

SMART ATTENDANCE MANAGEMENT SYSTEM USING MACHINE LEARNING

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Abstract Managing the attendance can be a great burden if teachers take attendance manually by calling out each and every student name. To resolve this problem, smart attendance management system is being used. Each person has a Unique face. In this project face of an individual is used for the purpose of automatically marking the attendance. The smart attendance management system is executed generally with the help of biometrics. One of the biometric method called Face recognition is used to improve this system. Facial recognition is being used vastly in many applications, like System of CCTV footage and video monitoring, an interaction between humans and computers. Traditionally, attendance is taken by calling the name or roll number of the student and then marked attendance is recorded. Time consumption is the main concern for this purpose. Suppose the duration for one subject is around 60 mins, it takes about 5 to 10 minutes to record attendance. This leads in excess time consumption. To prevent such losses, an automatic process attendance marking is used in this project which is based on image processing. Face detection and face recognition is used in this project. The created database of all the students in the class is stored and when the individual student face matches with one of the faces stored in the database, the attendance is recorded.

Key Words: Face Recognition, Machine Learning, Open CV, Support Vector Machine.

1. INTRODUCTION

An Attendance plays a vital role in the educational organization for both the teacher and student. As it plays a prime important role to keep the record of the attendance. While earlier, as we think about the traditional process of taking the attendance in class room by Calling name or roll number of each student for the attendance, the problem arises by following this traditional process is more time consumption and also it requires more energy. As the students have to wait in queue for giving their attendance, which is very much time consuming. In order to overcome with this problem an automatic attendance management system is designed, that can solve all the above related problems.

Currently there are so many institutions and organizations who are using automatic attendance managing system. One of the most commonly used system in these institutions and organizations is biometric technique form. As this technique is automatic and a step forward compared to traditional method, which has been failed to meet the time constraint.

This project helps by introducing an involuntary attendance marking system, devoid of any kind of interference with the normal teaching procedure. The system can also be used by implementing the cameras during exam sessions or in other teaching activities where attendance is highly mandatory. By using this system which helps to eliminate the classical student identification such as calling name of the student, or checking respective identification cards of the student, which can not only interfere with the ongoing teaching process, but also can be stressful for students during examination sessions.

1.2. FACE RECOGNITION SYSTEM

Face Recognition is a process of marking attendance of each student by recognizing the face of the student to ensure that his/her presence in the classroom. During the lectures it can also be used for the lecturer to find whether the student is sleeping or awake during the lectures.

A web cameras or High-Definition camera is used to capture the image of the student by using the installed cameras in each classroom. Thus from the captured image, the attendance is marked for the student in the database, based on face recognition of each student the images are further segregated by recognizing the face region based on the captured image to ensure their

presence in the classroom. By using some machine learning algorithms, the attendance marking in the database is done based on the face segregation of the student. The Face Recognition technology is considered because without any influence of either the student or the lecturer or any other external person, the attendance of each student can be easily marked based on the face image of the student that can be captured from a various locations and which can be further used for analysis. As a result, no student can put the proxy attendance and imitate as another student. As now a days everything is in biometric form such as the physical fingerprint of the student is required to mark the attendance based on considering fingerprint recognition system or, iris of an individual student is supposed to be scanned through a biometric device to mark attendance based on considering iris recognition system. If we considered the other recognition technologies which requires the physical interference of each and every student whereas the face recognition technique does not require any physical interference of the student. Therefore, on-going with a face recognition system, the face of the student can be easily captured and obtained through the camera installed in the classroom and the attendance of each student can be easily maintained in a database. The face recognition system contains two major things that need to be maintained as follows,

- i. Enhanced Security
 - ii. Faster Processing
- i. Enhanced Security - because the face image of every student should not be misused by an external authority.
 - ii. Faster Processing-helps in maintaining attendance for all the students of the institution, thus faster processing helps for easier retrieval of attendance to send email or message to the parent.

2. LITERATURE SURVEY

The main aim of this paper review is to find the best solutions by considering the errors and imperfection of

the system proposed by authors and also to give the solutions provided by other authors.

In [1], Kawaguchi introduced a new method called continuous monitoring by organizing lecture attendance system. Based on the captured images of each student in the classroom by using cameras, the student's attendance is marked automatically. The implementation of the system is designed simple. As the two cameras are equipped with the wall of the classrooms. The first camera is a capturing camera and the second camera is a sensor camera. As the first camera is used to capture the image of each and every student in the classroom and the second camera is used to capture the student getting the seat inside the classroom and these cameras captures will snap the image of each and every student. The designed system must compare the obtained images captured from a camera and those images should match with the faces with the actually stored database in order to generate the attendance along with time.

Another paper [2] proposed of automatic attendance management system, introduced a real-time computer vision algorithm. In this designed system the camera is installed with non-intrusive, which takes the snap images of the student in the classroom and then compares the extracted facial images with the images captured by the camera within the system. This system usually used in computer vision and also used in machine learning algorithm. Also, HAAR CLASSIFIERS used to train the captured snaps or images from the camera installed. The captured facial images by the cameras will then convert to grayscale and do segregation on the captured images, further the image is transferred for processing and to store on the server later.

Other paper [3], the author introduced a system which implements Automatic Attendance using Face Recognition. The designed system also uses the system MATLAB with Principal Component Analysis (PCA) which does the extraction of the Object in the face such nose, mouth. As the result, shows that this paper based on the experiment, the system can difference view of the face in the classroom or Recognize in case the dark background.

Jyotshana Kanti [4], also introduced the Automatic Attendance Marking System. This system merges the two different Algorithms such as The Artificial Neural Network and The Principal Component Analysis. The main purpose of the author is to resolve the Traditional

Attendance Marking System and also to resolve the time-consumption. The Principal Component Analysis is implemented in the system, that does an actual extraction of images and to identify the similarities of the facial images in database and based on captured images. The Artificial Neural Network(ANN) is used to solve the Learn from the Input data, and the expect value and also to solve the problem of the Input data. This model of the system is implemented by the author using Back Propagation Algorithm and then combines it with the mathematical function to perform within that system. As a result, shown by the author research is, it shows that the system can use to recognize in a different environment.

3. PROPOSED SYSTEM

The proposed system task is to capture the face of each individual student and to store it in the database for students attendance. The student face needs to be captured in such a way that all the students face features needs to be detected and even the posture and the seating of the student needs to be recognized. There is no need for the teacher to take the attendance manually in the class because the system records a video and through further processing steps the face is being recognized and finally the attendance database is updated.

OpenCV: OpenCV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real-time computer vision. OpenCV is developed by Intel and later supported by Willow Garage and then Itseez. The library is free for use under the open-source BSD license. Python is dynamically typed and garbage is collected. It supports multiple programming paradigms, including structured, object-oriented and functional programming. Python is often described as a "batteries included" language because of its comprehensive standard library. The proposed face recognition is categorized into four major steps namely,

- i. Image Acquisition
- ii. Face Detection
- iii. Face Recognition
- iv. Attendance Marking

3.1. Image Acquisition

The first step involved in the second phase is image acquisition, that is obtaining the face image of the students which is present in the classroom. It can be obtained through the High Definition Video Camera that installed in each classroom. From the video sequence which will be obtained during the lecture hour, the frames of each sequence are extracted from the video and numbered for further processing. From the extracted frames, two or more frames are taken at random and proceed with further processing steps.

3.2. Face Detection

From the frames which are extracted, each face of the image needs to be segregated (divided).For this segregation purpose, we go with the face region bounding box methodology process usually it is called marking the region of interest using HAAR cascade classifiers that is available in the OpenCV and face-recognition library respectively. After dividing the frame, the first frame is taken and the face image is detected and then it is marked. Then next the second frame is taken and again the face image is detected and marked. Again the same process is repeated for all the frames.

3.3. Face Recognition

The face image detected in each frame is taken and compared with the directory where the pre-trained face image of the student has resided. Again the same process is repeated for all the frames. To perform this comparison the process of Super Vector Machine Learning algorithm is employed.

3.4. Attendance Marking

If face image presenting the frame1 matches the pre-trained image the n the attendance is obtained of the particular student for the concerned lecture hour. If the student named as frame1 and that is not available in the trained dataset then student's face saved as image1 doesn't belong to the particular class, which means that the particular student may belong to the different class. The attendance can be maintained in

any kind of csv file for further retrieval of attendance data of the student.

4. RESULT ANALYSIS

The working process of this system includes the following steps:

- i. Database Creation.
- ii. Training the Model.
- iii. Recognition of Person.

The following are necessary libraries that are imported:

- i. **Imutils:** A series of convenience functions to make basic image processing functions such as translation, rotation, resizing and displaying Matplotlib images easier with open cv and python 3
- ii. **Time:** Provides many ways of representing time in code, such as objects, numbers and strings
- iii. **Open CV:** Used to process images and videos to identify objects, faces or even the hand writing of human.
- iv. **Numpy:** It is in the form of arrays to work with a pixels.
- v. **OS:** It is used to create/change and also to open directory.
- vi. **Pickle:** It is used for serializing and de-serializing python object structures.
- vii. **XLSX:** to create/read/write to excel sheet.

4.1. Database Creation

A Database of the students is created first, from the images captured by the video frame which is done before the recognition process. Data set is created only to train the system and the data set includes the Name, USN, and images of the students in different variations and poses. Image count of 50 is captured for better accuracy. Here we use csv file to store student data.

4.2. Training Model

The next step is to train the model. The model is trained with the extracted images from the video. The pre-processing step is taken for feature extraction from the video and then generate variations and alignments from the video. This is done using face_imutils feature from imutils module. These features that are extracted are then dumped to a pickle(pkl) file, with names and images properly mapped using pickle.

4.3. Recognition of Student

The last step is Recognition of the student. This step is done only when the detecting and processing of the face is completed. It compare the face present in the database of the students and then update the attendance of the students.

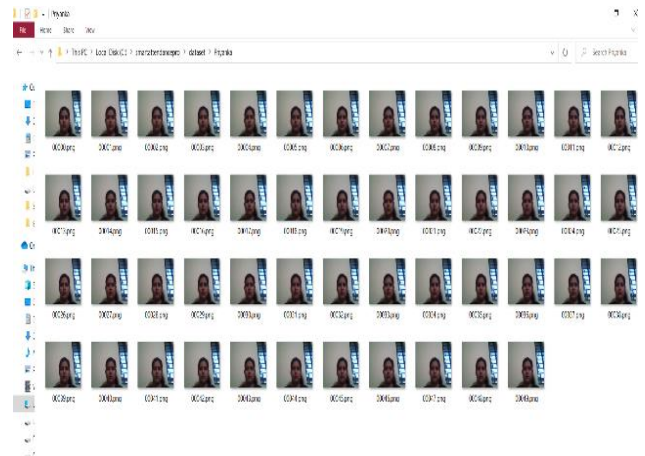


Figure 1: Dataset creation of student

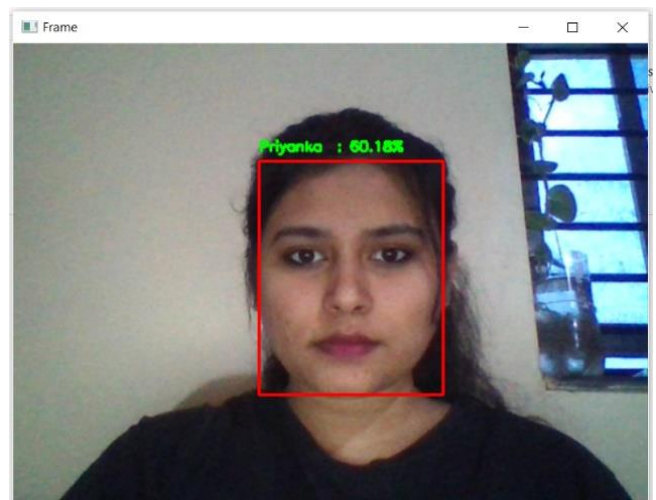


Figure 2: Recognition of Student

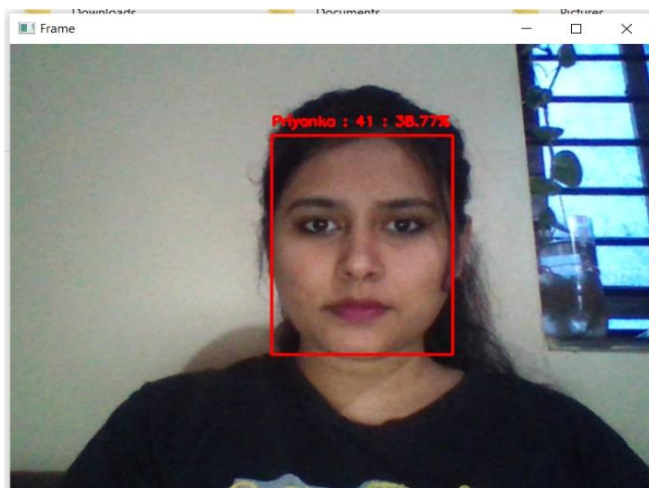


Figure 3: Recognition with csv

- ii. The accuracy level of this project has reached up to 80% for imperfect and opaque images. Further it can be improved for obtaining higher accuracy levels.
- iii. Two or more IP cameras can be further used for working and processing of each image can be done separately. The merged results of these can help to obtain better results and accuracy in denser classrooms.

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
2153	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2154																						
2155	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2156																						
2157	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2158																						
2159	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2160																						
2161	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2162																						
2163	ajayl	124	25-07-2021	13-07-2021	10:58																	
2164																						
2165	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2166																						
2167	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2168																						
2169	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2170																						
2171	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2172																						
2173	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2174																						
2175	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2176																						
2177	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2178																						
2179	Priyanka	41	25-07-2021	13-07-2021	10:58																	
2180																						
2181	Priyanka	41	25-07-2021	13-07-2021	10:58																	

Figure 4: Attendance sheet

5. CONCLUSION

Smart attendance management system is designed to solve the issues of existing manual systems. We have used face recognition concept to mark the attendance of student and make the system better. The system performs satisfactory in different poses and variations. In future this system need be improved because these system sometimes fails to recognize students from some distance, also we have some processing limitation, working with a system of high processing may result even better performance of this system.

6. FUTURE WORK

- i. Future work of this project can be sending alert SMS to student with reference of the attendance. GSM module can be used for this concept. Alert SMS can be sent to the parent of the student.

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