

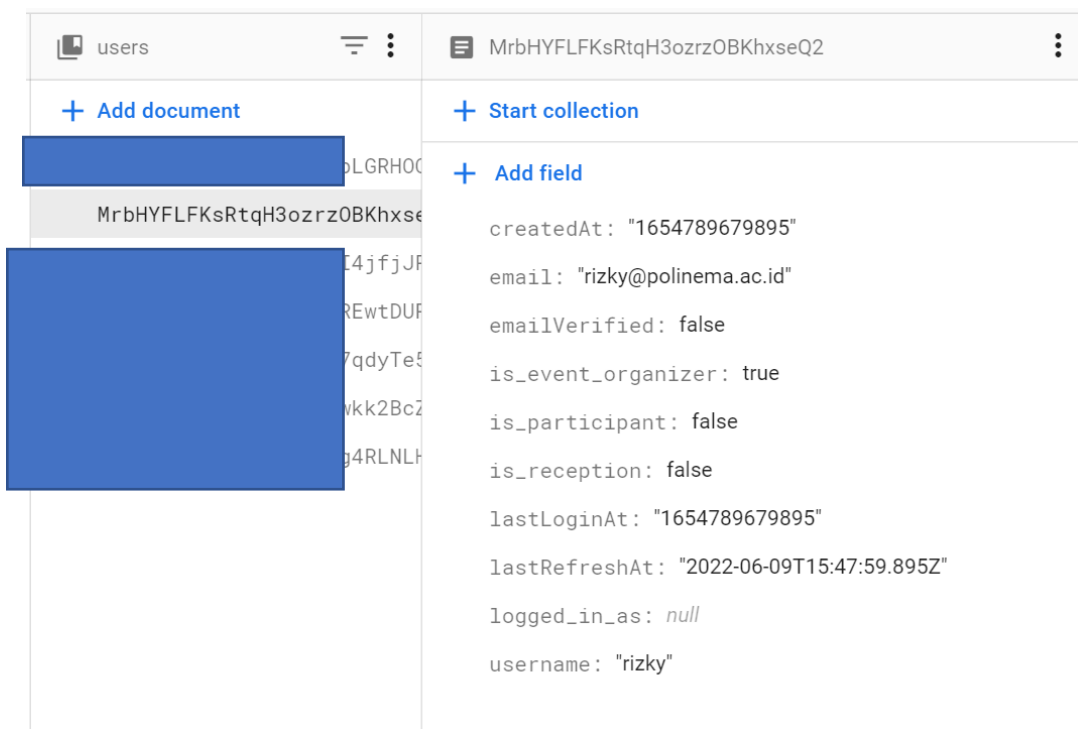
## CHAPTER V. IMPLEMENTATION AND TESTING

### 5.1. Database Implementation

The database used in the system is NoSQL Database on Firestore Firebase, in this study the author uses NoSQL Database because NoSQL databases are quite fast and more compatible with mobile applications that require a fairly fast response time. Firestore database has 2 options, paid and unpaid, here the author chooses a paid database as application development on Google Cloud Platform.

#### 5.4.1 Users Collection

Users table that previously design in figures, implemented in figures.



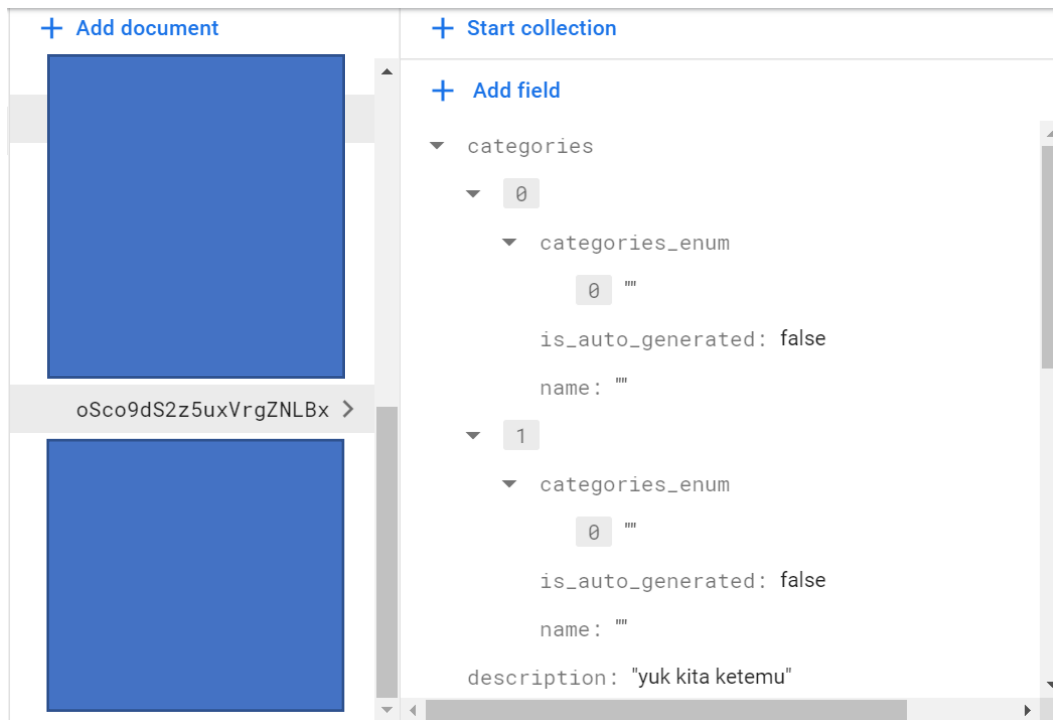
Figures 5.1 Users Collection in Firestore Database

Information:

- users document (Auto Generated) is a document id or id of a field itself.
- createdAt field (datetime) is information about when the user document is created.
- Email field (string) is email of registered user.
- emailVerified (boolean) is information about the registered email has been verified or not.
- is\_event\_organizer (boolean) is information about the registered user register as an event organizer.

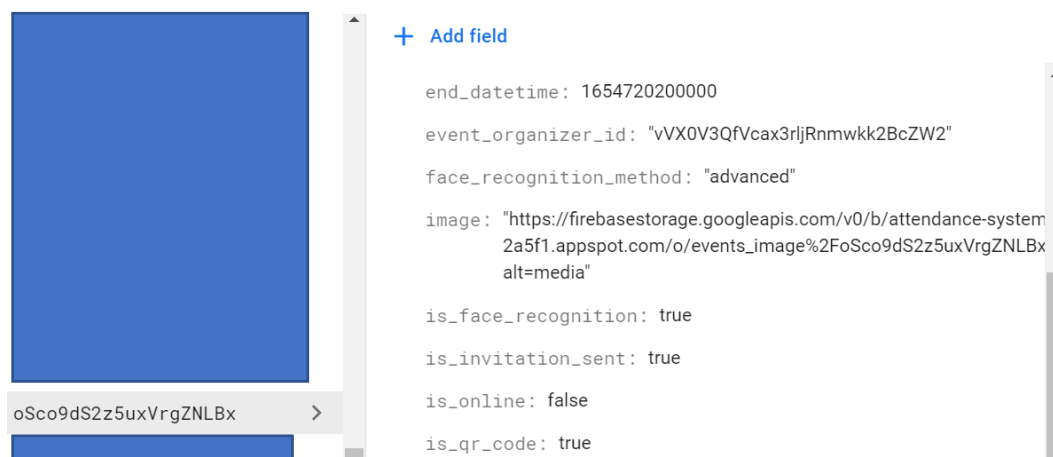
- f. `is_participant` (boolean) is information about the registered user register as a participant .
- g. `is_receptionist` (boolean) is information about the registered user register as a receptionist.
- h. `lastLoginAt` (datetime) is information about last login information of user.
- i. `lastRefreshAt` (datetime) is information about last refresh information of user.
- j. `logged_in_as` (string) is information about last login user as who.
- k. `username` (string) is information about username of registered user .

#### 5.4.2 Events Collection



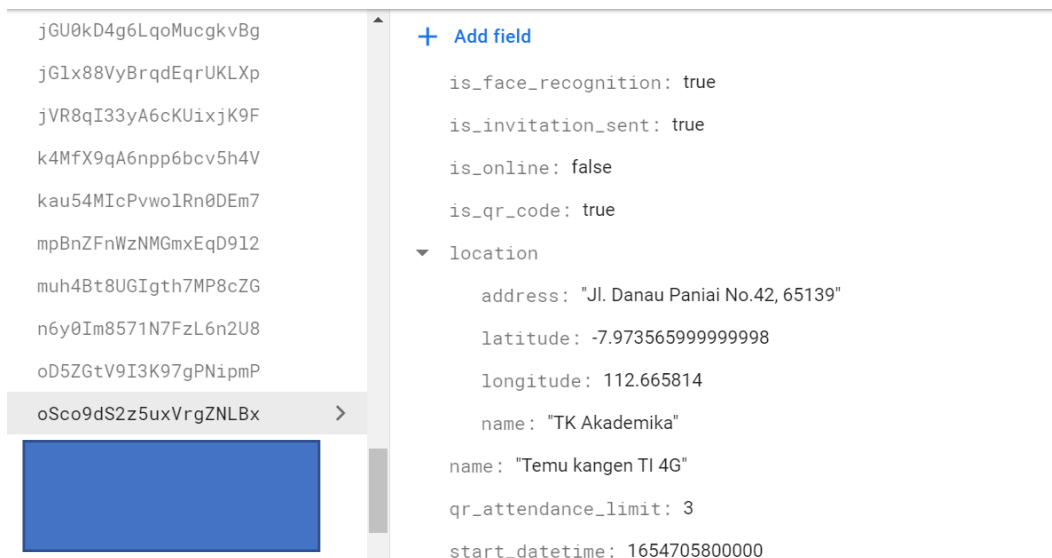
```

+ Start collection
+ Add field
- categories
  - 0
    - categories_enum
      - 0 ""
      is_auto_generated: false
      name: ""
  - 1
    - categories_enum
      - 0 ""
      is_auto_generated: false
      name: ""
description: "yuk kita ketemu"
end_datetime: 1654720200000
event_organizer_id: "vVX0V3QfVcax3rIjRnmwkk2BcZW2"
face_recognition_method: "advanced"
image: "https://firebasestorage.googleapis.com/v0/b/attendance-system-2a5f1.appspot.com/o/events_image%2FoSco9dS2z5uxVrgZNLBx-alt=media"
is_face_recognition: true
is_invitation_sent: true
is_online: false
is_qr_code: true
  
```



```

+ Add field
end_datetime: 1654720200000
event_organizer_id: "vVX0V3QfVcax3rIjRnmwkk2BcZW2"
face_recognition_method: "advanced"
image: "https://firebasestorage.googleapis.com/v0/b/attendance-system-2a5f1.appspot.com/o/events_image%2FoSco9dS2z5uxVrgZNLBx-alt=media"
is_face_recognition: true
is_invitation_sent: true
is_online: false
is_qr_code: true
  
```



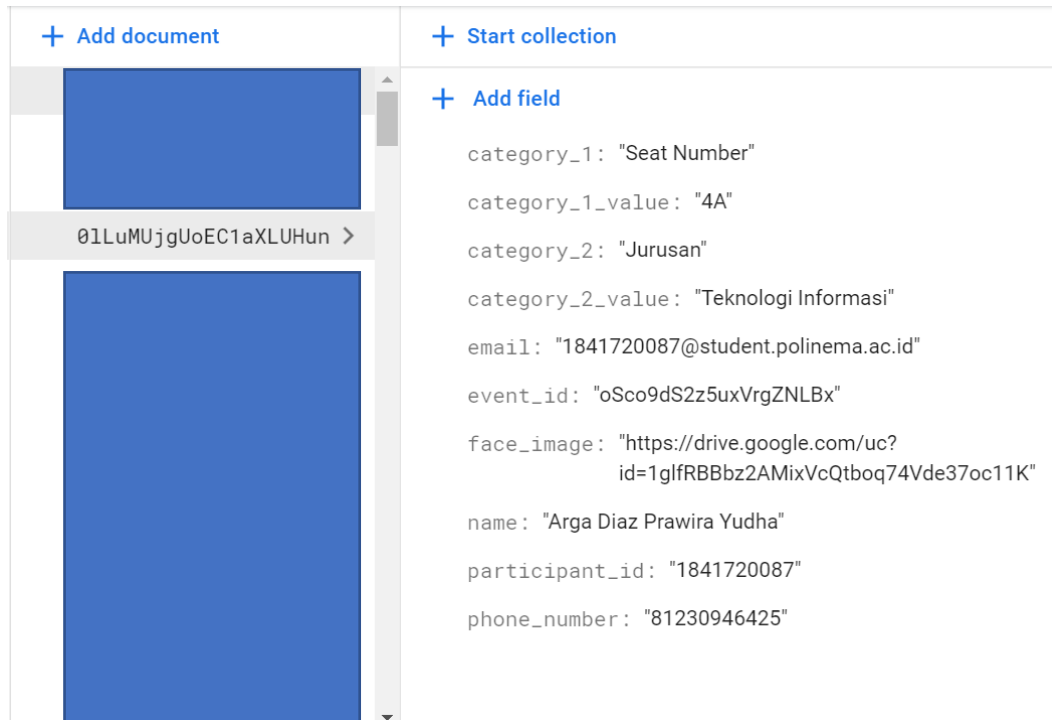
Figures 5.2 Events Collection in Firestore Database

**Information:**

- a. event document (Auto Generated) is a document id or id of a field itself.
- b. Categories field (map) have information about enum of a categories and information about categories that will be provided in event.
- c. Description field (string) is information about description of event.
- d. End\_datetime (datetime) is information about end date and time of event.
- e. Event\_organizer\_id (string) is information about user event organizer that created selected event.
- f. Face\_reecognition\_method (string) field is information about the face recognition authentication method, there are 2 options, basic or advanced, every method has its own advantage and disadvantages.
- g. Is\_face\_recognition field (boolean) is information about the event attendance authentication method is using face recognition or not.
- h. Is\_invitation\_sent field (boolean) is information about the event invitation already sent to participant or not.
- i. is\_online (boolean) is information about the event is online event or offline event.
- j. is\_qrcode (boolean) is information about the event attendance authentication method is using qrcode or not.
- k. Location (map) is information about event place, this map contains address, landmark name, latitude place, longitude place.
- l. Name is information about event name.

- m. Qr\_attenance\_limit (number) is information about how many times participant can do attendance in one qr code.
- n. Start\_date\_time (datetime) is information about start time of event.

### 5.4.3 Guest Details Collection

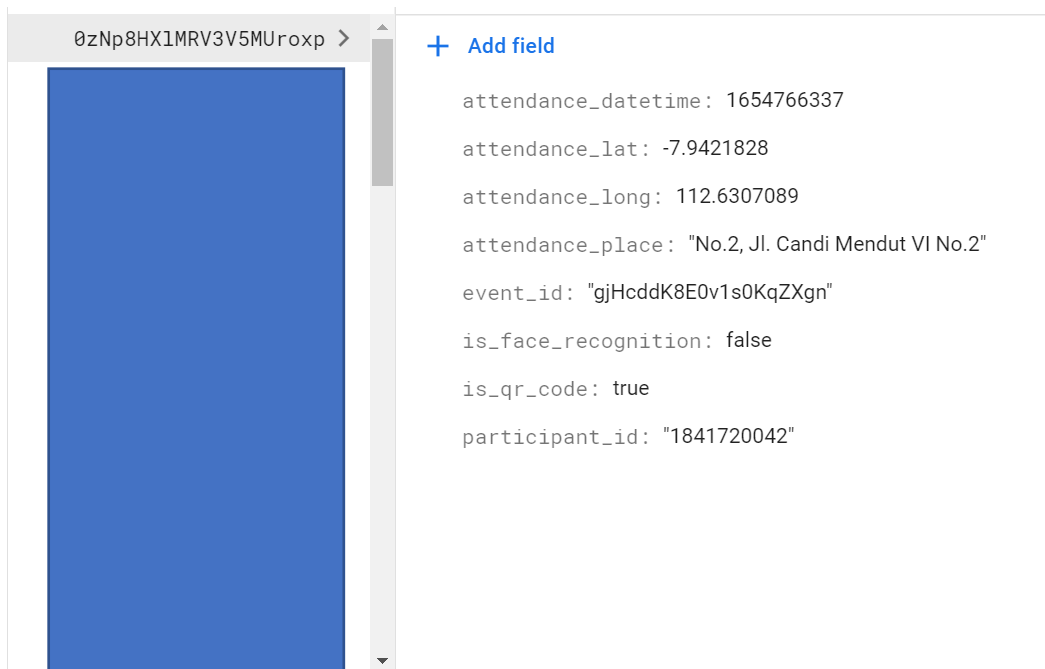


Figures 5.3 Guest Details Collection in Firestore Database

#### Information:

- a. Guest Details document (Auto Generated) is a document id or id of a field itself.
- b. Category\_1 field (string) is information about category\_1 name of event.
- c. Category\_1\_value field (string) is information about value of category\_1 in selected participant.
- d. Category\_2 field (string) is information about category\_2 name of event.
- e. Category\_2\_value field (string) is information about value of category\_2 in selected participant.
- f. email (string) is information about email of participant.
- g. Face\_image (string) is information about participant face dataset image.
- h. Name (string) is information about name of participant.
- i. Participant\_id (string) is information about id of participant.
- j. Phone\_number (string) is information about phone number of participant.
- k. username (string) is information about username of registered user.

### 5.4.4 Attendances Collection

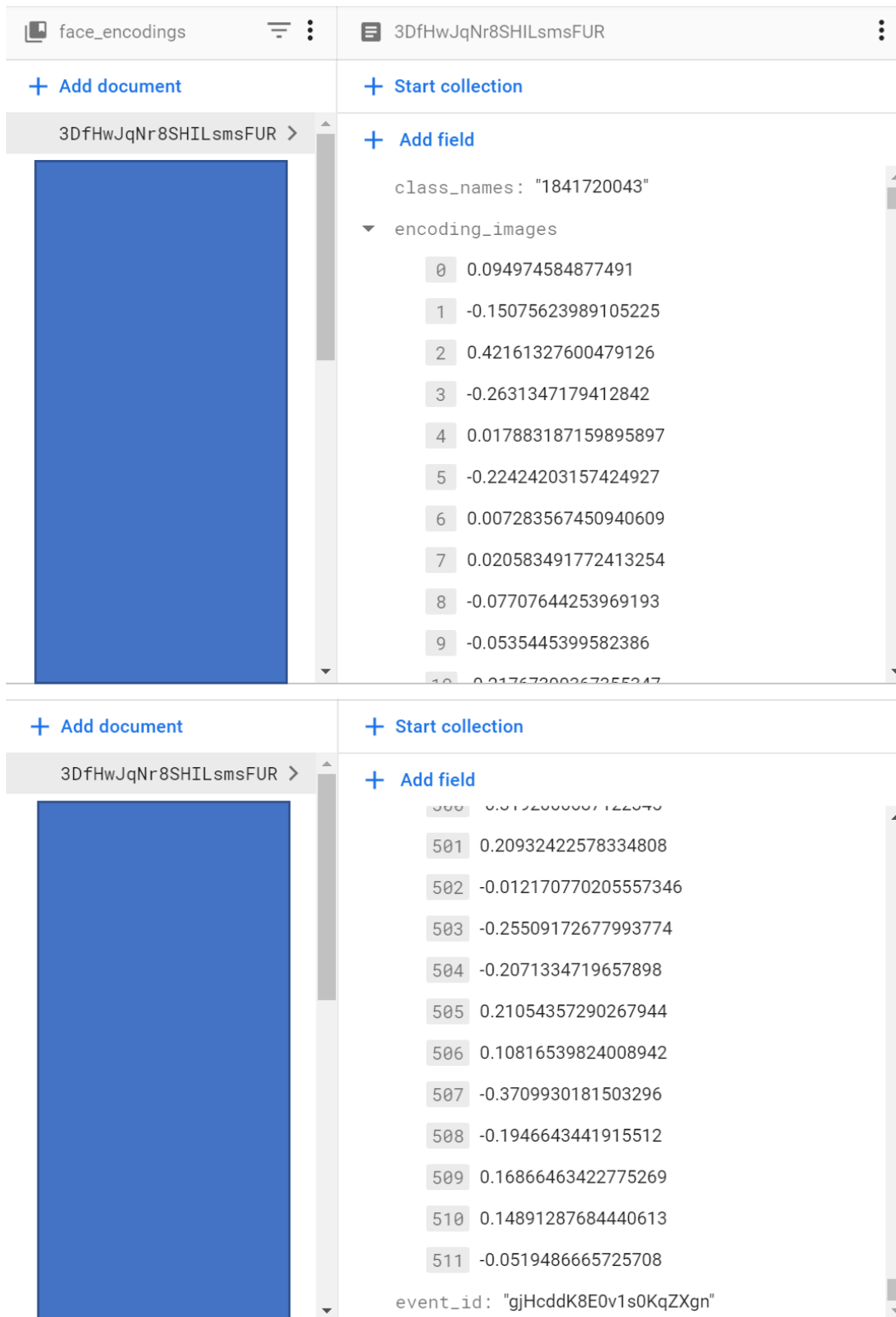


Figures 5.4 Attendances Collection

#### Information:

- a. Attendance document (Auto Generated) is a document id or id of a field itself.
- b. Attendance\_datetime field (string) is information about date and time when the participant take attendance.
- c. Attendance\_lat field (number) is information about latitude of place where participant take attendance.
- d. Attendance\_long (number) is information about longitude of place where participant take attendance.
- e. Attendance\_place (string) is information about place name of place where participant take attendance.
- f. Event\_id (string) is information about event that participant attending.
- g. Is\_face\_recognition (boolean) is information about participant take attendance using face recognition authentication method or no.
- h. Is\_qr\_code (boolean) is information about participant take attendance using Qr Code authentication method or no.
- i. Participant\_id (string) is information about id of participant.

#### 5.4.5 Face Encodings Collection



Figures 5.5 Face Encodings Collection in Firestore Database

Information:

- a. Face encodings document (Auto Generated) is a document id or id of a field itself.
- b. Class\_names field (string) is information about the name of the result of the facial representation that has been done.

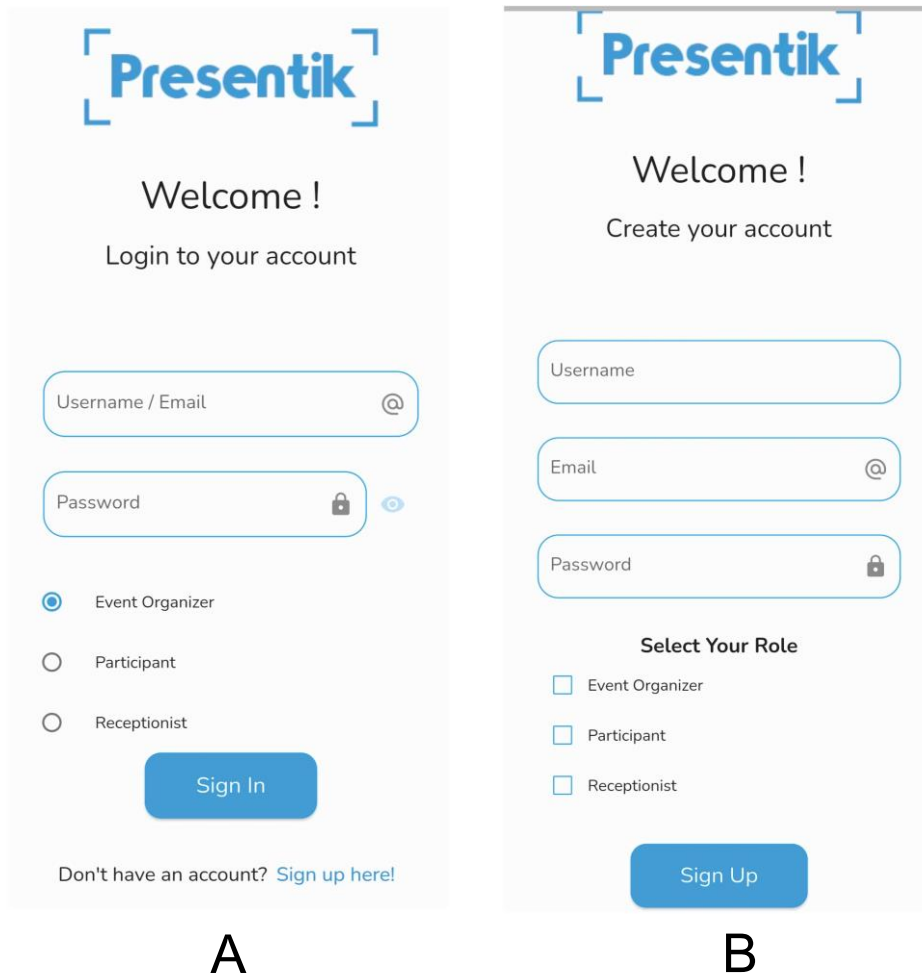
- c. Face\_encodings field (array) is information about feature embedding or face representation of face image datasets.
- d. Event\_id (string) is information about id of event.

## **5.2. UI Implementation**

The development of the front-end system is done with Flutter 3.0.1 and Dart 2.17.1. The UI is developed based on the mockups that already been designed using Figma in the system design phase. The UI designs of the application is listed below.

### 5.2.1 Login and Register Page

The first thing that the user must do is log into their account or register a new account before proceeding to the system. The user can choose which role that they want to login, with each role has their own features. For the register page, the user can choose multiple roles to be assigned to the account.

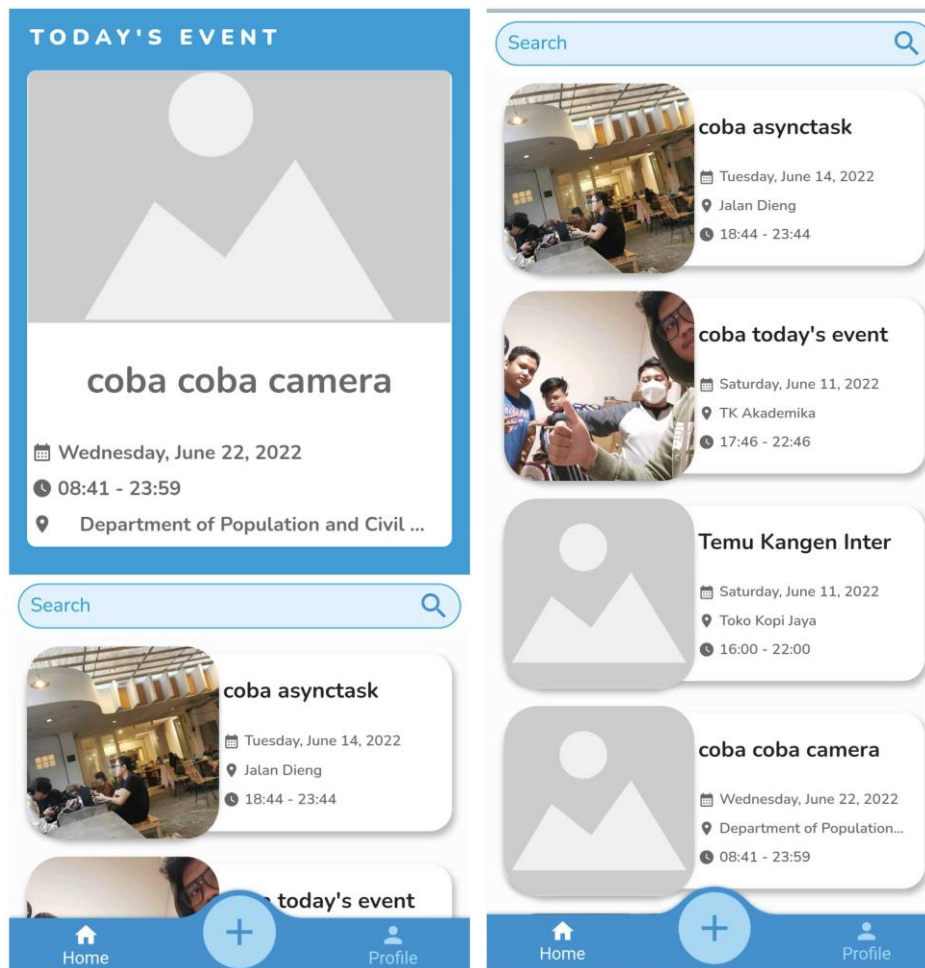


Figures 5.6 a) Login Page, b) Register Page

### 5.2.2 Home Page

After logging in, the user will be redirected to the main screen. The main screen displays the event that takes place today. The main screen also displays the events that the user organized.

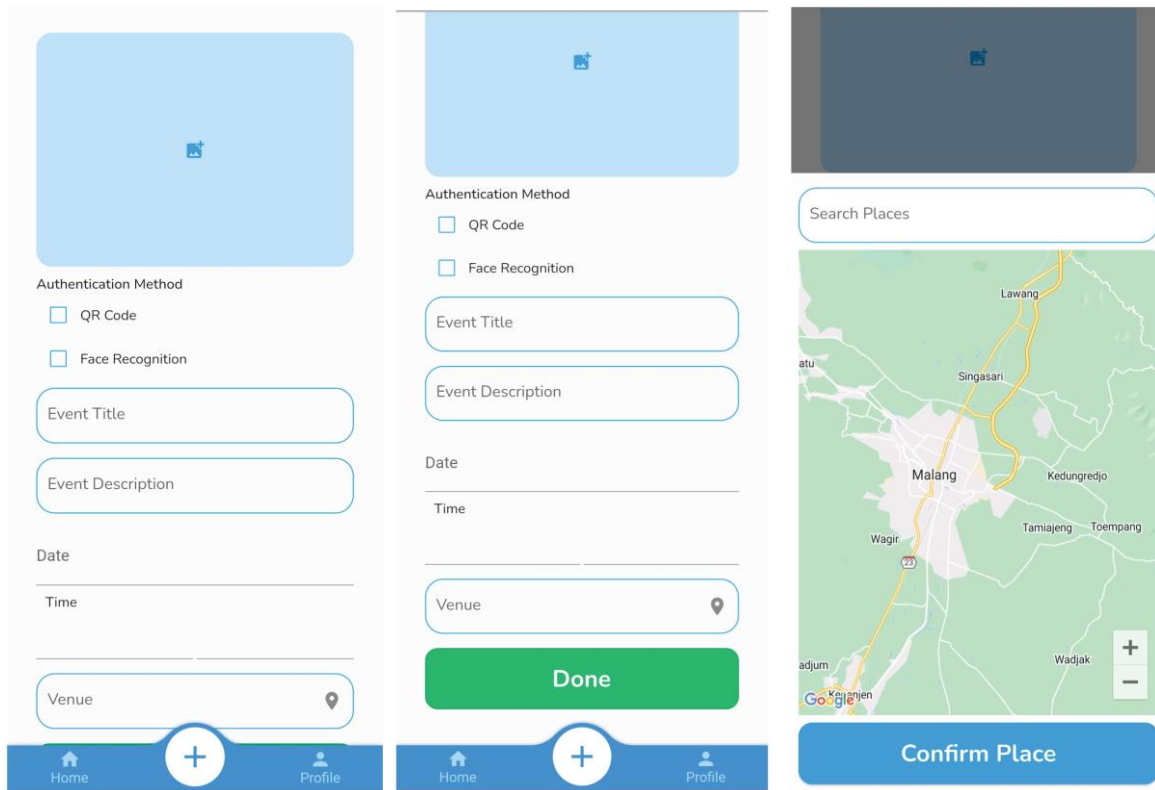




Figures 5.7 Home Page

### 5.2.3 Add Event Page

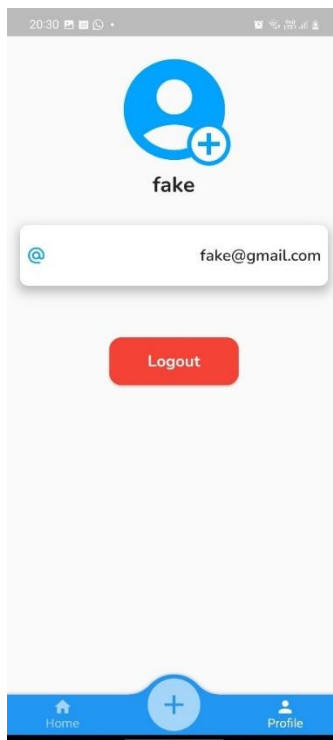
User can register new events by clicking the ‘+’ button at the bottom navigation bar. The user must fill all the information except the photo/media of the event. The user can add the exact location of the event by searching the place in the google maps.



Figures 5.8 Add Event Page

### 5.2.4 Profile Page

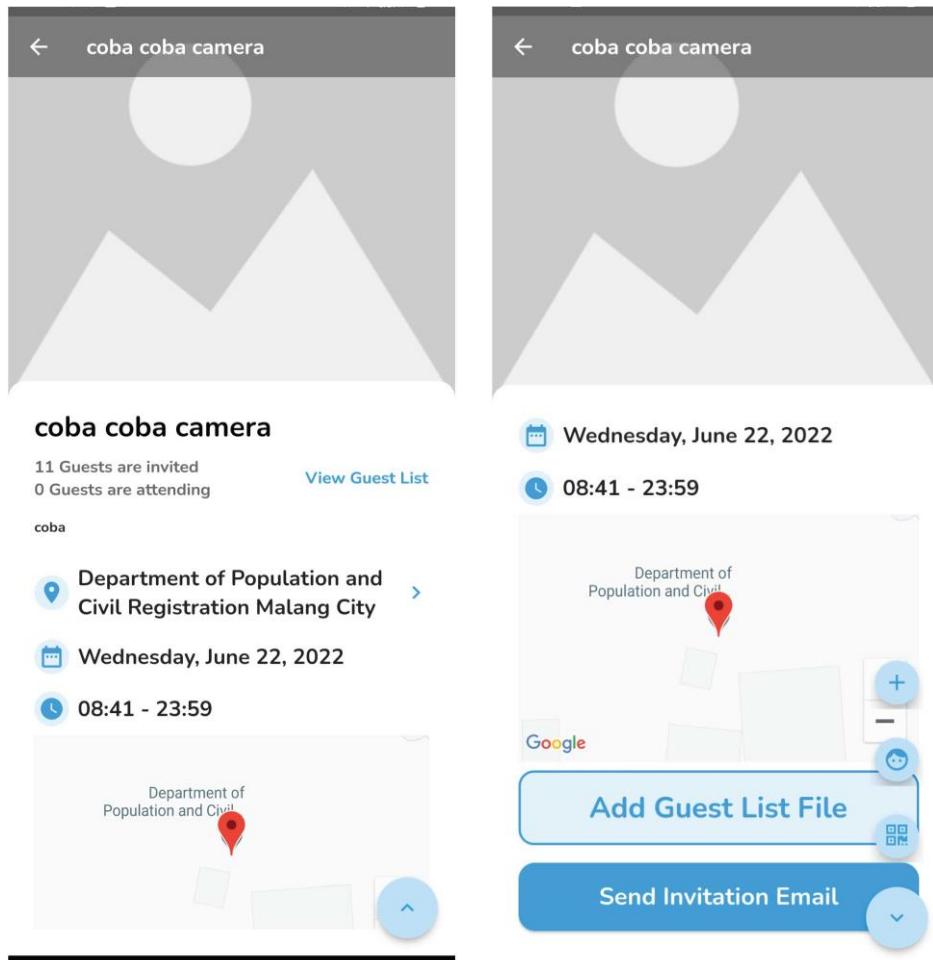
In this page, the user can logout the current user



Figures 5.9 Profile Page

### 5.2.5 Event Detail

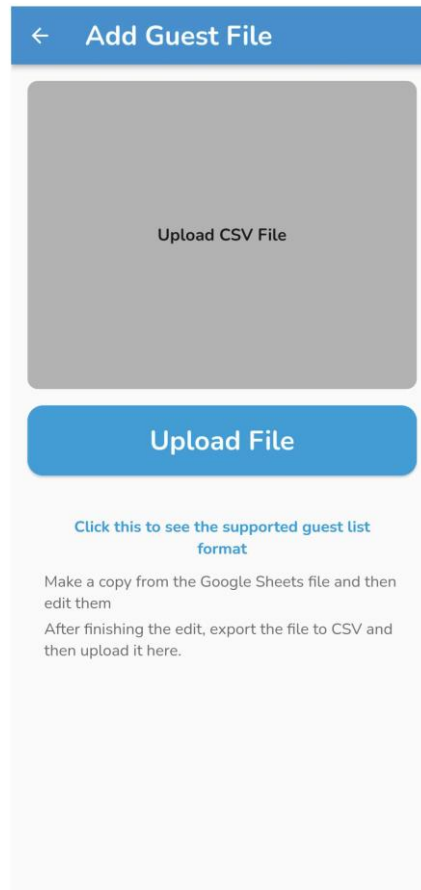
This page displays the detail of the event such as: title, description, location, date, time, and maps. This page displays the sum of the invited guests and the guests that already attends the event. After adding the guests, the invitation can be sent by clicking the ‘Send Email Invitation’ button.



Figures 5.10 Event Detail Page

### 5.2.6 Add Guest File

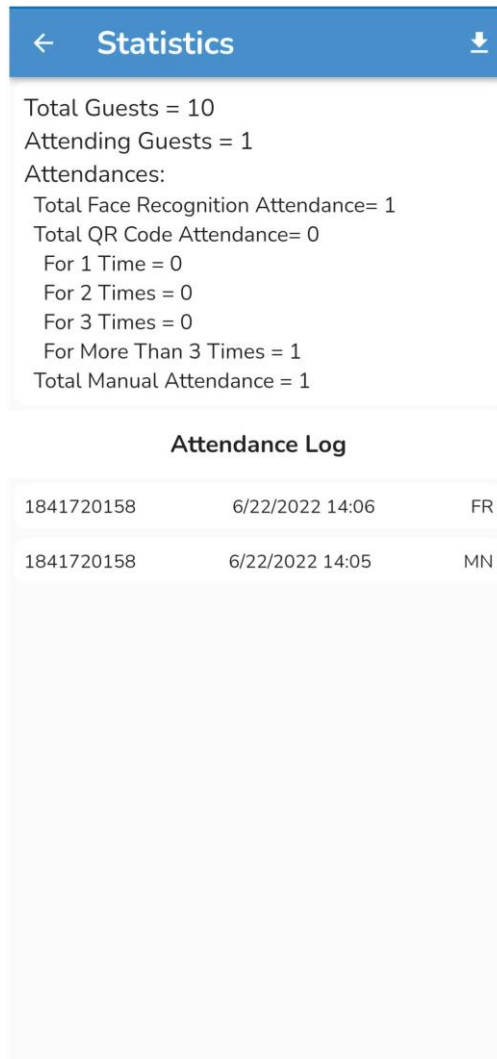
User can add the guests list by uploading the CSV file here. To choose the desired file, user can tap the grey rectangle on the screen. After adding the file, the user uploads them by clicking the ‘Upload File’ button.



Figures 5.11 Add Guest File Page

### 5.2.7 Statistics Page

This page displays the attendance statistics of the event. The statistics includes total guests invited; total guests already attend; guests that use QR code as the identification; etc. This page also displays the detailed attendance of the user, including their ID, the time of the attendance, and the attendance method.



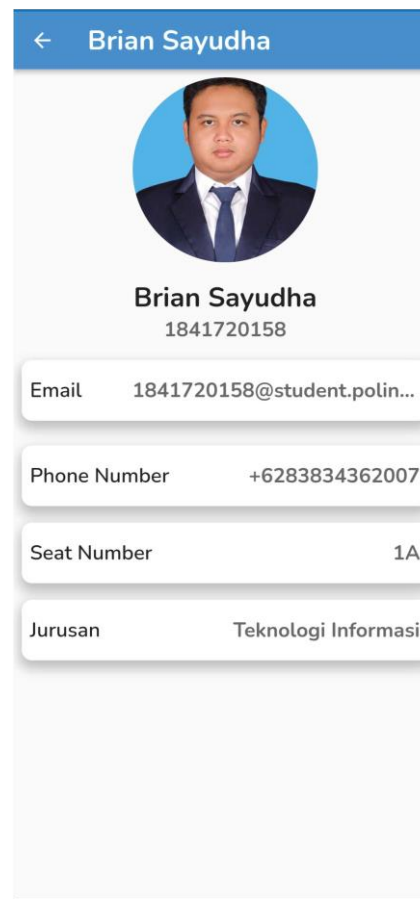
Figures 5.12 Statistics Page

### 5.2.8 Guest List and Detail Page

User can see the list of the guests added to the event. User can also see the details of the guests by clicking one of the users. The detailed page displays the guest info and the photo of the guests.



A

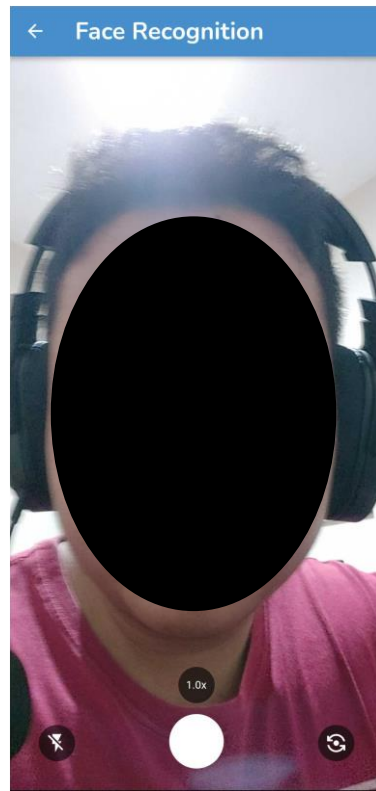


B

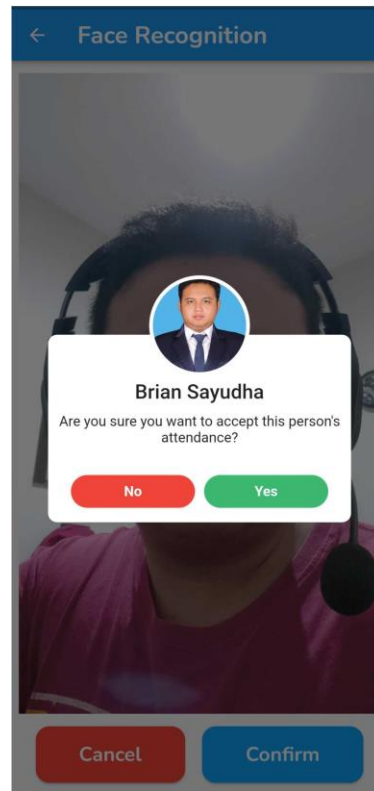
Figures 5.13 a) Guest List Page, b) Guest Detail Page

### 5.2.9 Face Recognition Attendance Page

The main feature of this application is the Face recognition attendance. The user can mark the attendance of the guests by recognizing guest face. If the face is recognized, event organizer will be showed some pop ups and press confirm to mark the attendance.



A

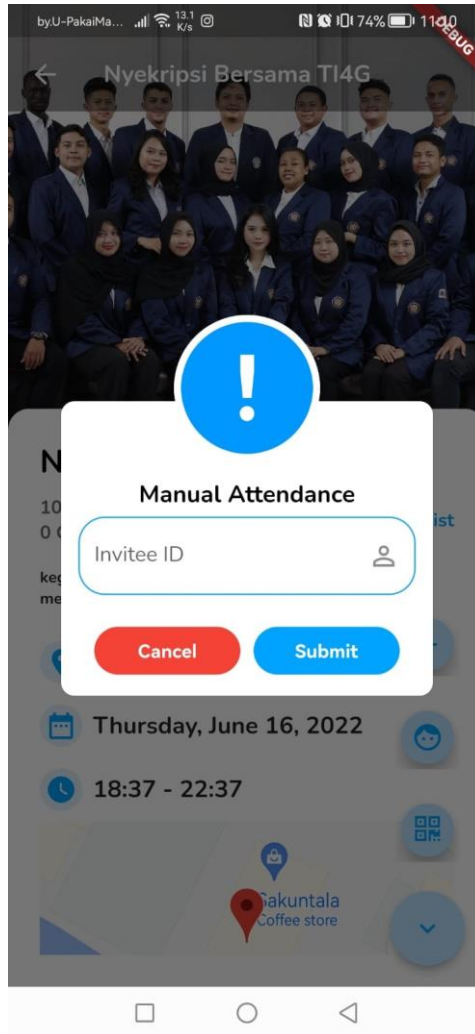


B

Figures 5.14 a) Face Recognition Camera, b) Face Recognition Result

#### 5.2.10 Manual Attendance Dialog

Other than face recognition Attendance, the user can mark the attendance manually by inputting the guests ID.



Figures 5.15 Manual Attendance Dialog

### 5.3. CSV File Implementation

To fill in participant data, event organizers can follow the template provided by providing information that suits the needs of the event to be held, templates can be downloaded at the following link:

[https://docs.google.com/spreadsheets/d/1h5hAAewZNm7wj1abjFaFU6PXLyig0SoX6\\_v6FaRCMNE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1h5hAAewZNm7wj1abjFaFU6PXLyig0SoX6_v6FaRCMNE/edit?usp=sharing).

The following is an example of an image from the provided csv template:

A	B	C	D	E	F	G	H	I	J
participant_id	name	email	phone_number	category_1	category_1_value	category_2	category_2_value	face_image	
1841720001	person 1	person1@gmail.com	+628214563312	Seat Number	1A	Jurusan	Teknologi Informasi	<a href="https://drive.google.com/file/d/1G/">https://drive.google.com/file/d/1G/</a>	
1841720002	person 2	person2@gmail.com	+628214563312	Seat Number	2A	Jurusan	Teknik Mesin	<a href="https://drive.google.com/file/d/1G/">https://drive.google.com/file/d/1G/</a>	
1841720003	person 3	person3@gmail.com	+628214563313	Seat Number	3A	Jurusan	Teknik Elektro	<a href="https://drive.google.com/file/d/1G/">https://drive.google.com/file/d/1G/</a>	
1841720004	person 4	person4@gmail.com	+628214563314	Seat Number	4A	Jurusan	Teknik Kimia	<a href="https://drive.google.com/file/d/1G/">https://drive.google.com/file/d/1G/</a>	
1841720005	person 5	person5@gmail.com	+628214563315	Seat Number	5A	Jurusan	Akutansi	<a href="https://drive.google.com/file/d/1G/">https://drive.google.com/file/d/1G/</a>	

Figures 5.16 Guest List Data File Template

Csv template has a total of 9 columns with 5 main fields that must be filled in (participant\_id, name, email, phone\_number, and face\_image) and 4 side fields that can be left



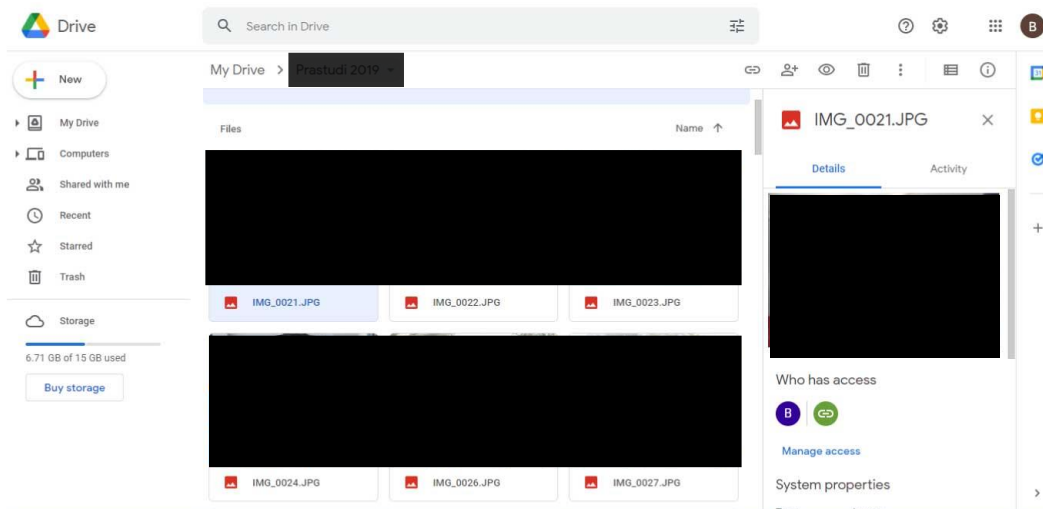
blank (category\_1, category\_1\_value, category\_2, and category\_2\_value), for the main column there are:

- 1) **participant\_id (Required)** to fill in the id or differentiating number for each participant, this column must be filled in as the participant's main information. such as for example "1", "2", "numbers or sentences that cannot be the same", etc.,
- 2) **name (Required)** as the name of the participant to be added, this column must be filled as the participant's main information. such as for example "Brian", "Sayudha", "A person's name", etc.
- 3) **email (Required)** as participant's email data that can be contacted to send invitation information, this column must be filled as the participant's main information. for example: "briansayudha@gmail.com", "1841720158@student.polinema.ac.id", "contact@gmail.com", etc.,
- 4) **phone\_number (Required)** as the participant's cellphone number that can be contacted to send invitation information, this column must be filled as participant key information. for example: "+6212345678", "+190864638202", "contact\_number\_can\_contact", etc.,
- 5) **category\_1 (Nullable)** is the name of the first category to be added, this column can be left blank if the event does not have a distinguishing category. such as for example: "Seat Number", "Department", "Class", "name\_a\_value", etc.
- 6) **category\_1\_value (Nullable)** as input or data from participants in a predetermined category, this column can be left blank if the event does not have a distinguishing category. for example, if category\_1 contains majors, the value will contain "Information Technology", "Mechanical Engineering", etc.
- 7) **category\_2 (Nullable)** is the name of the second category to be added, this column can be left blank if the event does not have a distinguishing category. If the category\_1 column is filled then category\_2 is recommended to be different from category\_1, for example if category\_1 contains "Department" then category\_2 can contain: "Seat Number", "Class", "name\_an\_value\_different\_with\_category\_1", etc.,
- 8) **category\_2\_value (Nullable)** as input or data from participants in a predetermined category, this column can be left blank if the event does not have a distinguishing category. for example, if category\_2 contains "Class" then the value will contain "TI-4G", "TI-3G", etc.,
- 9) **face\_image (Required)** as face data from participants by including a face photo data link in the column, such as providing a gdrive link obtained from image link that will be shared by providing link information as follows

"https://drive.google.com/file/d/1GWL14Ze9bHxrXQUGu3bbH1zj9DFvAvVi/view?usp=sharing" or by providing another photo link (photo link cannot be base:64 because too long number of characters)

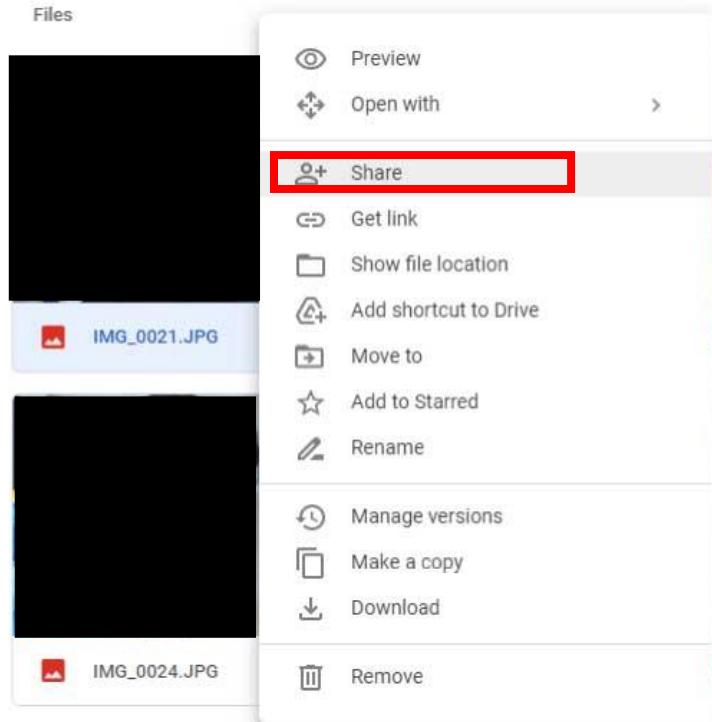
To get shareable links with Google Drive, users can share images in the following sequence: open Google Drive → choose file photo → right click on selected photo → click share → click Change to anyone with the link → change restricted to Anyone with the link → click copy link → paste the link to CSV or Excel data.

### 1. Open Google Drive and Choose file photo



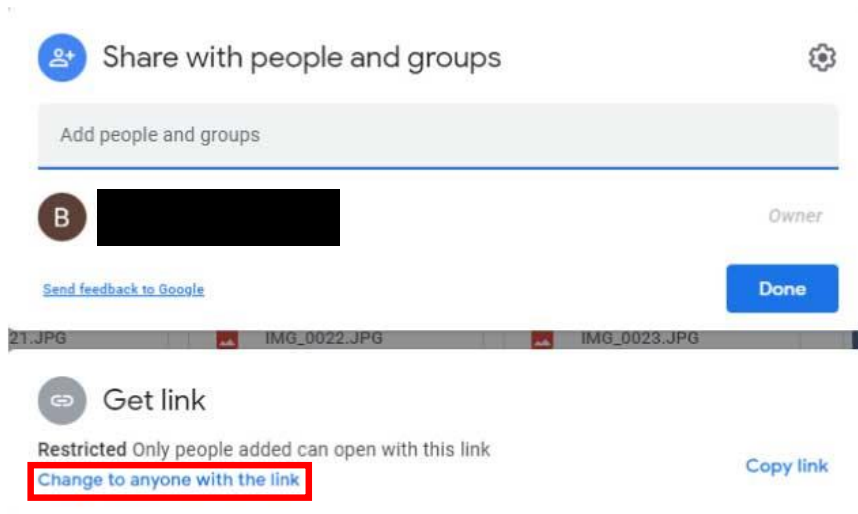
Figures 5.17 Google Drive and Choose photo example

### 2. Right Click to open option and click Share



Figures 5.18 Get link with click Share Example

3. Click Change to anyone with the link



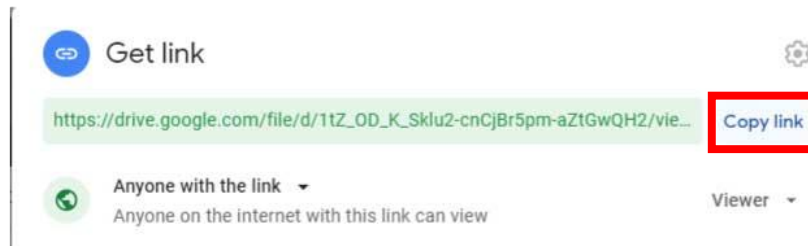
Figures 5.19 Change anyone with the link example

4. Change Restricted to Anyone with the link



Figures 5.20 Change restricted to anyone with the link

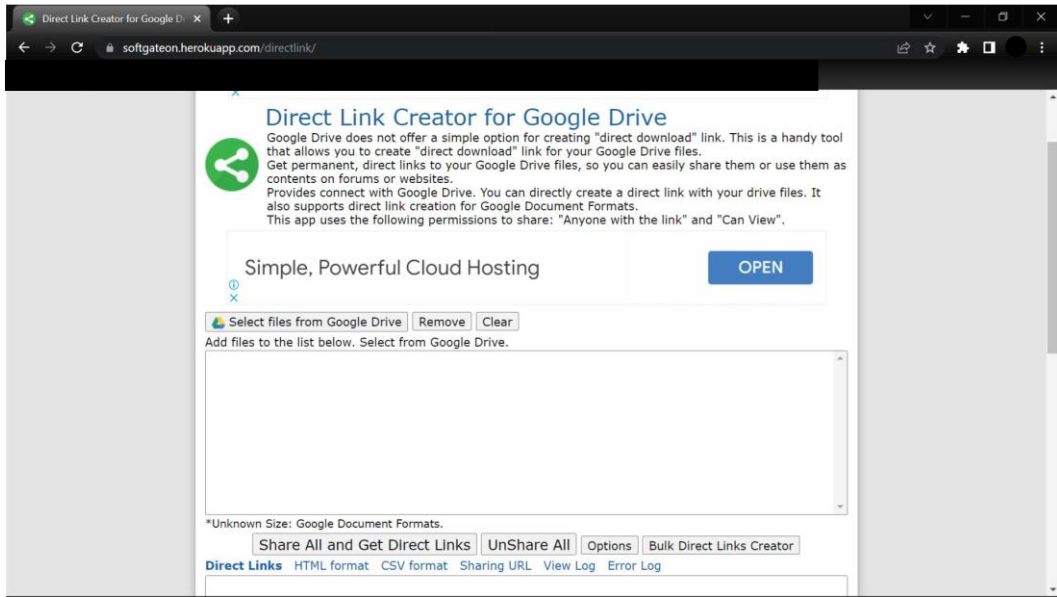
## 5. Copy Link



Figures 5.21 Copy Link Example

To get shareable links with Google Drive, when the event organizer has a lot of face data to enter, the user can open the following link: <https://softgateon.herokuapp.com/directlink/> to get shareable links easily. Use of links can be used by Select “Select files from Google Drive” (Authorize the drive usage if prompted) → select the face dataset folder to be added → Select all files or press CTRL + A → select “Select” → Select Share all and get direct links → Then replace the Direct Links option with Sharing URL → Copy all the converted results and input into CSV or Excel Data.

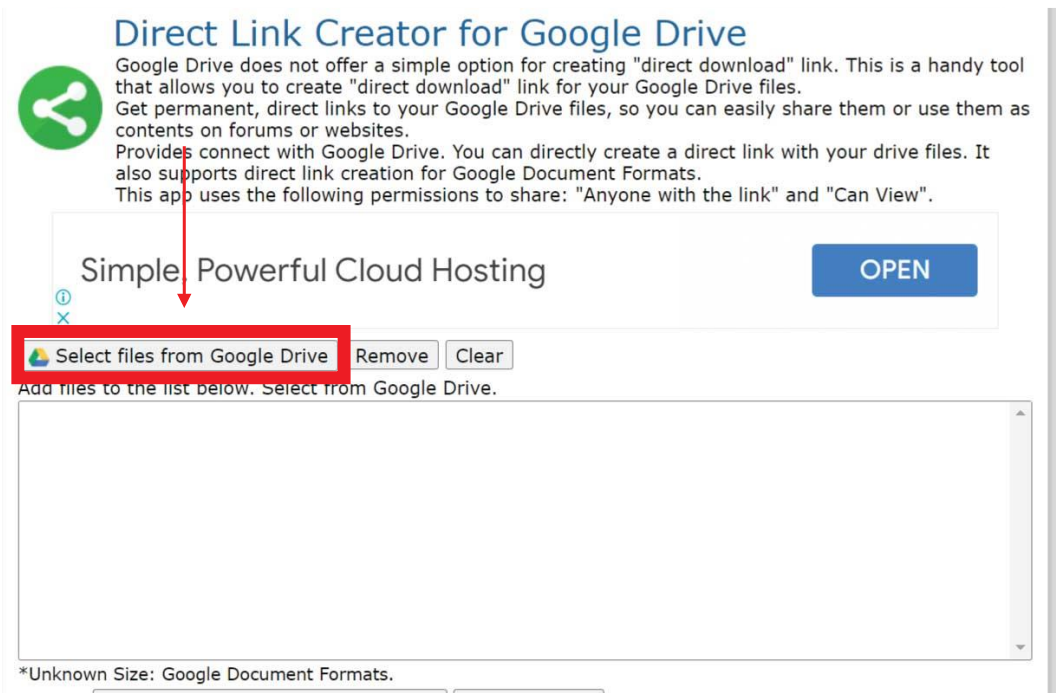
1. Open <https://softgateon.herokuapp.com/directlink/>



Figures

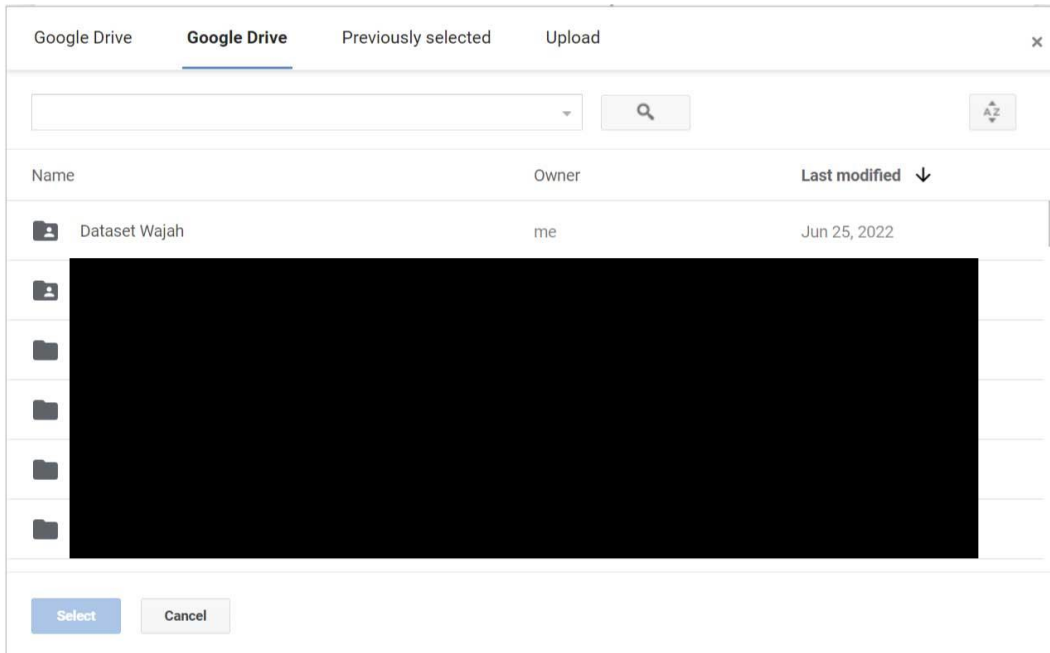
## 5.22 Link Website Interface

2. Select “Select files from Google Drive”



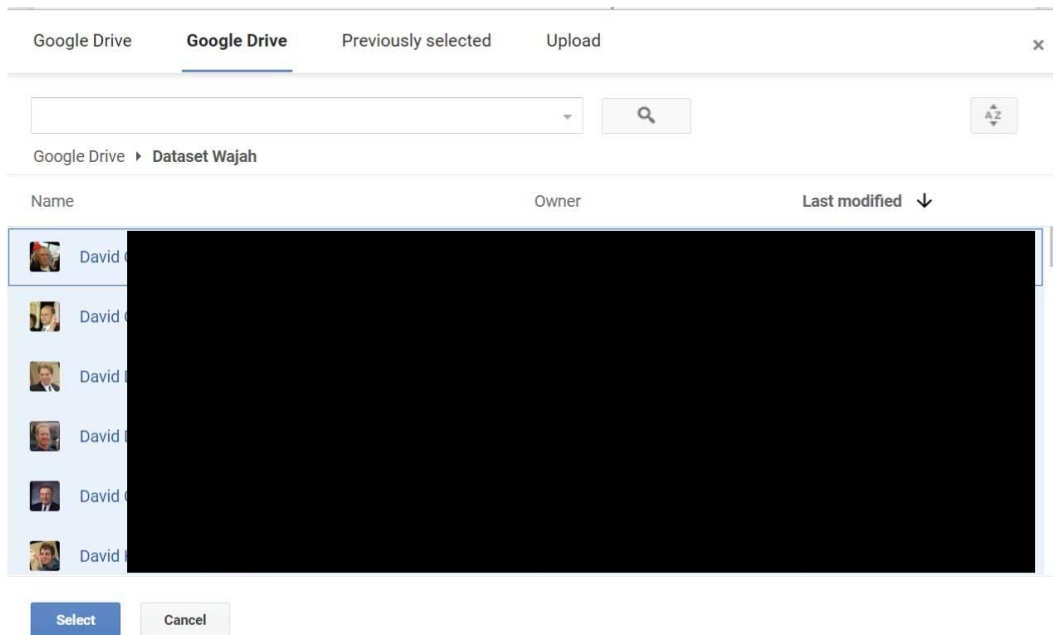
Figures 5.23 Select Files from Google Drive Button

3. Select face dataset folder (The naming of the folder in the image is just an example)



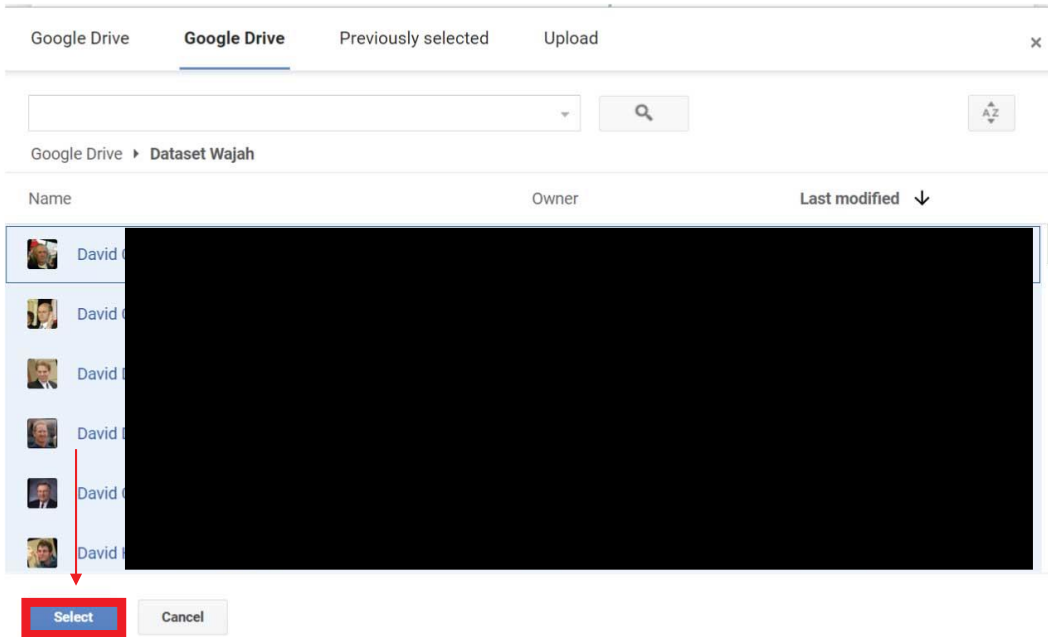
Figures 5.24 Google Drive folder example

4. Select all files



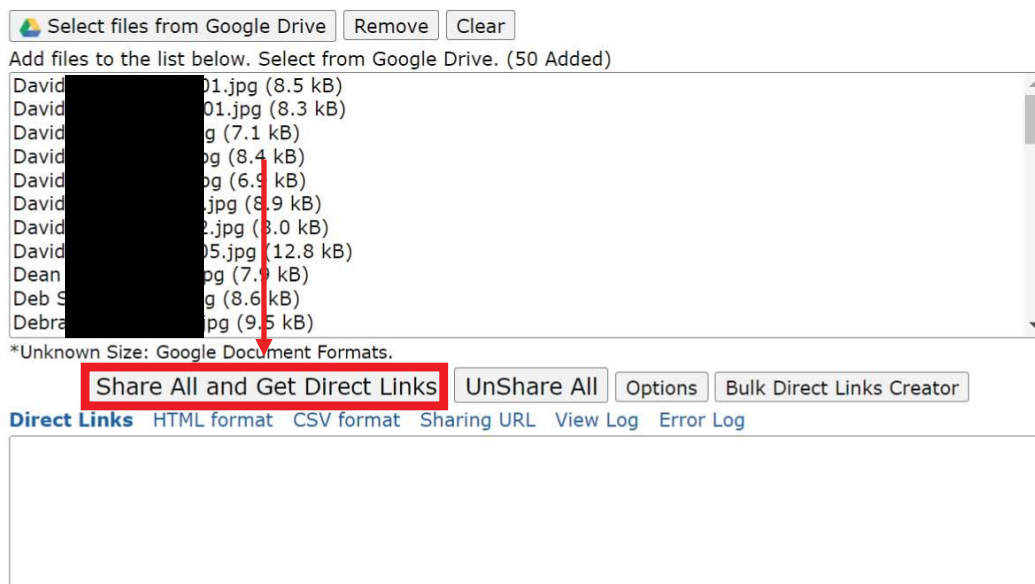
Figures 5.25 Select All Files example

5. Select “Select”



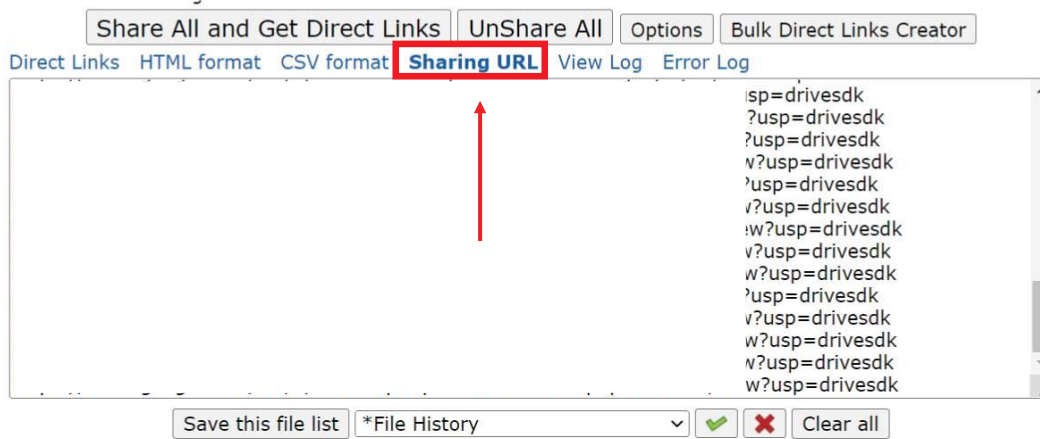
Figures 5.26 Select Button

6. Select share all and get direct links



Figures 5.27 Share all and get direct links button

7. Replace direct links convert to Sharing URL Convert



Figures 5.28 Change convert method example

#### 5.4. Application Implementation

Here is how to use the attendance system application from start to finish, for clarity of use, you can see the following video: <https://youtu.be/657eEIXiHLs>.

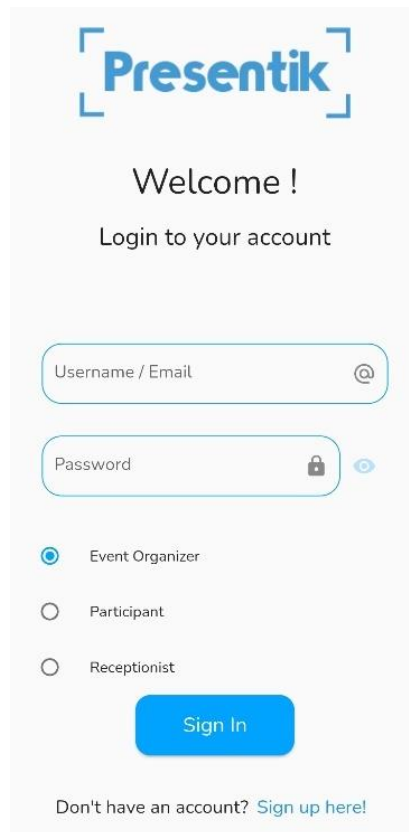
For the order of using the application, you can follow the steps below:

##### a) Sign Up / Registration

For registration can be started by opening the application, once open press the words "Sign up here!" which is at the bottom of the page, after the register page opens, fill in the form and role provided, when finished press Sign Up button and you will be redirected to the login page.

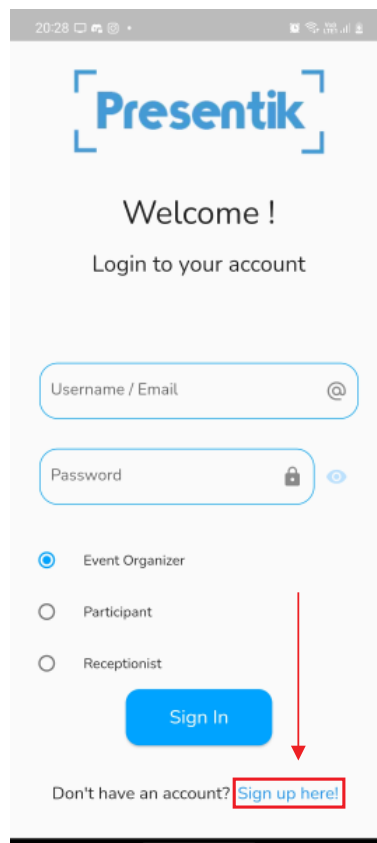
##### 1. Open Application

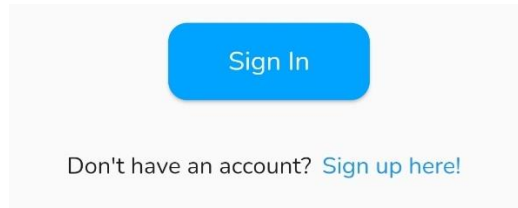




Figures 5.29 Login page after opening application

2. Press the words “Sign up here!” which is at the bottom of the page





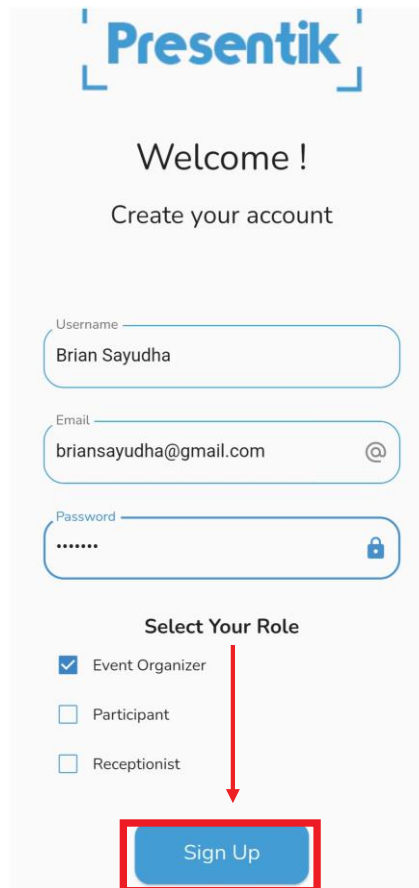
Figures 5.30 Sign In Here Button

3. Fill the registration form

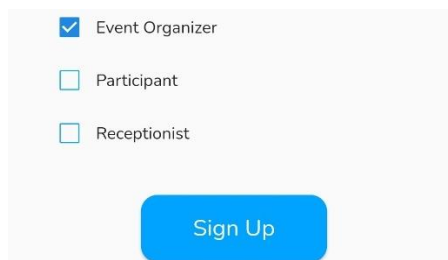
Two side-by-side screenshots of a registration form for "Presentik". The left screenshot shows the empty form with fields for Username, Email, and Password, and a "Select Your Role" section with three radio button options: Event Organizer, Participant, and Receptionist. The right screenshot shows the same form with the fields filled: Username "Brian Sayudha", Email "briansayudha@gmail.com", and Password masked with dots. The "Event Organizer" role is selected with a checked radio button. Both screenshots have a blue "Sign Up" button at the bottom.

Figures 5.31 Registration Page form filling example

4. Press Sign Up button



The image shows a registration form for 'Presentik'. At the top, the logo 'Presentik' is displayed in blue. Below it, the text 'Welcome!' and 'Create your account' is centered. The form consists of three input fields: 'Username' with the value 'Brian Sayudha', 'Email' with the value 'briansayudha@gmail.com', and 'Password' with a masked value '.....'. Below these fields is a section titled 'Select Your Role' with three radio button options: 'Event Organizer' (checked), 'Participant', and 'Receptionist'. A red arrow points from the 'Event Organizer' option down to a blue 'Sign Up' button, which is highlighted with a red rectangular border.



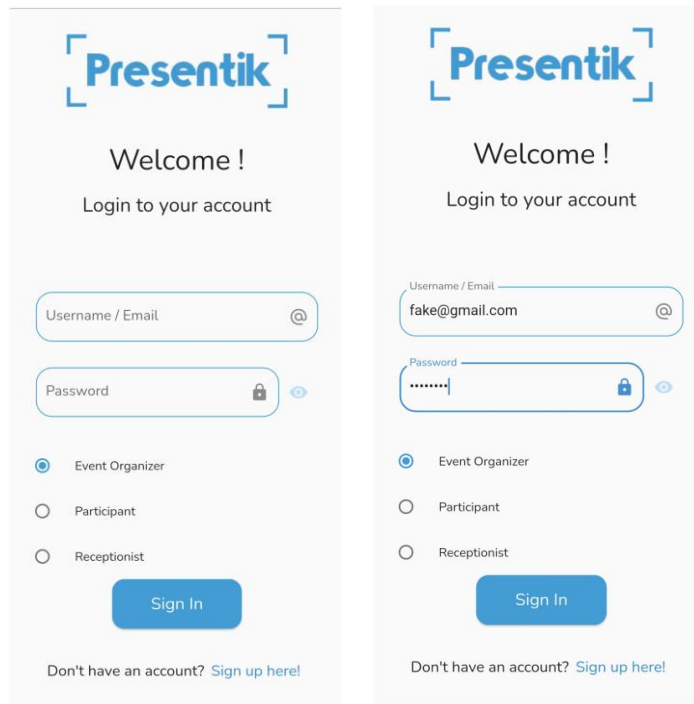
This image shows a close-up of the 'Select Your Role' section of the registration form. The 'Event Organizer' option is selected with a checked radio button. Below the radio buttons is a blue 'Sign Up' button.

Figures 5.32 Sign Up button

## b) Login

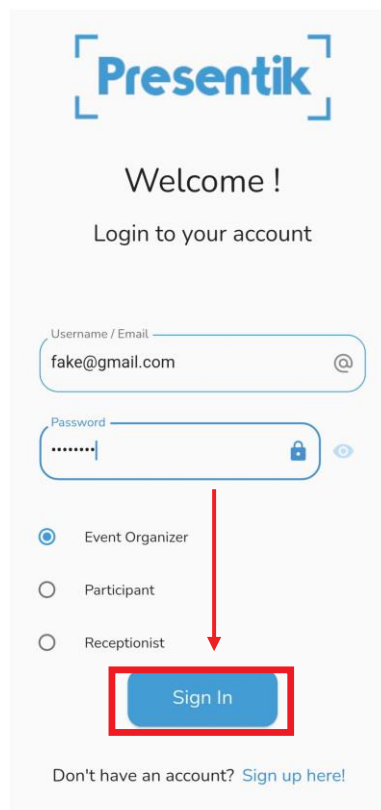
Login can be done when the user has registered a username, email, password, and role. Login is done by filling in the data form regarding the registered email and password and the selected role, after the form is filled and the role has been selected the user can press the Sign In button, user will be redirected to homepage

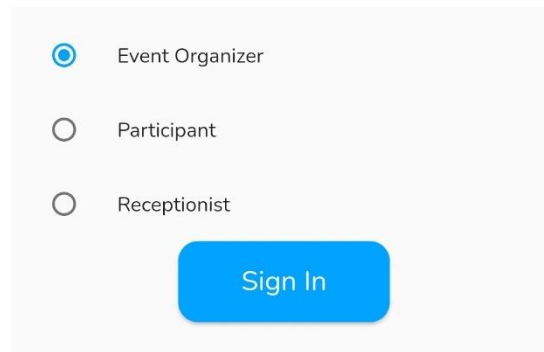
1. Fill the form and choose role



Figures 5.33 Logging form filling example

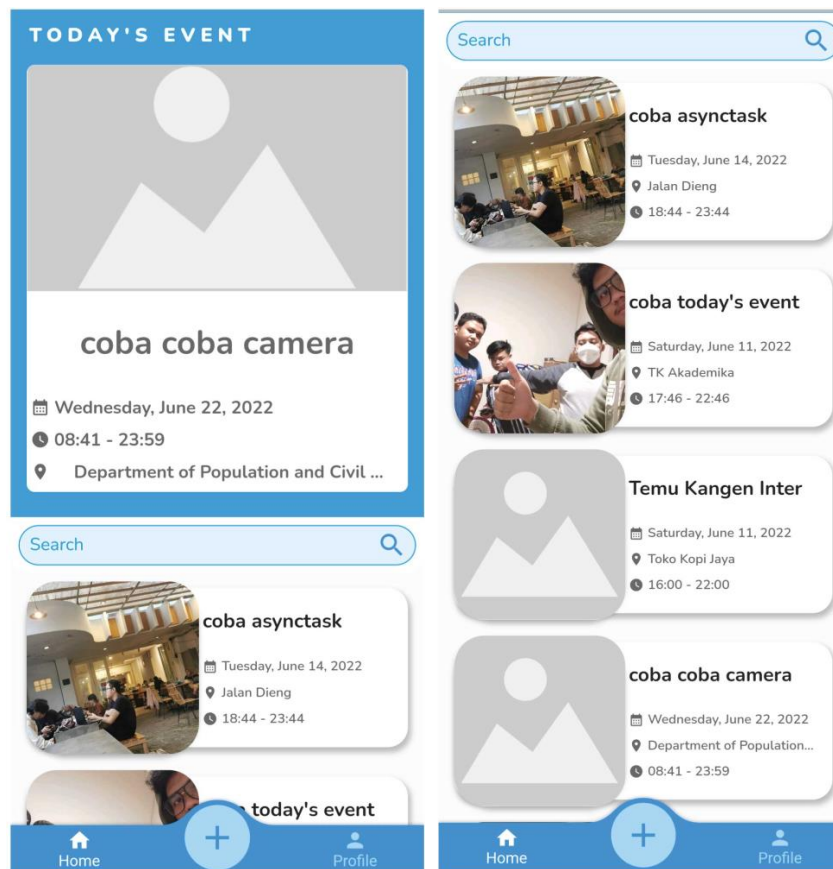
## 2. Press Sign In





Figures 5.34 Sign In Button

### 3. Homepage

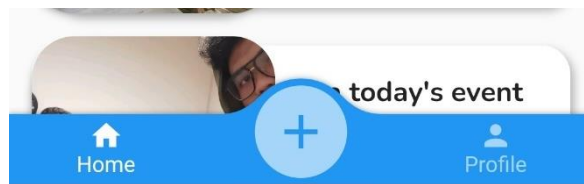
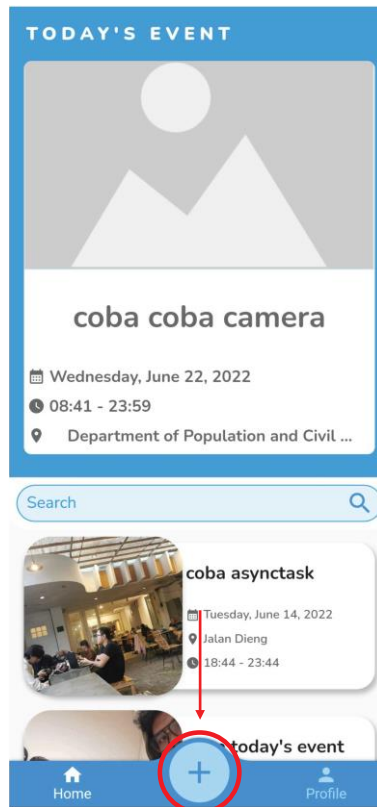


Figures 5.35 Homepage After login

#### c) Add Event

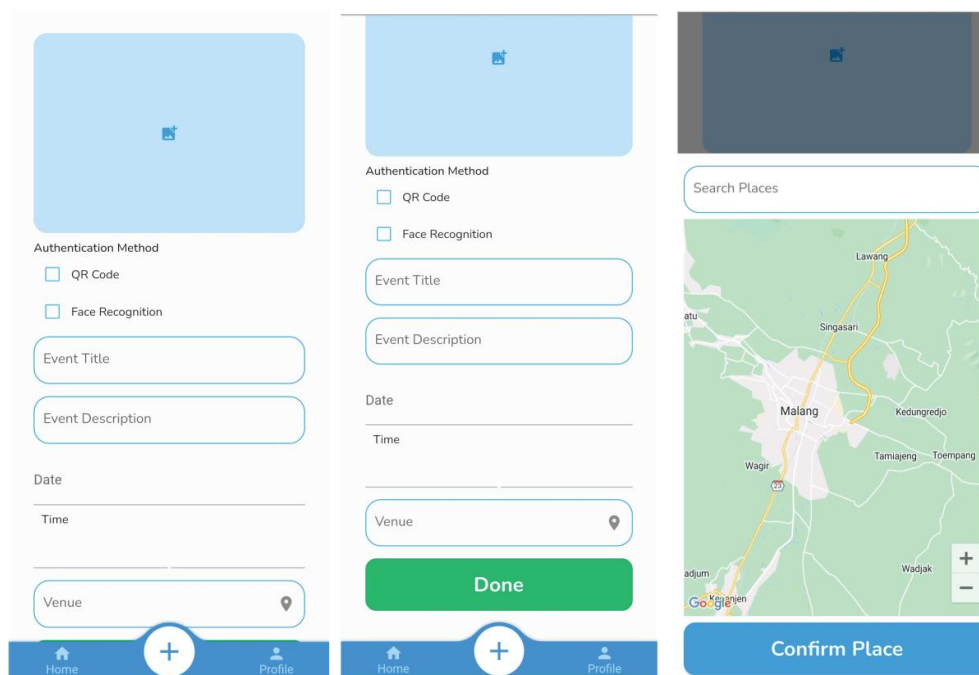
Add events can be done after logging in and redirected to the homepage, to go to the add event page the user can press the "+" symbol in the middle bottom of the application, after going to the login page, the user can upload the event image, fill in the form from the name, description, time, to fill in the location of the event to be held, after all forms have been filled in, the user can do done to save the data.

1. Press "+" symbol in the middle bottom of application



Figures 5.36 Add Event Button

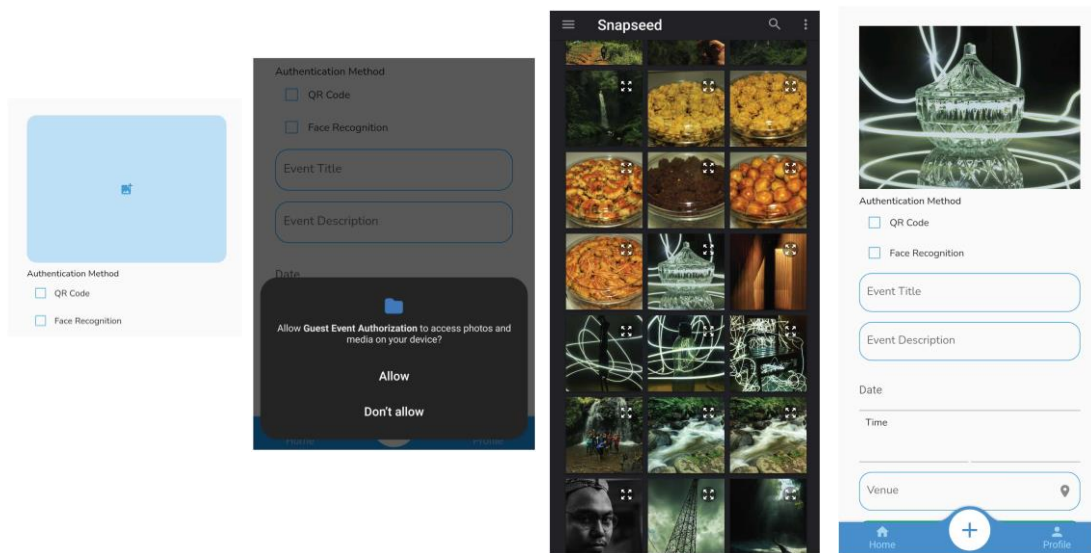
## 2. Add event page



Figures 5.37 Add Event Page

3. Upload image event

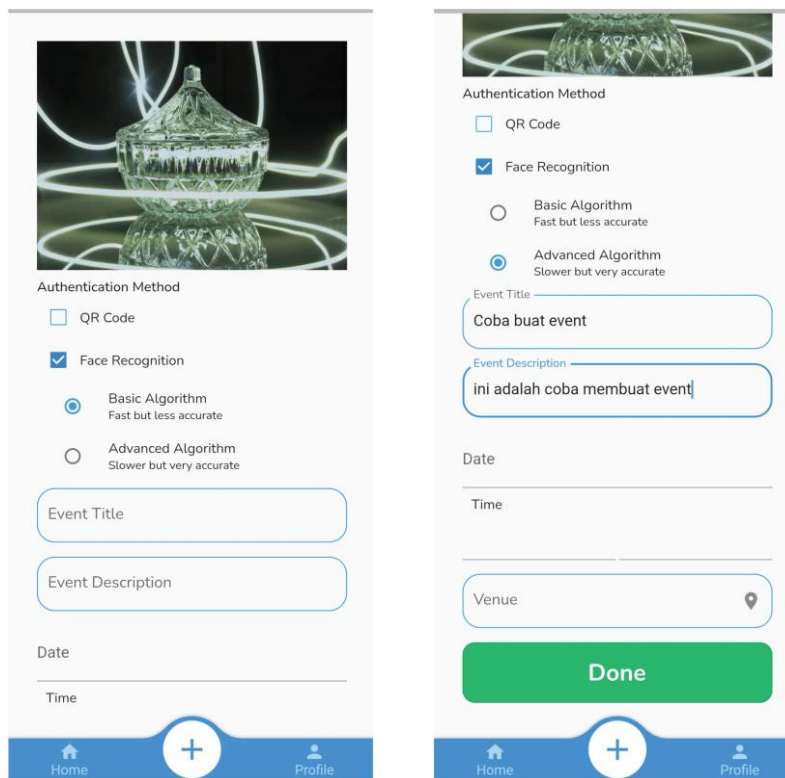
Click image symbol, allow the permission to open media storage, choose the photo, and image already uploaded



Figures 5.38 Steps by steps to choose event image

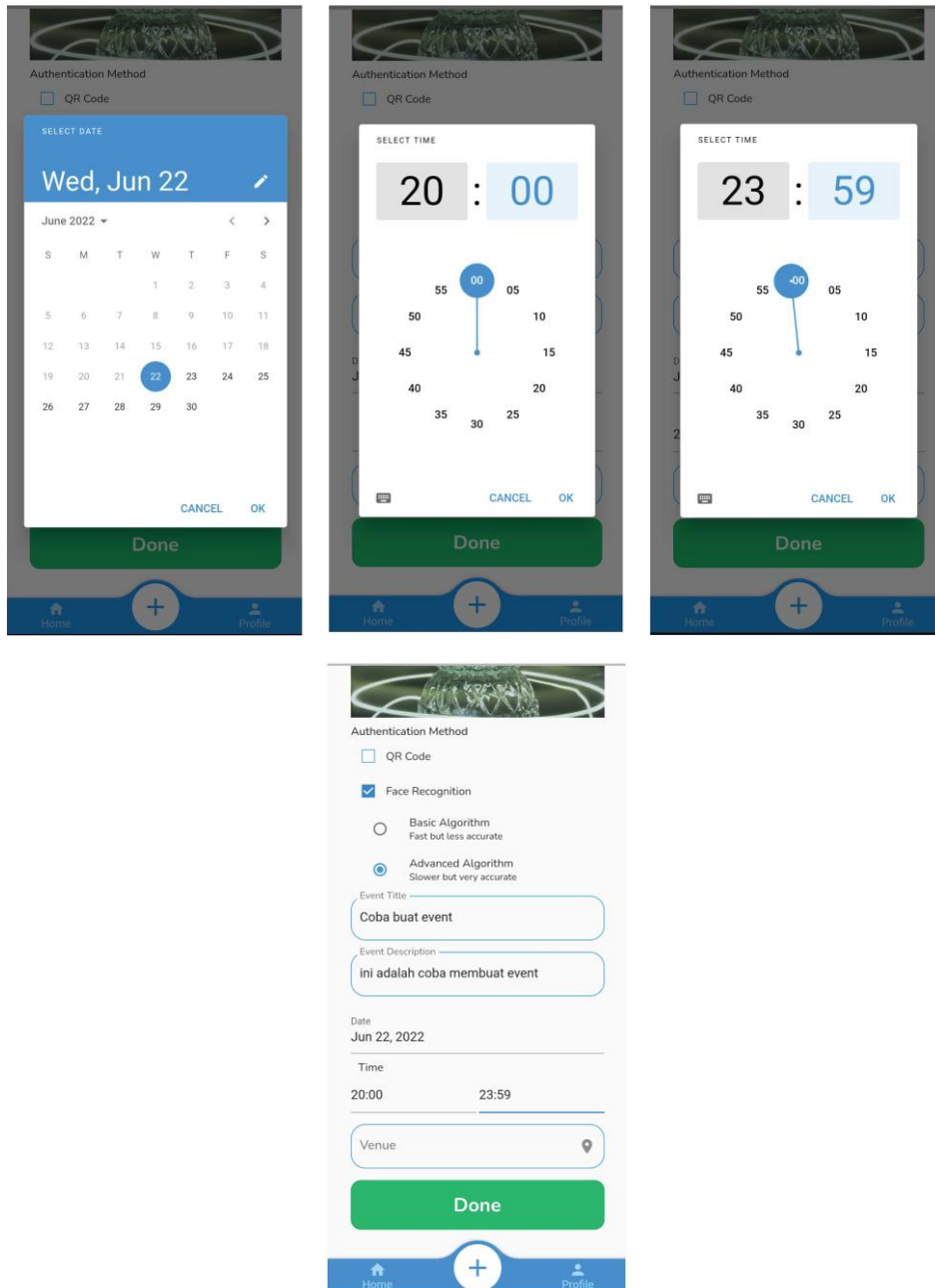
4. Fill event information

Choose face recognition authentication method, after that user can choose the face recognition algorithm, after that fill the event name, event description.



Figures 5.39 Choose Authentication and Fill Event Title + Description

Fill event date, event start time and event end time

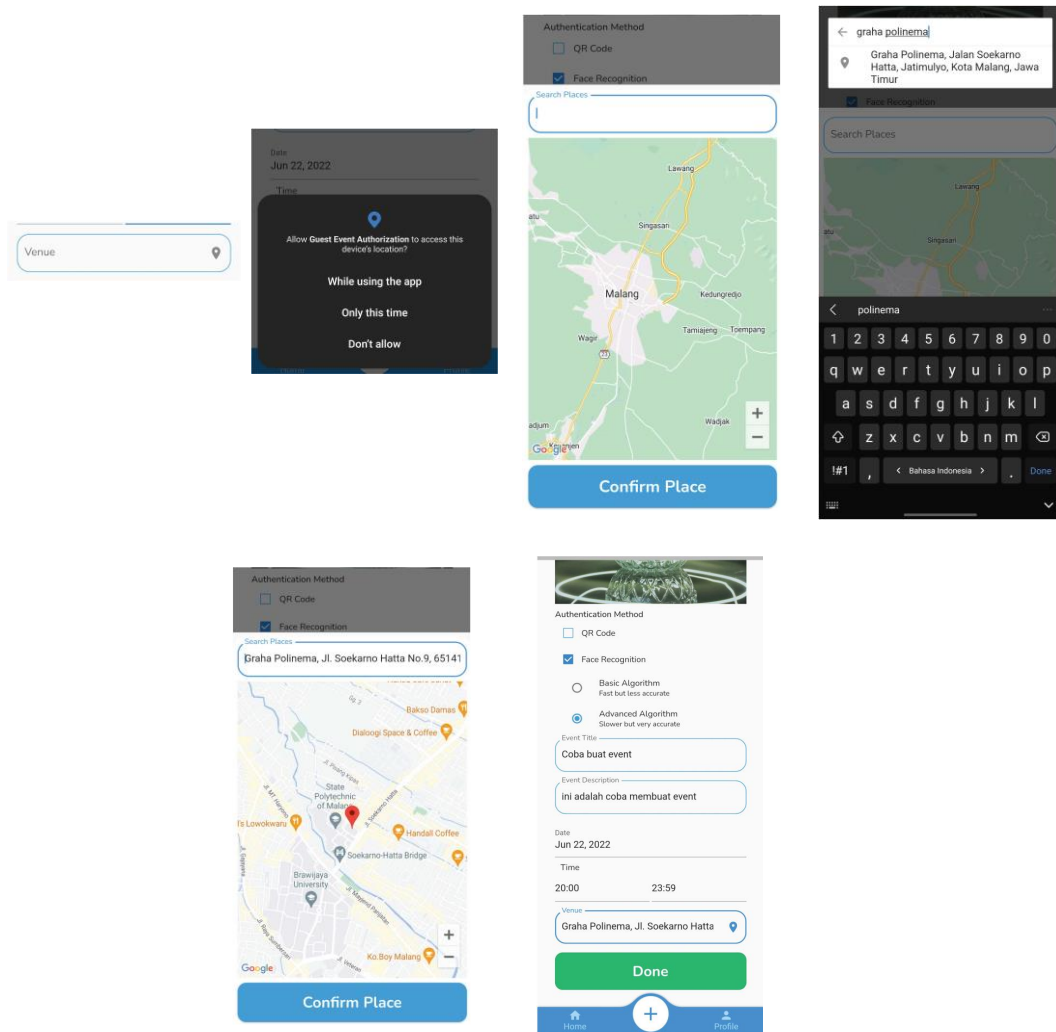


Figures 5.40 Choose date and Choose time display

## 5. Add event location

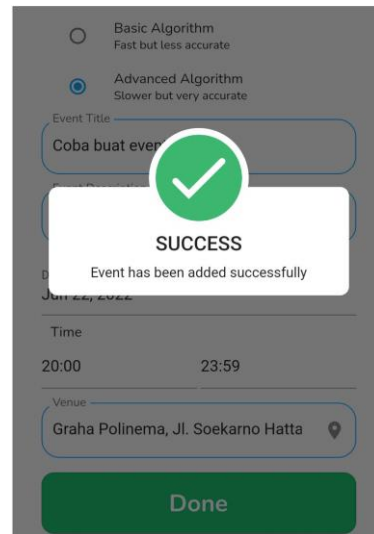
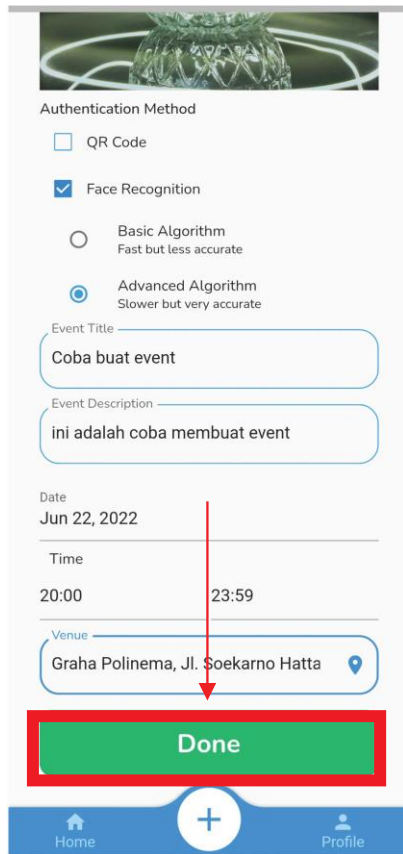
Choose venue form, Allow permission of location, input location name, choose the location you have been looking for, click confirm.





Figures 5.41 Steps by steps to add event venue (from left to right)

6. Press Done button to save

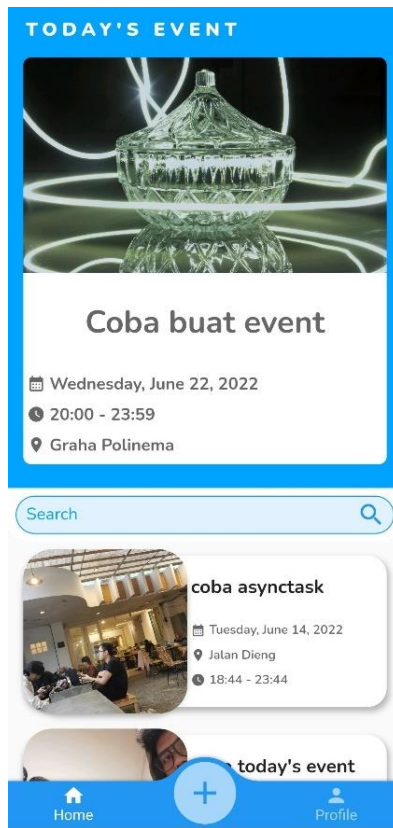


Figures 5.42 Done Button and Success pop up

d) Event details

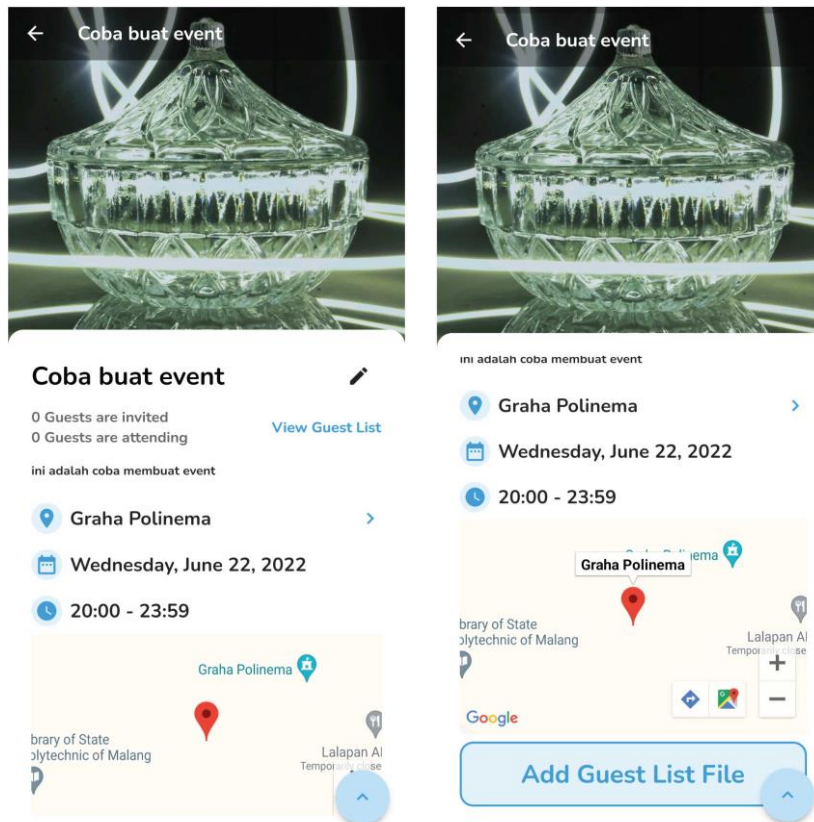
For event details can be seen when the user has logged in and has at least one event to view, the user can press the event that he wants to see the details.

1. Choose Selected Event



Figures 5.43 Homepage to select event

## 2. Event Detail Page

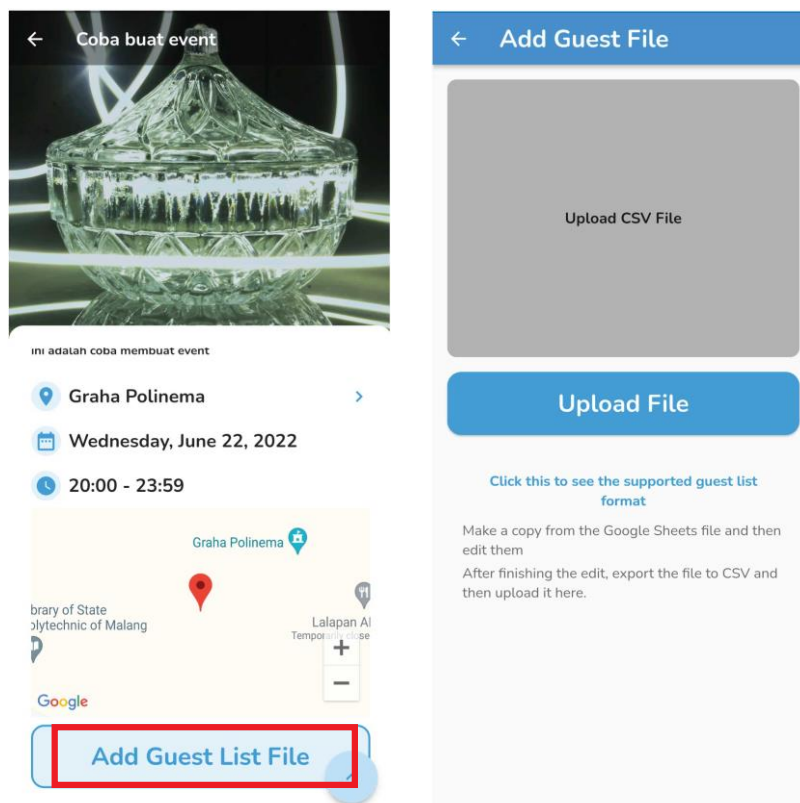


Figures 5.44 Event Detail Page

e) Add Guest list File

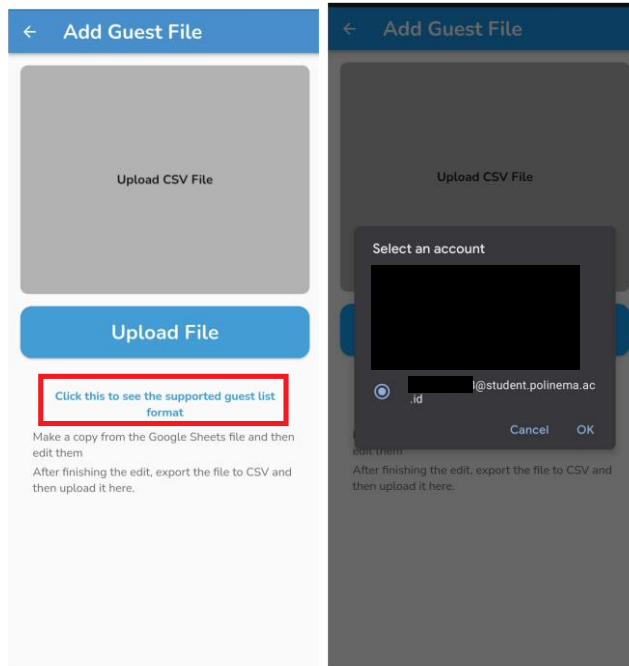
To add a guest list, the user can open the event that will be added to the guest list, then press the "Add Guest List File" button to open the Upload file page, If user does not have a specified format, user can download or make a copy of the template that has been provided by pressing the sentence "Click this to see the supported guest list format", when the guest list has been created the user can press the "Upload CSV File" button, then select the CSV file or Excel file that contains the guest list that has been created, after selecting the file the user can upload the file by pressing the "Upload File" button, after pressing the button a pop up will appear and information that the guest face dataset is in the process of representation or encoding, after the encoding is complete the user will get notification information that the encoding has been completed.

1. Press "Add Guest List File" button



Figures 5.45 Add Guest list button and add guest file page

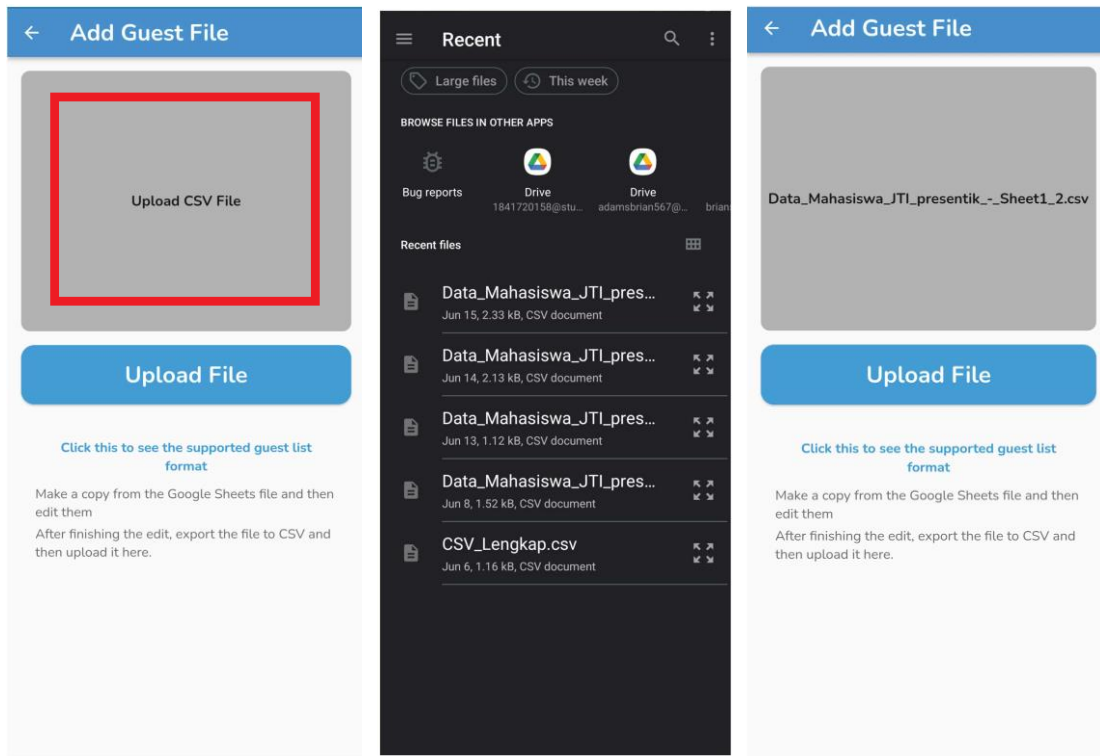
2. Make a copy of format



	A	B	C	D	E	F	G	H
1	participant_id	name	email	phone_number	category_1	category_1_value	category_2	category_2_value
2	1841720001	person 1	person1@gmail.com	+628214563312	Seat Number	1A	Jurusan	Teknologi Informasi
3	1841720002	person 2	person2@gmail.com	+628214563312	Seat Number	2A	Jurusan	Teknik Mesin
4	1841720003	person 3	person3@gmail.com	+628214563313	Seat Number	3A	Jurusan	Teknik Elektro
5	1841720004	person 4	person4@gmail.com	+628214563314	Seat Number	4A	Jurusan	Teknik Kimia
6	1841720005	person 5	person5@gmail.com	+628214563315	Seat Number	5A	Jurusan	Akutansi
7								
8								
9								
10								
11								

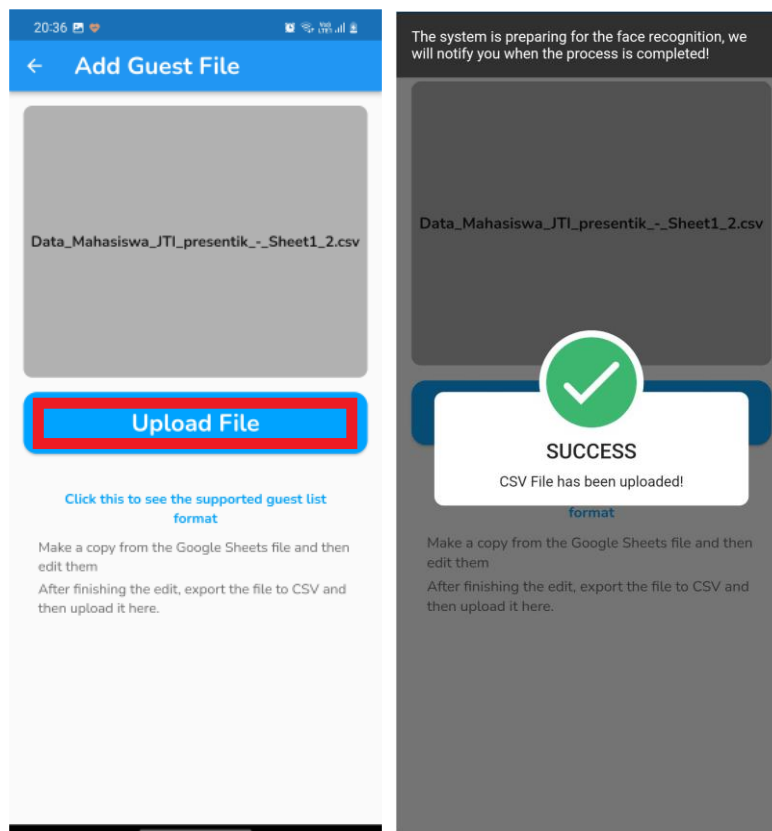
Figures 5.46 How to make a copy of template

### 3. Upload CSV or Excel file



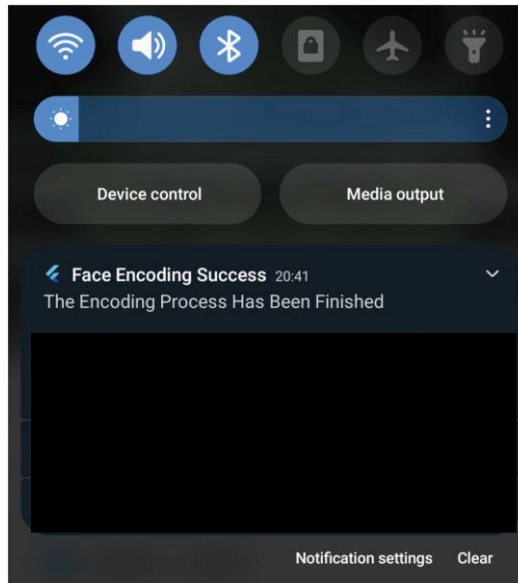
Figures 5.47 How to upload Guest list file

4. Click Upload file button



Figures 5.48 Upload File button and Success pop up

5. Wait until Encoding Completed (Until notification pop)

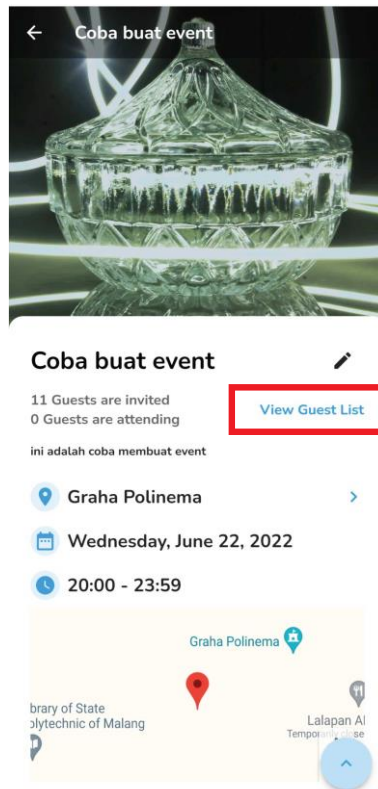


Figures 5.49 Encoding Success Notification

f) View Guest list

View guest list can be done in the event details page, to see the guest list the user must at least finish doing the add guest list file once, to open the guest list the user can press the sentence "View Guest List", after that the user will be displayed in the form of a guest list of the selected event, the user can see guest details containing guest information related to the event to be held.

1. Click "View Guest List" sentence



Figures 5.50 View Guest List Sentence

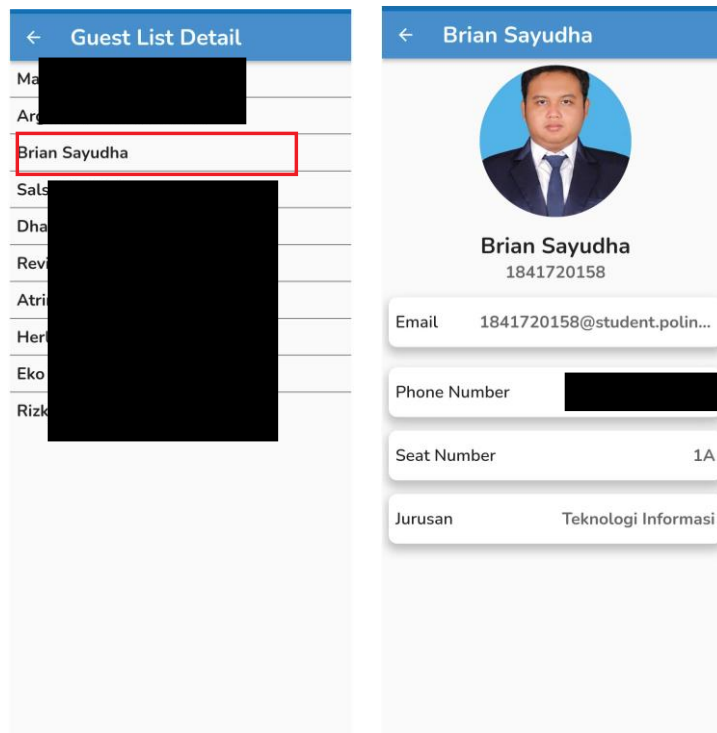
## 2. Guest list Page



Figures 5.51 Guest list page

## 3. Guest Details



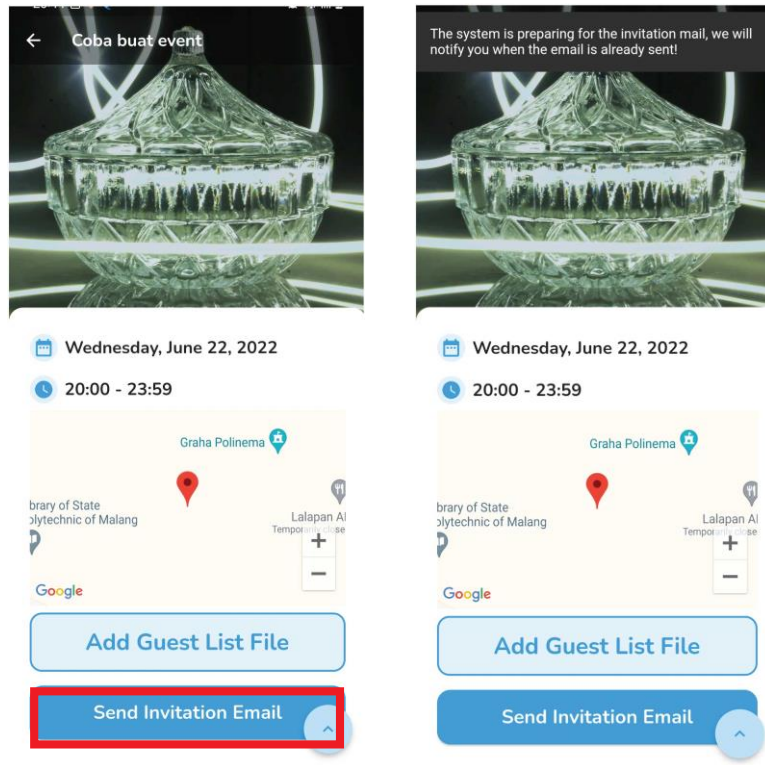


Figures 5.52 Guest Details Page

g) Send Invitation Email

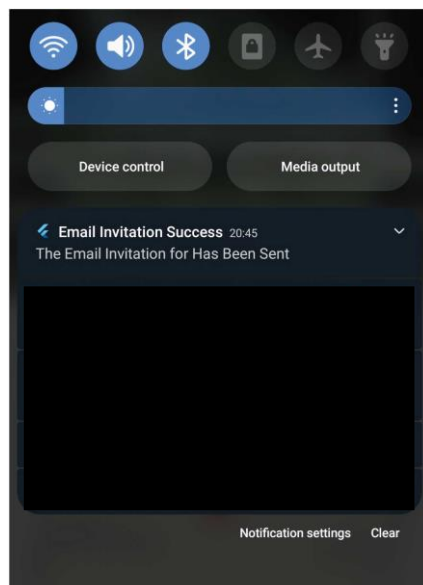
For sending email invitations, the user has at least added a guest list, for sending email invitations can be done by pressing the "Send Invitation Email" button, after that a pop up will appear that the system is sending an email to the guest that has been added, after completion the user will get a notification that all guests have received an email and the guest will get an email according to the default format given.

1. Click "Send Invitation Email" button



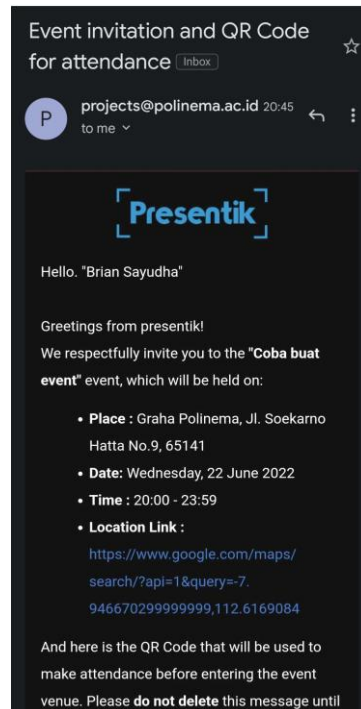
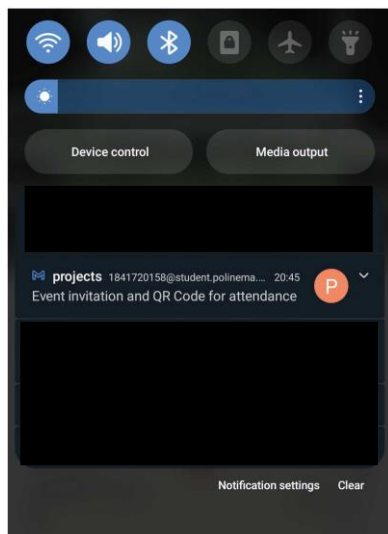
Figures 5.53 Send invitation email button and notification

2. Event organizer notification



Figures 5.54 Event Organizer Email Success Notification

3. Guest Notification and email format

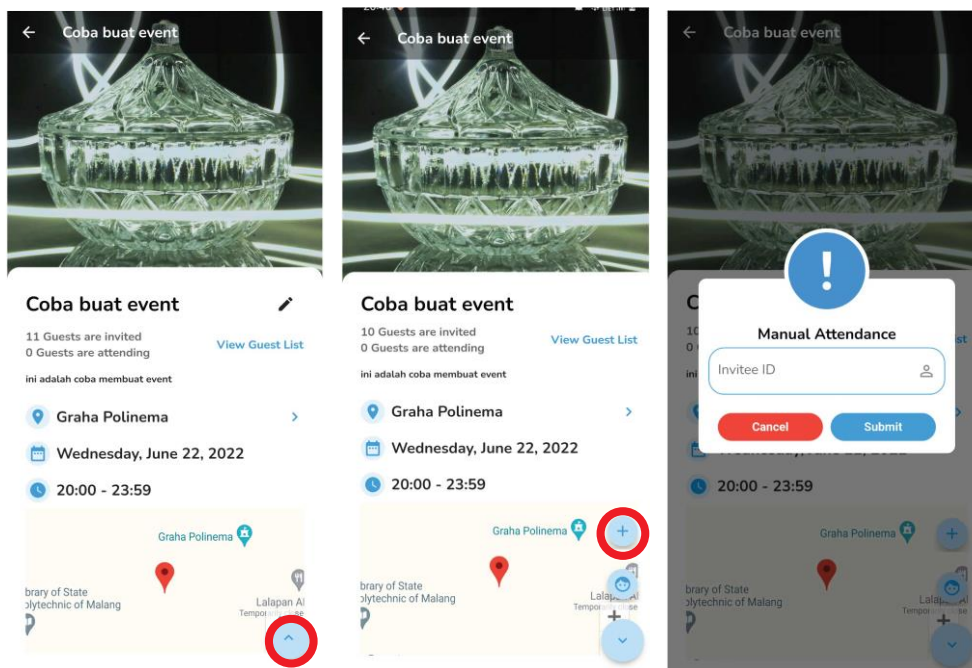


Figures 5.55 Guest Email Notification and the contents of the email

#### h) Manual Attendance

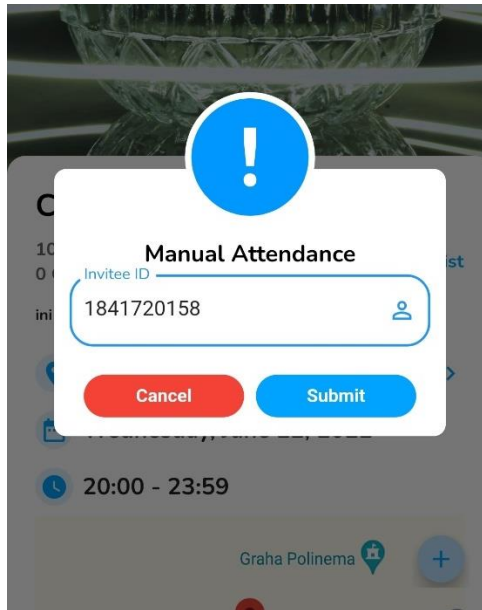
For manual attendance, event organizers can do it by pressing the speed dial button or button with the "^" symbol then pressing the "+" button, after that a pop up will appear to enter the id of the guest, then the user is asked to enter the id of the guest and press the confirm button to save attendance data, to do attendance event organizers are asked to do it near the event location at least 100m from the event location point

1. Click button “^” and “+” to start manual attendance



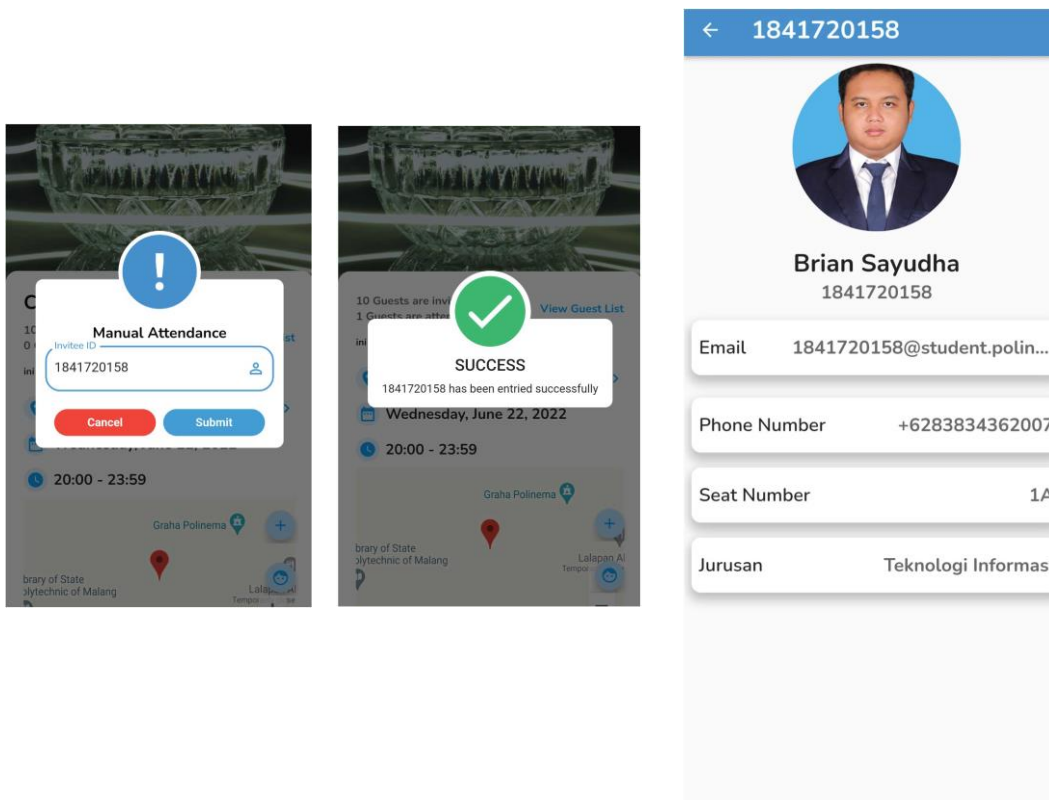
Figures 5.56 How to start manual Attendance

2. Input Guest id



Figures 5.57 Manual attendance fill id example

3. Click confirm

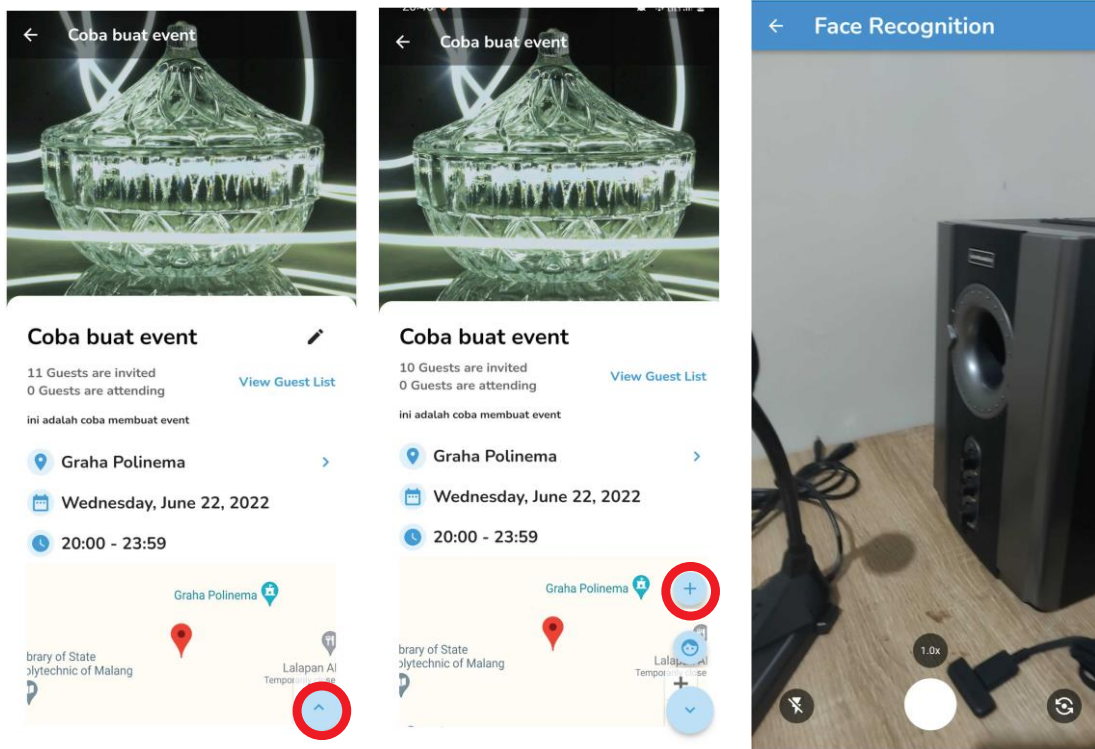


Figures 5.58 Mark Attendance with Manual Method Example

i) Face Recognition Attendance

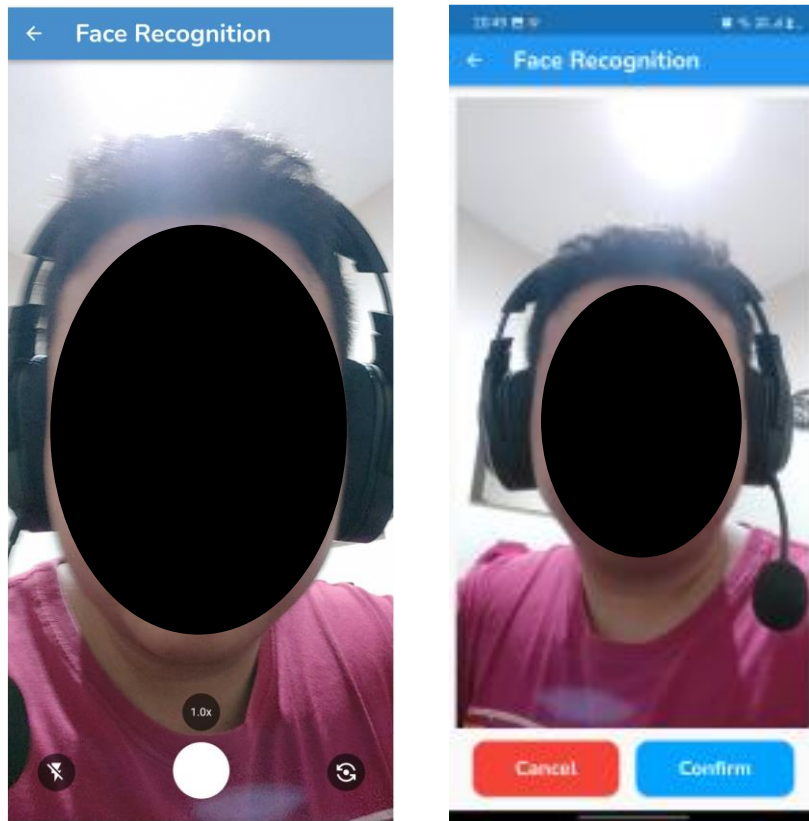
For face recognition attendance, event organizers can do it by pressing the speed dial button or button with the "^" symbol then pressing the face symbol button, after that system will redirected to face recognition page to capture guest face, after guest face is captured event organizer can click confirm if face is good enough to recognized by system, wait 2 seconds or less until pop up of recognized guest proporely recognized user event can click yes to save the attendance and redirected to guest information, to do attendance event organizers are asked to do it near the event location at least 100m from the event location point.

1. Click button “^” and face image symbol to start face recognition attendance



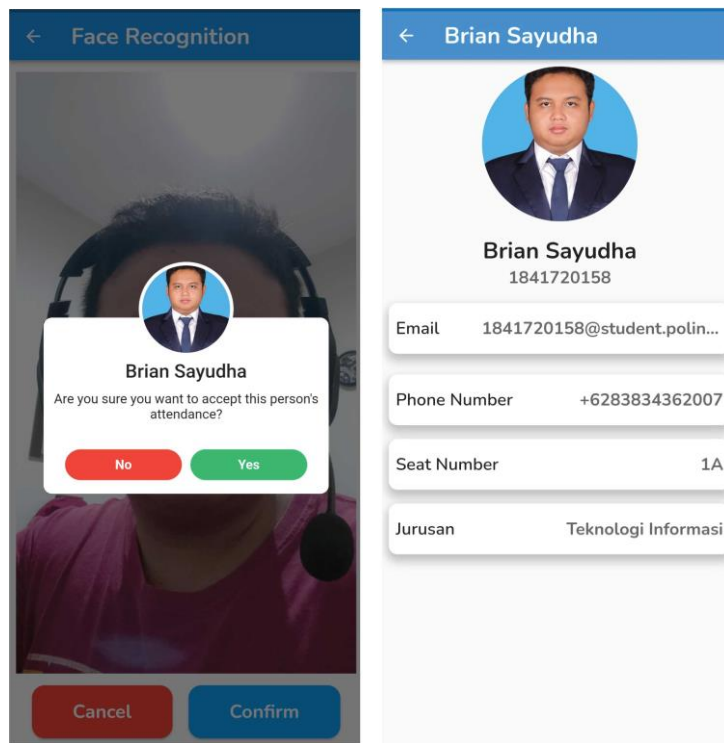
Figures 5.59 How to Start Face Recognition Attendance

2. Capture image of guest face



Figures 5.60 Capturing Guest Face Example

3. Click yes if guest properly recognized

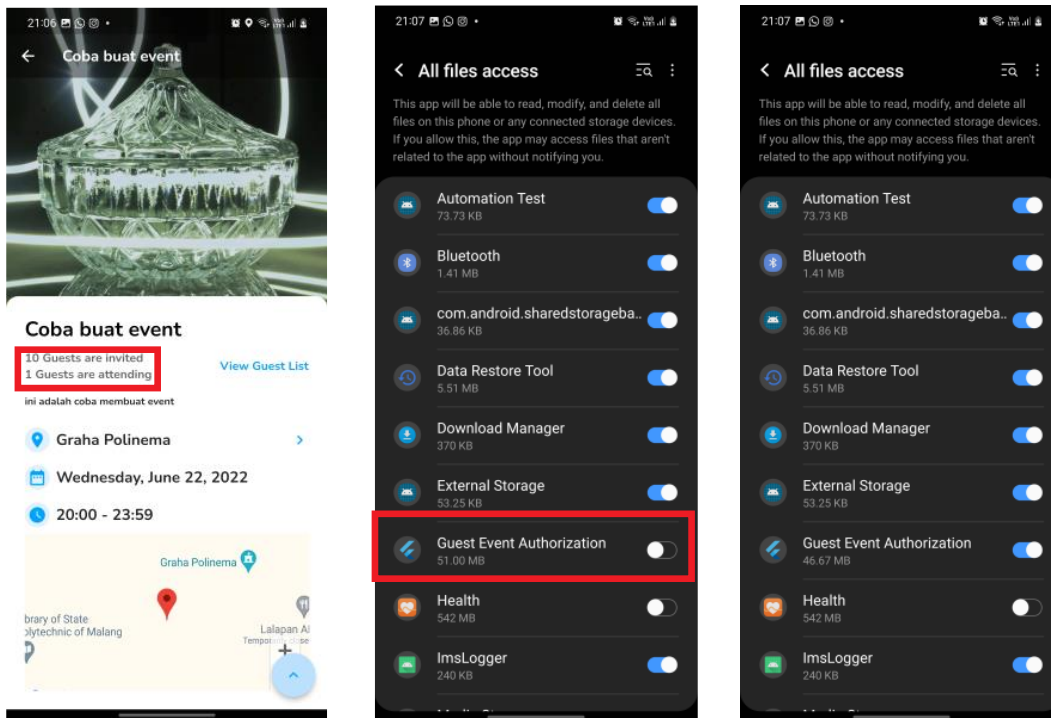


Figures 5.61 Recognition Result Example

j) Statistics

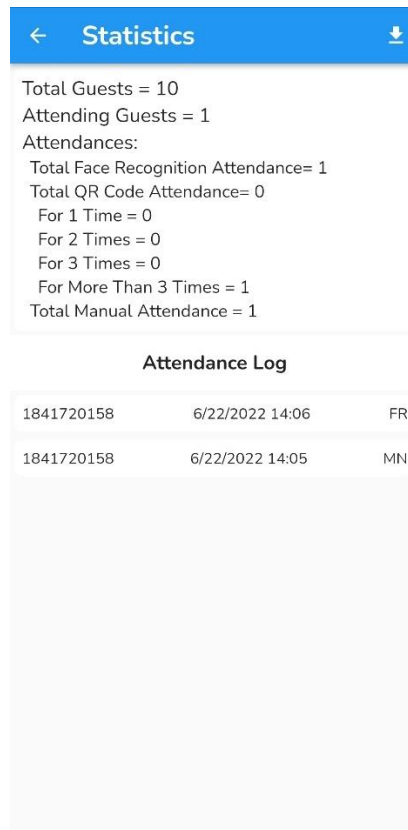
For statistics, it can be seen that there is at least one or more guest data who have made attendance, for statistical data it can be seen by pressing the statistical sentence "... Guest are invited", the system will open the statistics page and ask for permission regarding storage by displaying information about the total guests, total attending, and the user logs for attendance, the event organizer can download by pressing the "download" symbol, when the download button is pressed, a pop up will appear to download data.

### 1. Click "... Guest are invited" sentence



Figures 5.62 Opening Statistics Button and Allowing Permission steps

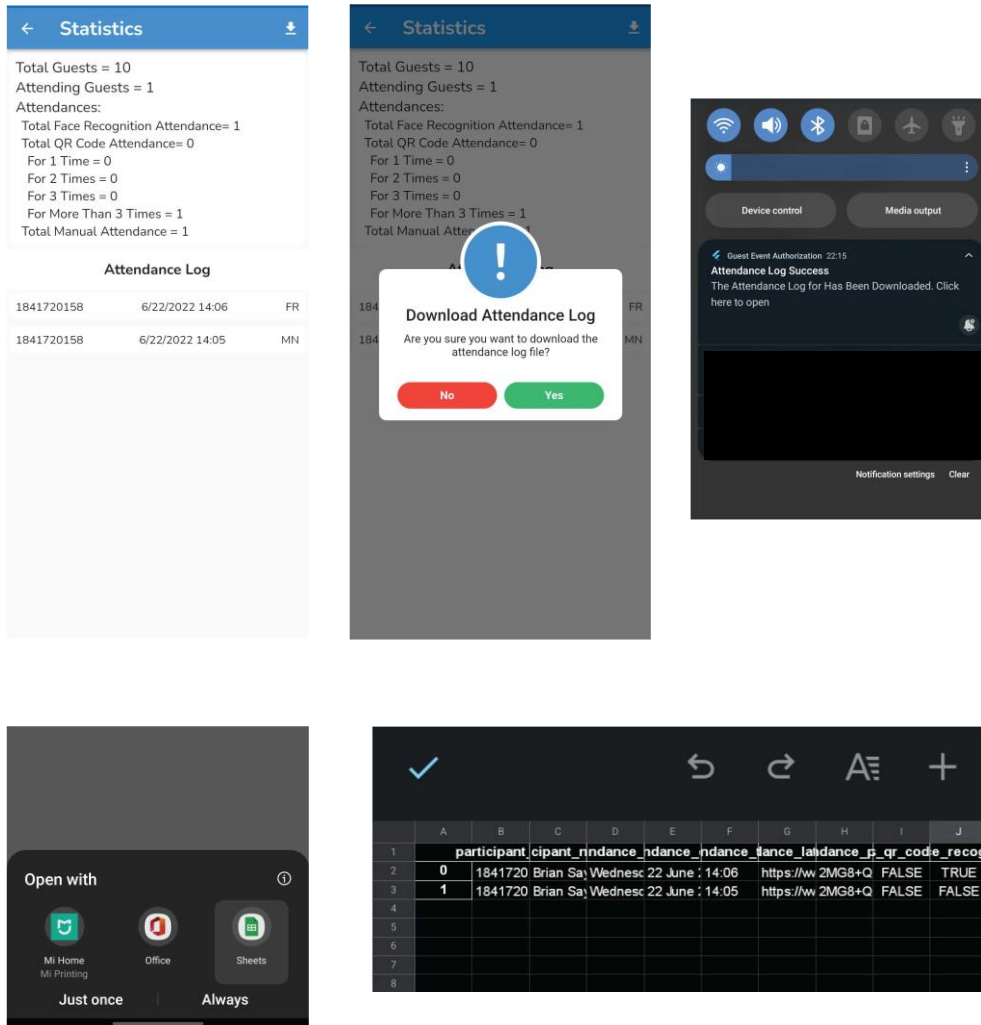
### 2. Statistics Page



Figures 5.63 Statistics Page

### 3. Download Log attendance





Figures 5.64 Download Attendance Log and Open Attendance Log Example

## 5.5. Functional Testing

Functional testing is a test carried out to test and check every function that exists in the system and then see the compatibility of the expected results.

### 5.5.1 System Testing

System testing is done by testing every feature on the system with the aim of knowing each feature is running well or not as expected, functional testing can be seen in the following tables.

Table 5.1 Register Page Test Table

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Register Page	-	Open register page	Can display the register page	Succeed

2.	input fields username, email, password, and checkbox for role	the system will display a warning if the email has been registered, or one of the forms is not filled in	Redirected to Login page	Application redirected to login page	Succeed
----	---	--	--------------------------	--------------------------------------	---------

Table 5.2 Login Page Test Table

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Login Page	-	Display Login page	Can display the login page	Succeed
2.	input fields email, password, and radio button for role	the system will display a warning if the email or password is wrong	Redirected to homepage	Application redirected to homepage	Succeed

Table 5.3 Homepage Page Test Table

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Home Page	-	Display Login page	Can display the login page	Succeed
2.	Event Table	-	Redirected to event details page	Application redirected to selected event details page	Succeed
3.	Plus Symbol	-	Redirected to add new event page	Application redirected to add event page	Succeed
4.	Profile Symbol	-	Redirected to profile page	Application redirected to profile page	Succeed

Table 5.4 Event Detail Page Test Table

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Event Details Page	-	Display Event Details of selected event	Can display the event details of selected event	Succeed
2.	Event Details Information	-	Display selected event detail information	Can display selected event detail information	Succeed
3.	Button View Guest List	System will display no guest list if guest list not added yet	Redirected to Guest list of selected event	Application redirect to guest list of selected event	Succeed
4.	Pencil button	System will make button missing if guest	Redirected to edit selected event page	Application redirect to edit selected event page	Succeed

		list already added			
5.	Maps Arrow button	-	Redirected to google maps application and open the direction	Application redirect to google maps application	Succeed
6.	Add Guest list file button	-	Redirected to Add guest list page	Application redirect to add guest list page	Succeed
7.	Face icon button	if today is not the same as the day of the event, the button will disappear	Redirected to scan guest list face	Application redirect to scan guest list face	Succeed
8.	+ Symbol button	if today is not the same as the day of the event, the button will disappear	Display modal to add manual event	Application display modal to add manual event	Succeed
9.	Send Invitation Email Button	if the event does not have a guest list, then the button will disappear	Send Email invitation to added guest list	Application send email in background task	Succeed
10.	Statistics information	-	Display attendance statistic in selected event, if clicked will redirect to detailed statistics information	Can display attendance statistic in selected event, if clicked will redirect to detailed statistics information	Succeed

Table 5.5 Add Event Page Test Table

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Add Event Page	-	Display add event page	Can display the add event page	Succeed
2.	Image icon Button	-	Redirected to mobile storage to choose photo to upload	Application redirect to mobile storage to choose photo	Succeed
3	Authentication checkbox, form input for event title, description, date, time and venue location	System will display a warning if one of input not filled	Add new event data	Application add new event data to database	Succeed

Table 5.6 Add Guest List File Page

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Add Guest List File Page	-	Display add guest list file page	Can display the add guest list file page	Succeed
2.	Upload csv file button	System will the system only allows csv files or excel files to be uploaded	Redirected to mobile storage to choose guest list csv or excel file	Application redirect to mobile storage to choose guest list csv or excel file	Succeed
3	Upload file button	-	Saving guest list data to database and start encoding or represent of face image of guest	Application saving data to database and start encoding or represent face image in background task	Succeed

Table 5.7 Guest List Detail Page

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Guest list detail page	-	Display guest list detail page	Can display the guest list detail page	Succeed
2.	Guest Name Table	System will display information if event doesn't have guest details	Display all of guest name in selected event, if one name is selected will redirect to selected guest details page	Can display all of guest name in selected event, can redirect to selected guest detailed information	Succeed
3	Upload file button	-	Saving guest list data to database and start encoding or represent of face image of guest	Application saving data to database and start encoding or represent face image in background task	Succeed

Table 5.8 Guest Detailed Information Page

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Guest Detailed Information Page	-	Display selected guest detailed information	Can display the selected guest detailed information	Succeed
2.	Guest Detail Information	-	Display all of required information of selected guest	Can display all of required information of selected guest	Succeed

Table 5.9 Face Recognition Page

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Face Recognition Page	-	Open device camera	Can open device camera	Succeed
2.	Camera button	-	Capture image with device camera and display confirm and cancel button after capturing	Can capture image with device camera and display confirm and cancel button after capturing	Succeed
3.	Change Camera button	-	Switch between back camera and front camera	Can switch between back camera and front camera	Succeed
4.	Confirm Button	-	To confirm the captured image and send to server to start recognizing face	Can send the captured image to server to start recognizing image	Succeed
5.	Cancel Button	-	To cancel the captured image being send to database, and go back to capturing image	Can cancel the captured image being send and go back to capturing image	Succeed
6.	Face recognition result modal	System will display information if face is not recognized	Display the result of faces recognized by the system, and button to confirm recognized faces	Can display the result of faces recognized by the system, and button to confirm recognized faces	Succeed
7.	Face recognition result confirmation button	-	If no is selected, system will go back to capturing image, if yes is selected will save the attendance of recognized participant result and redirect to recognized participant information	If no is selected, system will go back to capturing image, if yes is selected will save the attendance of recognized participant result and redirect to recognized participant information	Succeed

Table 5.10 Detailed Statistic Information Page

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Detailed Statistic information page	-	Display detailed statistic about attendance in selected event	Can display detailed statistic about attendance in selected event	Succeed

2.	Statistics information	-	Display all of attendance information in selected event from total guest to attending guest	Can display all of attendance information in selected event from total guest to attending guest	Succeed
3.	Attendance log table	-	Display all attendance log information	Can display all attendance log information	Succeed
4.	Download icon button	-	Display modal and download the attendance log of selected event in Excel file if yes selected	Can display modal and download the attendance log of selected event in Excel file if yes selected	Succeed

Table 5.11 Profile Page

No.	Features	Error Handling	Expected Result	Results Obtained	Result
1.	Profile Page	-	Display profile page	Can display profile page	Succeed
2.	User information Table	-	Display all of logged in user information	Can display all of logged in user information	Succeed
3.	Logout Button	-	To logged out user from application and redirected to login page	Can logged out user from application and redirected to login page	Succeed

### 5.5.2 Method Testing

The test method is intended to determine the accuracy of the use of CNN and face detection methods in recognizing and identifying a person's face by using facial photo data used as input data and event participant data in this testing and development. In testing this method there are, the 3 test scenarios are:

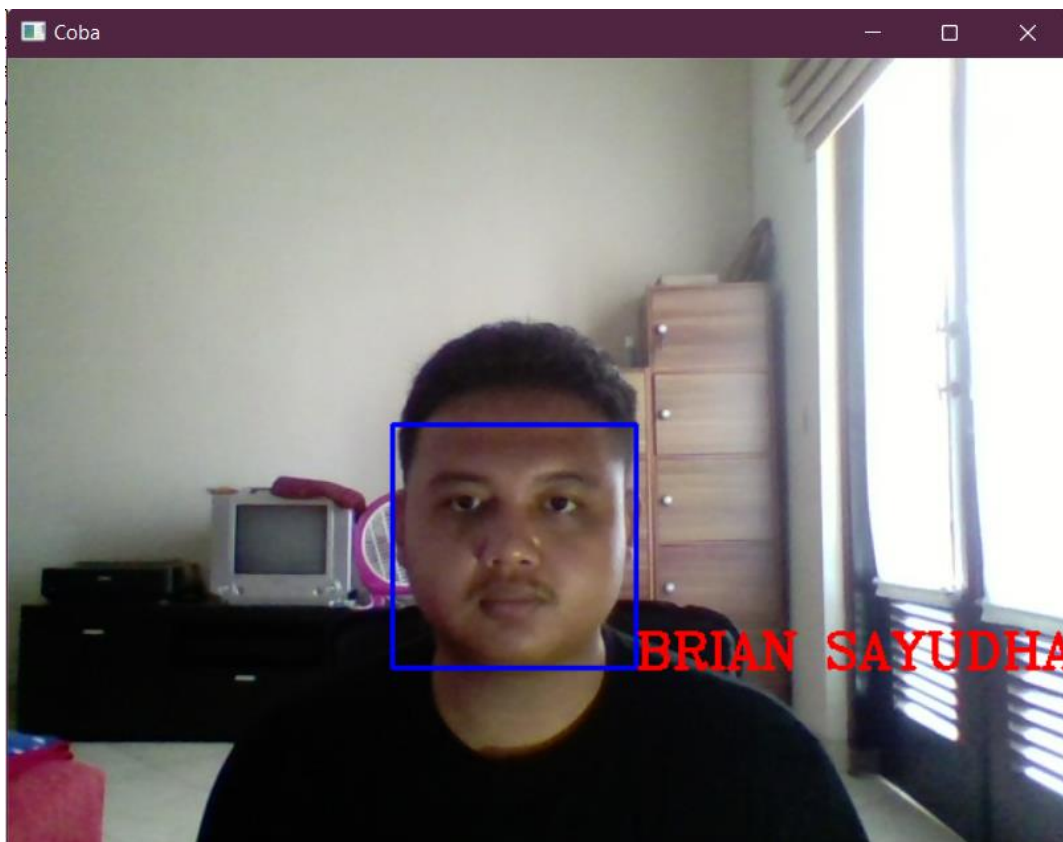
1. Finding the best time of face representation, accuracy, and cosine distance from a combination of face recognition model and backend detector using 20 image datasets with 1 person having more than 1 image dataset.
2. Finding the best time of face representation, accuracy, and cosine distance from a combination of face recognition model and backend detector using 200 image datasets with 1 person only having 1 image dataset.

3. Looking for the best accuracy of the face recognition model and backend detector that has been determined from two previous experiments by implementing it into the attendance application that has been made.

The first and second scenario is used to determine which face recognition model is the best and the backend detector for facial recognition for the application. In this selection there are 2 Face recognition models (Facenet and ArcFace) and 3 backend detectors (Retinaface, **MTCNN**, opencv) for testing to determine which method is the best.

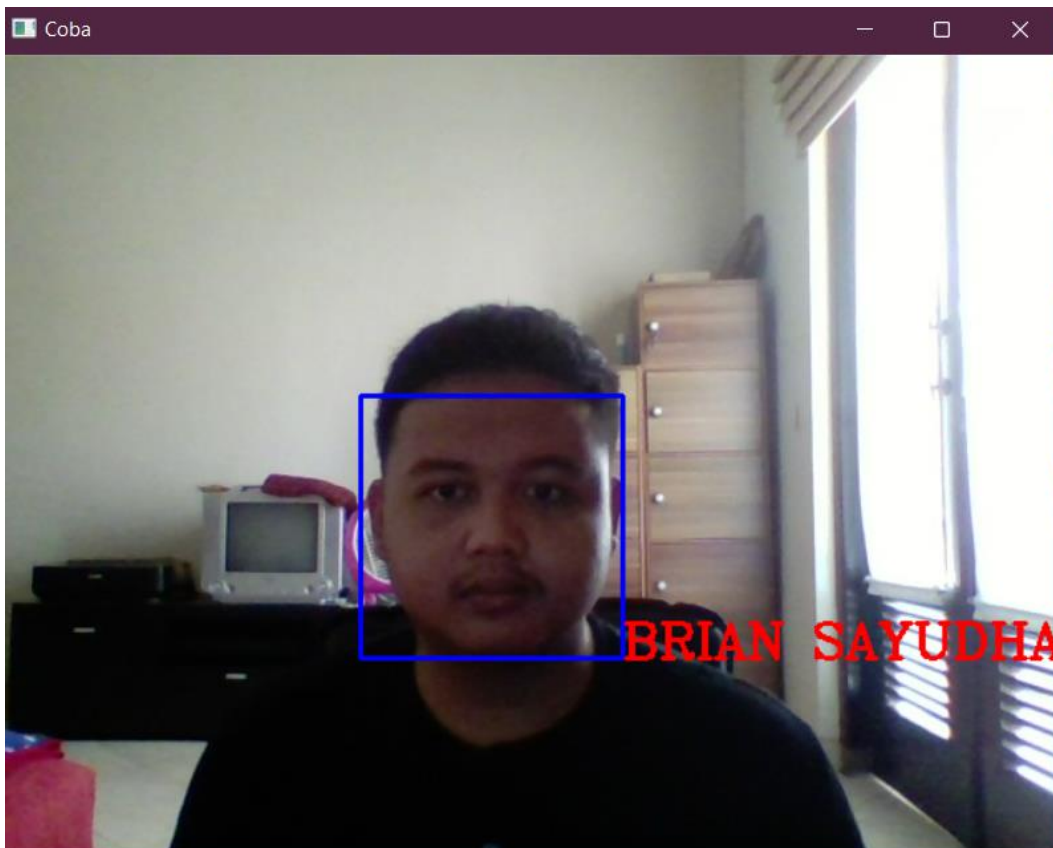
The following is an example of testing where the face will be given flashlight and not given flashlight to find out the difference between the two existing facial recognition models:

With Flashlight:



Figures 5.65 Example with Flash Testing

Without Flashlight:



Figures 5.66 Example without flash testing

#### 5.5.2.1 First Scenario Method Test

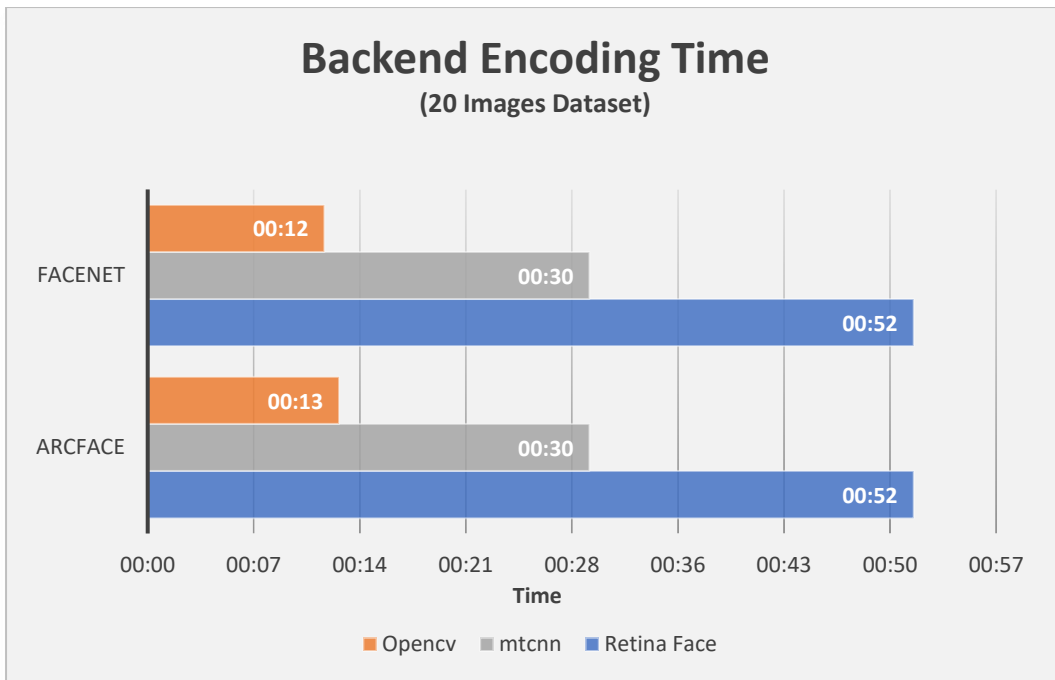
The initial experiment was carried out by doing recognition with a total of 20 image datasets, where each person had more than 1 photo data. out of 20 image datasets contains only 2 different people.

for the time encoding or face representation have the following data

No	Model Name	Detector Backend	Encoding Time
1	ArcFace	Retina Face	52 Second
2	ArcFace	MTCNN	30 Second
3	ArcFace	Open cv	13 Second
4	FaceNet	Retina Face	52 Second
5	FaceNet	MTCNN	30 Second
6	FaceNet	Open cv	12 Second

Table 5.12 Encoding Time First Scenario Table





Figures 5.67 Encoding Time First Scenario Chart

Testing will be tried to get the accuracy and the smallest distance from the recognition carried out. Accuracy means that the total faces detected are correct compared to the total faces that have been recognized and the smallest distance means the distance of dissimilarity between photo 1 and photo 2, the smaller the distance, the more exact the face between the 2 photos, the minimum distance is 0.0

For first scenario of 20 image datasets recognizing testing, will be using ArcFace Model, and 3 different detectors backend, with cosine distance metrics. This phase will be differentiated between recognizing with flash and without flash:

Table 5.13 Table of testing ArcFace with flash (First Scenario)

<b>Model Name</b>	<b>Detector Backend Encoding</b>	<b>Detector Backend Recognition</b>	<b>Smallest Distance from first 10 Data</b>	<b>Accuracy from first 10 Data</b>
ArcFace	Retina Face	Retina Face	0,281676755	100%
ArcFace	Retina Face	Mtcnn	0,318485705	100%
ArcFace	Retina Face	Opencv	0,268337715	70%
ArcFace	mtcnn	Retina Face	0,288693554	90%
ArcFace	mtcnn	Mtcnn	0,243104198	100%
ArcFace	mtcnn	Opencv	0,263086376	60%
ArcFace	Opencv	Retina Face	0,268763176	100%
ArcFace	Opencv	Mtcnn	0,357595826	90%
ArcFace	Opencv	Opencv	0,345921404	40%

Table 5.14 Table of testing Arcface without flash (First Scenario)

<b>Model Name</b>	<b>Detector Backend Encoding</b>	<b>Detector Backend Recognition</b>	<b>Smallest Distance from first 10 Data</b>	<b>Accuracy from first 10 Data</b>
ArcFace	Retina Face	Retina Face	0,400562206	100%
ArcFace	Retina Face	Mtcnn	0,399848353	100%
ArcFace	Retina Face	Opencv	0,363541167	60%
ArcFace	mtcnn	Retina Face	0,36951831	90%
ArcFace	mtcnn	Mtcnn	0,337110146	90%
ArcFace	mtcnn	Opencv	0,461156148	40%
ArcFace	Opencv	Retina Face	0,398579244	100%
ArcFace	Opencv	Mtcnn	0,166203068	90%
ArcFace	Opencv	Opencv	0,34279795	30%

For second phase of 20 image datasets recognizing testing, will be using Facenet Model, and 3 different detectors backend, with cosine distance metrics. This phase will be differentiated between recognizing with flash and without flash:

Table 5.15 Table of testing Facenet with flash (First Scenario)

Model Name	Detector Backend Encoding	Detector Backend Recognition	Smallest Distance from first 10 Data	Accuracy from first 10 Data
Facenet	Retina Face	Retina Face	0,198167025	80%
Facenet	Retina Face	Mtcnn	0,140421573	70%
Facenet	Retina Face	Opencv	0,170774742	70%
Facenet	mtcnn	Retina Face	0,104959025	70%
Facenet	mtcnn	Mtcnn	0,167967374	60%
Facenet	mtcnn	Opencv	0,189046971	60%
Facenet	Opencv	Retina Face	0,185916181	50%
Facenet	Opencv	Mtcnn	0,073296788	60%
Facenet	Opencv	Opencv	0,194567901	50%

Table 5.16 Table of testing without flash (First Scenario)

Model Name	Detector Backend Encoding	Detector Backend Recognition	Smallest Distance from first 10 Data	Accuracy from first 10 Data
Facenet	Retina Face	Retina Face	0	0%
Facenet	Retina Face	Mtcnn	0	0%
Facenet	Retina Face	Opencv	0	0%
Facenet	mtcnn	Retina Face	0	0%
Facenet	mtcnn	Mtcnn	0	0%
Facenet	mtcnn	Opencv	0	0%
Facenet	Opencv	Retina Face	0,051307458	30%
Facenet	Opencv	Mtcnn	0,063068076	70%
Facenet	Opencv	Opencv	0,139049429	70%

### 5.5.2.2 Second Scenario Method Test

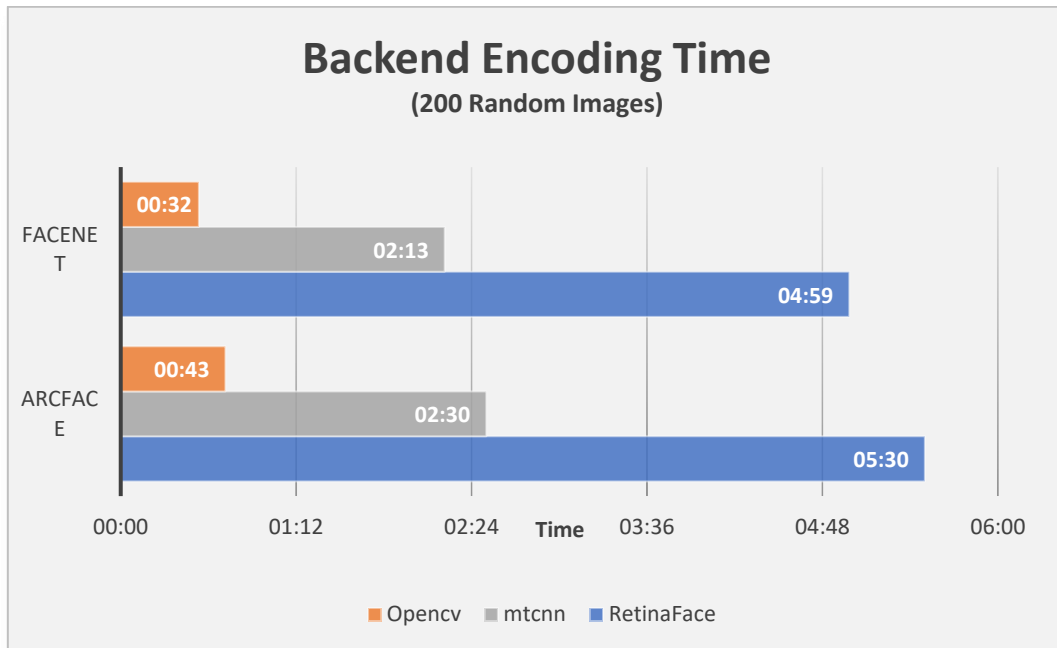
The second experiment was carried out by doing recognition with a total of 200 datasets, where each person only has 1 photo data. out of 200 dataset contains only 200 different people.

for the time encoding or face representation have the following data

Table 5.17 Encoding Time Second Scenario Table

No	Model Name	Detector Backend	Encoding Time
1	ArcFace	Retina Face	5 Minute 30 Second
2	ArcFace	MTCNN	2 Minute 30 Second
3	ArcFace	Open cv	43 Second
4	FaceNet	Retina Face	4 Minute 59 Second
5	FaceNet	MTCNN	2 Minute 13 Second

6	FaceNet	Open cv	32 Second
---	---------	---------	-----------



Figures 5.68 Encoding Time Second Scenario Chart

Testing will be tried to get the accuracy and the smallest distance from the recognition carried out. Accuracy means that the total faces detected are correct compared to the total faces that have been recognized and the smallest distance means the distance of dissimilarity between photo 1 and photo 2, the smaller the distance, the more exact the face between the 2 photos, the minimum distance is 0.0.

For first phase of 200 image datasets recognizing testing, will be using ArcFace Model, and 3 different detectors backend, with cosine distance metrics. This phase will be differentiated between recognizing with flash and without flash:

Table 5.18 Table of testing ArcFace with flash (Second Scenario)

<b>Model Name</b>	<b>Detector Backend Encoding</b>	<b>Detector Backend Recognition</b>	<b>Smallest Distance from first 10 Data</b>	<b>Accuracy from first 10 Data</b>
ArcFace	Retina Face	Retina Face	0,241793027	100%
ArcFace	Retina Face	Mtcnn	0,279789023	90%
ArcFace	Retina Face	Opencv	0,300591581	30%
ArcFace	mtcnn	Retina Face	0,274608634	90%
ArcFace	mtcnn	Mtcnn	0,277149523	100%
ArcFace	mtcnn	Opencv	0,287671487	60%
ArcFace	Opencv	Retina Face	0,254759803	90%
ArcFace	Opencv	Mtcnn	0,287943788	90%
ArcFace	Opencv	Opencv	0,320846233	60%

Table 5.19 Table of testing ArcFace without flash (Second Scenario)

<b>Model Name</b>	<b>Detector Backend Encoding</b>	<b>Detector Backend Recognition</b>	<b>Smallest Distance from first 10 Data</b>	<b>Accuracy from first 10 Data</b>
ArcFace	Retina Face	Retina Face	0,289933637	100%
ArcFace	Retina Face	Mtcnn	0,342109882	90%
ArcFace	Retina Face	Opencv	0,381855879	60%
ArcFace	mtcnn	Retina Face	0,310246164	80%
ArcFace	mtcnn	Mtcnn	0,315287931	70%
ArcFace	mtcnn	Opencv	0,299897147	50%
ArcFace	Opencv	Retina Face	0,818053381	70%
ArcFace	Opencv	Mtcnn	0,741983907	70%
ArcFace	Opencv	Opencv	0,837558394	30%

For second phase of 200 image datasets recognizing testing, will be using Facenet Model, and 3 different detectors backend, with cosine distance metrics. This phase will be differentiated between recognizing with flash and without flash

Table 5.20 Table of testing Facenet with flash (Second Scenario)

Model Name	Detector Backend Encoding	Detector Backend Recognition	Smallest Distance from first 10 Data	Accuracy from first 10 Data
Facenet	Retina Face	Retina Face	0,159117397	80%
Facenet	Retina Face	Mtcnn	0,10531818	60%
Facenet	Retina Face	Opencv	0,162786666	50%
Facenet	mtcnn	Retina Face	0,139021046	100%
Facenet	mtcnn	Mtcnn	0,159726573	80%
Facenet	mtcnn	Opencv	0,182894394	70%
Facenet	Opencv	Retina Face	0,129552021	70%
Facenet	Opencv	Mtcnn	0,191188684	70%
Facenet	Opencv	Opencv	0,22407676	40%

Table 5.21 Table of testing Facenet without flash (Second Scenario)

Model Name	Detector Backend Encoding	Detector Backend Recognition	Smallest Distance from first 10 Data	Accuracy from first 10 Data
Facenet	Retina Face	Retina Face	0	0%
Facenet	Retina Face	Mtcnn	0	0%
Facenet	Retina Face	Opencv	0	0%
Facenet	mtcnn	Retina Face	0	0%
Facenet	mtcnn	Mtcnn	0	0%
Facenet	mtcnn	Opencv	0	0%
Facenet	Opencv	Retina Face	0	0%
Facenet	Opencv	Mtcnn	0	0%
Facenet	Opencv	Opencv	0	0%

### 5.5.2.3 Conclusion for first and second scenarios

From the experiments that have been carried out, using 20 image datasets with 1 person having more than 1 photo and using 200 image datasets with 1 person having only 1 photo, the results show that the facial recognition model that will be used is the ArcFace model and the backend detector will use Retina Face as the main detector and mtcnn as the second detector. This is determined because of the accuracy displayed and the robustness of the backend model or detector used

### 5.5.2.4 Third Scenario Method Test

in the third scenario testing will use the best face recognition model and backend detector that have been selected based on the two previous experiments which are implemented into the application.

Testing will be conducted on volunteers who are willing to be participants in an event that is made, and facial recognition is carried out for attendance, each person will have their own experimental conditions such as using masks, glasses, or makeup. and each condition per person will be tested with 15 different photo poses.

The following are the results of experiments carried out in the attendance application with a total of 11 guest data, where each guest only has 1 face image dataset:

1. Maretyatianhar G.

a. Image Dataset



Figures 5.69 Maretya Image Dataset

b. Photographs of various poses



Figures 5.70 Maretya Image Testing

c. Face recognition results table

Table 5.22 Maretya Face Recognition Results Table

No	Name	Face Recognition Methode	Akurasi	Deskripsi
----	------	--------------------------	---------	-----------

		Advanced (Retina Face)	Basic (MTCNN)	Advanced (Retina Face)	Basic (MTCNN)	
1	Maretya ( <b>Natural and Hijab</b> )	TRUE: 12, False: 3	TRUE: 0, FALSE: 15	80%	0%	Have a comparison between dataset photos wearing hijab and quite thick makeup compared to natural testing photos and wearing hijab

## 2. Herlangga

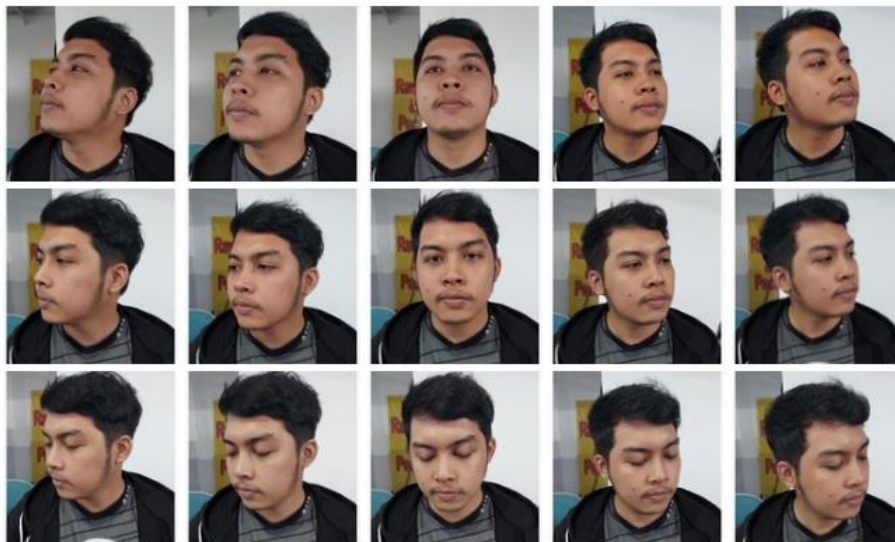
### a. Image Dataset



Figures 5.71 Herlangga Image Dataset

### b. Photographs of various poses

#### i. Natural



Figures 5.72 Herlangga Testing Image (Natural)



ii. Glasses



Figures 5.73 Herlangga Testing Image (Glasses)

iii. With mask



Figures 5.74 Herlangga Testing Image (Mask)

c. Face Recognition results table

Table 5.23 Herlangga Face Recognition Result Table

No	Name	Face Recognition Methode		Akurasi		Deskripsi
		Advanced (Retina Face)	Basic (MTCNN)	Advanced (Retina Face)	Basic (MTCNN)	

1	Herlangga <b>(natural)</b>	TRUE : 11, False: 4	TRUE : 10, FALSE : 5	73%	67%	Have a comparison between natural dataset photos and natural testing photos
2	Herlangga <b>(Glasses)</b>	TRUE : 10, False: 5	TRUE : 7, FALSE : 8	67%	47%	Have a comparison between dataset photos wearing natural and setting photos with glasses
3	Herlangga <b>(Mask)</b>	TRUE : 5, False: 10	TRUE : 1, FALSE : 14	33%	7%	Have a comparison between natural dataset photos and testing photos with masks

### 3. Eko Setyo

#### a. Image Dataset



Figures 5.75 Eko Image Dataset

#### b. Photographs of various poses

##### i. Natural



Figures 5.76 Eko Testing Image (Natural)

ii. Glasses



Figures 5.77 Eko Testing Image (Glasses)

iii. With mask



Figures 5.78 Eko Testing Image (Mask)

c. Face Recognition results table

Table 5.24 Eko Face Recognition Results Table

No	Name	Face Recognition Methode		Akurasi		Deskripsi
		Advanced (Retina Face)	Basic (MTCNN)	Advanced (Retina Face)	Basic (MTCNN)	
1	Eko (Natural)	TRUE : 11 FALSE : 4	TRUE : 11 FALSE : 4	73%	73%	Have a comparison between natural dataset photos and natural testing photos
2	Eko (Glasses)	TRUE : 9 FALSE : 6	TRUE : 6 FALSE : 9	60%	40%	Have a comparison between natural dataset photos and testing photos with glasses
3	Eko (Mask)	TRUE : 3 FALSE : 12	TRUE : 1 FALSE : 14	25%	7%	Have a comparison between natural dataset photos and testing photos with masks

- 4. Veronicha
  - a. Image Dataset



Figures 5.79 Veronicha Image Dataset

- b. Photographs of various poses
    - i. Makeup (soft)



Figures 5.80 Veronicha Testing Image (Makeup)

- ii. With mask



Figures 5.81 Veronicha Testing Image (Mask)

c. Face Recognition results table

Table 5.25 Veronicha Face Recognition Results Table

No	Name	Face Recognition Methode		Akurasi		Deskripsi
		Advanced (Retina Face)	Basic (MTCNN)	Advanced (Retina Face)	Basic (MTCNN)	
1	Ve (MakeUp)	TRUE : 13 : FALSE : 2	TRUE : 12 : FALSE : : 3	87%	80%	Have a comparison between dataset photos with makeup and testing photos with makeup
2	Ve (Mask)	TRUE : 3 : FALSE : 12	TRUE : 2 : FALSE : 13	20%	13%	Have a comparison between dataset photos with make up and testing photos with masks

5. Rizky

a. Image Dataset



Figures 5.82 Rizky Image Dataset

b. Photographs of various poses

i. Natural



Figures 5.83 Rizky Testing Image (Natural)

ii. Glasses



Figures 5.84 Rizky Testing Image (Glasses)

c. Face Recognition results table

Table 5.26 Rizky Face Recognition Results Table

No	Name	Face Recognition Methode		Akurasi		Deskripsi
		Advanced (Retina Face)	Basic (MTCNN)	Advanced (Retina Face)	Basic (MTCNN)	
1	Dhana (Natural)	TRUE : 12 : FALSE : 3	TRUE : 13 : FALSE : : 2	80%	87%	Have a comparison between natural dataset photos and natural testing photos
2	Dhana (Glasses)	TRUE : 8 : FALSE : 7	TRUE : 7 : FALSE : 8	53%	47%	Have a comparison between natural dataset photos and testing photos with glasses

6. Brian

a. Image Dataset





Figures 5.85 Brian Image Dataset

b. Photographs of various poses

i. Natural



Figures 5.86 Brian Image Testing (Natural)

ii. Glasses



Figures 5.87 Brian Image Testing (Glasses)

iii. With mask



Figures 5.88 Brian Image Testing (Mask)

c. Face Recognition results table

Table 5.27 Brian Face Recognition Results Table

No	Name	Face Recognition Methode		Akurasi		Deskripsi
		Advanced (Retina Face)	Basic (MTCNN)	Advanced (Retina Face)	Basic (MTCNN)	
1	Brian (Natural)	TRUE : 15 : FALSE : 0	TRUE : 13 : FALSE : 2	100%	87%	Have a comparison between natural diploma photos and natural testing photos
2	Brian (Glasses)	TRUE : 14 : FALSE : 1	TRUE : 10 : FALSE : 5	93%	67%	Have a comparison between natural diploma photos and testing photos with glasses

3	Brian <b>(Mask)</b>	TRUE : 14 : FALSE : 1	TRUE : 5 FALSE : 10	93%	33%	Have a comparison between a natural diploma photo and a testing photo with a mask
---	------------------------	--------------------------	------------------------	-----	-----	---