

CMSC 190 SPECIAL PROBLEM

CLASSPIC:

AUTOMATED ATTENDANCE CHECKING WEB
APPLICATION USING FACIAL RECOGNITION

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INTRODUCTION

What is Attendance Checking?

It is an essential aspect of classroom management, it makes sure that students maximize their potential for learning by attending every single class.

Status Quo of Attendance Checking

Issues and Problems

- **Efficiency**
- **Can be cheated, lost or stolen**

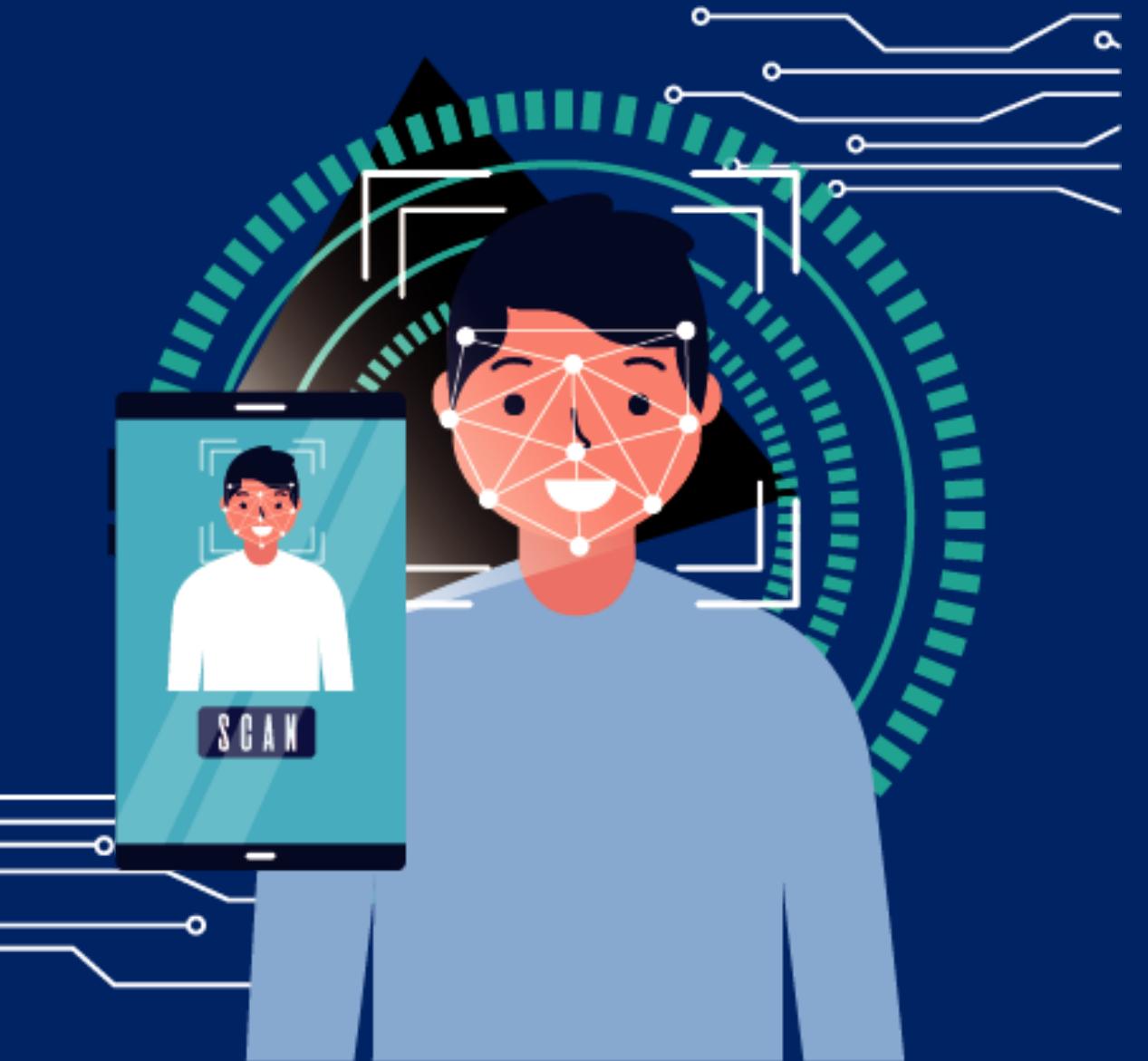


FACIAL RECOGNITION

It is a recognition technique used to detect faces of individuals whose images are stored in a database. It uses algorithms to pick out specific, distinctive details about a person's face. These details are then converted into mathematical representation and then compared to other faces in the database.

Current Uses

- **Security**
- **Healthcare**
- **Marketing**



OBJECTIVES

The general objective of the study is to implement a web application that utilizes facial recognition which will be used to automate attendance checking. It specifically aims to:

- **Create a web application for teachers to easily manage the attendance of a class;**
- **Generate a spreadsheet that contains the attendance record using the web application; and**
- **Assess the overall performance of the developed application.**

RELATED STUDIES

Existing Attendance Checking Technologies

- **Radio-Frequency Identification (RFID)**
- **Geolocation**
- **QR Code**

Utilizes Facial Recognition

- **Facial Recognition using CCTV**
- **Facial Recognition for PC Platform**
- **Facial Recognition for Mobile**

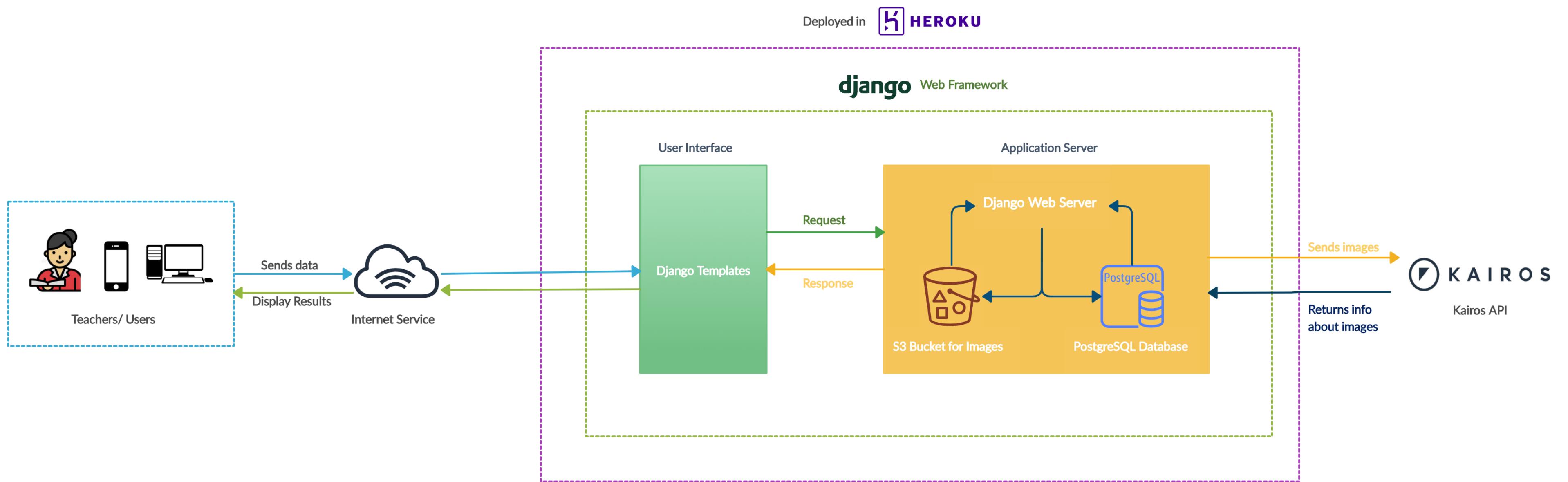
METHODOLOGY

Image Acquisition

- **Household of 10 people**
- **12MP Main Camera of Samsung S9+**
- **8MP Front Camera**

METHODOLOGY

Architecture of the Application



METHODOLOGY

Kairos API

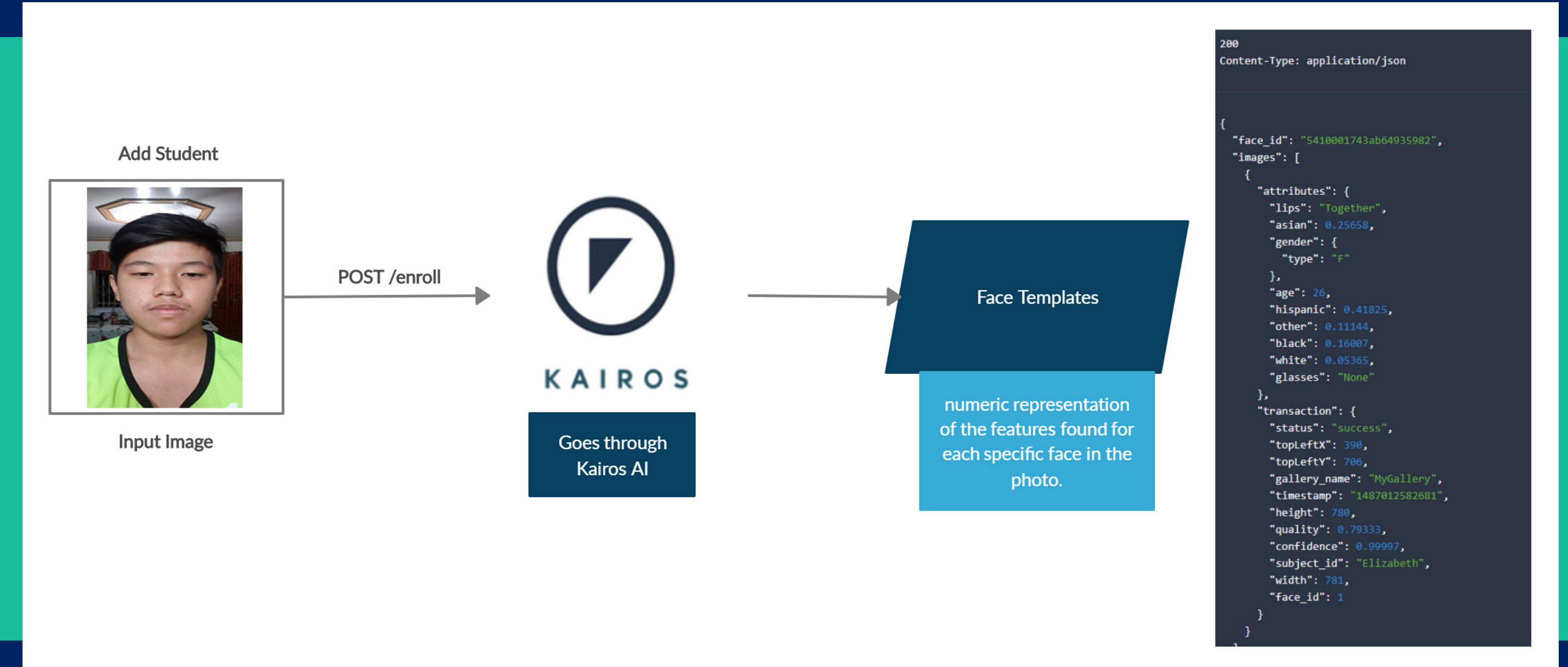
- Kairos provides state-of-the-art, ethical face recognition to developers and businesses worldwide.
- Kairos is state-of-the-art—scoring 99.63% on the popular LFW database.

Face Templates

- Each time you enroll a face into the API, it extracts the facial features, generating a template of the features as a random alphanumeric string of code.
- anonymizes the facial data therein and the template cannot be reverse engineered back into a photo.

METHODOLOGY

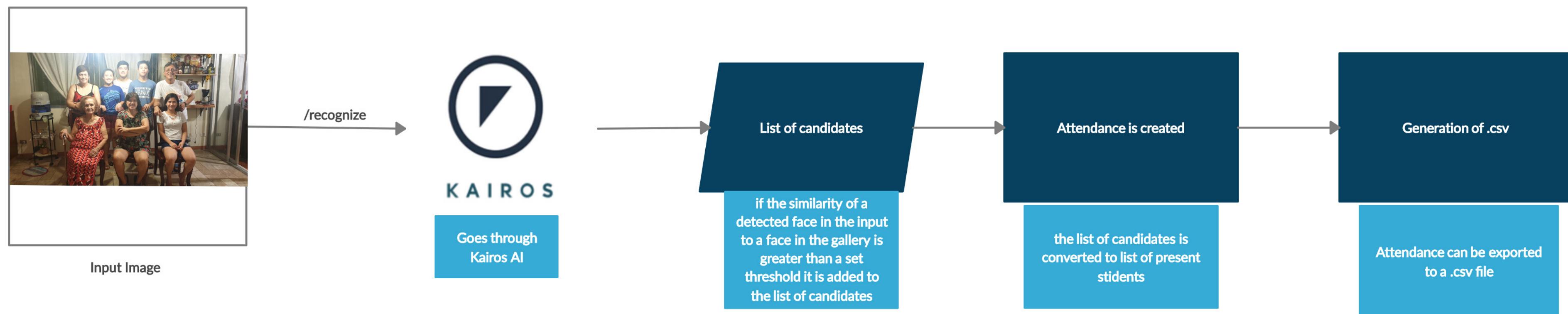
Generation of Face Templates



METHODOLOGY

Attendance Checking and Recording

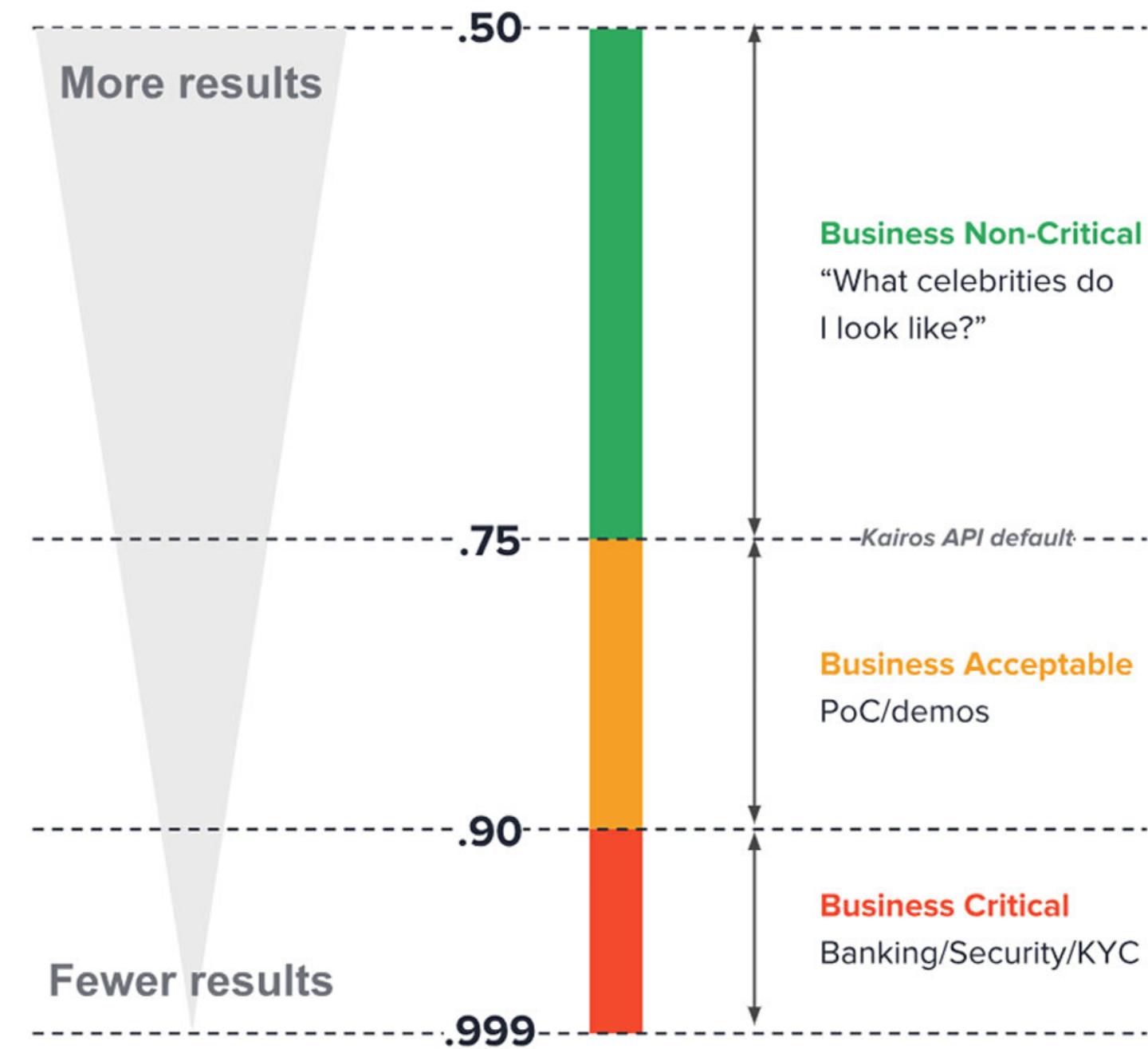
Take ClassPic



METHODOLOGY

Attendance Checking and Recording

App False Match Rate	Threshold Required
1 in 10	.50
1 in 50	.60
1 in 100	.70
1 in 500	.75
1 in 1,000	.80
1 in 5,000	.87
1 in 10,000	.90
1 in 50,000	.95
1 in 100,000	.97
1 in 200,000	.99
1 in 500,000	.995
1 in 1,000,000	.999



RESULTS AND DISCUSSION

Web Application

Technology Stack

CSS



HTML



HEROKU

django



PostgreSQL

RESULTS AND DISCUSSION

Web Application

Login Page

ClassPic

Login Register

Login

Username*

Password*

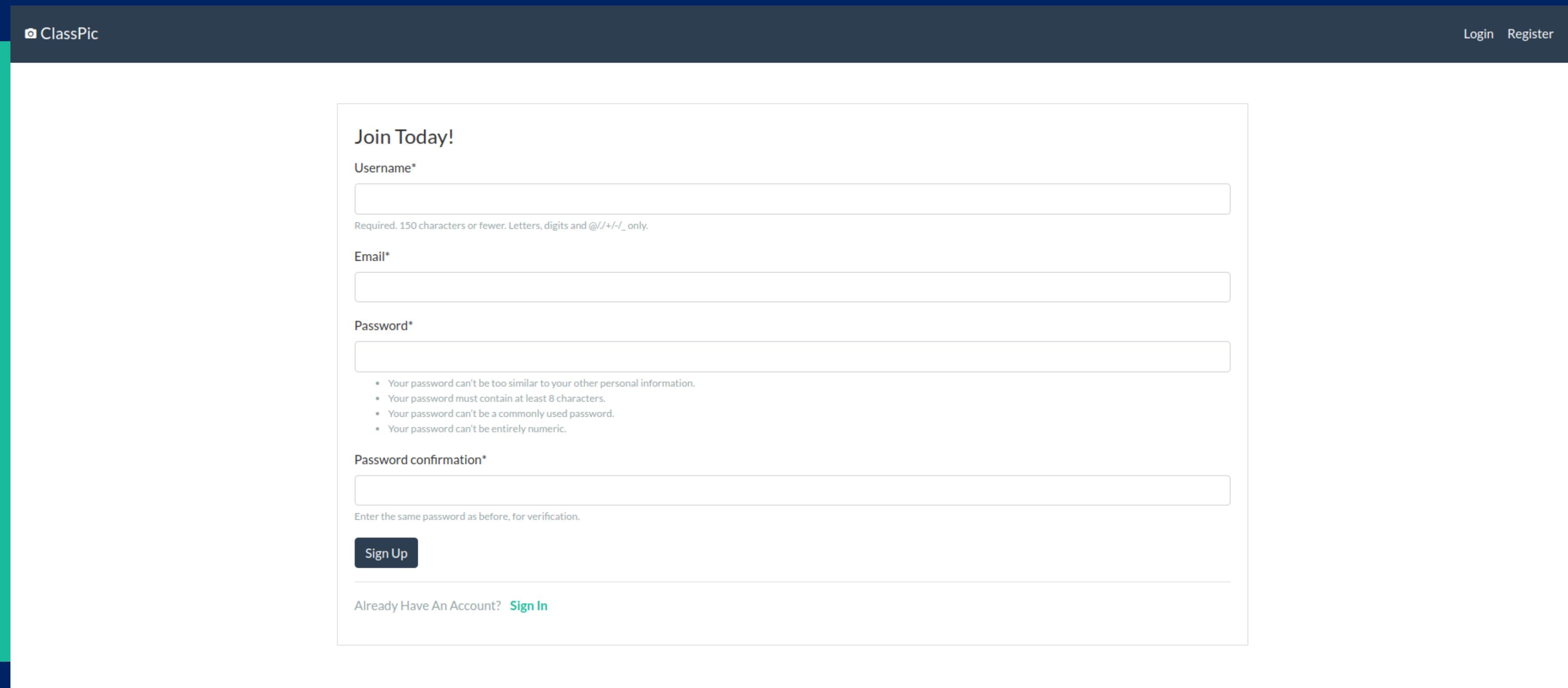
[Login](#) [Forgot Password?](#)

Don't Have An Account? [Sign Up Now](#)

RESULTS AND DISCUSSION

Web Application

Register Page



ClassPic

Login Register

Join Today!

Username*

Required. 150 characters or fewer. Letters, digits and @/./-/_. only.

Email*

Password*

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation*

Enter the same password as before, for verification.

[Sign Up](#)

Already Have An Account? [Sign In](#)

RESULTS AND DISCUSSION

Web Application

Profile Page

paolo

pmrastudillo@gmail.com

Profile Info

Username*

Required. 150 characters or fewer. Letters, digits and @/./-/_. only.

Email*

Update

RESULTS AND DISCUSSION

Web Application

Forgot Password Page

Reset Password

Email*

pmrastudillo@gmail.com

Request Password Reset

RESULTS AND DISCUSSION

Web Application

Forgot Password Email

password reset on www.classpic.dev Inbox ×

 pmrastudillo@gmail.com
to me ▾

You're receiving this email because you requested a password reset for your user account at www.classpic.dev.

Please go to the following page and choose a new password:

<https://www.classpic.dev/password-reset-confirm/MQ/5gt-333fcde06064a60a4477/>

Your username, in case you've forgotten: paolo

Thanks for using our site!

The www.classpic.dev team

Reply Forward

RESULTS AND DISCUSSION

Web Application

Forgot Password Form

ClassPic

Login Register

Reset Password

New password*

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

New password confirmation*

Reset Password

RESULTS AND DISCUSSION

Web Application

Dashboard Page

ClassPic

Profile Logout

Subjects

+ Add Subject

CMSC 131 AB

Introduction to Computer Organization and
Machine Level Programming

WeFr 8:00AM - 9:00AM ICSMH

10 students

CMSC 100 UV-2L

Web Programming

TuTh 11:00AM - 12:00PM ICS PC7

0 students

CMSC 161 B-1L

Interactive Computer Graphics

WeFr 9:00AM - 10:00AM ICS LH4

0 students

RESULTS AND DISCUSSION

Web Application

Subject Detail Page

The screenshot shows a web application interface for managing a class. At the top, there's a header bar with the title "ClassPic" and navigation links for "Profile" and "Logout". Below the header, a box displays class details: "CMSC 123 CD", "Data Structures", "WeFr 11:00AM - 12:00PM ICSLH3", and "10 students". There are two buttons at the bottom of this box: "Take ClassPic" and "View Attendance".

The main content area is titled "Class List" and contains a table of student records:

Student Name	ID	Action Buttons
Astudillo, Francis Bien	10002	[Edit] [Delete]
Astudillo, Mariel	10004	[Edit] [Delete]
Astudillo, Paolo Miguel	10001	[Edit] [Delete]
Astudillo, Rene	10005	[Edit] [Delete]
Astudillo, Renelle Mae	10003	[Edit] [Delete]
Boquir, Jojo	10010	[Edit] [Delete]
Jane, Sarah	10008	[Edit] [Delete]
Leones, Matilde	10006	[Edit] [Delete]
Santos, Alma	10007	[Edit] [Delete]
Victorio, Alice	10009	[Edit] [Delete]

RESULTS AND DISCUSSION

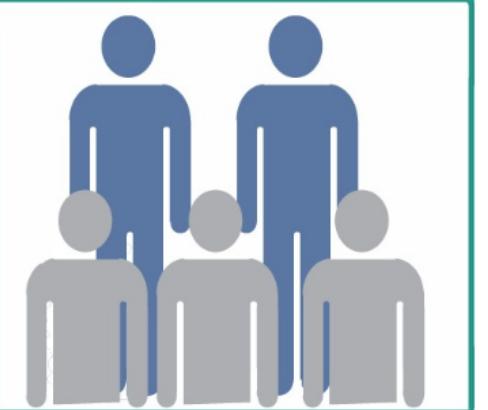
Web Application

Take ClassPic/ Create Attendance Page

ClassPic

Profile Logout

Take ClassPic



✓

Reminders

1. Position camera so people's faces appear vertical in the image.
2. For best results, the camera should be placed in such a way that subjects will be looking directly at the camera.
3. Images can only be BMP, JPG or PNG.

Subject image*

Choose File No file chosen

Subject image2

Choose File No file chosen

Cancel Submit

RESULTS AND DISCUSSION

Web Application

Attendance List Page

The screenshot shows a web application interface for managing class attendance. At the top, there is a navigation bar with the logo "ClassPic" and links for "Profile" and "Logout". The main content area displays information about a class named "CMSC 123 CD" with the code "CD". The class details include "Data Structures", "WeFr 11:00AM - 12:00PM ICS LH3", and "10 students". Below this, there is a section titled "Attendance List" which lists ten entries, each corresponding to a specific date and time: May-15-2020 02:27 AM, May-15-2020 02:25 AM, May-15-2020 02:24 AM, May-15-2020 02:23 AM, May-15-2020 02:22 AM, May-15-2020 02:21 AM, May-15-2020 02:20 AM, May-15-2020 02:19 AM, May-15-2020 02:17 AM, and May-15-2020 02:16 AM. To the right of each entry is a small red square icon. At the bottom of the attendance list, there is a pagination control with pages 1, 2, and 3.

Date	Action
May-15-2020 02:27 AM	[Red Square]
May-15-2020 02:25 AM	[Red Square]
May-15-2020 02:24 AM	[Red Square]
May-15-2020 02:23 AM	[Red Square]
May-15-2020 02:22 AM	[Red Square]
May-15-2020 02:21 AM	[Red Square]
May-15-2020 02:20 AM	[Red Square]
May-15-2020 02:19 AM	[Red Square]
May-15-2020 02:17 AM	[Red Square]
May-15-2020 02:16 AM	[Red Square]

Page: 1 2 3

RESULTS AND DISCUSSION

Web Application

Attendance Detail Page

← Go back to Attendances

Attendance for May-25-2020 02:31 AM



A photograph showing a group of approximately ten people, mostly adults, sitting in a living room. They are arranged in two rows, some on chairs and some on a sofa. The room has a television, a computer monitor, and various household items in the background.

Present

Absent

Present Students

8/10

 Astudillo, Paolo Miguel 10001	
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RESULTS AND DISCUSSION

Attendance Checking

- Facial Hair/ Haircut does not affect recognition
- Eyeglasses do not affect recognition (except for sunglasses)
- "Sit-in" students or unenrolled students are not recognized



No. of students=10, Automated Count=10



No. of students=10, Automated Count=10

RESULTS AND DISCUSSION

Attendance Checking

- Can feed up to two pictures (for large classes)



(a) Left side of the room: No. of students = 6



(b) Right side of the room: No. of students = 4 + 1 sit-in

No. of students=10 + 1 sit-in, Automated Count=10

RESULTS AND DISCUSSION

Attendance Checking

- Low accuracy images caused by faces blocked by other students



No. of students=10, Automated Count=6

RESULTS AND DISCUSSION

Attendance Checking

- Low accuracy images caused by faces blocked by other students



No. of students=10, Automated Count=9

RESULTS AND DISCUSSION

Attendance Checking

- 100% accuracy when all faces are clearly visible



No. of students=10 + 1 Sit-in, Automated Count=10



No. of students=8, Automated Count=8

RESULTS AND DISCUSSION

Attendance Checking Randomized Seating Arrangement

TABLE I: System Performance in Randomized Seating Arrangement

Test Image	No of students	Automated Count	Accuracy
1	10	10	100%
2	10	10	100%
3	10	8	80%
4	10	6	60%
5	8	8	100%
AVERAGE			88%

RESULTS AND DISCUSSION

Attendance Checking

TABLE II: System Performance in According to Height Seating Arrangement

Test Image	No of students	Automated Count	Accuracy
6	10 + 1 sit-in	10	100%
7	10	10	100%
8	10	9	90%
9	8	8	100%
10	8	8	100%
AVERAGE			94%

RESULTS AND DISCUSSION

Performance Issues

- Due to time request limitations caused by a Heroku, a request which is greater than 30 seconds throws back a request timeout error.
- If a user has a slow internet connection the website will throw back a request timeout and attendance entity is not created.
- Commonly encountered if the user decided to upload 2 images in the take classpic form

These errors are caused by:

- Slow upload speed
- Kairos API /recognize can only cater one image per request

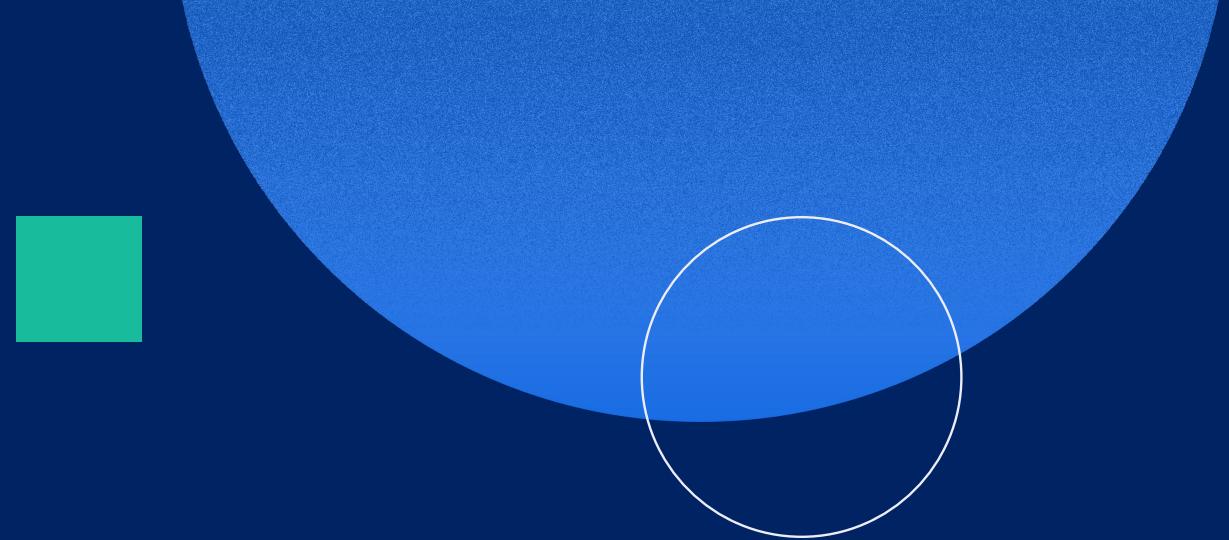
These issues are not encountered when the website is in local machine

CONCLUSIONS AND RECOMMENDATIONS

- **Attendance checking is an essential aspect of classroom management**
- **Status Quo of Attendance Checking**
- **Available technologies exist but expensive and require certain machinery**
- **Web application developed is more efficient, reliable and cost-effective**
- **Accuracy is satisfactory given the optimal conditions are met such as all of the faces are visible**

Future works include:

- **Using another API or developing new facial recognition algorithm to improve accuracy**
- **Fixed phone mounted to take class picture at a certain time to detect late students and remove hassle of taking pictures**
- **Integration to existing classroom management platforms such as Google Classroom and Edmodo**



THANK YOU!

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