College of Computing and Informatics

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Face recognition-based attendance system for primary school and kindergarten kids

by

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ACKNOWLEDGEMENT

We would like to precise our uncommon much obliged of appreciation to our instructor Dr Ibrahim Abaker Hashem as well as our head department Dr Naveed Ahmed who gave us the brilliant opportunity to do this superb project on the subject Face recognition, which moreover made a difference in us in doing a part of Inquire about and we came to know around so numerous modern things we are truly grateful to them. Secondly, we would moreover to thank our guardians and companions who gave us the needed motivation to finalizing this project within the limited time frame.

UNDERTAKING

These days, biometric verification strategies start developing quickly as one of the promising verification strategies, other than the ordinary verification strategy. Nearly all biometrics innovations require a few activities by the client, which is the client must put reserves on the scanner to set the fingers or the hand geometry discovery. The user should standstill in a settled position before the camera for iris or retina identification reasons. The face recognition strategy has a few outside focal points compared to the other biometric strategies since this strategy can be done latently without express activity or ought to be held by the client since the confront picture can be gotten by the camera from a certain remove. This strategy can be particularly valuable for mission and supervision. This investigation would create and execute the face recognition framework comprised of four organize handles. All the analysis, design and system development have been accomplished by the undersigned. Moreover, this project has not been submitted to any other college or university.

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ABSTRACT

There are incidents of children being left behind on school buses that happen every year, which can result in their deaths, especially in summer, due to high temperatures. Research has shown that children's bodies appear to heat up three to five times faster than adults, while children are unable to cool down, too. Paediatric associations worldwide have further documented the negative effects of high temperature on kids, with children frequently falling victim to dehydration of hyperthermia and other risks that may be fatal.

With the evolution of technology, we aim to create a system that decreases the number of children dying after being left behind on buses. Since it is easier to take attendance using face recognition than a manual attendance system and to make sure parents feel safe about having their kids riding school buses, our system makes sure there is a communication between them and their child's status of whether they entered or left the bus by receiving notifications.

The main objective of this project is to provide a system based on Face Recognition (FR) technology. Unlike the manual attendance system, our system will simplify and automates the process of documenting and monitoring the attendance of students. Machine learning algorithms will be adopted for facial recognition to improve the limitations of the present systems, it requires a high-quality camera to record student images, a database, and a mobile application. Our project will be implemented using python and MySQL technologies. This system will be responsible of monitoring student in school buses and make sure that all the students will reach home safely and on time.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: Introduction

1.1 Overview

The main objective of this project is to provide a system based on Face Recognition (FR) technology. Unlike the manual attendance system, our system will simplify and automates the process of documenting and monitoring the attendance of students. Machine learning algorithms will be adopted for facial recognition to improve the limitations of the present systems, it requires a high-quality camera to record student images, a database, and a mobile application. Our project will be implemented using python and MySQL technologies. This system will be responsible of monitoring student in school buses and make sure that all of the students will reach home safely and on time.

1.2 Project Motivation

There are incidents of children being left behind on school buses that happen every year, which can result in their deaths, especially in summer, due to high temperatures. Research has shown that children's bodies appear to heat up three to five times faster than adults, while children are unable to cool down, too. Pediatric associations worldwide have further documented the negative effects of high temperature on kids, with children frequently falling victim to dehydration of hyperthermia and other risks that may be fatal.

With the evolution of technology, we aim to create a system that decreases the number of children dying after being left behind on buses. Since it is easier to take attendance using face recognition than a manual attendance system and to make sure parents feel safe about having their kids riding school buses, our system makes sure there is a communication between them and their child’s status of whether they entered or left the bus by receiving notifications.

1.3 Problem Statement

- Fingerprint is harder for young students to understand how to use it.
- The database will not be able to handle a huge amount of all the student's information.
- The notification is not supported by SMS.
- If the system did not work, teachers should overwrite attendance and mark as absent manually.
- The system cannot detect more than two faces at once.

Since Artificial Intelligence is a new area for us, we will need to learn about machine learning methods and applications and get acquainted with deep learning algorithms to get the best possible outcome for our project, we will also spend a few weeks learning Python and how to use ML libraries.

1.4 Project Aim and Objectives

With the evolution of technology, we aim to create a system that decreases the number of children dying after being left behind on buses. Our main objective is to create a successful system that helps in tracking the students attendance in a hands free-way and have a more accurate attendance system.

- Easy way to track students attendance.
- Attendance is easily reported to the school and to the parents.
- Have an integrated notification system.
- Providing a user-friendly UI for accessing the system
- The algorithm will be a combination of various proposed methods along with some other features.

1.5 Project Scope

The Face recognition process can be divided into two parts first is face verification and the second one is named face identification. The first one i.e., face verification system involves a one-to-one matching to confirm or deny a person's identity claim. This system compares the captured face image against the person's template(s) stored in the system. If the student presenting himself/herself to the system is the student, he/she is the same in the database then the system will consider him as attended, otherwise if the system will send a notification to the parents and the admission.

1.6 Project Software and Hardware Requirements

- 4 GB RAM (Minimum)
- 80 GB HDD
- Dual Core processor
- CDROM (installation only). VGA resolution monitor
- Microsoft Windows 98/2000/NT with service pack 6 / XP with service pack 2/ Windows 7 with service pack 2
- SQL Server 2008 R2

1.7 Project Limitations

There are incidents of children being left behind on school buses that happen every year, which can result in their deaths, especially in summer, due to high temperatures. Research has shown that children's bodies appear to heat up three to five times faster than adults, while children are unable to cool down, too. Paediatric associations worldwide have further documented the negative effects of high temperature on kids, with children frequently falling victim to dehydration of hyperthermia and other risks that may be fatal.

1.8 Project Expected Output

This project proposes that the system takes attendance automatically using face recognition cameras, the cameras are placed inside the buses at several locations to capture the faces of the students from various angles. The faces of students are previously stored in the database system. After the capturing of the student's faces, the camera detects and recognizes the faces of the students from the images and compares it to the images stored in the database, if the face matched with the stored image then the student is marked as present and no notification is sent to the parents via the application made for the system, if the image is not a match or undetected then the student is marked as absent and a notification is sent to the parents and at the same time the image is stored in the database as a new image and marked as unknown before further calculations are done. Refer to architectural diagram in Figure 1.[3][2][1]

For the proposed system for the application, and database to communicate with each other, we will use Python to program the backend of the system, while using a tool like MySQL database to find, change and store all the needed data for the students, we will be using HTML, CSS and JavaScript programming as a frontend for the users, like the school or the parents. we will also be using some hardware like a high-quality camera and a mobile for testing. [2]

our system will perform the main services:

- consolidated student attendance in a day based on notifications sent to the parents via an application.
- monitoring school kids using facial recognition technology

1.9 Project Schedule

Table 0-0: Schedule

From	To	Description
Jan. 23	Jan.28	Searching & choosing an idea
Jan.28	Jan.31	Submitting Team details
Feb. 2	Feb. 14	Reading articles and topics about sentiment analysis and Learning python
Feb. 16	Feb. 18	Writing & submitting the Proposal
Feb. 24	Feb. 29	learn and explore more concepts about Python libraries
Mar. 1	Mar. 7	Progress Report 1.
Mar. 8	Mar. 14	Work on project
Mar. 15	Mar. 22	Work on Datasets
Mar. 23	Mar.27	Work on project
Mar.28	Apr.1	Spring break
Apr.1	Apr.4	Progress Report 2
Apr. 5	Apr.19	Work on project
April20	May .2	Final Report + Presentation

Project, product, and schedule risks

Image quality affects how well facial-recognition algorithms work. **The image quality of scanning video is quite low compared with that of a digital camera.** Even high-definition video is, at best, 1080p (progressive scan); usually, it is 720p. These values are equivalent to about 2MP and 0.9MP, respectively, while an inexpensive digital camera attains 15MP. The difference is quite noticeable. When a face-detection algorithm finds a face in an image or in a still from a video capture, the relative size of that face compared with the enrolled image size **affects how well the face will be recognized**. An already small image size, coupled with a target distant from the camera, means that the detected face is only 100 to 200 pixels on a side. Further, having to scan an image for varying face sizes is a processor-intensive activity. Most algorithms allow specification of a face-size range to help eliminate false positives on detection and speed up image processing. **The relative angle of the target's face influences the recognition score profoundly.** When a face is enrolled in the recognition software, usually multiple angles are used (profile, frontal and 45-degree are common). Anything less than a frontal view affects the algorithm's capability to generate a template for the face. The more direct the image (both enrolled and probe image) and the higher its resolution, the higher the score of any resulting matches. Even though high-definition video is quite low in resolution when compared with digital camera images, it still occupies significant amounts of disk space. Processing every frame of video is an enormous undertaking, so usually only a fraction (10 percent to 25 percent) is run through a recognition system. To minimize total processing time, agencies can use clusters of computers. However, adding computers involves considerable data transfer over a network, which can be bound by input-output restrictions, further limiting processing speed.

Ironically, humans are vastly superior to technology when it comes to facial recognition. But humans can only look for a few individuals at a time when watching a source video. A computer can compare many individuals against a database of thousands.

CHAPTER 2: Related Existing System

2.1 Introduction

Programming has been popular in the past few years for solving problems with electronics and computers. Using the expertise and skills we learned at university, we established a system for identifying faces. In the last few years, programmers have experienced several improvements in their programming abilities. Several systems have been developed, and there has been a lot of face recognition. Such as Biometric Face Recognition , Facial Recognition With AWS, Face Recognition system for Detect Critical Events Faster.[6]

When the current system was put into action, it was found to have certain weaknesses. For example, the existing system did not concentrate on allowing parents to easily contact authorities if anything went wrong while they were tracking their children's attendance via the app or within the time they had scheduled. The shortcomings of the current system prompted the development of a new system for contacting school administration or, at the very least, bus drivers.[6]

2.2 Existing Systems

Table 0-1 The differences between the current system and the proposed system

Current system	Proposed system
• **There is no direct communication** • **A parent should only watch one child at a time** • **• The current system's efficiency was poor.** • **• The device does not keep track of active users.** • **The machine will only alert if you open and check it**	• **The system that will be built here is a chat facility and a direct call system.** • **It's a machine that's run from a central location.** • **All local clients are connected to the centralized server vis lan** • **The centralized server is accessible via LAN to all local parents** • **If the camera is not scanning or is impaired, attendance may be taken using a finger print.** • **there is a two way communication between different parents** • **It helps users to identify other users who are logged in.**

The current system needs an internet connection; however, the proposed system does not require an internet connection to use the app for monitoring and instead requires a LAN connection. This device is helpful to those who cannot afford a home internet connection. For example, not every bus has internet access, and not every family does as well.[7]

2.3 Overall Problems of Existing Systems & Solutions

Our existing system would include a chat function as well as a direct call system; it is a computer that is operated from a central location, despite the fact that all clients are connected to the centralized server via LAN. If the cameras are not scanning or are impaired, attendance may be taken with a finger print. In other cases, there is two-way contact between different parents, and it often aids users in identifying other logged-in users.

First, there is an existing system named Avalon Face Recognition, Temperature Monitoring, and Access Control System, which only saves time via the device and costs about $2,499 ". Even with a face mask on, the device captures and recognizes the human face, tests body temperature, and monitors the locking/unlocking/alarming for safe access. [8]

However, our face recognition will be available at an affordable price, making it ideal for parents and all. Avalon faces recognition will be available for entering homes, offices, unlike ours, which will be available for students and buses.[8]

to begin with , the innovatrica company has a SmartFace, which is a scalable facial recognition platform that can detect and monitor faces in multiple IP camera streams in parallel. [9]

uniqueness " Recognizes faces in a variety of places, including those partly obscured by hair, hands, or objects, and works accurately with photographs taken in poor lighting conditions. [9]

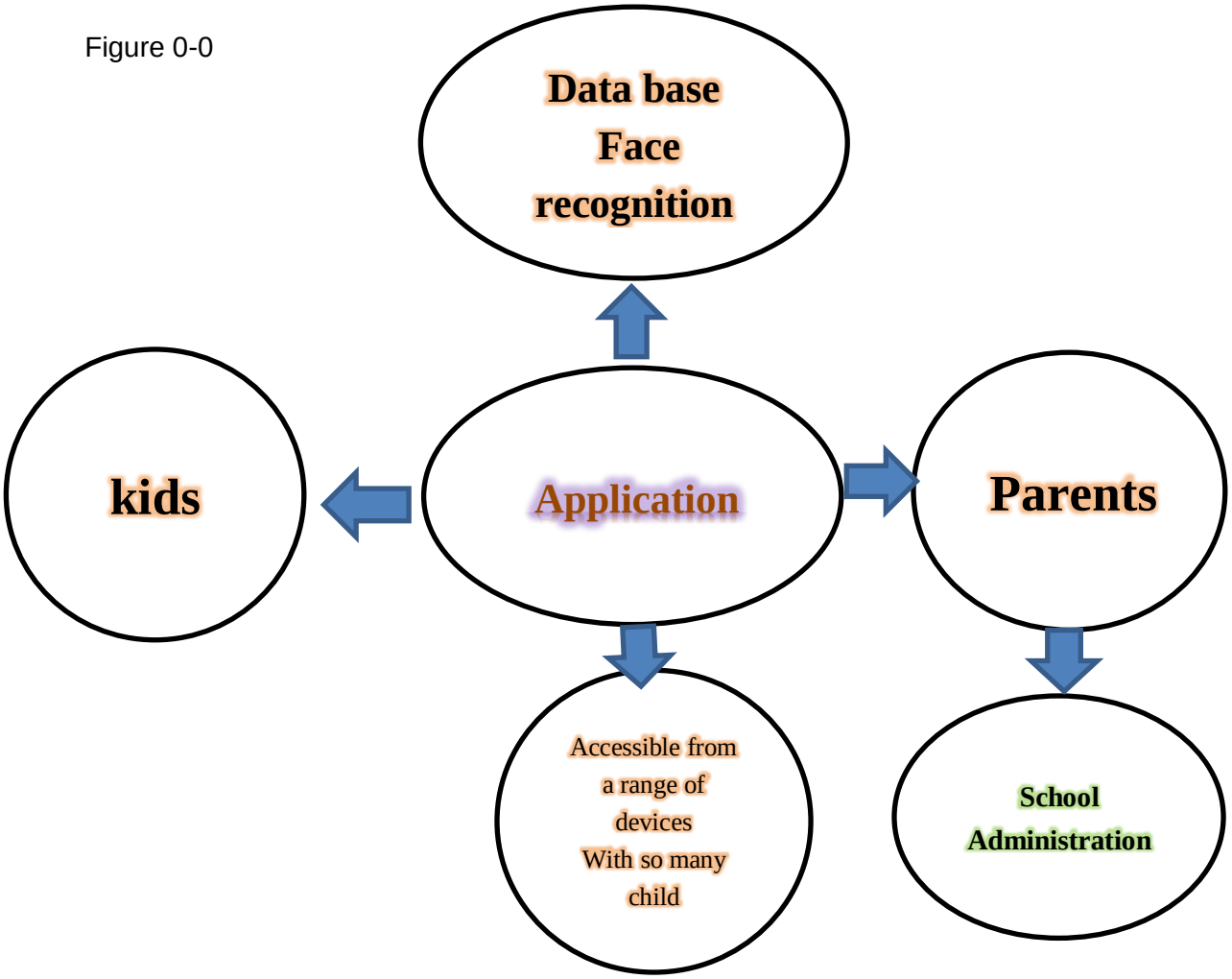
Our face recognition can improve to an excellent scanner for faces even when there is no light because it will have its own lights and detect. Innovatrica can recongize it even in low light, but ours will be able to work even when there is no light at all. [9]

Lastly, Thermal Face Detection Face Detection SDK For Thermal Cameras & Systems is available from Luxand. Rapidly and accurately detect human faces in thermal camera pictures. With the ability to differentiate real people from pictures and 3D masks, you can take your temperature, check for fever, or simply upgrade your security system. [10]

Eventually, Luxand's face recognition is good for pendamic in Covid19; our system will improve to check faces even with multiple faces or face shields, as well as checking body fever and not allowing the door to open unless there is no fever for the protection of the children. [10]

2.4 Overall Solution Approach

Figure 0-0



CHAPTER 3: Requirement Engineering and Analysis

3.1 Stakeholders

The environment in which our system operates in is dynamic, by the participants who are either affect or be affected by the system. The primary stakeholders in our system are Schools, Parents, Nurseries, Faculty and Colleges. And the secondary stakeholders are the Students.

Table 0-2

Stakeholders	Type
Schools	Primary Stakeholder
Nurseries	Primary Stakeholder
Students (Children)	Secondary Stakeholder
Faculty	Primary Stakeholder
Colleges	Primary Stakeholder
Parents	Primary Stakeholder

- The Schools will be the internal stakeholders and the Parents will be the external stakeholders.

3.2 Use Case Diagram

3.2.1 Use Case Section

Normal Flow for each use case including action, precondition, post-condition and other sections as you learnt in requirements engineering course.

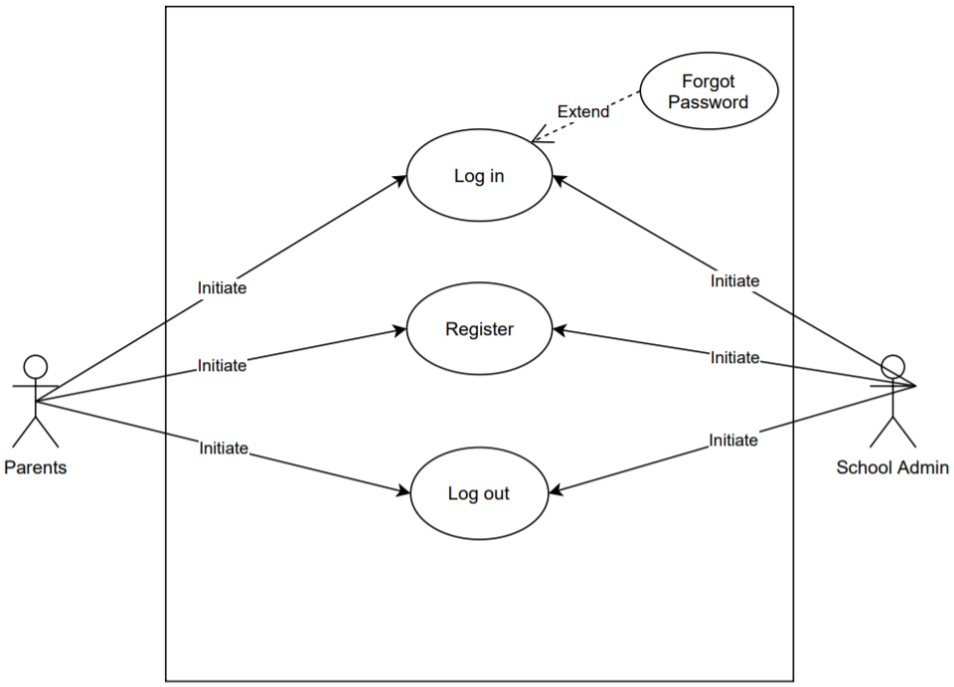


Figure 0-1

Table 0-3: Use Case (1)

Use Case Name:	Login use case
Brief Description:	This use case diagram shows the overview of the log in process.
Actors:	School(Admin) , Parents
Preconditions:	Registration in school system or through the application is required to access the application
Post Conditions:	School and Parents can view the relevant home page and receive notifications after logging in.
Basic Flow:	1. School/Parents Register 2. School/Parents log in 3. School/Parents log out
Alternative Flow:	Registration through the school system
Priority:	High
Frequency of Use:	High
Special Requirements:	Registration
Assumptions:	If log in is not successful, registration in school system is required.

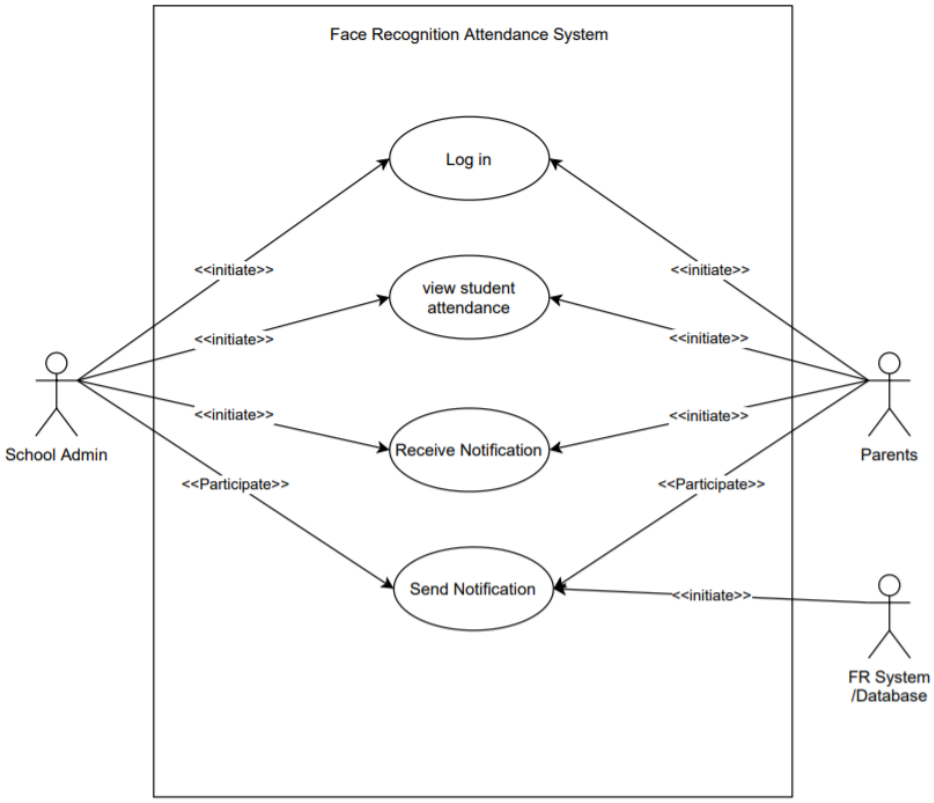


Figure 0-2

Table 0-4: Use Case (2)

Use Case Name:	Attendance use case
Brief Description:	This use case diagram shows the overview of the whole FRAS with its main actors who can log in to the system to view the attendance and receive notifications from the FRA system.
Actors:	School(Admin) , Parents, FR system(Database)
Preconditions:	Registration in school system is required to access the FRAS.
Post Conditions:	School and Parents can view the relevant home page and receive notifications after logging in.
Basic Flow:	4. School/Parents log in 5. View student attendance 6. School/Parents receive notifications via application
Alternative Flow:	None
Priority:	High
Frequency of Use:	High
Special Requirements:	None
Assumptions:	If log in is not successful, registration in school system is required. Parents and School Admins will receive notifications if students are absent.

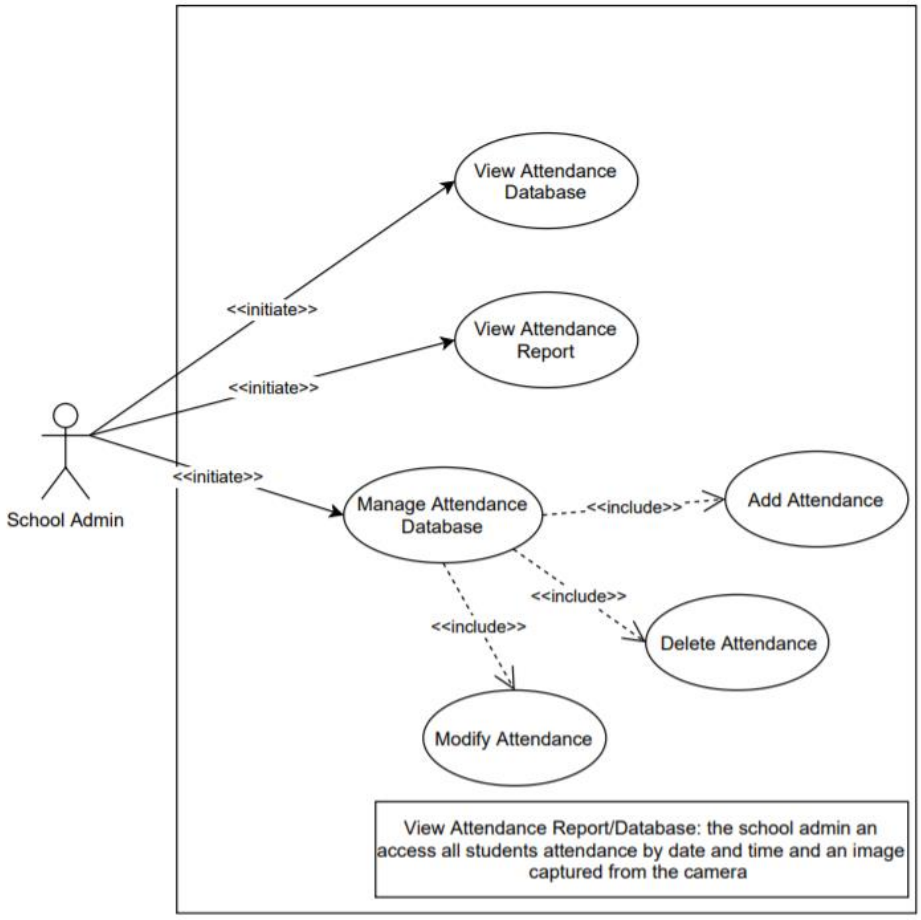


Figure 0-3

Table 0-5: Use Case (3)

Use Case Name:	Database Use Case
Brief Description:	This use case shows the management of the database system that is being managed manually by the School(Admin) as its main actor.
Actors:	School(Admin)
Preconditions:	Logging in as an admin gives you access to manage the attendance database system.
Post Conditions:	Managing the database manually in case of unexpected occurrences of errors that might result from the FRAS.
Basic Flow:	1. Log in as school admin 2. Can view relevant homepage depending on their level of access 3. Can view attendance database 4. Can view attendance reports 5. Can manage attendance database(Add, Delete, or Modify attendance)
Alternative Flow:	None
Extension Points:	None
Priority:	High
Frequency of Use:	High
Business Rules:	None

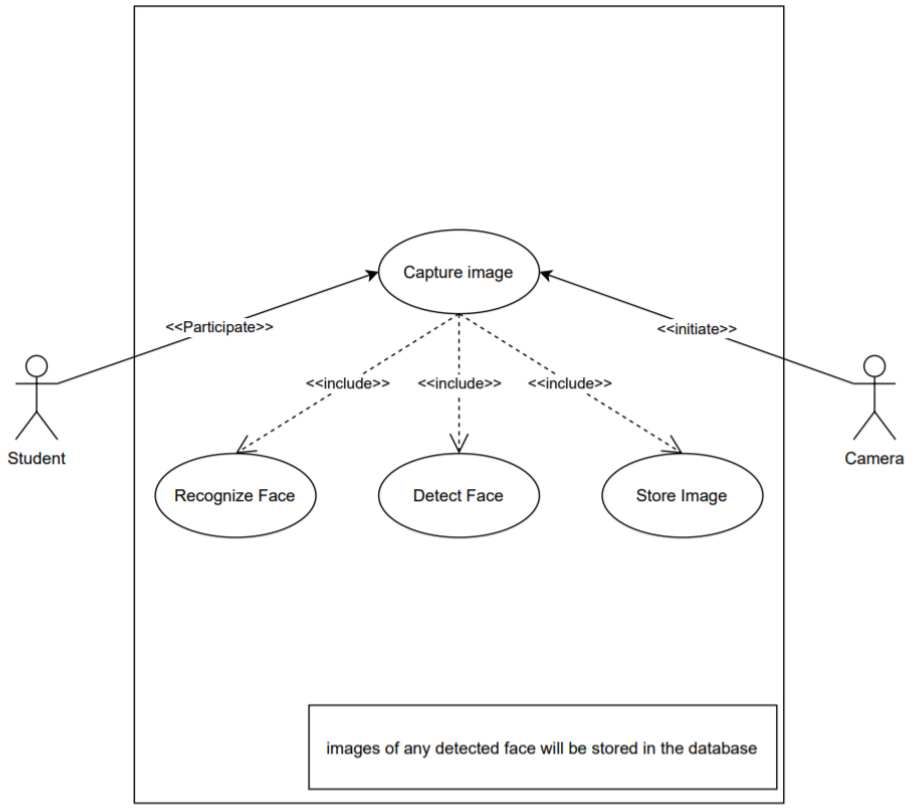


Figure 0-4

Table 0-6: Use Case (4)

Use Case Name:	Face Recognition Cameras (FRC) Use Case
Brief Description:	This use case shows the overview process of captured the images of the students to the matching process(Recognizing and detecting)
Actors:	Student, Camera
Preconditions:	Students images must be stored in the database beforehand.
Post Conditions:	A student will be marked as present if the FRC recognized their face, if not, the student will be marked as absent and their image will be stored in the database.
Basic Flow:	1. Image is captured then goes through face detection 2. Detected face goes through Face recognition and stored in database 3. Recognized face gets stored in database
Alternative Flow:	None
Priority:	High
Frequency of Use:	High
Business Rules:	None
Special Requirements:	None
Assumptions:	If captured face is recognized the database marks the attendance, if not it will mark as absent.

3.3 Non-functional requirements

Specify the non-functional requirements of this project that can be divided into two main categories:

1. Execution qualities, such as safety, security and usability, which are observable during operation (at run time).
2. Evolution qualities, such as testability, maintainability, extensibility and scalability, which are embodied in the static structure of the system.

Table 0-7: Non-Functional Requirements

Category	Subcategory
Usability	**Accessibility** Not Applicable
	Aesthetics Not Applicable
	UI Consistency 1. The system shall be compatible with different system resolutions and different versions of operating systems Examples of OSs: IOS, Android, Windows Phone OS
	Ergonomics Not Applicable
Reliability	**Availability** 1. The system should be operational 24/7 days depends on the network availability.
	Robustness 1. For every invalid input from the users, the system shall display a meaningful error message explaining what format input is expected. 2. All the errors regarding the networks, Database server systems will be logged to log file and the user will be notified with specific error message. 3. Exceptions regarding database transactions or business logic will be logged to a log file and the user will be notified with specific error message.
	Accuracy 1. Date and time of the attendance marking should be calculated at all times.
	Fault Tolerance Not Applicable
	Safety Not Applicable
	Security 1. The system shall provide a multi-level security access based on the user profiles.
	Correctness 1. The system shall validate each of the data entry type based on user input.
Performance	**Throughput** 1. The system shall accommodate 50 data entries per minute.
	Response Time

	1. Average system response time should be less than five seconds for each of web page. 2. Average time of returning a list of database shall not be more than 10 seconds.
	Recovery Time 1. Response-time of this system should be less than 5 seconds. 2. Average repair time shall be less than one hour.
	Startup/Shutdown time Not Applicable
	Capacity 1. The system shall accommodate 50 concurrent users.
	Utilization of resources. Not Applicable
Supportability	**Adaptability** 1. The supported server platform for database is the current approved versions of Windows.
	Maintainability *1.* An error log containing information about all critical errors shall be accessible to the system administrator.
	Compatibility 1. After the system is in production, subsequent version of the system shall be backward-compatible. All transactions entered in previous versions shall be available in the new version.
	Configurability Not Applicable
	Upgradeability 1. No installation on a user workstation shall be required. All system upgrades and new releases should be done on the server.
	Installability 1. Installing a new version of the system shall not require any installation on user's workstation.
	Scalability Not Applicable
	Portability 1. Changing the system database in the future shall require rewriting application logic.
	Reusability Not Applicable
	Interoperability Not Applicable
	Compliance Not Applicable
	Localizability

<table>
<tr><td></td><td>Not Applicable</td></tr>
<tr><td>Design Constraints</td><td>Not Applicable</td></tr>
<tr><td>Implementation Requirement</td><td>Software :

Operating System
Database</td></tr>
<tr><td rowspan="4">Interface Requirement</td><td>User Interface

1. The system shall provide the menu from each displayed Javascript page for user navigation.</td></tr>
<tr><td>Hardware Interface
Not applicable</td></tr>
<tr><td>Software Interface
Not Applicable</td></tr>
<tr><td>Communication Interface
Not Applicable</td></tr>
<tr><td>Business Rules</td><td>Not Applicable</td></tr>
<tr><td>Documentation Requirement</td><td>Basic documentation need to be provided for all the respective development activities.</td></tr>
<tr><td>Licensing and Legal Requirements</td><td>1. Windows 10, Linux or Later
2. MySQL Enterprise 5</td></tr>
<tr><td rowspan="3">Post Development Requirement</td><td>Training Requirements as stated below :

<table><tr><th>Training Type</th><th>Target Audience</th></tr><tr><td>End-User Training:- A total of 2-days System and Administration Training, will be provided during the project</td><td>Schools and Parents</td></tr></table></td></tr>
<tr><td>Technology Transfer Requirements
Not Applicable</td></tr>
<tr><td>Maintenance Requirements
Not Applicable</td></tr>
</table>

3.4 Constraints

List the conditions and restrictions of this project that must be satisfy.

Different issues can impact the specification, design, or implementation of the system such as:

1. Local hardware and software space (a server is needed to create the database (DB)).
2. Migration of existing data could be difficult.
3. Personal change.
4. Lack of team expertise.
5. Unwilling users.
6. Lack of top management support.
7. Conflicting preferences between users and system developers.
8. Inappropriate user interface.
9. Continual requests for change.
10. Lack of time management

CHAPTER 4: Architecture and Design

4.1 Overview

This project proposes that the system takes attendance automatically using face recognition cameras, an interface is provided for users to interact with the system to have a visual sense of the students' attendance, the cameras are placed inside the buses at several locations to capture the faces of the students from various angles. The faces of students are previously stored in the database system. After the capturing of the student's faces, the camera detects and recognizes the faces of the students from the images and compares it to the images stored in the database, if the face matched with the stored image then the student is marked as present and no notification is sent to the parents via the application made for the system, if the image is not a match or undetected then the student is marked as absent and a notification is sent to the parents via the application and at the same time the image is stored in the database as a new image and marked as unknown before further calculations are done.[3][2][1]

4.2 Software architecture

4.2.1 Physical view

The software architecture starts of when a user logs in the system which can be a Parent or a School Admin, after logging in the application will refer the user to their homepage depending on their access level, both users can get to view the results of the attendance based on the matching process but only the admin can view and modify the database. The captured images of the students face acts as the input for the matching process that can send a notification to both users.

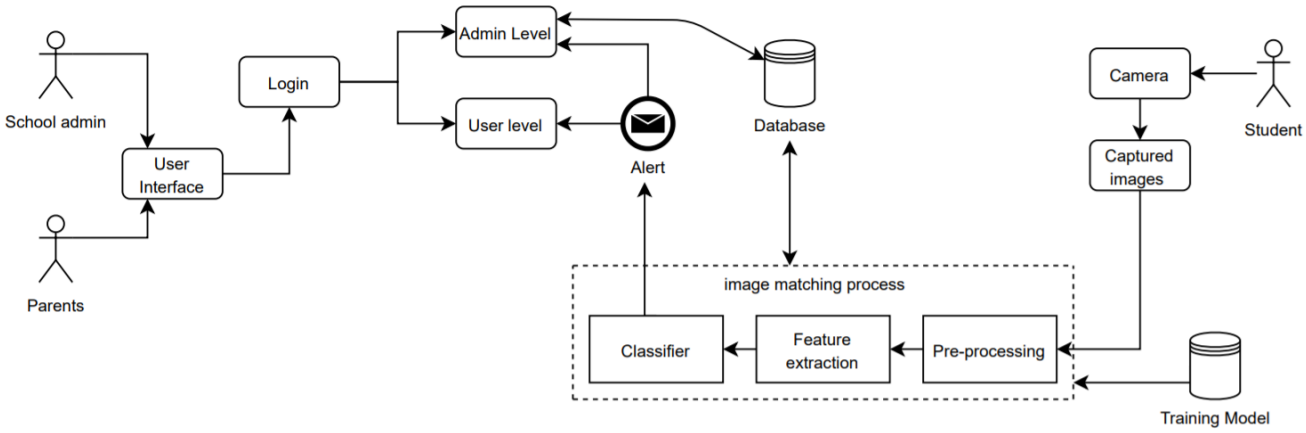


Figure 0-5: Physical View Diagram

4.2.2 Details of each component in a **separate section**.

Table 0-8

view	Components	users
Physical view	Database, cameras, Application, Training model	School Systems, Parents, Students (Children)

4.3 Software design

4.3.1 UML sequence/communication diagram

This sequence diagram shows the interaction between the users and the system after logging in and receiving notifications.

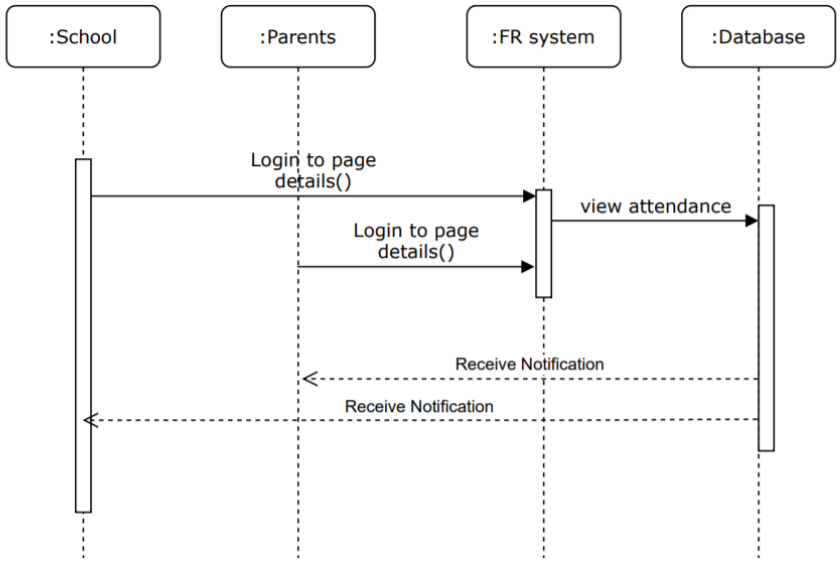


Figure 0-6: Attendance Sequence Diagram

This sequence diagram shows the interaction of the school admin with the system, the school admin can manage attendance (Add, Delete, Update) ,school admin can also view the report and view the attendance.

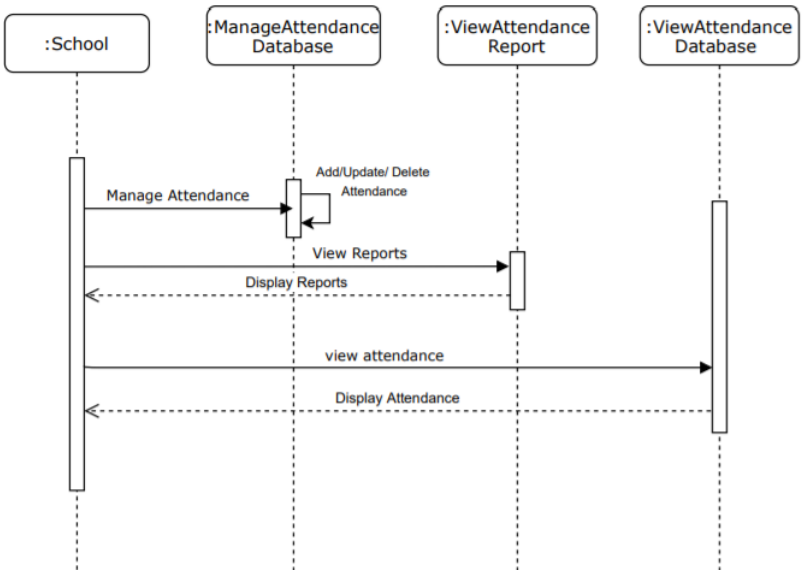


Figure 0-7: Database Sequence Diagram

This sequence diagram shows the process of the face recognition cameras, the camera will capture a student's face, the captured image will be stored whether the face is recognized or not. The face will be detected and recognized then stored as a recognized face.

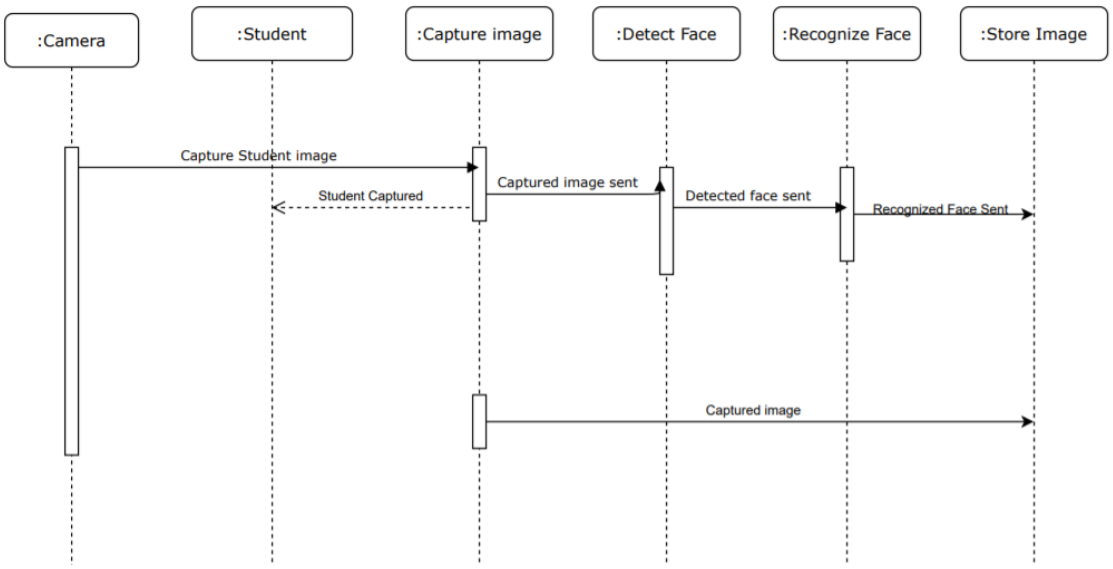


Figure 0-8: Face Recognition Cameras (FRC) Sequence Diagram

4.3.2 Class diagram

This class diagram shows the relationships between the main entities of the system, the diagram has 6 classes, System, Parents, Image, School Admin, Student, and Camera. It shows their methods and attributes.

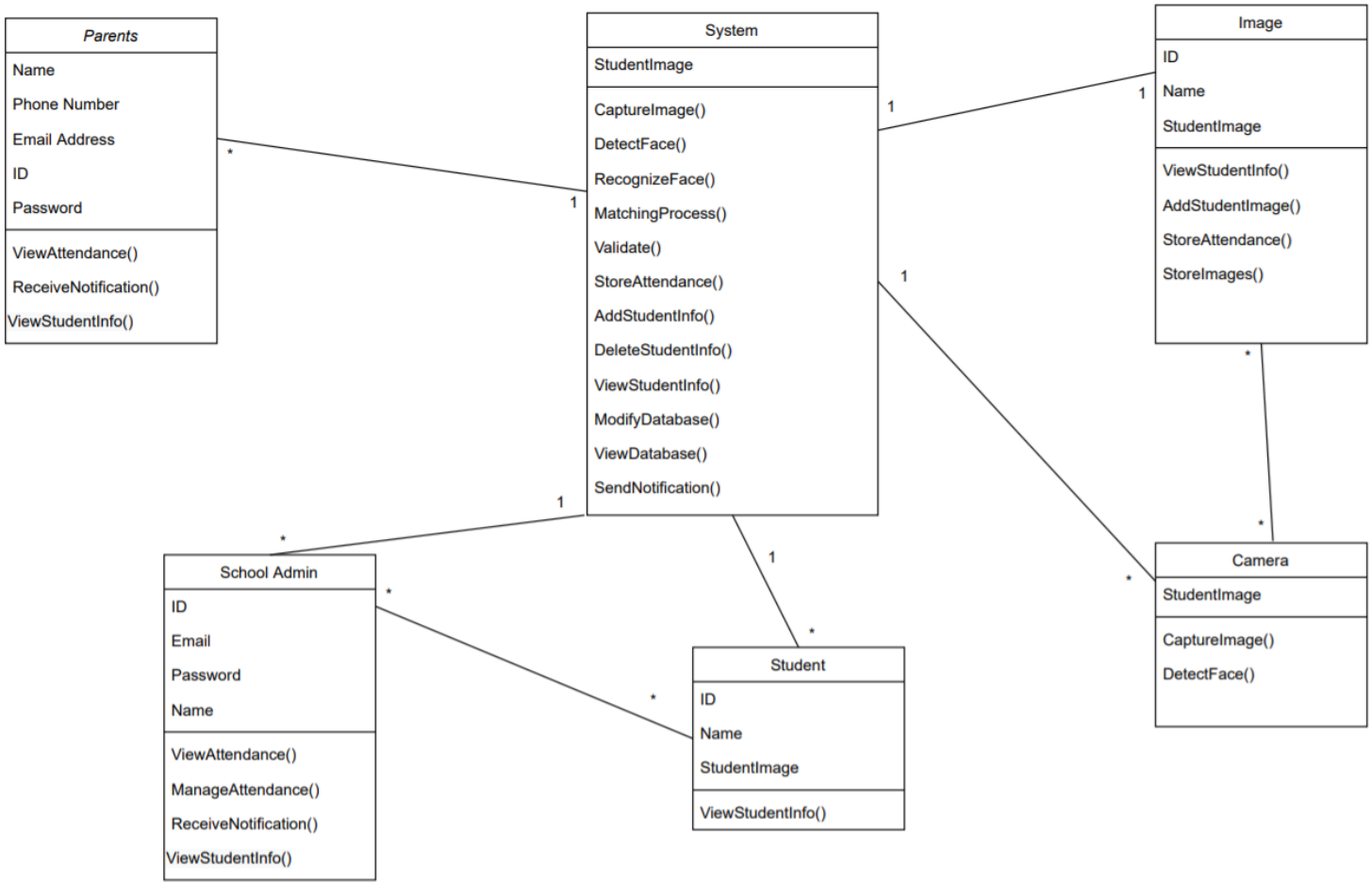


Figure 0-9: Class Diagram

4.3.3 State transition diagram

This state chart shows the process of capturing an image using the face recognition cameras that is then sent to the matching process then the training model which also stores the image in the database and sends alerts on required conditions.

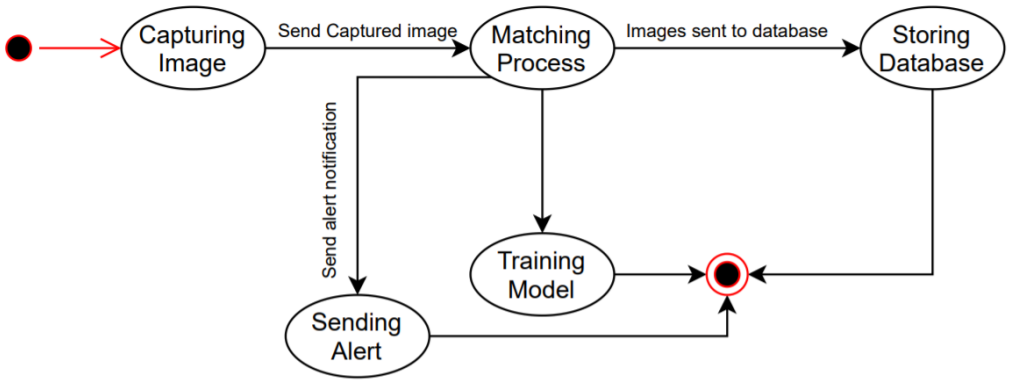


Figure 1-0: System State Transition Diagram(1)

This state Chart shows how each of the actors can access the system, the user can access by logging in with their ID & Password, if they are authorized the system will check their level of access if not they will be denied access. Once they are logged in the users can view attendance and receive alerts and some and access database if they are school admins.

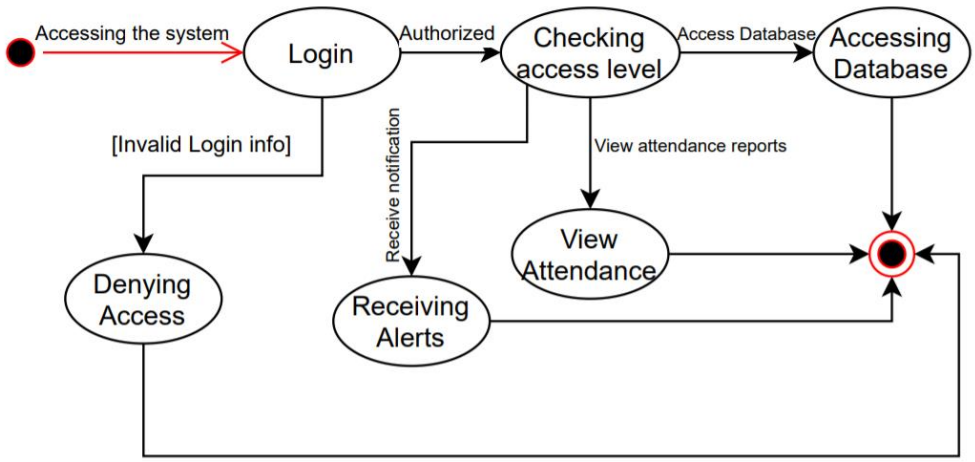
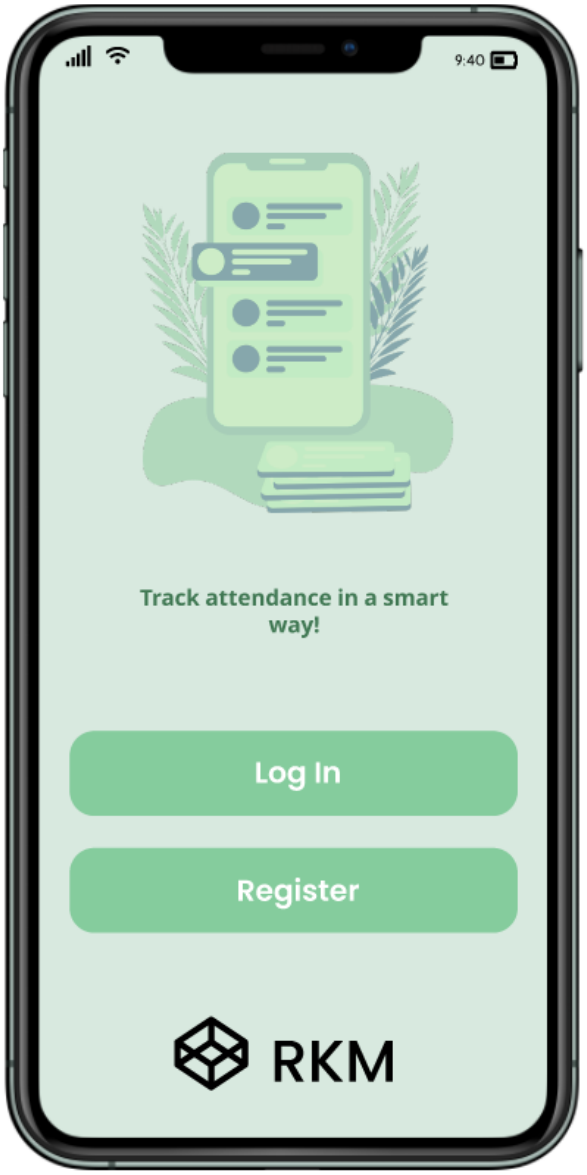


Figure1-1: System State Transition Diagram (2)

4.4 User interface design (prototype)

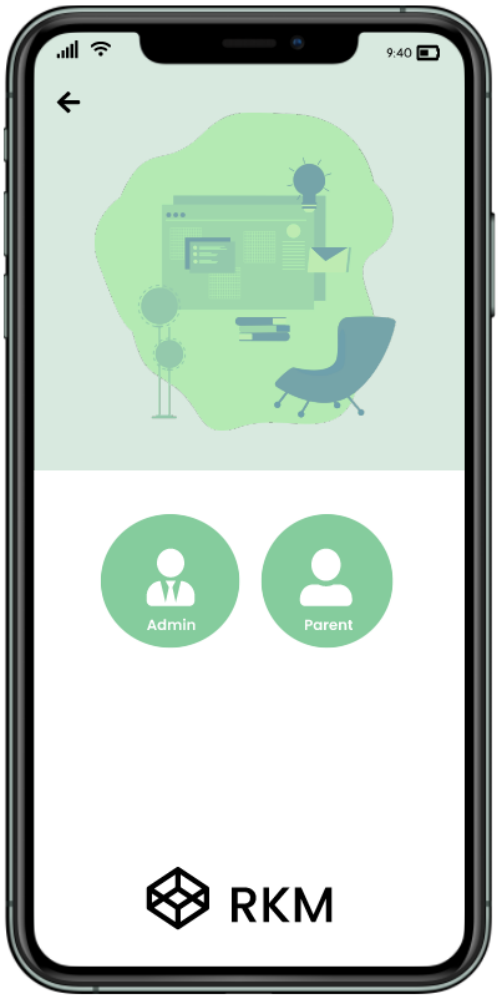
Splash page:



- This is the splash page of the app it contains the logo and the name of the app. The user is required to Login or Register in order to access the app.

Figure 1-2: UI (1)

Login page:



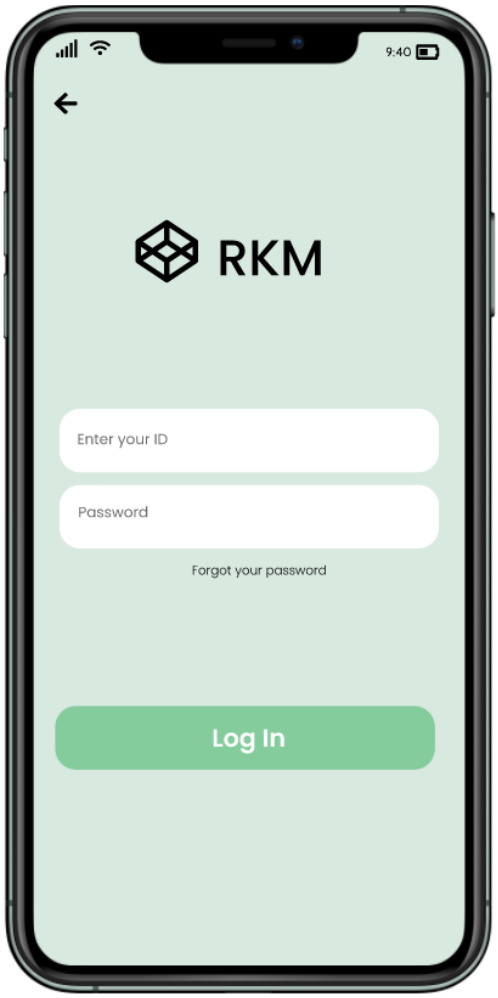
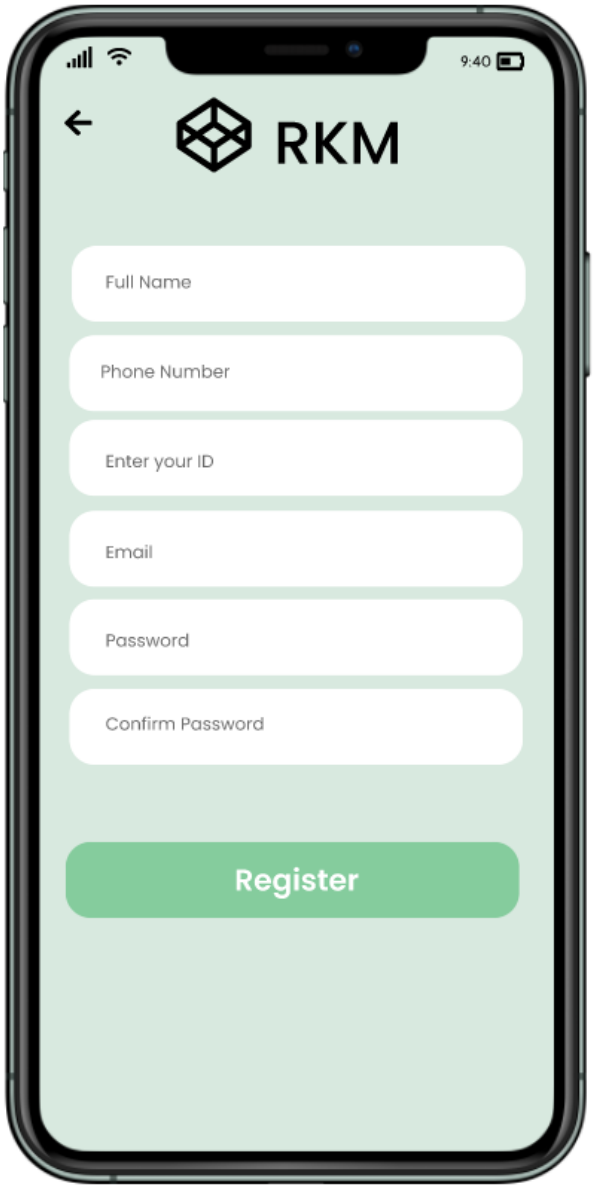


Figure 1-3: (a)
Figure 1-4: (b)

- This is the login page. The user can login to their account by choosing their level of access and are required to enter their ID and password to login.

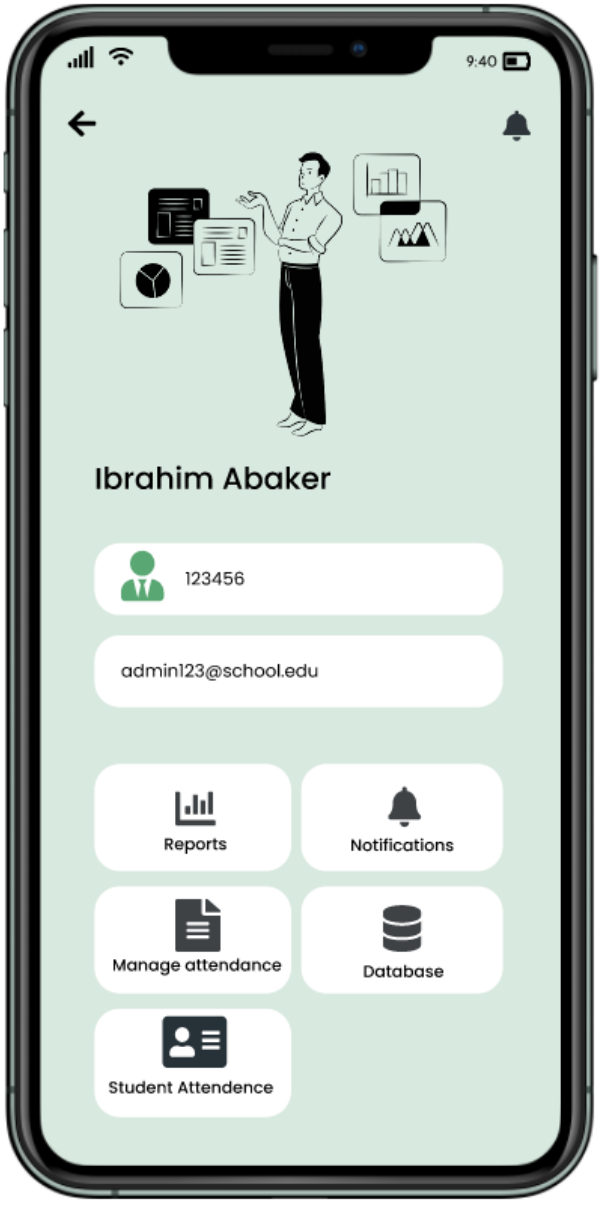
Registration page:



- This is the Registration page, the user is required to register in the application to access the attendance tracking system. The user is required to enter their, Name, Phone number, ID, Email & Password.

Figure 1-5: UI (2)

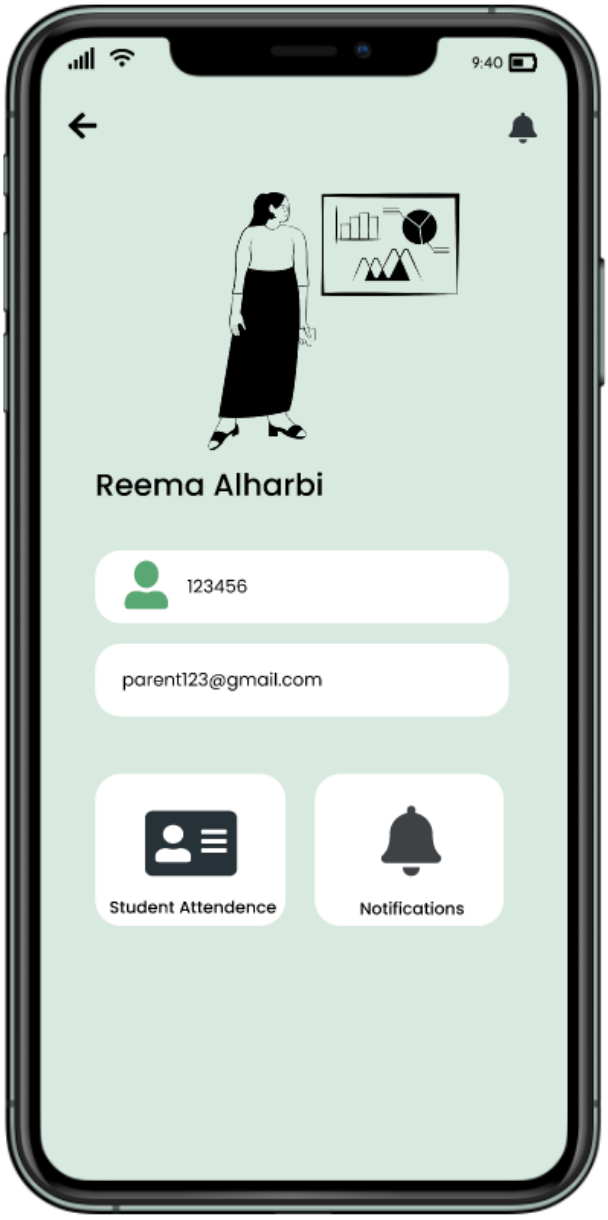
Admin home page:



- This page represents the homepage for Admin. The Admin can view attendance, receive notifications about the student's attendance, view report, view database, and manage the attendance manually.

Figure 1-6: UI (3)

Parents home page:



- This page represents the homepage for Parents. The Parents can receive notifications and view their child's attendance.

Figure 1-7: UI (4)

Notifications:

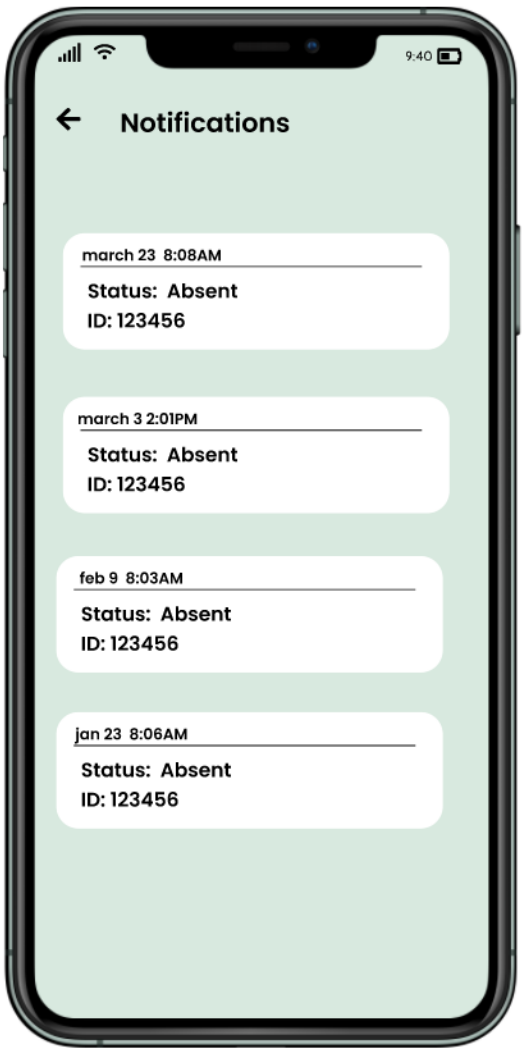
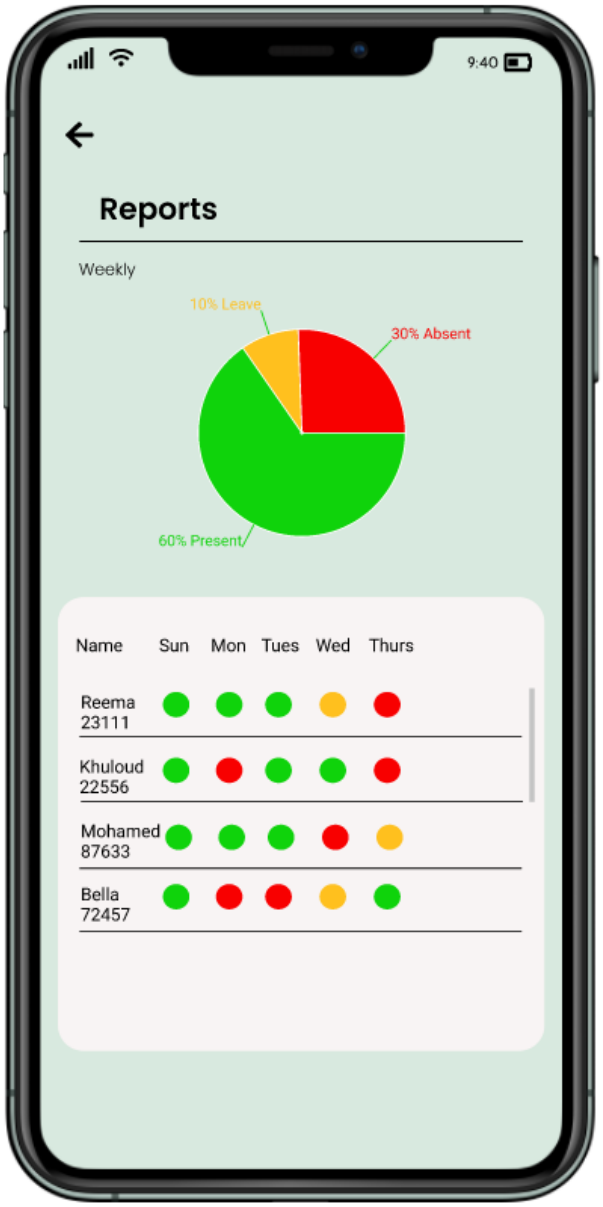


Figure 1-8: (a)
Figure 1-9 : (b)

- Notifications will be sent to the Parents and to the School Faculty

Reports:



- This page represents the Reports in the systems on a weekly basis, this page can only be viewed by the Admin.
  Present is shown in Green.
  Absent is shown in Red.
  Leave is shown in Orange.

Figure 2-0: UI (5)

Manage Attendance:

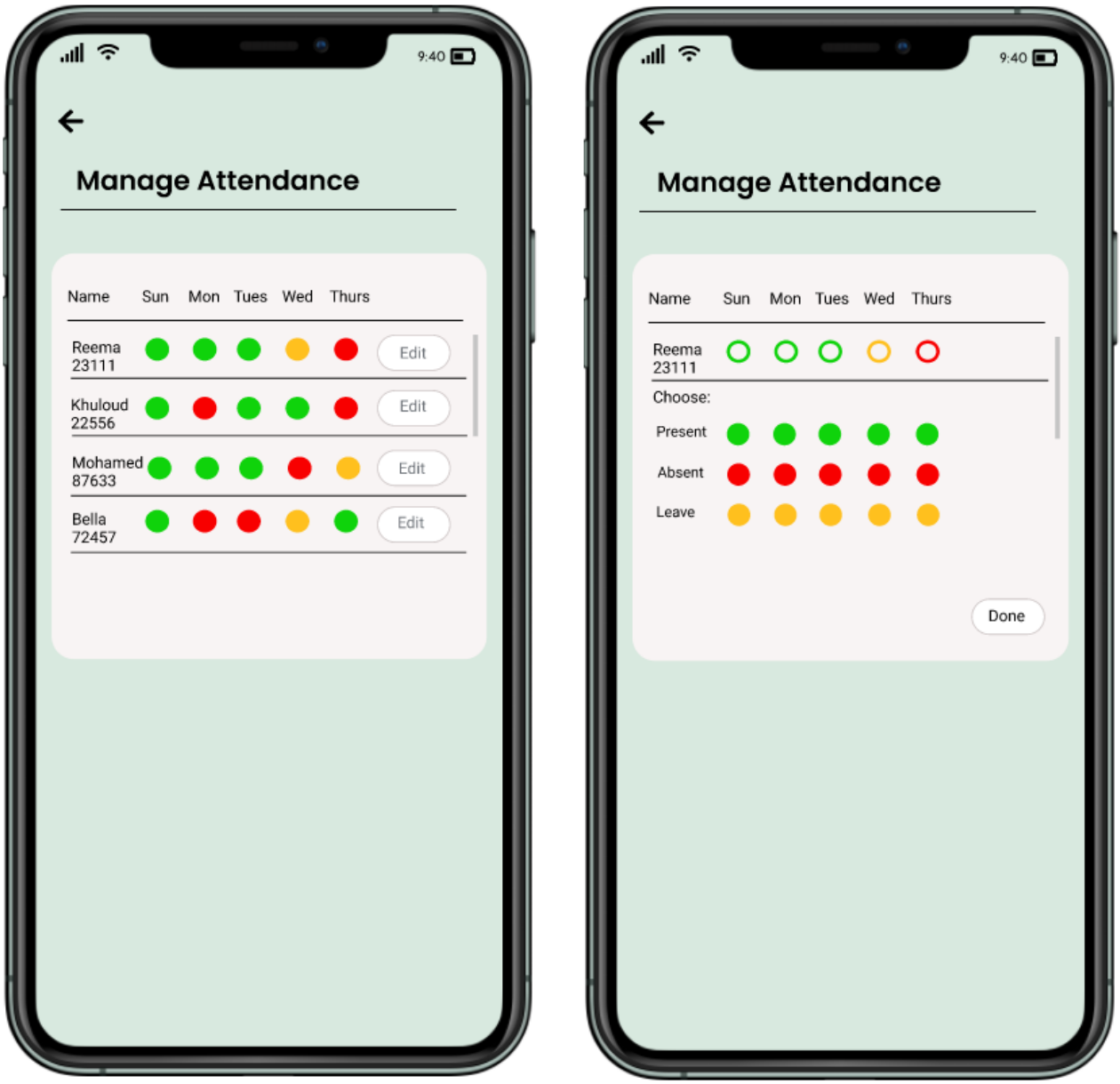
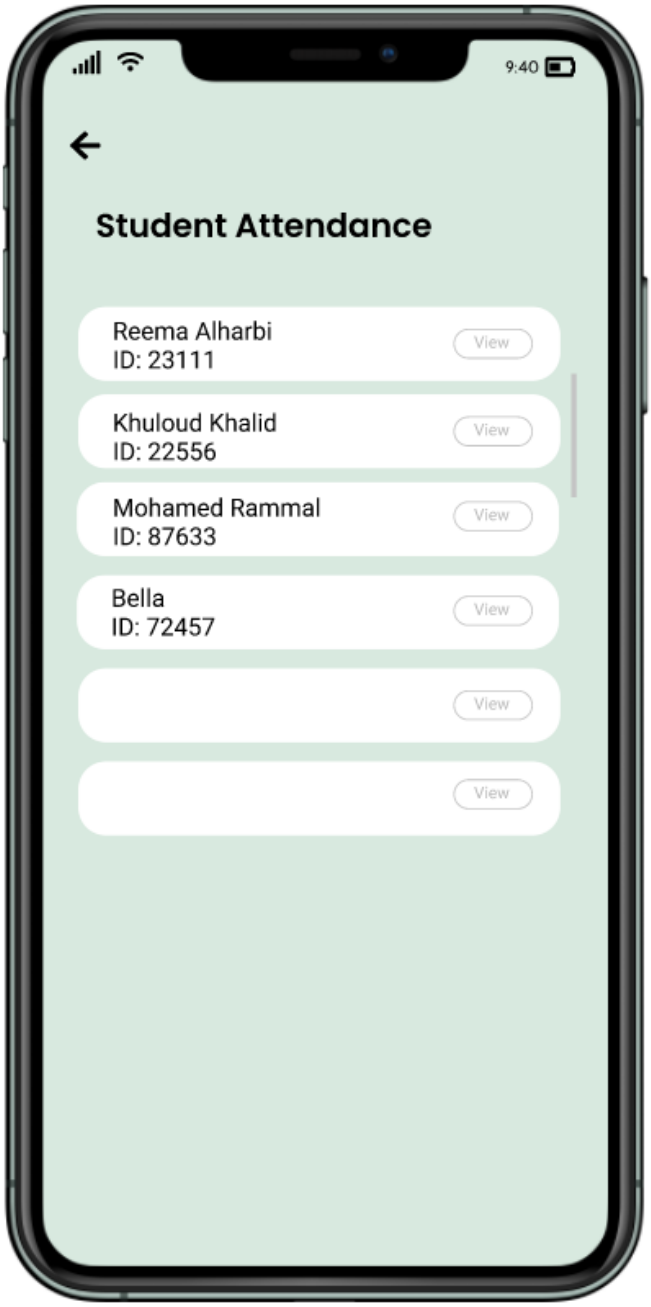


Figure 2-1: (a)
Figure 2-2 : (b)

- The school admin can manage the attendance of each student in this page, by clicking the “edit” button it refers them to another page where they can change the student’s attendance for that week.

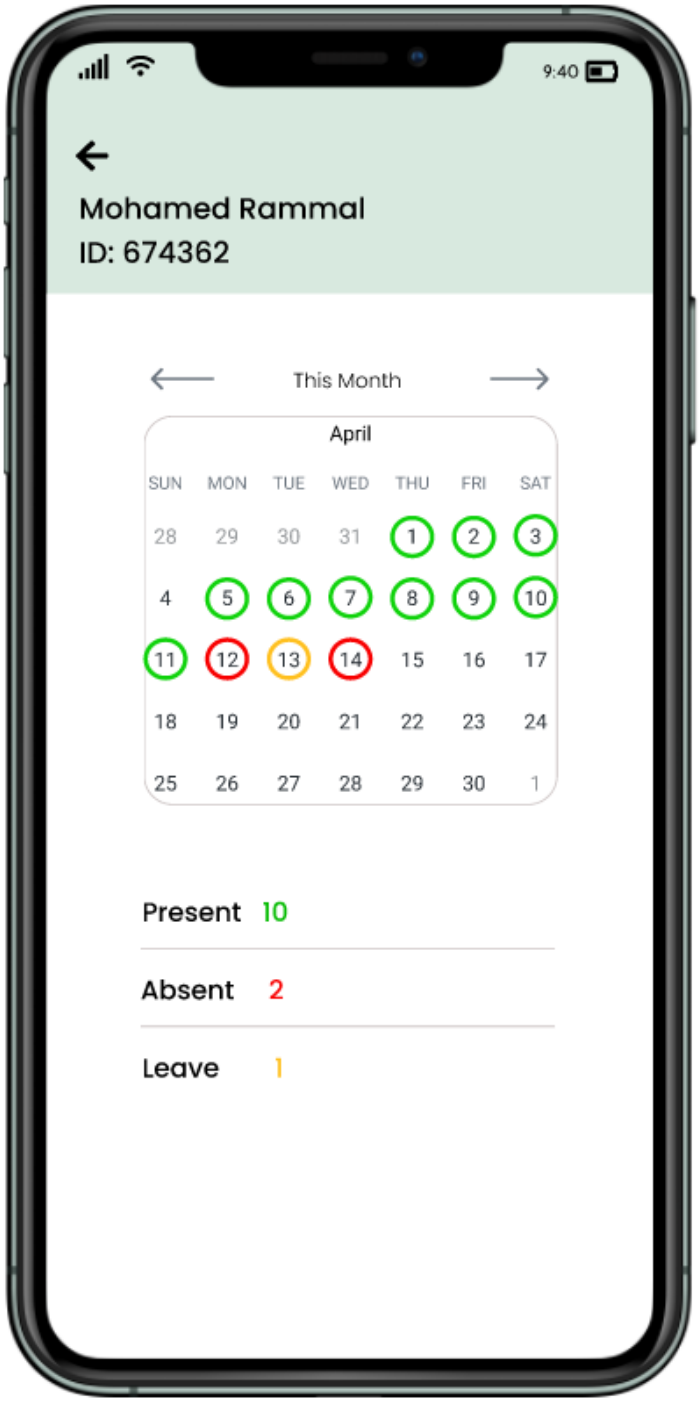
Student Attendance:



- This page shows the attendance of each student. By clicking the "view" button, it refers the user to the student's attendance for the month. This page is only shown to the school admin.

Figure 2-3: UI (6)

Student Attendance:



- This page can be viewed by the School Admin and the Parents. It shows the students overall attendance throughout the month.

Figure 2-4: UI (7)

To view the interactive UI prototype of the application visit:

https://www.figma.com/proto/hTe4JgYRFx5Omj3RODLruX/RKM?node-id=0%3A1&scaling=scale-down&page-id=0%3A1

CHAPTER 5: Implementation Plan

5.1 Description of Implementation

Initially, we will create a dataset of the students before the recognition process, this includes the student's name, ID number, grade, and images in various poses, these images are given as an input to the system.[2]

Face recognition will detect a face and then identifies of those detected face images with the existing database looking for a match which then can be communicated with an external application that tells the school or parents if the student is present or absent.[2]

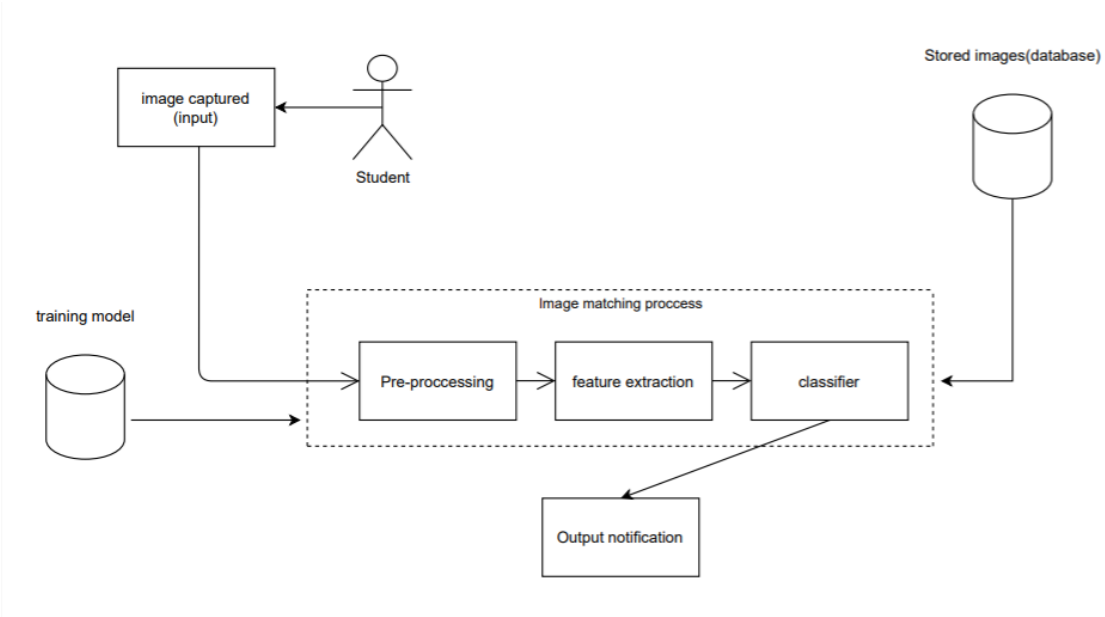
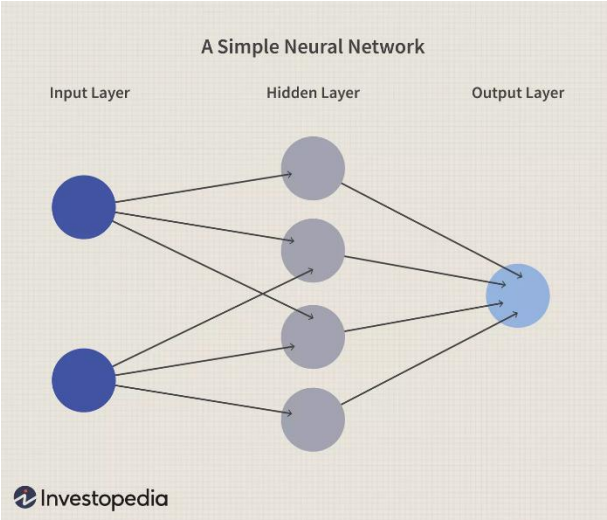


Figure 2-5: Implementation

Our program will be using neural network, A neural network is a series of algorithms that struggle to recognize underlying relationships in a set of data through a process that works the same way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature. [11] its divided into three parts which is input, hidden, and output. It is used in recognize the face through learning correct classification of the coefficients calculated by the eigenface algorithm. The network is first trained on the pictures from the face database, and then it is used to identify the face pictures given to it.

The database used in developing face recognition systems based on images of human faces captured and processed in preparation for implementing the recognition system. The assortment of data in these face pictures makes face location troublesome due to different impediments. Be that as it may, as our novel approach to face recognition is based on mimicking a human look and face nature, and since people can recognize recognizable faces despite the over issues,

the only orientation is considered when creating the work, with the suspicion that the input picture contains only one face which isn't blocked by other objects.
Facial highlights, expressions, postures, basic components, and imaging conditions are not considered as a deterrent in our work and are cleared out to the neural network to memorize by means of design averaging.



Creating a custom dataset is one simple way to feed the algorithm with the custom dataset. To create such a dataset, we need to enroll the faces of the people using OpenCV and camera module. This method is used to develop on-site face recognition system. These kinds of face recognition system are used for security purpose in various departments. The embedding of deep learning face recognitions depends on the deep metric Learning. This takes single shot image of the person and gives a real-valued feature vector as output instead of outputting single label. For Dlib face recognition model the output is feature vector is 128 real valued numbers which are used to quantify the faces of the person. Figure 2-6 : Neural Network

According to the research by Brunelli and Poggio (1993) all approaches to human face recognition can be divided into two strategies:

(1) Geometrical features and

(2) Template matching.

This technique involves computation of a set of geometrical features such as nose width and length, mouth position and chin shape, etc. from the picture of the face we want to recognize. This set of features is then matched with the features of known individuals. A suitable metric such as Euclidean distance (finding the closest vector) can be used to find the closest match. Most pioneering work in face recognition was done using geometric features (Kanade, 1973), although Craw et al. (1987) did relatively recent work in this area.

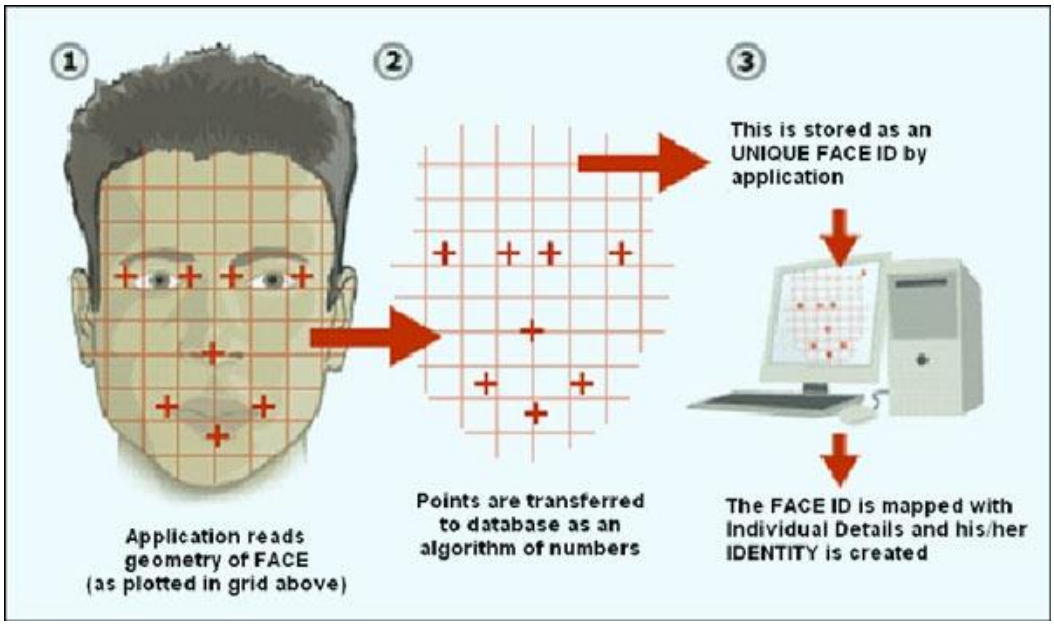


Figure 2-7 : Face recognition (1)

In 2D face recognition, images are often represented either by their geometric structure, or by encoding their intensity values. A geometric representation is obtained by transforming the image into geometric primitives such as points and curves. This is done, for example, by locating distinctive features such as eyes, mouth, nose, and chin, and measuring their relative position, width, and possibly other parameters. Appearance-based representation is based on recording various statistics of the pixels' values within the face image. Examples include: recording the intensities of the image as 2D arrays called templates and computing histograms of edge detectors' outputs.

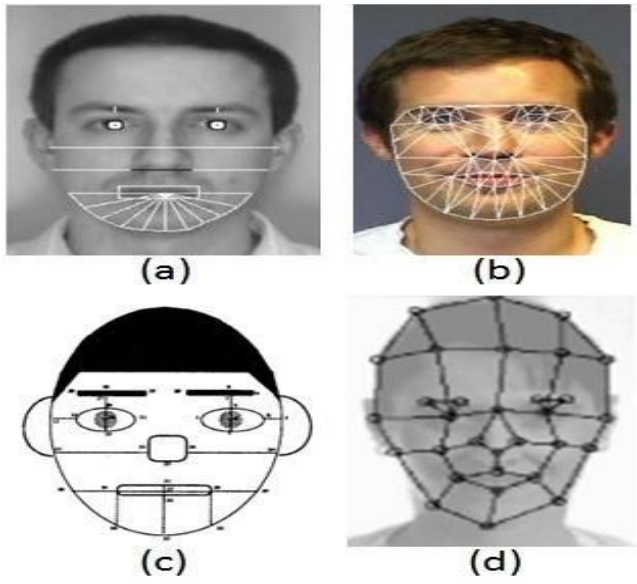


Figure 2-8 : Face Recognition(2)

5.2 Programming language and technology

For the proposed system for the application, and database to communicate with each other, we will use Python to program the backend of the system, while using a tool like MySQL database to find, change and store all the needed data for the students, we will be using HTML, CSS and JavaScript programming as a frontend for the users, like the school or the parents. we will also be using some hardware like a high-quality camera and a mobile for testing.[2]

CHAPTER 6: Experiments

6.1 Black-box

Black Box Testing is a software testing approach that involves testing the functionalities of software applications without knowing the internal code structure, implementation specifics, or internal paths. Black Box Testing is a form of software testing that focuses on the input and output of software applications and is entirely driven by software requirements and specifications. Behavioral testing is another name for it.

• First, the system's criteria and specifications are tested.

• In a positive test case, the tester selects appropriate inputs to see whether the SUT processes them correctly. In addition, some invalid inputs are chosen (negative test scenario) to ensure that the SUT can detect them.

• For each of those inputs, the tester calculates the predicted outputs.

• A software tester creates test cases using the inputs they've chosen.

• The test cases are carried out.

• The real outputs are compared to the predicted outputs by the software tester.

• Any defects are repaired and retested.

6.2 White-box

White Box Testing is a software testing methodology in which the software's internal structure, architecture, and coding are analyzed in order to validate input-output flow and improve design, usability, and security. White box testing is also known as Clear box testing, Open box testing, Transparent box testing, Code based testing, and Glass box testing because the code is visible to the testers.

White box testing means placing the software code to the test for the following:

• Vulnerability vulnerabilities on the inside

• The flow of unique inputs through the code

• Expected performance

• The functionality of conditional loops

• Broken or badly defined paths in the coding processes

• Individualized testing of each argument, entity, and function

CHAPTER 7: Conclusion and Results

To conclude, our project is to supply a system that, through face recognition technology, facilitate and automates the proves of documenting and controlling the attendance of students, our technology uses facial recognition methods to estimate the limitation of the present systems, it progresses with the best type of cameras to be able to record student images perfectly, and finally, will provide a mobile application to access the system easily.

CHAPTER 8: References

[1] Bharadwaj, R., & Rao, T. (2019). Attendance Management Using Facial Recognition. In International Journal of Innovative Technology and Exploring Engineering (IJITEE) (pp. 2278–3075). Retrieved from website: https://www.ijitee.org/wp-content/uploads/papers/v8i6/F3965048619.pdf

[2] Bhatti, K., Mughal, L., Khuhawar, F., & Memon, S. (2018). Smart Attendance Management System Using Face Recognition. EAI Endorsed Transactions on Creative Technologies, 5(17), 159713. https://doi.org/10.4108/eai.13-7-2018.159713

[3] https://www.facebook.com/jason.brownlee.39. (2019, May 30). A Gentle Introduction to Deep Learning for Face Recognition. Retrieved from Machine Learning Mastery website: https://machinelearningmastery.com/introduction-to-deep-learning-for-face-recognition/

[4] Face Recognition System. (n.d.). Retrieved from www.cdac.in website: https://www.cdac.in/index.aspx?id=cs_bi_Face_Recognition

[5] Edgell, J. (2013). 4 Limitations of Facial Recognition Technology. Retrieved from Technology Solutions That Drive Government website: https://fedtechmagazine.com/article/2013/11/4-limitations-facial-recognition-technology

[6] Bézier, P. E. (1971). Example of an Existing System in the Motor Industry: The Unisurf System. Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences, 321(1545), 207–218. Retrieved from https://www.jstor.org/stable/77846?seq=1

[7] dnraj. (2012, March 22). project. Retrieved March 14, 2021, from https://www.slideshare.net/dnraj/project-12123327

[8] Avalon Face Recognition, Temperature Monitoring & Access Control System - Standard. (n.d.). Retrieved April 11, 2021, from avalonnetworks.com website: https://avalonnetworks.com/avalon-face-recognition-temperature-monitoring-access-control-system-standard

[9] SmartFace Platform | Facial Recognition Platform. (n.d.). Retrieved April 11, 2021, from Innovatrics website: https://www.innovatrics.com/face-recognition-solutions/?gclid=CjwKCAjw07qDBhBxEiwA6pPbHgOx6Bh8aS87aa1uJbZatYXLpD_xW9hgguzQITNu-FwKN5KnmYvnZxoCkK8QAvD_BwE

[10] Detect and Recognize Faces and Facial Features with Luxand FaceSDK. (2021). Retrieved 11 April 2021, from https://www.luxand.com/facesdk/?utm_source=google&utm_medium=cpc&utm_campaign=face-recognition&gclid=CjwKCAjw07qDBhBxEiwA6pPbHrRS3YzM1Naa3x6o5Xj4O9sTJ5FwYJ7VBwkCLqwAANVdwYxYDctaIBoCajEQAvD_BwE

[11] Jamil, N., Lqbal, S., & Iqbal, N. (2019). Face recognition using neural networks. Proceedings. IEEE International Multi Topic Conference, 2001. IEEE INMIC 2001. Technology for the 21st Century. https://doi.org/10.1109/inmic.2001.995351

[12] Wolf, L. (2009). Face Recognition, Geometric vs. Appearance-Based. Encyclopedia of Biometrics, 347–352. https://doi.org/10.1007/978-0-387-73003-5_92