Attendance System using Face recognition

A PROJECT REPORT

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1. <u>**Abstract**</u>

Lately, we have all been a part of this online endeavour, willingly or unwillingly, be it work from home or online classes. More than half of the students in India are now receiving their education through online classes which are necessary considering the ongoing circumstances.

We can all agree to the fact that taking attendance has become more difficult than teaching itself, and the extension or other apps don't seem to be serving the purpose that well. Almost all teachers now take attendance through roll call which gives birth to 2 main issues, one proxies and other you don't know whether the student is actually paying attention, whether they just entered the class or just woke up and are giving the attendance. This method is not only very time consuming but also doesn't seem feasible during exams, given the high chances of proxy and time it takes.

All such problems require a real-world solution. The Attendance System using Face Recognition, recognizes the faces through webcam with high accuracy and records live attendance, with name and time in an excel sheet. Numerous algorithms and techniques have been developed for improving the performance of face recognition but the concept to be implemented here is Deep Learning.

2. <u>**Introduction**</u>

Deep Learning is one among the interesting domains that enable the machine to train itself by providing some datasets as input and provides an appropriate output during testing by applying different learning algorithms. Nowadays Attendance is considered as an important factor for any concerned person of an organization.

Manual Student Attendance Management system is a process where an authoritative person calls the name and marks the attendance manually.

This system has a lot of drawbacks like,

- Manipulating time records or Time thefts,
- Possible human errors
- Proxy attendance

An effective solution for the above-listed drawbacks is the automated way of marking attendance.

The Attendance System using Face Recognition recognizes the faces through webcam and records live attendance, with name and time in an excel sheet. This saves a lot of time and reduces human errors next to negligible.

The two common Human Face Recognition techniques are Feature-based approach and Brightness-based approach. The Feature-based approach also known as local face recognition system, used in pointing the key features of the face like eyes, ears, nose, mouth, edges, etc., whereas the brightness-based approach also termed as the global face recognition system, used in recognizing all the parts of the image.

3. <u>**Literature Review**</u>

3.1 <u>**Face recognition-based attendance system:**</u>
This research paper had focused on improving the attendance system in school and colleges because of the arising discrepancies.

In the Face recognition-based attendance system, people have to register with their images and names in the database and a camera has to be installed in a room which captures a video of each individual in the room and stores it in the database, frames are extracted from the video and matched with the existing images of the registered people. If a match is found, he/she is marked present otherwise absent.

<u>**Pros:**</u>
The entire process is done automatically, students need not to stand Infront of the camera so it saves time.
<u>**Cons:**</u>
It is hard to place the camera in such a way that it easily captures the video of every student without any error.

3.2 <u>**Automatic Attendance System Using Face Recognition Technique:**</u>
In this research paper, the solution is implemented by Haar features and AdaBoost classifier.

They have created a Graphical User Interface (GUI) for storing the name and roll number of students in a file, which in turn generates a dataset and is used for training the neural network.

A camera is fitted at the door of the classroom, which captures real-time images of the students and after comparing them with the stored images, marks them present in the excel sheet along with the time of entry, on getting a match otherwise they stand absent.

The proposed system is also useful for laboratory attendance, government office attendance, institutional/organizational attendance and library attendance.
<u>**Pros:**</u>
It captures real-time images of students and is also time efficient.
<u>**Cons:**</u>
Having a well-placed camera, which captures images with such accuracy is difficult.

3.3 <u>**An improved face recognition algorithm and its application in the attendance management system:**</u>
In this research paper, they have formulated a solution for identifying human faces from images and videos captured from a digital camera by a new method using Local Binary Pattern (LBP) algorithm combined with advanced image processing techniques such as Contrast Adjustment, Bilateral Filter, Histogram Equalization and Image Blending to overcome the issues hampering the accuracy of face recognition in order to improve the LBP codes, thus improve the accuracy of the overall face recognition system and they have also compared their results with the one obtained by using Haar features and AdaBoost classifier.

Pros:
It is more accurate than the Haar features and AdaBoost classifier.
Many image processing techniques have been added to make it more accurate.
Cons:
Damage and wrong placement of the camera may lead to inaccurate results.

3.4 Biometric Attendance System using Iris Recognition:
This research paper aims to improve the reliability of attendance records by proposing an automated attendance system that uses iris recognition and detection algorithms to mark attendance. Since every person has a different iris pattern, which is not dependent on genetic factors, this method has a high accuracy.
The system uses MATLAB software. It performs a series of steps to recognize the iris pattern, namely image acquisition, iris location, and pre-processing, iris texture feature extraction and signature encoding, iris signature matching for recognition or verification to give the most accurate result.
Few drawbacks of this method are that the person has to be in close proximity as iris is small and they shouldn't move and of course the cost of implementation is very high.

Pros:
The system is very accurate as everyone has a unique iris pattern of their own and it doesn't even depend on the genetic factors.

Cons:
High cost of implementation
Students whose attendance is getting marked have been in really close proximity for proper iris pattern recognition.

3.5 A Design and Implementation of a Wireless Iris Recognition Attendance Management System:
With the purpose of making user's attendance easier and more effective this research paper proposes a wireless iris recognition attendance management system based on Daugman's algorithm. Eye scanner, microcontroller and RF wireless communication module are main components of the system.
First everyone's eyes digital image is taken, an algorithm of feature extraction is carried out. Minutiae are extracted and stored as a template for later verification. For marking attendance people place his eyes on the iris recognition sensor for extracting the minutiae from the captured image. The matching algorithm is applied to match the minutiae with the previously stored template to give the accurate results.
Pros:
This system is really effective for companies, which can put in a lot of money for the software and hardware components.
Cons:
It is not very cost efficient.
The person has to stay steady and make sure their eyes are wide open and their eyelids or eyelashes are not obstacles.

4. **Modules Description**

4.1 **Image acquisition:** Image is acquired using a webcam, when the attendee sits in front of the laptop or computer during online meets. This image is given as an input to the system.

4.2 **Dataset Creation:** During the registration, the images taken are used for dataset creation and training the neural network. For better accuracy minimum 15 images of each student should be captured.
Images from the datasets are recalled during the recognition process.
This process is applying to each
image taken during registration.

4.3 **Face Detection and Extraction:** Face detection is
important as the image taken through the webcam and furnished as an input to the system, face detection algorithm is applied to identify the human faces in that image, the number of images
processing algorithms are also applied to detect faces in an
image and find the location of that detected face. We have used the HOG (histogram of oriented gradients) method to detect human faces in a given image.

4.4 **Face Positioning:** There are 68 specific points or landmarks in a
human face. The main function of this step is to detect landmarks of faces and to position the image. A python
script is used to detect the face landmarks and to position the face as much as possible without distorting the image.

4.5 **Face Encoding:** After the face is detected in the given image, the unique identifying facial features for each image are extracted. Basically,
The 128 key facial points are extracted for each image from the given input with high accuracy and these 128-d facial points are stored in a data file for face recognition.

4.6 **Face matching:** In the final step of face recognition process, we have used the deep metric learning which is capable of returning a real value feature
vector with high accuracy. We use compare_faces function from face_recognition library to compute the Euclidean distance between face in image and all faces in the dataset. If the input image is matched with the least Euclidean distance over the existing dataset, it will mark the attendance.

4.7 **Attendance Marking:**
After the face is matched, an entry in the excel sheet is added with the name and time to mark the attendance.
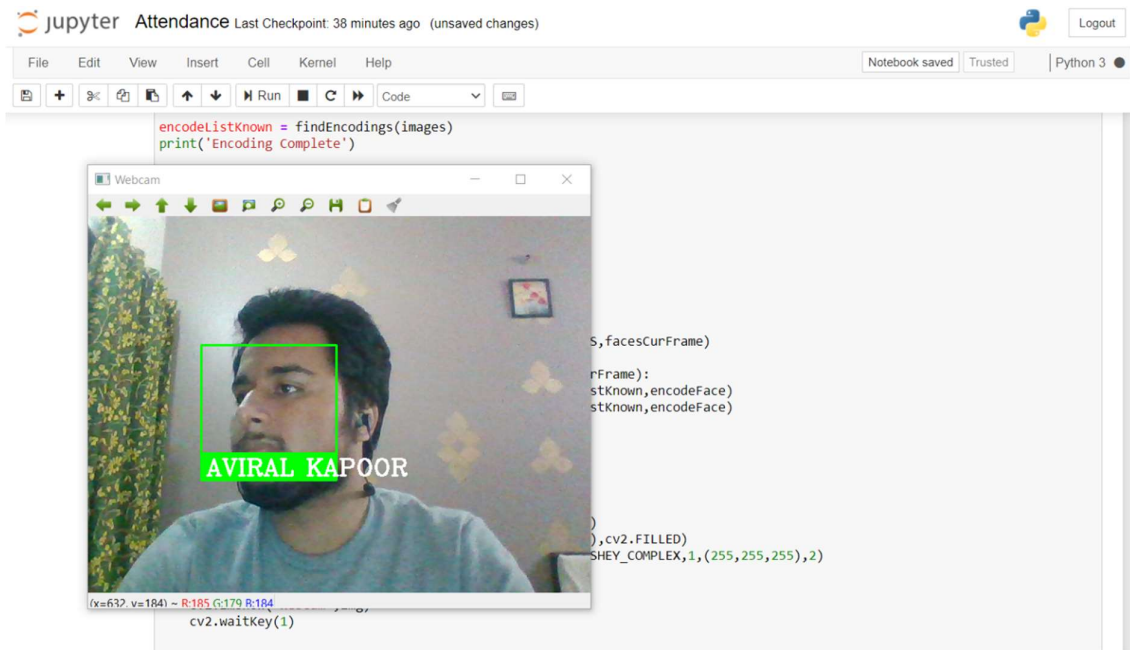
5. **Implementation**
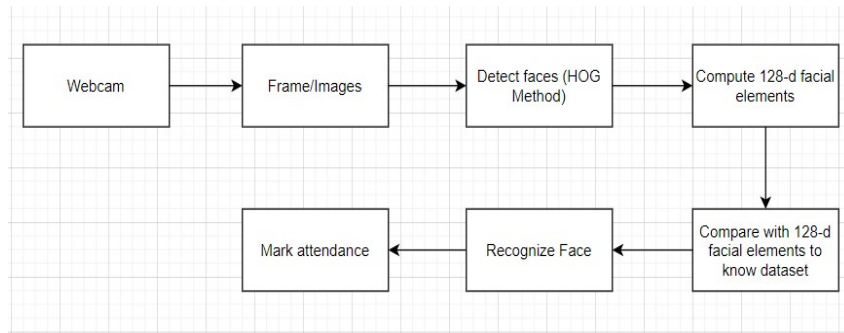
Block Diagram

5.1 **Process**
After the webcam supplies the image as an input to the neural network, it detects the face using HOG method. From the detected face 128-d facial embedded features are extracted and are compared with the stored 128-d facial element vector in the dataset. After a match is found, attendance is marked in the excel sheet by adding an entry with name and time, otherwise not.

5.2 **Result and Inference**
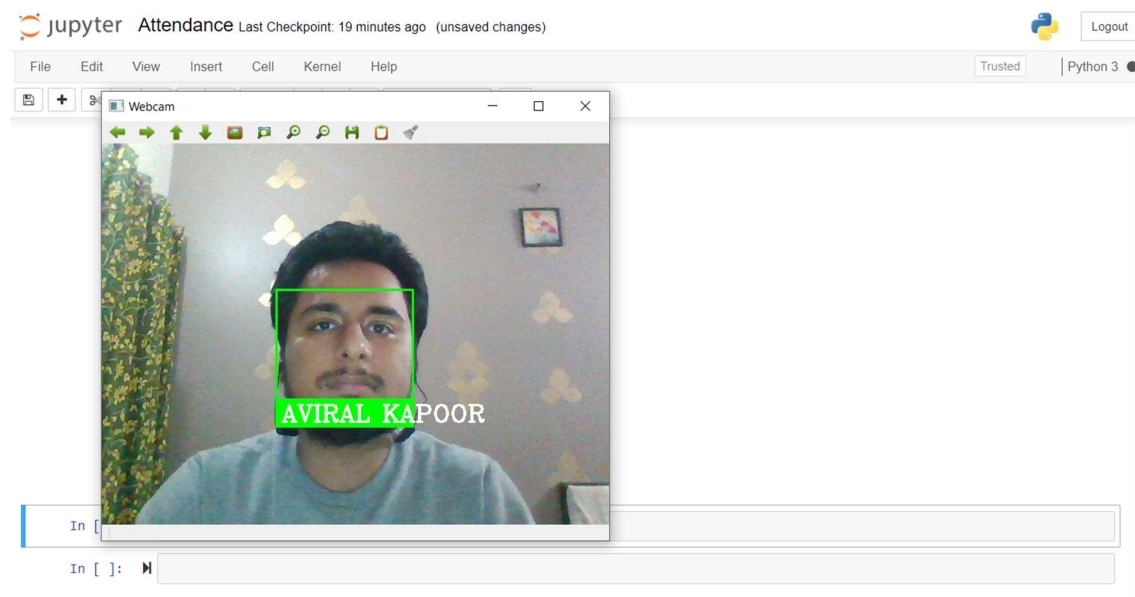
Real-time image Capturing using webcam (Front profile)

Real-time image Capturing using webcam (Side profile)

Attendance Excel Sheet

```
['Aviral Kapoor.png', 'Bill.jpg', 'Elon.jpg']
['Aviral Kapoor', 'Bill', 'Elon']
Encoding Complete
[True, False, False] [0.47660079 0.81531634 0.82572608]
```

From the above data we can conclude that left most picture (*Aviral Kapoor*) has the least face distance from the input image, therefore justifying the above results.

6. <u>Conclusion</u>

Attendance system using face recognition is designed to overcome the issues of existing manual attendance systems. We have used face recognition concept to mark the attendance of student and make the system more accurate and efficient. The system performs satisfactory in different poses and variations. The system sometime fails to recognize from a considerable amount of distance, which can be improved in future. Also, the performance of the recognition process depends upon the processing speed of the system over which it is executed. A system of high processing speed may result even more efficient.

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