Kingdom of Saudi Arabia

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# Face Recognition Attendance System

*Introduction to Artificial Intelligence.*

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## Abstract

Face detection and face recognition are very important technologies these days. So, we as Shaqra University students have decided to implemented a device that detects and recognize the face as a student attendance system and the goal of our application is to be a substitute for the regular paper attendance system and finger print attendance system. The main function in our project is going to be done using Python because, python is a very helpful programming tool in regards of facial uses and very helpful in other uses. We will be using OpenCV & Visual Studio for this project. A Face Recognition Based Attendance system using ESP32 Camera Module and Python. We will not just detect the person but also store the information of the person detected in a Microsoft Excel File. Moreover, the duration of time they have stayed in the frame is also recorded into an excel sheet.



**Keywords: Attendance system, Automated, Biometric, Face recognition, and Face detection.**

## Contents:

## Introduction:

The human face plays an important role in our day-to-day life mostly for the identification of a person. Face recognition is a part of biometric identification that extracts the facial features of a face and then stores it as a unique face print to uniquely recognize a person. Biometric face recognition technology has gained the attention of many researchers because of its wide application.

Face recognition technology is better than other biometric-based recognition techniques like a fingerprint, palm - print, and iris because of its non-contact process. Recognition techniques using face recognition can also recognize a person from a distance, without any contact or interaction with a person. Face recognition techniques are currently implemented in social media websites like Facebook, airports, and railway stations. Then, in criminal investigations it can also be used in crime reports, the captured photo can be stored in a database, and can be used to identify a person.

For face recognition, we require a large dataset and complex features to identify a person in all conditions like the change of illumination, age, pose, etc. Recent researches show there is a betterment in facial recognition systems. In the last ten years, there is a huge development in recognition techniques. But currently, most facial recognition techniques can work fine only if the number of people in one frame is very few and under controlled illumination, with the proper position of faces, and clear images. For face recognition purposes, there is a need for large data sets and complex features to uniquely identify the different subjects by manipulating different obstacles like illumination, pose, and aging. During the recent few years, a good improvement has been made in facial recognition systems. In comparison to the last decade, one can observe an enormous development in the world of face recognition.

Currently, most facial recognition systems perform well with limited faces in the frame. Moreover, these methodologies have been tested under controlled lighting conditions, proper face poses, and non-blurry images. Face recognition systems can be implemented by using facial characteristics as biometrics. Attendance tracking is the most difficult task in any organization.

Since the face is the most important part of the human body because it uniquely identifies a person. Face recognition systems can be implemented by using facial characteristics as biometrics. Attendance tracking is the most difficult task in any organization. Face recognition is a biometric technique that determines whether the image of a person’s face matches any of the face images stored in a database.

The primary goal of this project is to build a face recognition-based attendance monitoring system for students in university to improve and upgrade the current attendance system to make it more efficient and effective than before.

The facial recognition feature embedded in the attendance monitoring system not only ensures accurate attendance but also eliminates flaws. Using a system to overcome defects not only saves resources but also reduces human intervention in the overall process by delegating all complex tasks to the system.

## Problem:

Taking manual attendance is a time-consuming task. Instead of squandering time, it may be put to better use. There's a chance the teacher will miss a few students because they have to take attendance for more than 50 students. Another option is for a student to take attendance for other students who are absent. We can employ deep learning and facial recognition ideas to avoid such a scenario. We can recognize faces and things using facial recognition.

However, facial recognition is insufficient because the system is unable to distinguish between faces and other items. As a result, we require deep learning. We can educate our system to solve issues using Deep Learning, in this case, detecting faces using biometrics and facial measurements. Each face has its own characteristics and measurements.

A machine can detect these faces, but we need to teach our system to match faces accurately in order to find the specific ones. As a result, Deep Learning can be used. We can achieve automatic attendance by employing this real-time facial recognition technology. The main purpose of this paper is to learn how to use facial recognition to take attendance. The machine will learn to recognize students' faces based on their facial structure and unique features, give them attendance, and save their names in an excel sheet with time stamps when the system has been loaded with various students' photographs. easing the work of the faculties in terms of attendance.

## Objectives:

Our primary goal is to help the lecturers, improve and organize the process of track and manage student attendance and absenteeism. Additionally, we seek to:

- ✓ Provides a valuable attendance service for both teachers and students.
- ✓ Reduce manual process errors by provide automated and a reliable attendance. system uses face recognition technology.

- ✓ Increase privacy and security which student cannot presenting himself or his friend while they are not.
- ✓ Flexibility, Lectures capability of editing attendance records.

## Methodology:

One thing we must know, **face detection** is the first step on the path to facial recognition. This technology can look at a frame, image, or video and tell if a human face is present. In this case, it does not matter to whom the face belongs.

Many factors influence the process of **face recognition** such as shape, size, pose, occlusion, and illumination. Facial recognition has two different applications: **basic and advanced**.

**Basic face recognition recognizes faces or no faces** such as balls and animals. If it is a face, then the system searches for eyes, a nose, and a mouth. **Advanced facial recognition manages the question on a specific face.** This contains unique landmarks: "the width of the nose, the wideness of the eyes, the depth and angle of the jaw, the height of cheekbones, and the separation between the eyes, and makes a unique numerical code."

Utilizing these numerical codes, the system then matches that image with another image and distinguishes how comparable the pictures are to each other. The image provenance for face recognition includes pre-existing pictures from various databases and video camera signals.
Generally, a facial recognition system consists the following steps: Face detection, feature extraction, and face recognition as illustrated in Figure1

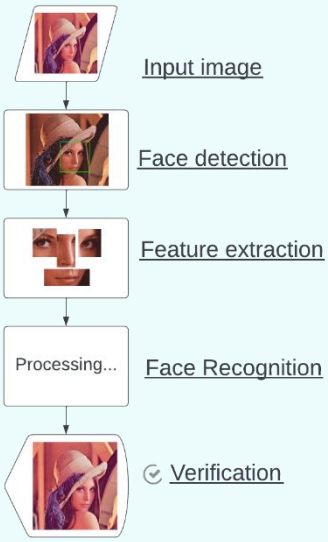


Figure1 General structure of the face recognition system.

Following flow chart describes the process of the attendance management proposed system shows in Figure2

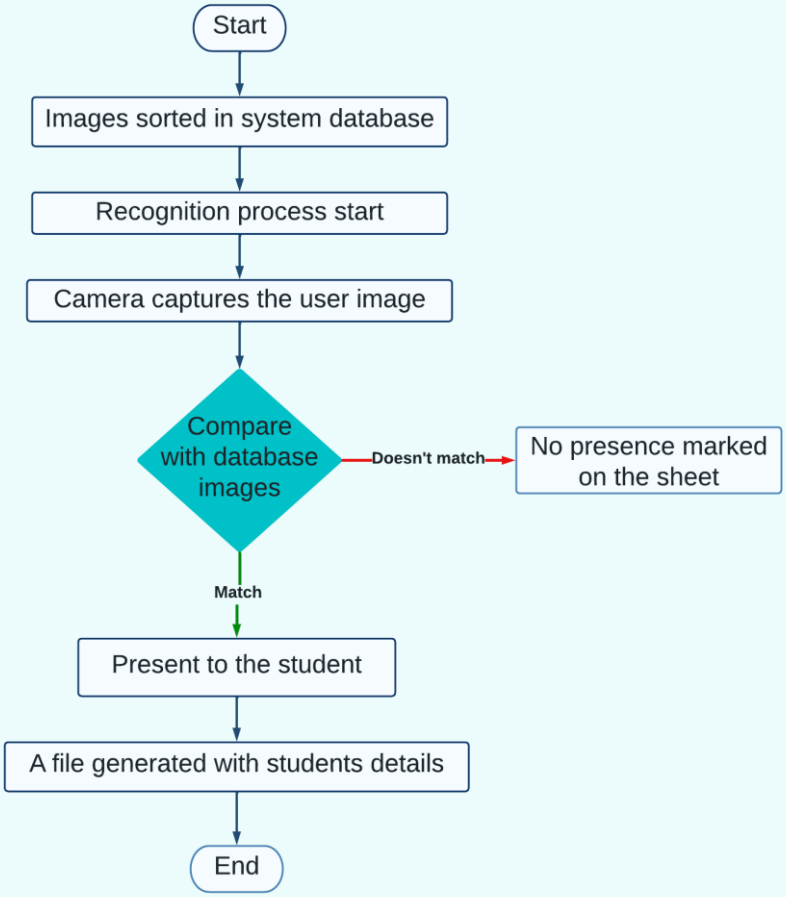


Figure2 flow chart for attendance management system.

## Result:

We have successfully built and tested an automated system for classroom attendance. We create a **Face Recognition Based Attendance system** using ESP32 CAM and Python.

The assembled components as designed in the prototype are shown here

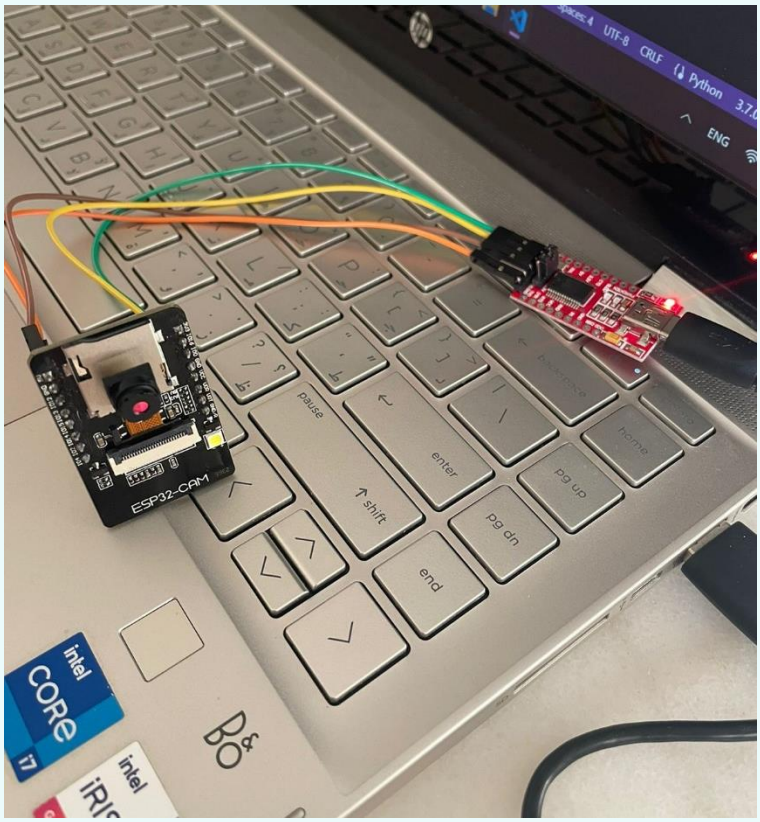


Figure3 Facial Recognition Attendance system.

The results were great and accurate. This was done in several stages, as follows:

A. Training the model

The system store multiple photos of human faces in order to correctly recognize them. Before we can do that, we need to train the system how to recognize faces and correctly identify them. The basic goal of training a system is to make it able to recognize faces in a variety of situations, including lighting variations, low resolution, occlusion, and so on. As illustrated in figure4.

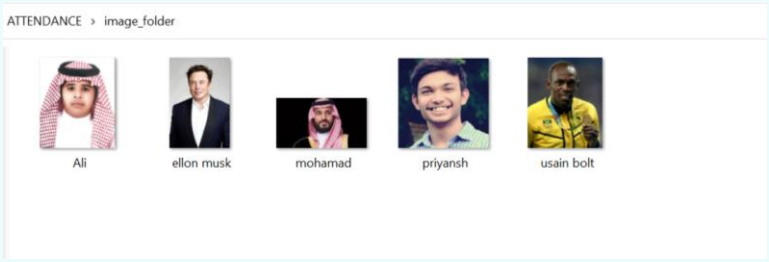


Figure4 training the system

B. Identifying the face

Since the model has been trained with the collected dataset, now the system can easily identify the face by analyzing the unique features of the faces. We must first read the 'images folder' that was created during data training.
The system camera ESP32 must connect to the device, then be initialized using *openCv*. It's tough to interpret the images captured by the camera because they're so large. As a result, we'll draw a boundary around the face to help the system **focus** on it. A square box is drawn around the face using *openCv*. We work through a function that will read image, recognize specific faces, and processing images written by us using *openCv*. Once the object has been detection from the live video using the *openCv & face_recognition*, we must make a prediction as to which face this image belongs to. We call this prediction because no system can be certain whether the individual in the image is 'x' 100 %. As a result, making a prediction could assist the mode in learning and training more effectively in order to recognize more accurately. (Figure5)

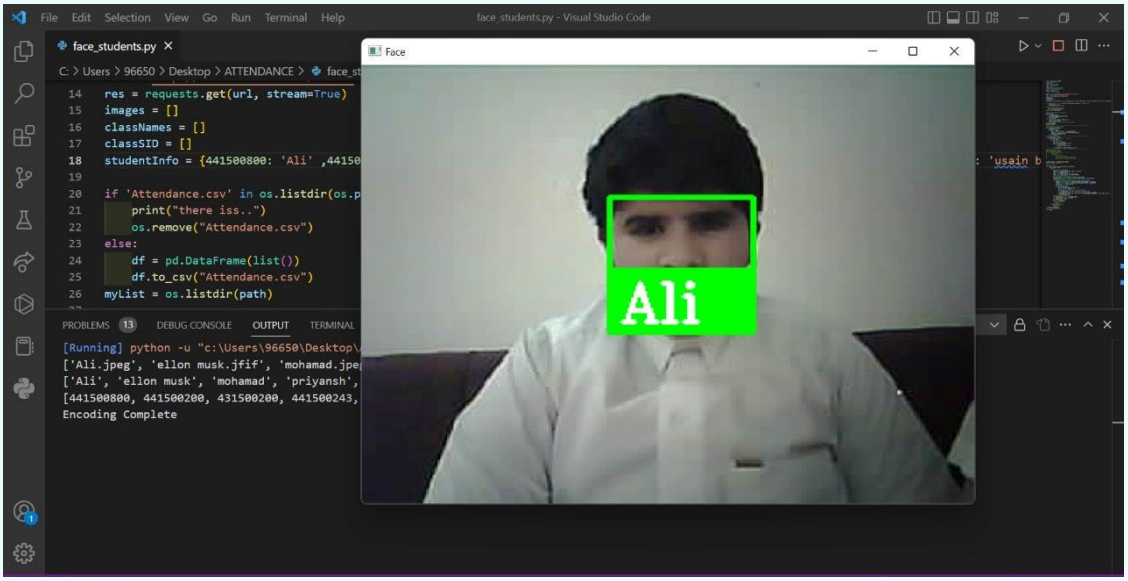


Figure5 face has been identifying

C. Providing Attendance

The final phase in the process is to give attendance to students whose faces have been identified. All of the information will be stored in a csv file. We'll extract all of the data from the database and save each column in its own variable. Then, using the append() function, append all variables. Now we'll use the datetime.now() function to collect the date and time of the face that was detected. Once all required details are stored then using writelines() we will insert all details into the csv file. (Figure 6)

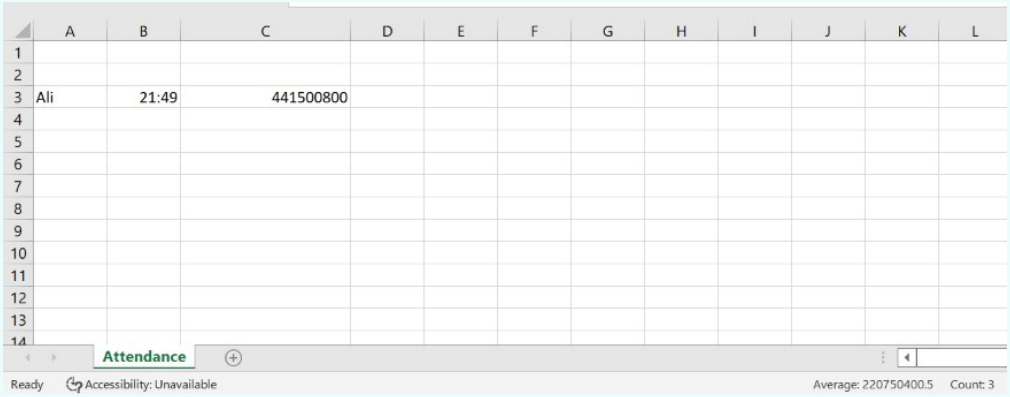


Figure6 details of the student's attendance stored

## Recommendations:

The system can be made more flexible and scalable using these recommendations. The recommendations are as follows:

- The system can be extended to change list of students according to class changes.
- The system can also be extended to allow better face recognition algorithm in which even rotational features of face can be detected efficiently.

## Conclusion:

This paper introduces the efficient and accurate method of attendance in the classroom environment that can replace the old manual methods. This method is secure enough, reliable and available for use. No need for specialized hardware for installing the system in the classroom. It can be constructed using a camera and computer.

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## Appendence:

### ARDUINO:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It's intended for anyone making interactive project

OpenCV: is an open-sourced **image processing library**.