



Face Identification Attendance System using Image Processing and Machine Learning

Kapil Kadam¹, Archana Deokate², Sandip Mundhe³, Kajal Patil⁴

Department of E&TC, SKNCOE, SPPU, Pune

Abstract— Face recognition is among the most productive image-processing applications and has a pivotal role in the technical field. Recognition of the human face is an active issue for authentication purposes specifically in the context of attendance of students and staff. An attendance system using face recognition is a procedure of recognizing students by using face biostatistics based on high-definition monitoring and other computer technologies. The development of this system is aimed to accomplish digitization of the traditional system of taking attendance by calling names and maintaining pen-paper records. Present strategies for taking attendance are tedious and time-consuming. Attendance records can be easily manipulated by manual recording. The traditional process of making attendance and present biometric systems are vulnerable to proxies. The main implementation steps used in this type of system are face detection and recognizing the detected face. The proposed automated attendance system using face recognition is a great model for marking the attendance of students in a classroom and for the staff. This system also assists in overcoming the chances of proxies and fake attendance. In the modern world, a large number of systems using biometrics are available. However, facial recognition turns out to be a viable option because of its high accuracy along with minimum human intervention. This system is aimed at providing a significant level of security. Hence, a highly efficient attendance system for classroom attendance needs to be developed which can perform recognition on multiple faces at one instance. Also, there is no requirement for any special hardware for its implementation.

Keywords— Facial recognition, attendance management system, Convolutional Neural Network, Principle Component Analysis.

I. INTRODUCTION

AIM: To develop a real-time attendance system that overcomes the shortcomings of previous methods and to give the best solution. This project is divided into two parts:

- 1) Data: collection
- 2) Data analysis.

Generally, in the classroom attendance was taken by the teachers manually at the beginning and end of the class. The problem with this approach is that it requires some time to take and also the manual process will have chances to make mistakes in most cases. To overcome that problem, RFID (Radio Frequency Identification) was introduced in the past years. But those are also having the faith proof of attendance system. So, we are introducing the concept of a Face Recognition Based Attendance system, the main objective of the proposed system is to allow attendance to the students using face recognition-based algorithms to achieve a fail-proof attendance system. Face detection is used for many applications for the identification of human faces in digital images or video. It is defined as a specific case of object-class detection; where it is used to find the locations and sizes of all objects in an image that belongs to a given class. The technology is can be able to predict frontal or near-frontal faces in a photo, regardless of orientation, lighting conditions or skin colour. Face Recognition is a form of biometric software that maps an individual's facial features mathematically and stores the data as a face print. The software consists of Deep Learning algorithms to compare a live capture or digital image to the stored face print in order to verify an individual's identity.

II. PROPOSED SYSTEM

The proposed system is very simple, effortless, and manageable with lucid operations. It embraces a database of students' faces and their details like name, enrolment number, and course. Two or more cameras depending on the need and size of the classroom are to be accommodated on the ceiling of the classroom covering the entire area. These cameras will capture images several times during a lecture. This will increase the efficiency of the system because if the camera will not cover some students, then other cameras will capture their faces. There are numerous expressions and poses possible that a student can perform. If at a particular instance system fails to detect faces due to unfavorable poses then the system can detect those faces at another instance of image acquisition.

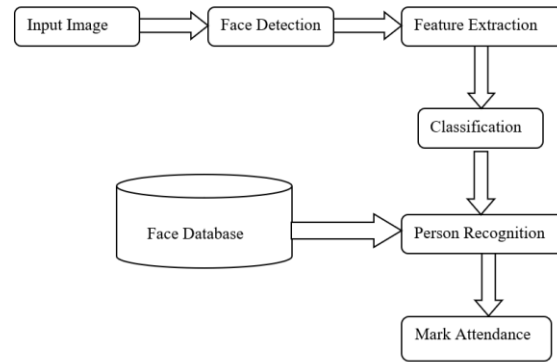
BLOCK DIAGRAM:

Figure 1: Block Diagram of face recognition attendance.

METHODOLOGY

- Input image
- Face detection
- Feature extraction
- Classification
- Face database
- Person recognition
- Mark attendance

□ Input image:

In the first step, the database will be created at the time of enrollment of students. The database will store generic information of students like name, identification number, course, semester subjects. Alongside the image of the student is to be captured by the system for training of the proposed system. This system captures a single image for a student for training purposes. With the aid of all the pictures the student has stored in the database, facial recognition for all of the students attending a lecture. It can be accomplished.

□ Face detection: Due to the movements of a student in a classroom, the image captured by the camera may get blurred. The image can be ameliorated using Generative Adversarial Networks. GANs are known for their ability to retain texture information in images, create solutions similar to the actual range of aspects, and look perceptibly convincing.

□ Feature extraction: For the detection of faces 68 landmark faces are taken into account. With the help of these landmarks, faces are detected. For face detection, Haar classifiers have been used. It is an approach based on machine learning in which a cascade function is trained from many positive and negative images. This is then used on other images to detect images. These classifiers are simply the subtraction of the sum of pixels under the black area from the sum of pixels under the white area. Applying 6000 features on each window frame was found to be difficult. Features were grouped into stages which are known as cascades of a classifier. AdaBoost is used for removing redundant features and for selecting only appropriate features. These features are known as weak classifiers. A weighted combination of weak classifiers is used to detect faces. Using the AdaBoost linear combination of weak classifiers is constructed known as a strong classifier. For feature extraction, Gabor filters are used to lay hold on facial features inclined at various angles. It is a very critical step since it is believed that a successful feature extractor selects a function that is not prone to occlusion, lighting, context, and pose variance. 2D Gabor filters are used to resolve spatial distortions caused by position and lighting variances.

□ Classification: Convolution Neural Networks allow us to derive from images a large variety of features. This concept of extracting the functionality for face recognition can also be used. CNN uses 68 facial landmarks to generate 128-dimensional encodings which are facial features encoded in RGB format. These encodings are compared to match faces. The strictness of face comparison can be manipulated by tolerance value.

□ Person recognition: KNN is called memory-based or lazy learning since it only preserves the interpretations of the training examples as a result of the way it learns. The Euclidean distance metric is often selected to determine the location of data points within KNN. An object is classified according to the Voting done by most of its neighbors, with the object delegated to the most

common class of its nearest neighbors (k is a positive integer). If $k = 1$, the object is then it is allocated to his closest neighbor's family.

□ Redundancy removal: The system encompasses multiple cameras. There might be a possibility of the presence of the face of a single student in different images. Redundant faces will be removed and single faces will be considered to mark single attendance for a student during a lecture.

Mark attendance: Trailing face recognition reports are generated by marking present in front of the student name and enrollment number in excel format during a lecture.

FLOW CHART:

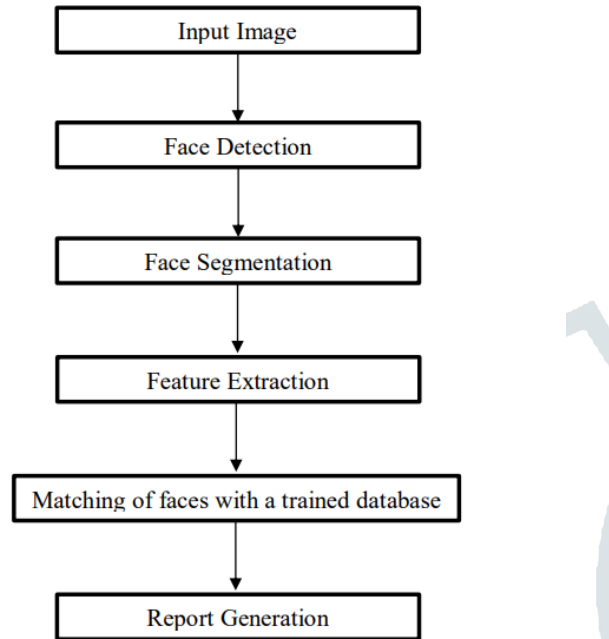


Figure 2: Flow chart of face recognition attendance system

III. PRACTICAL IMPLEMENTATION

I. TECHNICAL SPECIFICATIONS

Python:

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general-purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems. This versatility, along with its beginner friendliness, has made it one of the most-used programming languages today.

What can you do with python?

- Data analysis and machine learning
- Web development
- Automation or scripting
- Software testing and prototyping

Performing the face recognition: In this step, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and create a histogram which represents the image. So, to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram. We can use various approaches to compare the histograms (calculate the distance between two histograms), for example: Euclidean distance, chi-square, absolute value, etc. So the algorithm output is the ID from the image with the closest histogram. The algorithm should also return the calculated distance, which can be used as a 'confidence' measurement. We can then use a threshold and the 'confidence' to automatically estimate if the algorithm has correctly recognized the image. We can assume that the algorithm has successfully recognized if the confidence is lower than the threshold defined

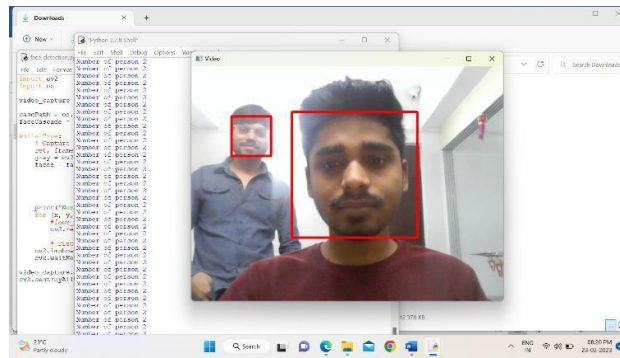


Figure 3: Face detection

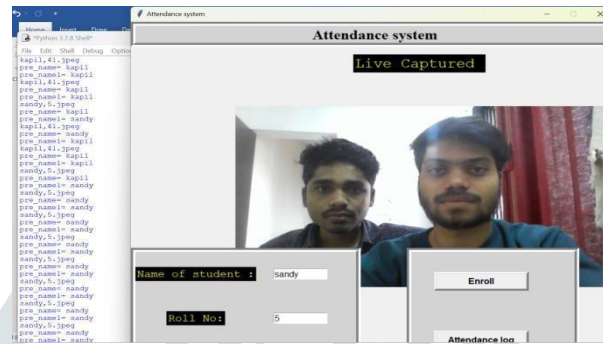


Figure 4: Face recognition

In figure 3, there are two faces captured by the camera is detecting through the face detection library. In this image, two faces are detected and counting the faces.

In figure 4, detected faces through camera are recognizing with the help of trained data set, showing their names and roll numbers.

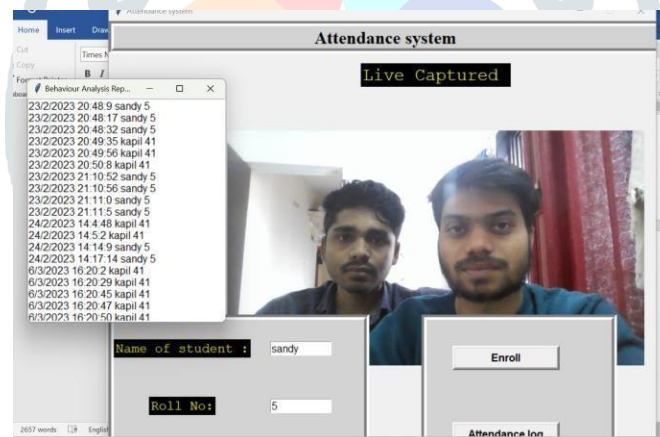


Figure 5: Marking attendance

In figure 5, marks the attendance of students who are recognized through the data set.

IV.RESULT AND DISCUSSION

	A	B	C	D	E	F	G	H
1	Attendance							
2	Names	Total	Wed 2/1/17	Thu 2/2/17	Fri 2/3/17	Mon 2/6/17	Tue 2/7/17	Wed 2/8/17
3	Student1	3	1	1	1			
4	Student2	3	1	1	1			
5	Student3	3	1	1	1			
6	Student4	3	1	1	1			
7	Student5	2	1	1				
8	Student6	2	1	1				
9	Student7	3	1	1	1			
10	Student8	2		1	1			
11	Student9	2		1	1			
12	Student10	3	1	1	1			
13	Student11	2	1	1				
14	Student12	2	1	1				

Figure 6: Marking attendance

In figure 6, mark the attendance in excel sheet. Sending the students with the help of mail. Absent students got blank in sheet and present students returned as 1 number.

VI. ADVANTAGES

- It is used for more security, easy integration, and automated identification.
- Because of face recognition attendance, the time of lectures wouldn't be reduced.
- We can send the attendance sheet of students to their parents.
- It provides real-time data and syncs the data with no time lag.

VI. APPLICATIONS

- It will be used for schools and colleges.
- And also will be used for corporate offices to maintain their employee record.
- It can be used for assistance in security systems.
- It can be used in jail for the attendance of a prisoner

VII. FUTURE SCOPE

Some of the future enhancements that can be done to this system are as follows:

- For students, we can develop a dedicated login page in which they can see their details and attendance record.
- In the future we can update the modules like notices for students and many more.
- It can be made for employees for corporate offices to monitor.

VIII.CONCLUSION

The proposed automated attendance system using face recognition is a great model for marking the attendance of students in a classroom. This system also assists in overcoming the chances of proxies and fake attendance. In the modern world, a large number of systems using biometrics are available. However, facial recognition turns out to be a viable option because of its high accuracy along with minimum human intervention. This system is aimed at providing a significant level of security.

REFERENCES

- [1] Yohei Kawaguchi, Tetsuo Shoji, "Face Recognition-based Lecture Attendance System", "3rd AERU..." 2005.
- [2] B. Kavinmathi, S.Hemalatha, "Attendance System for Face Recognition using GSM module", 4th International Conference on Signal Processing and Integrated Networks", 2018.
- [3] Ketan N. Mahajan, Nagaraj V. Dharwadkar," Classroom attendance system using surveillance camera", International Conference on Computer Systems, Electronics and Control",2017.
- [4] Shubhobrata Bhattacharya, Gowtham Sandeep Nainala, Prosenjit Das, Aurobinda Routray "Smart Attendance Monitoring System (SAMS): A Face Recognition based Attendance System for Classroom Environment", IEEE 18th International Conference on Advanced Learning Technologies, 2018.
- [5] E.Varadharajan, R.Dharani, S.Jeevitha, "Automatic attendance management system using face detection", 2017.
- [6] Guo, Jing-Ming, "Complexity reduced face detection using probability based face mask profiteering and pixel-based hierarchical-feature Ada boosting", Signal Processing Letters, IEEE 2011.
- [7]K.Senthamil Selvi1, P.Chitrakala, A.Antony, Jenitha S, "Face recognition based attendance marking system", International Journal of Computer Science and Mobile Computing, 2014.
- [8] Chen, Joy Iong Zong. "Smart Security System for Suspicious Activity Detection in Volatile Areas." Journal of Information Technology 2, 2020.
- [9]Jacob, I. Jeena. "Capsule network based biometric recognition system." Journal of Artificial Intelligence 1, 2019.
- [10] Kirtiraj Kadam, Manasi Jadhav, Shivam Mulay, Tushar Indalkar, "Attendance Monitoring System Using Image Processing and Machine Learning", International Journal of Advance Engineering and Research Development, 2017.
- [11] Rajat Kumar Chauhan, Vivekanand Pandey, Lokanath M, "Smart Attendance System Using CNN", International Journal of Pure and Applied Mathematics, 2018.
- [12] Mayank Yadav, Anmol Aggarwal, "Motion based attendance system in real time environment for multimedia application", 2018.
- [13] Wei Wu, Chuanchang Liu, Zhiyuan Su, "Novel Real-time Face Recognition from Video Streams", International Conference on Computer Systems, Electronics and Control, 2017.
- [14] Changxing Ding, Dacheng Tao, "Trunk-Branch Ensemble Convolutional Neural Networks for VideoBased Face Recognition", IEEE transactions on pattern analysis and machine intelligence, 2018.
- [15] Aziza Ahmed, Dr Suvarna Nandyal, "An Automatic Attendance System Using Image processing", The International Journal of Engineering and Science, 2018.

