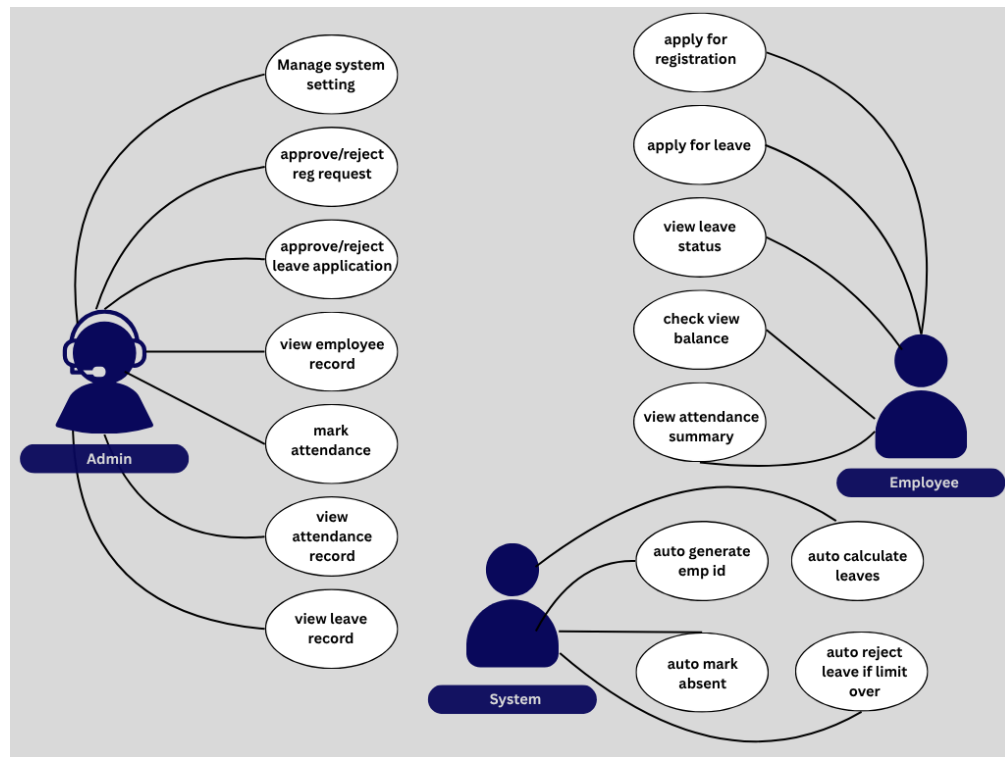
Fig 6.12: Use Case Diagram

6.5 Sequence Diagram
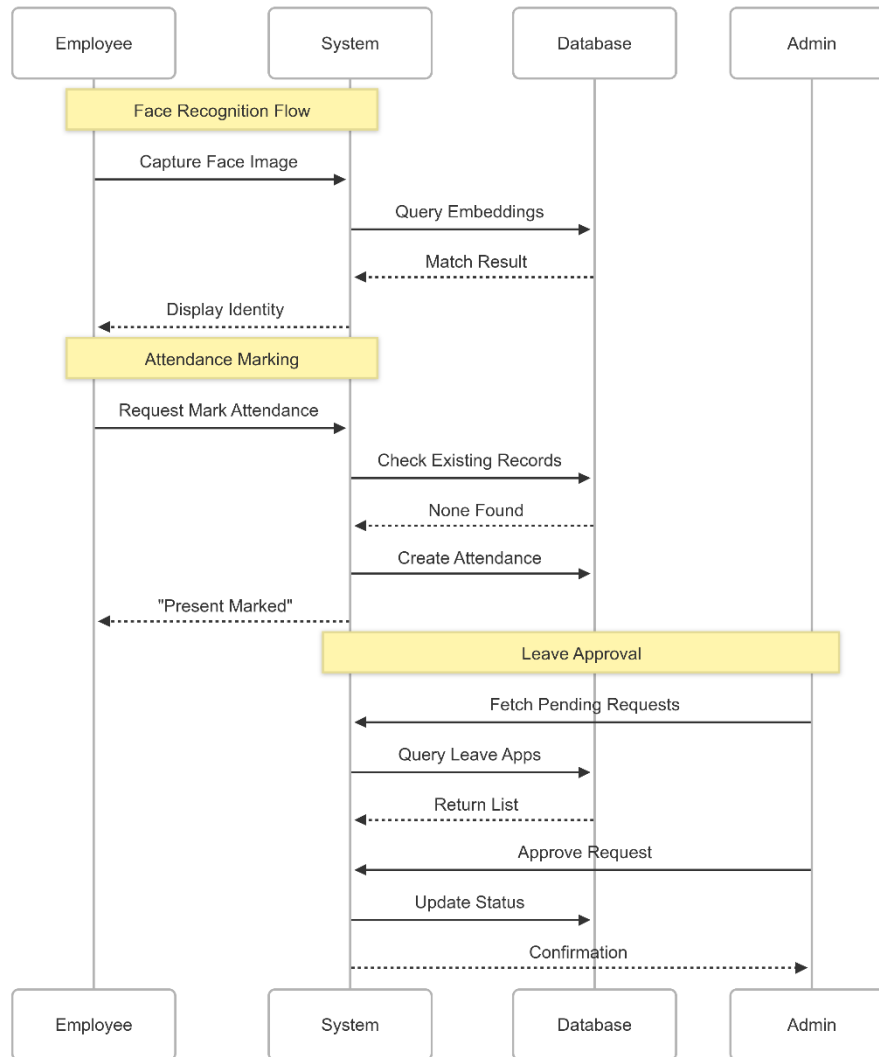
Fig 6.13: Use Case Diagram

CHAPTER 7

USER INTERFACE

7.1 Overview

The layout is an important part of creating a system like ours, which includes everything which need for organization to regularize the employee, including the ability to manage attendance and user in single space. The user interface (UI) serves as the primary point of contact between the user or client and the system.

7.2 Frontend Interface

The aim of designing user interface is to give the Facial Recognition attendance and user management system an easy-to-use and intuitive interface. In order to guarantee a productive user experience, it entails creating the layout, interactions, and visual components. In addition to adhering to usability guidelines, the design should take into account the unique needs of users of the system, including administrators and consumers.

7.3 Users Involved in Our System

We have used the Employee and Admin Interfaces to the Course management system as a student and I can confirm that both interfaces are most certainly targeted to different users. The employee perspective is a lot friendlier, as all we need to focus on is potential assignments (the seeable ones, anyway), course handouts, and discussions response, which is not complicated, and can be learned as we go. The story behind the admin view is totally different. The back-end is perhaps closer to a complete control-room, where you get a complete summary of each course, their instructors and the number of students enrolled therein. A lot more is crammed in and since it all comes in so comprehensive, one would only expect a person in the position of being in control of an entire department to need some form of training to feel his or her way around here. Altogether, the employee perspective is the fast smack dashboard that allows you to do your job; and the

administrative perspective is the in-depth command center that allows you to oversee the whole thing.

- Employee Interface
- Admin Interface

7.3.1 Employee Interface

Employee interface allows employee to register yourself using personal information and live picture with face attributes using DeepFace. The user interface will have concise information about employee portal, with registration and login buttons. The interfaces serve as visual and interactive component that allow customers to interact with a website's features and functionalities. Here are some key interfaces commonly found in a facial recognition and user management system website:

a) **Home Page**

The homepage serves as the gateway to the website and provides Registration and login buttons. The home page of the Facial Recognition attendance and user management system serves as the entry point for employees.
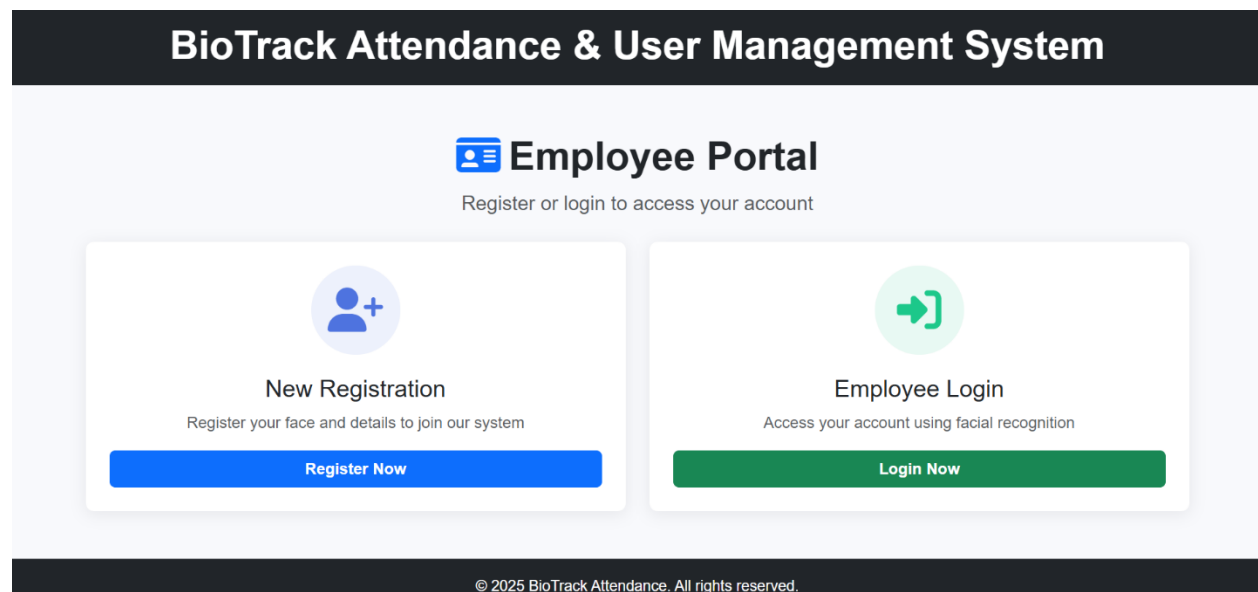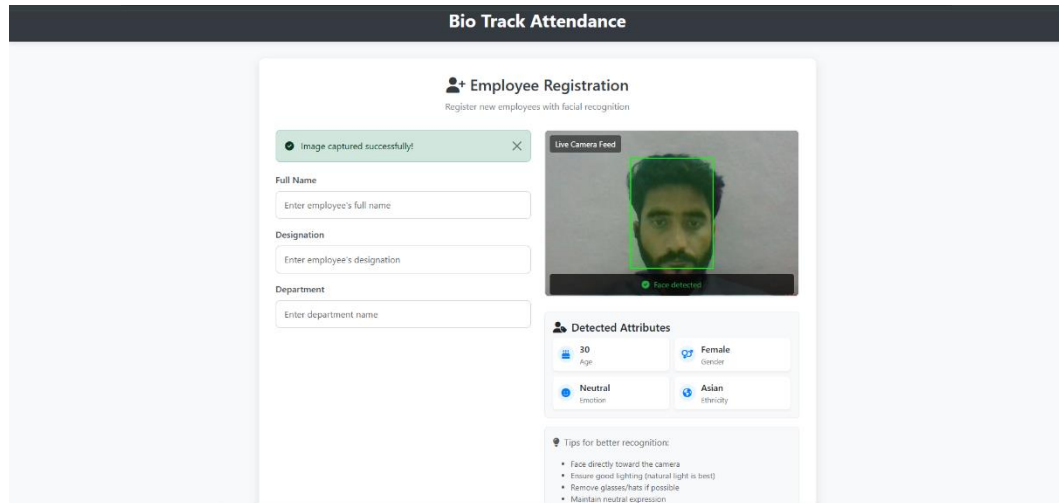
Fig 7.1: Home Page

b) Registration

Through this section, employee can request for registration using personal information like name, designation, department and profile picture with face attribute extracted by DeepFace.

Fig 7.2: Registration Section

c) Login Section

When an Employee clicks on *Login Now* button then he is shown a webcam with login button to login to employee dashboard using face recognition. When employee face appears in webcam the yolov8 start detecting face if face is detected then employee will allow to click on login button then DeepFace will extract embedding using Cosine Similarity to match with the store one.
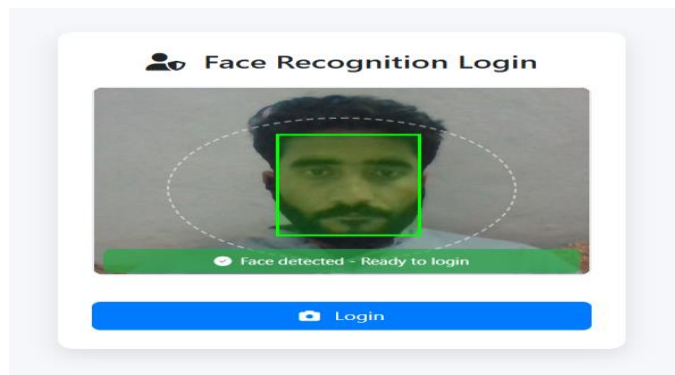
Fig 7.3: Face Login

d) Employee Dashboard

When employee login to dashboard the employee is shown a complete dashboard with complete information like id, name, designation, department, profile, current attendance status, monthly attendance status, leave request form and leave status.
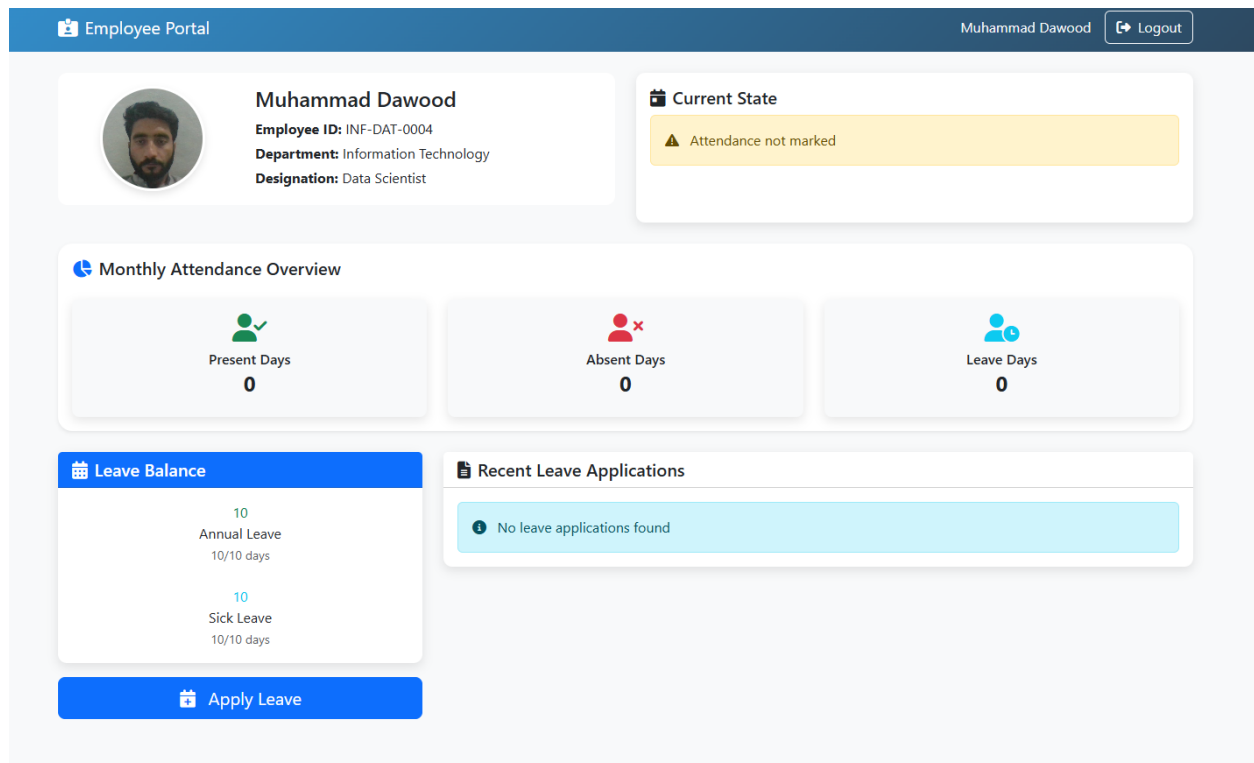
Fig 7.4: Employee Dashboard

e) Leave Application Form

When employee click on apply leave button a bootstrap model window open with Department name, leave, start and end date, text box for valid reason and input tab for attachment where user can attach pdf, jpg and png format file up to 5mb.
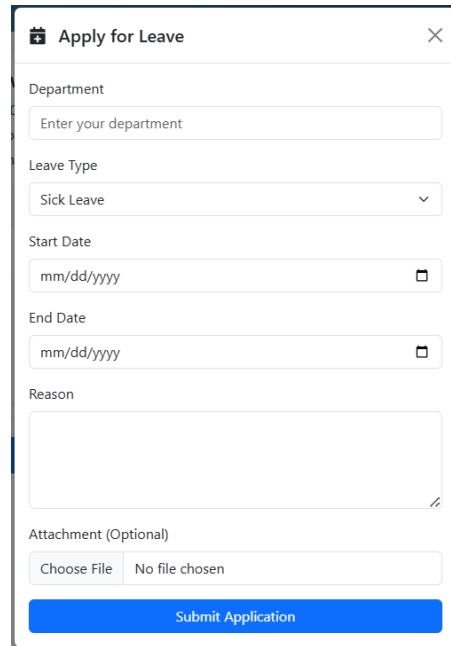
Fig 7.5: Leave Application form

f) Leave Application Status

After apply for leave user can check the application status like pending, reject and accept and he can download the application in pdf form.

Fig 7.6: Leave Application status

7.3.2 Admin Interface

Administrator is a person who manages overall facial recognition attendance and user management operations. Admin interface was built keeping in view his task complexity and his daily operations. He is responsible for overall activities of facial recognition attendance and user management. The admin has to enter his username and password to log in to the system. Admin is in charge of duties like:

- Accept User Registration Request
- Mark attendance using face recognition through webcam
- View daily attendance
- View Analysis of attendance
- Manage register user
- Manage Leave management
- Change the leave limit and absent time

All these are crucial operation which runs overall facial recognition attendance and user management activities therefore his interface has to be simple, interactive and easy to use.

a) Admin Login Page

Administrator need to login to the system before carrying out any task of the facial recognition attendance and user management. Authentication is required because admin handles sensitive data about facial recognition attendance and user management like accepting registration request and organization employee details etc.
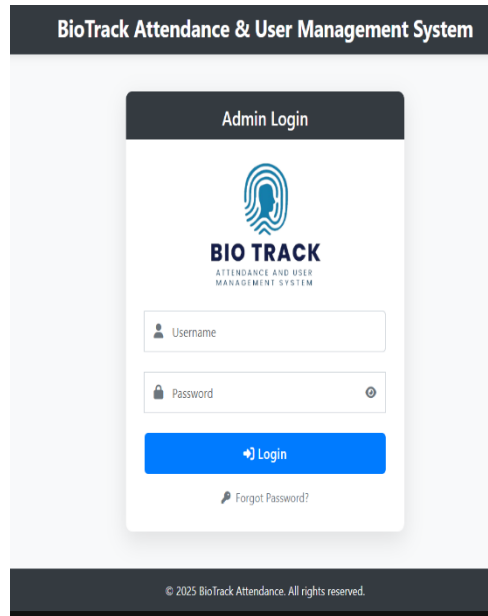
Fig 7.8: Admin Login Page

b) Admin Dashboard

Admin can see all the summed-up information about Face recognition attendance and user management system on dashboard. The User registration request, marking attendance, view attendance, analysis, total user, leave management and settings, and also every detail

about Face recognition attendance and user management system that Admin need to know is all visible on dashboard.
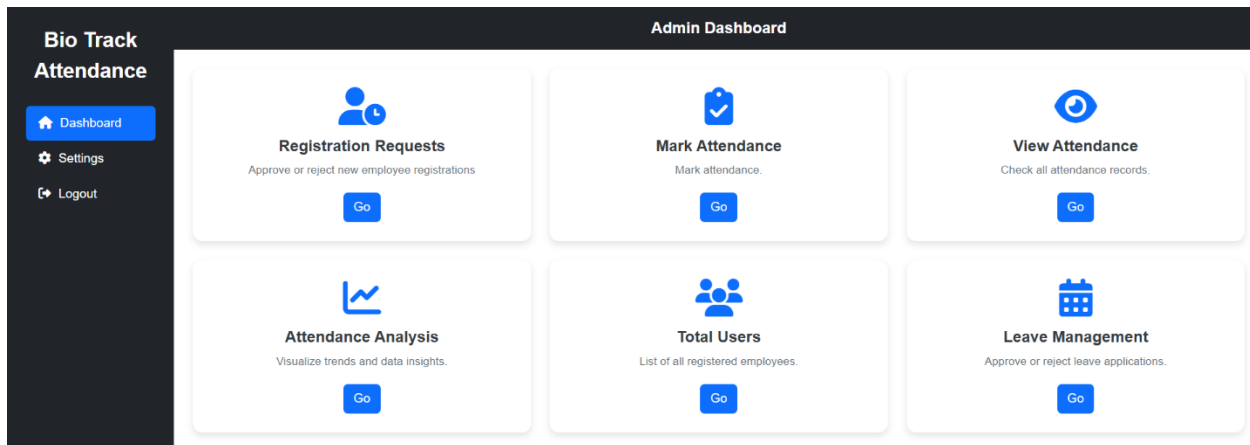
Fig 7.9: Admin Dashboard

c) Registration Request

Admin can accept or reject request made by employee, this page also show total pending, accepting and rejected employees request and also have search functionality to find employee by name and department.
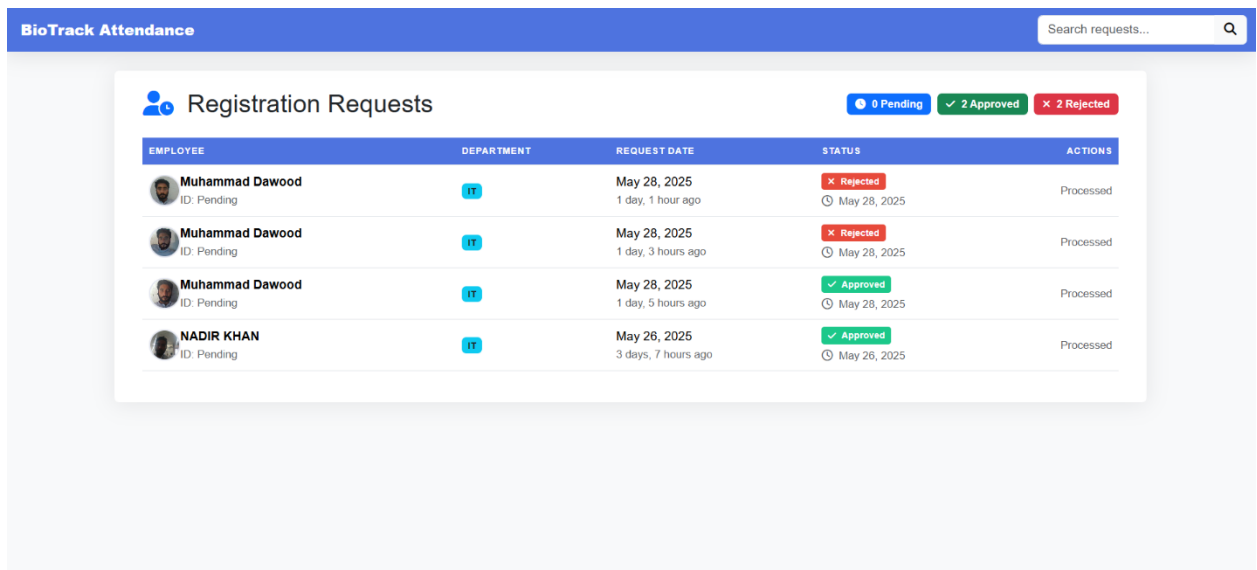
Fig 7.10: registration request

d) Mark Attendance

This page allow admin to mark attendance of employee using face recognition technology using webcam. Yolov8 detect the face, deepface extract embedding and compare with store embedding and mark attendance. It also shows the face expression of employee if they are register or not. If employee register it show name, department, attendance status and his id with face attributes. If not register it show not register with face attributes.
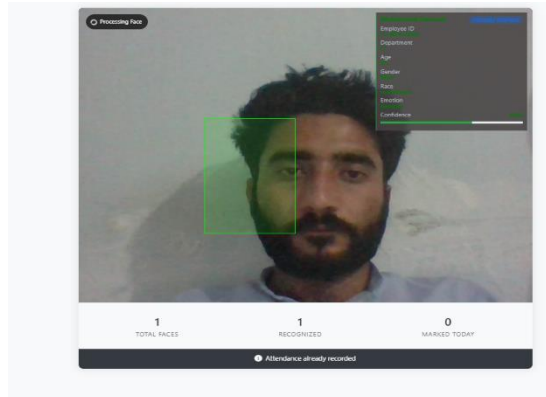
Fig 7.11: mark attendance

e) View Attendance

Admin can view the overall attendance of all employee with id, name, department, attendance date and time with present, absent and leave status and also can export in csv format.

Fig 7.12: view attendance

f) Attendance Analysis

Admin can see total register user, today present and absent, all employee attendance with total number of present, absent, leave and show over all performance in percentages.
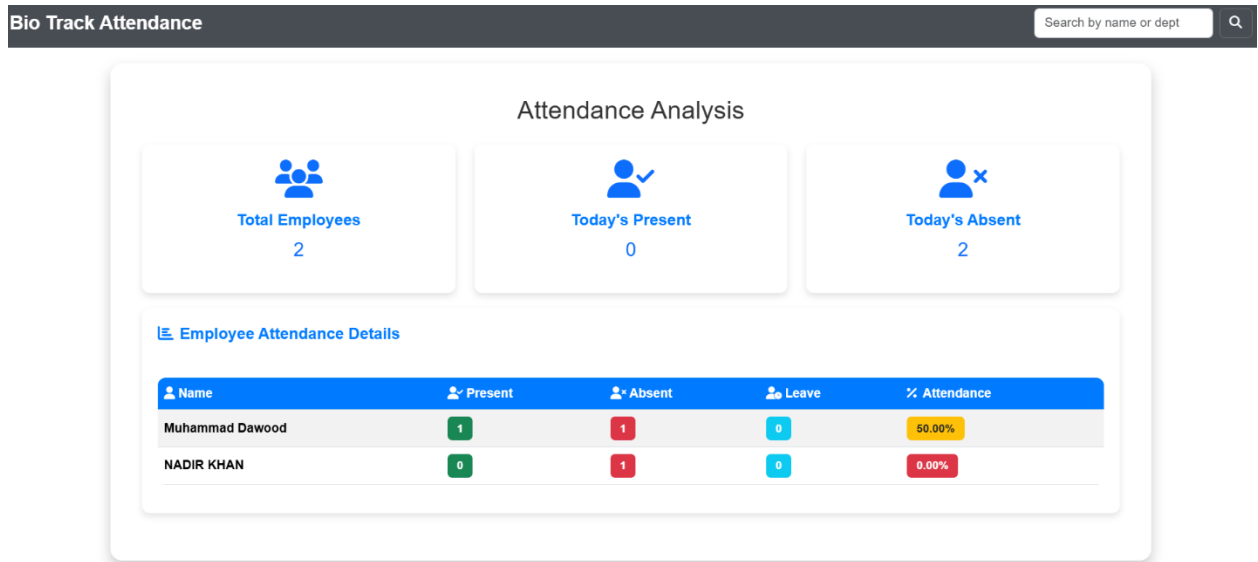
Fig 7.13: Attendance Analysis

g) Total User

Admin can manage user-site information from admin panel. He can edit user information and delete user from database.
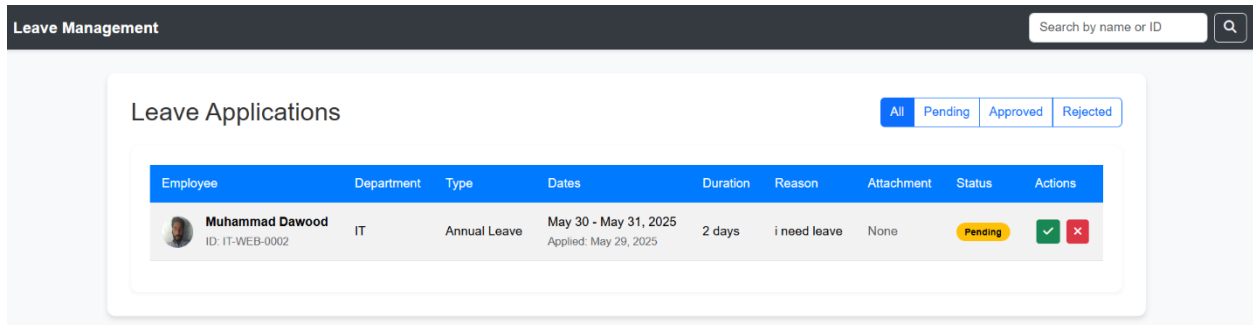
Fig 7.14: total user

h) Leave Management

Admin can accept or reject the user leave request from this page. This page can show all the user leave request with status of pending, accept and reject.

Fig 7.15: Leave Management

i) Settings

Admin can change account credential, absent time and leave limit from this page.

Fig 7.16: Settings

CHAPTER 8

DATABASE DESIGN

Database designers organize their information in a logical way in order to maintain data that is simple to modify and query. This operation is also referred to as database design and includes three key phases (1) enlisting properties and constraints, (2) establishing relationships among various types of data, and (3) creating tables to accommodate all of this material. Database schema is the blueprint of how the database is organized as an abstract view of the database that defines all the logical elements of a puzzle.

8.1 User Table

User table stores information about organization administrator. Admin's password, username, email, last login and registration information of staff or employees are stored in this table.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	Change	Drop	More
2	password	varchar(128)	utf8mb4_general_ci		No	None			Change	Drop	More
3	last_login	datetime(6)			Yes	NULL			Change	Drop	More
4	is_superuser	tinyint(1)			No	None			Change	Drop	More
5	username 🔑	varchar(150)	utf8mb4_general_ci		No	None			Change	Drop	More
6	first_name	varchar(150)	utf8mb4_general_ci		No	None			Change	Drop	More
7	last_name	varchar(150)	utf8mb4_general_ci		No	None			Change	Drop	More
8	email	varchar(254)	utf8mb4_general_ci		No	None			Change	Drop	More
9	is_staff	tinyint(1)			No	None			Change	Drop	More
10	is_active	tinyint(1)			No	None			Change	Drop	More
11	date_joined	datetime(6)			No	None			Change	Drop	More

Table 1: User Table

8.2 Attendance Table

This table stores the basic information about attendance like id, date, time, status marked_by and employee id which can be changed by admin panel.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	🖉 Change	⊖ Drop	More
2	date 🔑	date			No	None			🖉 Change	⊖ Drop	More
3	time	time(6)			No	None			🖉 Change	⊖ Drop	More
4	status 🔑	varchar(10)	utf8mb4_general_ci		No	None			🖉 Change	⊖ Drop	More
5	is_locked	tinyint(1)			No	None			🖉 Change	⊖ Drop	More
6	marked_by	varchar(20)	utf8mb4_general_ci		No	None			🖉 Change	⊖ Drop	More
7	emp_id 🔑	bigint(20)			No	None			🖉 Change	⊖ Drop	More

Table 2: attendance Table

8.3 Employee Table

Employee table stores information about Employee like their names, designation, department, join date, employee id, photo, limit of leave and attendance details.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	🖉 Change	⊖ Drop	More
2	name 🔑	varchar(255)	utf8mb4_general_ci		No	None			🖉 Change	⊖ Drop	More
3	designation 🔑	varchar(255)	utf8mb4_general_ci		No	None			🖉 Change	⊖ Drop	More
4	department 🔑	varchar(255)	utf8mb4_general_ci		No	None			🖉 Change	⊖ Drop	More
5	join_date	date			No	None			🖉 Change	⊖ Drop	More
6	employee_id 🔑	varchar(50)	utf8mb4_general_ci		No	None			🖉 Change	⊖ Drop	More
7	photo	varchar(100)	utf8mb4_general_ci		Yes	NULL			🖉 Change	⊖ Drop	More
8	annual_leave_remaining	int(10)		UNSIGNED	No	None			🖉 Change	⊖ Drop	More
9	sick_leave_remaining	int(10)		UNSIGNED	No	None			🖉 Change	⊖ Drop	More
10	total_leave_taken	int(10)		UNSIGNED	No	None			🖉 Change	⊖ Drop	More
11	is_active 🔑	tinyint(1)			No	None			🖉 Change	⊖ Drop	More
12	last_attendance_date	date			Yes	NULL			🖉 Change	⊖ Drop	More
13	user_id 🔑	bigint(20)			Yes	NULL			🖉 Change	⊖ Drop	More

Table 3: Employee Table

8.4 Employee Registration Request Table

This table stores information about Employee like their names, designation, department, request date, accepting date, photo, admin comment details.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	Change	Drop	More
2	name	varchar(255)	utf8mb4_general_ci		No	None			Change	Drop	More
3	designation	varchar(255)	utf8mb4_general_ci		No	None			Change	Drop	More
4	department	varchar(255)	utf8mb4_general_ci		No	None			Change	Drop	More
5	photo	varchar(100)	utf8mb4_general_ci		No	None			Change	Drop	More
6	face_embedding	longtext	utf8mb4_bin		No	None			Change	Drop	More
7	status	varchar(20)	utf8mb4_general_ci		No	None			Change	Drop	More
8	request_date	datetime(6)			No	None			Change	Drop	More
9	decision_date	datetime(6)			Yes	NULL			Change	Drop	More
10	admin_comment	longtext	utf8mb4_general_ci		Yes	NULL			Change	Drop	More

Table 4: Employee Registration Request Table

8.5 Leave Application Table

This table stores the details information of employees who make leave application. It also contains admin response.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	Change	Drop	More
2	leave_type	varchar(20)	utf8mb4_general_ci		No	None			Change	Drop	More
3	dept	varchar(50)	utf8mb4_general_ci		No	None			Change	Drop	More
4	application_date	datetime(6)			No	None			Change	Drop	More
5	reason	longtext	utf8mb4_general_ci		No	None			Change	Drop	More
6	start_date	date			No	None			Change	Drop	More
7	end_date	date			No	None			Change	Drop	More
8	attachment	varchar(100)	utf8mb4_general_ci		Yes	NULL			Change	Drop	More
9	status	varchar(10)	utf8mb4_general_ci		No	None			Change	Drop	More
10	admin_comment	longtext	utf8mb4_general_ci		Yes	NULL			Change	Drop	More
11	days_count	int(10)		UNSIGNED	No	None			Change	Drop	More
12	employee_id 🔑	bigint(20)			No	None			Change	Drop	More

Table 5: Leave Application Table

8.6 Absent Time Table

This table has the information about absent time after that all employee will be marked absent.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	🖊 Change	⊖ Drop	More
2	absent_time	time(6)			No	None			🖊 Change	⊖ Drop	More

Table 6: Absent Time Table

8.7 Employee Embedding Table

Embedding mean numerical data of face features. This table store the face embedding of all employees after admin accept the request of that who make registration request.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	🖊 Change	⊖ Drop	More
2	vector	longtext	utf8mb4_bin		No	None			🖊 Change	⊖ Drop	More
3	created_at	datetime(6)			No	None			🖊 Change	⊖ Drop	More
4	updated_at	datetime(6)			No	None			🖊 Change	⊖ Drop	More
5	version	varchar(20)	utf8mb4_general_ci		No	None			🖊 Change	⊖ Drop	More
6	employee_id 🔑	bigint(20)			No	None			🖊 Change	⊖ Drop	More

Table 7: Employee Embedding Table

8.8 System Settings Table

This tables store the default face matching threshold, default absent timings, default leave limit, session logout time and maximum wrong password attempts.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action		
1	id 🔑	bigint(20)			No	None		AUTO_INCREMENT	🖉 Change	⊝ Drop	More
2	face_match_threshold	double			No	None			🖉 Change	⊝ Drop	More
3	absent_time	time(6)			No	None			🖉 Change	⊝ Drop	More
4	max_login_attempts	int(11)			No	None			🖉 Change	⊝ Drop	More
5	lockout_time	int(11)			No	None			🖉 Change	⊝ Drop	More
6	annual_leave_limit	int(10)		UNSIGNED	No	None			🖉 Change	⊝ Drop	More
7	sick_leave_limit	int(10)		UNSIGNED	No	None			🖉 Change	⊝ Drop	More
8	last_leave_limit_update	datetime(6)			Yes	NULL			🖉 Change	⊝ Drop	More

Table 8: System Setting Table

CHAPTER 9

SUMMARY, CONCLUSIONS AND REFERENCES

9.1 Summary

The purpose of the thesis is to increase the effectiveness of facial recognition attendance and user management system with advance AI technology by streamlining activities and evaluating the automation and computerization of the manual attendance and user management system. We start our research with a brief perspective that describes the general goal of the project and why this undertaking is important. Then we probe into the gruesome details of feasibility study to determine whether the proposed system is capable of being put up in consideration of operational, technical and economic factors. Through this, we can establish a platform of designing the solution that really caters to the problems we have identified.

With the aim of gauging the effectiveness of the system we resort to a recognized methodology of systematic assessment. The surveys and practical testing amongst employees of the organization, as well as managers, support personnel, and all other users of the existing piece of software, collects feedback on the comparisons of the new design. Performance, effectiveness, efficiency and overall usefulness is given due importance.

All the requirements are analyzed, discussed and adopted in the most efficient manner possible, this ensures that every single one of the requirements is met. Lastly, the suggestions on how to improve the user experience, system functionality, and overall efficiency of its work are given. The main and primary goal was to ensure that it provides a convenient and efficient operations to the user enabling them to mark attendance without physical touch and wasting of time while they are entering to organization thus, speaking about this project, it belongs to two groups simultaneously as it not only works with the user, but also provides the help to the administrators at the organization and makes their work more efficiently.

9.2 Conclusions

In this section, we summarize major findings of the research, contributions and limitations. I also propose that subsequent efforts also consider what was discovered here so that the system could be improved more. In order to have an integrity of the study, I will focus on close interrogations of related text and adhering to the right procedure closely and conducting regular consultations with my thesis supervisor or advisor in the course of the work.

To sum up, this thesis has discussed the creation and assessment of Facial recognition attendance and user management, a web-based attendance and user management system. With careful planning, methodical design, and efficient execution, the system has effectively tackled the difficulties encountered in organization administration. User testing and feedback have been used to assess the system's performance, usability, and efficiency; the results show that the system has the potential to improve efficiency in managing and simplify several organization operations.

9.3 References

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