SMART EVENT ATTENDANCE SYSTEM USING FACE RECOGNITION

BY

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Firstly, I want to express my sincere gratitude to my friends and family for providing me with support and guidance as I worked through the project's hurdles.

Besides, I am also appreciative to my supervisor, Ts Wong Chee Siang for giving me critical assistance and answering my question with patience during this project.

Lastly, this project is a very meaningful task for me. Hence, I will do my best to finish this project.

ABSTRACT

This project is a development-based project to develop a Smart Customizable Event Attendance System. The main goal of this project is to develop a smart attendance system that will help the organization that wants to start up a business or event to set up a suitable attendance system. Hence, this report is a project proposal for system development. In this project, the brief introduction, literature reviews, project scope and methodology will be discussed. Attendance systems and facial recognition technology have been a concern by many developers and researchers for a long time. However, the application of the combination of facial recognition and various application has just gradually become popular in China in recent years. This is because facial recognition can be regarded as the use of facial biometrics as a "password" in some applications. Therefore, this may cause serious privacy and security risks problems. Hence, this project will also propose improvements and better solutions for this kind of problem and limitation. Then the improved facial recognition system will be applied to the attendance system. In addition, to enable users to use the system proposed in this project to create a suitable attendance system for any type of event, this project also provides other types of attendance system approaches for users to select which include QR code-based attendance system, location-based attendance system and multi-factor attendance system.

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LIST OF ABBREVIATIONS

DCNN	Deep Convolutional Neural Network
DT	Decision Trees
SVM	Support Vector Machine
KNN	K-Nearest Neighbor
FR	Facial Recognition
EAR	Eye Aspect Ratio
AES	Advanced Encryption Standard
FHS	Fully Homomorphic Encryption
QR	Quick Response
GPS	Global Position System
IP	Internet Protocol
XP	Extreme Programming
API	Application Programming Interface

CHAPTER 1

Introduction

In this chapter, the problem statement, motivation, objectives, project scope, contribution, background information and the whole report organization will be discussed.

1.1 Problem Statement and Motivation

Nowadays, the attendance system is already a very common thing. However, whether it is a manual attendance system or an automated attendance system, most of them face the following problem:

1. The traditional attendance systems usually encounter many types of fraudulent activities like fake attendance and identity theft.
2. Different organizations and events require different types of attendance systems, and it is difficult for ordinary attendance systems to be flexibly changed according to the situation.
3. Some biometric based attendance systems require the purchase of specific equipment, which can be very costly.

Although attendance systems are already a very common theme, the system developed in this project focuses on the use of facial recognition technology for authentication and the flexibility for users to customize the attendance system. The motivation for choosing this project is that today's attendance system is too monotonous. Different situations have different requirements, the attendance system should have features that can be flexibly changed according to the situation. In addition, for some important activities such as exams, airport boarding, etc., the traditional method cannot ensure the accuracy of the identity. However, performing identity verification one by one affects efficiency and it requires a lot of human resources. Hence, if there is an attendance system based on facial authentication or even multi-factor authentication, this problem can be perfectly solved.

1.2 Project Objectives

The main goal of this project is to develop a smart attendance system that will help the organization that wants to start up a business or event to set up a suitable attendance system. Besides, the proposed system will also consist of various approaches such as facial recognition, QR code and location to solve the issues of efficiency and identity verification. Hence, the main objective of this project can be divided into 5 sub-objectives as shown below:

1. To reduce the frequency of attendance fraud.
2. To deliver an easily maintainable attendance system to organizers.
3. To deliver a user-friendly attendance system to users.
4. To deliver a high flexibility attendance system to organizers.

Therefore, the proposed system will help the organization to set up the most suitable attendance system compare with other attendance setup software. Besides, the organization can also set up an easy-to-maintain attendance system at the lowest cost.

1.3 Project Scope and Direction

This project will deliver a smart customizable event attendance system that allows users to use contactless methods i.e., facial recognition, QR code, GPS location and IP address as the approach to taking attendance. This proposed system will consist of two sections which are a web version of the attendance customization system and dashboard for the event management system and a mobile version of the application to allow users to sign the attendance and manage their event schedules.

The web-based application, it is designed for an organization that wants to start up events/communities with a setup of an attendance system. To address the problem of attendance fraud, the attendance customization system allows the user to choose a facial recognition method to authenticate participants' identities. In addition, there are QR code and location methods for users to select to increase flexibility. This solution can solve the problem stated in the problem statement.

The project scopes of the web-based application are lists in below:

1. **Dashboard**
    - The system should only access by admins and managers.
    - Admin should be able to create the events in the organization.

- Admin should be able to edit the existing events.
- Admin should be able to create manager's account.
- Admin should be able to assign the manager to the specific event.
- Manager should be able to assign participant into the specific event.
- Manager should be able to manage the participants of the event.
- Admin and Manager should be able to receive an attendance report about the events.

2. **Attendance Customization System**
   - Manager should be able to customize the attendance system of the event with multiple approach combinations in any time.
   - Manager should be able to manage the attendance record of the participants in the event.
   - The check-in methods should include face recognition, QR Code, Location, and IP address.

Besides, the android version of the application is designed for the participant. To solve the problem of some biometric-based attendance systems requiring the purchase of costly equipment, the proposed system only uses the mobile device as an **attendance check-in tool**. The project scope of the application is listed in below:

- Participants should be able to join the events based on the invitation code.
- Participants should be able to view his/her events that they currently join.
- Participants should be able to receive the notification when the events are coming soon.
- Participants should be able to sign the attendance with various approaches.
- Participants should be able to view the attendance history record.

Lastly, the scopes that will not covered in this project is listed in below:

- This project will not cover the details of operations for account management such as user profile, password editing and forgetting passwords.
- This project cannot eliminate the problem of attendance fraud. However, it can only increase the difficulty of participants fake the attendance and reduce the frequency of attendance fraud.

1.4 Contributions

This proposed project is to develop a smart customizable attendance system that allows users to use contactless methods i.e., facial recognition, QR code, GPS location and IP address.

which can replace traditional methods such as pen and paper. The system will provide 2 platforms which are the mobile app version and a web app version. The web app version includes an attendance customization system and an attendance management system. Users can create an attendance system that is not limited to one in this web app and can manage and edit the attendance at any time. The attendance system customization system allows organizers to choose different types of attendance systems according to their own needs. This feature can reduce maintenance costs and improve efficiency for users. Besides, the facial recognition system can also solve the attendance fraud problem. The attendance management system also provides a user-friendly interface and report generation features to the user.

For mobile app version, it includes attendance check-in tools and a participant's registration/login system. Once the organizer creates events/communities, the participant can join the events/communities with the invited code generated by the system. This will save the organizer the trouble of manually adding the participant and avoid human error. Besides, the attendance check-in tools also provide a user-friendly interface for participants.

1.5 Background Information

An attendance system has always been a necessary part of education, the workplace, and organizations. Attendance systems can be used to record or track people's attendance to differentiate between participants and non-participants. With the rise of technology and the improvement of demand, the attendance system has gradually evolved into various types of methods such as manual systems, timesheets, mechanized systems, access control systems and biometric attendance systems. Nowadays, the use of human biometrics for authentication, such as face recognition, has always been an interesting research direction. Many scientists and engineers around the world are focused on building increasingly powerful and accurate algorithms and methods for biometrics systems and their applications in everyday life. It is because humanity is slowly going towards contactless everything. Especially face recognition technology has been able to be applied in various fields such as facial recognition markets, face recognition attendance, face recognition e-wallets etc.

Facial recognition refers to the computer technology that uses the analysis and comparison of face visual feature information for identity identification, including face image acquisition, face positioning, face detection, identity confirmation, identity search, etc. This proposed project is to develop a smart customizable attendance system that allows users to use

contactless methods i.e., facial recognition, QR code, GPS location etc. which can replace traditional attendance systems such as pen and paper. This is because human error is very prone to occur in the traditional attendance system [1] and there are also many limitations and difficulties. Hence, this is also the reason why many large enterprises and organizations are generally phasing out the manual attendance system. In this proposed system, users can customize the attendance system according to their needs. For instance, if the user is more concerned with the authentication of the participants than the efficiency, it is available to choose multi-factor verification i.e., facial recognition with GPS location and vice versa. This will give a lot of flexibility to the organization that wants to startup with the attendance system.

Besides, attendance management is also an important part for an organization to keeps track of its members and fetch some useful data like working hours, absent preference, and absent situations for further analysis. Hence, this proposed system will also provide users with a dashboard for attendance management. Based on the above, this proposed project can provide users with a more user-friendly and wider application range of the attendance startup tool.

1.6 Report Organization

In this report, the literature review and the previous work review will be discussed in Chapter 2. Besides, the proposed method and the design of the whole system will also be discussed in Chapter 3. Moreover, the preliminary work will also be discussed in Chapter 4. Lastly, the summary of the project will also include in Chapter 5.

CHAPTER 2

Literature Reviews

2.1 Previous Research on Facial Recognition

Due to the vigorous development of facial detection and facial recognition technologies, more and more researchers, and engineers have begun to work on developing frameworks for facial recognition and establishing increasingly robust and accurate algorithms and methods. The following is a brief introduction and review of the research on the frameworks and machine learning algorithms of facial detection and facial recognition.

2.1.1 A deep facial recognition system using computational intelligent algorithms

(Salama AbdELminaam D et al. 2020) [2] proposed research related to the face recognition system using the adaptive deep convolutional neural networks (DCNN). In this study, the authors aim to develop a deep FR system using transfer learning in fog computing. Fig 2.1 shows the overall view of the proposed face recognition system.

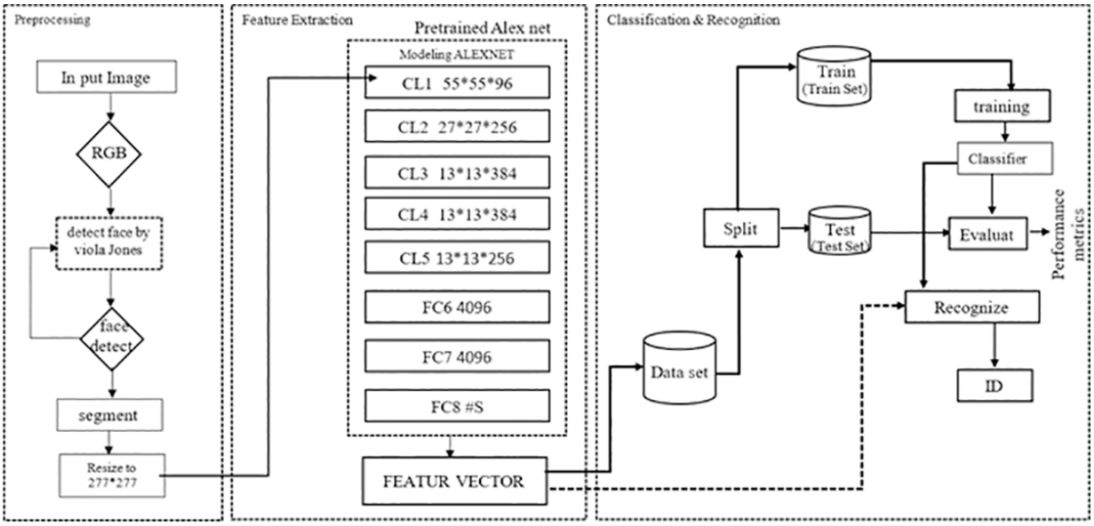


Figure 2.1 The general overall view of the proposed face recognition system (Salama AbdELminaam D et al. 2020)

The proposed system consists of three essential stages, including preprocessing, feature extraction and recognition stage.

The preprocessing phase covers the image input process, face detection process, segments and resizes process. The blue outline of Fig 2.2 shows the block diagram of the preprocessing step of the proposed system.

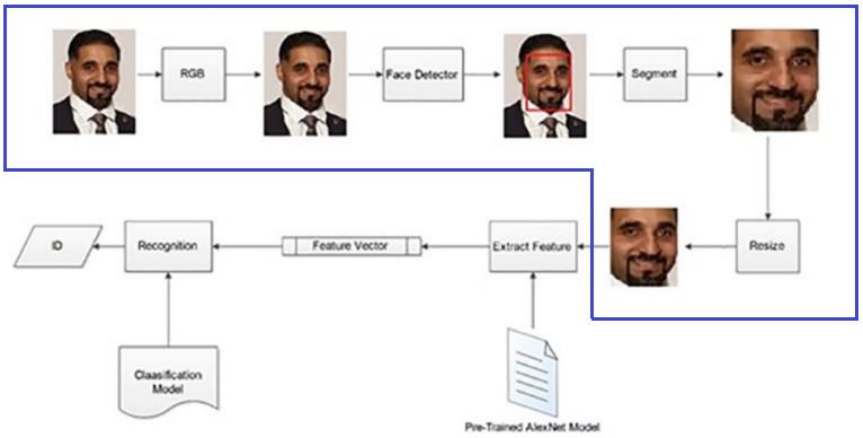


Figure 2.2 The block diagram of the proposed face recognition system (Salama AbdELminaam D et al. 2020)

At the beginning of this stage, once the system ensures the input image is an RGB image and aligns the size, the system will start to detect whether the image is a face image or not face image. AbdELminaam D et al. used the viola jones algorithm as the main algorithm of the face detection module in this study. Viola-Jones algorithm is a well-known face detection mechanism, it has good real-time detection ability and the ability to achieve high accuracy in face detection. I think this is also the reason why the authors use this algorithm in the proposed system.

2.1.1.1 Viola Jones Algorithm

The viola jones detector used by the author in the research includes the following 4 processes and technologies, that is, Haar-like features, Integral Image, AdaBoost and Cascade Filter [4]. The phases of the viola-jones detector method are shown in Fig 2.3.

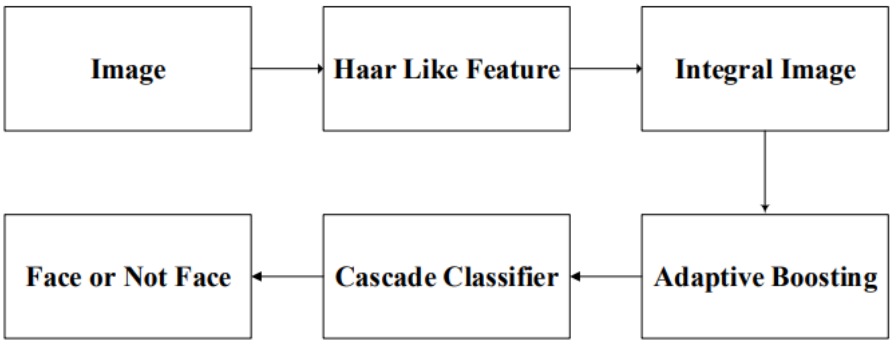


Figure 2.3 Phases of viola-jones method (Rudolfo Rizki Damanik et al 2018)

Haar-like features used in viola jones are similar to a box with a light side and a dark side which have various type and vary. Fig 2.4 shows the three most used types of haar features [3].

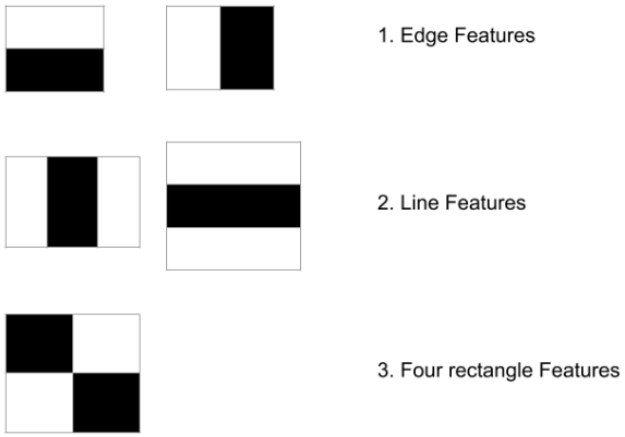


Figure 2.4 Haar-like features (Mrinal Tyagi 2021)

These features help the system identify each part of the image, such as the eyes, eyebrows, nose, and mouth. Fig 2.5 shown how the haar-like feature applied on the input image [4].

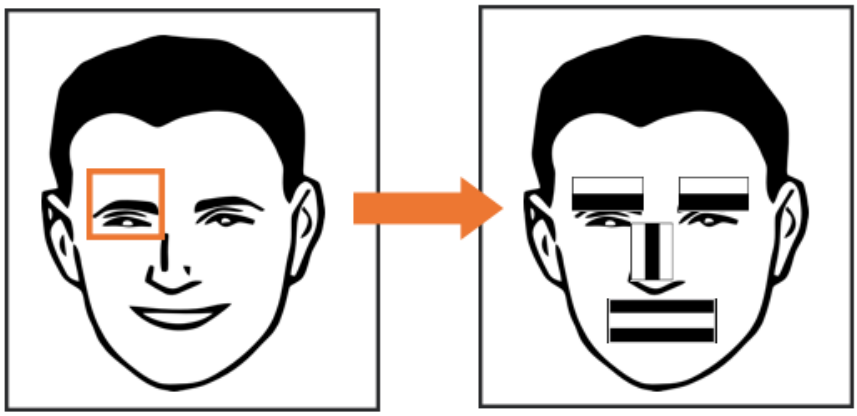


Figure 2.5 Haar-like feature applied on the input image (AaronWard 2020)

The Haar Like Feature value is derived from the difference between the number of pixels in the dark area and the number of pixels in the bright area:

$$F(H) = \sum F_{WHITE} - F_{BLACK}$$

However, only relying on the haar-like feature cannot effectively detect faces and various parts. This is because haar-like features need to be used on all possible sizes and positions of the image, which would result in a very large number of features to compute which is a very large number. Hence, viola-jones method uses integral image method [3] to calculate rectangular features value quickly as shown in fig 2.6.

2 Rectangle = *A-2B+C-D+2E-F*

3 Rectangle = *A-B-2C+2D+2E-2F-G+H*

4 Rectangle = *A-2B+C-2D+4E-2F+H-2I+J*

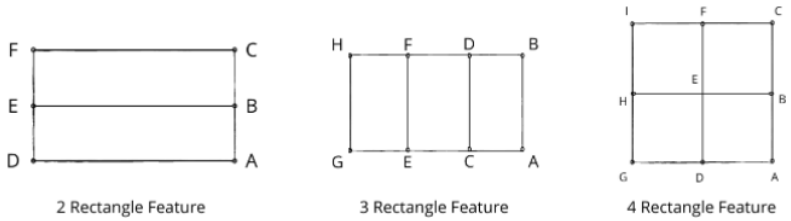


Figure 2.6 score Count of the features (Mrinal Tyagi 2021)

Besides, the method uses the Adaboost learning algorithm to select a small number of important features from a large data set. This algorithm allows the system to combine several weak classifiers into strong classifier. Hence, the system does not need to go through all the features and the classification performance will improve significantly.

In the end of the preprocessing stage, Cascade Filter will be used to detect the image of a human face as shown in fig 2.7.

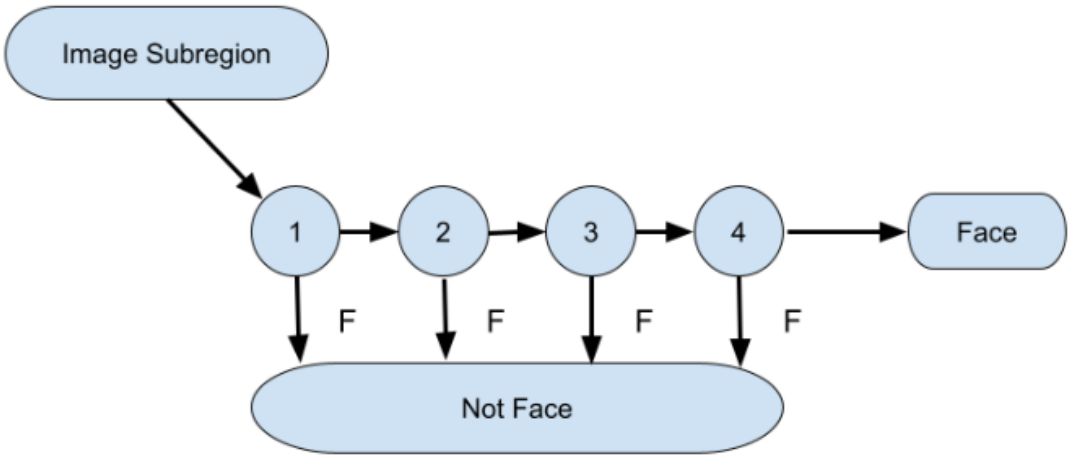


Figure 2.7 The cascade classifier structure (Mrinal Tyagi 2021)

For me, the viola jones algorithm is very suitable for use in my proposed attendance system. This is because the viola jones algorithm requires less training data than other ML algorithms. Although the detection rate, accuracy and precision of the viola jones algorithm are slightly

inferior to some neural network-based algorithms, it has comparatively low time complexity and faster Detection speed.

2.1.1.2 AlexNet

After ensuring the position of face in the image, the proposed system will crop and resize the face image to 227×227. Then proceed to the next stage – feature extraction. In this study, AbdELminaam D et al. proposed a modified AlexNet to replace the traditional Alexnet in the feature extraction phase. It is because the length of yield neurons (1000) in traditional AlexNet is not equivalent to the number of classes in the transfer learning task. The transfer learning method is used to fine-tuning on the last layer of AlexNet for new classification tasks. Fig 2.8 shows the core knowledge of transfer learning. Fig 2.8 shows the pseudocode [2] that proposed by the authors to overhaul the relating SoftMax layer and arrangement layer:

```
// Adapt AlexNet Structure
 FLayers ← Net.Layers(1:END-3)
 FLayers.append(new Convolutional layer)
 FLayers.append(new SoftMax layer)
 FLayers.append(new Classification layer)
```

Figure 2.8 Pseudocode to overhaul the relating SoftMax layer and arrangement layer.

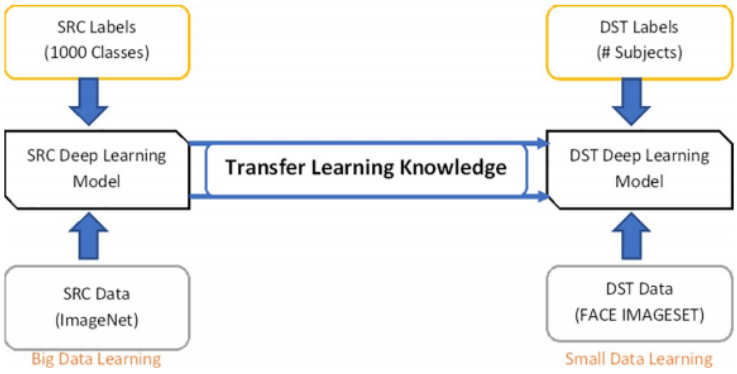


Figure 2.9 Core Knowledge of Transfer Learning (Salama AbdELminaam D et al. 2020)

Fig 2.10 and Fig 2.11 show the structure of the traditional alexNet and the author's modified alexNet, respectively, where the fully connected layer "fc8" which has 1000 neurons is replaced by the "fc8" which can be adapted to the dataset used during the training phase.

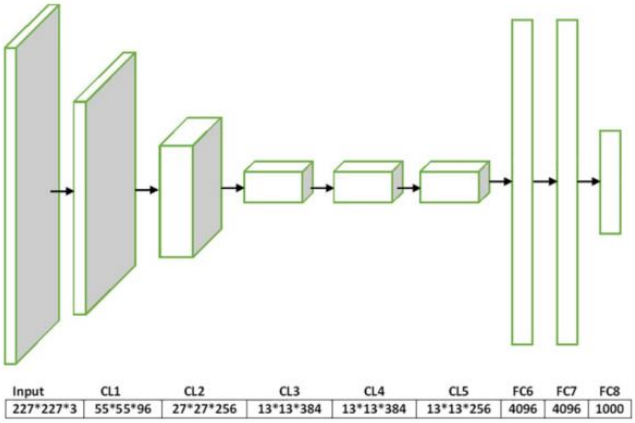


Figure 2.10 Original AlexNet Architecture (Salama AbdELminaam D et al. 2020)

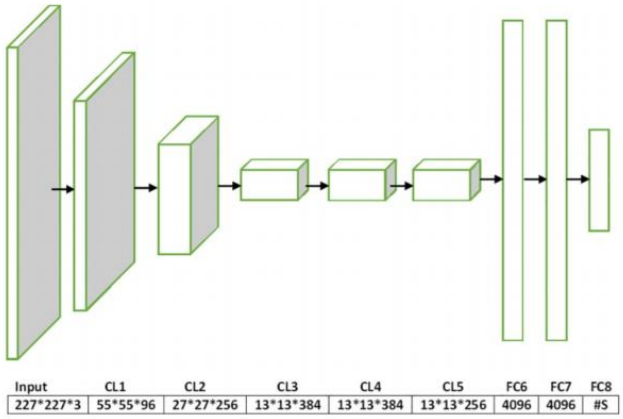


Figure 2.11 Adaptive AlexNet Architecture (Salama AbdELminaam D et al. 2020)

In my opinion, the main benefit of using transfer learning with AlexNet is efficiency and speed when training the new models. It is because AlexNet method allow the system use multiple GPU to train the model. It means the model's neurons can be distribute to multiple GPU to reduce the training time.

2.1.1.3 Fog computing FR system

After the feature extraction, the system will start to enroll the features or recognized the face. In this study, fog computing and cloud computing are used in the face recognition stage. The general architecture of the FR system is shown in fig 2.12.

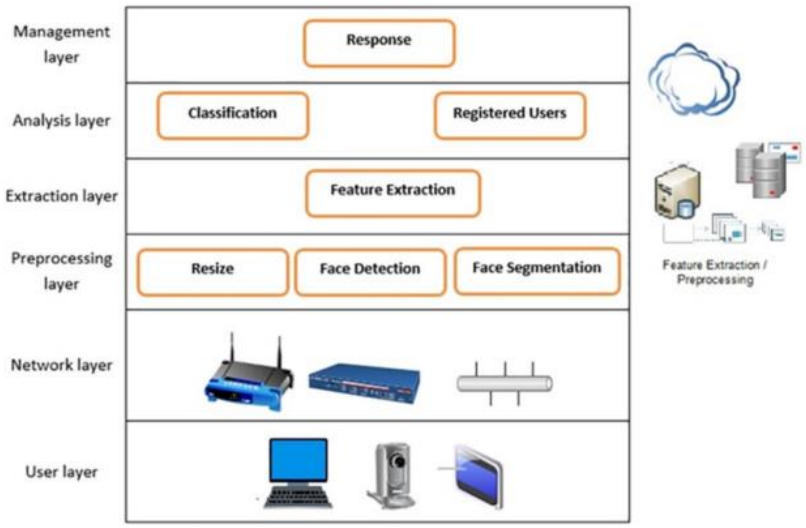


Figure 2.12 The general architecture of the FR system

(Salama AbdELminaam D et al. 2020)

In this architecture, the entire facial recognition process is partitioned into 6 layers, which include user layer, network layer, preprocessing layer, extraction layer, analysis layer and management layer. Among the 6 layers, the analysis layer is the most significant piece for the FR system. In the analysis layer, the cloud server stores all the training set and processes these sets. And distribute the sets to each fog server for training. I think this system makes full use of the processing speed of fog computing and the capacity advantages of cloud computing, and greatly improves the shortcomings of traditional distributed computing processes.

2.1.1.2 Experimental results

In the final section, Salama AbdELminaam D et al. also experimented with their proposed facial recognition system and some comparison systems. The comparison systems include DT, SVM and KNN, respectively. In the final results as shown fig 2.13, the proposed system is significantly higher than other systems in terms of precision, recall, accuracy and specificity.

Algorithm	Precision	Recall	Accuracy	Specificity
DT	96.30%	94.54%	94.96%	95.36%
SVM	98.02%	96.50%	97.17%	97.90%
KNN	96.22%	96.77%	96.30%	95.64%
Adaptive DCNN	99.12%	99.07%	99.06%	99.10%

Figure 2.13 Average results of the proposed system and the three comparison systems.

(Salama AbdELminaam D et al. 2020)

The author proves that the proposed system has more advantages in facial recognition than other comparison systems through experimental results. I think this is also the strength of this

research because the author did not propose algorithms and frameworks without any basis. Therefore, I think this research has great reference value for the attendance system proposed by this project.

2.1.2 Limitation of Previous Studies

Although the FR system proposed by the research and the algorithm it uses do perform very well in precision, recall, accuracy, specificity, and speed. But for the attendance system I want to develop, there are still exist some problems and limitations.

The first limitation is the FR system unable to detect is the person in front of the device a real person or a photo. Since the FR system needs to be applied to the attendance system, there is a great demand for the authenticity and timeliness of the face image. If the FR system cannot distinguish the difference between the real person and the photo, it may cause people using photos for attendance fraud.

Secondly, since the system use the viola-jones method as the main algorithms of face detector, it may limit the input image is in frontal view. This is because viola-jones was originally designed for the detection of frontal faces, so it is best able to detect frontal rather than sideways faces. This is also a point that needs to be paid attention to when applying this FR system to the attendance system.

Thirdly, this FR system module uses cloud computing and fog computing. It may cause security and privacy problems. Some malicious persons may attack the cloud server to steal the user's biological information, which is very fatal to the user's security.

The last limitation of this FR system is the detection efficiency may be affected by very high/low exposure and poor image quality.

2.1.3 Proposed Solutions

For the limitations proposed above, I will apply the following solution to improve my proposed system.

2.1.3.1 Eye blinks detector with EAR and Facial Landmarks

To address the potential attendance fraud problem, I will propose an eye blinks detector with Eye Aspect Ratio (EAR) and Facial Landmarks in this project and apply it to the proposed FR system. Fig 2.14 shows the flow chart of the modified FR system.

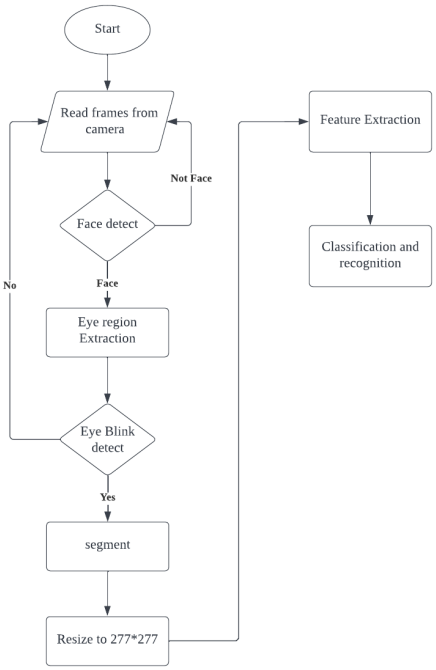


Figure 2.14 Flow chart of the modified FR system.

For the proposed eye blink detector, the following is a brief introduction to the technology selected for this project.

Adrian Rosebrock [6] proposed an eye blink detector method in 2017 to detect the human eye blinks by analyzing the change of the eye aspect ratio (EAR). The equation of EAR is:

$$EAR = \frac{\left||p2 - p6|\right| + ||p3 - p5||}{2||p1 - p4||}$$

Where the parameter p1 to p6 is the facial landmarks associated with the eye as shown in Fig 2.15.

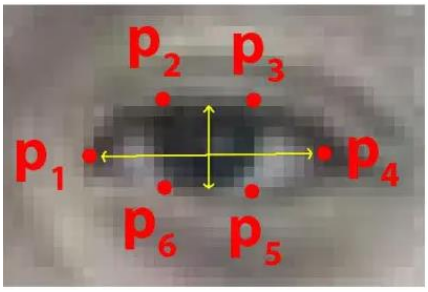


Figure 2.15 The 6 facial landmarks associated with the eye. (Adrian Rosebrock 2017)

Once the human eye is closed, the EAR drops rapidly. Therefore, when the statistics of the EAR are present like Fig 2.16, it is regarded as the person blinking once.

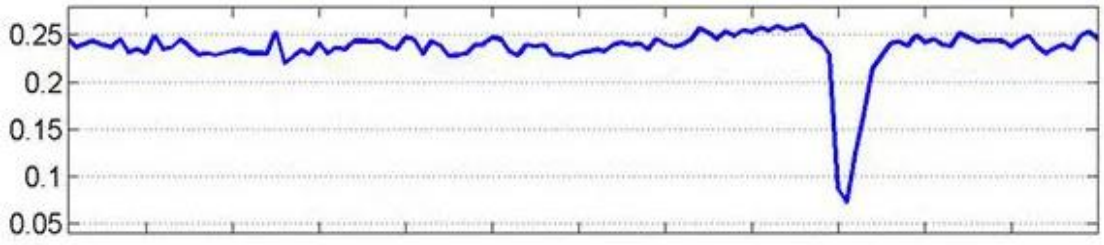
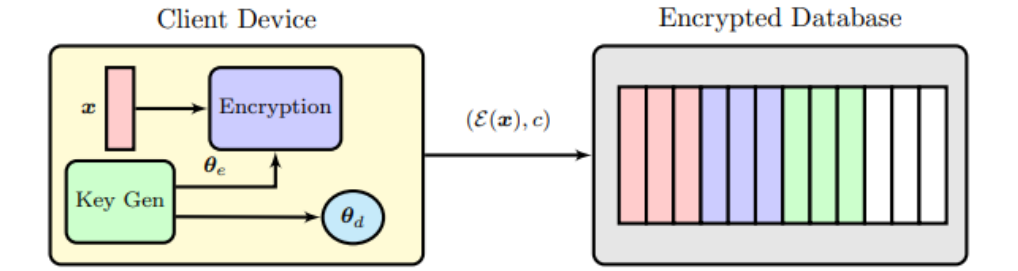


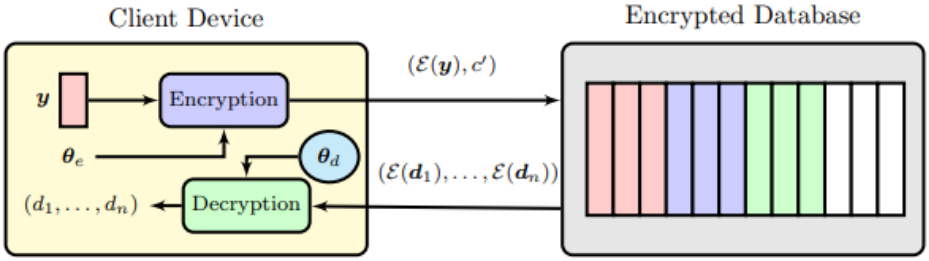
Figure 2.16 The eye aspect ratio over time (Adrian Rosebrock 2017)

2.1.3.2 Face Recognition with homomorphic encryption

Nowadays, the technical development of face recognition has gradually matured. However, developers rarely use the FR system in applications that require authentication, such as e-wallets, attendance systems, etc. This is because the face recognition system needs to collect the user's biometric information to process the training and recognition work. This can easily lead to many security issues as well as privacy concerns. Hence, in this project, I will propose a fully homomorphic encryption (FHE) [7] based framework to secure a database of face templates. This proposed solution can avoid most security risks and preserve the privacy of users. This is because the biometric information captured by the FR system will consist of encrypted data for future matching and identification. It means all the template matching processes will be directly processed in the encrypted domain and the cloud server will only store the encryption data. Therefore, even if the encrypted data is leaked, it cannot be used to recompose someone’s face and identify personal identity alone. Fig 2.17 shows the basics flow of the enrollment and authentication protocols for secure face matching using fully homomorphic encryption. Besides, all the input images used for training and recognition will be deleted after the feature extraction stage.



(a) **Enrollment:** During this phase the user generates the key pair (θ_e, θ_d), encrypts feature vector x with the public key θ_e and transmit the encrypted feature vector $\mathcal{E}(x)$ and the user identity c. The private key θ_d however remains on the client device.



(b) **Authentication:** During this phase, a user seeks to get authenticated, encrypts the probe feature vector y with the public key θ_e an transmits $\mathcal{E}(y)$ to the database along with the claimed identity c'. The database computes the dissimilarity score over encrypted feature and transmits the matching score to the client, where it is decrypted with the private key θ_d.

Figure 2.17 Enrollment and authentication protocols for secure face matching using fully homomorphic encryption. (Vishnu Naresh Boddeti 2018)

2.1.4 Comparison

Table 2.1 shows the comparison between the FR system proposed by Salama AbdELminaam D et al and my proposed FR system.

Table 2.1 Comparison between the FR system proposed by Salama AbdELminaam D et al and my proposed FR system.

Features/Criteria	**FR system (Salama AbdELminaam D et al. 2020)**	**My proposed FR system**
Privacy	Low	High
Security	Low	High
Identify the real person and photo	Cannot	Can
Edge storage	Not Include	Include

2.2 Previous research on Attendance system

In this section, I will study and compare the different attendance systems proposed by various researchers.

2.2.1 Attendance System Applying QR Code

(Nandgopal Devnath et al. 2017) proposed a Smart Attendance System Applying QR Code [8]. The main objective of the project is to develop an QR code-based attendance system with the following advantage:

- Ensure greater security
- Easier maintenance
- Produce results rapidly
- Make data more accurate and efficiency
- User friendly

The main contribution of this project is a QR code generator android app and an android app that take the attendance and generated the attendance report. Hence, the basic flow the system is:

1. Organizers create a subject database.
2. Organizers bind the participant to the subject.
3. Organizers generate QR codes based on the participant's roll code.
4. Participants scan the QR code to sign the attendance.
5. System records the result and generate an attendance sheet.

Among them, the two most significant processes of this proposed system are the QR codes generation process and the QR code scanning process. The organizer can generate the QR code as shown in Fig 2.18.

Figure 2.18 QR code generation (Nandgopal Devnathet al. 2017)

The code "130970101029" means the roll number of the student who has already enrolled in the subject that the organizer created. After the QR code is generated, organizer can show it to the participant. The participant can sign the attendance thought scan the QR code as shown in Fig 2.19.

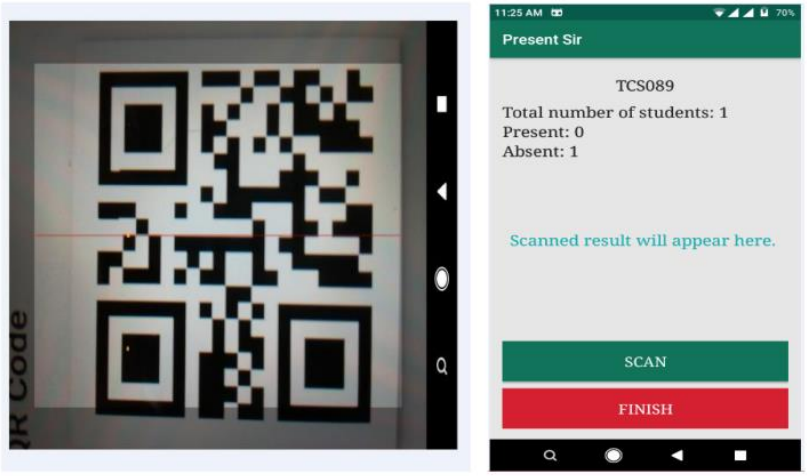


Figure 2.19 Taking Attendance (Nandgopal Devnathet al. 2017)

Compared to the traditional manual attendance system, this QR code-based attendance system is undoubtedly more efficient and user-friendly. But unfortunately, the system still cannot avoid the attendance fraud problem because the QR code cannot use to identify personal identities.

2.2.2 Attendance System Applying GPS

(Mohammad Salah Uddin et al. 2014) proposed a location-based time and attendance system [9]. Beside the attendance record, the system also allow organizer to track the information such as entry time and leaving time of participants. The architecture of the system consists of a mobile application which can get the location of user and a Time and Attendance Management software as shown in Fig 2.20.

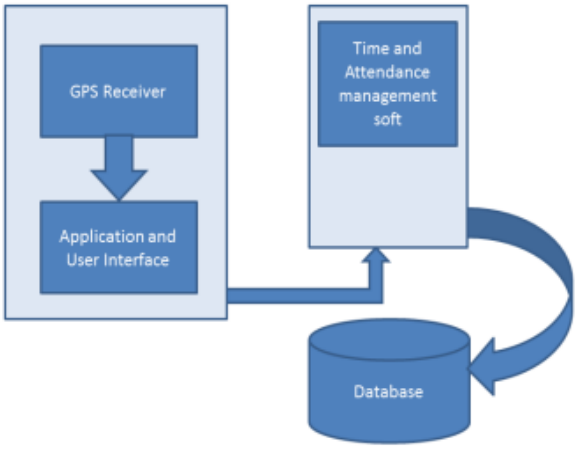


Figure 2.20 Schematic diagram of the proposed location-based time and attendance system. (Mohammad Salah Uddin et al. 2014)

For the mobile application, it includes the GPS receiver and a google map API. The main goal of the application is to detect the current location of user and send the current location and user ID to software's server. Fig 2.21 shows the basic flow of the application.

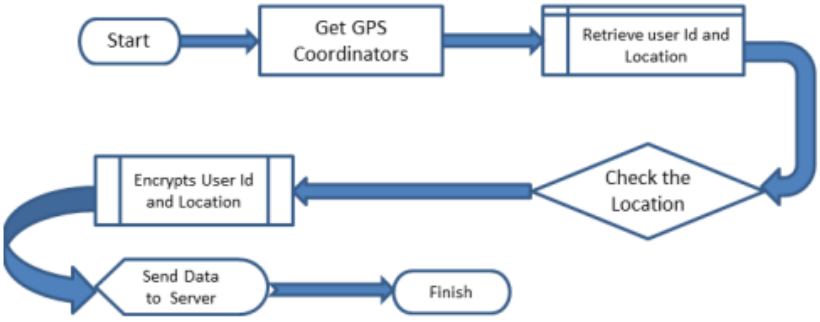


Figure 2.21 Flows of operations for mobile application (Mohammad Salah Uddin et al. 2014)

For the Time and Attendance Management software, it will fetch the user's data to do the further process. The main goal of the software is to compare user's current location with the workspace location that set by the organizer. If the location matching is correct, the system will

directly record the status and current time of the user. Fig 2.22 shows the basic flow of Time and Attendance Management software.

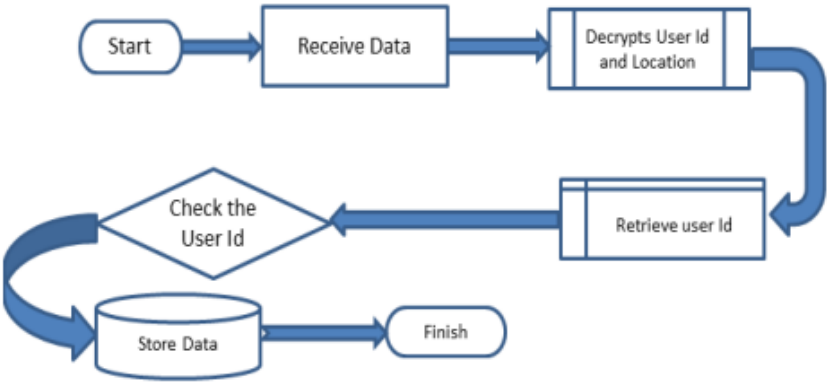


Figure 2.22 Flows of operations for Time and Attendance Management software (Mohammad Salah Uddin et al. 2014)

The location-based attendance system has huge advantages compare with the traditional system in terms of efficiency and cost. In addition, nowadays, GPS receiver has already become standard in mobile phones. Hence, there are nothing technical restrictions and difficulties in development. However, GPS is also very limited in addressing the issue of attendance fraud. This is because relying solely on location positioning, the system can only identify the user's identity through the device's registrant.

2.2.3 Comparison between previous approaches and facial recognition

Table 2.2 shows the comparison between previous approaches and facial recognition:

Table 2.2 Comparison between previous approaches and facial recognition.

	Traditional	**QR code**	**Location**	**Proposed Facial Recognition**
Cost	High	Low	Low	Low
Efficiency	Low	High	High	High
Automation	Not Automated	Semiautomatic	Fully Automated	Semiautomatic
Security Problem	No	No	No	Yes
Privacy Problem	No	No	No	Yes

Authentication	No	No	No	Yes
Time Tracking	No	No	Yes	No

2.2.4 Proposed Solution

Based on the table 2.2, we can observe that each of the approach has their own pons and cons. Hence, the proposed system will allow the user to customize or combine these approaches at will. Since difference organization requires different requirements of the attendance system, this proposed solution will bring great flexibility to users and maintenance will be more convenient. Whether it is the simplest “click yes” attendance or two factor attendance (facial recognition with location etc.), users can switch and customize the model at will.

Chapter 3

System Methodology/Approach OR System Model

In this chapter, the details about the system design will be discussed. Besides, the project methodology, tool used, verification plan and the timeline will also be discussed.

3.1 Design Specification

3.1.1 Project Methodology

In this project, I will use extreme programming (XP) [10] to develop the system. This is because this project does not have a professional and large-scale development team (1 person only), so using extreme programming can quickly make changes to the system and refactor. Extreme programming is one of the frameworks of agile software development, it is focused on the adaptability of the development rather than rigorous planning and predictability. In addition, extreme programming can also reduce the cost of documentation, the developer only needs to focus on coding. The most important thing is that extreme programming allows developers to better control the details of the system and better manage development time and release time. Fig 4.1 shows the basic cycle of the extreme programming process (XP).

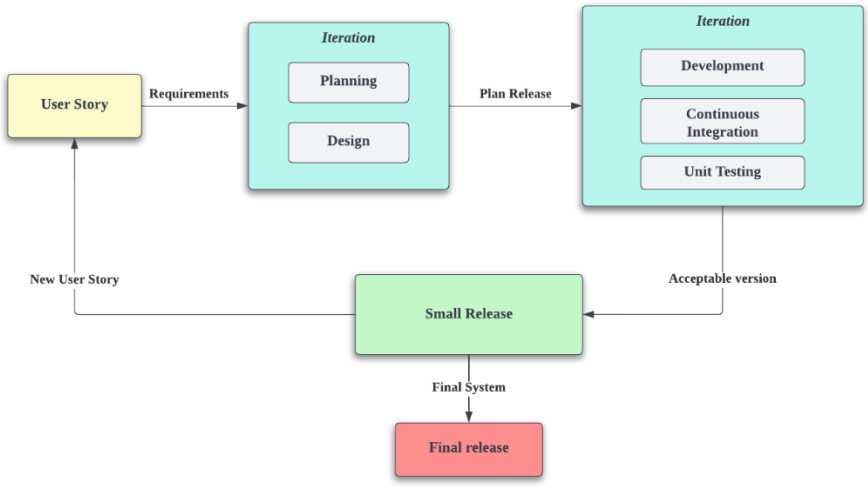


Figure 3.1 The extreme programming Lifecycle.

3.2 System Design Diagram

In this section, the system design diagram of the proposed system will be presented. The diagrams include a system architecture diagram and a use case diagram of each module of the whole system.

3.2.1 System Architecture Diagram

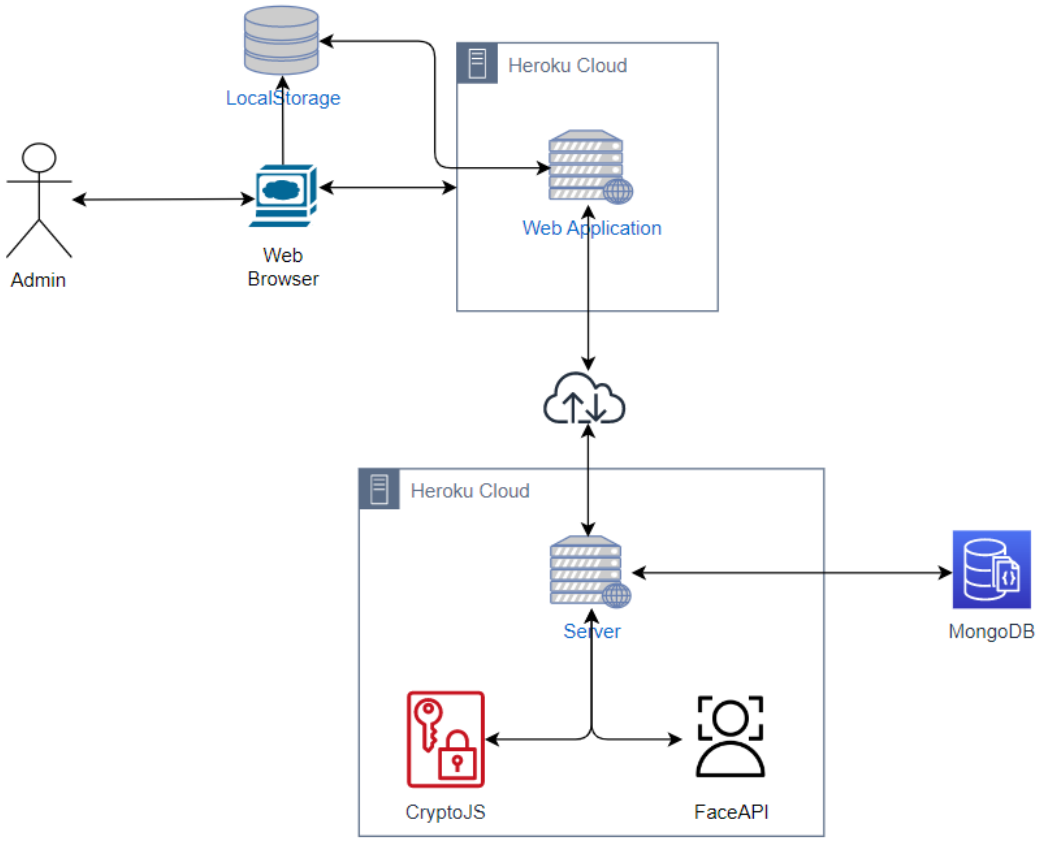


Figure 3.2 System Architecture Diagram of the proposed system (Web Application)

The above figure shows the System Architecture Diagram of the proposed system of the web application version. For the web application of SEATS, I used React framework to build the frontend architecture of the system. For the temporary storage technology, I used local Storage to store the token and id of the current admin account to implement the authentication function. This module is only designed for the admin who wants to use a smart event management tool to manage his/her event's participant attendance.

For the server side, I use NodeJS to set up the server and API to provide the basic services for the web application and the Android application. Besides, I use MongoDB as the central database for the whole system. In the architecture of the proposed system, MongoDB is connected to the server side and all data interaction will be done on the server side. Therefore, it will greatly improve the consistency and concealment of the entire system.

The following architecture diagram will present the fundamental architecture of the Android-based application of the proposed system.

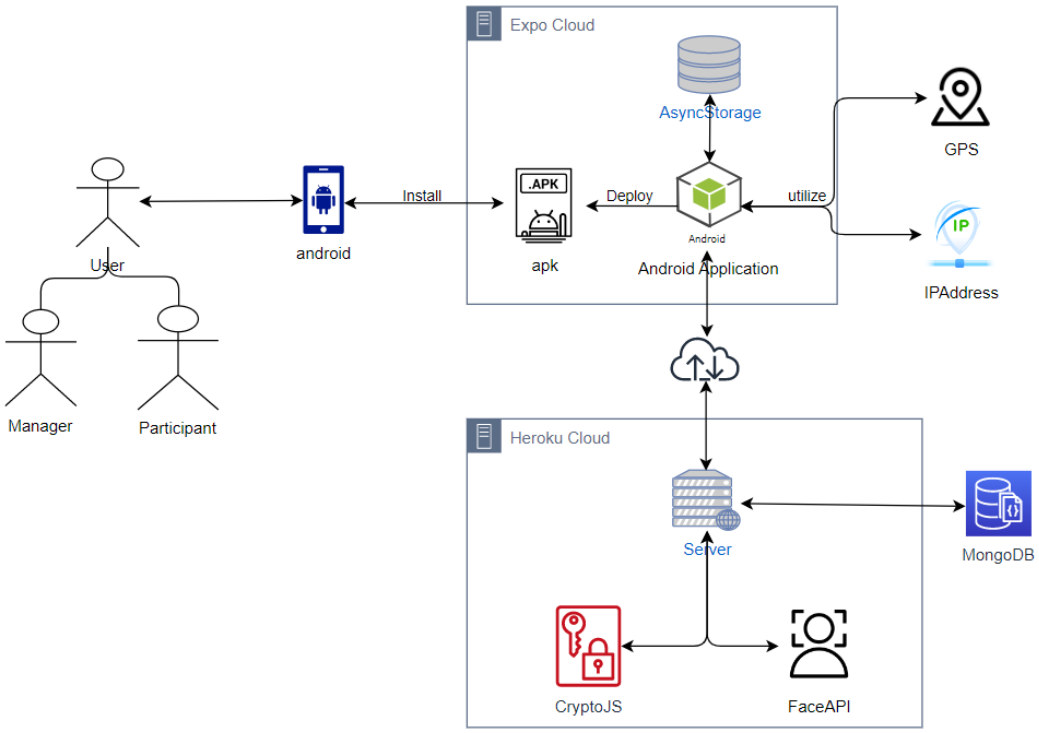


Figure 3.3 System Architecture Diagram of the proposed system (Android Application)

The above figure shows the System Architecture Diagram of the proposed system of the android application version. For the android-based application of SEATS, I used React Native framework to build the frontend architecture of the system. For the temporary storage technology, I used AsyncStorage to store the id of the current account to implement the authentication function. This module is only designed for the manager and participant.

For the server side, the Android-based application and web application will share the same server. Since the Android-based application includes the location and IP Address verification

module. I used the expo-location library to retrieve the device's latitude and longitude from the GPS system. Besides, I also used an external API to retrieve the device's network Ip address.

3.2.2 Use Case Diagram and Description

In this section, the use case diagram of the whole system will be presented. The system consists of 2 platforms version such as web application and an Android application. The web application will only allow the admin to create an account and access the functions. On the other hand, the Android application will only allow managers and participants to create accounts and access the functions.

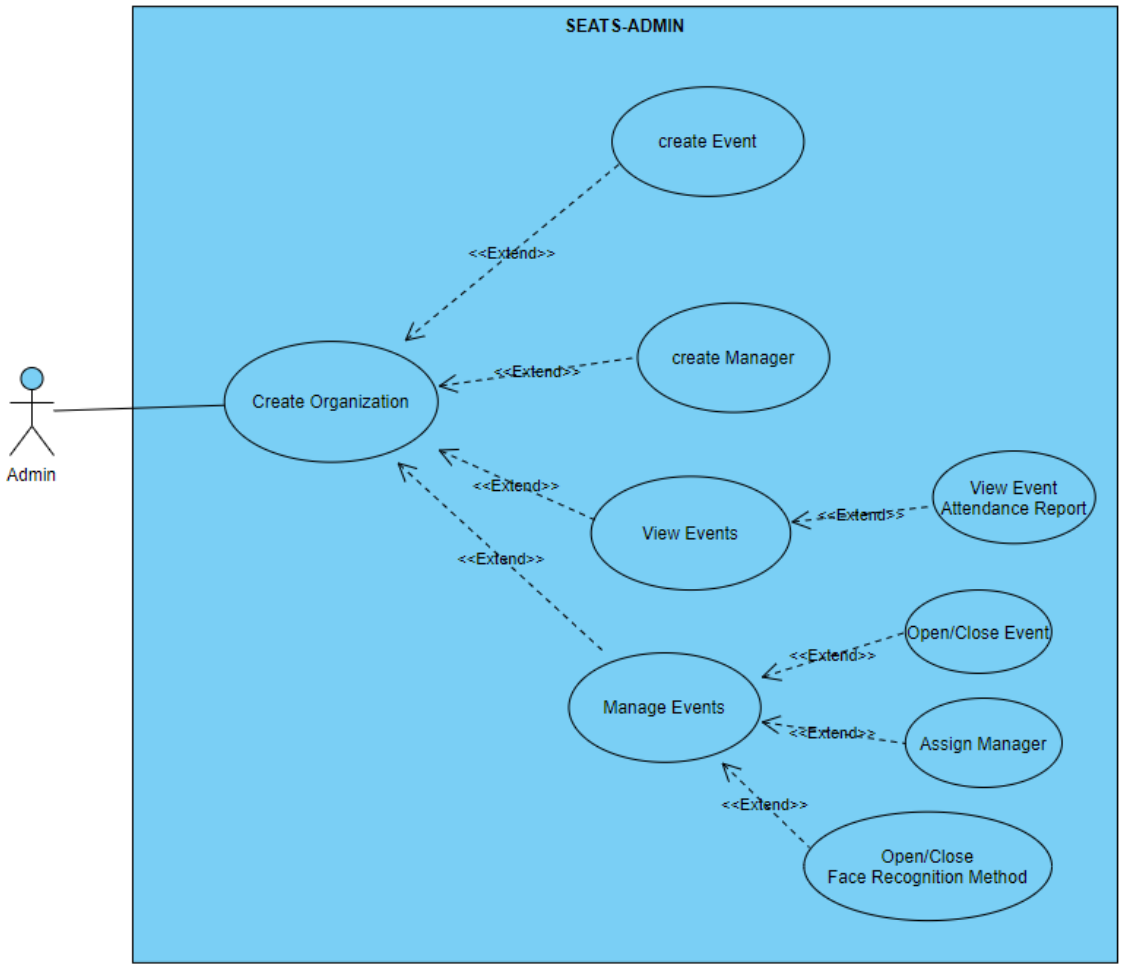


Figure 3.4 Use Case diagram – Admin Roles (web side)

Figure 3.3 shows the use case diagram of the admin in the web application of the proposed system. In this module, the admin can create many of the organizations for an account. Inside each organization, the admin can create many events. Besides, the admin can also view the existing event of the organization on the web-based platform. Furthermore, the admin can also manage the events such as closing the event and managing the managers in the event. For the attendance sign-in method, the admin can set/edit the method at any time. The default method should be QR Code-based attendance, the admin can always open or close the face recognition method. After the participant finishes the attendance sign-in step, the admin can also export/view the attendance report of the event.

For the manager management module, the admin can create many of the managers accounts in the organization. Besides, the admin can also view the existing managers of the organization on the web-based platform. Lastly, the admin can also assign the manager to the event.
Moreover, the use case diagram of the attendance management module and participant management module will be presented in the following section.

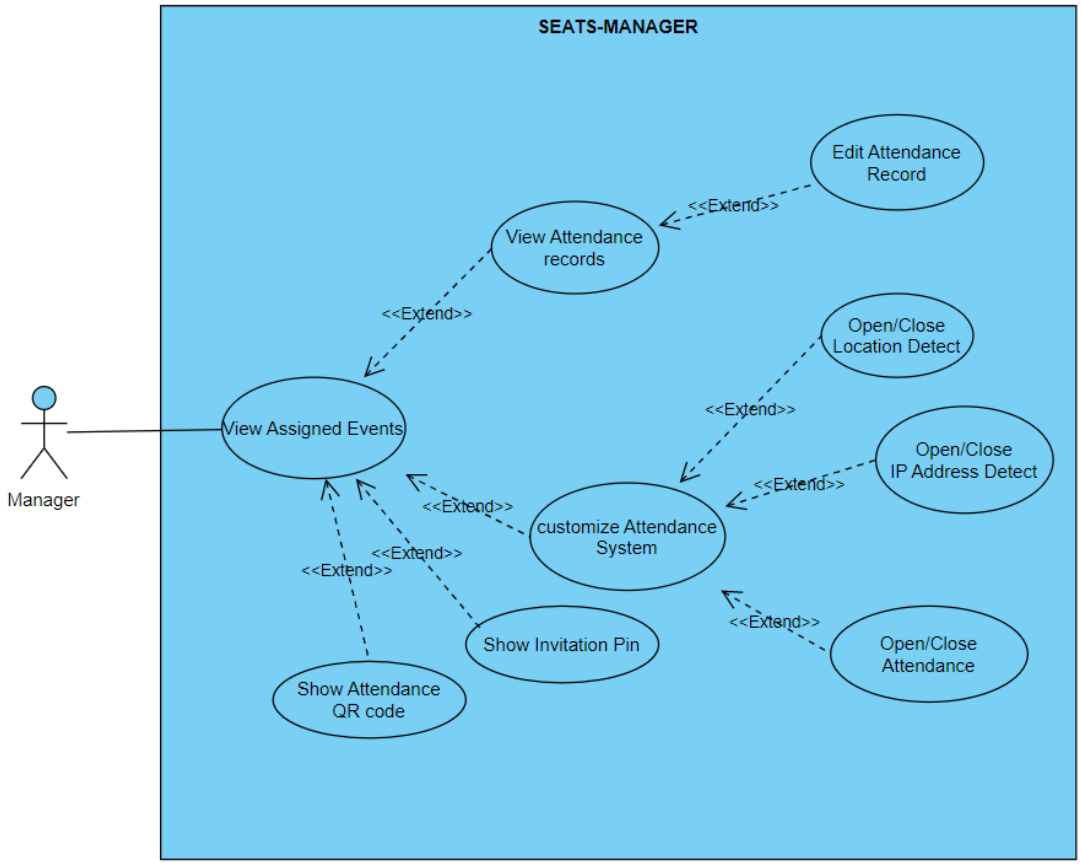


Figure 3.5 Use Case diagram – Manager Roles (Android side)

Figure 3.4 shows the use case diagram of the manager in the Android application. Since the manager account should only be created and assigned by the admin, the manager should only allow viewing the assigned events on the application dashboard. After the manager accesses the events, the attendance records of each participant will be presented.

Inside the event panel, the manager can edit the attendance record at any time. Furthermore, the manager can also be able to show the invitation pin of the event and the QR code of the attendance to the participant. For the attendance system of the event, the manager has permission to open or close the event. Once the manager closes the event, it means the participant will not be able to access the event anymore. Besides, the manager can set the Ip address verification and location verification method.

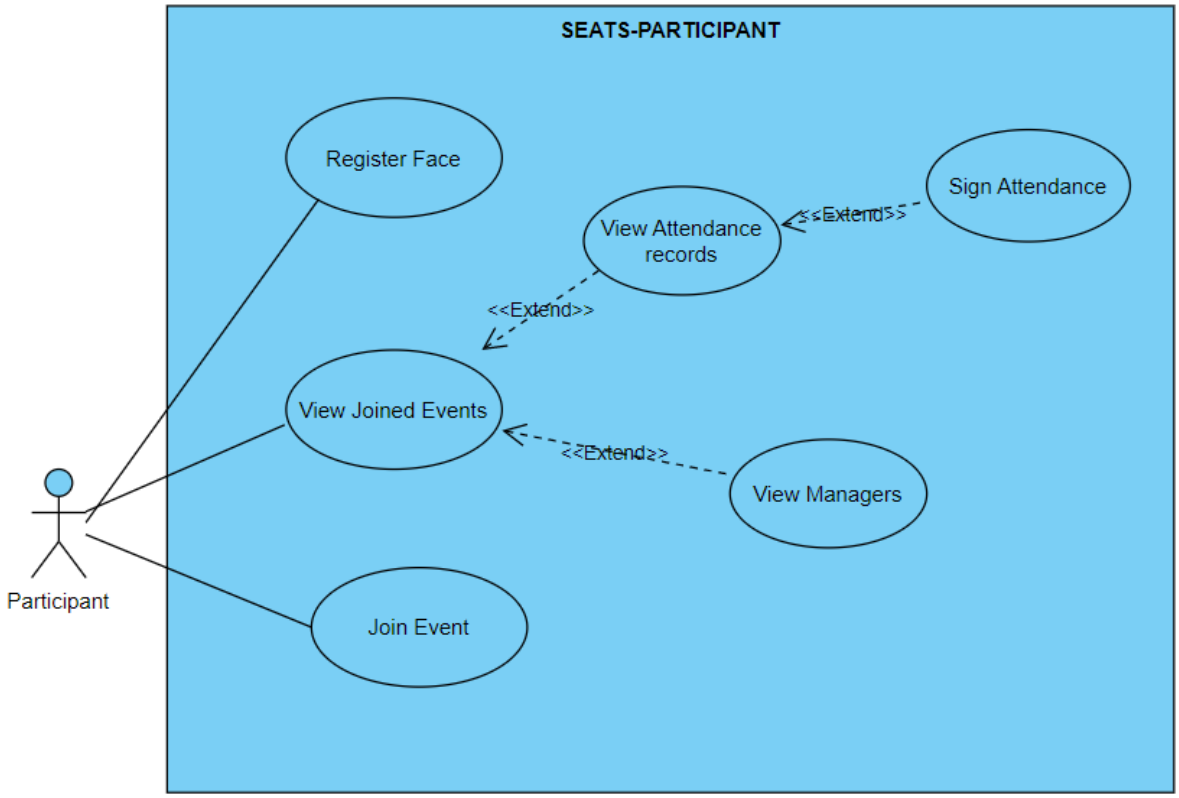


Figure 3.6 Use Case diagram – Participant Roles (Android side)

Figure 3.5 shows the use case diagram of the participant in the Android application. First, the participant can join the event by key in the invitation Pin that provide by the manager or admin. After the user joined the event, they can view the joined events on the application dashboard. Besides, the participant should be allowed to access into the open event and view the attendance status and manager list of the event.

In addition, attendees can sign attendance through the settings set by the event manager. The key method should include QR Code verification and face recognition. Besides the key method, the manager can also set the dependency method such as location verification or Ip address verification. On the profile page, the participant should be able to register the face with a secret key for use in the face recognition module.

Chapter 4

System Design

4.1 System Overview

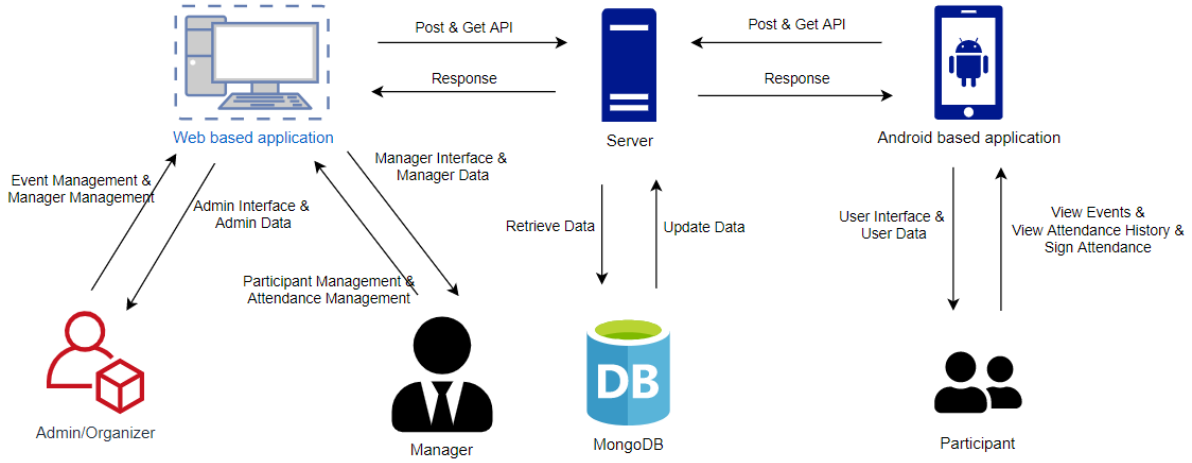


Figure 4.1 System overview diagram

The figure 4.1 shows the system overview of the proposed system. Based on the system overview diagram, it shows the proposed system consists of 4 important parts of the component which are a web-based application, an android-based application, a server, and a database.

The database is responsible to store all the system data such as the organization's data, event data, user's data, and the face model BSON file. The server is responsible for all the API routers for the operation of the proposed system. Besides, the server is also responsible to retrieve the data from the database. Moreover, the web-based application consists of four modules which are the event management, manager management, attendance management, and the participant management. Event management and manager management is only can be accessed by the admin. On the other hand, attendance management, and participant management is only can be accessed by the manager. Besides, the android-based application is mainly designed for the participants. The application allows the participant to join the event through the shared invitation pin set by the organizer. Participants can also sign the attendance with various methods such as face-recognition, QR Code, Location detection, and IP address detection once the event is open.

4.2 System Flow Chart

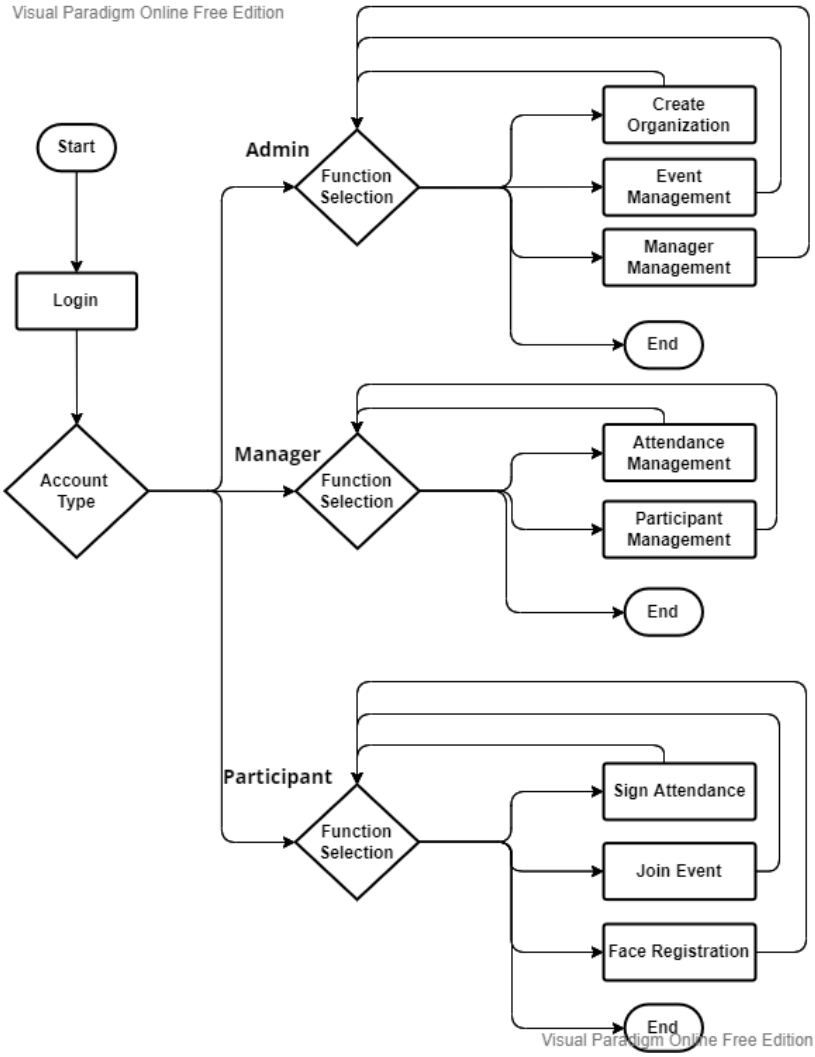


Figure 4.2 Flow Chart of the whole system

Fig 3.2.2 shows the flow chart of the whole proposed system. Based on the flow chart, the flow of the proposed system can be understood easily. No matter what account type, the user requires to log in to the system before using the function of the system. Once the user logs in to the system, the system will display the represented interface and user data based on the account type.

The admin will be able to access 3 modules which are organization creation, event management, and manager management. Besides, the manager will be able to access 2 modules which are attendance management and participant management. Lastly, the participant will be able to access 3 modules which are join event, sign attendance and face registration.

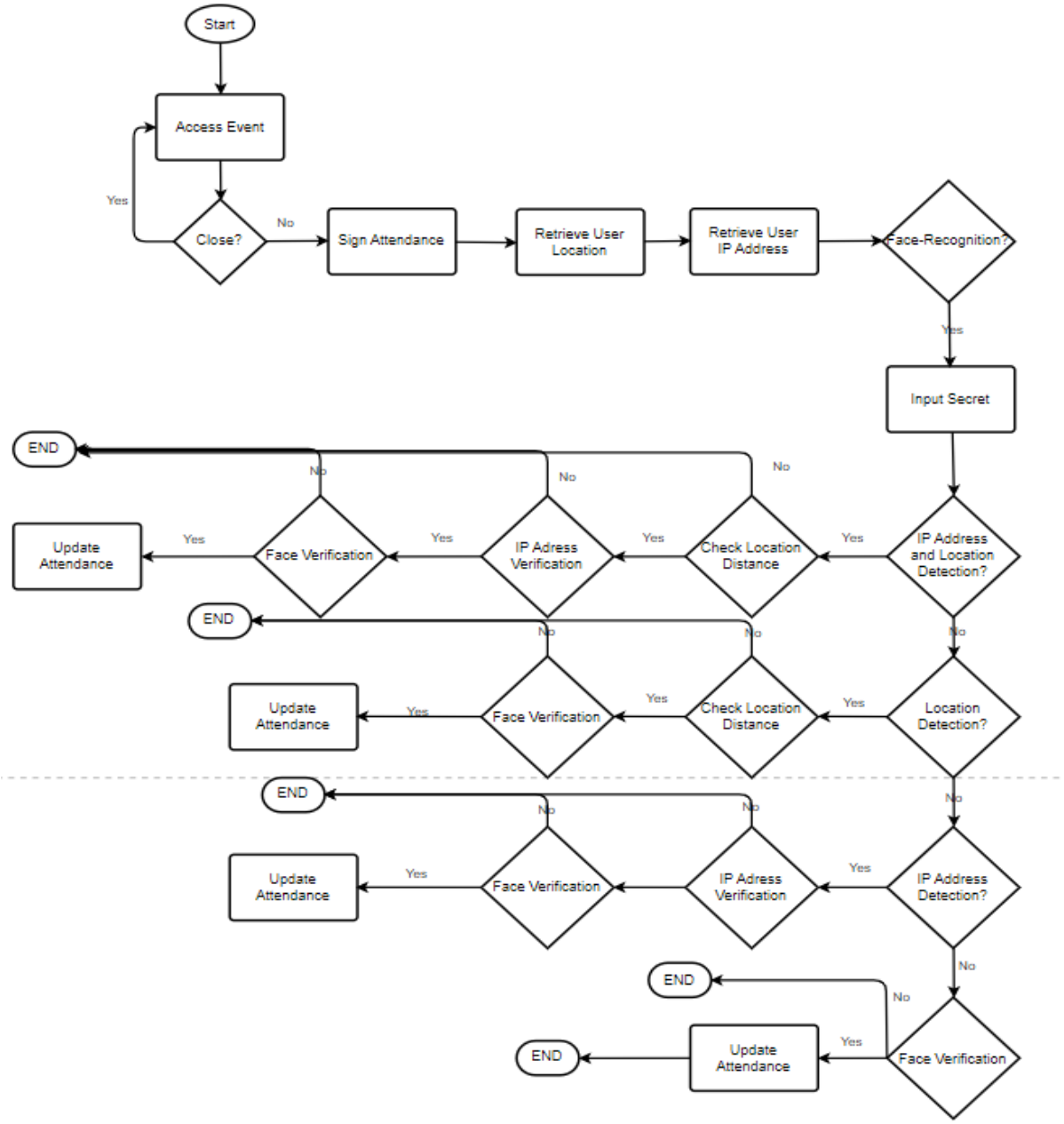


Figure 4.3 Flow Chart – Sign Attendance (Face Recognition)

Figure 4.3 shows the flow chart about how the participant signs the attendance with face recognition method. First, the participant needs to access the available event. After access to the event, the participant can sign the attendance based on the method set by the manager. In this case of flow chart, the sign-in method is facing recognition method.

After the participant press the sign in button, the system will retrieve the current latitude and longitude of the device and IP address of the device connected network. If the device does not provide the permission to the application, the system will keep loading until terminate the

process. After the system record the device latitude and longitude, the system will ask user to key in the secret key of user's face. After the user key in the secret key, the system will check the location or IP address conditions based on the setting of attendance. If the attendance required location verification, the participant device's location must within 200 meters of the location of the manager device. Similarly, if the attendance required IP address verification, the participant device must connect to the same network as the manager device.

After the participant fulfils the conditions of the attendance, the face verification process will eventually proceed. If the face verification returns a successful message, the system will update the attendance status to "Attend". Otherwise, the system will remain the status and prompt the error message to the participant.

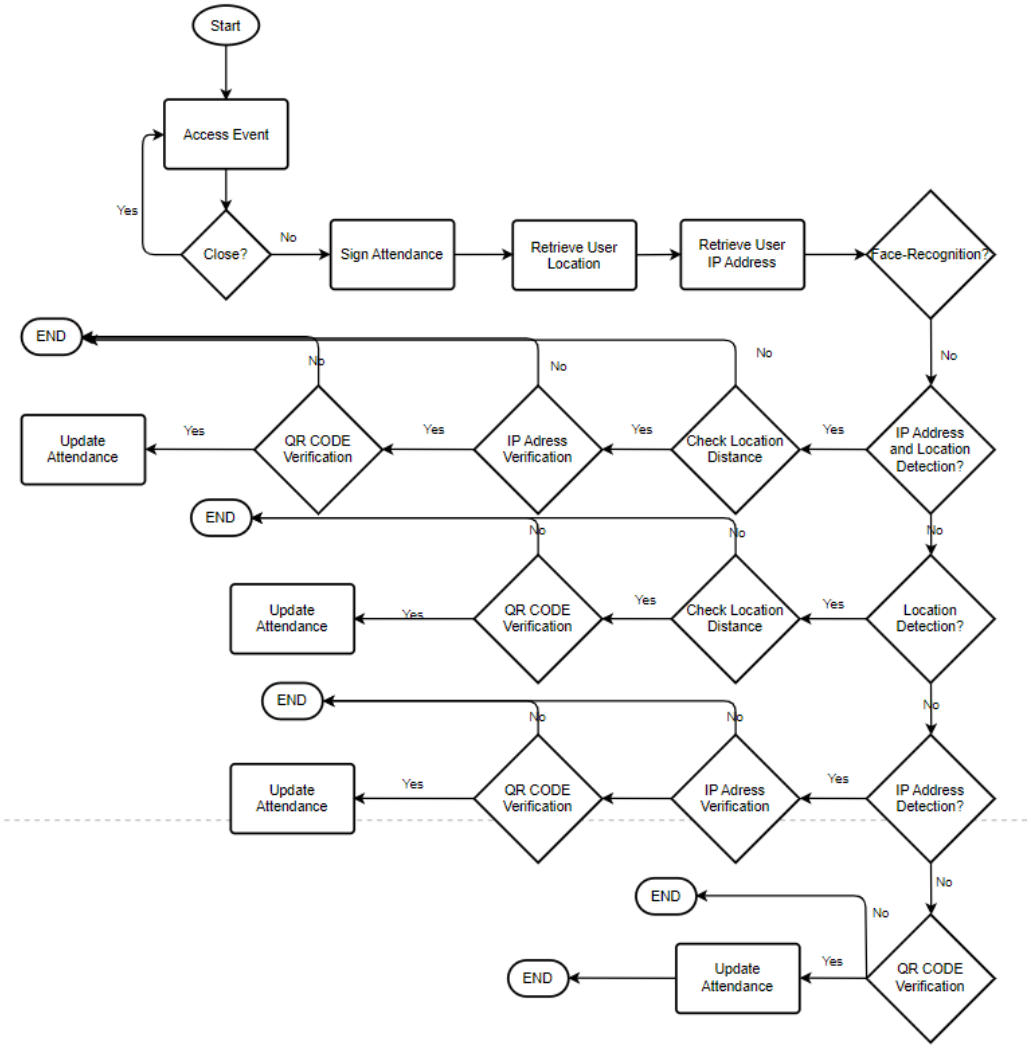


Figure 4.4 Flow Chart – Sign Attendance (QR Code)

Figure 4.3 shows the flow chart about how the participant signs the attendance with the QR Code verification method. The remaining process is the same as the face recognition method. The difference between these two methods is the QR Code does not require any pre-requirement such as face registration and secret key imputation.

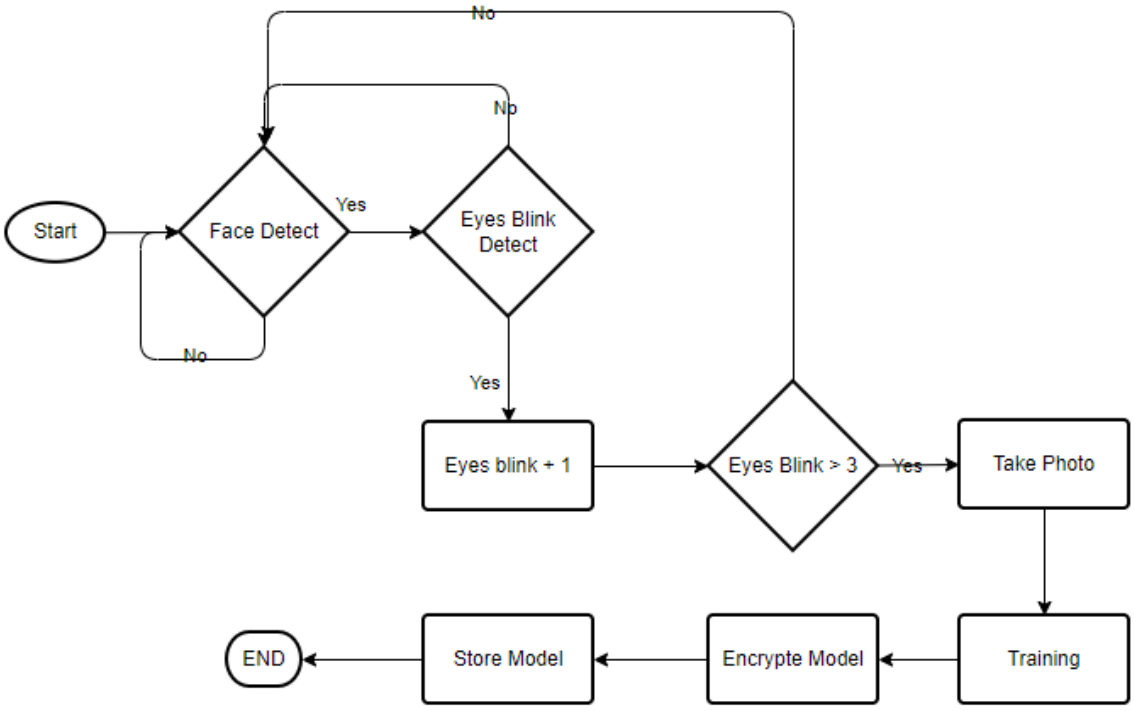


Figure 4.5 Flow Chart – Face Registration

Figure 4.5 shows the flow chart of the face registration module. First, the system will detect the face with the camera. Once the system detects the face exist, it will detect if there are any eye blink action. After the participant blinks three times, the system will continuously take the user's face photo. During the system collecting user photos, if the user's face leaves the camera, the system will stop collecting photos and return to the face detection process. After collecting enough photos, the system will train the photos and generate a face model of the user. Lastly, the system will encrypt the model and store it to the database. Except for the last stored process, all other processes are performed on the client side.

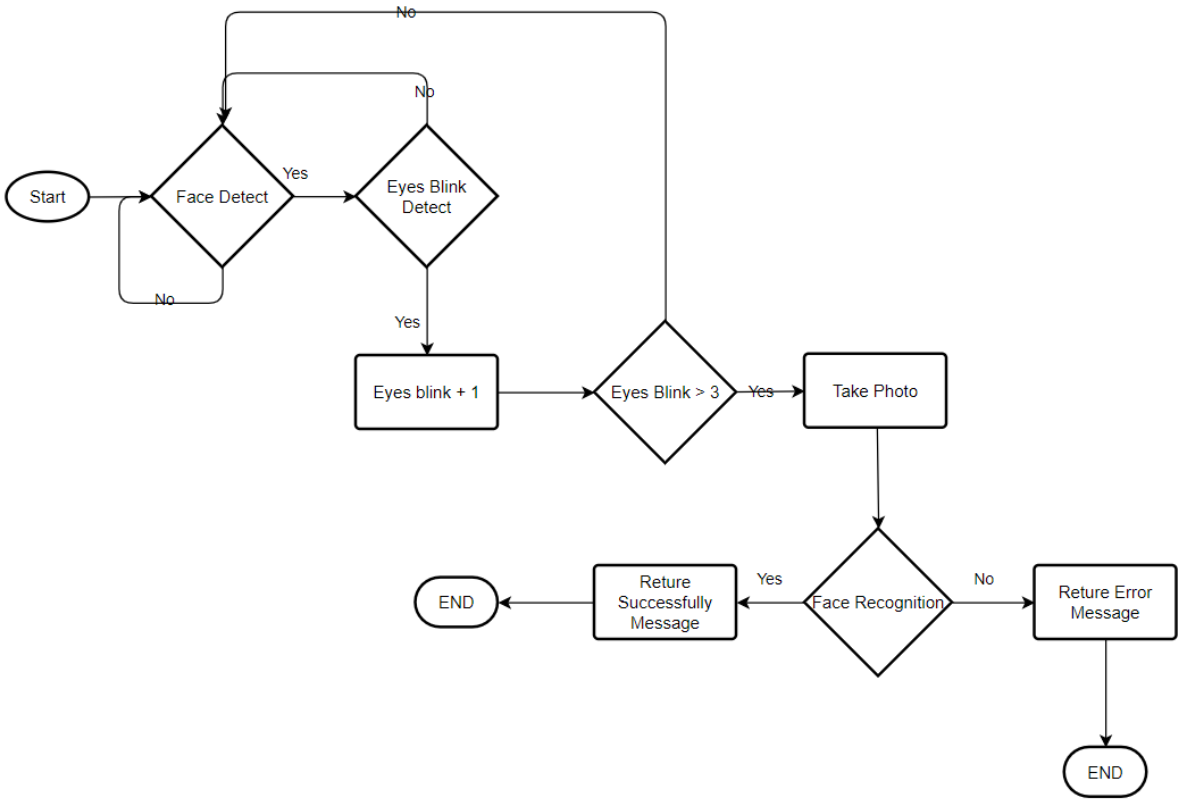


Figure 4.6 Flow Chart – Face Recognition

Figure 4.6 shows the flow chart of the face recognition module. The beginning step of face recognition is same as the face registration. After the system take the photo of the participant, the client will post the data to the server and proceed with the face recognition function.

First, the system will retrieve the face model file from the database and use the secret key participant input before decrypting it. After that, the system will verify the face based on the registered face model and find the best matcher face matric. If the matcher score is less than 0.6, the server will return the successful message. Otherwise, the system will return an error message.

4.3 Face Verification Module Implementation

In this section, the face verification module implementation step and pseudocode of face registration and face recognition will be presented.

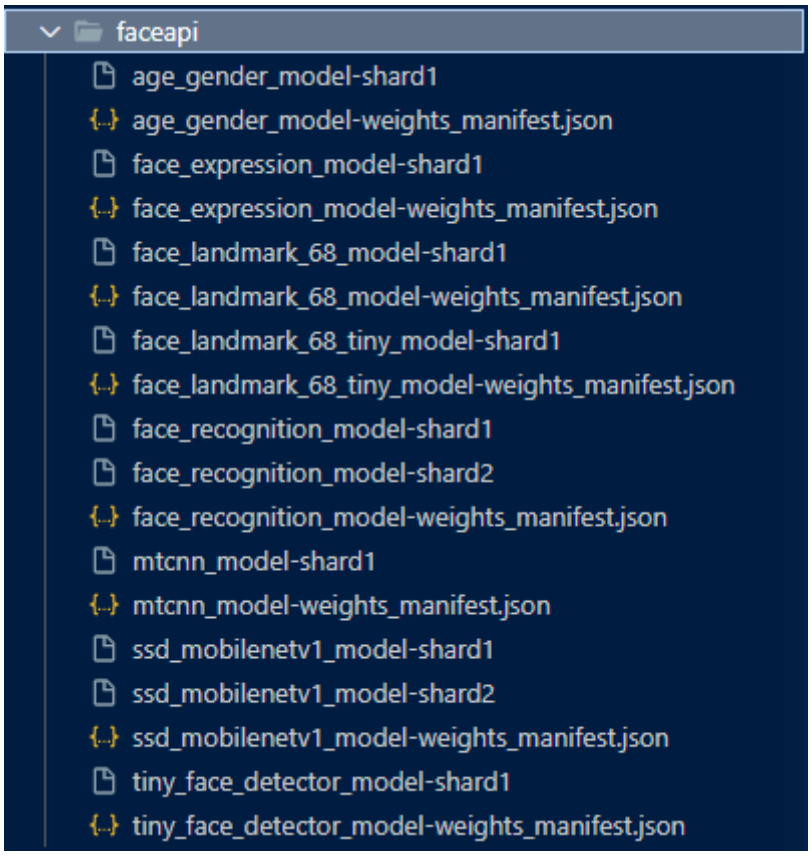


Figure 4.7 Pre-trained Model of the face api

```
const MODEL_URL = `${__dirname}/../../faceapi/`;

Promise.all([
  faceapi.nets.faceRecognitionNet.loadFromDisk(MODEL_URL),
  faceapi.nets.faceLandmark68Net.loadFromDisk(MODEL_URL),
  faceapi.nets.ssdMobilenetv1.loadFromDisk(MODEL_URL),
]).then(console.log("models loaded"));
```

Figure 4.8 Pre-configuration of the server

To improve the accuracy and speed up the training process, the face registration module of the proposed system is used the pre-trained model to recognize the landmark of the face and label it. Hence, before the server start running, the server will first load the pre-trained model. The figure 4.8 shows the pre-configuration code.

For the face registration function design in the server, the faceapi, cryptoJS, canvas, mongoose and nodejs will be used.

The following section will present about the pseudocode of the face registration function.

```
FUNCTION registerFace(request, response, next):
// Extract necessary data from request body
imageDataArray = request.body.imageURIs
user_id = request.body.user_id
secret = request.body.secret
TRY:
    // Convert base64 image data to ImageData
    imageDatas = []
    FOR EACH imageData in imageDataArray:
        image = loadImage(Buffer.from(imageData, "base64"))
        canvas = createCanvas(image.width, image.height)
        context = canvas.getContext("2d")
        context.drawImage(image, 0, 0, image.width, image.height)
        imageDatas.append(canvas)

    // Train the face recognition model on the images
    labeledDescriptors = []
    FOR EACH imageData in imageDatas.slice(0, -1):
        detections = faceapi.detectSingleFace(imageData).withFaceLandmarks().withFaceDescriptor()
        descriptor = detections.descriptor
        labeledDescriptor = new faceapi.LabeledFaceDescriptors(user_id, [descriptor])
        labeledDescriptors.append(labeledDescriptor)

    faceMatcher = new faceapi.FaceMatcher(labeledDescriptors)

    // Encrypte the face model
    encryptedModel = encryptModel(faceMatcher, secret)

    // Store the model to MongoDB
    updatedUser = schema.Users.findByIdAndUpdate(user_id, { faceModel: encryptedModel }, { new: true })

    // Send response with the updated user object
    response.status(200).json({
        success: 1,
        message: "Face registered successfully",
        data: updatedUser,
    })
CATCH error:
    PRINT error
    response.status(201).json({
        success: 0,
        message: "Fail to register the face"
    })
ENDTRY
ENDFUNCTION
```

Figure 4.9 Pseudocode of face registration function

Figure 4.9 shows the pseudocode of the face registration function. The input requirement is mentioned as follows:

- imageURIs: an array of base64-encoded image data.
- user_id: the ID of the user whose face is being registered.
- secret: the secret key used to encrypt the face recognition model.

The flow of the function will be presented as follows:

1. Convert base64 image data to ImageData for each image in imageURIs.
2. For each image, detect a single face, retrieve the face landmarks and descriptor, and label the descriptor with the user ID.
3. Train the face recognition model using the labeled descriptors.
4. Test the model on the last image and find the best match for the user ID.
5. Encrypt the face recognition model using the secret key.
6. Update the user object in the database with the encrypted face recognition model.
7. Return a response with the success status, message, and updated user face model.

The output response is shows as follows:

- success: a boolean indicating whether the face registration was successful.
- message: successful message
- data: the model of the user face

The following section will present about the pseudocode of the face recognition function.

```
recognizeFace(request, response, next):
  faceImage = request.body.faceImage
  userId = request.body.userId
  secret = request.body.secret

  try:
    # Retrieve the face model from MongoDB based on the user ID
    user = schema.Users.findById(userId)
    encryptedModel = user.faceModel
    if encryptedModel is null:
      response.status(400).json({
        success: 0,
        message: "No face model found for the provided user ID",
      })
      return

    buffer = Buffer.from(encryptedModel, "utf-8")
    originalData = buffer.toString("utf-8")
    # Process the face image
    decryptModel(originalData, secret).then(async result => {
      if result != false:
        image = loadImage(Buffer.from(faceImage, "base64"))
        canvas = createCanvas(image.width, image.height)
        context = canvas.getContext("2d")
        context.drawImage(image, 0, 0, image.width, image.height)
        detections = faceapi
          .detectSingleFace(canvas)
          .withFaceLandmarks()
          .withFaceDescriptor()
        descriptor = detections.descriptor

        # Match the face descriptor to a known user ID
        match = result.findBestMatch(descriptor)

        response.status(200).json({
          success: 1,
          message: "Face recognition successful",
          data: match.toString(),
        })
      else:
        response.status(500).json({
          success: 0,
          message: "Failed to recognize the face"
        })

    })

  except error:
    console.log(error)
    response.status(500).json({
      success: 0,
      message: "Failed to recognize the face",
      error: error.message,
})
ENDTRY
ENDFUNCTION
```

Figure 4.10 Pseudocode of face recognition function

Figure 4.10 shows the pseudocode of the face recognition function. The input requirement is mentioned as follows:

- faceImage: base64-encoded image data of the face to be recognized.
- user_id: the ID of the user whose face is being recognized.
- secret: the secret key used to decrypt the face recognition model.

The faceImage is the image data which is base64-encoded type. The image will be handled by the client side to ensure the image data can handling by the canvas. The user_id will be used to find the user instance from the MongoDB collection for storing the registered face model. Lastly, the secret key will be used to decrypt the face model.

The flow of the function will be presented as follows:

1. Retrieve the encrypted face recognition model from the database based on the user ID.
2. Decrypt the face recognition model using the secret key.
3. Process the input face image, detect a single face, retrieve the face landmarks and descriptor.
4. Match the face descriptor to the decrypted face recognition model to identify the best match.
5. Return a response with the success status, message, and the best match represented as a string.

The output response is shows as follows:

- success: a boolean indicating whether the face recognition was successful.
    - message: successful message
- data: the best match for the recognized face, represented as a string

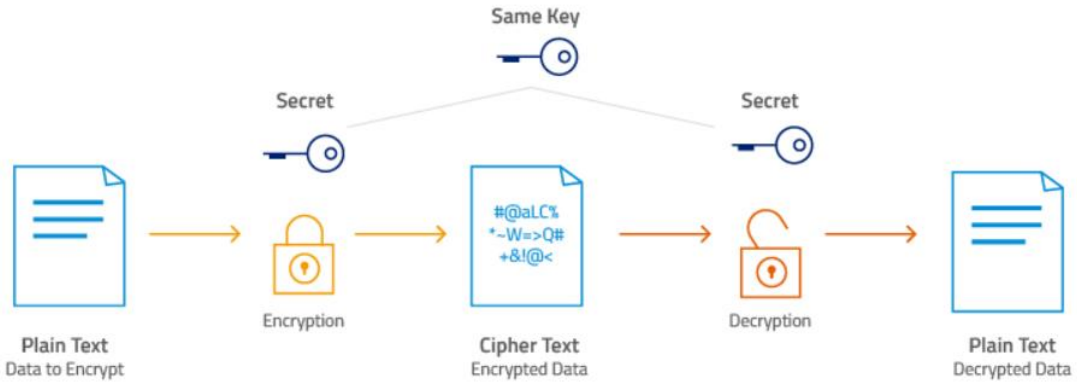


Figure 4.11 AES Encryption/Decryption Process

Figure 4.11 shows the encryption process and decryption process of the cryptoJS technology. This technology used the AES method to protect user privacy by encrypting the face model

(plain text) with the user's secret key. It means the encrypted face model will only be able to be decrypted by the user himself.

4.4 UML Component Diagram – Backend of the whole system

The server of this proposed system is a key component which controls the fundamental operation of the system such as CRUD operation with database, data handling and functions interaction. Hence, all the functions are packaged as API and collected through the server router for client-side system access. In this section, the backend services of the whole system will be presented as the component diagram paradigm.

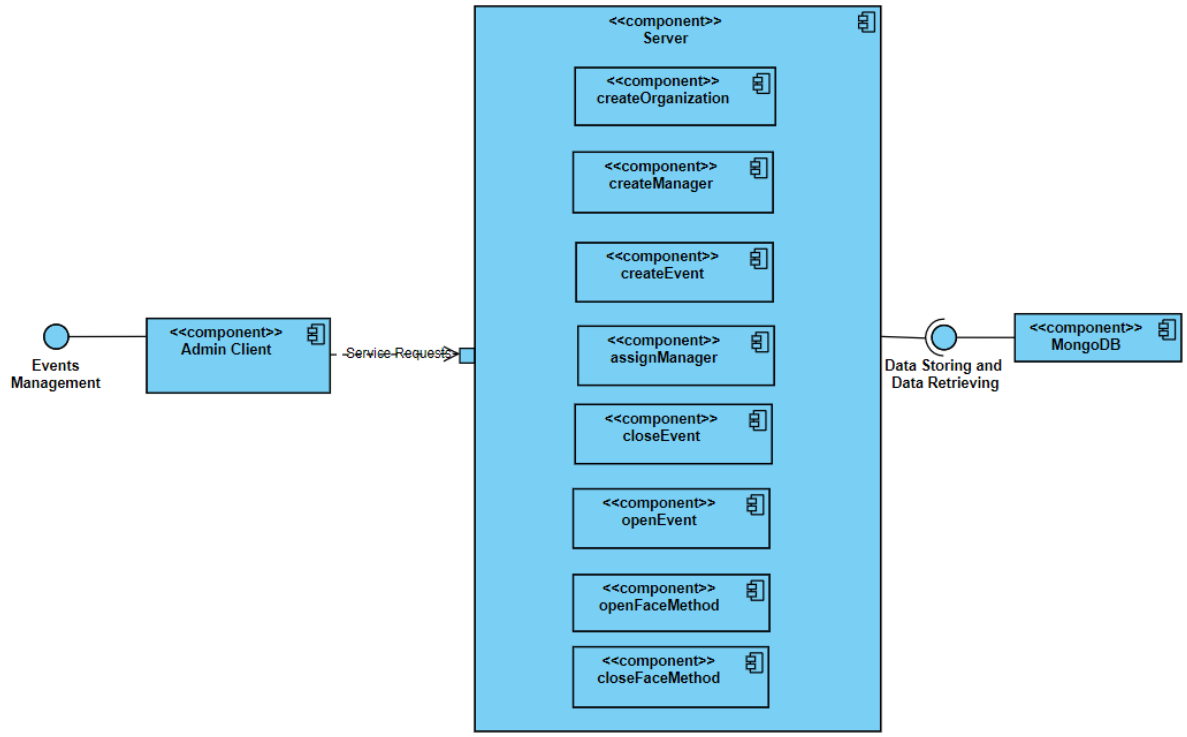


Figure 4.12 Component Diagram of admin client

Figure 4.12 shows the Component Diagram of admin client. The admin client's data modification and interaction with the entire system are represented in the diagram above, including creating organizations, creating managers, creating events, assigning managers, opening or closing events, and enabling or disabling facial recognition methods.

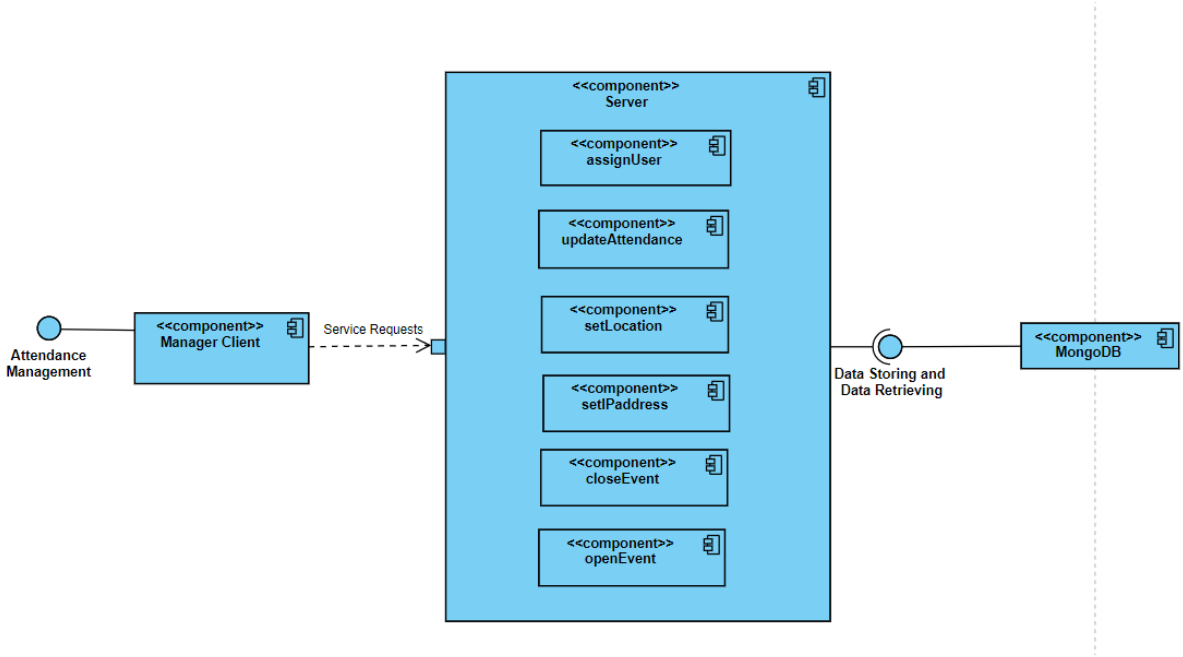


Figure 4.13 Component Diagram of manager client

Figure 4.13 shows the Component Diagram of Manager client. The manager client's data modification and interaction with the entire system are represented in the diagram above, including assigning user, update attendance status, set location, set IP Address, and opening or closing events.

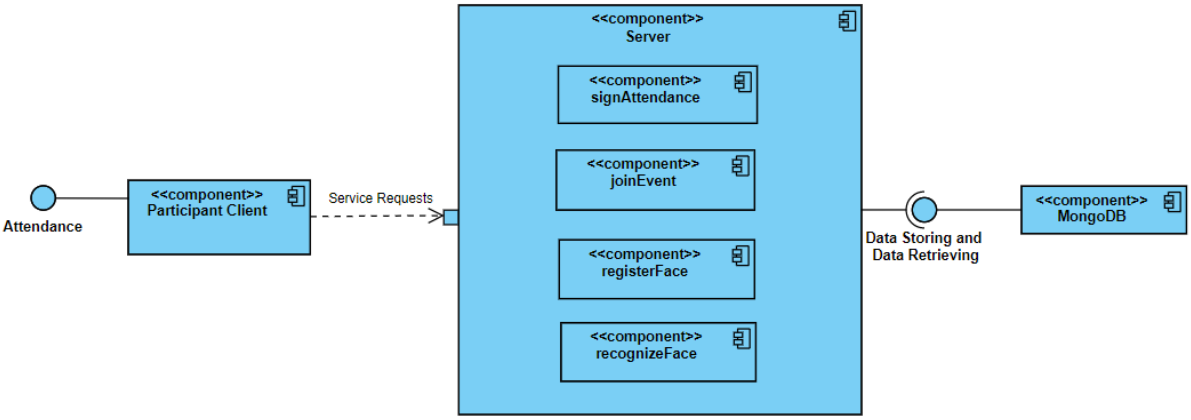


Figure 4.14 Component Diagram of admin client

Figure 4.14 shows the Component Diagram of Participant client. The participant client's data modification and interaction with the entire system are represented in the diagram above,

including sign attendance, join event with invitation pin, register face model, and recognition the face.

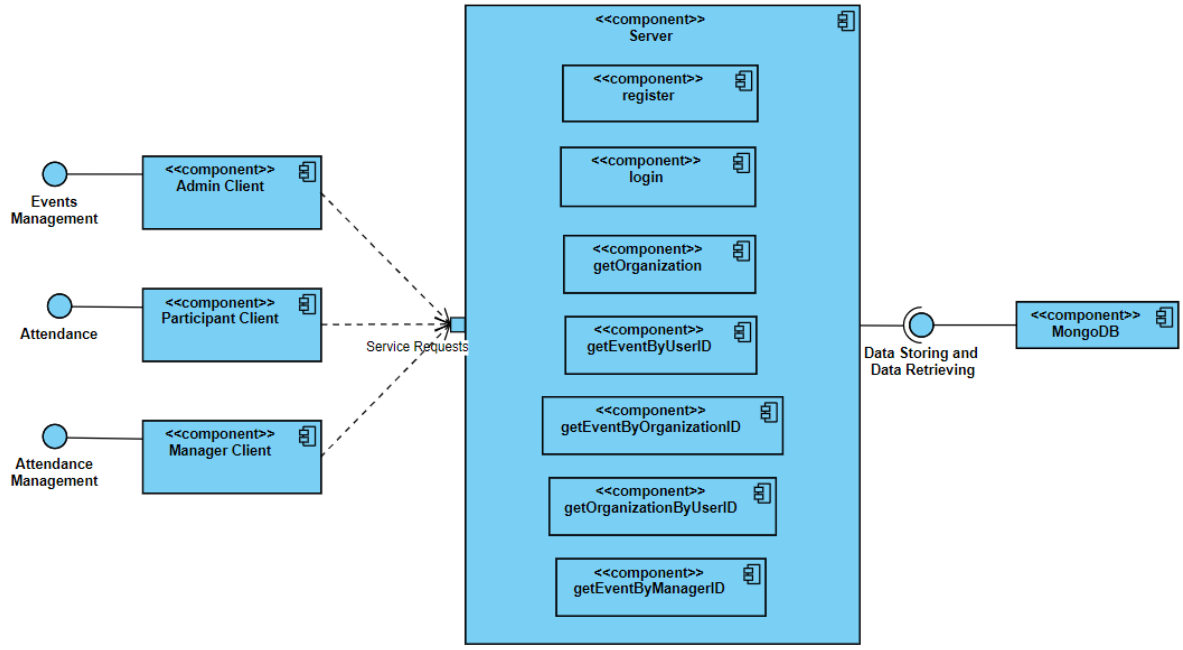


Figure 4.15 Component Diagram of the common services

Figure 4.15 shows the Component Diagram of the common services. The services that allow the whole system to get or fetch the system data are represented in the diagram above, including registering an account, login existing account, getting organization by admin id, getting organization by user id, getting event by user id, getting event by organization id, and get event by manager id.

4.5 No-SQL Database Diagram

This section will present about the database design of the proposed system.

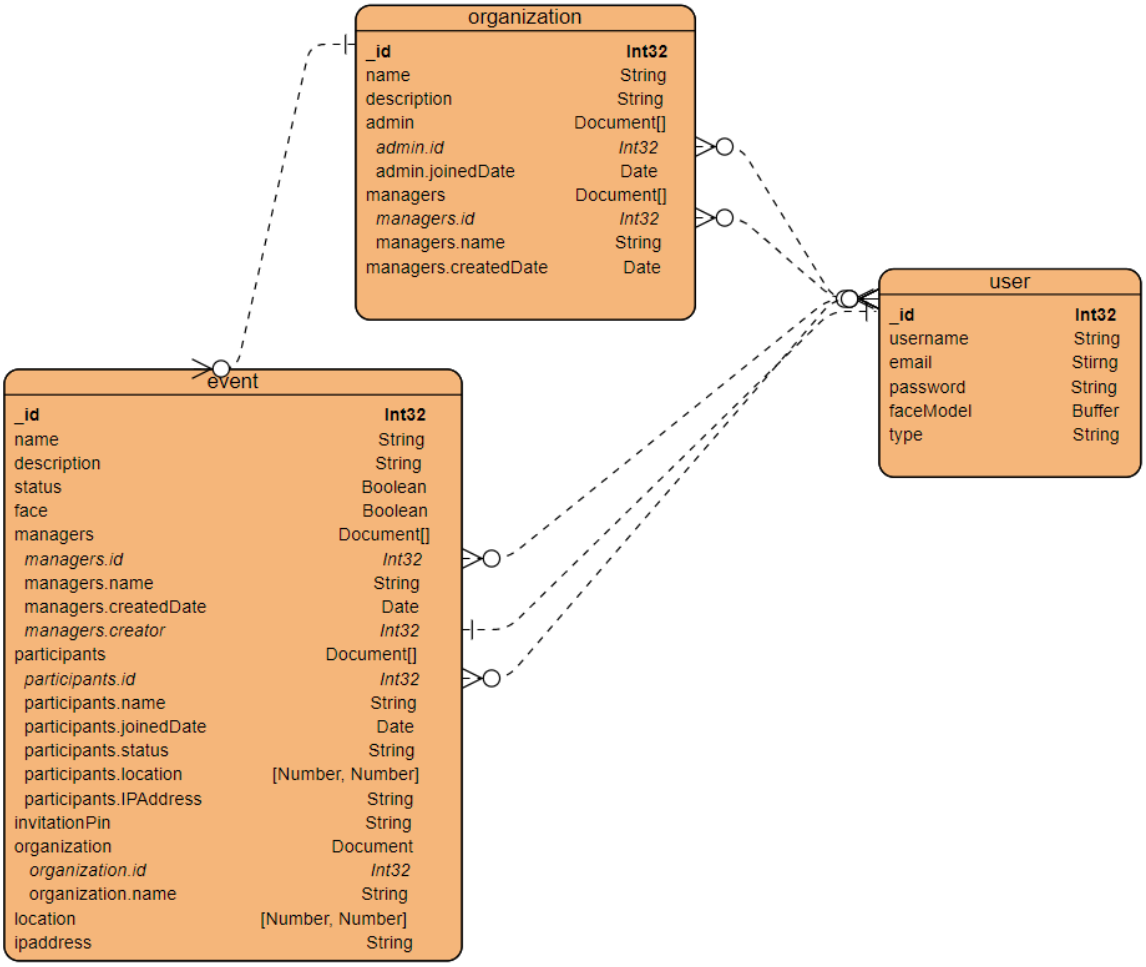


Figure 4.16 Database design of the whole system

For the database design, the system used MongoDB as the central data storage. MongoDB is a No-SQL database, the reason why MongoDB is chosen as the proposed system database is that a No-SQL database can provide better scalability, flexibility, and performance of data success speed. Besides, the project methodology is extreme programming, the timeline of the project should be as shortest as possible. Hence, No-SQL database design can improve the effectiveness of project development.

According to figure 4.16, the schema of the whole database design can be clearly observed. The user schema is design for the user account data such as id, user information, face model and the account type. The face model will store as buffer type to ensure that the face data is not

modified during the storage process or retrieval process. It is because the face data may be damaged or missing data when converting the face model to another type. Besides, the “type” attribute represents the account type such as admin, manager and participant.

For the organization schema, the attribute includes the organization details, admin document, manager document list. Each organization will have many managers account, but one manager should only belong to one organization.

For the event schema, the attributes include the event details, event status, face method, organization document, managers document list, participant document list, location method and IP address method setting. For the event status, the event includes open status and close status. For the organization document, each event should only belong to one organization, but one organization can have many events. For the manager document list and participant document list, one event should have many of the manager and participant. All the member details and status will store into the document. Lastly, the face method, location method and IP address method is representing the attendance method of the event. The data type of face attribute id Boolean type, ‘1’ is represented as face recognition method and ‘0’ is represented as QR Code verification method. For the location attribute, the default value is “[null, null]”, the designed data type of location is “[latitude, longitude]”. The value is used to validate the participant device’s location. The IP address is stored as ‘xx.xx.xx.xx’ data format, the default value should be “0.0.0.0”. If the values of any of these two fields are the default values, the system will automatically treat the verification method as "no setting".

4.6 System Deployment Diagram

In this section, the deployment diagram of the web application of system and the Android-based application of system will be presented.

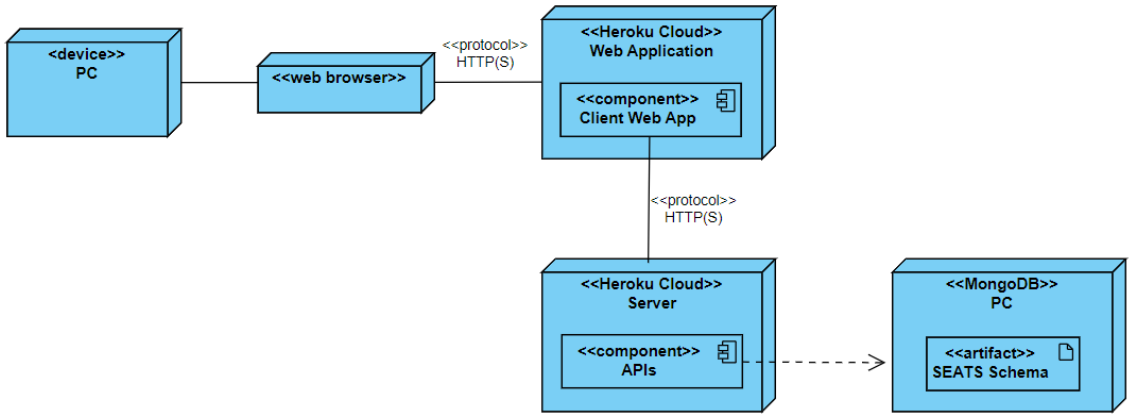


Figure 4.17 Deployment Diagram of web application

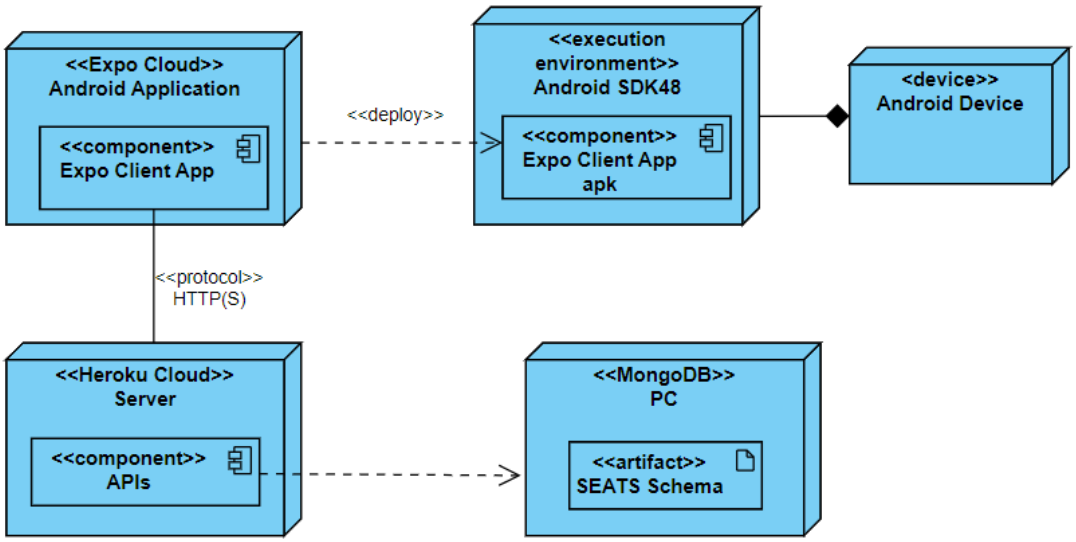


Figure 4.18 Deployment Diagram of Android-based application

Figure 4.17 shows the deployment diagram of the web application of the proposed system. For the client side of the application, Heroku will be used as the hosting service and deployment platform.

Figure 4.18 shows the deployment diagram of the Android-based application. For the development framework of an Android-based application, react native will be used. Besides, Expo is used as the development management technology for my Android-based project. The project will be stored in the GitHub and expo cloud. The expo also provides deployment services such as expo EAS Build to convert the project to an Android app which can be installed on the Android device.

Besides, for the NodeJS server, Heroku will also be used as the hosting service and deployment platform. The project will be stored in the GitHub cloud platform and deployed to a public web URL using the Heroku hosting service. The server will simultaneously provide services for the web application and the Android-based application simultaneously.

Chapter 5

System Implementation

In this chapter, the hardware and technology used for the development will be presented. Besides, the implemented system operations will also be presented in this chapter.

5.1 Hardware Setup

The hardware involved in this project is a computer and android mobile device. The computer is used to develop the whole proposed system. The mobile device will be used to test the system. Besides, The GPS receiver and camera of the device will be used.

Table 5.1 Specifications of laptop

Description	Specifications
Model	Legion Y530-15ICH
Processor	Intel(R) Core(TM) i7-8750H CPU @ 2.20GHz 2.21 GHz
Operating System	Windows 10
Graphic	NVIDIA GeForce GTX 1050 4GB GDDR5
Memory	8GB DDR4 RAM
Storage	1TB SATA HDD

Table 5.2 Specification of mobile

Description	Specifications
Model	RMX2061
Processor	Qualcomm(R) Snapdragon(TM) 720G Octa-core
Operating System	Android 11
Memory	8GB
Storage	128GB
Selfie Camera	16 MP, f/2.1, 26mm (wide), 1/3.06", 1.0µm

5.2 Technology Used

The technology involved in this project are shown in the following table.

Table 5.3 Technology used of system development.

Modules	Technology Used
Web-based application	• **ReactJS** • **Material-UI** • **Axios** • **Formik** • **Yup**
Android- based application	• **React Native** • **Expo** • **Axios** • **Formik** • **Yup** • **GPS Location** • **Expo-location** • **Camara** • **Async-storage**
Server	• **Nodejs** • **ExpressJs** • **Mongodb** • **Gridjs** • **FaceAPI** • **CryptoJS**

5.3 System Operations – Web Application

The system is consisting of 2 platform which are web-based application and android-based application. In this section, the operations of each module of these two-platform system will be presented.

First, the modules of the web-based application include:

- Organization Creation Module
- Event Management Module
- Assign Manager
- Attendance Management Module
- Event Attendance records

5.3.1 Organization Creation Module

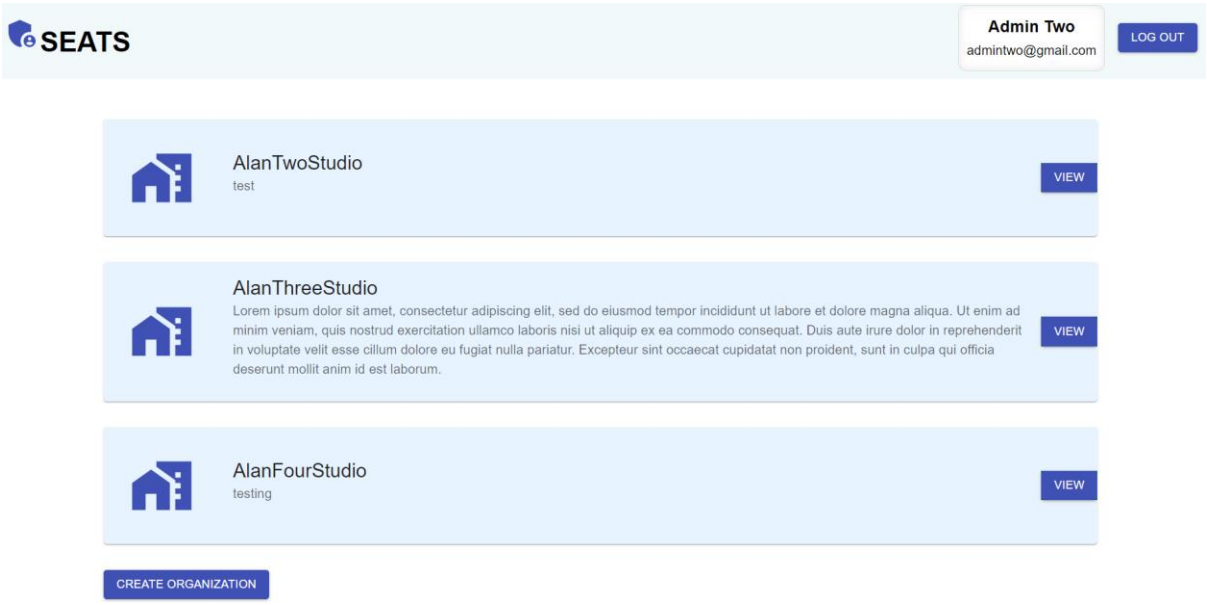


Figure 5.1 Dashboard of the web-based application

Figure 5.1 shows the dashboard of the web-based application. The admin can view and create the organization on this page. On the bottom side of this page, the admin can press the "CREATE ORGANIZATION" button to open the modal to create an organization.

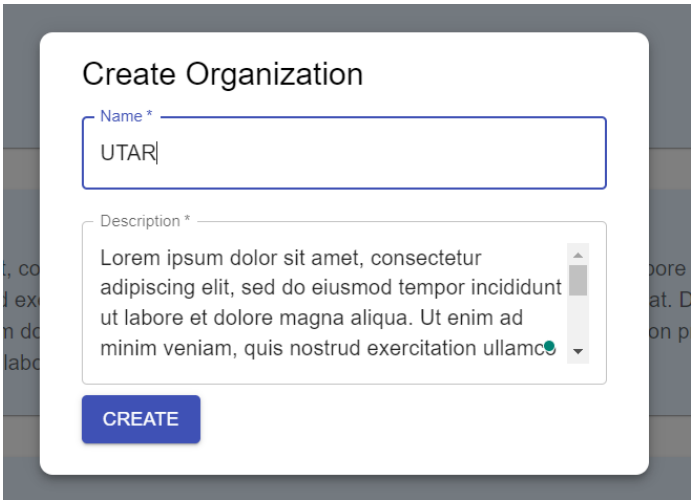


Figure 5.2 Create Organization

Figure 5.2 shows the modal of organization creation. The admin can key in the organization name and description to create an new organization.

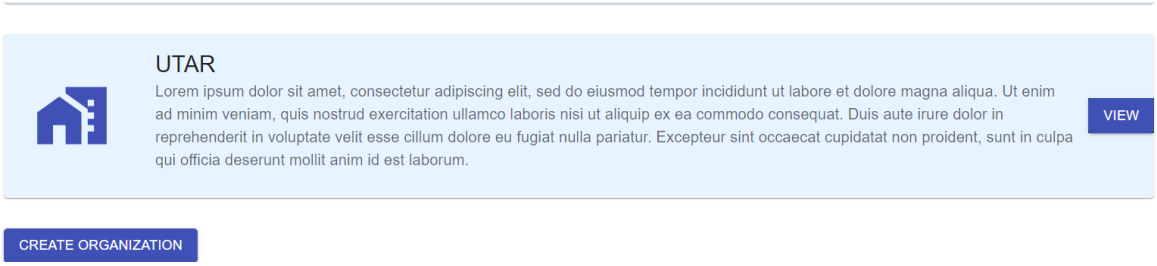


Figure 5.3 Successful Result of create organization.

Figure 5.3 shows the successful result after creating the organization.

5.3.2 Event Management Module

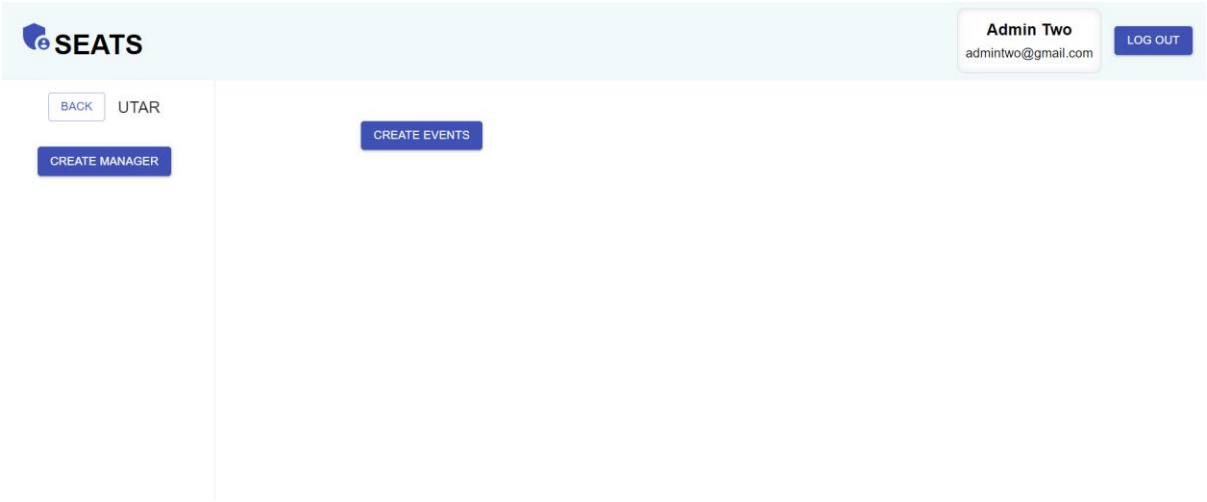


Figure 5.4 Organization Panel

After the admin press the "VIEW" button of organization item, he/she will be navigated to the organization panel shown in figure 5.4.

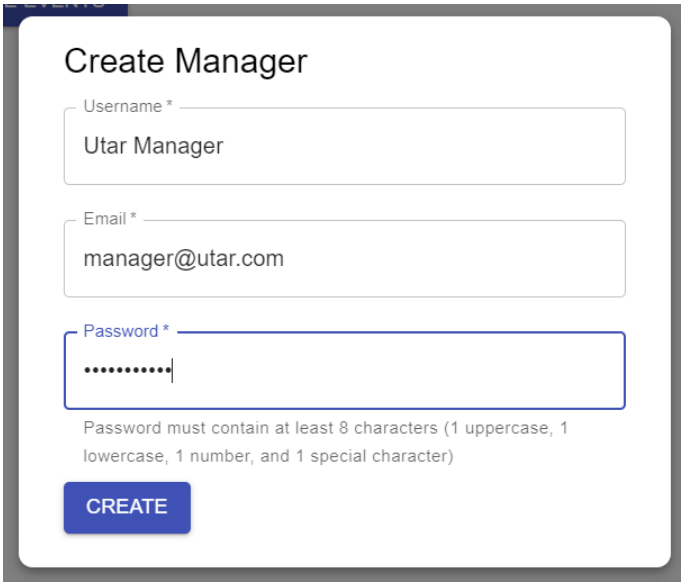


Figure 5.5 Create Manager

The admin can create the manager of the organization by pressing the "CREATE MANAGER" button on the left bar. Figure 5.5 shows the modal of manager creation. The admin can create a new account for manager by key in the username, email, and password.

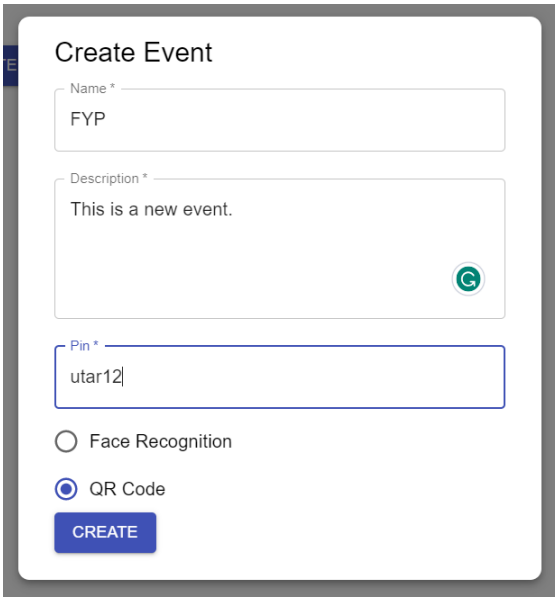


Figure 5.6 Create Event

In addition, the admin can create the event of the organization by pressing the "CREATE EVENT" button on this page. Figure 5.6 shows the modal of event creation. The admin can create a new event by key in the event name, event description, invitation pin and set the default attendance check-in method.

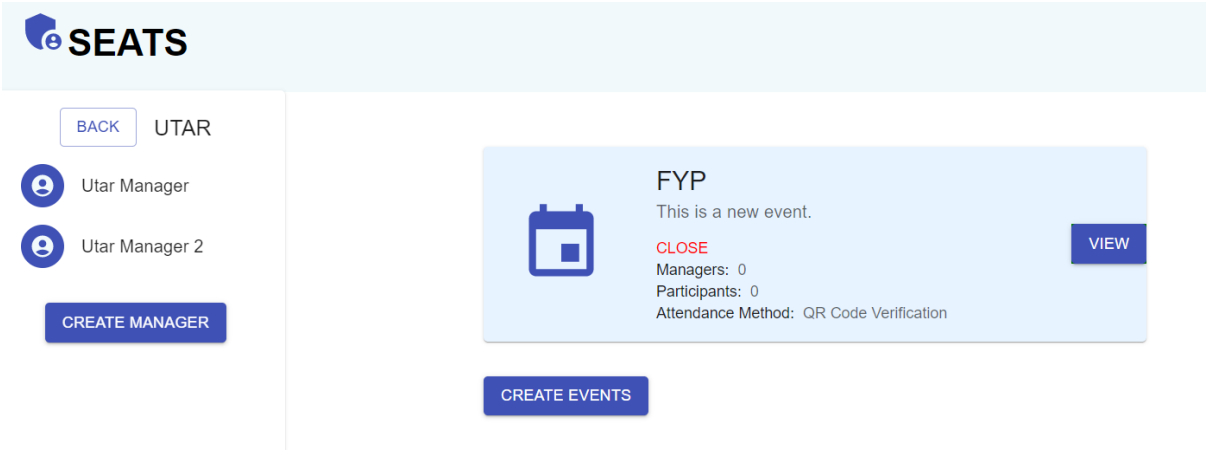


Figure 5.7 Successful Result after create event and managers.

Figure 5.7 shows the organization panel after creating a few manager accounts and events.

5.3.3 Assign Manager

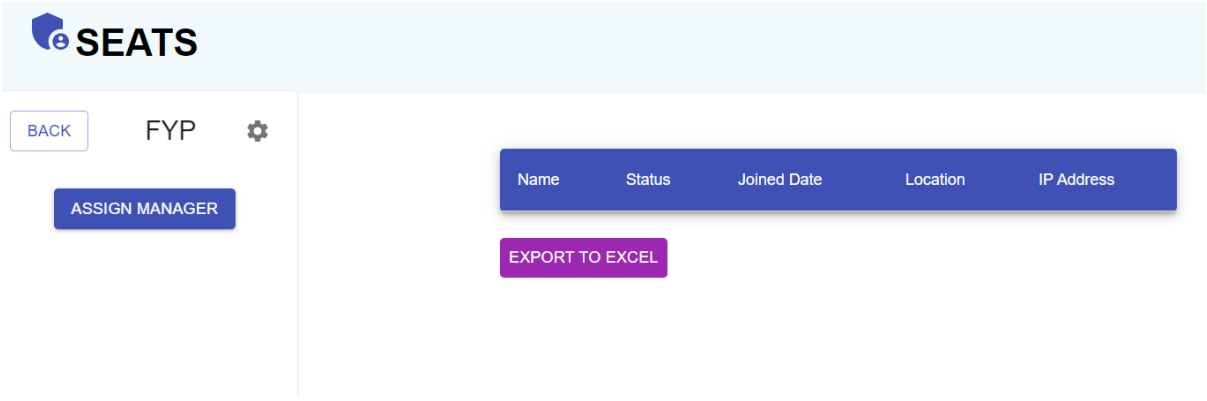


Figure 5.8 Event Panel

The admin can access into the event panel by pressing the "VIEW" button of the event item. Figure 5.8 shows the event panel of FYP event.

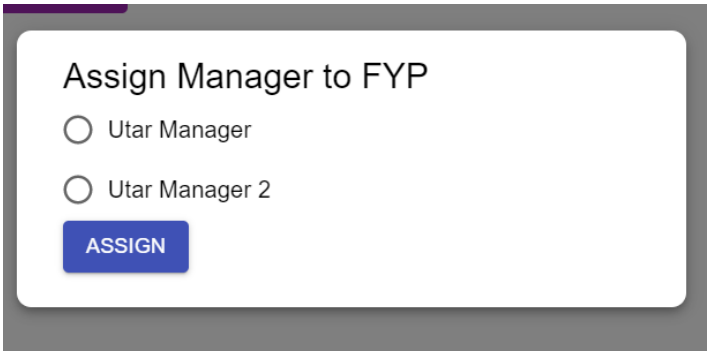


Figure 5.9 Assign Manager to Event

The admin can assign the organization manager to the event by pressing the "ASSIGN MANAGER" button. Figure 5.9 shows the modal of manager assignment. The admin can select any of the managers which not yet been assigned to the event.

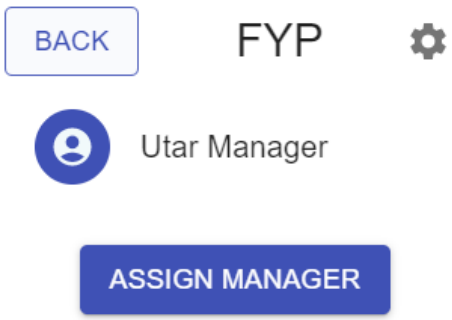


Figure 5.10 Successful Result after assign manager to event

Once the manager is successfully assigned to the event, the manager will present on the left bar of the event panel shown as in Figure 5.10.

5.3.4 Attendance Management Module – Admin Role

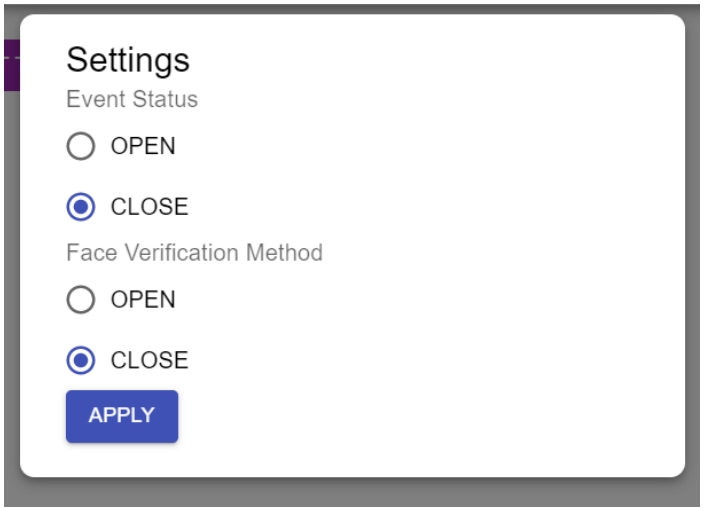


Figure 5.11 Settings of event

Furthermore, the admin can also set the event status and switch the attendance check-in method by pressing the setting icon on the left bar of event panel. Figure 5.11 shows the modal of event settings.

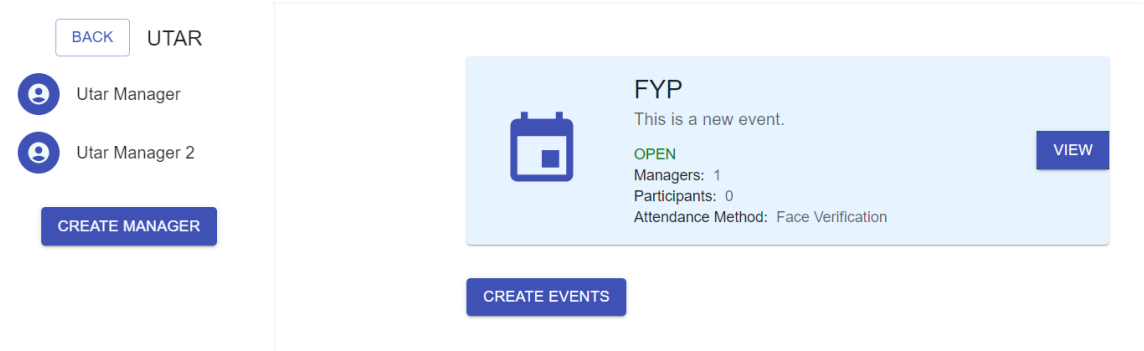


Figure 5.12 Successful result after open the event and open the face verification method.

5.3.5 Attendance Records

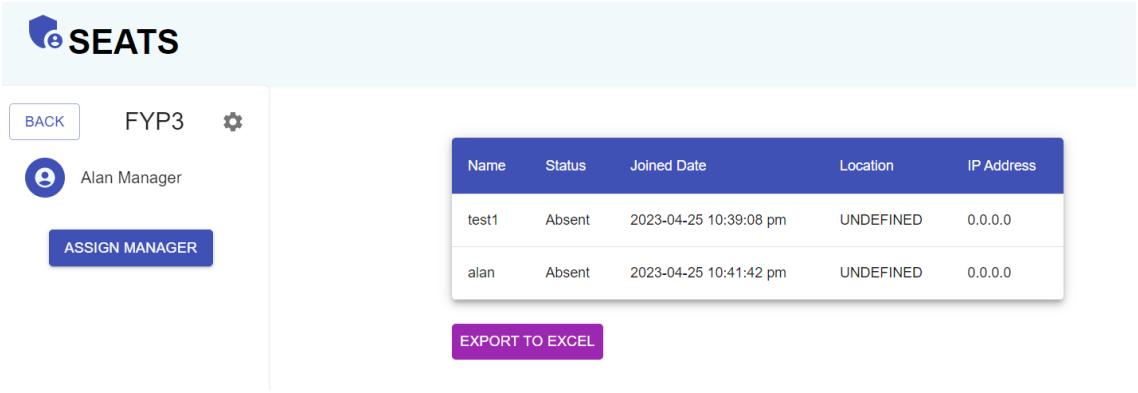


Figure 5.13 Event Panel (Attendance Records)

After the admin completes the pre-configuration of an event, the admin can provide the manager account to the manager. The manager will invite the participant by sharing the invitation code of the event. After the participant successfully joined the event, the event panel will show in Figure 5.13. The attendance records of the event's participants will be represented in table format.

	A	B	C	D	E
1	id	name	status	Joined_Date	
2	642060c0577f513ee2fea480	test1	Absent	2023-04-25 10:39:08 pm	
3	64206411577f513ee2fea48e	alan	Absent	2023-04-25 10:41:42 pm	
4					
5					

Figure 5.14 Exported Excel file of the event attendance records.

Moreover, the admin can also export the attendance records to the Excel file (.xlsx) shown in figure 5.14.

5.4 Android-based application Modules

Lastly, the modules of the android-based application include:

- Manager role
    - Attendance Management Module
- Participant role
    - Join Event
    - Face Registration
    - Sign-in Attendance (QR Code)
    - Sign-in Attendance (Face Recognition)

5.4.1 Attendance Management Module – Manager Role

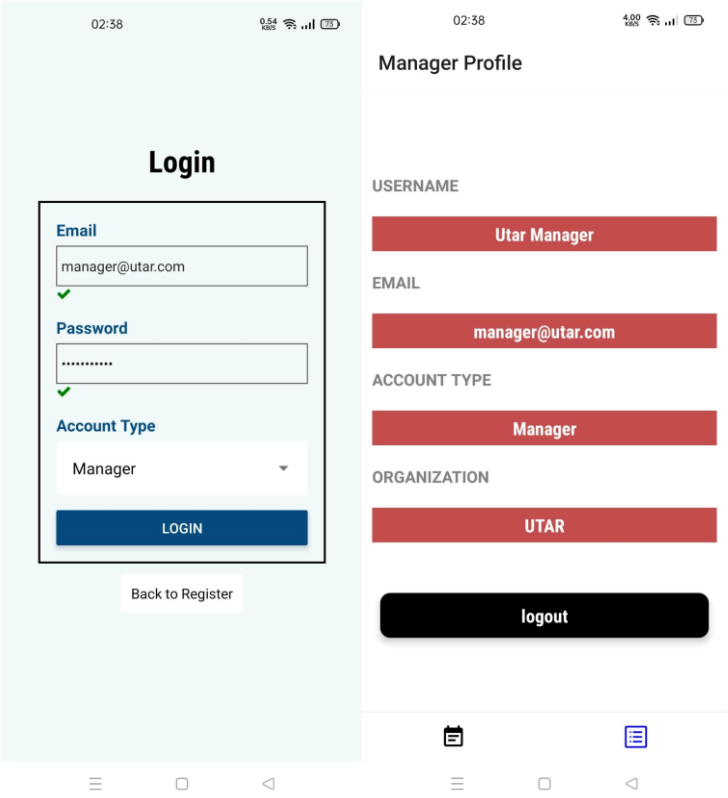


Figure 5.15 Manager account profile

Figure 5.15 shows the manager login process and manager profile.

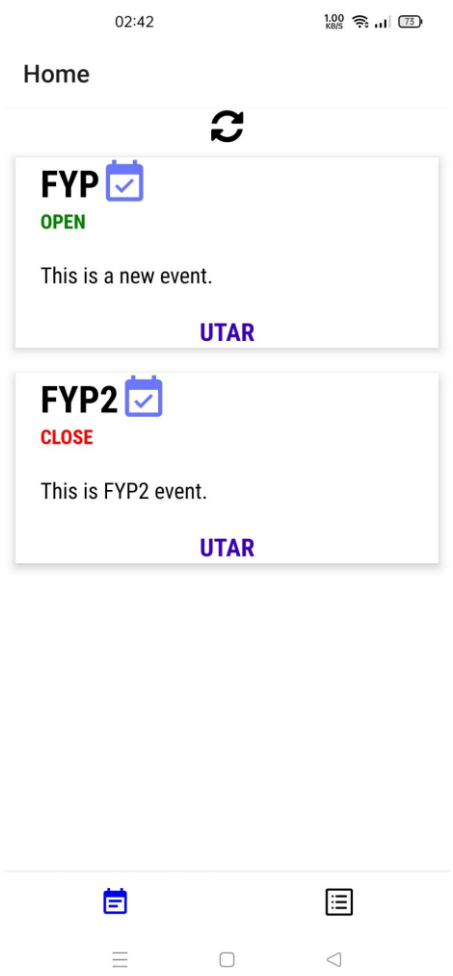


Figure 5.16 Manager Events Dashboard

On the dashboard of the manager account, the assigned events will be displayed, as shown in Figure 5.16. The manager can access the event by pressing the event icon beside the event title.

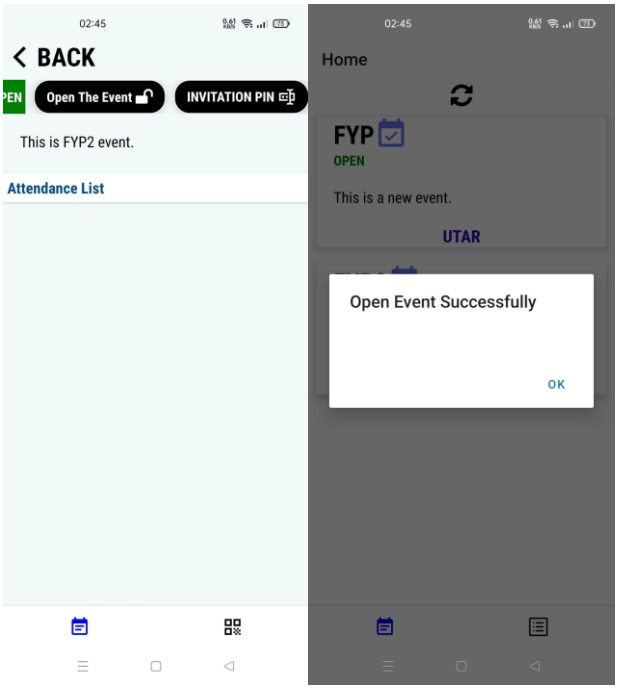


Figure 5.17 Open Event

Figure 5.17 shows the event details screen of the FYP2. In this screen, the manager can open or close the event by pressing the top button as shown in Figure 5.17.

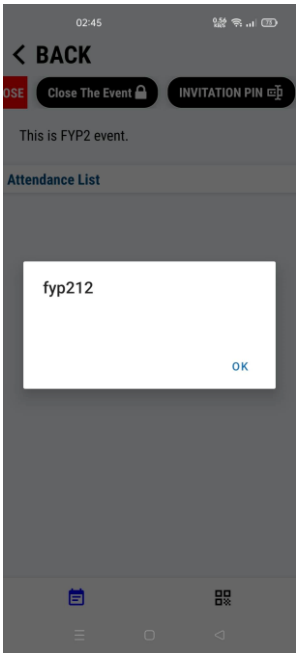


Figure 5.18 Show Invitation Pin

Besides, the manager can also press the “INVITATION PIN” button on the top of the screen to retrieve the invitation pin for the event. After the manager retrieves the invitation pin, he/she

can share the pin with the participant to allow them to join the event. Figure 5.18 shows the result after the manager presses the invitation pin button.

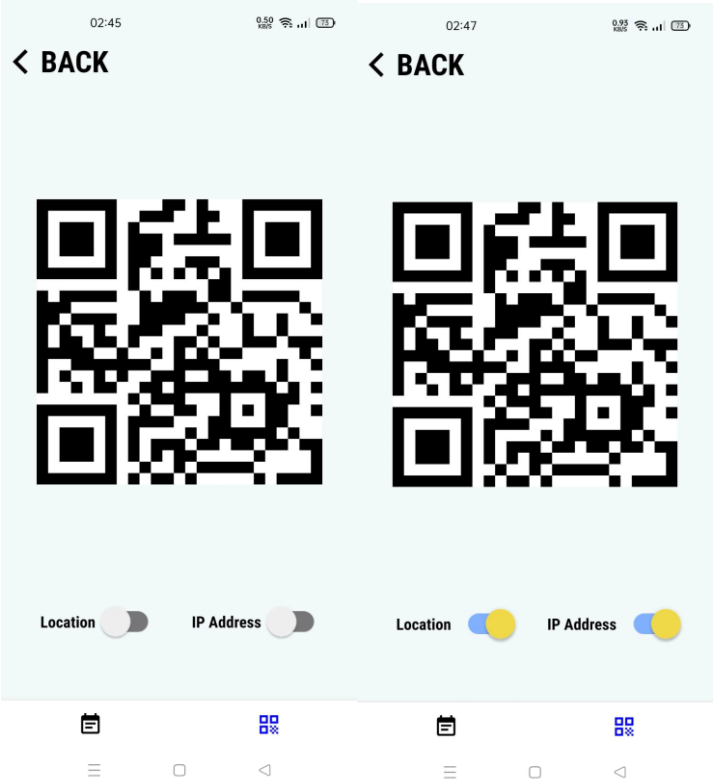


Figure 5.19 Set Location and IP Address conditions

In addition, the manager can open the QR Code screen as shown in Figure 5.19. The manager can share the QR Code with participants to allow them to sign the attendance by scanning the QR Code.

Besides, the manager can also open the verification condition of the event attendance such as location verification and IP Address verification. When the manager opens any of the conditions, the system will retrieve the manager's device location or network IP Address and store it in the database.

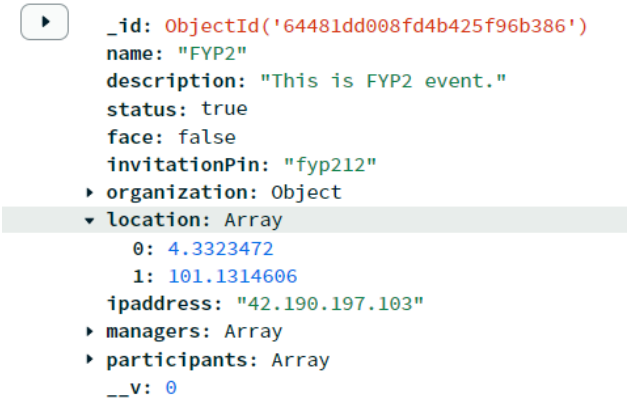


Figure 5.20 Mongo DB collection

Figure 5.20 shows the database collection after the manager opens the location and IP Address verification conditions.

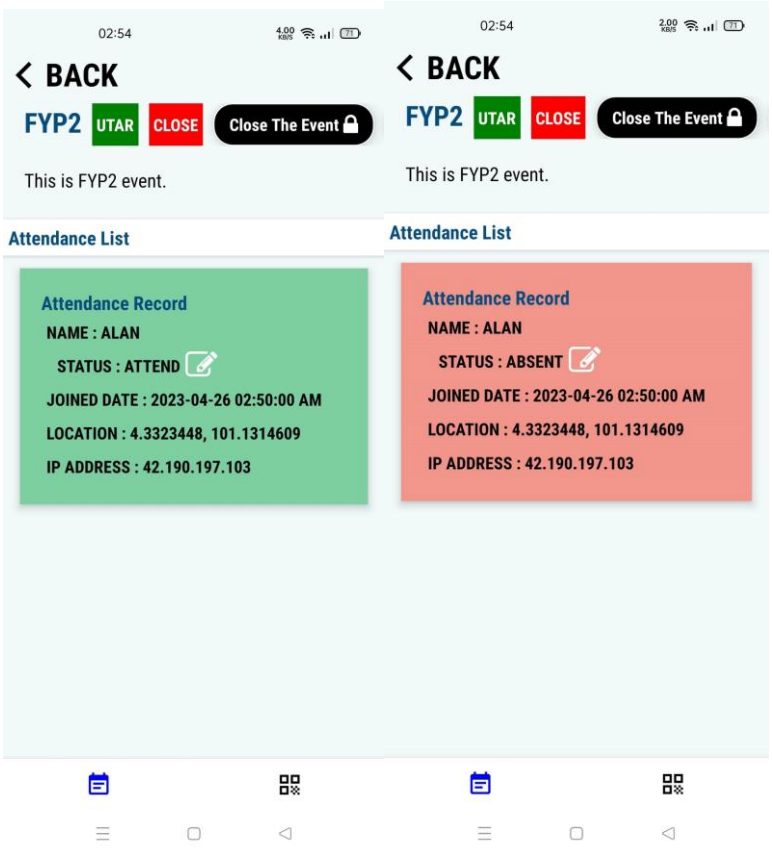


Figure 5.21 Edit Participant Attendance Status

Moreover, the manager can also edit the participants' attendance status from “ATTEND” to “ABSENT” and vice versa.

5.4.2 Join Event

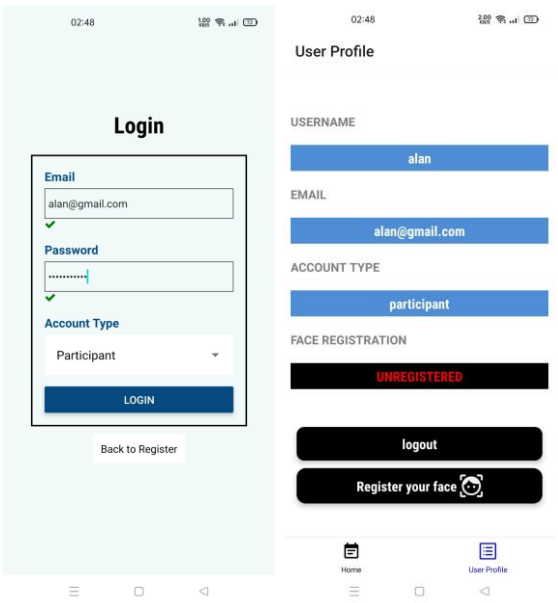


Figure 5.22 Participant Account Profile

Figure 5.22 shows the participant login process and participant profile.

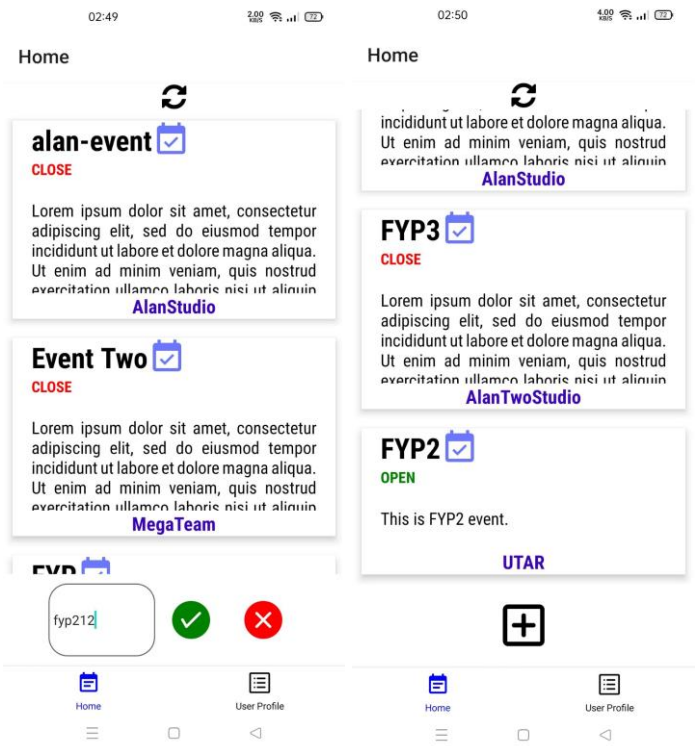


Figure 5.23 Join Event

After the participant login to their account, all the events they joined before will be displayed on the dashboard. Besides, the participant can always join the event by keying in the invitation pin as shown in Figure 5.23.

5.4.3 Sign-in Attendance (QR Code)

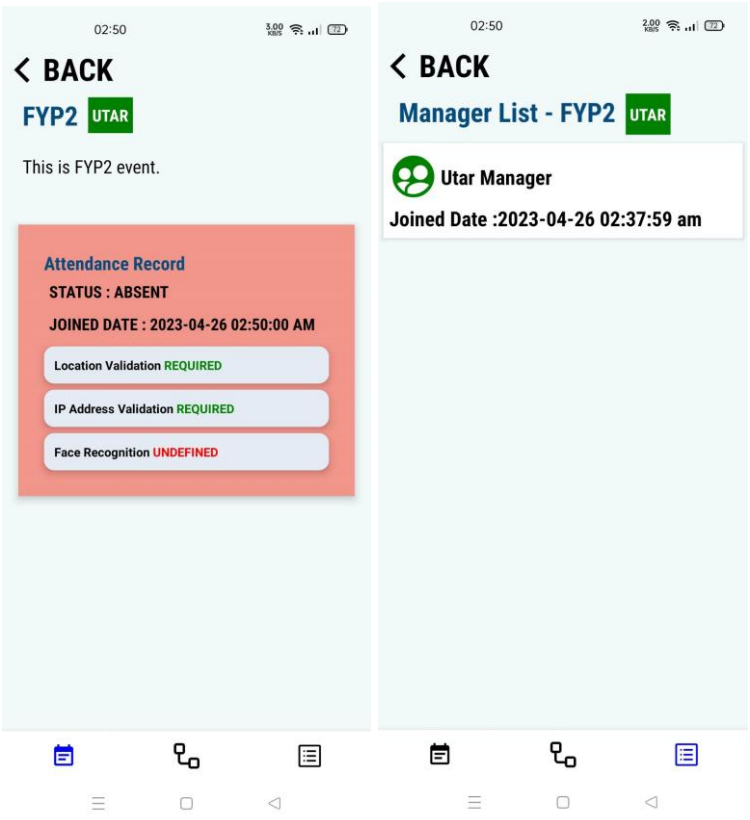


Figure 5.24 Attendance panel and manager list screen

After participant access the joined event, the attendance panel will be displayed as shown in Figure 5.24. Besides, the participant can also view the manager list by pressing the bottom tab on the screen.

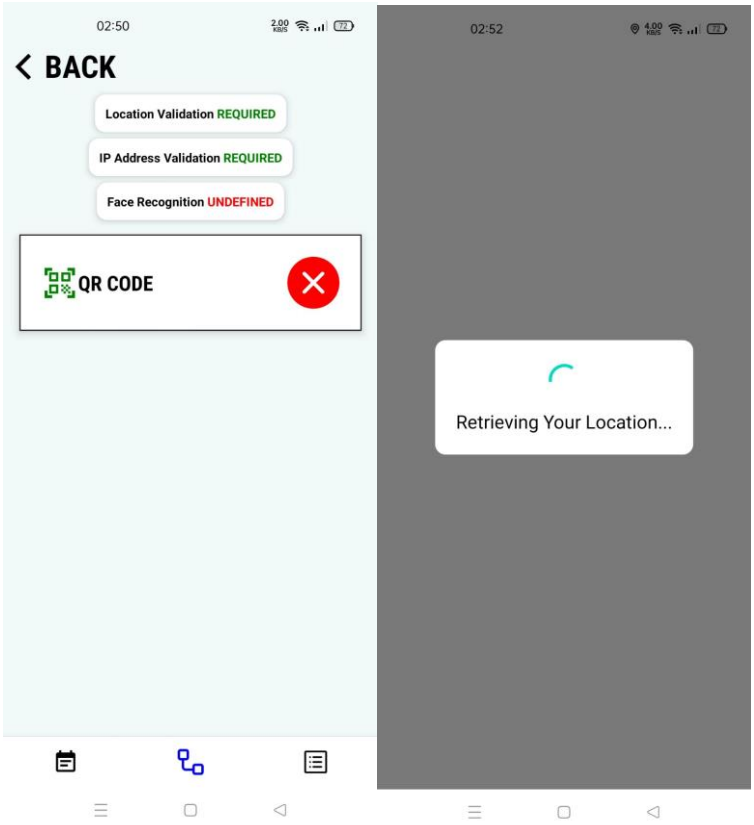


Figure 5.25 Attendance Sign-In Screen – QR Code method

Figure 5.25 shows the attendance sign-in screen. In this example of the figure, the check-in method is set to the QR Code Verification method. Since this event requires the location and IP Address verification conditions, the system will retrieve the user device's location and network IP Address before access to the QR Code scanner.

```
Logs for your project will appear below. Press Ctrl+C to exit.
Android Bundling complete 3585ms
 LOG  4.3323472 : 101.1314606 : 42.190.197.103 lat:null long:null ip:null
 LOG  4.3323472 : 101.1314606 : 42.190.197.103 lat:null long:null ip:null
 LOG  4.3323472 : 101.1314606 : 42.190.197.103 lat:4.3323448 long:null ip:null
 LOG  4.3323472 : 101.1314606 : 42.190.197.103 lat:4.3323448 long:101.1314609 ip:null
 LOG  4.3323472 : 101.1314606 : 42.190.197.103 lat:4.3323448 long:101.1314609 ip:42.190.197.103
```

Figure 5.26 Debug Console – Retrieve device location and Ip Address

Figure 5.26 shows the logs of debug console during the system retrieving the user device's location and network IP Address.

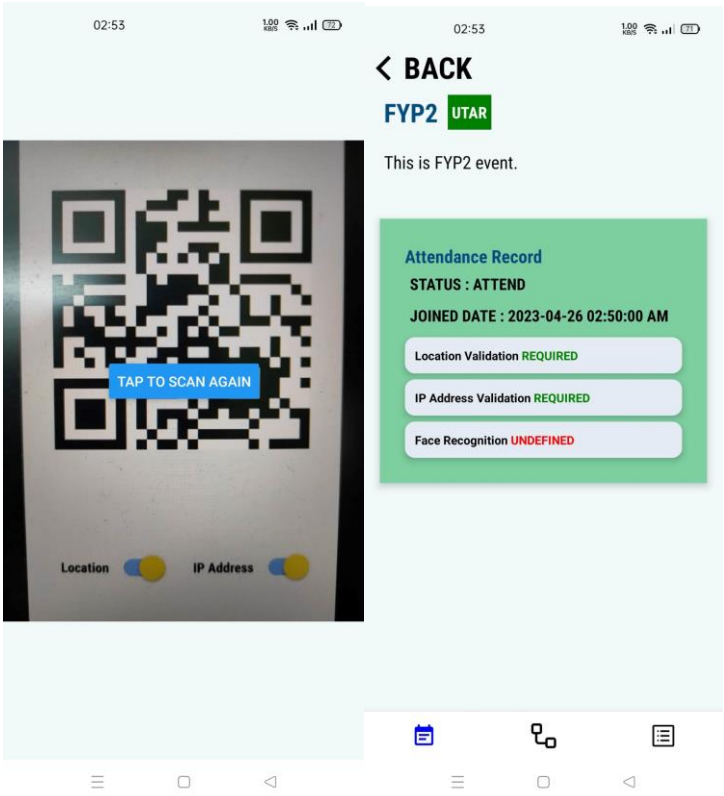


Figure 5.27 Sign-in Attendance by scan QR Code

After the system verifies the participant device's location and network IP Address to fulfil the event setting conditions, the QR Code scanner screen will be displayed as shown in Figure 5.27.

5.4.4 Face Registration

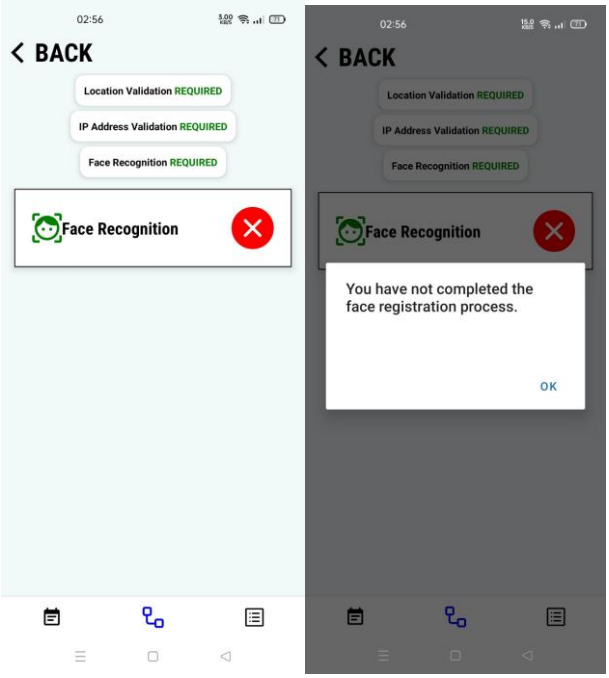


Figure 5.28 Attendance Sign-In Screen – Face Recognition Method

If the participant has not yet completed the face registration process, they will not be allowed to sign in the attendance with the face recognition method. Figure 5.28 shows the warning alert prompt by the system to notify participants to register their face.

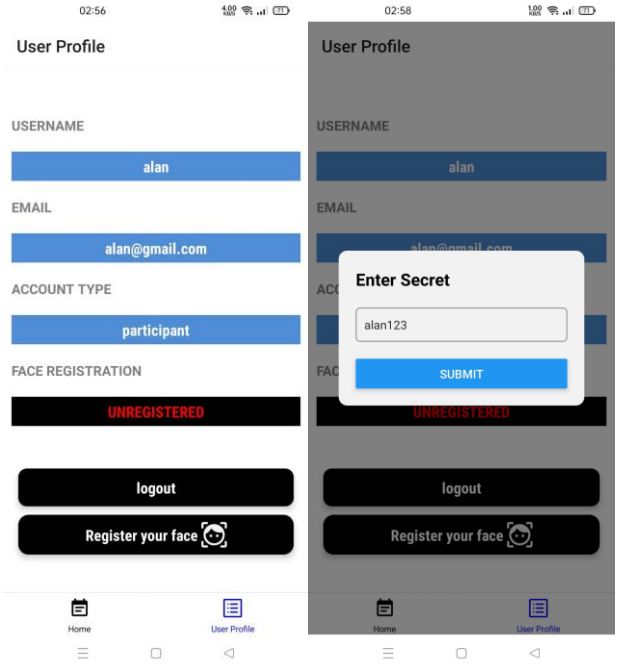


Figure 5.29 Key in Secret for Face Registration

The participant can register their face on the profile screen as shown in Figure 5.29. Before the participant access to the device camera, the participant must key in the private secret key for encrypted their face model.

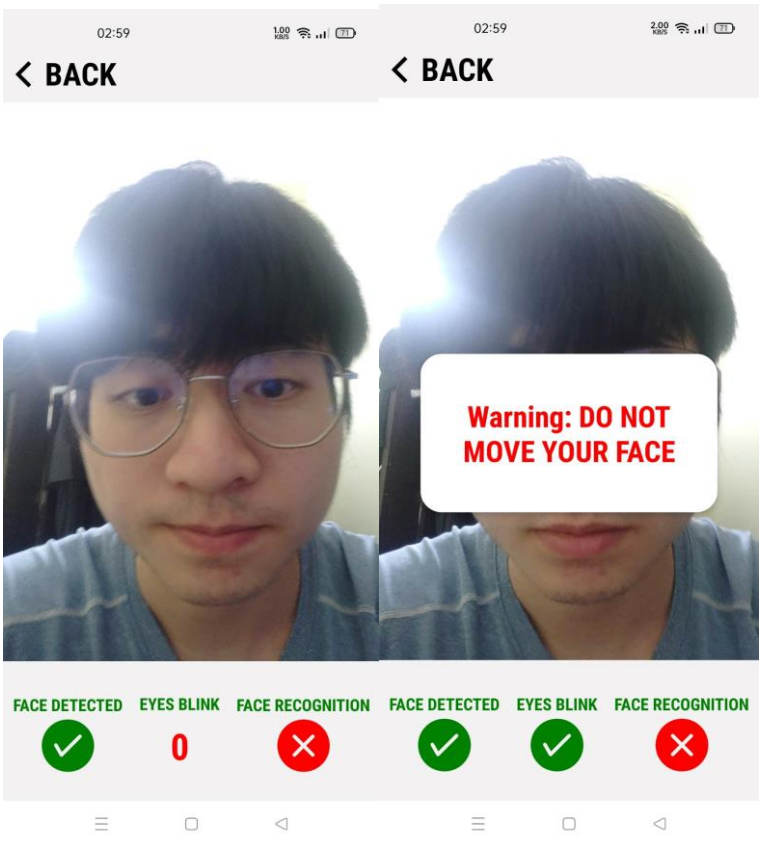


Figure 5.30 Face Scanner Screen for face registration

After the participant key in the secret key, the face scanner screen will be navigated as shown in Figure 5.30. The face scanner module consists of three steps to avoid fraud events which include face detection, eyes blink detection and face tracking detection. After the participant's face is verified by these three steps, the image data of their face will be collected and encoded to base64 data type and post it to the server face registration API.

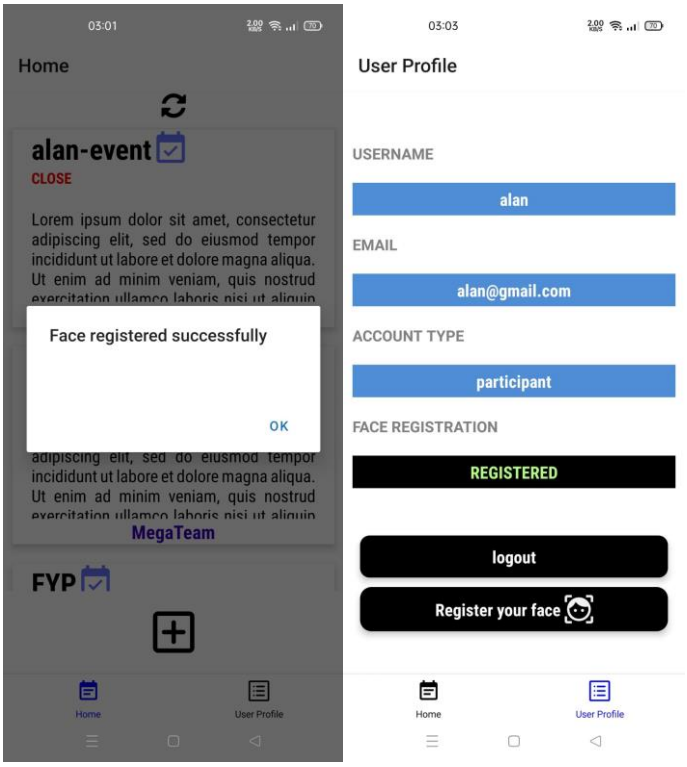


Figure 5.31 Successful result after registered face.


```
_id: ObjectId('64206411577f513ee2fea48e')
username: "alan"
email: "alan@gmail.com"
password: "$2b$10$yyYiPApapzY3GhZSuP99uO/4MeBi1DHc9lamd6bUUHITyVDRsxygC"
type: "participant"
__v: 0
faceModel: BinData(0, 'VTJGc2RHVmtYMS9XRTFnT3pmakdPNU82NnZ4cDVtMWJpNXM1eHRWd1dLSE9EZ05MZ0ZOb3VrM2cyL3R4NmxoUlJ0VnhrZ29q…
```


Figure 5.32 User Document store the encrypted face model.

Figure 5.31 and figure 5.32 shows the result after the system successfully registers the face and stores it in the user document.

5.4.5 Sign-in Attendance (Face Recognition)

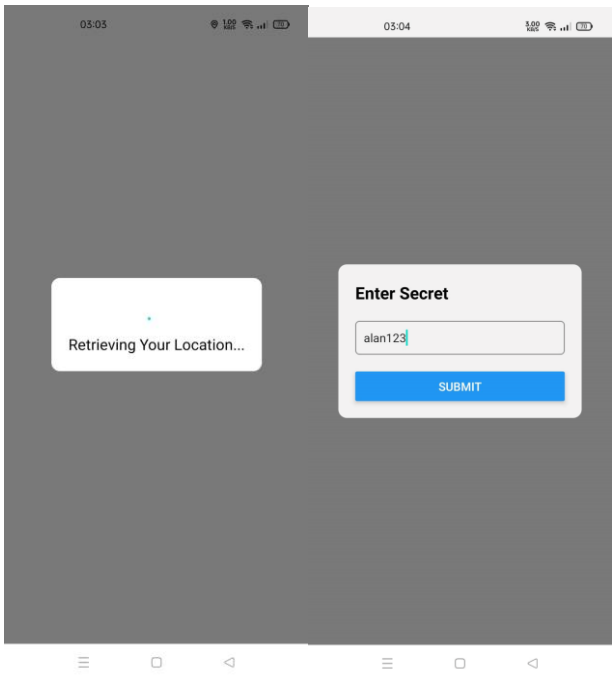


Figure 5.33 Key in secret for face recognition

After the participant completes the face registration, they can sign in through face recognition. Figure 5.33 shows the steps in which the participant must enter the correct secret key before entering the face scanner. If the secret key is different from the key registered before, face recognition will fail.

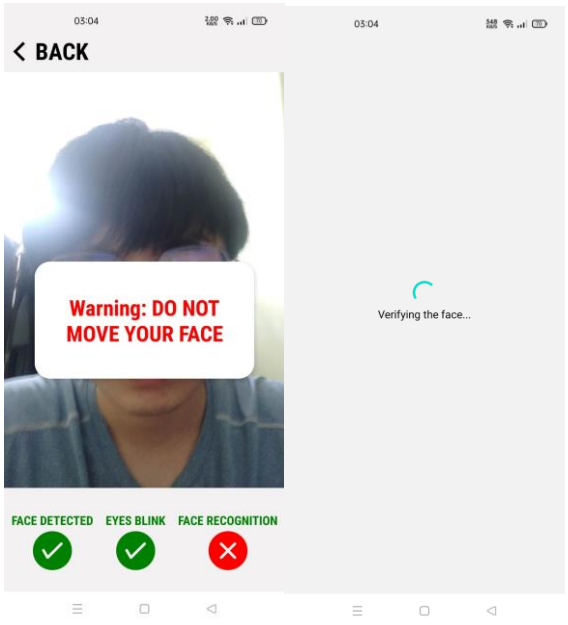


Figure 5.34 Face Scanner screen for face recognition

Figure 5.35 Debug Console return the best face matcher point (< 0.6)

The verification step of face recognition is the same as the face registration. After the system post user's face image data to the server, the server will return a best matcher score and label name to the client as shown in Figure 5.35. If the matcher score is lower than 0.60, it means the face recognition is successful and vice versa. In this example, the matcher points to 0.14, which is far less than 0.60, so the face recognition is successful.

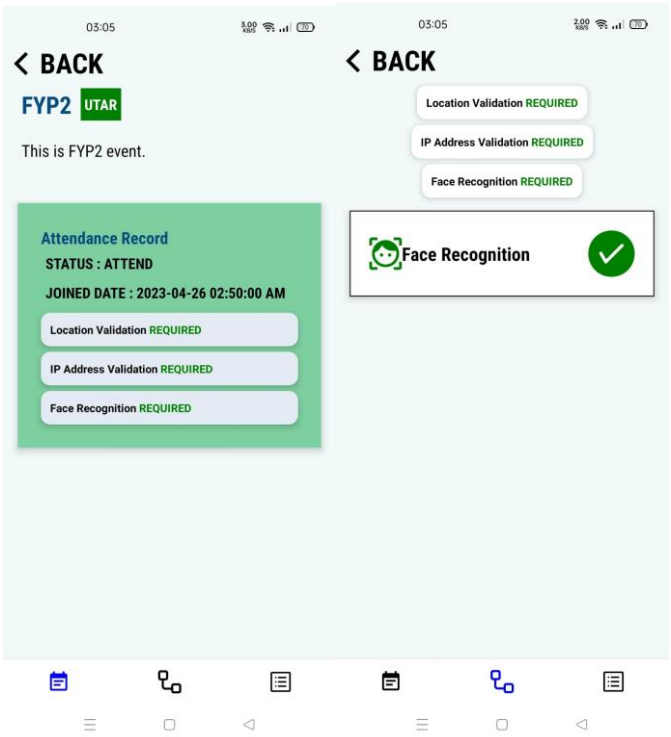


Figure 5.36 Successful result after recognizing the face.

Figure 5.26 shows the result after the participant successfully signs in the attendance using the face recognition method.

Chapter 6

System Evaluation and Discussion

In this chapter, the system testing, system evaluation, project challenger and objective evaluation will be presented.

6.1 System Testing

According to the project methodology of this project, after the completion of a module's development, it will undergo unit testing and component testing to ensure its quality and functionality. After the whole system is completely developed, the system testing will proceed to verification the system is workable and validate that the system is meet the requirement and objectives proposed in the beginning.

6.1.1 Performance Metrics

For the system testing of this project, the following performance metrics will be used to evaluate the system quality:

1. Errors
2. Response Speed
3. Availability

The above performance metrics will be used as the evaluation criteria for each module of the system. The criteria will be marked as “Accept” when the

1. The modules/function do not have any error.
2. The modules/function can respond within 10 seconds.
3. The modules/function can work as expectation.

6.1.2 Testing Setup and Result

For the testing setup and testing result, the modules name, expectation output, input, actual output, and criteria evaluation will be discussed. Besides, the testing result will be divided into 3 parts based on the actor role permission which is admin, manager, and participant.

Table 6.1 System Testing Result and Evaluation (Admin Role)

Modules	Expectation Output	Actual Output	Criteria
Organization Creation	**The admin should be able to create organizations and view organizations.**	**The admin successfully creates many organizations in the same account and can view the created organization on the dashboard.**	**Accept**
Organization Management	**The admin should be able to view the created event and created manager in the organization and create an event and manager account in the organization.**	**The admin successfully creates many events and manager account in the organization and can view the created event and created manager in the organization.**	**Accept**
Assign Manager	**The admin should be able to assign the manager who belong to the organization to the organization's event.**	**The admin successfully assigns the manager who belongs to the organization to the organization's event.**	**Accept**
Attendance Management	**The admin should be able to edit the setting of Event Attendance such as open/close the event attendance and open/close the face recognition method to event attendance.**	**The admin successfully edits the setting of Event Attendance such as open/close the event attendance and open/close the face recognition method to event attendance.**	**Accept**

Event Attendance records	**The admin should be able to view the attendance records of all the participants in the event and can export the attendance records to an Excel File with the event name.**	**The admin successfully views the attendance records of all the participants in the event and successfully export the attendance records to an Excel File with the event name.**	**Accept**

Table 6.2 System Testing Result and Evaluation (Manager Role)

Modules	**Expectation Output**	**Actual Output**	**Criteria**
Show Invitation Pin	**The manager show be able to show invitation pin of the event.**	**The manager successfully shows the invitation pin of the event.**	**Accept**
Edit Event Status	**The manager should be able to open/close the event status.**	**The manager successfully open/close the event status.**	**Accept**
Edit Attendance Record	**The manager should be able to edit the participant attendance status.**	**The manager successfully edits the participant attendance status.**	**Accept**
Show QR Code	**The manager should be able to show the QR Code of event attendance.**	**The manager successfully shows the QR Code of event attendance.**	**Accept**
Attendance Management	**The manager should be able to open/close the location verification and IP Address verification conditions of event attendance.**	**The manager successfully open/close the location verification and IP Address verification conditions of event attendance.**	**Accept**

Table 6.3 System Testing Result and Evaluation (Participant Role)

Modules	Expectation Output	Actual Output	Criteria
Join Event	**The participant should be able to join the event only if the participant keyed in the correct invitation pin.**	**The participant successfully joins the event when he/she keyed in the correct invitation pin.**	**Accept**
Face Registration	**The participant should be able to register his/her face by keying in the secret key.**	**The participant successfully registers his/her face by keying in the secret key.**	**Accept**
Sign-in Attendance (QR Code)	**The participant should be able to sign in the attendance by scanning the correct QR Code of the event attendance.**	**The participant successfully signs in the attendance by scanning the correct QR Code of the event attendance.**	**Accept**
Sign-in Attendance (Face Recognition)	**The participant should be able to sign in the attendance by recognising his/her face with the correct secret key.**	**The participant successfully signs in the attendance by recognising his/her face with the correct secret key.**	**Accept**
Sign-in Attendance (any method with Location verification Condition)	**The participant should be able to sign into the attendance by verifying the device's location is within the range of the event setting location.**	**The participant successfully signs into the attendance by verifying the device's location is within the range of the event setting location.**	**Accept**
Sign-in Attendance (any method with IP Address verification Condition)	**The participant should be able to sign into the attendance by verifying the device's network Ip address is the same as the Ip address of the event setting.**	**The participant successfully signs into the attendance by verifying the device's network Ip address is the same as the Ip address of the event setting.**	**Accept**

Sign-in Attendance (any method with both location and IP Address verification conditions)	**The participant should be able to sign into the attendance by verifying the device's location is within the range of the event setting location and verifying the device's network Ip address is the same as the Ip address of the event setting.**	**The participant successfully signs into the attendance by verifying the device's location is within the range of the event setting location and verifying the device's network Ip address is the same as the Ip address of the event setting.**	**Accept**

6.2 Project Challenges

In this project, there are a few issues and challenges in the implementation phase. The first issue is how can the proposed system solve the privacy problem of the face recognition system. In the proposal report, the solution to solve the privacy problem is using the homomorphic encryption method. This method will allow the system to run all the training and recognition phases in the encryption domain.

However, this method faces many problems in implementation such as running speed, and there are few resources about this technology on the Internet. Besides, the new solution mentioned in the previous FYP1 is to place all the training and recognition phases on the client side. However, this solution will highly depend on the device's performance and will increase the average response time. Hence, the final system will remain to place the training and recognition phases on the server side. After the image data post to the server, the image of the user will automatically remove. Besides, the face recognition module will use the AES encryption/decryption method to encrypt the model and store it in the database. This solution can greatly balance privacy protection and system performance.

In addition, although this system reduces the performance requirements of the device as much as possible, the device camera still needs a certain resolution to ensure the accuracy of face recognition.

6.3 Objectives Evaluation

Since the main goal of this project is to develop a smart attendance system that will help the organization that wants to start up a business or event to set up a suitable attendance system. To achieve this main goal, the following 4 sub-objective must be fulfilled:

1. To reduce the frequency of attendance fraud.
2. To deliver an easily maintainable attendance system to organizers.
3. To deliver a user-friendly attendance system to users.
4. To deliver a high flexibility attendance system to organizers.

Hence, the objective evaluation of this system will be presented in the following section.

6.3.1 Objective One

The objective 1 is to reduce the to reduce the frequency of attendance fraud. Although it is an unrealistic goal to completely eliminate attendance fraud, the system can increase the cost of participant fake attendance by adding identity verification conditions to achieve the goal of reducing the frequency of attendance fraud.

In this system, the facial recognition, location verification and IP Address verification will be used to verify and confirm the authenticity of participant attendance. There are some case of the attendance fraud that the system can be avoided:

Table 6.4 Cases of attendance fraud and proposed solutions

Cases of attendance fraud	Solutions
The participant did not participate in the event, but he asked his friend to send him the attendance QR Code to scan.	The event manager can open the location or IP Address verification conditions to avoid this situation.
The participant did not participate in the event, but he asked his friend to log in to his account to scan the attendance QR Code on the spot.	The event admin can apply the face recognition method to the attendance to avoid this situation.

The participant did not participate in the event, but he asked his friend to log in to his account to use his/her face image to crack the face verification.	The face recognition scanner of this system includes eye blink detection. The participant must blink three times before access into the face collection step.

Hence, through the above solution, it can be verified that the system can reduce the frequency of attendance fraud well.

6.3.2 Objective Two

Objective 2 is to deliver an easily maintainable attendance system to organizers. To achieve this objective, this system provides an organization management module and a manager assign module. The solution manages events and event attendance through a job division system.

The admin is dedicated to managing the sign-in method such as face recognition, and QR Code verification of all events under its organization and controlling whether the event is open or not. The remaining event management and attendance management are handed over to the managers assigned to the event. Admin only needs to view the attendance records or export attendance records to an Excel file after the completion of the pre-configuration.

Hence, this solution can provide an easily maintainable attendance system to organizers.

6.3.3 Objective Three

Objective 3 is to deliver a user-friendly attendance system to users. [12] Based on the research published by Tomayess B. T. Issa and Pedro Isaias, a user-friendly should be evaluated by the following criteria metrics:

1. **Ease of Use**: Participants should be able to easily understand how to use the system without extensive training or assistance.

2. **Navigation**: Participants should be able to easily navigate through the system to find what they need, such as their attendance records or upcoming events.

3. **Feedback**: The system should provide clear and timely feedback to participants, such as confirming their attendance or notifying them of any errors.

4. **Accessibility**: The system should be accessible to all participants, including those with disabilities or those who use assistive technologies.

5. **Design**: The system should have a user-friendly interface that is visually appealing, intuitive, and consistent.

The following table show the evaluation of interface design of participant Attendance system based on the above criteria metrics.

Table 6.5 Evaluation Results

Metrics	Evaluation	Criteria
Ease of Use	The system interface allows participants to press a button to open the sign-in attendance screen, such as a QR code scanner or face scanner, without requiring any additional action.	Accept
Navigation	The system interface provides a clear navigation bottom tab with represent icon to prompt the user to access the sign-in attendance screen.	Accept
Feedback	The system will always return an error alert or successful alert to notify a user about the operation result.	Accept
Accessibility	At present, the system has not installed any auxiliary system to provide the normal use of the attendance system for the blind.	Not Accept
Design	The system has a user-friendly interface that is visually appealing, intuitive, and consistent.	Accept

According to the evaluation result listed in Table 6.5, the system meets 4 of the 5 metrics. Therefore, the system can be verified as a user-friendly attendance system for participants.

6.3.4 Objective Four

Objective 4 is to provide organizers with a highly flexible attendance system. For the final system, the check-in and attendance methods and verification conditions included are shown in the table below.

Table 6.6 Attendance check-in method combination

Main Method	Location condition	IP address condition	Efficiency	Authentication
QR CODE	**No**	**No**	**High**	**Low**
	Yes	**No**	**Medium**	**Medium**
	No	**Yes**	**Medium**	**Medium**
	Yes	**Yes**	**Medium**	**Medium**
FACE RECOGNITION	**No**	**No**	**High**	**Medium**
	Yes	**No**	**Medium**	**High**
	No	**Yes**	**Medium**	**High**
	Yes	**Yes**	**Medium**	**High**

This system provides a few combinations of the attendance check-in method and verification conditions to improve the flexibility of the attendance system. This solution will increase the availability of the system since the organizer can use this system in almost all situations based on the event requirement.

Based on the above evaluation, this system successfully achieves all the sub-objective. Hence, the main goal of this project will also be implemented.

Chapter 7
Conclusion and Recommendation

7.1 Conclusion

This project will deliver a smart customizable event attendance system. The proposed system can allow any organization/community to create their own account to manage their events attendance. Hence, they do not need to spend extra costs to design the attendance system for the attendance of employees or participants. By using the proposed system, the organizer can select the suitable method for the attendance system to handle different situations such as face recognition, QR Code, location detection and IP Address detection. This attendance customization system can help improve the flexibility of the organization in setting up attendance. Besides, the proposed system only requires the user to have a personal computer and a mobile device. Hence, there is no extra equipment required to use the facial recognition method. This can bring a biometric-based attendance system without costly equipment to organizations in need. In addition to this, the most important problem stated in the chapter is the attendance fraud problem. The attendance fraud problem will affect the credibility and accuracy of the attendance records. Hence, this will result in the organization's decision-making and statistical results being affected. In this project, the proposed solution to reduce the frequency of attendance fraud is face recognition with location or IP address detection method. This multi-factor authentication method can make it harder for participants to fake attendance since they need to take more effort to fake their identity. In addition, this proposed system also provides a solution to prevent users from using pictures to impersonate real people during face registration and face recognition. The method is to use eyes blink detection system and a face tracking system.

In conclusion, after thorough verification and testing, it can be confidently stated that the final system has successfully addressed all the problem statements outlined and has demonstrated its efficacy in delivering the desired outcomes.

7.2 Recommendation

The following are some recommendations for future developers and researchers who want to develop related type systems:

- Since this final system still has not been able to implement to process the face registration and face recognition on the local client side. Hence, privacy issues are still an unresolved issue.

- The event check-in system is already a well-studied and mature system type, so the development potential is very limited. However, the future development trend of the attendance system can be researched and developed in the field of automatic management.

REFERENCES

[1] IceHrm, “Difficulties in manual attendance tracking,” IceHrm, 22-Jan-2020. [Online]. Available: https://icehrm.com/blog/difficulties-in-manual-attendance-tracking/. [Accessed: 18-Apr-2022].

[2] D. Salama AbdELminaam, A. M. Almansori, M. Taha, and E. Badr, “A deep facial recognition system using computational intelligent algorithms,” PLoS One, vol. 15, no. 12, p. e0242269, 2020.

[3] M. Tyagi, “Viola Jones algorithm and Haar cascade classifier,” Towards Data Science, 13-Jul-2021. [Online]. Available: https://towardsdatascience.com/viola-jones-algorithm-and-haar-cascade-classifier-ee3bfb19f7d8

[4] AaronWard, “Facial detection — understanding viola Jones’ algorithm,” *Medium*, 24-Jan-2020. [Online]. Available: https://medium.com/@aaronward6210/facial-detection-understanding-viola-jones-algorithm-116d1a9db218.

[5] R. R. Damanik, D. Sitanggang, H. Pasaribu, H. Siagian, and F. Gulo, “An application of viola jones method for face recognition for absence process efficiency,” J. Phys. Conf. Ser., vol. 1007, p. 012013, 2018.

[6] A. Rosebrock, “Eye blink detection with OpenCV, Python, and dlib,” *PyImageSearch*, 24-Apr-2017. [Online]. Available: https://pyimagesearch.com/2017/04/24/eye-blink-detection-opencv-python-dlib/.

[7] V. N. Boddeti, “Secure face matching using fully homomorphic encryption,” 2018.

[8] X. Wei *et al.*, “QR code based smart attendance system,” *Int. j. smart bus. technol.*, vol. 5, no. 1, pp. 1–10, 2017.

[9] M. S. Uddin, S. M. Allayear, N. C. Das, and F. A. Talukder, “A location based time and attendance system,” *Int. j. comput. theory eng.*, pp. 36–38, 2014.

[10] Editor, “Extreme programming: Values, principles, and practices,” AltexSoft, 23-Feb-2018.

[11] Advanced Technology Partners, "What is AES 256 Encryption?" [Online]. Available: https://www.atpinc.com/blog/what-is-aes-256-encryption. [Accessed: Apr. 26, 2023

[12] Issa, Tomayess & Isaias, Pedro. (2014). HCI and Usability Principles and Guidelines in the Website Development Process: An International Perspective. 10.1007/978-3-319-06121-4_9.

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 4**
Student Name & ID: Ho Wai Lun 20ACB01430	
Supervisor: Ts Wong Chee Siang	
Project Title: Smart Event Attendance System using Facial Recognition	

1. WORK DONE

I add on some methods to support my face recognition to increase the flexibility and accuracy of my system.

The **first method** is to allow the manager to use her phone as a location pinpoint, and the participant must scan their face/scan QR code within a range to take attendance.

The **second method** is to allow the manager to set the network IP Address as the verification condition.

2. WORK TO BE DONE

Continue to develop the face recognition modules and its interfaces.

3. PROBLEMS ENCOUNTERED

Encounter the development problem of face registration and face recognition. It is because the face training process is taking quite a long time to compute and generate the face matcher model.

4. SELF EVALUATION OF THE PROGRESS

The current development progress is still under control, and it is expected that all modules of the Android client can be developed in the next two weeks.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 8**
Student Name & ID: Ho Wai Lun 20ACB01430	
Supervisor: Ts Wong Chee Siang	
Project Title: Smart Event Attendance System using Facial Recognition	

1. WORK DONE

The module of the Android client has been developed. And initially set up the prototype of the web-based application.

2. WORK TO BE DONE

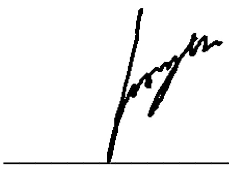
Continue to develop the modules of web-based application.

3. PROBLEMS ENCOUNTERED

No problems encountered.

4. SELF EVALUATION OF THE PROGRESS

The current development progress is still under control, and it is expected that all the system can be developed in the next two weeks.



Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 13**
Student Name & ID: Ho Wai Lun 20ACB01430	
Supervisor: Ts Wong Chee Siang	
Project Title: Smart Event Attendance System using Facial Recognition	

1. WORK DONE

The whole system has been finished developed and tested.

2. WORK TO BE DONE

No work to be done.

3. PROBLEMS ENCOUNTERED

Meet the deployment problem since the face registration and face recognition module require high computation resources. The free tier of the hosting service cannot support the usage of the server.

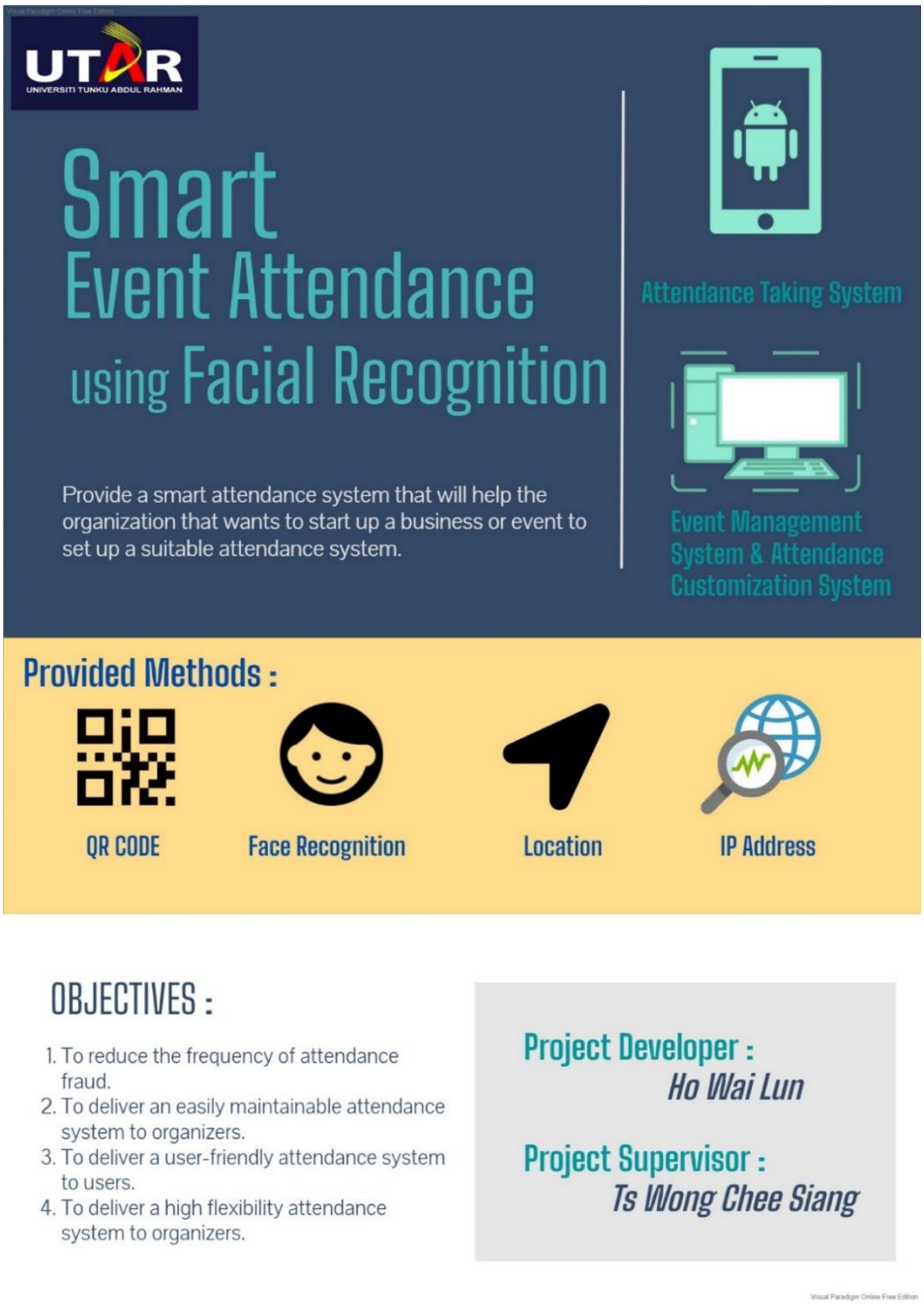
4. SELF EVALUATION OF THE PROGRESS

All work is done.

Supervisor's signature

Student's signature

POSTER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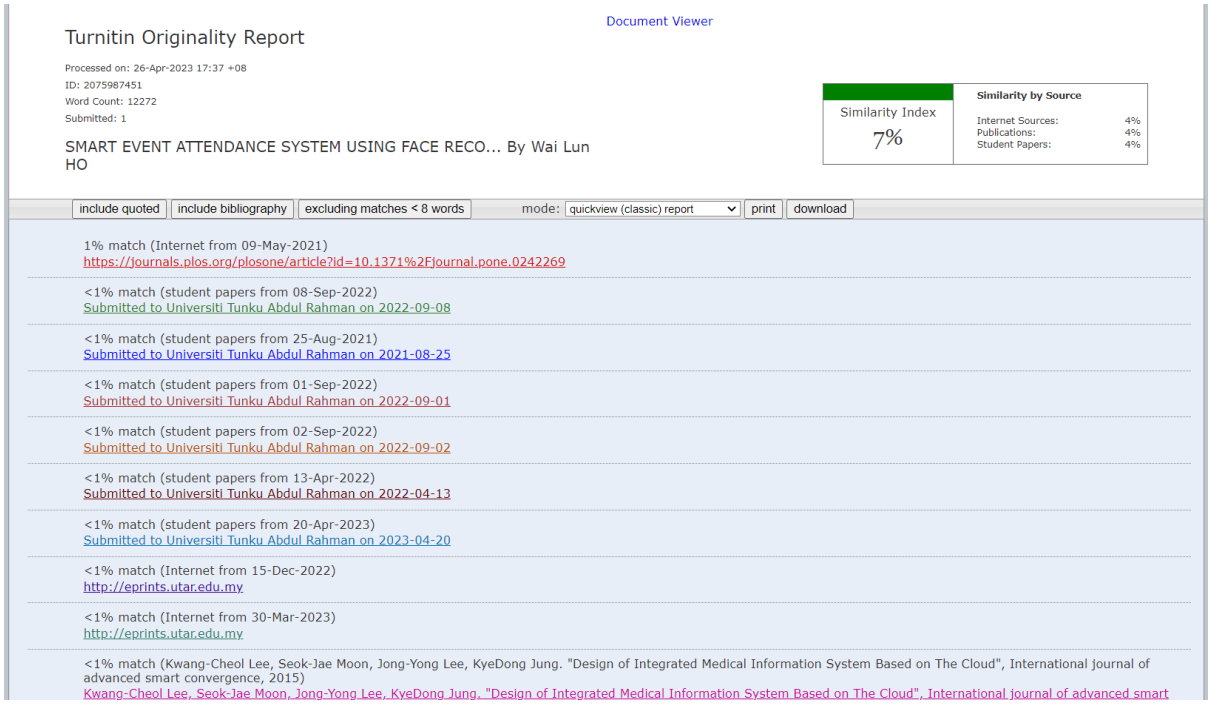
UNIVERSITI TUNKU ABDUL RAHMAN
Smart
Event Attendance
using Facial Recognition
Provide a smart attendance system that will help the organization that wants to start up a business or event to set up a suitable attendance system.
Attendance Taking System
Event Management System & Attendance Customization System
Provided Methods :
QR CODE
Face Recognition
Location
IP Address
OBJECTIVES :
1. To reduce the frequency of attendance fraud.
2. To deliver an easily maintainable attendance system to organizers.
3. To deliver a user-friendly attendance system to users.
4. To deliver a high flexibility attendance system to organizers.
Project Developer :
Ho Wai Lun
Project Supervisor :
Ts Wong Chee Siang

PLAGIARISM CHECK RESULT



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ID Number(s)	20ACB01430
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Signature of Supervisor

Name: Ts. Wong Chee Siang

Date: 27/04/2023

Signature of Co-Supervisor

Name: _____

Date: _____

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FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY
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