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Real-Time Attendance Management System

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ABSTRACT: Attendance management is an important procedure in an educational institution as well as in business organizations.Most of the available methods are time consuming and manipulative. The traditional method of attendance management is carried out in handwritten registers. Other than the manual method, there exist biometric methods like fingerprint and retinal scan, RFID tags, etc. All of these methods have disadvantages, therefore, in order to avoid these difficulties here, we introduce a new method for attendance management using deep learning technology. Using deep learning we can easily train a data-set. Real-time face algorithms are used and recognized faces of students in real-time while attending lectures. This system aims to be less time-consuming in comparison to the existing system of marking attendance. The program and the training of the data are all done in Google collab. The face of the students is recognized and attendance is marked on an excel file. The program detects the faces and also crop the detected faces and store it in a file.
KEYWORDS: Google Colabatory,Cosine Similarity,Face Detection,Face Encoding,FaceRecognition

I. INTRODUCTION

Nowadays, technology has improved a lot but still, attendance management is a major issue. Attendance marking is necessary to evaluate the performance of the students and the employees. There exist many methods of attendance marking. The traditional method involves the signature on paper sheets or manual systems that require human sight. Many methods have been developed in order to improve the existing method. Considering the case of a class, taking manual attendance every day and every period is such a tedious, time-wasting process and requires a lot of human effort. Here the attendance will be carried out in the handwritten registers. It causes interruptions in the class, very error-prone and wastage of lot of resources. Attendance management is not only a problem within the classroom, but it also affect the business organization. Other than the manual method, there exist other methods that is biometric methods like fingerprint, retinal scan, and RFID tags and so on. While using RFID tag masquerading is easy for employees and in other method attendance of a group of people cannot be marked at the same time.

Attendance marking is effective only when it is real-time. The disadvantage of the previous methods can be trimmed down by employing facial recognition to mark the attendance. Face detection, which is a simple and easy task for humans is not so for computers. It has been regarded as the most complex and challenging problem in the field of computer vision due to large intra-class variations caused by the changes in facial appearance, lighting, and expression. Such variations result in the face distribution to be highly nonlinear and complex in any space that is linear to the original image space. Face detection is the process of identifying one or more human faces in images or videos. So we aim at making the attendance- taking process automatic and hands-free by employing facial recognition systems so it can automatically update digital attendance records in real-time. This will computerize the traditional method of attendance marking and thereby provides a better user interface. This can be achieved by using a technology called deep learning, which make use of neural networks to teach computer by observing data. The proposed system capture live images using webcam and the face detection is done using a frontal face detector. The detected face are then cropped and stored in a folder for recognition process. Similarly, the images trained using a sequential model is also stored in a folder. The recognition process is carried out by checking the similarity of the detected face with the trained images stored in the folder. This is then marked to an excel sheet as attendance.

II. PREVIOUS WORKS

One of the methods was to mark the attendance was by using a motion sensor and a camera which turns on when motion is detected by the sensor. Here the process is that when the sensor detects motion it automatically makes sure the camera is recording a video of the students and compares the input data with the data that is stored in the database. The defect of this system is that even the slightest movement will result in the camera to turn on[1]. The second method is based on deep learning face recognition where using Dlib which analysis the chin and nose of the person and compares it with the Rfid tag logged at that moment.This is a tedious task and takes a long time for processing[2]. The third method is the multi-face recognition where faces

were detected for straight faces and faces at a distance of about 200cm. This process can be implemented to get the most faces at the point of time[3]. The fourth method is face recognition usingraspberry pi where the face is recorded on the camera and compared with the stored data and the value preset and absent is marked according to the recognized face. This process can only recognize a few people at the time and due to lighting issues, it can't recognize a large number of people in the class[4].

III. REAL TIME ATTENDANCE MANAGEMENT SYSTEM

The proposed system workflow is as shown in **Figure1.**The input is captured by the web camera which will be a live image . The Face recognitionsoftware runs with the given input and compares it with the trained data that is already stored with respect to each student's image. On analyzing the data it marks the attendance with the respect to identifying faces inthe images with values like a present and absent. This digital information is marked automatically to the nameof the student without external help.

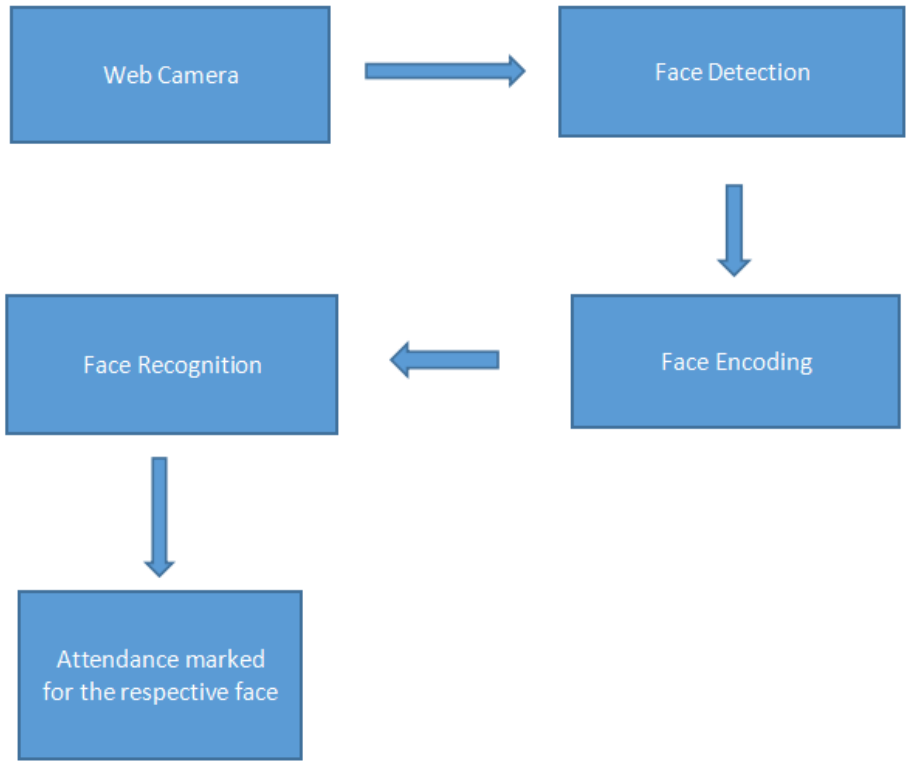

Figure 1: Proposed Work-flow

IV. PROPOSED SYSTEM

1. Face Detection

The face detection process begins withloading input images from the web camera. After a live image is captured using the webcam, it is given to the pretrained classifier, that is the haarcascade frontal face detector. It is a Haar feature based cascade classifier proposed by Paul Viola and Michael Jones in their paper,"Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001[5]. This classifier is trained from a lot of positive(images of faces) and negative images(images without faces) and then used to detect objects in other images. They uses some windows as shown in **Figure 2** to identify the facial features.

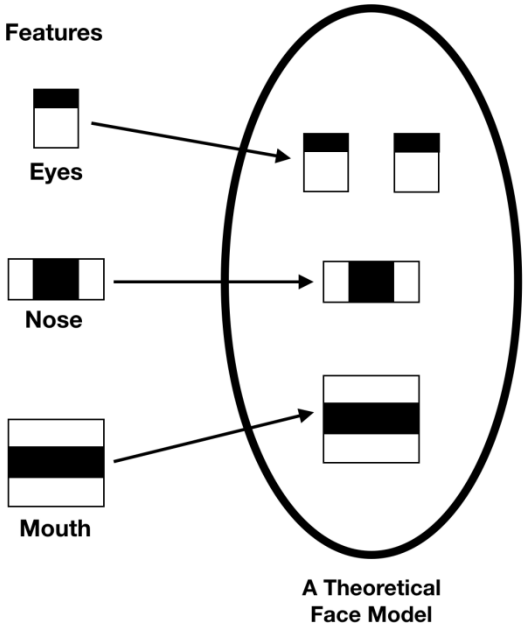

Figure 2: Haar Cascade Frontal Face Detector

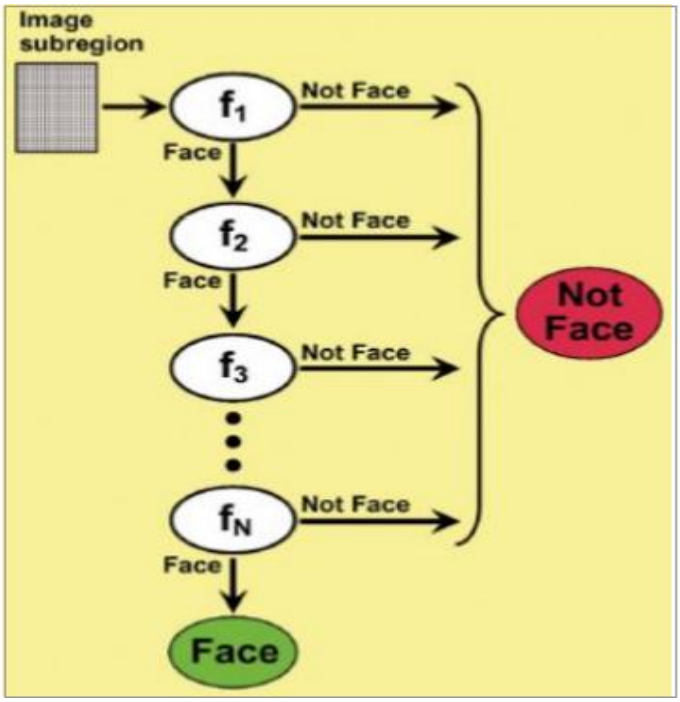

Figure 3: Face Detection Process

In this cascade of classifier instead of applying all features on a single window, it groups the features into different stages of classifiers and then applied one by one. The first few stages of the classifier contain very less features and if a window in this stage fails, then remaining features are not considered. If it passes, the second stage of features are applied and this process is continued as shown in **Figure 3**. Consider **Figure 4** as the input image which is given to the Haar cascade frontal face detector. The faces detected using the classifier is cropped and saved to a folder on the drive as shown in**Figure 5**

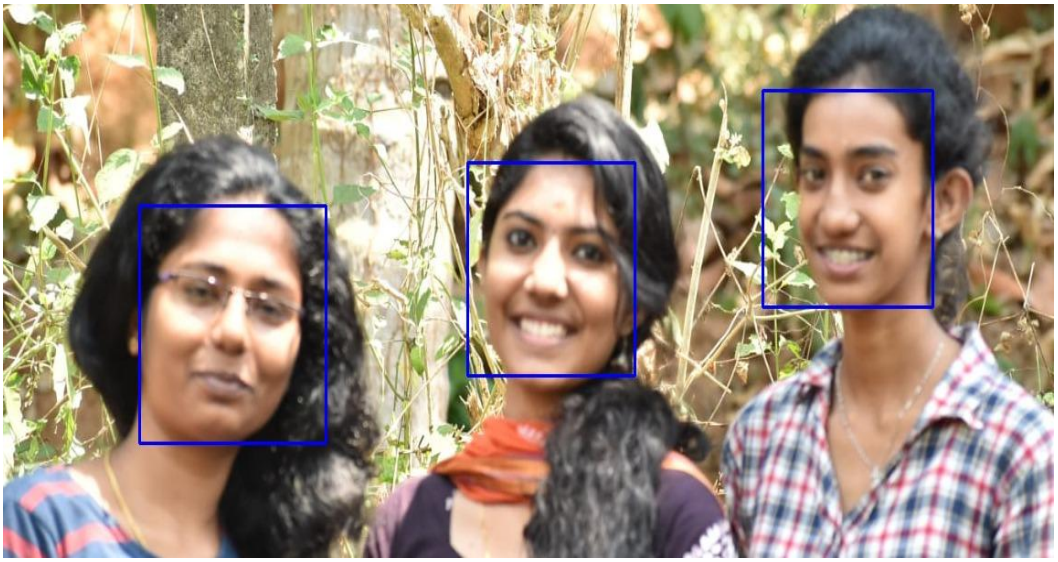

Figure 4: Input Image

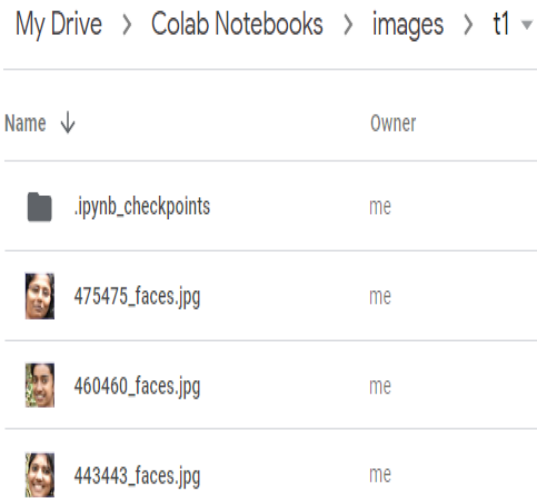

Figure 5: Folder with detected faces

2. **Face recognition**

For the training process, images of students are stored in a folder in drive with their names as the image name as shown in **Figure 6** .This is given to an existing sequential model to teach the computer for later recognition process. Here images of 10 different persons are used for training.The detected faces from the input images are then compared with these trained images and their comparison is done based on cosine similarity&euclidean distance[6][7][8]. If the faces are identified similar, then attendance is marked as present and else marked as absent. The whole process of face detection, training and recognition is done on Google colab[11].Google Colab is a free cloud service that supports free GPU. It also support python and libraries such as keras, tensorflow, PyTorch and OpenCV which can be used for AI applications.

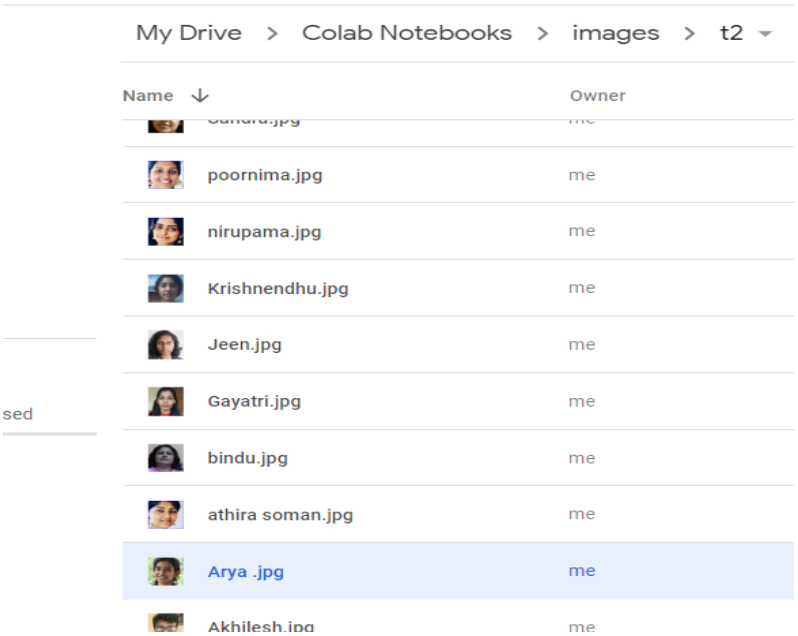

Figure 6: Folder with trained mages

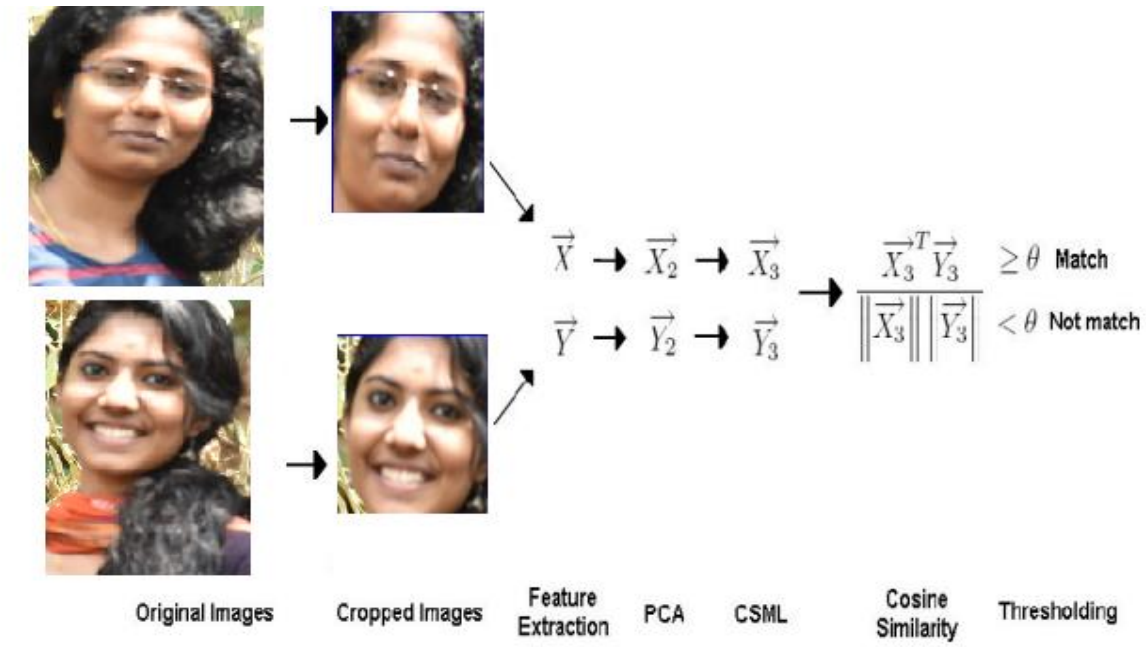

Figure 7: Checking cosine similarity

In the **Figure 7**, first we give a image it first crops only the face from the input image after which it extracts the features from the face that is X vector means features taken out from the first image and the Y vector means features taken out from the second image. These features will have a pixel value and for comparison cosine similarity function is used. We have set a threshold value so when we come to the part of comparison we compare with the threshold value. Depending on the comparison results we can identify the face and mark the attendance.

Figure 8: Face Recognition using cosine similarity Check

For the **Figure 8** we can see that after comparison of input image the system has been successful in finding that the faces are not the same and this makes sure that the system is working properly.

3. Marking attendance onto the excel

After the process of detection, feature extraction and face recognition the known and unknown persons are marked as present or absent in the excel sheet.In the **Figure 9** we can see that the faces are recognized and marked properly.

1	Name	31/03/2020
2	Akhilesh	Absent
3	Arya	present
4	Gayatri	Absent
5	Jeen	present
6	Krishnendhu	present

Figure 9: Attendance Marking

V. SYSTEM SPECIFICATIONS

The system uses the method of deep learning[12] to extract the features of the input database. The computer language to be used is python. The software used includes the latest version of google colaboratory which is a machine learning platform.

VI. RESULT

Input has been taken from the web camera of the system. Live capturing of the image is done and the image taken is cropped and stored in a folder. The image from the folder is compared with already provided trained images and finally face is recognized. After recognizing the face detected corresponding attendance is marked to the identified person. The platform used here is Google colaboratory.

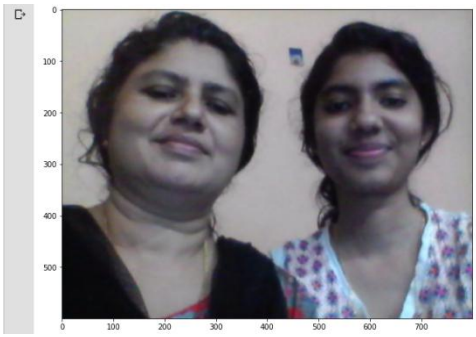

Figure 10: Live Captured Image

	A	M
1	**Name**	**02/07/2020**
2	Akhilesh	Absent
3	Arya	Absent
4	Gayatri	Absent
5	Jeen	Absent
6	Krishnendhu	present
7	Sandra	Absent
8	athira soman	Absent
9	poornima	Absent
10	nirupama	Absent
11	bindu	present

Figure 11: Visible Result

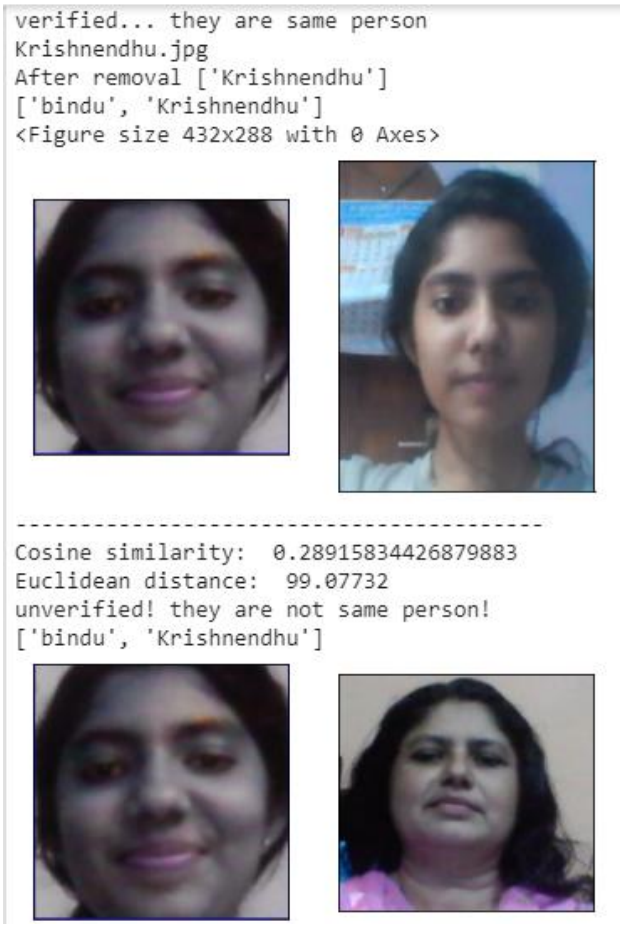

Figure 12: Final Result

From the **Figure 11** and **Figure 12** we see that the system has been successfully able to distinguish between faces and the attendance has been marked in the sheet.

VII. CONCLUSION

This method of Real-time attendance system based on deep learning is to overcome the disadvantages of the previous works which include the delay of the processor, accuracy, etc. Deep learning extracts the features of the input dataset and this input dataset is trained using the neural network and this can be done using different deep learning platforms such as Keras, tensor flow and so on. The machine learning program can be done using a platform called google colaboratory. Colab notebooks execute code on Google's cloud servers, meaning we can leverage the power of Google hardware, including GPUs and TPUs, regardless of the power of the machine. All we need is a browser. In this attendance management system, the live images are taken using web camera, and this videos are converted into frames and stored in a file for face recognition. Later the face recognition model takes these as the input images and further does the process of face detection and crop the detected images and store it in another file. These cropped faces are later compared with the given set of data using cosine similarities and thus the faces of each person are recognized. According to the date the attendance of each person are marked to the excel sheet. This excel file can also be saved in the system from the colab notebook.

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