

Attendance Automation Using Deep Learning

Jayanth Kamath, Punit Naik, Vighnesh M S, V Sharan Reddy, Dr. Gokul Kannan Sadasivam
Department of Computer Science
PES University,
Electronic City Campus, Bengaluru India

Abstract—A highly significant and well-liked technique for keeping track of everyone in the organization's working hours is the attendance monitoring system. The use of the attendance management system is widespread, including in business, higher education, and other settings. Calculating attendance and how many people are present or missing is a pretty straightforward process. Manual attendance, fingerprint punching based attendance systems, RFID-based attendance systems, iris recognition attendance systems, SMART-FR attendance systems, automated attendance systems using face recognition, real-time human face tracking and detection, and robust real-time face detection are just a few of the methods available for keeping track of attendance.

Index Terms—Face Recognition, Convolutional Neural Networks, MTCNN, Mediapipe

I. INTRODUCTION

Artificial intelligence is a technology that is dramatically advancing the state-of-the-art in a wide range of fields, including marketing, security, and healthcare. People favour using intelligent systems over cumbersome conventional approaches.

Many academics in computer technology are focusing more of their attention on the broad field of face recognition. It is difficult to recognize human faces in video clips because there is variety in the lighting, facial expressions, backdrop imagery, and the bulk of the face. The frontal face of mankind is the primary target of detection techniques, while other factors such as photos of structures, trees, and backgrounds. Typically, face recognition technology is utilized for security. However, this method is currently employed for a variety of other purposes.

The automatic attendance system's primary goal was to keep track of who was present in the company. The automatic attendance system helps to cut down on the amount of time and physical labor required to keep track of attendance. This device uses a high-definition surveillance camera to record video within a classroom. This film is used to highlight the importance of student attendance. Additionally, this system is producing attendance reports for academic purposes. However, attendance is still recorded manually, which is inefficient and inaccurate. This essay outlines a clever method for recording everyone's attendance in one go. Every kid does not have to stand in front of the camera and wait for their face to be identified. In order to streamline and accurately record attendance, this paper proposes a standalone piece of software with a customized interactive user interface.

The user can easily develop, train, and test the dataset using the application. The application analyses the video and camera footage, finds the faces using Google's Mediapipe and face recognition is done using Arc face module and records the attendance of all the identified students. The attendance is recorded in a spreadsheet with the subject and date that were input.

The effectiveness of the face detection and face recognition algorithms we employ will largely determine the outcome of an automated attendance management system using surveillance cameras. For face detection and recognition systems, there are several methods available, but these algorithms have various restrictions. Therefore, the primary obstacle is addressed by exploiting the shortcomings of the current face detection and face recognition algorithms.

II. LITERATURE SURVEY

Convolutional Neural Networks (CNN) are used in this paper [1] to present an "end-to-end face identification attendance" approach that analyses CCTV or video of the class to register everyone's attendance in a single frame. The proposed solution's resistance to uncommon difficulties including occlusion, direction, alignment, and classroom luminescence is one of its key advantages. The real-time accuracy of the suggested solution was 96.02 percent, which is higher than the majority of the end-to-end face attendance systems now in use. The proposed system's flaw is that it has trouble with low-definition videos and faraway faces. Because the MTCNN architecture is ineffective for faces with closed eyes, this system is limited to faces with open eyes, equivalent to a camera.

Faster RCNN face detection algorithm and SeetaFace face recognition algorithm are two deep learning algorithms that are integrated in [3] to create an automatic attendance system. Numerous experiments' findings support the following: 1. The system can keep track of these five classroom infractions: absence, tardiness, early departure, unrestricted access, and carelessness with attendance. It can also provide an attendance table that shows how each student is doing academically after school. 2. 1080P classroom monitoring video can be used for small classes less than 6 meters in length, but 4K classroom surveillance video should be used for large classrooms more than 9 meters.

The method utilized in this paper [4] will watch when individuals enter and leave a facility or university. A person's face is instantly detected and the admission time is recorded when they go up to a surveillance camera near the entrance. Similar to when entering, their faces will be detected in a different embedded deep learning model camera, and the exit time will be recorded.

The automated attendance system's primary function in this study [7] has been to record the presence of persons inside the organization. The automatic attendance system helps to cut down on the amount of time and physical labour required to keep track of attendance. Using the Viola-Jones Face identification technique, we were able to recognize the faces of the students. This approach is significantly faster than other face detection algorithms currently in use. The Viola-Jones face detection technique offers great accuracy yet requires minimal computing time.

Adaboost is used in conjunction with the viola Jones because it performs better under various lighting settings. The image in this case is 24*24 and has about 160000 attributes that can be used to identify a human face. If we compute an image's features utilizing all of them, the computation will take too long and require a powerful computer that is expensive. It cannot recognize the subjects whose half-faces were photographed.

III. PROPOSED APPROACH

In this project, the face encodings are created using Google's mediapipe during the face identification phase. The recognition module should be able to effectively recognize and update the person's attendance in the spreadsheet when you pass two distinct images of the same person, i.e., recognized face and image in the database. Using this concept, we train the model to recognize photographs of people and update the attendance for each individual.

The steps taken to get the desired outcome are as follows:

- 1) Use a face detection model to find and identify faces in an image.
- 2) For the faces identified in step 1, predict face poses and landmarks.
- 3) Determine face encodings using the information from step 2 and the real image (numbers that describe the face).
- 4) To identify the person in the photo, compare the facial encodings of known faces with those from test photos.
- 5) Update attendance in accordance with the outcome of step 4.

A. Training

For training the model, we initially create a folder in which we place images of all the people of the organization. These images are named after the person itself and these faces are pre-trained (i.e. resizing of the images). These images and their

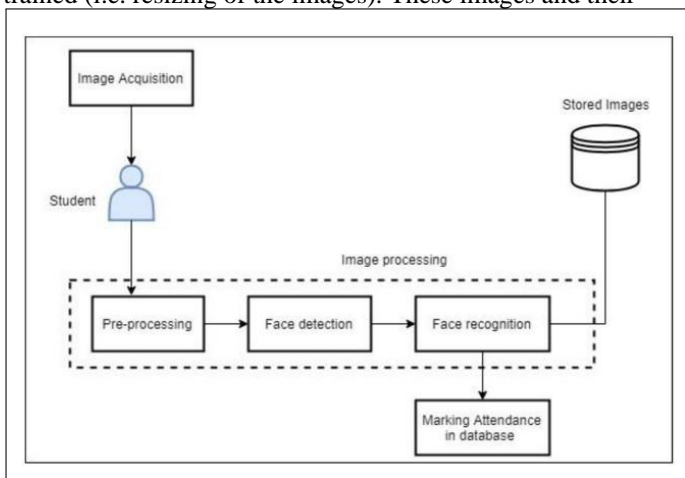


Fig. 1. The proposed framework

face encoding (face values) are input to the face recognition process in the testing process later on.

This module primarily focuses on the features associated with adding new students to the organization, logging in, and managing student profile information. Using the functionality offered by this module, an administrator can add new students to the application. The administrator and the student both can log into the application using their respective credentials.

B. Testing

In the testing model, face encodings of detected faces (using mediapipe by Google) are compared with the faces in the database using the face recognition module in python. The function will return boolean values(True/False) that indicates whether or not there is a match. The images of the people to be recognized are updated in the attendance spreadsheet in the next model. A function is defined to resize the detected face and draw boundaries on the face and it also shows the detection score of the detected faces using mediapipe sub-function.

C. Attendance Recording

After testing the attendance is updated in a CSV file, containing name of the person and time at which the person faces was detected. The person in-charge of the organization can access this file and make changes if the person wishes to but the client invoked can only read this file and cannot make changes to it.

This module mostly covers elements relating to students' attendance. The application will record the student's attendance, the duration for which he attended the class. The students attendance report can be viewed by the administrator as well as the respective student himself along with certain filters.

IV. IMPLEMENTATION

The application is broken down into three modules.

A. Manage Registration and Login

This module mostly deals with the features connected to logging into the system, managing student profiles, and registering any new students into the company. Using the functionality offered by this module, an administrator can add new students to the application. The administrator and the student both can log into the application using their respective credentials.

B. Manage Attendance Details

The elements pertaining to the student's attendance are the main focus of this module. The system will record the student's presence, time-in, and time-out using this method. In addition to certain potential filters like filter by student and filter by date, the admin may view each student's availability report and each student can view his or her attendance report.

C. Manage Student Details

The attributes associated with the student's profile are the main focus of this module. A photo of the newly registered student may be added by the admin using this method. The application will perform the necessary classification and store the image recognition points that will be used later to uniquely identify each student. The administrator can also explicitly instruct the system to train the model.

V. RESULTS AND DISCUSSION

A. Login Page

- Input: Students need to enter their credentials.
- Output: If the credentials are verified, the student will be redirected to the homepage of the application.
- Exception Flow: If there is any discrepancy in the verification of the credentials an error message will be displayed.

B. Mark your attendance-in

- Input: The student needs to be seated in the class facing toward the camera, the application will read his face.
- Output: The application will detect a face and then try to recognize it then passes a message conveying the result and updates the result in the database.

C. Mark your attendance-out

- Input: Same procedure as done during the marking attendance in.
- Output: The application will detect and recognize the student and will update the database with the time period for which the student has attended the class.

D. Admin home page

- Description: Authorized personnel needs to feed the application with images of the student.
- Input: The name and image of the student rest will be retrieved from the database.
- Output: Message displaying the registration result.

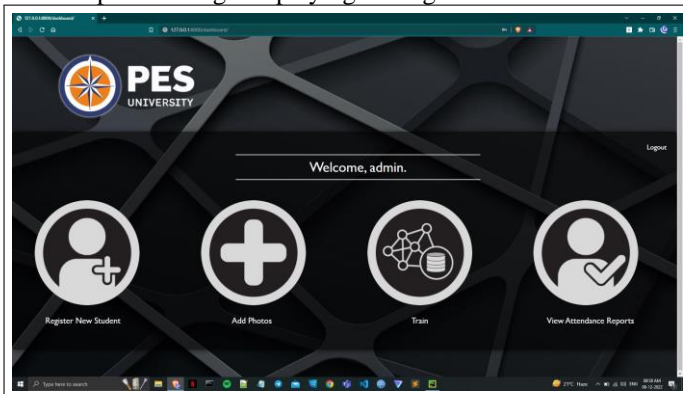


Fig. 3. Admin home page

E. Register a new Student

- Description: Creating a new user.
- Input: Details of the student.
- Output: Result will be displayed.

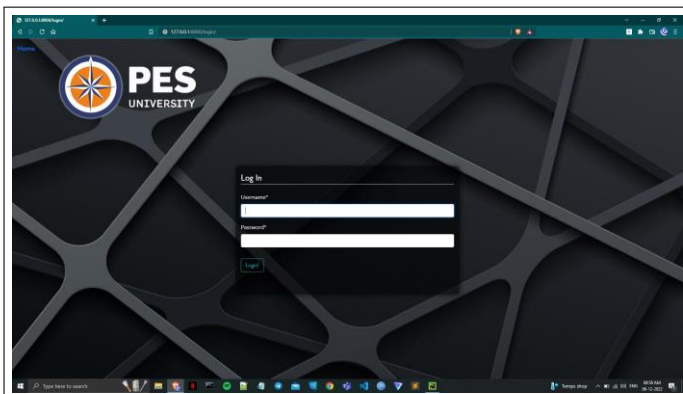


Fig. 2. Login Page

F. View Student's Attendance Report

- Description: The authorized personnel can view and update the student's attendance.
- Input: Need to select the student from the menu whose attendance report we need to view.
- Output: Attendance record of the student and also the total head count of the students attending on that particular day. We can choose to view the report in the form of a graph or table.

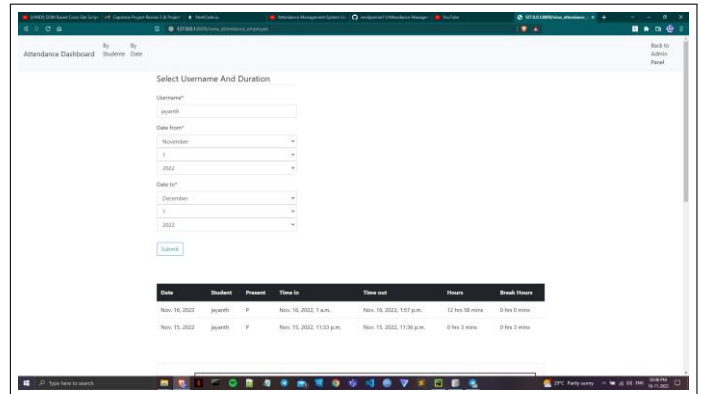


Fig. 5. Attendance reports

VI. CONCLUSION

We have successfully demonstrated the effectiveness of mediapipe in facial detection, and we can use this to automate attendance, which is much simpler than the outdated manual methods and biometric systems that require more storage/memory to store information about the user and also saves significant amount of time when taking attendance manually.

This initiative makes it possible to do away with the idea of proxies and avoid malpractices. This is more efficient and straightforward when applied at a higher level, requiring very little hardware and such a small initial investment and upkeep. We have seen from the comparisons made so far that mediapipe is capable of recognizing very small faces. Additionally, as we saw when comparing the photographs, mediapipe might produce the greatest results if the size of the images is very extreme and there is a guarantee that the lighting will be decent, with the least amount of occlusion and primarily front-facing faces. However, mediapipe's identification speed is rather slow. We are using Mediapipe for face detection and an inbuilt python module for face recognition in light of this. The face monitoring will take place throughout the entire hourlong class.

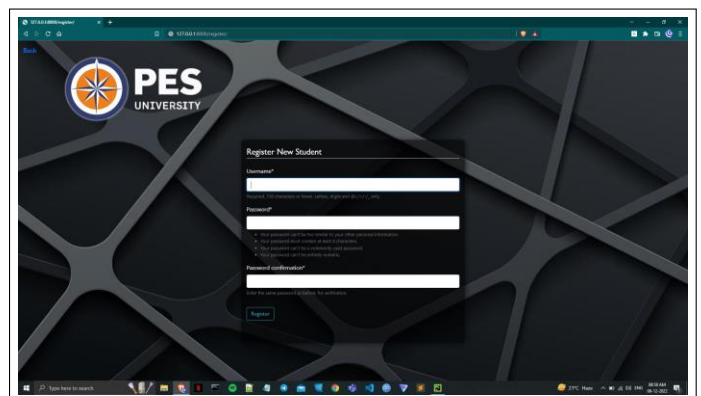


Fig. 4. Register new student

VII. FUTURE WORK

The system will be able to detect unauthorized faces or blocked faces and can alert users to intruders. A plan of training the model with fewer images to save storage and also maintain accuracy by removing multiple images of the same person or images with identical visual characters. Also in order to improve the recognition model's accuracy, incorrectly labelled photos can be included in the training dataset. The training time can be shortened by retraining the classifier exclusively for the newly uploaded images. If the student's attendance or working hours fall below the required level set up by the institution, a message-passing system can be introduced whereby a warning is immediately delivered to him.

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