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Smart Attendance System Using Deep Learning

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ABSTRACT: Face recognition systems are used in practically every industry in this digital age. One of the most widely utilized biometrics is face recognition. It can be used for security, authentication, and identity, among other things. Despite its low accuracy when compared to iris and fingerprint identification, it is commonly employed because to its non-invasive and contactless approach. Face recognition systems can also be used to track attendance in schools, colleges, and companies.

KEYWORDS: Machine Learning, Face Recognition, Assessment, Face Detection Algorithm, LBPH,HAARCASCADE

I. INTRODUCTION

The main goal of this project is to create an automated student attendance system based on facial recognition. This proposed approach's test and training images are limited to frontal and upright facial photographs of a single face alone, in order to obtain superior performance. To ensure that there is no quality variation between the test and training photographs, they must be acquired with the same instrument. In order to be acknowledged, students must also register in the database.

Checking for student presence and maintaining attendance is a time-consuming task for the institute. Each institute has approved its own way of taking attendance, such as calling names or sending out attendance forms. RFID, IRIS, FINGERPRINT, and other popular automatic attendance systems are now in use.

Making a queue, on the other hand, is necessary in these situations, therefore it takes more time and is inconvenient. If the RFID card is damaged, it may result in an incorrect attendance. Aside from that, adopting these systems on a wide scale is not cost effective, and posting attendance takes a long time. Face recognition is a good method to have both time and cost efficiency with no human participation because people's first scheme of person identification is their face. The efficiency of this system continues to improve as the field of image processing develops at a rapid pace. We utilize an image to register attendance in lectures or sections, and we keep a database of attendance in this system, which gives an automated attendancesysteM. It takes almost no work from the user's side after generating the student database. As a result, there is no intrusive nature in this system, which makes it more effective.

II. LITERATURE SURVEY

In this paper, a deep learning approach was used to execute Student Attendance.This technology automatically recognises keeps track of student records such as attendance. As a result, by identifying the student's face, the student's attendance can be determined. As a result of the recognition, the student's attendance information [1].Automated Attendance System Using Face Recognition proposes that the system is based on face detection and recognition algorithms, which are used to automatically detect the student face when he/she enters the class and the system is capable of recognising him and marking his attendance. For face identification, the Viola-Jones Method was utilised, which detects human faces utilising a cascade classifier, Haar_Cascade_Frontal_Face algorithm for classification, and LBPH for feature selection.When compared to traditional attendance tracking, this technique saves time and aids in student monitoring [3]. In this proposed system, the student is supposed to be standing in front of the camera so that the system may detect and recognise his or her iris and mark his or her attendance. Some Gray Scale Conversion and Six Segment Algorithms are examples of such algorithms. Skin Pixel Detection is being employed with a Rectangular Filter discover the iris. It aids in the prevention of proxy difficulties and maintains the student's attendance in an

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efficient manner in a time-consuming manner, but in one of the most time-consuming processes for a pupil or a member of staff to wait until the prior task is completed members [5]. This research suggests that the system uses continuous observation to automatically recognise attendance. Continuous observation helps in estimating and increasing attendance performance. The positions and faces of the users present in the class room are captured to determine the attendance [8].

III. PROPOSED SYSTEM

A. *Proposed Work*

Face recognition-based attendance system can be separated into five key modules in the suggested system.
The following are the modules and their functions.

B. *Image Capture*

The camera is positioned at a distance from the entrance to catch the students' frontal images.

C. *Face detection*

Face recognition systems always perform better when they use a good and efficient face detection algorithm. Face detection techniques include face knowledge-based methods, feature invariant methods, and machine learning-based methods. I developed a technique for locating faces in digital photos for this project. These are only available in JPEG format.Before we go any further, it's important to understand the difference between face recognition and face detection. Although they are not identical, one is dependent on the other. In this example, face recognition necessitates face detection in order to "recognize" a face. I'm solely going to talk about facial detection. Face detection employs classifiers, which are algorithms that determine if an image contains a face(1) or does not contain a face(0).
Classifiers have been trained to detect faces using thousands to millions of images in order to get more accuracy. OpenCV uses two types of classifiers, LBP (Local Binary Pattern) and Haar Cascades

D. *Understanding Haar Cascades*

The basis of a Haar Cascade is "Haar Wavelets," which are defined as "a succession of rescaled "square-shaped" functions that collectively comprise a wavelet family or basis." It uses the Haar Wavelet approach to break down pixels in an image into squares based on their function. This makes use of machine learning techniques to extract a high level of accuracy from "training data." The "features" discovered are computed using "integral picture" principles.The Classifiers learning method is used in Haar Cascades, which picks a small number of essential features from a vast set to get an effective classifier result.

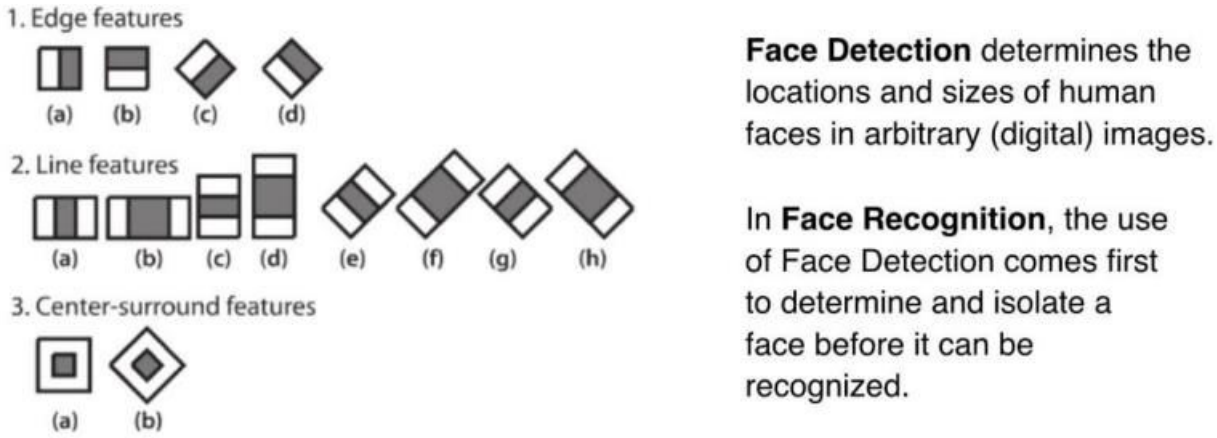

Fig 1. Face Detection and Face Recognition using Haar Cascades

E. *Pre-Processing*

The face that has been discovered is retrieved and pre-processed. The retrieved facial picture is histogram equalized and scaled to 100x100 pixels in this pre-processing stage. The most frequent technique for histogram normalisation is histogram equalization. This improves the image's contrast by widening the intensity ranges in the image and making it more ideal.

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F. Post -Processing

After recognising all of the user faces, the proposed system updates the names of individuals onto an excel sheet prepared by the database's exporting process. The database may also provide reports on student attendance on a monthly and day basis. Faculty can look at the records that have been generated.As a result, the system will be able to be corrected, making it more stable and accurate.

G. Proposed Algorithm

1. Capture the student's image through camera.
2. Detect each and every individual face by apply face detection algorithm.
3. Extract the ROI(Region Of Interest) in rectangular bounding box.
4. Converting to gray scale, apply histogram equalization and resize to 100x 100 i.e. apply pre-processing.
5. If image captured then Store in database Else Apply LBPH (for feature extraction) End if
6.Post-processing

H. Proposed Architecture

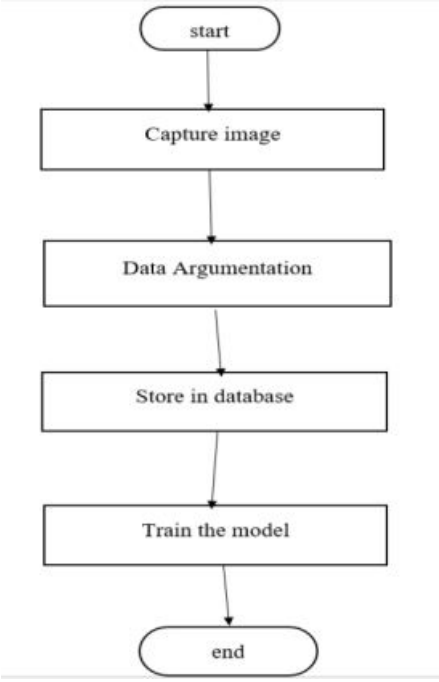

Fig 2. Proposed Architecture

V. RESULTS & DISCUSSION

Local Binary Patterns Histogram(LBPH) :

Step- by -step algorithm:

1. **Parameters:** the LBPH uses 4 parameters: • Radius: the radius is used to build the circular local binary pattern and represents the radius around the central pixel. It is usually set to 1. • Neighbours: the number of sample points to build the circular local binary pattern. Keep in mind: the more sample points you include, the higher the computational cost. It is usually set to 8.
    - Grid X: the number of cells in the horizontal direction. The additional cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.
    - Grid Y: the number of cells in the vertical direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector .
2. **Training the Algorithm:** First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of

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the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID.

3. **Applying the LBP operation:** The first computational step of the LBPH is to create a intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameter's radius and neighbours.
4. **Extracting the Histograms:** Now, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids.

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. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^{n} (hist1_i - hist2_i)^2}$$

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

Output 1: When the video contains new user,It displays as unknown as shown in Fig 1.

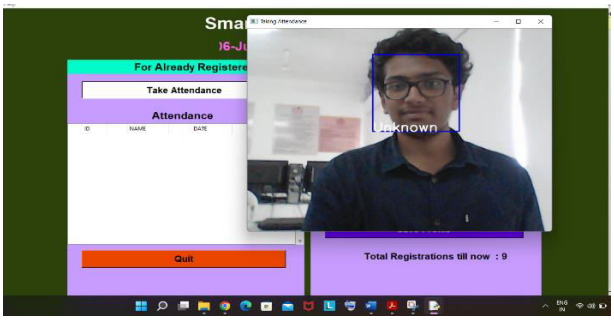

Fig 3. Output 1

Output 2: When the video contains the register user it displays his name and the attendance is updated in excel fileas shown in Fig 2.

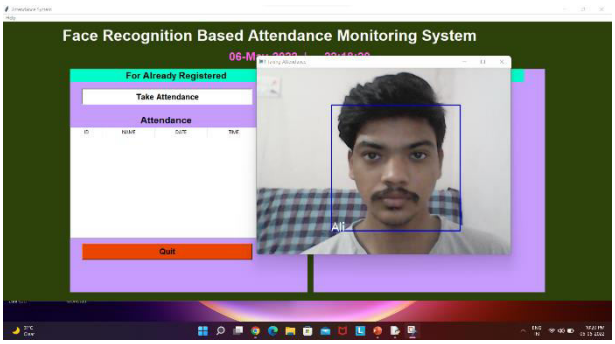

Fig 4. Output 2

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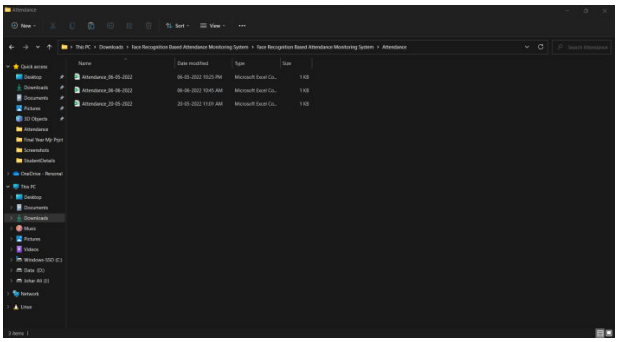

Fig 5. Output 3

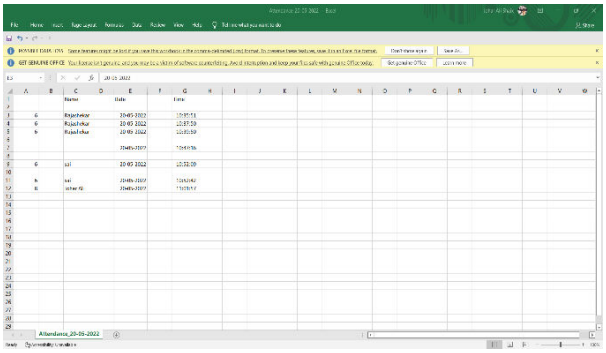

Fig 6. Output 4

Output 4:The attendance is updated for particular day and date and saved in a fileas shown in Fig 3.

Output 3:Attendance is updated with date and time in the particular excel sheetas shown in Fig 4.

VI. CONCLUSION

This system eliminates the need for a fail-proof of-attendance system and serves as a replacement for all existing systems, such as Radio Frequency Identification and other biometric technologies. It saves time and effort when it comes to taking attendance. Face recognition-based Automated Attendance Systems have therefore shown to be both time-saving and secure.

This technique can also be used to identify an unknown person, whether or not he is affiliated with the organization (or) institution.

VII. Future Work

Further improvements can be implemented to achieve real-time detection of individual students in the surveillance area. We can work with recorded videos instead of taking photos. However, some time is set aside for recording the photos, because continuous recording increases database load. The goal of future research is to enhance algorithm recognition rates when people make unintended changes to their appearance, such as tonsuring their heads, wearing a scarf, or growing a beard.

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