

AI And Imaged Processing Based Student's Attendance System

Pushkar Nath Chaturvedi
Apex Institute of Technology
Chandigarh

University Gharun, India
21BCS6590@cuchd.in

Aman Kumar
Apex Institute of Technology Chandigarh
University Gharun, India
21BCS6494@cuchd.in

Jyotirmaya Mishra
Apex Institute of Technology Chandigarh
University Gharun, India
21BCS6246@cuchd.in

Asheesh Tanwar
Apex Institute of Technology Chandigarh University
Gharun, India 21BCS6491@cuchd.in

Neeru Bala
Apex Institute of Technology Chandigarh University
Gharun, India neeru.e13122@cumail.in

Abstract

Tracking attendance is a crucial function for educational institutions and organizations. To simplify this process, we propose an AI-based solution. This system can recognize known students, update records of attendance and show information of the student on screen. It also sends information to Firebase that stores both student and image data, thus it can be easily obtained. The code is user friendly and displays attendance with student detail and also marks attendance by face recognition which prevents false attendance. The system consists of a database of facial images of students of a particular class. So, for accurate attendance tracking, we use Convolutional neural networks(CNNs) via transfer learning. Overall, this code serves as an innovative solution for automating attendance tracking in educational institutions, reducing manual work, and increasing accuracy through AI-driven face recognition technology.

Keywords – Automated Attendance tracking, user-friendly, Convolutional Neural Networks (CNNs), transfer learning, face recognition

I. INTRODUCTION

Attendance tracking is a mandatory requirement in educational institutions globally, which records the exact number of people who are present in the classrooms/practice areas. Traditional attendance solution use manual, burdensome methods where instructors, teachers painstakingly record student data for all students, starting with their names and serial numbers, followed by their status. This collected data is difficult to manage. To address these challenges, we propose a digital attendance

management system that aims to replace the old system with a new and efficient solution that is easy to use and offers a high level of accuracy. This is done using image processing methods and also real-time updates from the Internet of Things (IoT).

Attendance Management — While attendance management can be in terms of employees or students, it is the aspect of recording whether a certain person is present, and then managing their time accordingly. Face recognition technology has become a major part of many different industries in the digital age — for security, authentication, and identification, for example. The Face Attendance Monitoring System introduced in the above code is a state-of-the-art application that utilizes advanced technologies like computer vision and artificial intelligence to revolutionize the traditional approach of attendance monitoring in educational institutions and organizations. In essence, this system revolutionizes and streamlines the conventional attendance tracking, which traditionally used to be a tedious manual process.

In this project, we proposed a smart AI Face Recognition based Attendance Management System. The software is designed to simplify attendance through the use of computer vision and facial recognition, measuring different angles. Essentially, the system is a service that is built using OpenCV and face_recognition library to automate and remarkably accurate attendance system. It leverages the system of facial recognition and the presence of student/officer can be identified and logged in real time. Save time consumed by attendance marking manually. It

also works in conjunction with a large database of student facial images, allowing for accurate identification of known students while successfully blocking potential attempts to attend on behalf of other users.

Key feature of this system is communication with Firebase for reading and writing data. Not only does this make data management easier, but the system is also able to derive welcome insights into attendance patterns. Educators and administrators can view attendance statistics and student information in an easy-to-use interface that helps improve communication with students and parents. Simply put, harnessing the power of AI and facial recognition technology, it sets in motion an era of administrative efficiency that allows educators to dedicate their energy to teaching and enhance the educational landscape as a whole. This, a highly scalable distributed system provides much higher data accuracy where attendance management can be automated and analytics can be provided with the help of powerful database. As an educational administrative technological breakthrough which directly not only improves efficiency but also brings further transparency to the attendance process.

II. LITERATURE REVIEW

Abdelfatah Aref Tamimi[1] **ABSTRACT** This paper presents a new system for real time group face-detection in order to improve students attendance system. It is a system of automatic identification of students in the class using facial analysis. It does this by taking pictures of students with a classroom camera and quickly finding their faces to create a guest list. This method allows for fast real-time processing with a good detection rate ($\approx 94.73\%$) according to extensive experiments with digital cameras. Several experiments have been carried out on a total of 10 different class lectures/recordings with the established algorithm to examine its performance in detecting student faces in video frames, given a different number of students in each of the lectures. Experimental results showed an acceptance detection ratio from 75 to 94.73 Percent.

Akshara Jadhav[2]- Face recognition has become very important in computer vision today. This phenomenon arises mainly from commercial and law enforcement applications, along with breakthroughs in practical technologies after decades of R&D. because of the nature of the problem this field is of great interest to computer scientists, neuroscientists and psychologists alike. Face recognition refers to the ability to automatically identify a person in a photo or video frame. We propose an automated attendance management system using face detection and recognition algorithms. Using facial recognition, the system identifies students who walk in to automatically register their attendance. Algorithms used in this project are Viola-Jones Algorithm for face detection, PCA

(Principal Component Analysis) for feature selecting and SVM (Support Vector Machine) for classification. It saves time compared with traditional attendance marking methods and can also be used to monitor students.

Partha Chakraborty[3]- This paper presents an automatic appearance monitoring framework which depends on unique face identification and recognition methods. It scans the students entering the class and recognises the student based on features like face, eyes, nose, etc. The evaluation is done in real time situations including effectiveness against various techniques, e.g., spoofing and student impersonation. At the same time, it helps with more efficient, effective, and saves time on the stands of attendance. It is an energy-efficient and secure solution that takes the place of previous ways of doing things and eliminates administrative tasks. The face recognition program developed is simple, efficient, secure, and can easily be deployed using only a computer and a camera, making it a simple solution to manage classes.

Muhammad Farhan Siddiqui[4] — This Paper discussed on use of face detection voice and biometric technology for automating attendance marking. The system uses Cascade Classification algorithm to take several shots of body through camera and identifies the facial structure. It then stores these features in a database along with identifiers. There are improved security features, enhanced punctuality, and it is able to use in schools and banks. The paper talks about some new methods of age and gender identification and suggests further enhancement in security. The system works best at a certain lighting range, and could have faced some difficulty in facial recognition under poor lighting. This application, created with ASP. NET, CSS framework to ensure that students will be learning with the proper technology, which can leave an impact and also can be used to retrieve previous records from database.

Muhammad Zeeshan Khan[5] In the age of growing data from IoT devices, deep learning and edge computing have proven to be a powerful solutions for dealing with large amounts of data. Facial recognition has demonstrated to be an effective and accurate approach for authentication which is one of the important challenges. In this paper, we propose a CNN- based algorithm which solves problems reliably and efficiently. Using the LFW dataset, the algorithm successfully detects and recognizes the faces with high accuracy in a smart classroom attendance system. Each generated data from the smart/classroom is passed on through an IoT-based Edge computing architecture that increases the data latency and real- time compared to the other architectures.

Tulabandu Aadithya Kiran[6]- Although, user authentication has been a major issue in general, human face recognition (HFR) is one of the key techniques ensuring the same. Wide applications of HFR can be found in areas of surveillance

systems, house entrance, mobile face unlock and network security. Computerized Attendance Monitoring with Face Recognition Adaptive Memory Application to Childhood Development in School Students We have designed and implemented a student attendance system for classrooms based on face recognition technology. To explain, the system identifies students' images and marks attendance based on the matched data from a facial database. This HFR system is independent and works without disturbing the teachers to get into their teaching work. It can save time by using this system and the proposed system is using open CV.

Hao Yang[7] As the information age grows rapidly, face recognition has become a technology with a promising commercial value and market demand. The project is aimed to design a video based, real time face detection attendance system. The four points deal with the accuracy of check-in, stability of real-time video processing, anticipation of truancy rate, and setting of the interaction interface. Through the analysis of these problems, a real-time video processing engagement face recognition system is designed and implemented. Experimental results for the video face recognition system show 82% accuracy. The system was found to have about 60% less attendance time than traditional methods and a significant reduction in truancy. Attendance is performed with great efficiency, name staking is easy, class efficiency is improved, and the development of the attendance system is assisted.

Louis Mothwa[8] Student attendance is crucial for educational institutions. Biometric- based attendance monitoring systems are available, but due to a lack of system modelling, they have demonstrated limitations. Therefore, this paper provides a motivation for using AI-based attendance systems with a conceptual model of face recognition. In the complete system architecture, there is a multi-camera setup for optimal face capturing and processing, comprising front and back-end components. Different feature extraction methods (e.g., PCA, LDA, LBP, PCA and LDA) were investigated. The proposed model has yielded 90% recognition accuracy and enhanced both the efficiency and accuracy of attendance monitoring.

III. PROPOSED SYSTEM

We have all worked for the Attendance system using various libraries and technologies. This system imports libraries first (OpenCV, cvzone, os, face_recognition, pickle, numpy, firebase_admin, and datetime). Then, the system creates the Firebase app using the credentials passed in, this includes the database URL location and the storage bucket. So you can interact with Firebase for data storage and retrieval. Video stream capture In order to capture the video stream, the system creates a VideoCapture object and sets the width and height of

the captured frames. This allows for uniform shape for processing.

It loads a background image from 'background'. Loading all the '.png' and mode images from the 'Modes' folder into a list. Then you will use these images to show information and later to overlay the frames you capture. The face encodings and matching student IDs are loaded from the 'encodings. p' file using pickle. These encodings are used as points of reference during face recognition.

The while loop is the core functionality of the system, which consists of capturing video frames from the webcam in a continuous manner. The preprocessing of each frame such as resizing, color format change etc. The face_recognition library is then used to detect faces in the frame and compare the encodings with known encodings. If yes, then its different factories work to process that matched faces. When the captured face matches a face that has been set as a mode, that image is overlaid on top of the captured frame. It fetches the student details from the database according to the matched student ID and downloads the student image from the Firebase storage.

The last time attendance is checked, the student can be either Present or Absent. If delta time is greater than a defined limit, update attendance data. Otherwise, the counter and mode type are reset by the system. However, during the whole process, the system keeps on displaying the student information including total attendance, major, student ID, standing, year, and starting year over the background image. It also displays the dob student name and uses string slicing to reposition it accordingly. Then the loop continues until the user presses the 'q' key to terminate. Finally, the system releases video capture and closes the rest of the OpenCV windows.

Implementing attendance data management The attendance data is stored and managed in a firebase realtime database. This leads to immediate synchronization and retrieval of attendance records. The system will update the attendance if the student is getting marked based on the date and time.

Front-End: It uses the OpenCV to create GUI. GUI overlays relevant details on the video frames captured by the webcam

— like the student name, ID, major, standing, year, total attendance, and others. This acts as an interactive feedback system as it enhances the usage and shows the results of recognition instantly.

Error Handling and Reporting: The system is equipped with error handling mechanisms to manage different scenarios (e.g., failures in face detection, database connection issues, image retrieval errors). It also offers warning messages and logs that help you with fixing the problems if encountered.

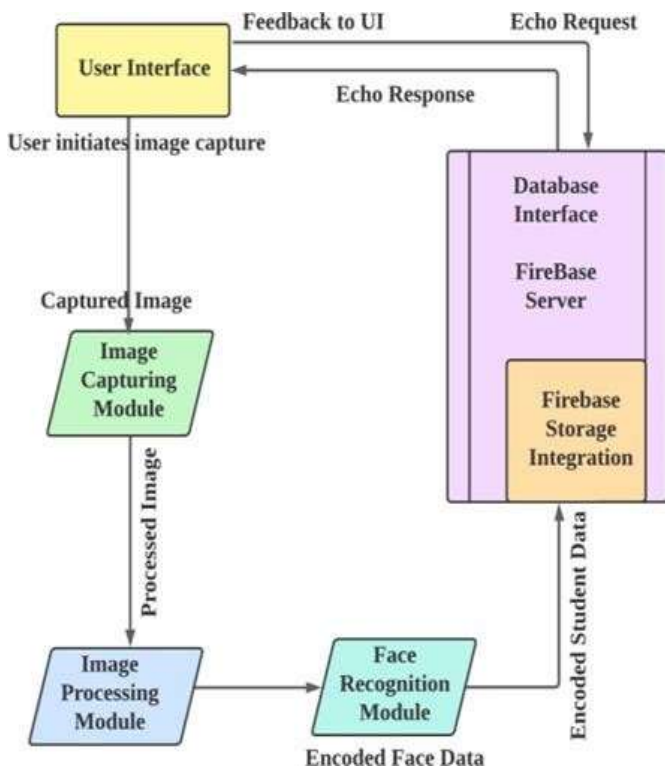


Fig 1.1: Use-case diagram for Attendance System

IV. RESULTS AND DISCUSSIONS

"The output obtained by executing the main.py file is as follows:"

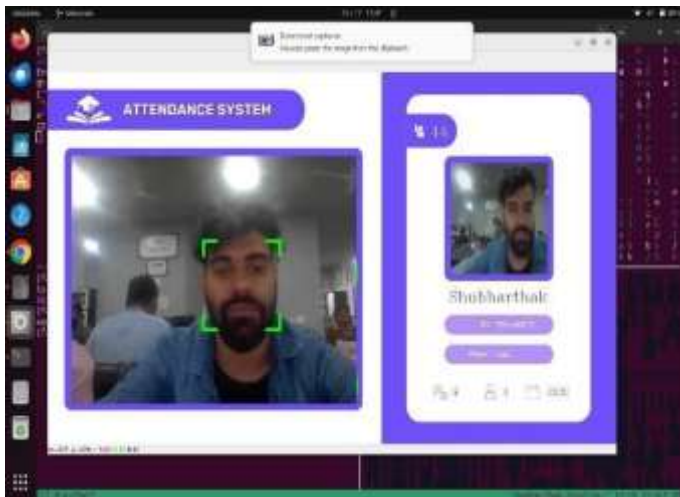


Fig 1.2: GUI Interface for Attendance System [running/

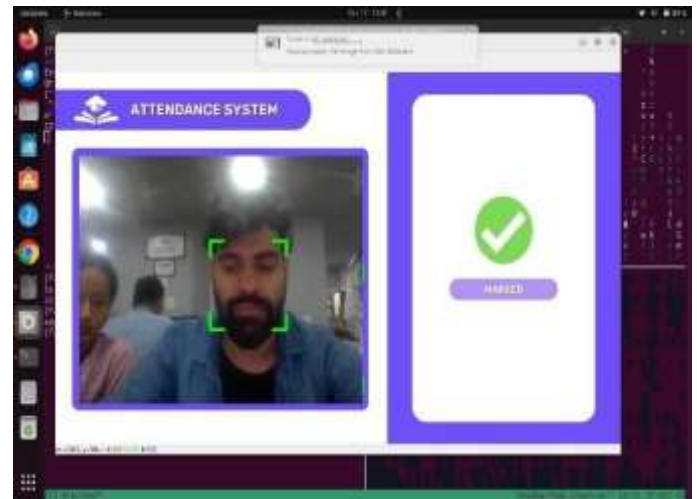


Fig 1.3: GUI Interface for Attendance System [marked]



Fig 1.4: Student Attendance System Firebase Database

V. CONCLUSIONS AND FUTURE SCOPES

In summary, the "AI and Image Processing Based Students Attendance System" is a game-changer in the landscape of attendance marking and management in educational institutions. This ground-breaking solution can truly solve the decades-old challenges of manual tracking for attendance using artificial intelligence and image processing. With its accurate real-time identification of students plus its easy-to-use interface and automated notifications, the system holds great potential for empowering educators, administrators, students, and parents. This project is relevant to the upcoming trend of technology-enhanced learning, where innovators leverage their skills to bring about a paradigmatic shift in the structure of teaching and learning by reducing inefficiency in face-to-face, asynchronous, and synchronous classroom

sessions, with the potential to nearly eliminate some of the current standard academic formats and procedures.

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