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# Attendance Marking System Using Facial Recognition for Online Classes

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*Abstract*—**COVID-19 brought an era of online class where students learn through online portals such as zoom, google meet, etc.This brought lots of changes, especially in attendance marking. Gone are the days where the teacher has to callout names manually to enter attendance. Now the teacher can detect login details of the student to mark attendance. It is an efficient way that saves lots of time and makes attendance hassle-free, but this also made proxy more and more frustrating for the teacher.Students can make anyone sit in their place behind the screen and have attended and there is no way of knowing if the real student is attending class or not.Proxy is being used by many students who do not even attend classes because there is no way to verify if a real student is behind screen or not but what if whenever student logins in teaching portal, he must verify his identity by dynamic facial recognition software.This software will recognize students by facial recognition and enter attendance on the app. Students has to log in and show his face and his log will appear on the app showing when he connected and when software recognized his face.**

***Keywords—facial recognition, biometrics, online classes, attendance system***

## I. INTRODUCTION

FACE RECOGNITION is a technology that can easily re- place biometrics. It is unique in that it uses a person's facial features to identify them. Since each person's facial features arespecial,itcan be described as a technique with few flaws. Face recognition, which has triumphed in a variety of fields, can be used successfully for attendance systems, but it has not been pursued due to obvious weaknesses. The traditional method of manually labeling attendance on a piece of paper by the in-charge had its own set of advantages and disadvantages. The manual attendance marking method in question is insecure and time-consuming, resulting in a setback forstudents.

In order to address this issue, various developments have resulted in the widespread use of biometrics.Biometric attendance management came with a hefty pricetag.

At the user's end, effort and personal time are needed. Observing the outbreak of face recognition as a practical tool, techniques were developed.It has progressed to the point that it is now used in attendance management.Iris is the most popular biometric used in attendance management. As time progresses, Advancements are also needed to keep up with the ever-increasing demand. Bio- metric attendance management is also being improved and introduced. As attendance marking techniques improve, the urgent need to eliminate impediments grows. Gadget com- plications, delays, and genuine attendance is the subject of discussion. Unlike the traditional system of the attendance marking/management scheme is slow and inefficient.

Face recognition is used by the machine torecognize and mark people. Students' attendance Facial recognition is accomplished using a camera with no extra equipment and the attendance is marked. The faces are used to verify the student's identity.The software is extremely useful for keeping track of attendance and keeping records for teachers, students, and management. Algorithms are used to align faces with the correct

categories.Thestudent'sfacesarestoredinadatabase.Manypeople have looked into this aspect and was able to effectively enforce thescheme.There were some flaws in the quality and validity of the data.After comparing with other biometric techniques like fingerprint and iris, face recognition is the best biometric technique. Because in fingerprint and iris recognition, the persons have to give the input one by one to the recognition system. So, these methods need more time. In face recognition approach, the faces of more than one person can be captured by the camera simultaneously and can recognize them in less time as compared to other biometric techniques. Also, face recognition is advantageous because of its noncontact process. In this, a camera which is installed at a particular distance captures the images of the person. In this way the person can be recognized. So, this type of recognition approach does not require any contact with the person.

## II. LITERATURE REVIEW

**Automated Student Attendance Management System Using**

**Face Recognition**

This research is aimed at developing a less intrusive, cost effective and more efficient automated student attendance management system using face recognition that leverages on cloud computing (CC) infrastructure called FACECUBE. FACECUBE takes attendance by using IP camera mounted in front of a classroom, to acquire images of the entire class. It detects the faces in the image and compares it with the enrolled faces in the database. On identification of a registered face on the acquired image collections, the attendance register is marked as present otherwise absent.[1]

**Design of Face Recognition AttendX forRecording Student Attendance Data Based on Artificial Intelligence Technology**

AttendX is an online attendance platform created by Signy Advanced Technologies from India which aims to facilitate attendance in the scope of work and college. The way this system works is very easy by just registering so that the system can verify faces that have been registered for attendance. This application is designed with modern facial recognition technology that has developed rapidly, with this sophistication it can make it easier to detect faces on structured parts such as the forehead, cheekbones, eyes, and even the nose. When doing face detection, it is not only on one side but there are 3 (three) parts used, so that the results are more optimal, namely the right side, the left side, and the front side[2].

**Monitoring Daily Attendance by Using Face Recognition**

In the project "Monitoring daily attendance using face recognition" the attendance is recorded by using face recognition. To detect real time human face are used and a simple fast principal component analysis has used to recognize the faces detected with high accuracy rate. The face recognition system includes three-part face detection, feature extraction and face recognition. Find the face detection find out the face information. The extended local binary pattern then extracts local features of the face. Various algorithm used for identification of face. The matched face is used to mark attendance of the student. Our system maintains attendance records of students automatically[3].

**Class Attendance Management System Using Face Recognition.**

This paper proposes a method of developing a comprehensive embedded class attendance system using facial recognition with controlling the door access. The system is based on Raspberry Pi that runs Raspbian (Linux) Operating System installed on microSD card. The Raspberry Pi Camera, as well as a 5-inch screen, are connected to the Raspberry Pi. By facing the camera, the camera will capture the image then pass it to the Raspberry Pi which is programmed to handlethe facerecognition by implementing the Local Binary Patterns algorithm LBPs. If the student's input image matches with the trained dataset image the prototype door will open using Servo Motor, then the attendance results will be stored in the MySQL database. The database is connectedto AttendanceManagement System (AMS) web server, which makes the attendance results reachable to any online connected web browser[4].

**Student Attendance System in Classroom Using Face Recognition Technique**

This paper proposes a method for student attendance system in classroom using face recognition technique by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT) to extract the features of student's face which is followed by applying Radial Basis Function (RBF) for classifying the facial objects[5].

**Local Binary Patterns and Its Application to Facial Image Analysis**

Huang presented a survey on Local Binary Patterns and Its Application to Facial Image Analysis: A Survey. This paper presents a survey on LBP and its variations. The different variations of LBP allows it to enhance its discriminative ability, to improve its robustness on noisy images, changes the scale of LBP to provide other categories of local information [6].

**Face Recognition Based on HOG and FastPCA Algorithm**

For object detection, Histogram of Oriented Gradients is used. The intensity of the gradients and the edge directions describes the appearance of the local object and the shape within an image. For improved accuracy, the local histograms can be contrast-normalized by calculating a measure of the intensity distribution of the gradients across a major region of the image, called a block, and then using this value to normalize all cells within the block. This results of normalization in better invariance to changes in illumination and shadowing[7].

**Learning Compact Binary Face Descriptor for Face Recognition**

Jiwen proposed Learning Compact Binary Face Descriptor for Face Recognition. In this he proposed a compact binary face descriptor feature learning method for face recognition. In this, firstly, PDVs of the local patches are calculated. Then it learns these binary codes are clustered for histogram representation[8].

**FACE RECOGNITION METHODS**

P. Beham presented a survey on A Review on Face Recognition Method. In this survey paper he categorized the different severe conditions of face recognition into meaningful approaches, viz.
appearance based, feature based, and soft computing based. and a comparative study of merits and demerits of these approaches

were presented[9].

**Face recognition-based attendance management system using DLIB.**

In this proposed system the attendance is recorded by using camera that is attached in front of classroom which is continuously recording but the system will never store any recorded files. And the features obtained from the detected images are compared with the features stored in the database and the system mark's the attendance. This paper aims at automating the whole process and implementing a system that can't be cheated.The entire system is built by using a machine learning tool called DLIB[10].

**Attendance management system**

Proposed system has a small handy hardware, a remote server and software components for acquisition of data manually or from sensors electronically. It could be used in doing survey's, closed loop control monitoring systems in industries, hospitals, attendance management system of schools and colleges[11].

**IoT based Attendance System**

The project proposed in this paper deals with attendance data of students, which is directly stored on the cloud, and which doesn't waste any precious minute of students and professors by maintaining 100% accuracy of the attendance data, after completion of total procedure, the professor can access the attendance report at the last minute of the class[12].

**Online attendance system**

This paper introduces a new approach in automatic attendance management systems, extended with computer vision algorithms.In our proposed system real time face detection algorithms are used in integration with an existing Learning Management System (LMS), which automatically detects and registers students attending on a lecture[13].

**Integrated system for monitoring and recognizing students during class session**

In the proposed system,a new student attendance system based on biometric authentication protocol. Thissystem is basically using the face detection and the recognition protocols to facilitate checking students'attendance in the classroom.The classroom's camera is capturing the students'photo, directly the face detection and recognition processes will be implemented to produce the instructorattendance report[14].

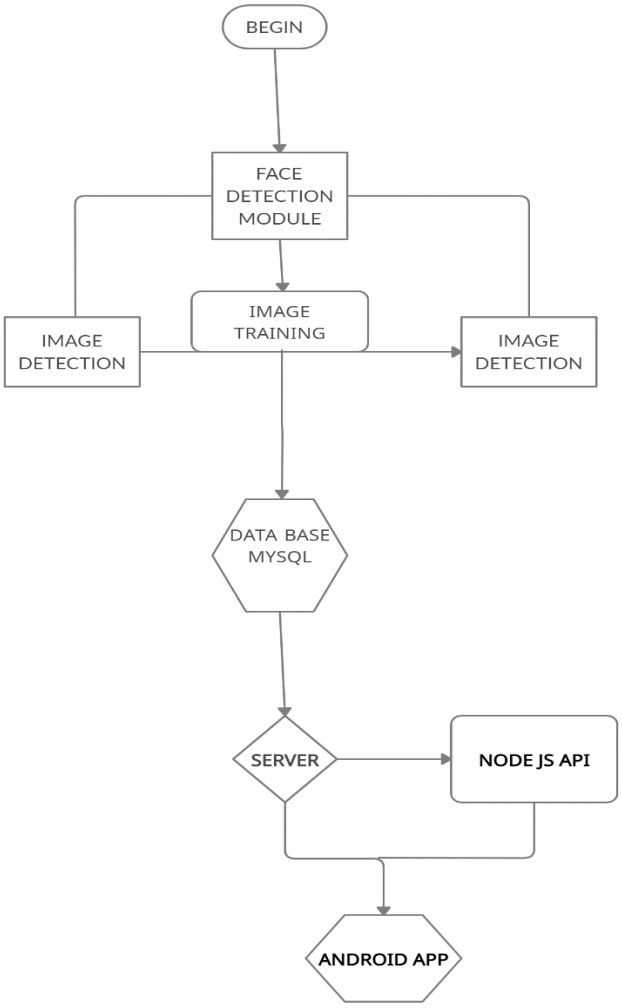
**Biometrics Based Time Attendance System using Face Recognition Algorithm**

The purpose of this research is to implement and develop face recognition algorithm provided by Open CV 2.4.8. Even though all biometrics has its own unique positive value, no single biometric trait has been identified as fully stable or distinctive for now. This is where the multimodal biometric takes its role as the combination of several biometric systems to make it even more secure and powerful. The goal of this research is also to test and develop face recognition as part of future multi-modal biometrics application by taking Attendance System as its case study[15].

## III. PROPOSED MODEL

**Figure 3.1System flow diagram**

We propose a model for an attendance management system in




which we will recognize faces through webcam during online classes and mark attendance which can be seen in our app. It will have a database that will contain detected faces of all students. Once the student enters the online class, our software will

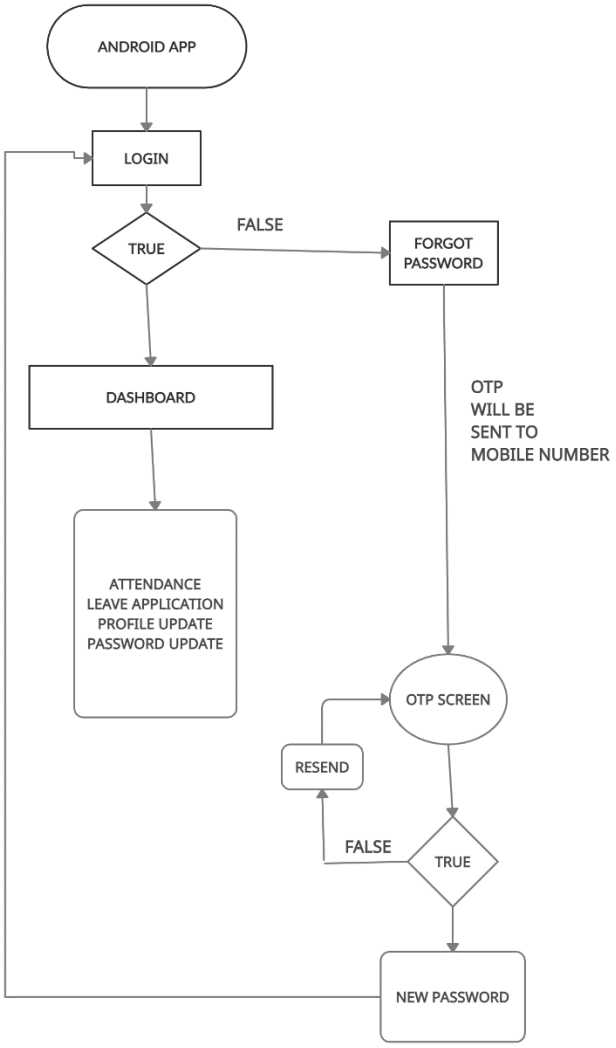
measure the facial feature by detecting the face then it will run the OpenCV algorithm which will break the task of identifying images into thousands of classifiers. Once it detects the face it will go through stored faces and try to match it with them. If it matches with faces inside the database, it will mark the attendance and send the log in-app.

As we can see in fig 1.1, proposed model is divided into 3 modules.

**A.Face detector using python and OpenCV:**
- image capture
- image training
- image detection.

**B.Database with backend API:**
**-**creating database using MySQL
-creating backend using Nodejs.

**C.Android app:**
**-** below **fig 3.2** shows working of app:



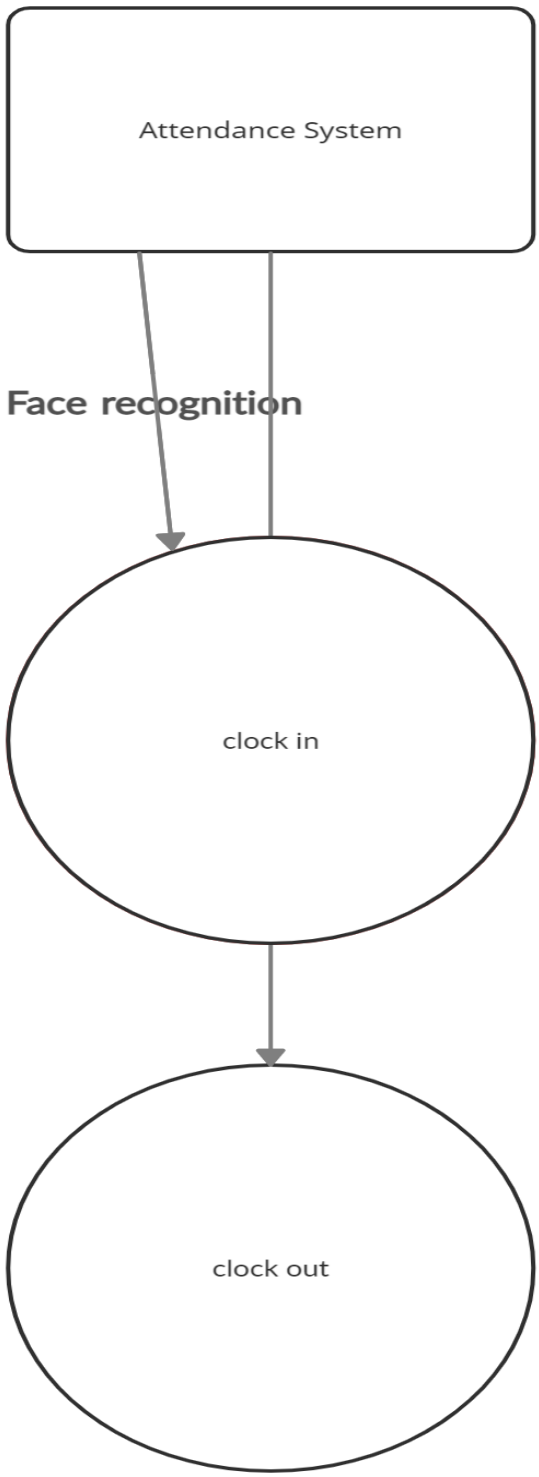



**Figure 3.3 Mobile App Concept Diagram**

## I. IMPLEMENTATION

**System Description**

The online attending system uses face recognition technology for its core purpose. It provides on-line access for two user roles: Student and Administrator roles severally.

**Administrator Role**: The administrator's role is deemed. because the most elementary since he/she can either be aggregating the whole method or watching it in-depth. The administrator should initially register his/her subject if there is not one for the students to recruit. If the subject already exists, the administrator may select which subject to be used to record attendance.

**Student Role:** The primary responsibility of the student is to maintain attendance by communicating with the system. The student must, however, be enrolled for the device to recognize his or her face. This is achieved first with the student completing the registration process. After completing the enrollment process, the student would be able to have attended for a variety of subjects.

**System Design**

The components were created as a window service application using Machine Learning on a Python system to achieve our goals. Since image processing can be very computing- intensive, particularly when large amounts of data are in- volved, the device is designed to transfer compute-intensive tasks like face detection and recognition to an on-premises local server. When implementing the framework, this causes the client local server to be any commodity hardware. The window service component is a lightweight program that runs in the context of an on-premises local server and has a GUI component as a front-end interface. It oversees listening for attendance requests, turning on the webcam and continuously acquiring frames from every location. The service uses a web service system to send all acquired im- ages to a local server for storage, where they are processed and modified in a mutable excel sheet. The system's GUI is designed to provide users with an intuitive and easy self-service interface from which they can communicate with the system. It manages all aspects of image storage, processing (face enrolment, face detection, and face recognition), and attendance. Users may also perform all administrative tasks with it. One of the most important features of this frame- work is that it prevents any kind of presentation attack, such as identity spoofing, from being forced into the GUI. This exemplifies the importance of the automated attendance system's liveness detection.

## II. ANALYSIS AND RESULTS

The Visual Studio Code IDE was used to create the online attendance framework and its machine learning models. For the back end and server-side applications, Python was used, and GUI was used for the front-end user interface. This system's implementation workflow can be summarized as follows:

To perform facial recognition and liveness detection, a machine learning model was designed and developed using the OpenCV, TensorFlow, and cascades libraries. Following that, a dynamical

run source code was used to generate data sets for the model to be trained on.

When a user or a student takes a picture of himselfwhile going through the enrolment process, the datasets are generated. This image was then used to train the model. The model was then put to the test on a live stream, which was a complex dataset collected during the registration process. To keep track of the student and attendance information,

a mutable excel sheet was developed. Using the openly library, the source code may dynamically communicate with and modify this worksheet.

The GUI model, which is part of the Java UI modules, was used to create a quick and appropriate user interface. This provided the user with an engaging window through which they could perform the various actions necessary for managing and maintaining attendance.

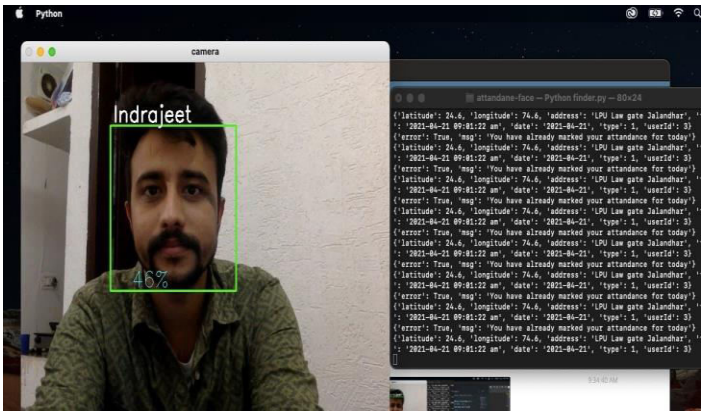



**Fig5.1 Facial recognition of student**

**Above fig5.1** shows how student is recognized by system and terminal showing “attendance is marked”

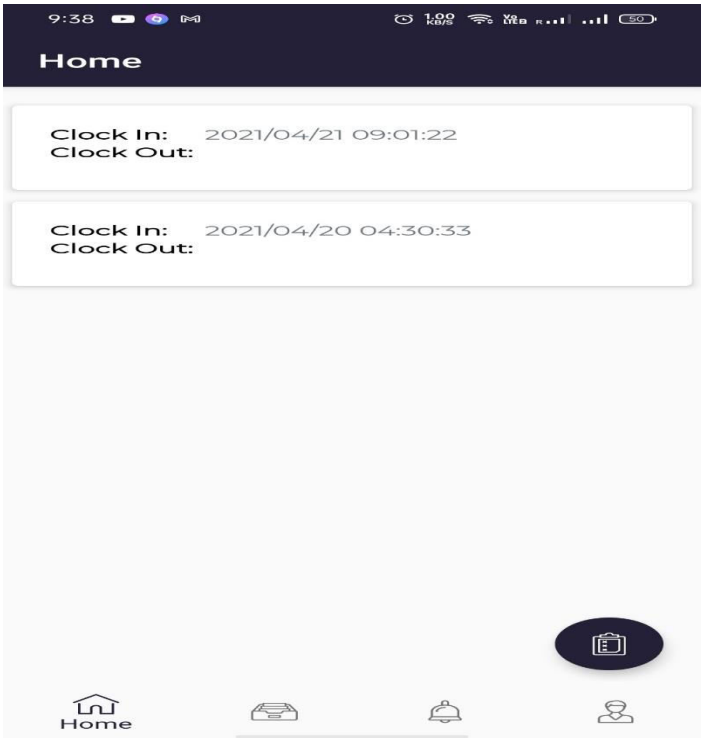



**Fig5.2 attendance history**

**Above fig 5.2** shows marked attendance under “clock in” Student can check his attendance history in App.

## I. CONCLUSION

A face recognition-based automated student attendance system is outlined in detail in this approach. The proposed method identifies individuals by comparing their input image obtained from video frame recording with the train image obtained during the respective semester’s registration process. This proposed method is capable of detecting and localizing faces from input facial images stored in a database and collected from a recording video frame. A face recognition-based automated student attendance system is outlined in detail in this approach. This method describes in depth a face recognition-based automated student at- tendance system. Individuals are identified using the pro- posed procedure, which compares their input image from the video frame recording with the train image collected during the respective semester’s registration phase. From input facial images stored in a database and captured from a recording video frame, this proposed method is capable of detecting and localizing faces. Developing and deploying non-intrusive solutions that do not require the use of additional sensors to summarize, this proposed system replaces a manual system with an automated system that is quick, reliable, cost-effective, and time-efficient because it eliminates stationery materials such as bulky registers and paperwork.

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