University Institute of Engineering and Technology
Kurukshetra University

Minor Project Report On

Multiple Face Detection Attendance System

Bachelor of Technology (Electronics & Communication Engineering) (Session: 2020-2024)

Submitted To:-

Dr. Reeta Dahiya

Dr. Ekta

Submitted By:-

Rohit Sain, 252001038

1. Abstract:

Automatic face recognition (AFR) technologies have seen dramatic improvements in performance over the past years, and such systems are now widely used for security and commercial applications. So Smart Attendance using Real Time Face Recognition is a real world solution which comes with day to day activities of handling students. The task is very difficult as the real time background subtraction in an image is still a challenge. To detect real time human face are used and a simple fast Principal Component Analysis has used to recognize the faces de-tested with a high accuracy rate. The matched faces are used to mark attendance of the student. Our system maintains the attendance records of students automatically. Manual entering of in logbooks becomes a difficult task and it also wastes the time. So we designed an efficient module that comprises of face recognition to manage the attendance records of students. Our module enrols the student's face. This enrolling is a onetime process and their face will be stored in the database. During enrolling of face we require a system since it is a onetime process. You can have your own roll number as your student id which will be unique for each student. The presence of each student will be updated in a database. The results showed improved performance over manual attendance management system. Attendance is marked after student identification

2. Introduction

1.1 Background:

Maintaining the attendance is very crucial in all the organizations especially multinational corporations and educational institutions. Every organization puts forward its own method of taking or maintaining attendance records. In

educational institutions, attendance is marked using the age-old paper-based method, but in professional space this is often impractical where various innovative techniques like Bluetooth attendance systems are deployed. Majorly, two variations of student attendance frameworks are there, one being Manual Attendance System (MAS) and other is the Automated Attendance System (AAS) [1]. There is one common characteristic in all the currently available systems. All attendance marking system employs relies both on students and teachers to mark attendance.

In paper-based methods, students have to respond to his/her roll number and teacher has to make sure that all the present students are marked which becomes extremely cumbersome and repetitive procedure of recording the attendance manually and accumulate turnout of the class taking note of each student's presence in the case when student to teacher ratio is very huge. Similarly, in Bluetooth attendance [2, 3] assumes the fact that each student carries a smartphone. But generally, this is not the case. In case the student forgets to carry a smartphone or does not own one, this Bluetooth system converts into a traditional paper-based method, in which case the student has to ask the teacher to mark his/her attendance manually.

Another drawback of both the above-mentioned systems is that it requires additional efforts to make sure that no proxy attendances are being marked. In case of paper-based attendance, it is quite easy to mark a fake attendance by answering to someone else's call. In Bluetooth based attendance, it can be done by changing Bluetooth's name and logging into someone else's account and them marking attendance.

1.2 Objective:

The primary goal of this project is to create a robust Multiple Face Detection Attendance System that can automatically identify and record attendance by detecting multiple faces in a given environment. This system employs computer vision and deep learning to achieve high accuracy in recognizing individuals. Considering all the above-mentioned points, it has been attempted to develop a face-based attendance system which could overcome some of the drawbacks of the previous systems. The teacher has to just click pictures of group of students using the developed app. 2-3 pictures can over the whole class. The app then applies deep learning algorithms to detect and match faces in the pictures with the student database records.

This system thus alleviates the teacher from manually marking attendance of students. Also, marking proxy attendance will be very difficult in the proposed system, as facial features are very hard to impersonate and it is also possible for a teacher to judge if there are live people sitting in the class thus preventing any possibility of spoofing in real image by playing a recorded image or video of a student. Along with all these benefits, student also gets his own personal portal for viewing his attendance, and administrator gets his own separate view of the system for making sure that

the system is working properly thus helping establishing high level of confidence in the system and its utility to manage their own daily schedule.

3. Methodology:

Attendance management is a critical task in various institutions and organizations. Traditional methods often involve manual processes, which can be time-consuming and error-prone. The introduction of face detection and recognition technology provides an opportunity to streamline attendance management. We designed a web-based face recognition system that captures the student faces from a webcam and uses the face recognition deep learning library to detect their facial features. The system was deployed to a web application after testing to ensure that it was working properly. The first step in building a face recognition attendance system is to collect face images of students using a camera or webcam connected to the system during registration. The stored images in the database are compared to the detected faces from the video feed. Once student faces are recognized, their attendance is marked in the system. Fig. 1 shows the overview proposed architecture of the face recognition attendance marking system.

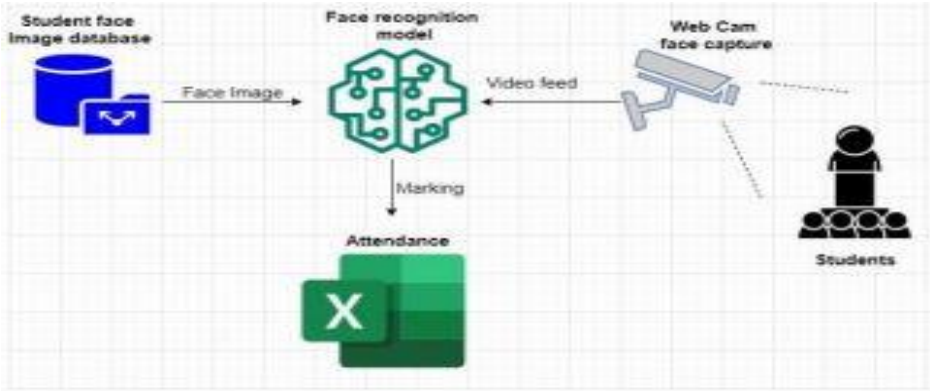


Fig. 1. Overview system architecture

Database

The data needed for facial recognition is stored as image data in folders with the student's name as the label. Manually or through the user interface of the attendance web app, the data is collected during student registration. For precise detection, the images are

taken in a way that displays a clear frontal face view. The features from the face image data will be extracted by encoding them first. Fig. 2 below shows the image database for the system in form of labelled folders containing images.

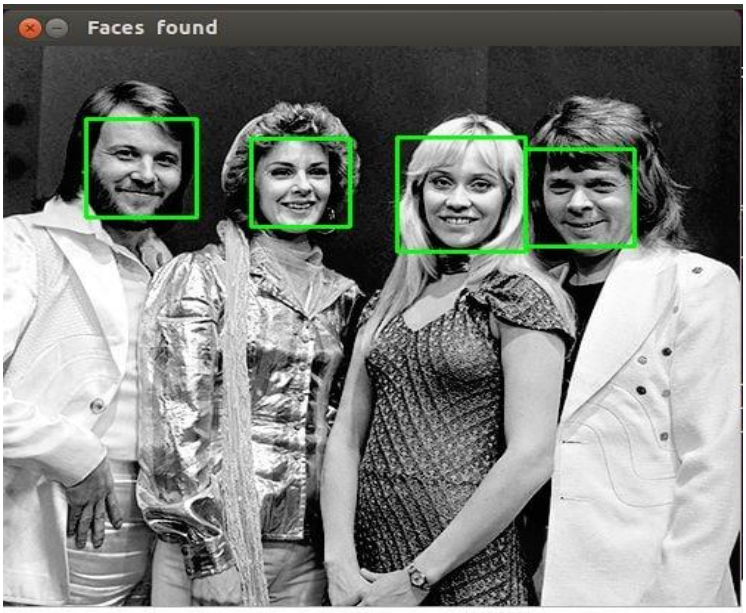
Fig. 2. Student database

Face Detection

The core of the system is a Convolutional Neural Network (CNN) trained to detect multiple faces in images and video frames. This model leverages state-of-the-art techniques to identify faces with high accuracy.

The face recognition library uses the face_locations method to find the face's location within a specific frame in order to identify faces from the video stream frames. Since OpenCV has a face scrapping function, it is utilized to extract faces. A cascade classifier is defined with built in cascade xml files. The multi selection detect method is called by the cascade classifiers to find patterns using the supplied inputs [7]. A few of the arguments include the scaling factor, the required minimum number of neighbours, and the required minimal pattern size. The multi-selection detect method returns an object that has been detected at all 4 corners of every rectangle and on every face. The

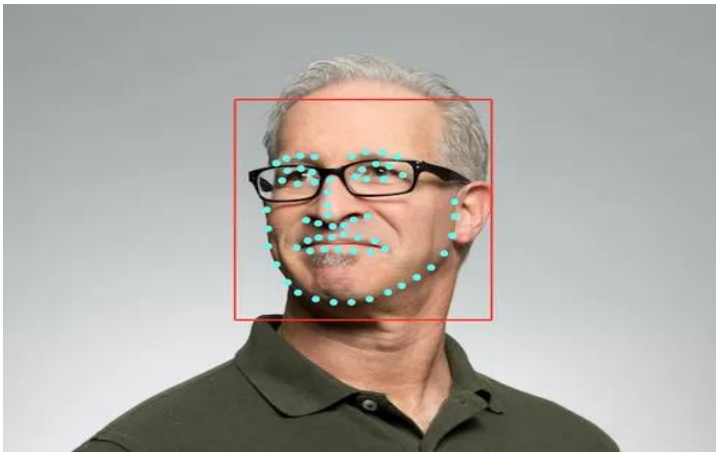
haarcascade frontalface classifier was applied in this instance. A red rectangle box will be assigned to detected faces which will serve as the region of interest during face.



Face Recognition

The system makes use of the dlib's state-of-the-art face recognition model which achieved an accuracy of 99.38% on the labeled faces in the benchmark dataset [8]. The camera locates and recognizes student faces in the video feed, after which it analyzes the face images by contrasting them with images stored in the database. The geometry of the face, including the separation between the eyes, the depth of the eye socket, the distance from the forehead to the chin, the curve of the cheekbones, and the contour of the lips, ears, and chin, are the important features in identifying faces, according to the face recognition library. The detected faces from frames in the video are encoded using the face_encodes function. The faces detected are compared to the ones in the dataset using the compare_faces method and if an image that matches an image in the student

database, a prediction will be made and the label is assigned to the image. The faces that do not match those in the database, an unknown label will be assigned to them and they won’t be entered into the attendance record.



Web Application

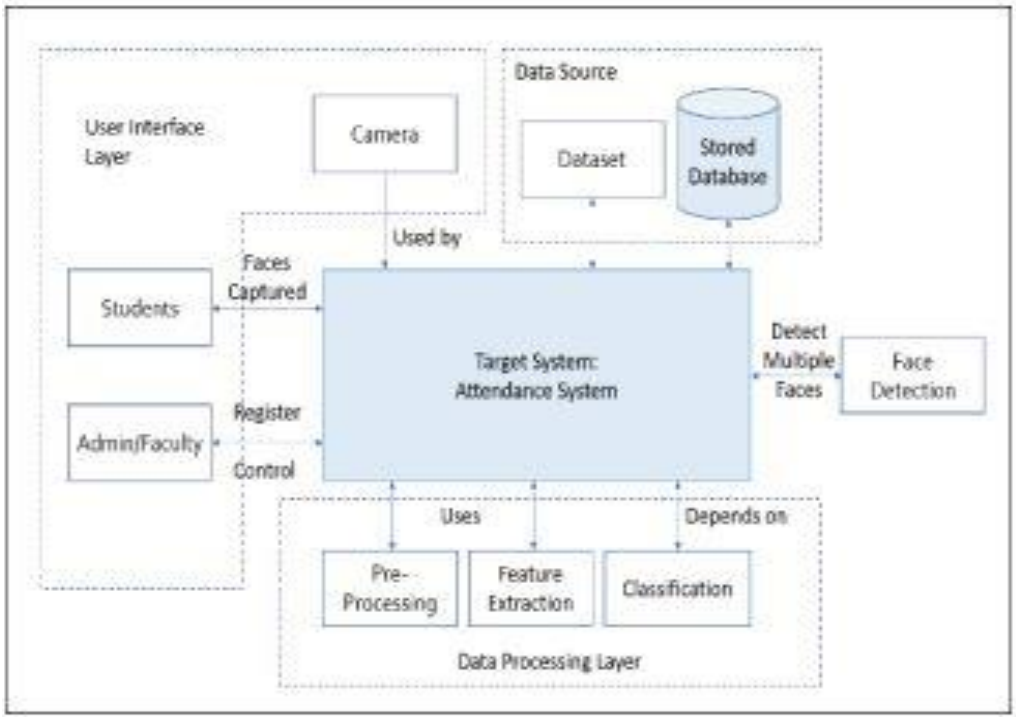
To facilitate user interaction and enhance the accessibility of the system, a web application was developed using Python's Tkinter library. This web application provides a user-friendly interface for configuring the system, viewing attendance records, and managing the attendance database. Users can conveniently initiate attendance recording sessions and monitor real-time attendance data via this interface.

The system is able to establish an interaction with the users by means of using a web app. The web app offers the user interface via which users may control the system's back-end. We designed the system in such a way that users can register new students either through the manual registration or using the web application user-interface. The manual registration method is currently the most effective way for registration. The administrator can just create a folder labeled the student’s name and manually insert the student’s face image. Once the folder

has been inserted in the record database, the new student's faces are able to be recognized in the video feed during taking attendance taking. On the other hand, users can access the website and navigate to the registration form shown in Fig. 4 to register new students. To register new students, the teacher enters the name of the student into the textbox of the form and press submit. Once its submitted the form ID and input text (name) are displayed in the URL which will be taken by the request.Get() function to the backend. The function will get the name used to register a student then use it to execute the code for making a directory in which the image data will be saved. Once the submit button is clicked the camera automatically opens and captures faces from the video frames once the program is executed. However, since the camera takes a few seconds once it opens to capture a particular number of images (we assigned 10 images), it is impossible to have a visual of the video feed hence the user before pressing submit they have to position the person on the right camera position. Once the camera turns off, the captured images will already have been taken and saved directly into the student database folder created. Then the system requires the user to close the webserver and restart again lest an index error will happen since the program hasn't processed the new student folder for recognition.

4. PROPOSED MODEL:

By analysing all the facts through the above section, this comes to a conclusion of implementing this system for Attendance system.



Step 1: Taking the image.

Step 2: Detecting the total faces in the image.

Step3: Cropping the image into total faces.

Step4: Applying pre-processing algorithms.

Step 5: Classification of faces as known and unknown faces.

Module for registration/Data feeding into system.

Step 1: classifying the system as User and Admin.

Step 2: Admin feeding details.

Step 3: Admin requesting for system resource.

Step 4: Capture image for database.

Step 5: Training the Dataset and storing into database.

5. Discussion:

5.1 Advantages:

- The system can detect multiple faces in images and videos, making it suitable for group attendance scenarios.

- It offers increased efficiency and reduces the potential for errors in attendance recording.

5.2 Limitations:

- Performance may be influenced by the quality of input images and videos.

- It may not be effective in scenarios with significant occlusions or low light conditions.

6. Conclusion:

The Multiple Face Detection Attendance System presents a promising solution for attendance management in a wide range of settings. It streamlines the attendance process and reduces errors compared to manual methods. While certain limitations exist, continued research and development efforts can address these issues and further enhance system performance**.**

Automated Attendance System has been envisioned for the purpose of reducing the errors that occur in the traditional

(manual) attendance taking system. The aim is to automate and make a system that is useful to the organization such as an institute. The efficient and accurate method of attendance in the office 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 office. It can be constructed using a camera and computer.

7. References :

[1] Real-time Web-based Multi-facial Recognition Attendance System Mutyambizi Mabasa Nyasha1 , Wasara Leeshward2 , Rusike Samantha3 , Khondowe Enock4 1, 3, 4College of Mathematics & Computer Science, Zhejiang Normal University, Jinhua-China 2Electrical Engineering & Automation, Zhejiang University of Science & Technology, Hangzhou-China

[2] Deep-learning based group-photo Attendance System using One Shot Learning Dr Aruna Bhat Delhi Technological University Shahbad Daulatpur, Main Bawana Road, Delhi-110042. aruna.bhat@dtu.ac.in Shivam Rustagi Delhi Technological University Shahbad Daulatpur, Main Bawana Road, Delhi-110042. shivamrustagi@hotmail.com Shivi R Purwaha Delhi Technological University Shahbad Daulatpur, Main Bawana Road, Delhi-110042. shivir_bt2k16@dtu.ac.in Shubhang Singhal Delhi Technological University Shahbad Daulatpur, Main Bawana Road, Delhi-110042. shubhang_bt2k16@dtu.ac.in

[3] Multiple Face Detection Attendance System Raj Kaste1, Harish Pandilla2, Priyesh Surve3, Mubin Shaikh4, Shalaka Deore5, Prof. Shubhangi Ingale6 1-6Modern Education Society College of Engineering, Pune.

----------***----------