

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE



**DEVELOPING A MACHINE LEARNING BASED FACE RECOGNITION ATTENDANCE
SYSTEM FOR EMPLOYEES**

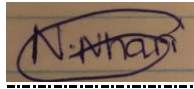
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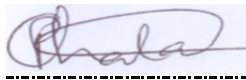
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DEDICATIONS

I dedicate this project to my mother for her endless love, patience, and support throughout my project journey. Her unwavering belief in me kept me going during the most challenging times, and her comforting words gave me strength when I felt overwhelmed. She has been my greatest source of inspiration, and I am truly blessed to have her by my side. This achievement is as much hers as it is mine.

ABSTRACT

This study presents the expansion and evaluation of a machine learning-based face recognition attendance system designed to update and streamline employee attendance tracking in organizations. Traditional attendance means such as manual registers and RFID cards are increasingly prone to issues such as inaccuracy, buddy punching, and administrative inefficiencies. To discourse these limitations, this study proposes a contactless, real-time facial recognition solution that ensures secure, accurate, and automated attendance recording. The system used advanced computer vision systems and machine learning algorithms, integrating facial detection and recognition modules using tools such as OpenCV and deep learning frameworks. Key image processing methods like Contrast Limited Adaptive Histogram Equalization (CLAHE), median filtering, and Principal Component Analysis (PCA) are used to enhance illumination, reduce noise, and extract relevant facial features. Euclidean distance is used as a metric to match detected faces with those stored in a secure database. Once a match is confirmed, attendance is automatically logged along with timestamp data. A prototype was developed and tested within a workplace setting. The system confirmed a promising performance in recognizing faces under variable conditions, with evaluation metrics including accuracy, precision, and recall used to assess its reliability. Feedback collected from employee surveys indicated a high level of user satisfaction, ease of use, and a general preference for the new system over traditional attendance methods. However, some challenges such as inconsistent lighting, limited hardware resources, and concerns over data privacy were noted. This research confirms that facial recognition technology, when properly implemented, offers a scalable, user-friendly, and efficient alternative to conventional attendance systems. It reduces manual workload, prevents time fraud, and supports a digital transformation in employee management

practices. The system is particularly relevant in a post-pandemic era, where contactless technologies are increasingly vital. Future improvements may focus on enhancing recognition speed, strengthening data protection, and incorporating mobile and cloud-based functionality to extend the system's reach and flexibility.

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CHAPTER 1

1.1INTRODUCTION

Traditional pen-and-paper methods for employee attendance are easily influenced by inaccuracies and falsification. Biometric systems, despite being secure, face issues such as unclean or injured fingers. In this study, a cutting-edge employee attendance tracking system using facial recognition is developed, addressing the shortcomings of conventional attendance methods and biometric systems. Face recognition has been a significant area of research in computer vision due to both its practical importance and theoretical interest from cognitive scientists. Although other identification methods such as fingerprints can be more precise, facial recognition remains a key focus of research because of its non-invasive nature. It necessitates include virtually zero effort from the user compared to other biometric options.

Recording employee attendance has develop an elementary requirement for organizations. However, traditional attendance systems often lead to pointless errors. For example, studies have found that fingerprint attendance systems have a mistake rate of about 5%, and there are cases where fingerprints do not register, which can severely affect attendance efficiency, especially in large settings, leading to congestion. Moreover, card attendance systems face issues such as employees swiping cards for one another, making real-time attendance tracking difficult. In comparison, facial recognition offers unconventional accuracy and stability because it utilizes multiple reference points which makes it more reliable than other systems. Effective personnel management is crucial for the administration of organizations. The lack of security and extensive

paperwork in traditional systems highlights the need for new tactics to personal verification and employee identification technologies.

In recent years, organizations have increasingly benefited from fingerprint and facial recognition technologies for attendance tracking. The exceptionality of fingerprints and facial shapes enhances system security because there are no two individuals share the same patterns. Both fingerprints and facial assemblies are stable and do not change over time. Administrations of all sizes use time and attendance schemes to record when employees start and stop work, as well as the departments in which they work. It is also common to track meal breaks types of work performed, and production counts. Additionally, organizations need to manage their employees when they are not working, vacation time, compensation time, Family and Medical Leave Act time, and all injury duty must all be recorded. Some organizations also maintain detailed attendance sleeps, such as who calls in sick and who arrives late. Facial recognition often referred to as face recognition which analyse the characteristics of a person's face from images captured by a camera. It measures general facial structure and the detachments between features such as the eyes, nose, mouth, and jawline. These measurements are stored in a database for contrast when a user stands before the camera.

One of the strongest advantages of facial recognition is non-intrusive. This means it does not affect or disrupt the user's natural behavior or environment. Verification or identification can be proficient from two feet away or more even without requiring the user to wait for long periods or do anything more than look at the camera. Facial recognition is an easy and secure way of tracking attendance.

In a post-pandemic world facial recognition in the workplace is expected to become common in modern cities. Business owners around the world are seeking contactless methods for employees to clock in and out and calculate payroll. As a result solutions will be utilized more frequently especially with image capture devices that photograph employees and process the information to store it in a database. The trained facial image coordinates are mapped and stored which makes employee faces readily identifiable by the deployed system. This study employs computer vision approaches which apply facial recognition techniques using Contrast Limited Adaptive Histogram Equalization (CLAHE) for illumination control, median filtering for noise removal, Principal Component Analysis (PCA) for feature extraction, and Euclidean distance for template matching. These methods collectively enhance the recognition accuracy of the facial recognition system in employee attendance tracking and management.

1.2 BACKGROUND OF THE STUDY

Face recognition is crucial in daily life in order to identify family or someone we are familiar with. We might not perceive that several steps have actually been taken in order to identify human faces. Human intelligence tolerates us to receive information and understand the image projected into our eyes by the retina in the form of light. Light is form of electromagnetic waves which are radiated from a source onto an article and predictable to human vision. The analysed information will be equated to other representations of the objects or face that existing our recollection to recognize. In fact, it is hard contest to build an automated system to have the same ability as a human to recognize faces. However, we need big memory to recognize different faces, for instance, in the mining sector there are a lot of employees with different race and

gender, making it impossible to remember every face of the individual without making mistakes. In order to overcome human limitations and computers with almost limitless memory, high processing speed and power are used in face recognition systems. The human face is an exceptional presentation of individual identity. Thus, face recognition according to (Kumar , Sundar , & Haris , 2021) is defined as biometric method in which identification of an individual is performed by comparing real time capture image with stored image in the database of that person. For instance, airport protection system and FBI use face recognition for criminal investigation by tracking suspects, missing children and drugs activities. Facebook which is popular social networking website implement face recognition to allow the user to tag their friends in the photo for entertainment purpose Proudfoot (David, et.al 2017). Furthermore, Intel Company permits users to use face ID to get access to their online account. According to Rasekhar et al (2018), Apple allows users to unlock their mobile phone to face recognition in 1960. Gorodnichy & Roth (2004) suggested it introduced system which require the administrator to locate eyes, nose and mouth from images. The distance and ratios between the located topographies and common reference points are then calculated and contrasted. The studies are further enhanced by (Samal & Iyengar, 1992) using other features such as hair colour and lip thickness to automate the recognition. Zhao and Yuen (2006) suggested principal component analysis to solve face recognition problem. Many studies on face recognition were then conducted continuously until today.

The global face ID attendance system market was estimated to be worth USD 1.37 in 2022 and is expected to reach a value of USD 4.88 Billion by 2030, growing at a fast rate of 17.2% during the forecast period 2023-2024. A cutting-edge technology called a face recognition attendance system makes it easier for companies, institution of higher learning, and other organizations to

monitor and record employee attendance. It uses face traits like spacing between the nose, eyes and mouth to identify people based on their biometric data. The market for face recognition is expanding quickly as a result of technology's recent surge in popularity. The desire for accurate and effective attendance monitoring, the rising security concerns are some of the reasons that drive face recognition into the market. These systems offer a trustworthy and effective way with the need for paper attendance records and minimizing fraud and errors. China, Japan, South Korea, Singapore, and India are the most countries dominating in the Asia-Pacific region for the Global Face Recognition Attendance System Market.

The software aims to automate business processes and optimize human resource department. In March 2023, Etihad Engineering partnered with Ramco systems to implement Aviation Suite, which covers various modules for maintenance and engineering solutions. Manual recording of in and out of employees as well as maintaining the time sheets (in Microsoft Excel) are attendance systems but that already exists in most of institutions of Zimbabwe.

For instance, airport protection system and FBI use face recognition for I discovered that:

- i. Personnel department spend a lot of time correcting errors due to employees recording their hour of work incorrectly in a time sheets and the information is incorrectly entered into payroll software.
- ii. A lot of time is spent on attendance register and employees have to enter or exit.
- iii. Paperwork cover a lot of space.

1.3 STATEMENT OF THE PROBLEM

Traditional employee attendance tracking methods such as manual sign in sheets or RFID cards are plagued by inaccuracy, inefficiency, and security concerns. Manual methods are prone to errors, buddy punching, and lost records, while also requiring significant administrative effort for data entry, record keeping, and payroll processing. Furthermore, these methods are vulnerable to manipulation and unauthorized access, compromising the integrity of attendance records. As organization grow, manual methods became increasingly cumbersome, highlighting the need for more efficient and secure solution. A face recognition attendance system offers robust solution to these challenges. By leveraging face recognition technology, organization can accurately identify employees and record attendance in real world, reducing errors and disputes. Automated attendance tracking minimizes administrative effort, streamlines payroll processing and enhance security by preventing buddy punching and unauthorized access. Additionally, face recognition system are scalable, making them ideal solution for large organization.

1.4 RESEARCH OBJECTIVE

The objective of the system is to develop face recognition attendance system. Expected achievements in order to fulfill the objective are:

1. To design and develop a machine learning face recognition attendance system for employees that is exact, consistent and efficiency sector.
2. To evaluate performance of the proposed face recognition attendance system in-terms of accuracy, precision and recall.

3. To investigate the security and privacy concerns associated with the use of face recognition technology in attendance tracking and propose measures.
4. To assess the user acceptance and satisfaction of the proposed face recognition attendance system among employees and administrators and identify areas of improvement.

1.5 STATEMENT OF HYPOTHESIS

1.5.1 Null hypothesis

The implementation of face recognition attendance system will not be significantly improving accuracy and efficiency of employee's attendance tracking.

1.5.2 Alternative hypothesis

The implementation of face recognition attendance system will significantly improve the accuracy and efficiency of employee's attendance tracking, reducing errors and increasing employee accountability.

1.6 RESEARCH QUESTIONS

1. What are essential features and functionalities of machine learning-based face recognition attendance system?
2. How accurate and reliable is the proposed face recognition attendance system in tracking employee attendance?

3. What are potential security and privacy risks associated with the use of face recognition technology in attendance tracking?
4. To what extent do employees and administrators accept are satisfied with the proposed face recognition attendance system?

1.7 ASSUMPTIONS OF THE STUDY

- i. Manager might participate in my survey in helping to identify problems faced when capturing attendance of employees.
- ii. Accountants might participate in my survey in helping to identify the challenges faced in calculating fair wages.
- iii. Employees might participate in survey in helping to identify the challenges faced with employees' attendance.
- iv. Employees might participate in my survey, helping to point out the problem faced with wages and working hours in respect to their attendance.
- v. Bindura University of Science Education might sponsor my project.

1.8 SIGNIFICANCE OF THE STUDY

The importance of this study is to be able to know the details of recognition and detection in order to specify the work of the system in a good condition. Face recognition is a system has been used in old dynamic methods; this system has developed according to deep learning network as automatic system that can be functional perfectly. This study is one of the most

important studies nowadays due to call for every attendance system or recording organization that can recognize and detect the human face with good facial features. Employees record their hour of work erroneously in the time sheet and improper information is entered in payroll system, therefore the study will deliver a system that automatically record hours of work accordingly. Manual time sheets and punched cards may not prevent time theft or punching for families therefore the study delivered a system that uses face recognition to prevent signing in by a friend.

Employees have to queue or exit human resource department to spend time dealing with time ticket issues but the study delivered a system that is and spend less time in dealing with exit and entrance issues. Paperwork use a lot of space when presence is marked in the records, so the study provides a solution which system that do not use paper for storage devices. For big institutions the daily wages depend on demand and workload of that particular day therefore the system will be able to calculate the daily wages depending on the pay rate of particular day. Employees will be more in good time on attending duties, because the attendance of an employee can only be taken generally where any absents will be recorded by the system. This can not only train the employee, but it also avoids any immoral ethics such as signing the attendance of a friend.

The institution can save a lot of resources implementation are now done by means of technology rather than human management which will waste a lot of human resource for an insignificant process. The application can work on any devices at any location which makes the attendance system to be moveable and to be placed at any intended location. For instance, the devices can be placed at ant entrance of the workplace to record the attendance. It reduces cost in the sense that

it had eliminated the paperwork completely. The system is also time actual because all calculation is all robotic. In short, the project is developed to solve the existing issues in the old attending system.

1.9 LIMITATIONS OF THE STUDY

The system improved efficiency and bring convenience for all the operation at the university. But the system faces some limitations which include:

- i. Unable to obtain a dataset of faces to train the model.
- ii. Unable to obtain an HD camera.
- iii. Low response rate from managers and employers during the survey.
- iv. The system is unable to check_ in and check out a single person multiple times when g0ing out for a break.
- v. The software cannot actually confirm the entrance of an individual. One can check_in and go back home at that moment and come back later check-out.

1.10 DELIMITATIONS OF THE STUDY

I am setting up to design a system comprising of a module that captures worker's faces extraction techniques and do face recognition of the captured images in the file, marks the works register and then stores the results in a database for future analysis. Although the project covers the boundary of developing an application to be used by managers, employers and staff from different institutions ranging from government complex, schools, mining sectors as well retail

shops and many others. I shall develop only a prototype as a proof of concept for the Faculty of Science Education and Engineering Complex General Workers. This is on the basis that if the system works for one group of workers at the faculty. It can easily work for all the Faculties at the University the problem I intended to address herein are universal to all groups of workers in unlike institution.

The main purpose of this project is to solve the issues encountered in the old attendance system but producing a brand new innovative smart system that can provide convenience to the institution. In this project, an application will be developed which is capable of recognising the identity of each individual and eventually record down the data into a database system. Apart from that, an excel sheet is created which shows the employees attendance.

The following are the project scopes:

- a. The targeted groups of the attendance managerial system are the employees and staff of an institution.
- b. The facial recognition process can only be done for one person at a time.
- c. An excel sheet is created which contains the employee attendance.

1.11 DEFINATION OF TERMS

1.11.1 Biometrics

Biometric refers to the measurements and statistical of people's unique physical and behavioral characteristics. Biometrics are used for identification and access control as well monitoring and tracking purpose.

1.11. 2 Interface

An interface is a shared boundary across which two or more separate components of a computer system exchange information. The exchange can be between software, computer hardware, peripheral devices, humans, and combinations of these.

1.11.3 System

A system is a collection of elements related in a way that allows common objective to be accomplished. In a computer system, these elements include hardware, software, people, facilities and processes.

1.11.4 Software

Software is a set of instructions data and programs used to operate a computer and execute specific tasks.

1.11.5 Operating system

An operating system is the program that initially loaded into the computer by a boot program, manages all of the other application programs in a computer.

1.11.6 Prototype

A prototype is a rudimentary working model of a product or information system usually built for indicating purpose or as part of development process.

1.11.7 Face detection

Face detection is the process of identifying and locating all present faces in a single image or video regardless of their positions, scale, orientation, age and expression and the detection should be irrespective of extraneous illumination conditions and image and video content

1.11.8 Face recognition

Face recognition refers to a process of detecting faces by identifying facial features in a photo or video using machine learning algorithms. It first looks for an eye and from there it identifies other facial features.

1.11.9 Difference between face detection and face recognition

Face provides answers to the question such as where is the face? It identifies an object as a face and locates it in the input image. Face recognition on the other hand responses the question who is this? Or whose face, is it? It decides if the noticed the face of someone. It can therefore be seen

that face detection output is the input to the recognizer and the face recognition's output is the final decision therefore face known.

1.11.10 Haar cascade classifier

A Haar cascade classifier is a machine object detection program that classifies objects in an image and video.

1.11.11 Smart attendance system

A smart attendance system refers to a technology driven classification that allows organization or education institution to manage and track attendance in a more efficient and automated way. This system uses various technologies such as biometric recognition, RFID, QR codes, or facial recognition to identify individual and record their attendance.

1.11.12 NFC

NFC stands for Near Field Communication, which is a technology that allows wireless communication between two devices that are in close proximity to each other, typically within few centimeters. NFC uses radio waves to transmit data between devices, which can include smartphones, tablets, and other electronic devices.

1.11.13 RFID

RFID stands for Radio Frequency Identification which is a skill that uses radio waves to identify and track objects for people. RFID systems consist of three parts: a tag, a reader and a database.

1.11.14 Open CV

Open CV (Open Source Computer Vision) is a popular open_source computer vision and machine knowledge library that is written in C++ and has interface for python, java and other programming languages.

1.11.15 NumPy

NumPy (short for Numerical python) is a popular library that provide support for large, multi_dimensional arrays and matrices, as well as a wide range of mathematical functions to operate on them.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, I will review relevant theories from empirical and theoretical literature related to facial recognition system. The journal utilized in this chapter will be from 2014-2024.

Every institution that depends on people must account for its employees as a first step in modern-day. As a result, creating and maintaining a suitable management system costs the different organization a large sum of money, in many countries, government organization and educational institution keep track of attendance using paper-based methods. For example, to maintain track of each employee's presence and it takes time to call out their name at the beginning of the day. False signs, names missing from spreadsheets, manually inputting data into system, and the likelihood of proxy attendance are further problems. Such techniques have a few problems that have grown over time. To track attendance, it is crucial to swap out these outdated practices for modern ones. As a result, a lot of work and investigations has been done in this area using current technologies. Especially, automatic appreciation of a particular individual based on distinctive characteristics such as QR code, ID and password, face recognition, fingerprint recognition is of interest to study.

2.2 ON CURRENT SYSTEM

The traditional method of attendance marking is dull task in any institution and organization. (Mohari, et al (2023) stated that it is also an extra burden to the institution who should mark attendance by manually calling the names of workers which might take about 5 minutes of entire

session. This is time consuming. There are some chances of proxy attendance. Therefore, many institutes started deploying new techniques for recording attendance like using radio frequency identification (RFID), iris recognition, and fingerprint recognition and so on. However, these systems are queue based which might consume more time and intrusive in nature.

Abdalkarim & Akgün, (2022) mentioned that, in many countries' régime, organization and educational institutions keep track of attendance using paper-based methods. For example, to maintain track of each employee's attending, it takes time to call out their names at the commencement of the day. Dishonest signs, names missing from worksheets, manually inputting data into systems, and possibility of proxy attendance are further problems. Such methods have a few problems that have fully-fledged over time. To track appearance, it is crucial to swap out these outdated practices for modern ones. As a result, a lot of work and research has been done in this area using current technologies. Especially, automatic recognition of particular individual based on distinguishing characteristics such as ID and password, face recognition and fingerprint recognition.

Many organizations are using some automatic system such as punch cards, RFID cards, fingerprints scanner and to some extent face recognition and most traditional method of marking attendance through roll call (A & TE, 2019). The paper also projected that the most of the organization have moved towards digital approaches such as swipe or punch cards to get the job done. Both the methods got some disadvantages. Roll call method is time wasting and prone to human errors. Mistakes such as marking the present person absent and vice versa can occur in this method. Digital methods such as swipe and punch cards can overcome the drawbacks in the previous mentioned method, but it also gives rise to new issues. Swipe cards are less time

consuming but it doesn't check for the presence of the person while swiping the card, which may lead to another person marking proxy attendance of the absent person. Also, another concern is that if the person loses his or her swipe card, then he or she may have wait sometimes before getting to new card. Using biometric can help to overawed the issues existing in previous techniques.

2.3 LITERATURE SURVEY

2.3.1 DIGITALIZING THE OLD APPROACH

Traditional employee attendance involves all roll calling issues and takes a lot of time for employees and managers to conduct departmental session. The procedure is lengthy and takes more instructors and employee's time. (Feroze, Bazif , & Abbasi, 2024) reduced the length of the complete attendance verification by designing an online system. Substituting the conventional procedure, managers had to call each employee's name and note the attendance when employee answered. It offers a more straightforward and quicker approach to monitoring attendance. Instructors were no longer a paper time-sheet to mark employee attendance in their proposed system. They can compere attendance records by obtain the essential information from database, marking the entire procedure paperless. Abdalkarim & Akgün, (2022) mentioned that another research used mobile devices in the attendance management system which were developed and put into practices. A mobile based attendance administration program for android system was developed using VB.NET and SQL Server. The study allows for maintained of employee attendance, calculating attendance, calculating grades, and creating a report. Five mechanisms that make up a system which include: admin, registration, employee, SMS and an

android component. Employees can use the android part to send message to the system notifying managers of their absence. Employers can also get SMS notices on attendance system.

2.3.2 ATTENDANCE AND FEEDBACK SYSTEM USING MACHINE LEARNING TECHNIQUES

According to Feroze & Ali, (2024) this system automatically detects the employee performance and maintain employee's records like attendance and their feedback on the salary and wages. Therefore, the attendance of the employee can be made available by recognizing the face. On recognizing, the attendance details and details about the wages of the employee is obtained as feedback.

2.3.3 AUTOMATED ATTENDANCE SYSTEM USING FACE RECOGNITION

The system is based on face detection and recognition algorithm, which is used automatically detects the employee face when he/she enters the room and the system is capable to mark the attendance by recognizing him/her (Nandhini, Duraimurugan & Chokkalingam, 2019). Viola jones algorithm has been used for face discovery which detects human face using cascade classifier and principal component system for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves the time and also helps to monitor the employees.

2.3.4 EMPLOYEE ATTENDANCE SYSTEM USING IRIS DETECTION

Nandhini, et. al (2019) proposed a system in which the employees requested to stand in front of the camera to detect and recognize the iris, for the system to mark the attendance for the employees. Some system like Gray Scale alteration, six segment Rectangular Filter, Skin Pixel Detection is being used to detect the iris. It helps in preventing the proxy issues and it maintains the attendance of the employee in an effective manner, but in one of the time-consuming processes for employees or staff to wait until the completion of previous members.

2.3.5 ATTENDANCE SYSTEM USING NFC TECHNOLOGY WITH EMBEDDED ON MOBILE DEVICE

According to Bhise et., (2015), the attendance system is improved by using technology and mobile application. According to the Research paper, each employee is given at NFC tag and a unique ID during their recruitment into the institution. Attendance of each employee were taken by touching or moving these tags on the director mobile phone. The embedded camera on the phone was capture employee's face to send all the data to the institution server to do validation and verification. The advantage of this method is where the NFC is simple to use and speed of connection is established is very high. It indeed speeds up the attendance taking process a lot. However, this system was not automatically spot the desecration when the NFC tag is not personally tagged by the original owner

2.4 EXISTING RECOGNITION SYSTEMS

2.4.1 FINGERPRINT BASED RECOGNITION SYSTEM

In the Fingerprint based existing attendance system proposed by Geethapriya in 2019 a portable fingerprint device need to be configured with the employees' fingerprint earlier (Geethapriya et. al 2019). Later either during the working hours or before, the employee needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach it needs contact which is no hygienic and not convenient than fingerprint scanning whilst the face recognition is non-contact which is more hygienic and convenient than fingerprint scanning. Fingerprint scanning typically requires decent lightning whereas face recognition requires or work in low light condition.

The method of digitally comparing one or more unknown fingerprints to a collection of known and unknown fingerprints in the database is known as automatic fingerprint recognition. A common finger assumption devices that is used as a component of a special finger impression attendance framework was described by (David, 2018). The students may check their essence by placing their fingertips on the device's sensor. But because fingerprint scanners can't always identify something the first time, this framework lacks viability. (Abdalkarim & Akgün, 2022) presented an attendance system employing smartphone GPS and fingerprint technologies. The method takes a lot of time since it makes use of fingerprint recognition. (Vinod, Murugesan, Mekala, Thokaiandal, & Vishnudevi, 2022) proposed a solution of using fingerprint to mark the attendance. This system has used 2 microcontrollers to deal with the fingerprint recognition process. Firstly, the fingerprint pattern was be obtained through a fingerprint sensor, then the information will be transmitted to microcontroller 1. Next microcontroller 1 was pass the information used to microcontroller 2 for the checking with the database that resides in it. After finding an operative's match the details are sent to the PC through serial communication to be

displayed. This design is respectable because it accelerates development while maintaining design flexibility and simplifies testing. But again, this system is attached to a PC which make it not portable. Other than that, the database information cannot be accessible easily. Meaning that, the employees who are interested in knowing their attendance cannot easily or conveniently access the information. Therefore, to provide convenience of the employee's information to the legitimate concerned party, the information was uploaded to a web server for easy access. While the verification for the appropriate access was enforced through a login screen.

2.4.2 RFID BASED RECOGNITION SYSTEM

In the RFID based existing system, the employee needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day (Chokkalingam & Komathy n/d). The system is capable of linking to radio station and record the attendance to the saved database. There are possibilities that fake access may occur. Some of the employees may use of other employees ID to ensure their presence when the particular employee is absent or they even try to misuse it sometimes.

Abdalkarim (2022) refer to RFID as a more straightforward form of the NFC (Near field communication) technology that many Android devices utilize for digital payments. (Khashaba & Al-Najaar, (2022) suggested numerous frameworks put up for board involvement using different improvements. The board is advised to use another form of participation specifically for ordinary level institutions in consideration of this discussion. The projected model includes components for mobile applications and RFID. The RFID constituent is suggested for documenting student engagement in the database at the back end. The application helping is

intended to give their families attendance data. When there is no electricity or not many resources to send by the RFID component, the application part is used as a backup to track the attendance.

According to (ROHEL, 2019) the proposed solution is almost similar to the first research journal where RFID technology is used to improve the older attendance system. In this system, a tag and a reader is again used as a method of tracking the attendance of the employees. The difference between the first journals with this is where attendance's information can be accessed through a web portal. It provides more convenient for information retrieval. Again, this system is imperfect in the sense that, firstly, it is not portable, as the RFID reader can only work when it is connected to a PC. Secondly, the RFID tag is not genuine information that can uniquely identify an employee, thus, resulting in the inaccuracy of the collected attendance information. The problem with this approach is that it requires carrying a physical card, which can be lost, stolen or damaged whereas face recognition does not want physical cards. This approach is not more safe compared to face recognition and in RFID they is higher chances of spoof compared to face recognition.

2.4.3 IRIS BASED RECOGNITION SYSTEM

In the Iris based student attendance system, student needs to stand in front of a camera, so that the camera will scan the Iris of the student (Geethapriya et. al 2019). The scanned iris is matched with data of student stored in the database and the attendance on their presence needs be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of

laying the corresponding network. The problem with iris base gratitude, the iris requires more precise positioning and can be perceived as more invasive whereas face recognition is generally considered more user friendly and less intrusive than iris scanning. Iris scanning typically entails the user to be closer to the scanner and focus their eyes on a definite point, but face recognition can be performed at a distance which makes it suitable for surveillance and situations where users cannot or do not want to actively participate in identification process. Iris scanning requires particular hardware, whilst face recognition operates using existing camera infrastructure such as security camera and webcams.

2.4.4 FACE BASED RECOGNITION SYSTEM

Face Recognition-based Attendance Management System, was developed by (Dixit, Saxena, Arif , & Sharma, 2024) to develop an organized attendance system using face recognition methods. Through facial ID, the system can record involvement. Through a camera, it finds faces and then recognizes them. The system is split into two parts: facial recognition and detection. Using the Local Binary Pattern Histogram (LBPH), the system will identify faces of workers in the live-streamed video from the database, the system will mark their attendance.

Face recognition technology was also discussed by (Mishra, Varadharajan, Tupakula, & Pilli, 2018) in their paper. They placed a camera inside a room, using this technique to take pictures. The attendance is recorded as a present after faces are found and identified in the database. Managers are informed their employee's disappearance if their attendance is noted as absent. According to Chandramouli et al., (2019), where they utilized NVIDIA's Jetson Nano, is one of many that tries to modernize how attendance is managed in a certain method and even the

parameters for time management. The device is set in a room where the records (names and photos) of the employees are held. Open CV is used to acquire the photos. The processor board would be NVIDIA Jetson Nano's Developer kit. A Haar classifier is used to identify faces once the extraction has been processed. They subsequently identified with the aid of the LBPH Algorithm. An Excel spreadsheet is generated and refreshed hourly with data from the appropriate department manager. (Akgün, 2022) suggested a system named Automated Attendance Management System Using Face Recognition that highlights the use of Cloud Computing (CC) technological concepts to boost the performance of face identification methods. The FACECUBE system, which is suggested here uses facial ID to take attendance. The system provides workers, coaches, and administrators with online features. However, putting this system together involves several steps which include: purchasing new hardware and software. Susanto et al., (2021) alluded that, were attempted to perform a slightly different type of research regarding the detection of face recognition of users who are present in the application system via an android device. They make a connection with face recognition detection and save it to the database that was used as information about the presence of users. The local binary pattern histogram (LBPH) classifier approach which may be used as a plan in the attendance system of employees to be more efficient and productive, is used to evaluate the facial recognition system. An open-source, generic application for assessing daily attendance using face recognition and making use of the Android system was proposed in the (Hava et al., 2022) study. Almost every institution may readily get it at no cost. With this suggested solution, Google Sheets are automatically created and available to the institution with no effort. The system involves facial identification and recognition algorithms to identify individual workers and record their participation. Prangchumpol, (2020) mentions that, his performance still falls short when it

comes to accurately identify employees' faces and that he is still unable to confirm or rectify the data when a mistake occurs. Therefore, the study improves the efficiency of the face ID based attendant system and make the system's principles simple for employees to understand. This sort of validation aims to discover how to detect faces utilizing the Android Face Recognition with Deep Learning approach. According to Alburaiki et al. (2018) The database is linked to the web server using cloud storage and developed a methodology that solved three key elements: First, using mobile phone cameras and automatically recognizing and analyzing faces. The second is a machine-learning based facial recognition API. Lastly, maps API. The outcome demonstrates that face recognition has attained high accuracy in identifying employees' faces even in unfavorable conditions. The system displayed applied examples of responses by marking the employee's attendance after recognizing the employee's face and location as well as the manager has the option to access a report of submitted attendance. A portable attendance system that could be accessed from any location at any time inspired (Abdalkarim & Akgün, 2022). Without carrying paper and PCs, the manager may simply verify attendance using an android smartphone. The students' android phones make it simple for them to 21

check their attendance information. Additionally, SMS technology is employed to ensure the safety of the employees and to notify families about their attendance. Face recognition is also used to establish a proper attendance record. A particular employee's face is sensed and noted as present in the database using the android device's camera. When necessary, attendance reports could also be formed.

Chitrakala & Jenitha, (2014) notes that, the identification of face ID to solve the previous attendance system's issues. The organization uses camera to capture the images of the employee to do face detection and recognition. It captured image and compared one by one with the face

database to search for the worker's face where attendance will be marked when a result is found in the face database. The main benefit of this system is that attendance is marked on the server which is highly secure and no one can mark the attendance of another. Moreover, in this proposed system, the face discovery algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are capitalized in the accuracy of the face detection algorithm and the system is yet not portable. This system requires a standalone computer which will need a constant power supply that makes it not portable. This type of arrangement is only suitable for marking staff's attendance as they only need to report their presence once a day, distinct students which require to report their attendance at every class on a particular day, it will be troublesome if the attendance marking system is not portable. Thus, to solve this issue the whole attendance running system can be developed on an portable module so that it can be work just by executing the python program.

2.4.5 GPS-BASED ATTENDANCE SYSTEM

Global Positioning System, or GPS, enables us to determine a person's location and direction at any time, any place on Earth (Abdalkarim & Akgün, 2022). In terms of knowing where humans are and how to go to other areas, people still need objects in the sky, but now satellites utilize them. According to Kumar & Kumar, (2018) presented a creative location-based time and attendance monitoring system that was deployed on an Android mobile app. The use of smartphones helps to reduce the need for extra biometric scanning equipment. Components of the organization include a detailed location which may be located using GPS. The GPS on mobile phones controls each employee's place and these locations are crucial for some time and attendance tracking. The problem with global placement is that GPS signals are often weak or

unavailable indoors due to signal impasse by buildings, whereas face recognition using camera inside building, can provide location information by identifying who is in a specific room or area. GPS provide location data, but it doesn't verify who is at that location whilst face appreciation can confirm the identity of the person at the GPS coordinate, adding a layer of authentication.

2.4.6 BARCODE / QR CODE BASED

An associatedal (2018), developed a methodology that solved three key elements: First, using mobile phone cameras and automatically identifying and analyzing faces. The second is a machine-learning based facemask recognition API. Lastly, maps API. The outcome proves that face recognition has attained high accuracy in identifying employees' faces even in unfavorable conditions. The system showed practical examples of responses by marking the employee's attendance after identifying the employee's face and location, as well as the manager has the option to access a report of submitted attendance. A portable attendance system that could be accessed from any location at any time inspired (Abdalkarim & Akgün, 2022). Without carrying paper and PCs, the manager may simply verify attendance using an Android smartphone. The students' Android phones make it simple for them to 21

Check their attendance information. Additionally, SMS technology is employed to ensure the safety of the employees and to notify families about their attendance. Face recognition is also used to establish a proper attendance record. A particular employee's face is detected and recorded as present in the database using the Android device's camera. When necessary, attendance reports could also be formed.

The research (Selvi, Chitrakala & Jenitha, 2014) is based on the identification of face recognition to solve the previous attendance system's issues. This system uses camera to capture the images of the employee to do face detection and recognition. The captured image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is found in the face database. The main advantage of this system is that attendance is marked on the server which is highly secure and no one can mark the attendance of another. Moreover, in this proposed system, the face detection algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested in the accuracy of the face detection algorithm, the system is yet not portable. This system requires a standalone computer which will need a constant power supply that makes it not portable. This type of system is only suitable for marking staff's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not portable. Thus, to solve this issue, the whole attendance management system can be developed on a portable module so that it can be work just by executing the python program.

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which will need a constant power supply that makes it not portable. This type of system is only appropriate for marking workforce's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not moveable. Thus, to solve this issue, the whole attendance management system can be developed on a portable module so that it can be work just by executing the python program.

The problem with this is that barcodes and QR codes can be damaged, obscured, or counterfeited, rendering them unreadable. Face recognition relies on facial features, which are generally more robust to minor damage or variations in lightning. Barcodes and QR codes simply provide data; they don't verify the identity of the person presenting the code. Anyone with a copy of the code can use it. Face recognition confirms the identity of the person, adding a layer of security. Barcodes and QR codes can be easily copied or shared, leading to unauthorized access or fraudulent activities. Face recognition is more secure because it's based on a unique biometric trait. Barcodes have limited data storage capacity, while QR codes have a higher capacity but are still restricted. Face recognition, when linked to a database, can provide access to a vast amount of information about the identified individual.

2.4.7 ANDROID-BASED AUTHORIZED ID AND PASSWORD

(Hameed, 2017) developed and put into use an intelligent Android-based attendance system. The technology creates attendance data automatically and offers a quicker, more economical, and accessible solution for tracking online employee attendance. The three characteristics of the attendance system are the admin account, which can log in and change the database; the

instructor account, which can mark workers as present; and the reporter which can verify attendance records and report all duties. The instructor will be ready to obtain attendance with ease using phones with Android OS which has been developed to save attendance both on the device and servers, as well as to Verify statistics and print a paper version according to (Islam et al., 2017) paper. Their system can record attendance, mark invaders' admission, calculate attendance percentages. The proposed system allows internet access at any time and from any location, which might greatly help instructors take care of their worker's attendance. An attendance management system was developed by (Kumbhar et al., 2016) to address issues with class attendance using Android devices. Both employees and managers must install APKs on their phones to access the system. They also received a unique ID and password. Employees must fill out the application with their information. The employee may register their attendance with only one click after the program is started by the instructor and is ready for use during attendance checking

2.5 SOLUTIONS TO ADDRESS PROBLEMS

Smitha et al (2020) mentioned that, the purpose of this system is to build an attendance system which is based on face recognition techniques. Here face of an individual will be measured for marking attendance. Currently face recognition is gaining more admiration and has been widely used. The study proposed a system which detects the faces of employees from an entrance

camera and attendance will be noticeable if the detected face is found in the database. This new system will consume less time than compared to old-style methods.

Wankhade et al (2022) stated that, with the continuance of technology, the frauds and malpractices linked to it have been on the verge of fashionable and technology has been a kind of redeemer in so many cases. Face ID can be considered as such a savior in terms of frequent malpractices and fraud activities. Not only in the field of fraud deterrence or detection, but facial recognition and robotic face detection tools and technologies play an important role in the attendance management systems.

Abdalkarim & Ali, (2022) pointed out that, old-style employee attendance involves all the roll-calling issues and takes a lot of time for employees and managers to conduct departmental sessions. The procedure is drawn-out and takes many instructors' and employees' time. This research reduced the length of the complete attendance verification by designing an online system. Substituting the conservative procedure managers had to call each employee's name in board room and note the attendance when the employee answered. It offers a more upfront and quicker approach to nursing attendance. Instructors will no longer require a paper sheet to mark employee attendance in their proposed system. They can construct attendance records by obtaining the necessary information from the database, making

2.6 THE PROPOSED SYSTEM

According to Abraham et al (2020), the task of the proposed system is to capture the face of each employee and to store it in the file for their attendance. The face of the employee needs to be taken in such a manner that all the feature of the employees' face needs to be detected, even the seating and the posture of the employee need to be recognized. There is no need for the operate

to manually take attendance because the system records a video and through further dispensation steps the face is being recognized and the attendance database is updated.

2.7 EMPLOYEE ATTENDANCE SYSTEM

Katara et al (2017) mentioned disadvantages of RFID card system fingerprint system and iris credit system. RFID card system is applied due to its simplicity. Though, the user tends to help their friends to check in as long as they have their friend's ID card. The fingerprint scheme is indeed effective but inefficient because it takes time for the verification process so the user has to line up and perform the verification one by one. However, for face recognition the human face is always bare and contains less material compared to iris. Iris recognition classification which comprises more detail might invade the privacy of the user. Voice recognition is available, but it is less accurate compared to other methods. Hence, face recognition system is suggested to be implemented in the student attendance system.

2.7.1 DIGITAL IMAGE PROCESSING

mentioned that Digital Image Processing is the processing of images which are digital innature by a digital computer (Kumar et al., 2021). Digital image processing techniques are motivated by three major applications which include:

1. Improvement of pictorial evidence for human perception.
2. Image processing for self-directed machine application.
3. Efficient stowage and transmission.

Digital image processing includes the following basic tasks:

Image Acquisition - An imagination sensor and the capability to digitize the signal produced by the sensor.

- Preprocessing – Enhances the image quality, filtering and contrast enhancement.
- Segmentation – Partitions an input image into essential parts of objects.
- Description/feature Selection – extracts the explanation of image objects suitable for further computer processing. 25
- Recognition and Interpretation – Assigning a label to the object based on the information provided by its descriptor and interpretation assigns meaning to a set of labeled objects.
- Knowledge Base – This helps for efficient dispensation as well as inter Module cooperation

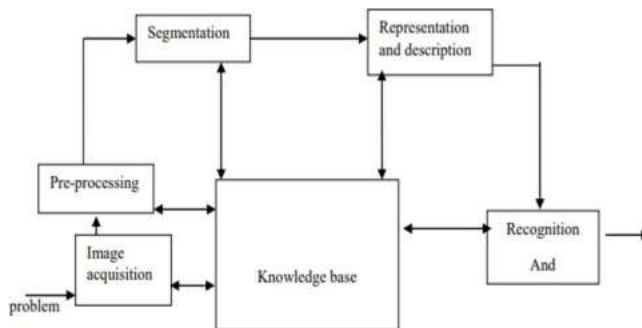


Figure 1: A diagram showing the steps of digital image processing

2.7.2 SYSTEM DESIGN

As suggested by Suresh et al (2019), the design part of the attendance monitoring system is alienated into two sections which consist of the hardware and the software part. Before the software can be industrialized the hardware part is first finished to provide a platform for the software to work. Before the software part we need to install some public library for effective working of the application. We install OpenCV and NumPy through Python.

2.7.3 LIBRARIES DEVELOPMENT

OpenCV

Suresh et al (2019), define OpenCV (Open-source computer vision) as a library of software design functions mainly aimed at real-time computer vision. The OpenCV project was initially an Intel Research inventiveness to advance CPU-intensive applications, part of a series of projects including real-time raytracing and 3Ddisplay walls. The main contributors to the project included numerous optimization experts in Intel Russia, as well as Intel's Performance Library Team.

NumPy

As defined by Suresh et al (2019), NumPy is a multi-dimensional array object and associated fast math functions that operate on it. It also delivers simple routines for linear algebra and sophisticated random-26 number cohort. NumPy replaces both Numeric and Numarray. The numpy namespace includes all names under the NumPy. core and numpy.lib namespaces as well. Thus, import numpy will also import the names from NumPy. core and numpy.lib. This is the suggested way to use numpy.

2.7.4 SOFTWARE DEVELOPMENT

There are two major system flows in the package development section as shown below:

1. The creation of the face record.
2. The procedure of attendance taking.

Both processes above are essential because they make up the backbone of the attendance management system (Suresh et al.,2019). Their full functionality detailed requirements and also the methods/approach to accomplish such objectives will be discussed in the next chapter.

2.7.5 OVERVIEW

According to Suresh et al (2019) is a software system which was spotted attendance using facial recognition. In this project we used OpenCV module integrated with Python which was helped the institution to make the attendance process easy and efficient. The system comprises of a computer and an HD Video Camera.

2.8 RESULTS AND DISCUSSIONS

According to Nandhini and Chokkalingam (2019), the main working principle of the project is that, the video captured data is rehabilitated into image to detect and 27 recognize it. Further the recognized image of the employee is providing with attendance else the system marks the database as absent.

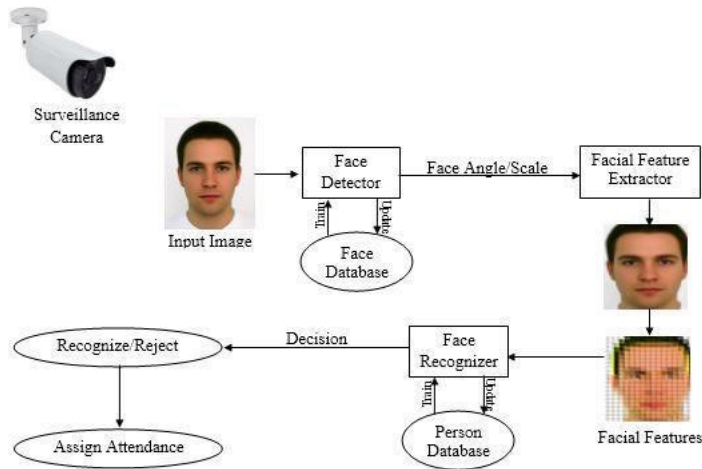


Figure 2: Image Processing

2.8.1 CAPTURE VIDEO

The Camera is static at a specific distance inside a room to capture videos of the front images of the entire employees.

2.8.2 SEPARATE AS FRAMES FROM THE VIDEO

The captured video desires to be converted into frames per second for easier detection and acknowledgment of the employees' face to generate the attendance database.

2.8.3 FACE DETECTION

Face ID is the process where the image, given as an input (picture) is examined to find any face, after finding the face the image processing cleans up the facial image for easier identification of the face. CNN (Convolution Neural Network) algorithm can be implemented to detect the faces.

2.8.4 FACE RECOGNITION

After the completion of detecting and processing the face and it is compared to the faces present in the employees' database to update the presence of the employees

2.8.5 POST-PROCESSING

The post-processing machine involves the process of updating the names of the employees into an spread sheet. The excel sheet can be maintained on a daily basis to record the employees' attendance. This attendance record can be used by staff to calculate employee wages.

2.8.6 FUTURE ENHANCEMENTS

Sometimes the poor lighting disorder of the room may affect image quality which indirectly degrades system routine, this can be addressed in the latter stage by improving the quality of the video or by using some system.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter we shall fully elaborate on the set of all requirements that are to be imposed on the design and verification of the application. Both the functional and non-functional requirements will be briefed herein.

3.2 REQUIREMENTS ENGINEERING

3.2.1 ELICITATION

In order to get data and facts to be able to come up with the scope management plan, the following techniques were applied:

1. QUESTIONNAIRES

To gather insights on employee attendance face detection system, I created a google form covering crucial aspects like accuracy, data security, integration, scalability. I distributed questionnaires to a number of staff members working at different organizations as well as government and nongovernmental institutions to gather precise information on service provision in the general workers section.

2. INTERVIEWS

I carried out the interviews with the employees and managers of all departments.

3. OBSERVATION

Moving from one organization to another made it relatively easy for me to be able to get first-hand experience of the former system and gather an understanding of what exactly is required.

3.2.2 FUNCTIONAL REQUIREMENTS

1. Register a new staff member, that is

Allow Login to registered users.

2. Register new workers.

3. Allow to take workers' attendance.

4. Show attendance of that particular day.

4. Provide the users with workers daily wages.

6. It should give the admin, the ability to see the number of workers in the database.

3.2.3 NON FUNCTIONAL REQUIREMENTS

1. Intuitive, attractive, and functional user interface design.

2. Secure user information architecture.

3. Efficiency and throughput.

4. Fast.

5. Functional.

3.2.4 USER SOFTWARE REQUIREMENTS

The final application will run on windows devices with a web browser.

3.3 SYSTEM REQUIREMENTS

3.3.1 INPUTS

The system shall require user input through forms and press gestures. Below is a generic list of some of the input to be collected.

1. Workers details (images, names, ids, time in, time out).
- I2. Administrator inputs. (name, gender, roll, phone number, email, password).

3.3.2 PROCESSES

1. Login details validation.
2. Capturing user data.
3. Updating user data in the database
4. Face verification when taking attendance.
5. Wage calculation.

3.3.3 OUTPUTS

1. View of that particular day attendance.

2. View of the total number of workers in the database.
3. View of a form to select wage rate.
4. View of workers' wages.

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1 OBJECTIVES INTRODUCTION

Chapter 4 of the Results and Discussion section explores the effectiveness and implications of employee face detection technology in workplace settings. This chapter provides a thorough analysis of data gathered from different implementations, emphasizing important findings regarding accuracy, efficiency, and employee perceptions. By investigating technological progress and its effects on security and productivity, we seek to identify both the advantages and challenges of face detection systems. Furthermore, the discussion will consider ethical issues and possible future advancements in this fast-changing domain.

4.2 OBJECTIVES

4.2.1 To design and develop a machine learning face recognition attendance system for employees that is accurate, reliable and efficiency in sector

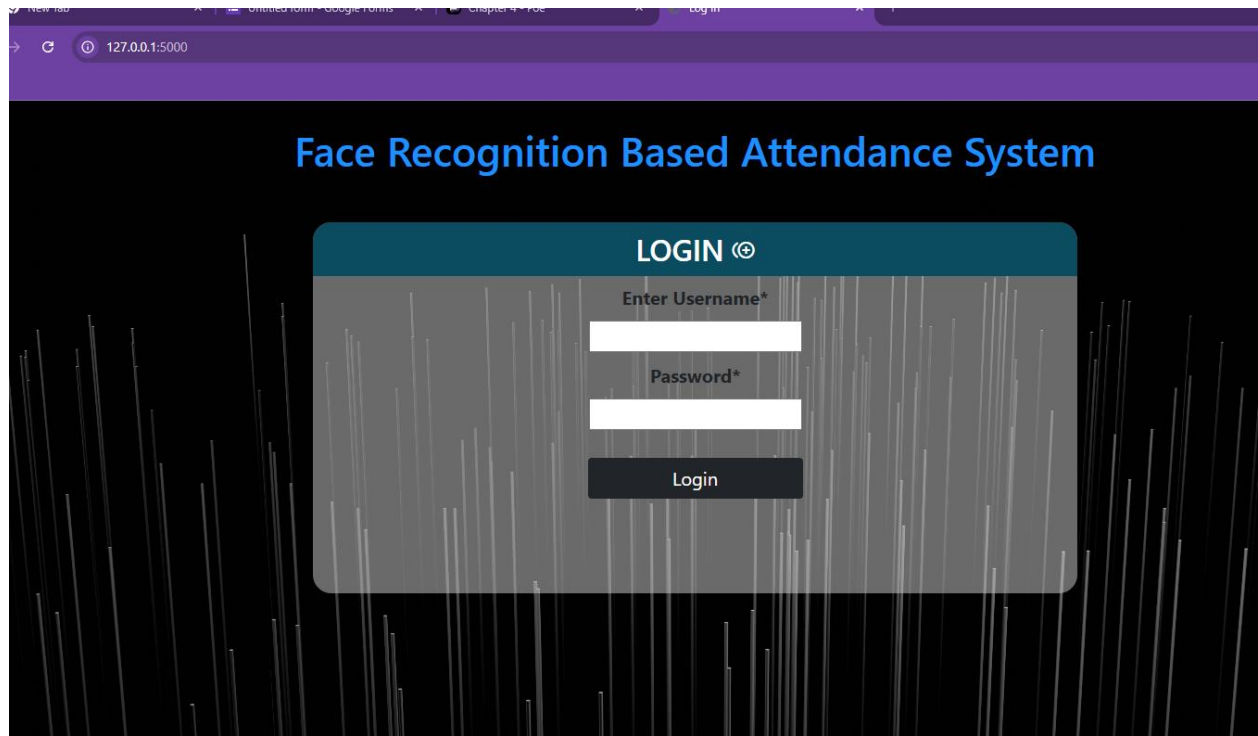


Figure 3: Login design

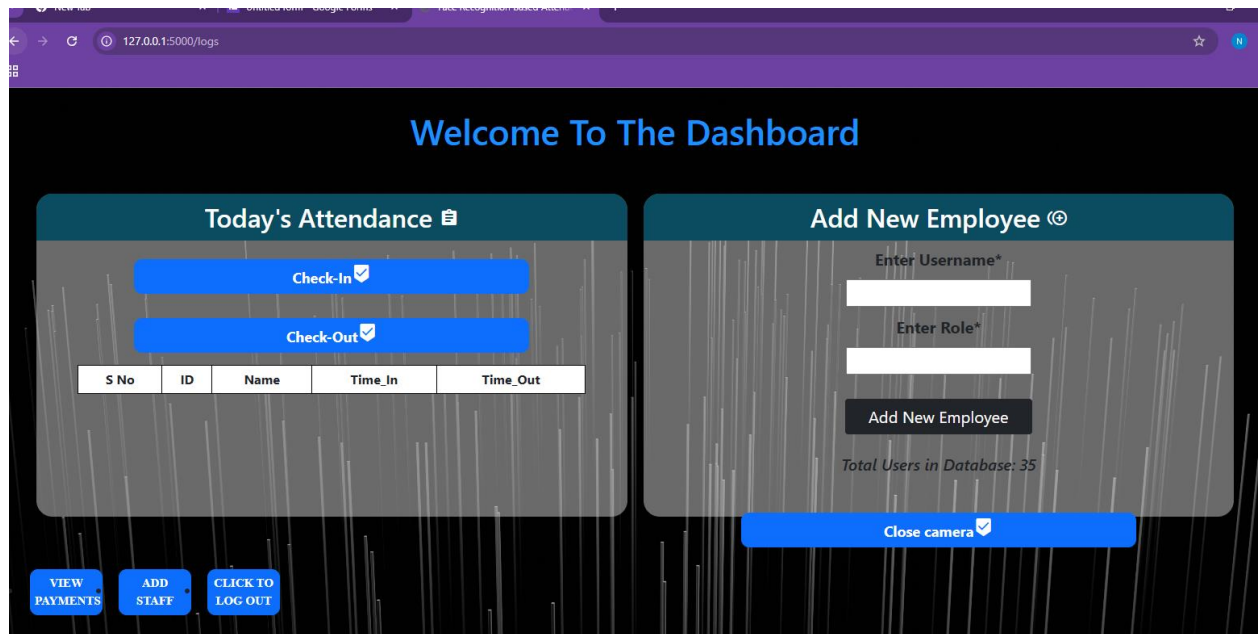


Figure 4: dashboard



Figure 5: Image capturing

SIGN UP

Name*

Gender*

Role*

Phone Number*

Email Address*

Password*

Submit

Figure 6: Add Staff

Employees Dashboard

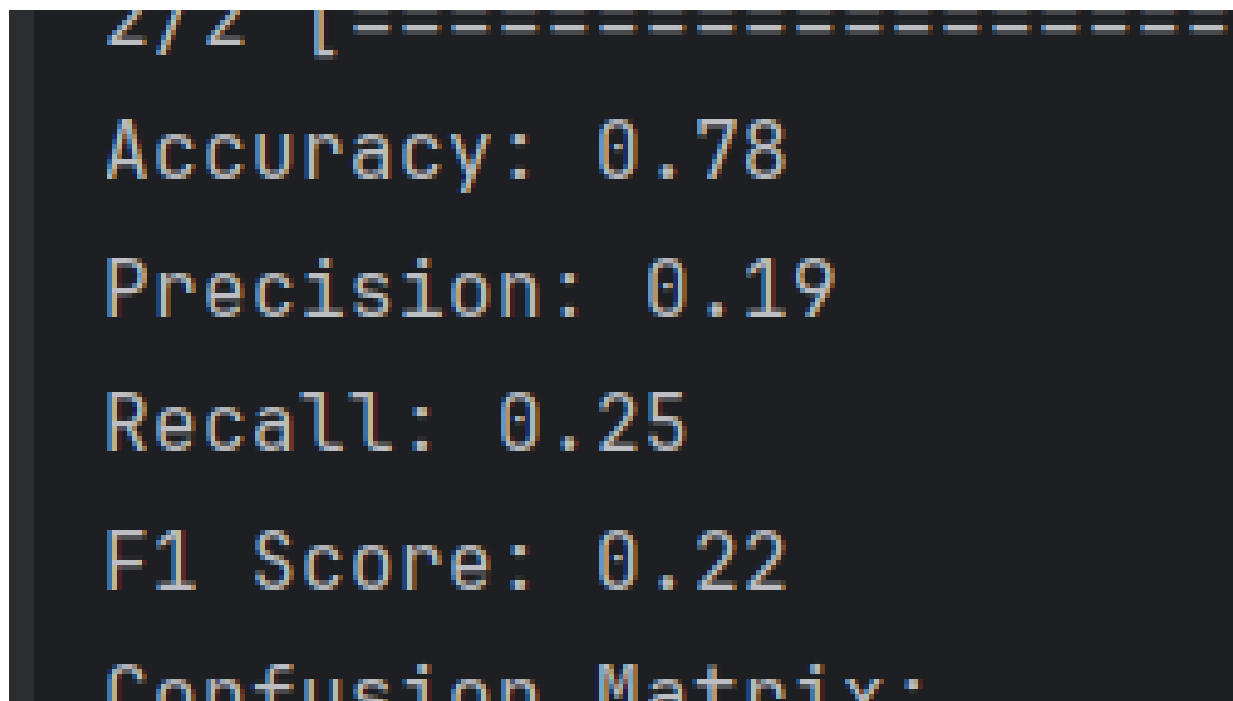
Today's Attendance

Enter Today's Pay/Hour

S No	ID	Hours	Wage(US\$)
------	----	-------	------------

Figure 7:Payment list

4.2.2 To evaluate Performance of proposed face recognition attendance system in-terms of accuracy, precision and recall.



```
2/2 [-----]
Accuracy: 0.78
Precision: 0.19
Recall: 0.25
F1 Score: 0.22
Confusion Matrix:
```

Figure 8: Evaluation Metrics

1.How often does the system correctly recognize your face?

16 responses

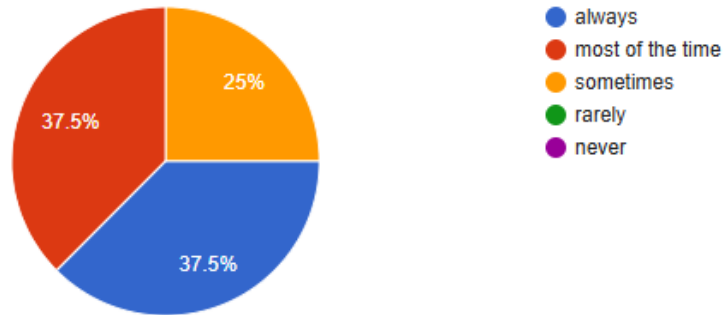


Figure 9: Response by employees

According to the response from the questionnaire, the above pie chart, shows that 37.5% confirm that the system always correctly recognises faces of employees. It also confirms that 37.5% the system correctly recognises your faces of employees and 25% shows that sometimes system correctly recognize your face.

2. have you ever experienced false attendance marking (when not present, but marked present)

16 responses

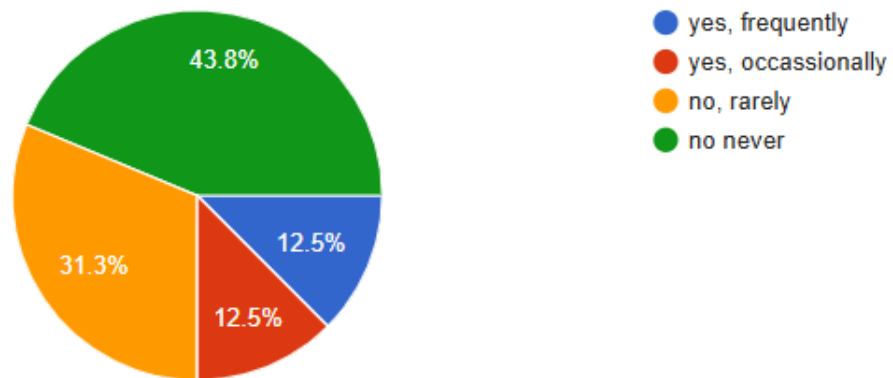


Figure 10: Response by employees

According to the pie chart above it shows that 43.8% had never experienced false attendance marking, and 31,3% rarely experienced false attendance marking. According to the survey it also shows that 12.5% occasionally experinced false attendance marking and also 12.5% frequently experienced false attendance marking.

3.How easy is it for you to check in using face recognition system?

16 responses

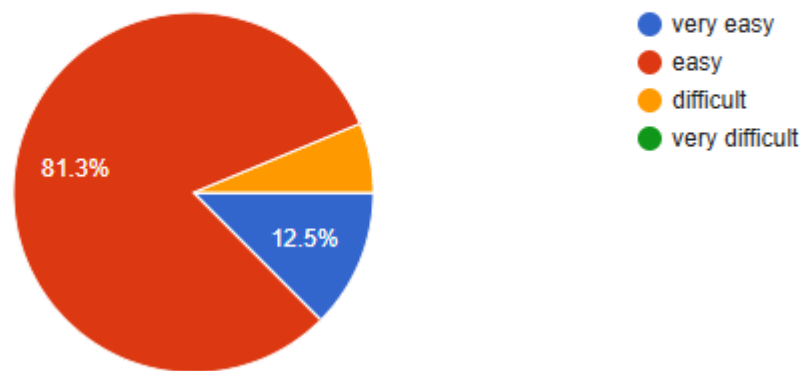


Figure 11: Response by employees

According to the pie chart above of response from the employee 81.3% confirm that it is easy to check in using face recognition system, 12.5% confirm that it is very easy to check in using face recognition. It shows that 6.2% that it is difficult to check in using face recognition system.

4. How would ypu rate the speed of face recognition ?

16 responses

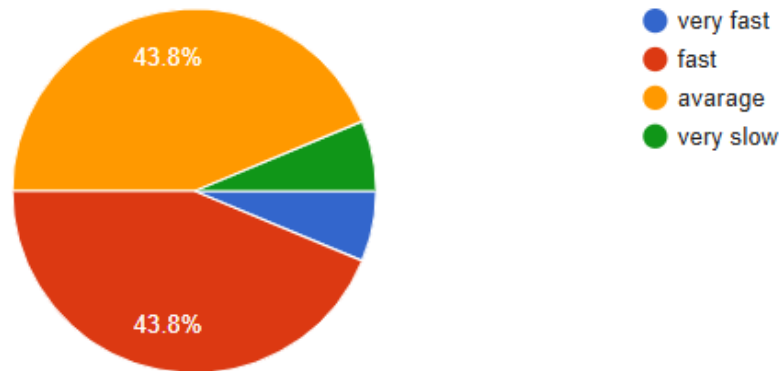


Figure 12: Response by employees

According to the survey I did which shows the results above, it confirms that 43.8% rate the speed of face recognition being average, and also 43.8% confirm that the speed of face recognition is fast. It also shows that 6.2% the system is very fast and slow.

5. how confident are you in the accuracy of attendance recorded by the system?

16 responses

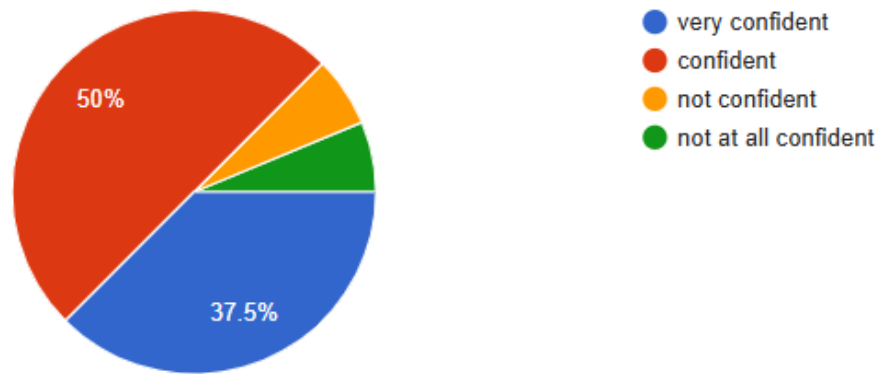


Figure 13: Response by employees

According to the pie chart above it confirms that 50% are confident in the accuracy of attendance recorded by the system 37.5% are very confident. It also that 6.25% are not confident and not at all confident in the accuracy of attendance recorded by the system.

6. Have you faced any issues with lighting or background affecting face recognition?

16 responses

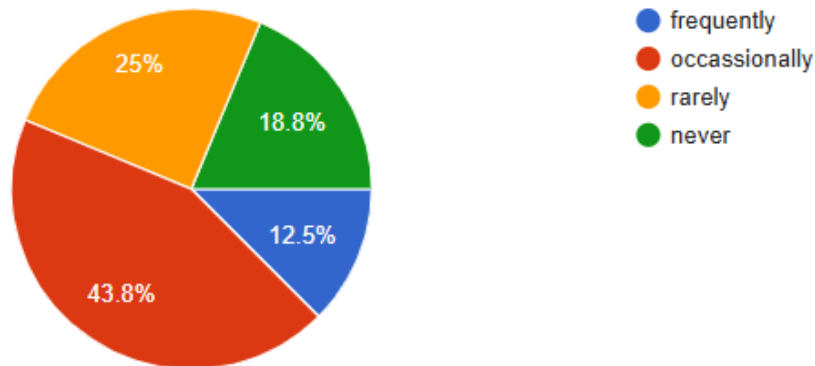


Figure 14: Response by employees

According to the pie chart the result from the survey shows that 18.8% never faced issues with lighting or background affecting face detection, and 43.8% occasionally experienced. It also confirms that 25% rarely faced issues with lighting or background effects. The pie chart also confirms that 12.5% frequently faced issues with lighting or background affecting face recognition.

4.2.3 What are potential security and privacy risk associated with the use of face recognition technology in attendance tracking?

7. How concerned are you about the privacy implications of using face recognition technology?

16 responses

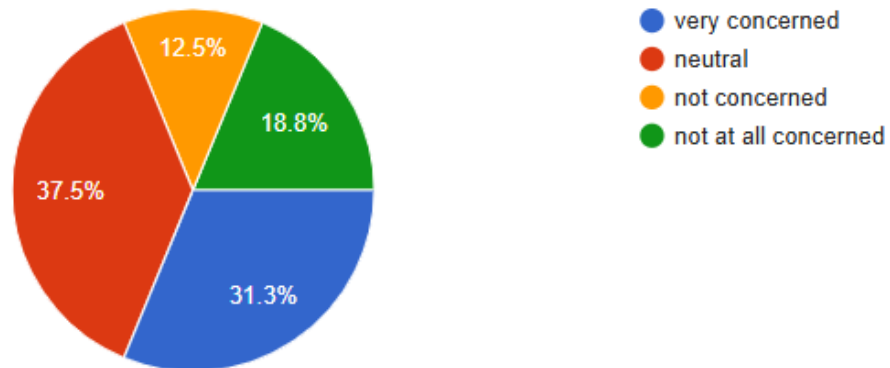


Figure 15: Response by employees

According to the pie above 31.3% are very concerned and 12.5% are not concerned about the the privacy and implications of using face recognition technology. According to the survey it confirms that 37.5% neutral and 18.8% are not concerned at all about the privacy implications of using face recognition technology.

8.Do you believe that your facial data is secure when used for attendance tracking?

16 responses

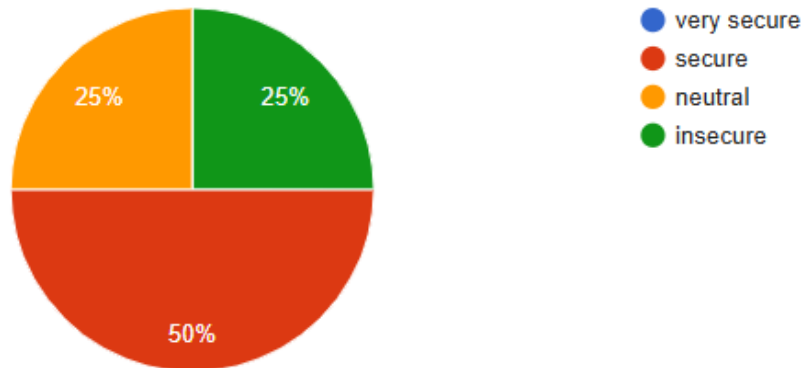


Figure 16: Response by employees

Figure15: Response by employees

According the the survey it confirms that 50% believe that the facial data is secure when used for attendance tracking, and 25% believe that the facial data is very secure. It also shown that 25% believe that facial data is insecure when used for attendance tracking.

According to the graph above it shows that 33.3% completely received adequate information about how your facial data will be used and stored and 40% not all. It also confirms 13.3% neutral and 13.3% not all.

10. Do you believe that alternative attendance methods would be preferable to face recognition



16 responses

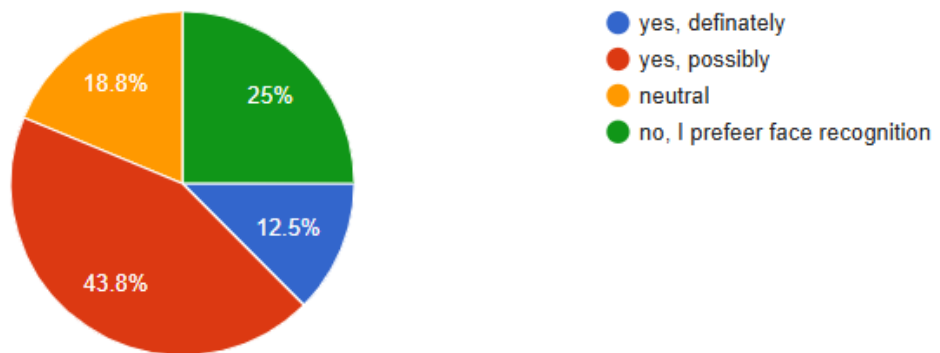


Figure 17: Response by employees

According to the pie chart 25% prefer face recognition attendance system and 43.8% possibly prefer alternative attendance methods. It also confirms that 12.5% believe alternative attendance methods and 18.8% are neutral.

4.2.4 To assess the user acceptance and satisfaction of the proposed face recognition attendance system among employees and administration, and identify area of improvement.

11.How would you rate your overall satisfaction with face recognition?

 [Copy chart](#)

16 responses

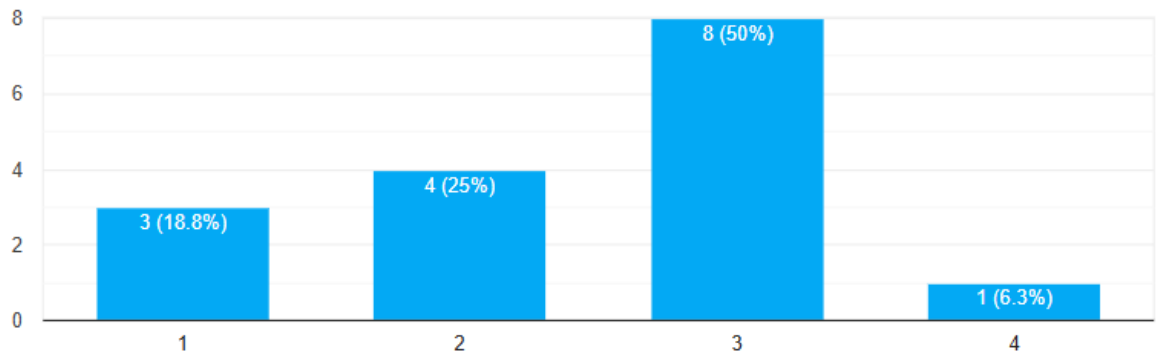


Figure 18: Response by employees

According to the graph above 3 out of 16 people rate overall satisfaction with face recognition by 18.8% and 4 people rate it by 25%. It also shows that half of the people who complete the survey rate it by 50% of satisfaction and 1 person rate it by 6.3%.

12. How easy was it to learn how to use the face recognition attendance system?

14 responses

Very easy
Easy
Hard
Very easy
We never used it
was easy
Very easier
Not complicated at all and very straight forward
So easy

Figure 19: Response by employees

.

According to the answers above that completed by the target audience or employees it shows that the face recognition it easy easy for many employees to use the system while few say it is difficult to learn how to use the system.

13.How frequently do you encounter issues while using the system

16 responses

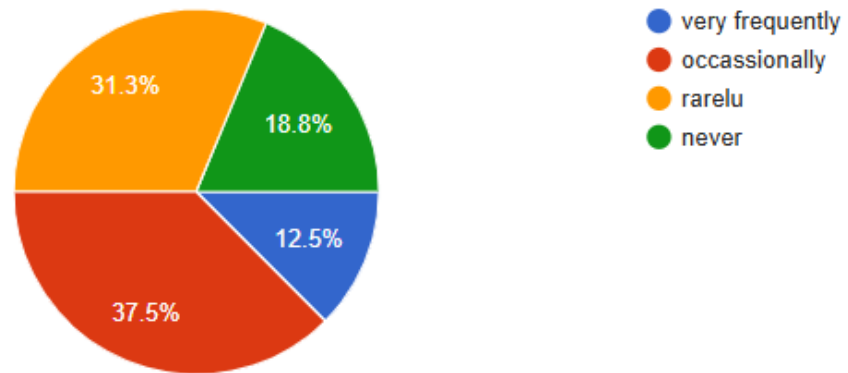


Figure 20: Response by employees

According to the pie chart above it confirm that 37.5% occassionally encounter issues while using the system and 31.3 frequently encounter issues while using the system. It aslo confirm that 18.8 never encounter issues

14.Do you feel that the system is user friendly

16 responses

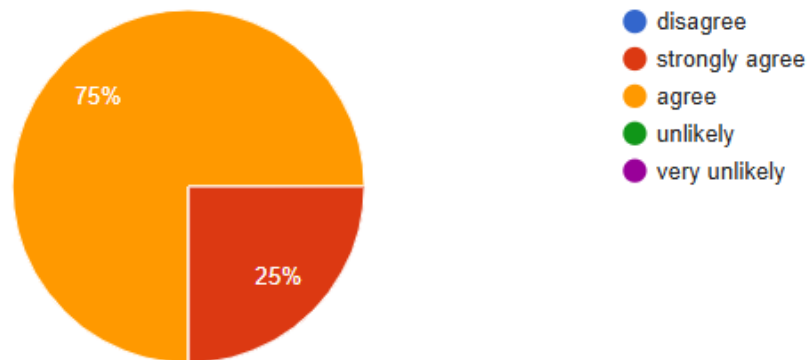


Figure 21: Response by employees

figure21: responds by employees

According to the pie chart above 75% agree that the scheme is user friendly and 25% strongly agree that the system is user friendly.

15.What improvement would you like to see in the system?



16 responses

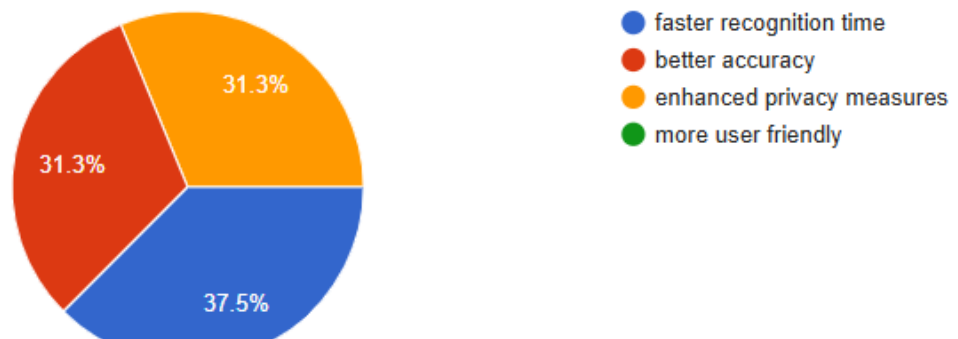


Figure 22: Response by employees

According to the graphy it indicates that 37.5% recommend faster recognition time to be improved and 31.3% recommend accuracy to be improved. It also confirm that 31.3% want privacy measures to be improved.

4.3 PROCESS DIAGRAM

PROCESS FLOW CHART

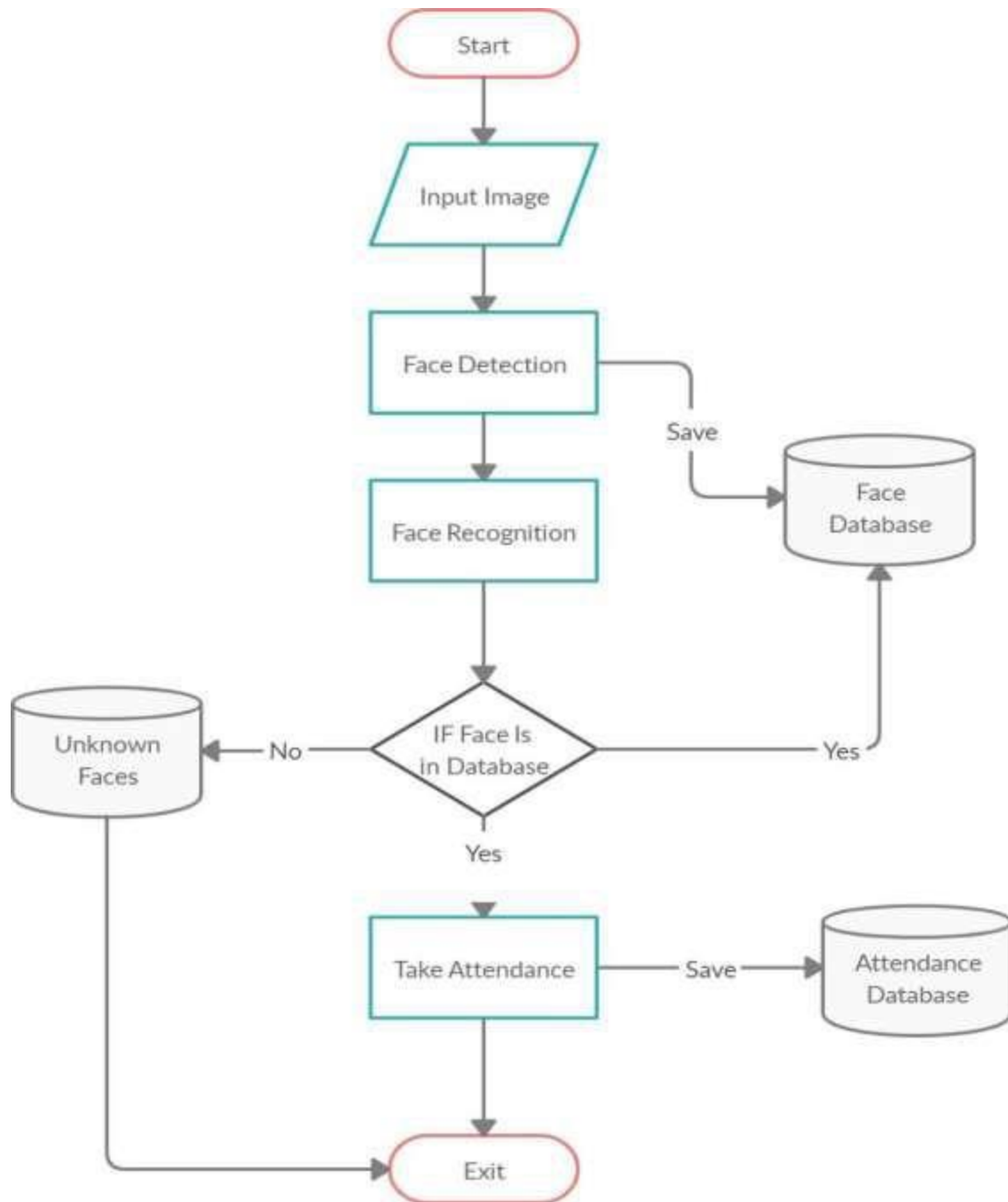


Figure 23: Response by employees

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

Face recognition technology has rapidly evolved, offering significant advancements in security, convenience, and user interaction across various sectors. As a powerful biometric identification method, it harnesses the capabilities of artificial intelligence and machine learning to analyze facial features and match them against databases. However, while the possible benefits include: substantial, concerns regarding privacy, data security, and ethical implications must also be addressed.

5.2 CHALLENGES

During the face recognition project, several significant challenges arose that are important to share. Firstly, collecting a sufficient amount of high-quality training data was more time-

consuming than expected, which led to delays in model training. Additionally, integrating the face recognition system with existing infrastructure posed technical challenges, resulting in compatibility issues that required further troubleshooting. The system also struggled with varying lighting conditions and angles, necessitating extensive testing and adjustments to improve accuracy. Ensuring that the algorithm was fair and unbiased became critical, prompting a need for diverse training datasets and further analysis. Privacy and ethical concerns added complexity to the project, as addressing these issues required thorough discussions and adjustments to data handling practices. Gaining user acceptance was another challenge, as many individuals were wary of surveillance technology, necessitating additional efforts in education and communication. Lastly, the project demanded significant computational resources for model training and real-time processing, leading to increased costs and resource allocation challenges. These issues underscored the importance of careful planning, user engagement, and flexibility throughout the project lifecycle.

5.3 RECOMMENDATIONS

To ensure the system runs efficiently without delays or interruptions, it is essential to have a reliable and uninterrupted internet connection. For any computer-based system to be effectively integrated into an organization, proper training and orientation must be provided to both staff and employees. It is important to emphasize the system's benefits and how it can assist them in their respective roles. Additionally, employees should be made aware of the maintenance costs associated with the new system, encouraging them to handle it with care.

To enhance the application further, I recommend integrating machine learning to monitor attendance and advance the accuracy of employee face identification. Since this is currently a prototype, the application should be developed to meet the needs of all organizations. It would also be beneficial to consider adding a payment gateway during the maintenance phase, allowing for daily payments to be processed alongside work attendance.

5.4 CONCLUSION

The development of the Face ID System for employees achieved its objectives and successfully met all requirements. This research project can be considered a success. The application development consisted of several phases, beginning with an in-depth analysis of the existing issues and opportunities within the Human Resource and Accounts Sector. These recognized problems, information needs, and activities were standard and served as the foundation for the subsequent system design phase. This phase focused on specifying the system components to align with the organization's needs, adhering closely to established software engineering principles and practices. Following this design, the application was developed using PyCharm.

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