

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

Attendance management system refers to the to an organization's method of tracking employee's time and attendance data. Using method of papers, sheets and old file system method. For instance, a study by Walia and Jain (2016) reveal that attendance has huge implications on the performance and growth of an organizational while a study by Talaviya, Ramteke and Shete (2013) considers it to be having an implication on the integrity of the security system of an organization. This approach has also been introduced to tertiary institutions and colleges to confirm students' attendance in classes and examination halls and it has been in use for years. On the notable sector that is seeing growing incidences in the use of fingerprint recognition systems is the education sector. This is because there have been a lot of cases where students would fake their attendance (Ahmed et al., 2016). Moreover, universities are now in need of new attendance capturing systems that are more timeous and cost effective (Walia & Jain, 2016). Furthermore, some of the available attendance recognition systems are considered to be old and ineffective in achieving their intended purposes and hence pushing pressure on developers to come up with new and improved ways of capturing student attendance (Dastidar et al., 2017). There are so many bottlenecks with this usual and accepted method, one of such problem is the difficulty for the management to compute the percentage of student attendance in classes and frequently modify their information. Also in institution, tracking and monitoring student time of attendance could be tedious task, time consuming and as well prone to errors. This research will focus on developing face based Biometric Student Attendance Monitoring System. The face Biometrics is adopted in this research work for the fact it is one of the most successful applications of biometric technology. In the manual signing processes, where lecturer give a sheet of paper to student to write their names and signature as a form of confirming their presence for a particular class session, falsification in student attendance mostly occur a situation where by a student can sign on behalf of his or her colleague as being present in the class when not true can be so difficult to prevent from happening especially for large classes where row count can take longer time. According to Tech Target contributor, Biometric authentication is a security process that relies on the unique biological characteristics of individuals to verify they are who they say they are. Biometric authentication systems compare physical or behavioural traits to stored, confirmed, authentic data in a database.

If both samples of the biometric data match, authentication is confirmed. A researcher refers to Biometric as a solution for detecting user's identity in this modern day. Biometric identification is any automatically measurable, robust and distinctive physical characteristic or personal trait that can be used to identify an individual or verify the claimed identity of an individual. Biometric science utilizes the measurements of a person's behavioural characteristics (keyboard strokes, mouse movement) or biological characteristics (fingerprint, iris, nose, eyes, jaw, voice pattern, etc). Face authentication is a form of biometric authentication that automatically compares a user's facial features to a stored facial template to validate their identity. Since biometric authentication relies on unique physical characteristics, the risk of credentials being lost or stolen is eliminated, and identity fraud—such as signing in on behalf of another employee—is prevented in workplace scenarios. Utilizing biometric authentication, particularly face authentication, is generally more efficient in terms of speed and convenience compared to traditional methods like manual signatures or passwords. Using a person's face as a form of authentication is similar to using natural physical data as a password, offering a seamless and secure way to verify identity.

One major advantage of face authentication is its uniqueness—no two individuals have the exact same facial features. This makes it highly secure, as infiltration becomes difficult since one person's facial data cannot be used by another. However, face authentication also comes with some challenges. For instance, if an unauthorized person gains access to a stored facial template or uses advanced spoofing techniques, such as deepfake technology or high-quality images, they may be able to trick the system. In such cases, security vulnerabilities could allow unauthorized access to sensitive information.

Despite these challenges, advancements in artificial intelligence and anti-spoofing measures continue to improve the reliability and security of face authentication systems.

## **1.1 STATEMENT OF THE PROBLEM**

The old system is still mostly used in lecture room or laboratory session in most institution today. Lecturer will give out a sheet of paper containing list of student's names to sign or in some cases, the student will be the ones to write their names, and matriculation number to indicate their presence for a particular class. The security of the existing attendance system that are now use in classroom (signature system) can be easily compromised. Some students can master other student's signature. Thereby, helping their colleagues who are absent for a particular class to sign

the attendance sheet using the duplicated signature. Falsification in student attendance occurs rampantly in this conventional method.

- Inconsistency in data entry and generate errors
- Time consuming and costly to produce reports
- Entry of false information
- Lack of security
- Duplication of data entry

To address the issue of attendance fraud, it is necessary to develop an authentication system for students using **face biometric recognition** to track and maintain attendance records for each student in a given class. The system designed in this project does not rely on traditional signatures, which can be easily falsified when a student signs on behalf of another.

Unlike signature-based or manual attendance methods, this face authentication system provides a more secure and efficient platform where students mark their attendance using their facial features. By leveraging **face recognition technology**, the system ensures that only the registered student can authenticate their presence, eliminating the possibility of proxy attendance.

The expected benefits of implementing a **face authentication-based attendance system** include:

- **High Accuracy** – Reduces errors and ensures precise identification.
- **Eliminates Time Theft** – Prevents students from logging attendance for absent peers.
- **Trustworthy Data** – Provides reliable records that cannot be easily manipulated.
- **Boosts Student Accountability** – Encourages punctuality and class participation.
- **Increases Efficiency** – Automates the attendance process, reducing manual effort.
- **Saves Time** – Speeds up attendance marking, allowing more time for learning.

By integrating face authentication into attendance tracking, institutions can improve security, streamline administrative tasks, and enhance overall accuracy in student attendance management.

## 1.2 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to design and develop a reliable biometric-based attendance monitoring and recording system specifically for students. Once implemented, the system will achieve the following objectives:

1. **Automate Attendance Tracking** – Design and develop a biometric-based attendance system to streamline student attendance recording.
2. **Enhance Report Generation** – Enable automatic generation of attendance-related reports, including class participation and academic performance tracking, for easy access by teachers and administrators.
3. **Improve Accuracy and Transparency** – Eliminate human errors and attendance manipulation by ensuring only registered students can mark their attendance.
4. **Enhance Data Security** – Implement secure encryption to protect attendance records from unauthorized access and tampering.
5. **Increase Efficiency** – Provide a reliable and user-friendly solution to improve administrative efficiency in educational institutions.

## 1.3 SCOPE OF THE STUDY

This project focuses on the designing and implementation of Face Biometric-Based Attendance System for Moshood Abiola Polytechnic.

This project focuses on the design and implementation of a face biometric-based attendance system to record and manage student attendance efficiently. The system will be utilized at Moshood Abiola Polytechnic to streamline attendance tracking across various levels and departments. Additionally, it can be used in examination halls to ensure secure and accurate attendance recording during school exams.

By implementing a face biometric system, attendance fraud, including impersonation and proxy attendance, will be eliminated. This system enhances security by ensuring that only registered students can mark their attendance, making it impossible for imposters to gain unauthorized access to classrooms or exam halls.

The system will store historical attendance data, allowing lecturers to easily access, review, and assess student attendance records. A dedicated server will be maintained for attendance

management, ensuring seamless data storage and retrieval. When a student's face is scanned, the system will automatically recognize the student and update their attendance record in real-time. This solution is expected to reduce manual workload, improve accuracy, and save time by eliminating the need for traditional roll calls. The face biometric attendance system will provide a more efficient and transparent method of tracking attendance, benefiting both students and lecturers.

The objective of this project is to replace traditional attendance methods with a secure, automated, and efficient system that leverages face biometric authentication as proof of class attendance at Moshood Abiola Polytechnic.

#### **1.4. SIGNIFICANCE OF THE STUDY**

The classrooms in Moshood Abiola Polytechnic will benefit from this research, It can also be useful in the staff rooms, the Offices of the Dean's and the HOD's of each department. When being used in the classes, it helps the lecturers to track or investigate student class attendance in a particular course having poor attendance thereby enabling the school authorities to rectify the situation by providing necessary interventions. Biometric based student attendance recording system is extremely useful in institutions especially during classes, tutorials, laboratory sessions and examination during which heavy security are normally deploy to validate student's identity in order to cob imposters, with the use of authentication system the number of security personnel in the examination hall will greatly reduce. The Authentication system is not only useful to the institutions and lecturers alone, even the students benefit a great deal by reducing the stress in queuing up which result in delay and often time in the damage of the attendance sheet.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 RELEVANCE OF BIOMETRIC ATTENDANCE SYSTEM**

##### **High Accuracy**

A face biometric attendance system provides a high level of accuracy in tracking attendance. Unlike traditional methods such as roll calls or manual signatures, which are prone to errors and manipulation, face recognition ensures that only the registered student is recognized. This eliminates the possibility of proxy attendance or impersonation. Since facial features are unique to each individual, the system provides a reliable and foolproof way of recording attendance (Jain, Flynn, & Ross, 2007).

##### **Eliminates Attendance Fraud**

One of the most significant benefits of using a face biometric attendance system is its ability to eliminate attendance fraud, including time theft and proxy attendance. In traditional systems, students may sign in for absent peers, leading to inaccurate attendance records. With facial recognition, students must be physically present for their attendance to be recorded. This system also prevents students from clocking in and leaving immediately, ensuring integrity in academic participation (Bowyer, 2004).

##### **Trustworthy and Real-Time Data**

The data collected through a face biometric attendance system is real-time, accurate, and secure. Lecturers and administrators can access attendance records instantly, reducing the need for manual record-keeping. Additionally, historical attendance data can be easily retrieved for performance tracking, making it easier to identify students with low attendance and take necessary action (Wayman et al., 2005).

##### **Saves Time and Increases Efficiency**

Implementing a face biometric system significantly reduces administrative workload. Traditional attendance methods, such as calling out names or signing sheets, consume valuable lecture time. With facial recognition, attendance is marked automatically within seconds, allowing educators to

focus more on teaching. This also eliminates the need for storing and managing physical attendance registers, making data management more efficient (Jain et al., 2011).

## **2.2 AREAS OF APPLICATION OF BIOMETRIC ATTENDANCE SYSTEM**

The **face biometric attendance system** is particularly relevant to **educational institutions** like **Moshood Abiola Polytechnic**. This technology will be deployed to:

- Ensure that only **registered students** are allowed into classrooms and examination halls.
- Provide **secure and automated** attendance tracking for lectures, tutorials, and exams.
- Generate **accurate attendance reports** for lecturers and administrators.

By implementing this system, **student accountability** will improve, and cases of **examination malpractice through impersonation** will be significantly reduced (Prabhakar, Pankanti, & Jain, 2003).

## **2. Government Applications**

Governments worldwide use biometric technology for **national identification systems, passport control, border security, and social welfare programs**. Facial recognition databases help in preventing identity fraud and ensuring **accurate citizen verification** (Wayman, Jain, Maltoni, & Maio, 2005).

## **3. Commercial Applications**

Many private organizations use face biometric systems for **employee attendance, access control, and security**. This technology is applied in **banking, healthcare, and corporate offices** to track workforce attendance efficiently while enhancing workplace security (Jain & Ross, 2008).

## **4. Forensic and Law Enforcement**

Law enforcement agencies use face recognition for **criminal identification, forensic investigations, and counterterrorism**. Automated facial recognition can quickly match **suspects'**

**faces against a criminal database, improving investigation accuracy and security operations** (Boulgouris, Plataniotis, & Micheli-Tzanakou, 2010).

## **2.3 MODES OF ATTENDANCE**

There are two kinds of attendance system a company can choose from, i.e manual or automated. The traditional attendance tracking method includes punch locks or some other sort of manual system. However, this method requires consistent human supervision. But fortunately, the evolving technology has led to the introduction of the automated attendance system that provides much better result.

### **2.3.1 Manual system**

Manual attendance requires employees or students to fill in their own present time. Manual recording has been utilized over the years as a standard for attendance and time tracking, either in the form of a register or record keeping depending on how it is recorded. The manual system is classified into two types:

**Sign-in sheets:** The most basic form of time and attendance tracking is using a handwritten sign-in sheet with a calendar. Most of the time, employees will sign into and out of their shifts by hand by noting the time and date on the page. Of course, this is the cheapest option when it comes to time and attendance tracking systems. But it is also the riskiest, as it is very prone to error and time theft. If an employee or student arrives or chooses to leave, they must write down the time in the attendance book. It usually has their name, time of arrival, and signature too. (Kiran Bajpai 2021)

**Spreadsheets:** As an alternative to a handwritten sign-in sheet, some businesses use digital spreadsheets for time and attendance purposes. For instance, employees may use an Excel sheet on a business computer to record their hours. While this method reduces paper, it is no less prone to error or time theft than a paper-based sign-in sheet.

**Analog system:** In the analog system, each employee will have an attendance card to record their attendance. Since employees must keep the record of their own arrivals, this system is similar to book attendance. This system is mostly used in organizations and not schools.



### 2.3.2 Automated System

This attendance system has made it a lot easier to manage the attendance of the employees in organizations, especially in large scale companies. Apart from recording attendance, it can prevent unwanted movements of employees and unauthorized entry.

**Time Cards:** Each employee receives a time card that must be swiped on a machine in order to punch their attendance. As soon as a card is swiped, the data in the card is collected, and the data is transferred to the computer, all the manual paper works eliminated from the process. You can integrate your system with other third-party card swipe system. (Kiran Bajpai 2021)

**Mechanized Systems:** The system generates a record automatically with all the employee timing in and out based on the data inputs. The employee must register every time he or she enters or leaves the office. Therefore, the employee needs not to be scrutinized every time an entry or exit is made. A more effective system for tracking employee attendance would, however, be an automated one. This can mean fewer manual tasks and more reliability than other methods because it requires less manual work.

**Interactive Voice Response:** An interactive voice response (IVR) system allows employees to punch in, check their schedules, receive operator messages, and request time off using only their touch-tone phones. It is custom-designed to meet the needs of each organization, starting with the call dialogue and professional-recorded voice prompts.

**Biometric Attendance:** The purpose is to verify and identify the employee to the employer within an organization using a biometric device. This template is captured and stored on a smart card or database of a biometric machine so that it can be used for the purpose of verifying a user's (employee's) identity. Consequently, users are identified by their biometric characteristics alone, without the use of smart cards, usernames, or other identification methods.

## 2.4 BIOMETRIC TECHNOLOGY

Biometrics are body measurements and calculations related to human characteristics. Biometric authentication is used in computer science as a form of identification and access control. The process of Biometric validation is much by which an assessing of some spotting biological or traits will be distinctly identified in a private. These unique identifiers constitute retina, earlobe geometry, iris patterns, fingerprints, hand geometry, voice waves, earlobe geometry DNA, and

signatures. The voice waveform recognition method with tape recordings in telephone wiretaps of verification which has been utilized for thus a few years is now majorly being employed in research facilities for access to restrictively databanks. enforcement has implemented Facial-recognition technology to fish out people in congregation with significant unwavering quality and reliability. Mostly industries utilize Hand geometry for providing physical access to buildings. For folks that attempt to impersonate another individual, earlobe geometry is used to detect their identity. Signature comparison isn't concerning as being dependable or reliable in isolation to other method of biometric verification but provides a further level of check or verification when utilized in along with other biometric verification methods. In computing, identification or identity verification is used as a mode of identification and access control and also being implemented to detect individuals in groups that are being watch or under surveillance. Using biometric verification is popping into a progressively regular for Authentication in corporate and security systems, consumer electronics and point of sale (POS) applications. additionally, to security, the motivation behind biometric verification has been convenience to avert fraud, biometric data is typically encrypted when it's gathered (Wayman, 2005). the method of biometric verification process starts by employing a software application to identify some specific points of human physical characteristics which is point or template. The point which is stored within the database is then processed using an algorithm that converts the data captured into a numerical format. The input gotten from user input through biometric scanner is now being compared to the numerical value stored, and therefore the authentication process if matches that of the database template is approved or rejected if it differs. The identification verification process is that the same regardless of the biometric methodology employed. a private distinct feature is captured, processed by a software application and stored as a template into a database. Subsequently, when there's need for verification of a private, a replacement physical feature is captured and compared against the template stored from an information source. Using biometrics for recognizing users offers some extraordinary favourable circumstances because only biometrics can recognize a private as himself or herself, biometrics could make keys and combination locks could end up to not be useful thanks to biometrics and every one data, including biometrics is vulnerable whether in storage or in processing state (Kadry, Smaili, 2010)

### **2.4.1 TYPES OF FACE BIOMETRIC DEVICES AVAILABLE**

Face biometric devices use **facial recognition technology** to authenticate and verify individuals based on their unique facial features. These devices are widely used for **attendance management, security access, identity verification, and surveillance**. There are different types of face biometric devices, each designed for specific applications. Below are the major categories:

#### **1. 2D Facial Recognition Devices**

2D facial recognition devices analyze a person's face using a standard 2D camera. They capture facial features such as eye position, nose shape, mouth placement, and overall face structure. These devices rely on light and shadows to map the face, making them cost-effective and widely used.

##### **Advantages**

- Affordable and easy to deploy
- Compatible with standard cameras
- Works well in controlled environments

##### **Disadvantages**

- Less accurate in poor lighting conditions
- Easily fooled by photos or videos
- Not as secure as 3D recognition

##### **Applications**

- Basic access control systems (offices, schools, and public buildings)
- Smartphone facial unlock features
- Time and attendance tracking in low-security environments

#### **2. 3D Facial Recognition Devices**

3D facial recognition devices use depth-sensing cameras to scan and analyze the contours of a person's face in three dimensions. This technology captures facial landmarks and measures depth to create a detailed face map. It improves accuracy and security compared to 2D recognition.

##### **Advantages**

- Highly accurate and secure
- Works well in low-light conditions

- Hard to spoof with photos or videos

#### **Disadvantages**

- More expensive than 2D systems
- Requires specialized 3D cameras
- Can be affected by facial expressions or accessories

#### **Applications**

- High-security access control (banks, government buildings, research labs)
- Airport immigration and border control
- Advanced mobile facial recognition (iPhone Face ID, etc.)

### **3. Infrared (IR) Facial Recognition Devices**

#### **Overview**

Infrared facial recognition devices use **infrared light to detect heat patterns and facial features**.

They do not depend on visible light, making them ideal for **low-light and night-time applications**.

These devices **read temperature variations** in the face to enhance security.

#### **Advantages**

- Works in complete darkness
- Difficult to deceive with printed images or videos
- Reliable in various lighting conditions

#### **Disadvantages**

- Higher cost due to infrared technology
- May struggle with extreme facial temperature changes

#### **Applications**

- Military and defense security
- High-security buildings and VIP areas
- Night-time surveillance and authentication

### **4. Contactless Facial Recognition Terminals**

These devices do not require any physical interaction with the user. They use AI-driven cameras and sensors to detect and verify faces from a distance. These systems are commonly used in public areas where hygiene and convenience are essential.

**Advantages**

- No need for direct contact (hygienic and convenient)
- Fast and seamless authentication
- Works in busy environments

**Disadvantages**

- May require large storage for high-volume face databases
- Can be affected by rapid movements or crowded spaces

**Applications**

- COVID-19-safe attendance systems in offices and schools
- Contactless security access control at airports and train stations
- Retail and customer service authentication

**5. AI-Powered Facial Recognition Devices**

These devices use advanced artificial intelligence (AI) and deep learning to improve facial recognition accuracy, adaptability, and security. AI-powered systems can recognize faces even if the user is wearing glasses, a hat, or a mask. They also improve over time by learning facial variations.

**Advantages**

- High-speed recognition and learning capability
- Can recognize partially covered faces
- Reduces false positives and enhances security

**Disadvantages**

- Requires significant computational power
- Privacy concerns due to data storage and analysis

**Applications**

- Smart surveillance systems (law enforcement and public security)
- Retail customer experience tracking
- AI-driven smart homes and offices

## **6. Edge-Based Facial Recognition Devices**

Edge-based face biometric systems process facial data locally on the device instead of relying on cloud-based servers. These systems offer faster recognition speeds, reduced latency, and enhanced privacy because data is not transmitted over the internet.

### **Advantages**

- More secure since data is processed locally
- Faster authentication with lower latency
- Less reliant on internet connectivity

### **Disadvantages**

- Requires powerful on-device processors
- Limited scalability for large-scale applications

### **Applications**

- Private corporate security systems
- Personal smart devices (e.g., laptops, home security systems)
- Healthcare and telemedicine authentication

## **2.5 SURVEY OF RELATED STUDIES**

The face biometric attendance system has gained prominence in recent years, offering a secure, efficient, and contactless solution for attendance management. Several studies have explored the use of biometric technologies, particularly face recognition, in educational and professional settings. The following survey summarizes key research and contributions to the field.

Krishna Prasad K (2018), in his work titled "ABCD Analysis of Fingerprint Biometric Attendance Maintenance System", explores the various advantages of biometric systems, particularly fingerprint recognition. While this study primarily focuses on fingerprint technology, the insights provided on the accuracy, distinctiveness, and universality of biometrics are relevant to the face biometric systems. Face recognition offers similar advantages, with the added benefit of being contactless, making it more suitable for environments that prioritize hygiene (Prasad, 2018).

Dr. B. Chellaprabha et al. (2016), in "A Fingerprint Based Attendance Management System Using GSM", present a fingerprint-based attendance system to eliminate issues such as proxy attendance. While this system uses fingerprint recognition, it draws attention to the importance of biometric authentication in attendance tracking. The same principles can be applied to face recognition systems, where authentication is achieved without physical interaction, providing a more efficient and accurate method for large-scale attendance management (Chellaprabha et al., 2016).

Adejumobi et al. (2021), in "Development of a Fingerprint-Based Attendance Notification System Using Simple Mail Transfer Protocol", discuss a real-time fingerprint-based attendance system that sends attendance notifications to relevant stakeholders. This system provides an automated solution for managing attendance records, which can be enhanced by incorporating face biometric systems to achieve contactless verification. Face recognition systems provide an additional layer of security by reducing the possibility of identity fraud (Adejumobi et al., 2021).

Seng Chun Hoo and Haidi Ibrahim (2019), in "Biometric-Based Attendance Tracking System for Education", discuss the selection of hardware components for biometric systems and how different microcontrollers are used for various biometric traits such as iris, fingerprint, and face recognition. Their study emphasizes that face recognition systems require high processing power and specialized hardware, making them suitable for more advanced applications like real-time attendance tracking. The increasing popularity of ARM processors for face recognition in educational settings has made it a viable solution for institutions like Moshood Abiola Polytechnic (Hoo & Ibrahim, 2019).

Ekhlas Ghaleb Abdulkadhim (2021), in "Design and Develop an Attendance System Based on Fingerprint and Arduino Board", explores the development of a fingerprint-based attendance system. While this study highlights the advantages of fingerprint biometrics, it also suggests that face recognition could serve as an alternative where fingerprint enrollment is difficult. Face biometrics are ideal for users who may face enrollment challenges with fingerprint systems and offer a contactless, non-invasive method of attendance marking (Abdulkadhim, 2021).

Sifatnur Rahman et al. (2018), in "Automated Student Attendance System using Fingerprint Recognition", acknowledge the limitations of fingerprint systems, such as poor fingerprint quality or the need for multiple fingerprint enrollment. The study suggests that face recognition systems could be used to complement or replace fingerprint systems, providing a more reliable solution for attendance tracking. Since face recognition systems do not require physical contact, they are more inclusive and user-friendly (Rahman et al., 2018).

J. Chandramohan et al. (2017), in "Attendance Monitoring System of Students Based on Biometric and GPS Tracking System", propose integrating biometric authentication with GPS tracking to enhance the security and accuracy of attendance systems. While this study explores fingerprint and finger vein recognition, the idea of using face recognition systems in combination with GPS could ensure that students' attendance is accurately recorded and verified without physical contact (Chandramohan et al., 2017).

Devendra Kumar Yadav et al. (2015), in "Fingerprint Based Attendance System Using Microcontroller and LabView", develop an attendance system using fingerprint recognition technology with an 8051 microcontroller. The study focuses on the accuracy and security of fingerprint-based systems but notes that face biometric systems can offer a more scalable and non-intrusive solution for environments with larger numbers of individuals, such as educational institutions like Moshood Abiola Polytechnic (Yadav et al., 2015).

D. U. Onyishi et al. (2021), in "Design and Implementation of a Biometric Students' Time and Attendance Logging System", describe the use of a fingerprint-based system to automatically log attendance by scanning and storing students' biometric templates. The system ensures real-time attendance marking and reduces the administrative burden. By transitioning to face recognition systems, the need for physical fingerprint scanners can be eliminated, allowing for faster, safer, and more efficient attendance management (Onyishi et al., 2021).



Jiexun Wang and Chen (2011), as cited in the research work of Oloyede et al. (2013), explain that biometrics has its origins in the public sector, primarily for criminal identification. However, in recent years, biometrics, especially face recognition, has expanded into various sectors, including banking, healthcare, and education. For example, in educational settings, face recognition has become an increasingly popular choice for attendance management, ensuring a secure and fraud-resistant way of verifying students' identities (Wang & Chen, 2011; Oloyede et al., 2013).

## **CHAPTER THREE**

### **DESIGN METHODOLOGY**

#### **3.1 OVERVIEW OF THE PROPOSED SYSTEM**

Student attendance tracking is a crucial aspect of organizations, educational institutions, and workplaces. Traditional methods such as manual attendance registers or RFID card-based systems are prone to errors, inefficiencies, and fraudulent practices like proxy attendance. The advancement of facial recognition technology has paved the way for an automated and highly accurate attendance system that enhances security and efficiency. This project explores the development and implementation of a facial recognition attendance system.

##### **3.1.2 OBJECTIVE OF THE SYSTEM**

The objective of the system is to develop facial detection system for student to take attendance during class session. Here are the few objectives

- i. To develop an efficient and contactless attendance system using facial recognition technology.
- ii. To reduce errors and fraudulent activities such as proxy attendance.
- iii. To enhance security and ease of access by integrating AI-based face authentication.
- iv. To create a scalable system applicable to workplaces, schools, and other institutions.
- v. To provide real-time attendance tracking and reporting features.

##### **3.1.3 METHOD OF DATA COLLECTION**

Having achieved the software requirements, the next step was to source for information relative to the subject. This process of information gathering was achieved through so many sources including:

1. File downloads from the Internet
2. Textbooks in the library
3. Newspaper, Journals and articles
4. Other publications
5. Personal observations.
6. Institution websites
7. Government education portals

#### **3.1.4 FEATURES OF THE APPLICATION**

- i. Automated Attendance Marking: Uses face recognition to authenticate users and record attendance.
- ii. Real-Time Verification: Captures and processes facial data instantly.
- iii. Anti-Spoofing Mechanism: Detects fake images or videos to prevent fraudulent attendance.
- iv. Cloud-Based Data Storage: Ensures scalability and remote access.
- v. User-Friendly Dashboard: Provides analytics, reports, and attendance trends

#### **3.1.5 INPUT ANALYSIS**

The input to the new system is student's login form, student's forum dialogue space, question setting form, and answer form. These forms are captured online and contain details of the user, the questions and answers.

#### **3.1.6 PROCESS ANALYSIS**

The answer supplied by the user is processed by accessing the institutions details and jobs details, and get more information about the institution and jobs.

#### **3.1.7 OUTPUT ANALYSIS**

The output from the system is to let the student know their career and how they can get started. The Career Guide system also forms part of the output.

#### **3.1.8 PROBLEM OF THE CURRENT SYSTEM**

Manual and traditional attendance tracking methods present challenges such as time consumption, human error, and the possibility of manipulation. There is a need for an automated, contactless, and reliable system that ensures accuracy in attendance tracking while minimizing fraud and administrative burden.

### **3.1.9 JUSTIFICATION FOR THE NEW SYSTEM**

The need for an advanced student attendance tracking system is driven by inefficiencies and security concerns in traditional methods. The facial recognition attendance system offers several advantages over conventional approaches:

- i. Accuracy and Reliability: Eliminates human errors and ensures precise identification of individuals.
- ii. Time Efficiency: Automates attendance tracking, reducing the time spent on manual record-keeping.
- iii. Elimination of Proxy Attendance: Prevents fraudulent activities such as buddy punching and attendance manipulation.
- iv. Contactless Operation: Enhances hygiene and safety, especially in post-pandemic environments.
- v. Security Enhancement: Uses AI-based authentication to prevent unauthorized access.

### **3.1.10 CHALLENGES AND LIMITATION**

- i. Lighting Conditions: Poor lighting can affect facial recognition accuracy.
- ii. Time Efficiency: Automates attendance tracking, reducing the time spent on manual record-keeping.
- iii. Facial Changes: Variations in expressions, aging, or accessories like glasses can impact recognition.
- iv. Privacy Concerns: Storing facial data requires adherence to data protection policies.
- v. Hardware Requirements: High-quality cameras and computational resources may be needed for optimal performance.

### **3.1.11 FUTURE ENHANCEMENT**

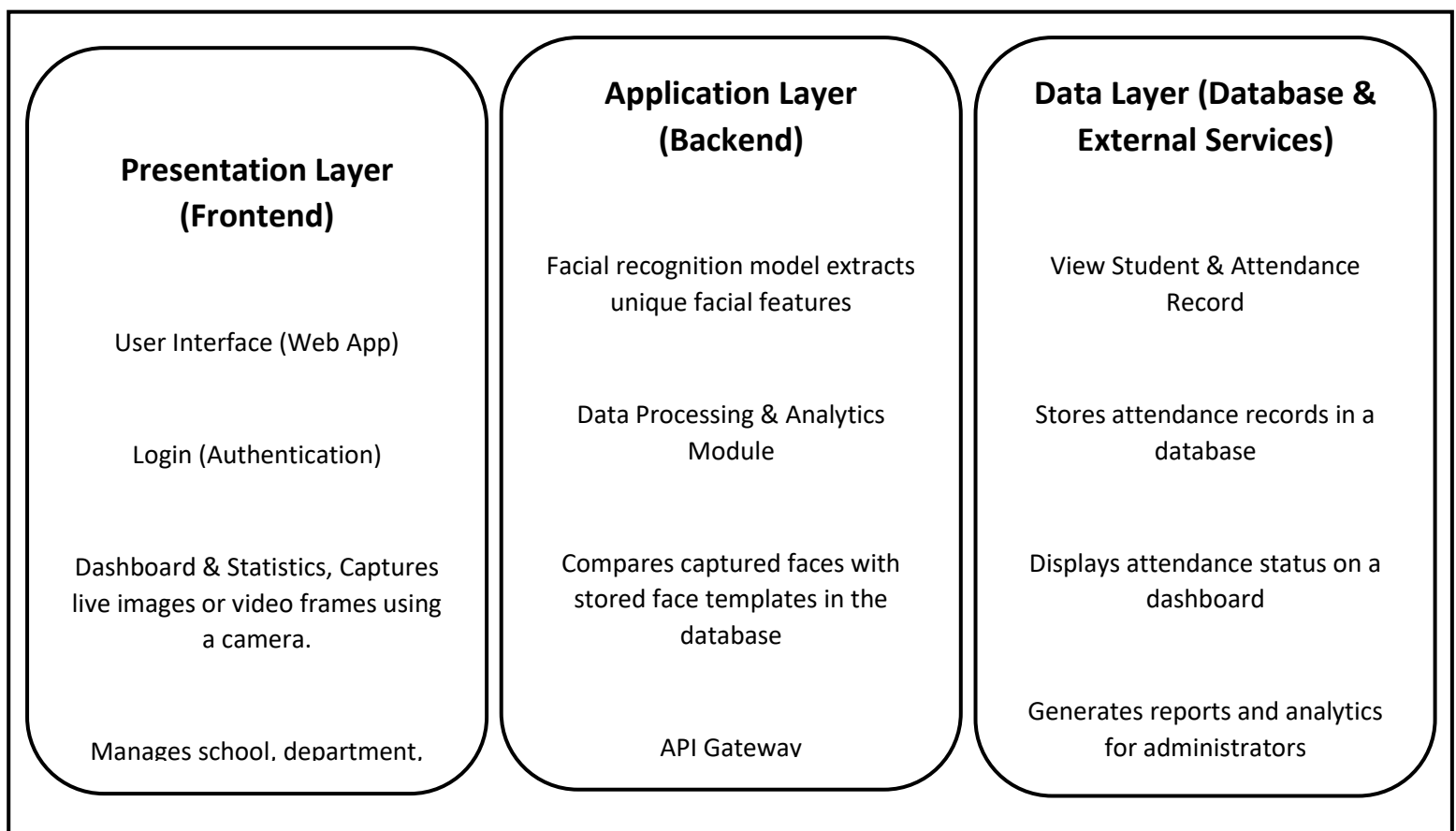
- i. AI-driven Accuracy Improvement: Enhancing recognition models to handle various facial variations.
- ii. Mobile App Integration: Allowing attendance marking via mobile applications.
- iii. Facial Changes: Variations in expressions, aging, or accessories like glasses can impact recognition.

- iv. Multi-Factor Authentication: Combining facial recognition with fingerprint or voice recognition for higher security.

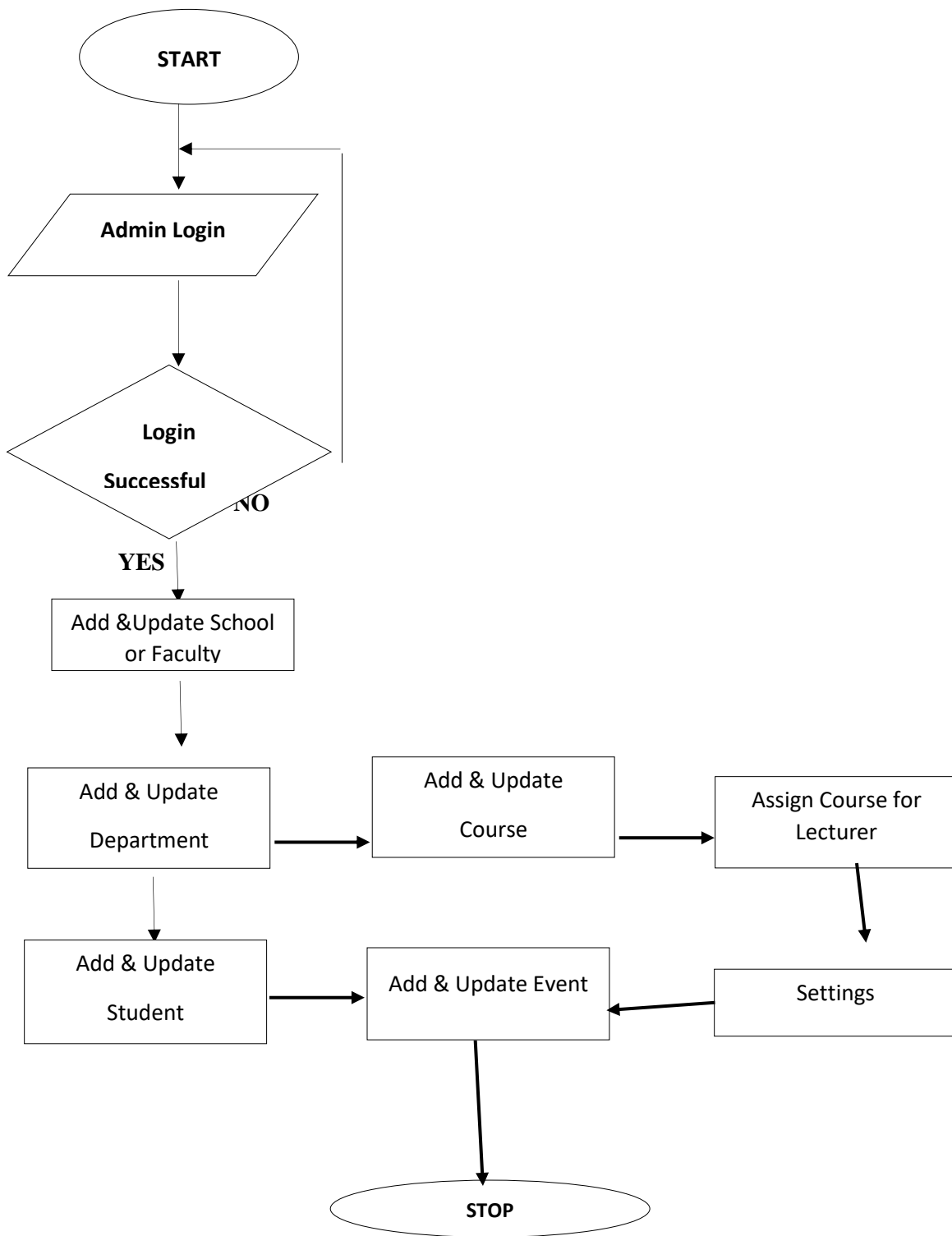
### 3.1.12 DATA PROCESSING

Data processing involves the manipulation and processes involved in taking student attendance and keep record for student so that institution or school can have good record keeping for student attendance. These processes start from the administrators, follow by lecturer (staff) to the student. All resources are uploaded to the system by the admin into the system where the student can take attendance from lecturer portal. All vital records are stored in the database for future purpose. All the processes are being strictly authenticated and validated to ensure data integrity.

### 3.1.13 SYSTEM LAYER



**Figure. 3.1: SYSTEM LAYER**



**FIGURE: 3.2 ADMIN SYSTEM FLOWCHART**

### 3.1.15 LECTURER SYSTEM FLOWCHART

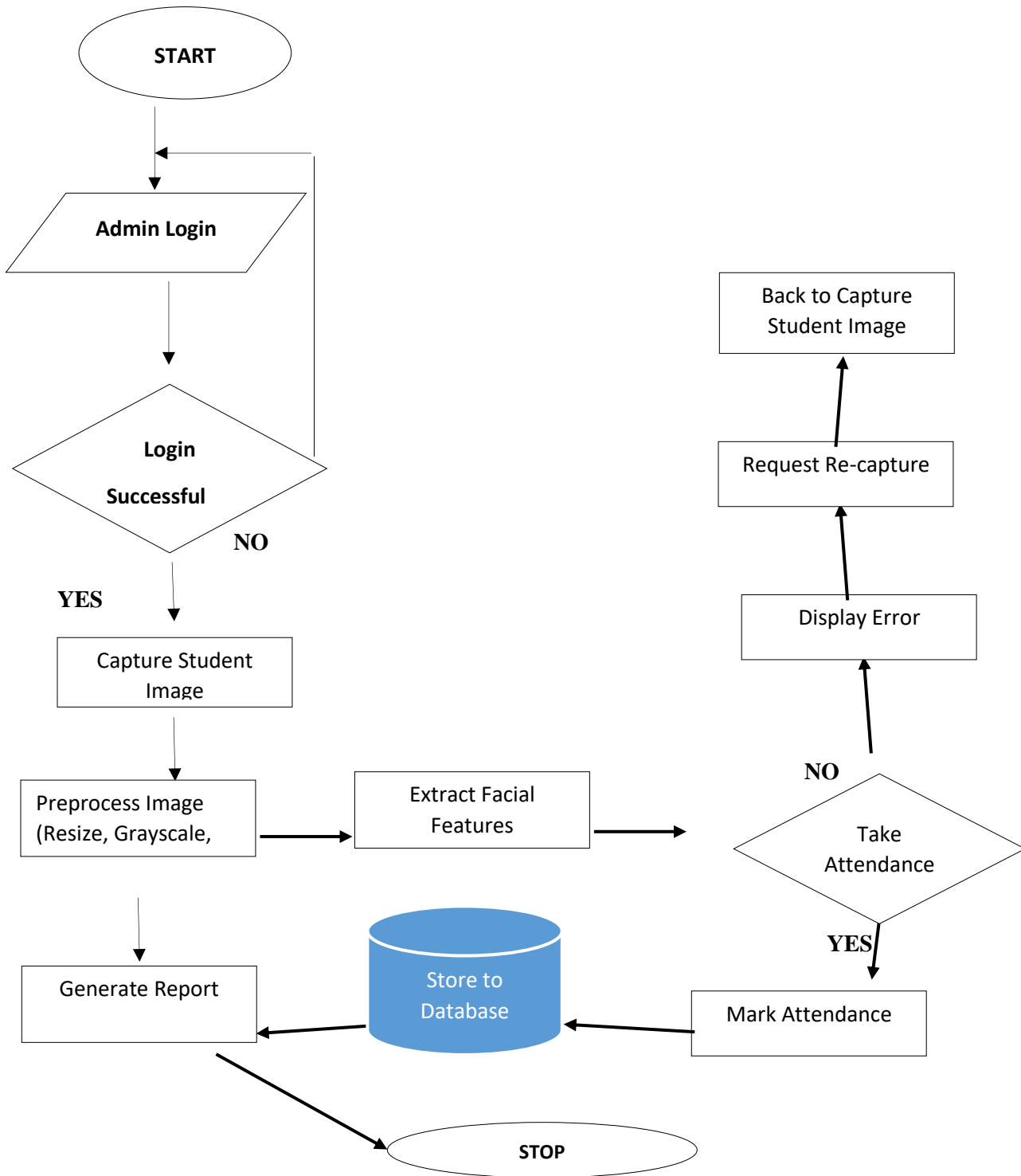


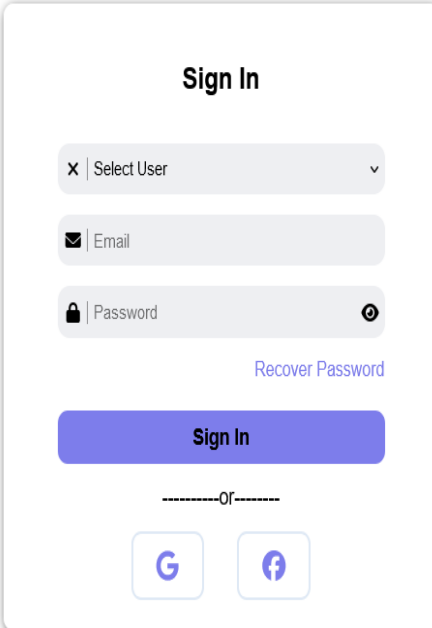
FIGURE: 3.3 LECTURER SYSTEM FLOWCHART

## CHAPTER FOUR

### SYSTEM IMPLEMENTATION AND DESIGN

#### 4.1 AUTHENTICATION MANAGEMENT

Every user who wants to use this software (facial student attendance system) by means of email address and password which is already created by the administrator and is stored in the database. This authentication module can only access administrator and student who has register under administrator portal. This authentication form is required select user role, email as username and password.



The image shows a 'Sign In' form with the following elements:

- Sign In** (Title)
- Select User** (Dropdown menu with an 'X' icon and a downward arrow)
- Email** (Text input field with an envelope icon)
- Password** (Text input field with a lock icon and an eye icon to toggle visibility)
- [Recover Password](#) (Link)
- Sign In** (Blue button)
- Or-----** (Separator)
- G** (Google icon)
- f** (Facebook icon)

**FIGURE: 4.1 AUTHENTICATION MANAGEMENT**



## 4.2 THE ADMINSTRATOR'S DASHBOARD PORTAL

The administrators are the back-end of the software, they are the one who manage and manipulate every module in this page. They can register administrators as (lecturer), students, add departments, add courses, add venue. Also they can assign course for staff and manipulate staff (update staff profile) and (update student profile).

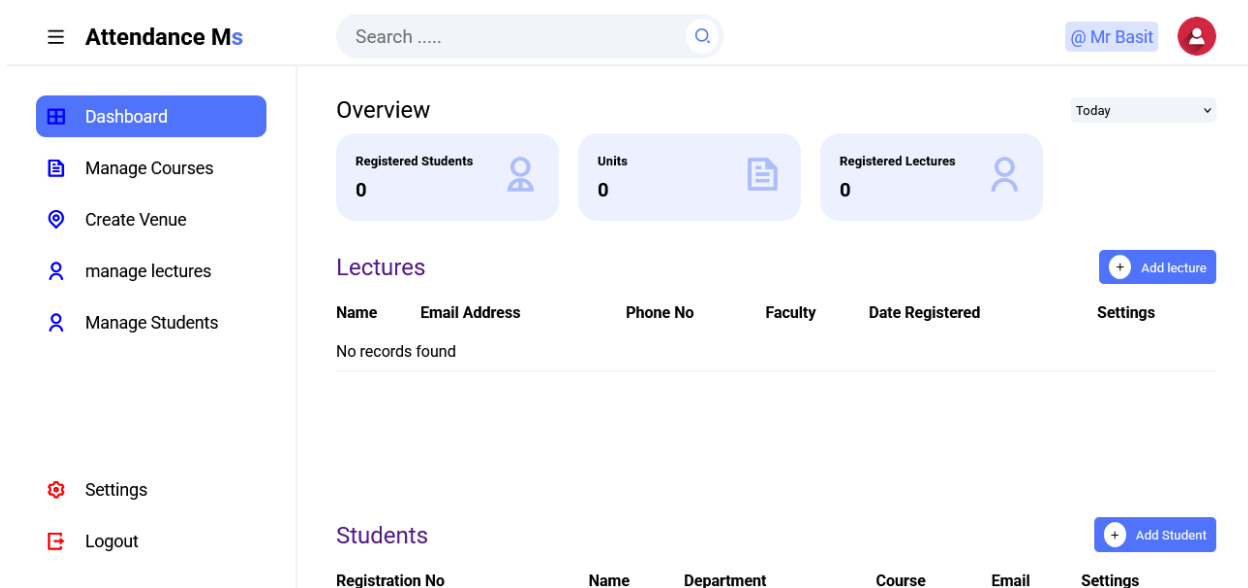


FIGURE: 4.2 ADMINSTRATOR'S DASHBOARD

### 4.3 LECTURERS'S REGISTRATION

Any lecturer, student want to make use of this software (attendanceMS) he/she must register under administrators. Every registration automatically the system will generate identity no for lecturer (staff id no) and student (matric no) so that the system can count number of lecturer and student that are registered.

The screenshot shows the 'Attendance Ms' application interface. On the left is a sidebar menu with options: Dashboard, Manage Courses, Create Venue, manage lectures (highlighted), Manage Students, Settings, and Logout. The top header includes a search bar, the user name '@ Mr Basit', and a profile icon. The main content area is titled 'Lectures' and shows a table with columns 'Name' and 'Email', containing the text 'No records found'. An 'Add lecture' button is in the top right. A modal window titled 'Add Lecture' is open, featuring a close button (X) and the following input fields: First Name, Last Name, Email Address, Phone Number, a password field with asterisks, and a 'Select Department' dropdown menu.

FIGURE: 4.3 LECTURER'S REGISTRATION

The screenshot shows the 'Attendance Ms' application interface with the 'Manage Students' option highlighted in the sidebar. The main content area is titled 'Students' and shows a table with columns 'Registration No' and 'Email', containing the text '2020344'. An 'Add Student' button is in the top right. A modal window titled 'Add Student' is open, featuring a close button (X) and the following input fields: First Name, Last Name, Email Address, Registration Number, a 'Select Department' dropdown menu, and a 'Select Course' dropdown menu.

FIGURE: 4.4 STUDENT'S REGISTRATION

#### 4.4 THE LECTURER'S DASHBOARD PORTAL

The Lecturer's portal are staff that are registered under administrators. The software carry operation like, registered administrators (staff) can take student attendance, view students attendance list, download student attended class and as well, it can upload materials for students and take student attendance

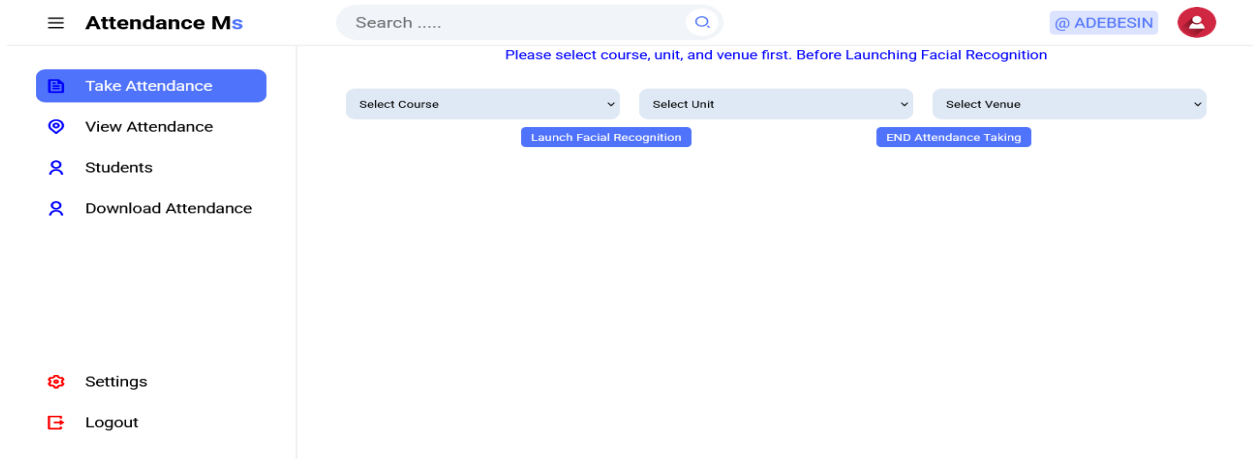


FIGURE: 4.5 LECTURER'S DASHBOARD

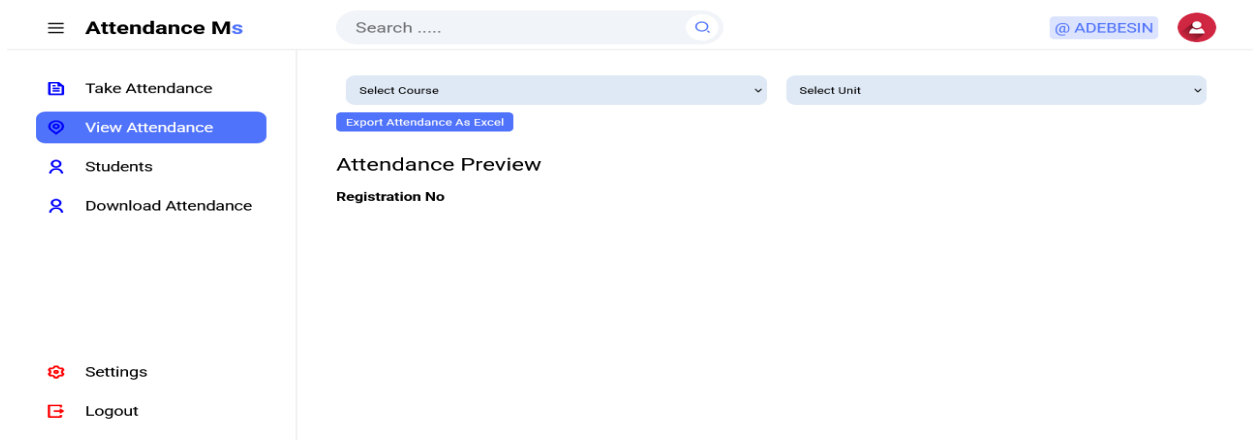
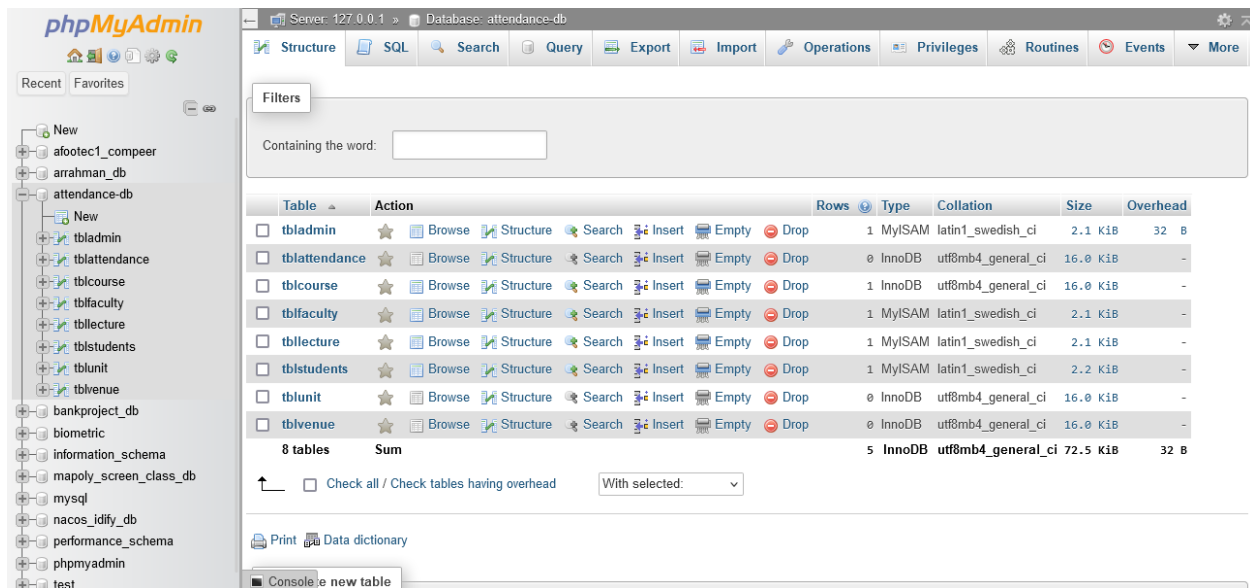


FIGURE: 4.6 STUDENT ATTENDANCE PREVIEW

## 4.5 DATABASE DESIGN

MySQL database was used in the design. There are ten tables used in the design. The student table, staff table, course table, department table, faculty table, lectures table, week table, status table, period table.



The screenshot shows the phpMyAdmin interface for a database named 'attendance-db'. The left sidebar lists various databases, including 'attendance-db'. The main panel displays the 'Structure' tab for the 'attendance-db' database. It shows a list of tables with their respective actions (Browse, Structure, Search, Insert, Empty, Drop) and details (Rows, Type, Collation, Size, Overhead).

Table	Action	Rows	Type	Collation	Size	Overhead
tbladmin	Browse Structure Search Insert Empty Drop	1	MyISAM	latin1_swedish_ci	2.1 Kib	32 B
tblattendance	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 Kib	-
tblcourse	Browse Structure Search Insert Empty Drop	1	InnoDB	utf8mb4_general_ci	16.0 Kib	-
tblfaculty	Browse Structure Search Insert Empty Drop	1	MyISAM	latin1_swedish_ci	2.1 Kib	-
tbllecture	Browse Structure Search Insert Empty Drop	1	MyISAM	latin1_swedish_ci	2.1 Kib	-
tblstudents	Browse Structure Search Insert Empty Drop	1	MyISAM	latin1_swedish_ci	2.2 Kib	-
tblunit	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 Kib	-
tblvenue	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 Kib	-
8 tables	Sum	5	InnoDB	utf8mb4_general_ci	72.5 Kib	32 B

FIGURE: 4.7 DATABASE DESIGN



The screenshot shows a Notepad window with SQL code for creating tables in the MySQL database. The code includes comments for table structure and the actual CREATE TABLE statements for 'tblcourse' and 'tblfaculty'.

```
-- Table structure for table `tblcourse`  
--  
CREATE TABLE `tblcourse` (  
  `id` int(50) NOT NULL,  
  `name` varchar(50) NOT NULL,  
  `facultyID` int(50) NOT NULL,  
  `dateCreated` date NOT NULL,  
  `courseCode` varchar(50) NOT NULL  
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_general_ci;  
  
-- Table structure for table `tblfaculty`  
--  
CREATE TABLE `tblfaculty` (  
  `id` int(10) NOT NULL,  
  `facultyName` varchar(255) NOT NULL,  
  `facultyCode` varchar(50) NOT NULL,  
  `dateRegistered` date NOT NULL  
) ENGINE=MyISAM DEFAULT CHARSET=latin1 COLLATE=latin1_swedish_ci;  
  
-- Dumping data for table `tblfaculty`  
--  
INSERT INTO `tblfaculty` (`id`, `facultyName`, `facultyCode`, `dateRegistered`) VALUES (1, 'John Doe', 'J123', '2023-01-01');
```

FIGURE: 4.8 MYSQL DATABASE DESIGN

## **4.6 SYSTEM REQUIREMENT**

### **Hardware Requirements**

In the design, the software developed needs the following hardware for an effective and efficient operation of the new system.

1. Intel Computer System.
2. At least 2GB RAM.
3. Enhanced keyboard.
4. At least 320GB hard disk.
5. A colored monitor.
6. An uninterruptible power supply (UPS) units
7. LaserJet or DeskJet printer.

### **Software Requirements**

The software requirements include: -

1. A window XP or higher version for faster processing
2. Database server (apache)
3. Web server (apache)
4. Graphical application (Corel draw)
5. Dreamweaver 8.0
6. Mozilla web browser
7. Fire Fox web browser
8. Chrome web browser

### **Operational Requirement**

For the new system to be operational, Internet access is needed in the computer.

### **Personnel Requirement**

A Computer system with internet access.

## CHAPTER FIVE

### 5.1 CONCLUSION

A **Facial Student Biometric Attendance System** can be regarded as an advanced technological product designed to replace traditional paper-based attendance methods. By utilizing facial recognition technology, the system automates the sign-in and sign-out process, saving time and minimizing errors associated with manual attendance recording. This technology is particularly beneficial in large organizations where manual sign-in methods are prone to inaccuracies and can be easily manipulated.

With rapid advancements in biometric security systems, facial recognition has emerged as a revolutionary tool, marking the decline of traditional attendance methods. It offers a higher level of security, accuracy, and efficiency, ensuring that attendance data is both reliable and tamper-proof. The system not only streamlines administrative tasks but also contributes to the broader adoption of biometric technologies in organizational management, signaling a new era in attendance tracking and security solutions.

### 5.2 RECOMMENDATION

The project is recommended for usage in classrooms, offices, and other large organizations that require efficient tracking of attendance. The **Facial Student Biometric Attendance System** significantly enhances the accuracy and reliability of attendance management. Unlike traditional methods, where individuals manually sign attendance sheets—which can be time-consuming and susceptible to manipulation—this system uses facial recognition technology to automatically record attendance. This eliminates the possibility of proxy attendance (having someone else sign in) and ensures that the time of arrival and departure is accurately captured and cannot be altered.

The facial recognition system improves administrative efficiency, reduces the workload of manually tracking attendance, and enhances the integrity of attendance data. In educational institutions, it fosters student accountability and punctuality. In office environments, it optimizes workforce management by providing real-time attendance reports. Overall, the system offers a

seamless, contactless, and secure solution for attendance tracking, making it a superior choice for modern organizations.

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## APPENDIX

### LOGIN PAGE SOUCE CODE

```
<?php

//handle user login logics

$code_version = date('Yhmis');
$errors = [];

if ($_SERVER['REQUEST_METHOD'] === 'POST' && isset($_POST['login'])) {
    $email = filter_input(INPUT_POST, 'email', FILTER_SANITIZE_EMAIL);

    $password = md5($_POST['password']);
    $userType = $_POST['user_type'];

    if (!filter_var($email, FILTER_VALIDATE_EMAIL)) {
        $errors['email'] = 'Invalid email format';
    }

    if (empty($password)) {
        $errors['password'] = 'Password cannot be empty';
    }

    if (!empty($errors)) {
        $_SESSION['errors'] = $errors;
        exit();
    }
}
```

```

if ($userType == "administrator") {
    $stmt = $pdo->prepare("SELECT * FROM tbladmin WHERE emailAddress = :email");
} elseif ($userType == "lecture") {
    $stmt = $pdo->prepare("SELECT * FROM tbllecture WHERE emailAddress = :email");
}

$stmt->execute(['email' => $email]);
$user = $stmt->fetch();

if ($user) {

    $_SESSION['user'] = [
        'id' => $user['Id'],
        'email' => $user['emailAddress'],
        'name' => $user['firstName'],
        'role' => $userType,
    ];

    header('Location: home');
    exit();
} else {
    $errors['login'] = 'Invalid email or password';
    $_SESSION['errors'] = $errors;
}
}

if (isset($_SESSION['errors'])) {
    $errors = $_SESSION['errors'];
}

```

```

function display_error($error, $is_main = false)
{
    global $errors;

    if (isset($errors["{$error}"])) {

        echo '<div class="' . ($is_main ? 'error-main' : 'error') . '">

            <p>' . $errors["{$error}"] . '</p>

            </div>';
    }
}
?>

<!DOCTYPE html>
<html lang="en">

<head>

    <meta charset="UTF-8">

    <meta name="viewport" content="width=device-width, initial-scale=1.0">

    <title> Login to access dashboard </title>

    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.5.1/css/all.min.css">

    <link rel="stylesheet" href="resources/assets/css/login_styles.css?v=?php echo $code_version?>">

</head>

<body>

    <div class="container" id="signIn">

        <h1 class="form-title">Sign In</h1>

        <?php

            display_error('login', true);

```

```

?>
<form method="POST" action="">

  <div class="input-group">

    <i class="fas fa-times"></i>

    <select name="user_type" id="" required>

      <option value="">Select User</option>

      <option value="lecture">Lecture</option>

      <option value="administrator">Admin</option>

    </select>

  </div>

  <div class="input-group">

    <i class="fas fa-envelope"></i>

    <input type="email" name="email" id="email" placeholder="Email" required>

    <?php
      display_error('email');
    ?>

  </div>

  <div class="input-group password">

    <i class="fas fa-lock"></i>

    <input type="password" name="password" id="password" placeholder="Password" required>

    <i id="eye" class="fa fa-eye"></i>

    <?php
      display_error('password')
    ?>

  </div>

  <p class="recover">

    <a href="#">Recover Password</a>

  </p>

```

```

        <input type="submit" class="btn" value="Sign In" name="login">

    </form>

    <p class="or">

        -----or-----

    </p>

    <div class="icons">

        <i class="fab fa-google"></i>

        <i class="fab fa-facebook"></i>

    </div>

</div>

<script src="resources/assets/javascript/script.js"></script>
</body>

</html>

```

## ADMIN DASBOARD SOURCE CODE

```

<?php $code_version = date('Yhmis'); ?>

<!DOCTYPE html>

<html lang="en">

<head>

    <meta charset="utf-8">

    <meta http-equiv="X-UA-Compatible" content="IE=edge">

    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

```

```

<link href="resources/images/logo/atnlg.png" rel="icon">

<title>Dashboard</title>

<link rel="stylesheet" href="resources/assets/css/styles.css?v=<?php echo $code_version?>">

<link href="https://cdnjs.cloudflare.com/ajax/libs/remixicon/4.2.0/remixicon.css" rel="stylesheet">

</head>

<body>

<?php include 'includes/topbar.php'; ?>

<section class="main">

    <?php include 'includes/sidebar.php'; ?>

    <div class="main--content">

        <div class="overview">

            <div class="title">

                <h2 class="section--title">Overview</h2>

                <select name="date" id="date" class="dropdown">

                    <option value="today">Today</option>

                    <option value="lastweek">Last Week</option>

                    <option value="lastmonth">Last Month</option>

                    <option value="lastyear">Last Year</option>

                    <option value="alltime">All Time</option>

                </select>

            </div>

            <div class="cards">

                <div class="card card-1">

                    <div class="card--data">

                        <div class="card--content">

                            <h5 class="card--title">Registered Students</h5>

                            <h1><?php total_rows('tblstudents') ?></h1>

```

```

        </div>

        <i class="ri-user-2-line card--icon--lg"></i>

    </div>

</div>

<div class="card card-1">

    <div class="card--data">

        <div class="card--content">

            <h5 class="card--title">Units</h5>

            <h1><?php total_rows("tblunit") ?></h1>

        </div>

        <i class="ri-file-text-line card--icon--lg"></i>

    </div>

</div>

<div class="card card-1">

    <div class="card--data">

        <div class="card--content">

            <h5 class="card--title">Registered Lectures</h5>

            <h1><?php total_rows('tbllecture') ?></h1>

        </div>

        <i class="ri-user-line card--icon--lg"></i>

    </div>

</div>

</div>

```

```

</div>

<div class="table-container">

    <a href="manage-lecture" style="text-decoration:none;">

        <div class="title">

            <h2 class="section--title">Lectures</h2>

            <button class="add"><i class="ri-add-line"></i>Add lecture</button>

        </div>

    </a>

    <div class="table">

        <table>

            <thead>

                <tr>

                    <th>Name</th>

                    <th>Email Address</th>

                    <th>Phone No</th>

                    <th>Faculty</th>

                    <th>Date Registered</th>

                    <th>Settings</th>

                </tr>

            </thead>

            <tbody>

                <tr>

                    <?php

                        $sql = "SELECT l.*, f.facultyName

                        FROM tbllecture l

                        LEFT JOIN tblfaculty f ON l.facultyCode = f.facultyCode";

                        $stmt = $pdo->query($sql);

```



```
$result = $stmt->fetchAll(PDO::FETCH_ASSOC);
```