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AUTOMATION OF ATTENDANCE USING DEEP LEARNING

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Abstract - *Student Attendance mainframe structure is defined for managing the student's class attendance data files using the concept of face detection and recognition through open computer vision.This approach is proposed primarily to improve the existing university attendance practices and prevent the waste of resources and time. The concept of moving from the traditional attendance system to the digital one using face detection and recognition techniques has been driven by the automation world's pointing sides.By adding the dataset of an individual, the Student Attendance structure is constructed in this way. In addition to lowering the long-term time burden work, and disposables required, the main goal of constructing this system was to increase the adaptability and performance of the attendance system procedure.The Student Attendance markup structure's primary function is to add and modify a student's attendance notes, make an automatic computation of the number of presentees and absentees depending on the subject and affability of the class, and then produce an automated document or spreadsheet.The concept of open computer vision is used in this approach, which is entirely based on the general-purpose language Python.For face detection system we used haarcascade and for face recognition, we used LBPH model;After training each individual student, the system generated a spreadsheet that included the number of students present in the classroom along with a picture or video that was captured live.*

Key Words: Principal Component Analysis, SVM, Dlib, LBP Feature, API, Tensorflow

1. INTRODUCTION

Maintaining attendance is crucial at any institute for monitoring the quality of education. Students' attendance is routinely recorded by establishing attendance files or notes provided by the departmental arch in the depths of the institutions. The teacher manually takes attendance by calling out each student's name and confirming whether or not they are present in the class. This process is dull, time-consuming, and unreliable because students frequently make the wrong calls for their absent friends. Additionally, this procedure makes it more difficult to alter every student's attendance in a large classroom. In order to automatically identify the students in a class and record their attendance by collecting their frames, we designed this application and used a range of techniques, including facial exposure and an understanding system. While some biotech assimilation metrics can be increased properly, in the past, students typically had to wait longer when they entered the room for attendance. Face recognition is the best option because of its non-intrusiveness and familiarity, as people generally know other people by their facial features. This facial biometric structure primarily consists of an enrolled approach in which, following the process of detecting and understanding, the key distinguishing characteristics of each individual face will be saved in the dataset. The traditional methods for analyzing student engagement in particular subjects involve physically signing the attendance logs in a PC framework for analysis. This approach is ineffective because students would sign up for their absent classmates, which is boring, unpleasant, and prone to errors. The use of the face identification and acknowledgment framework in place of the conventional methods will provide a quicker and more effective method for accurately capturing student participation while also providing secure, reliable, and strong restrictions on the framework records. After these restrictions have been approved, one can access the records for any purpose, including for organization, guardianship, or even for the student's own studies.

2. LITERATURE REVIEW

2.1 Face Recognition: From Traditional to Deep Learning Methods

Early face recognition research centered on techniques that matched basic features using image processing algorithms de-tracing the faces' geometrical shapes. Nevertheless, these techniques only functioned in incredibly restricted circumstances, they demonstrated. Computers are capable of recognizing faces automatically. Then, statistical sub spaces techniques like principal component linear discriminant analysis with principal component analysis (LDA) grew in acceptance. These techniques are known as holistic because they incorporate data from the full-face region. During this time, advancements in other computer vision fields led to the creation of capable local feature extractors that elucidate the texture of an image in several areas. Feature-based methods for facial recognition involve comparing these regional specifics over pictures of faces. Hybrid methods were created by further developing and combining holistic and feature-based approaches. Face recognition software using a combination of techniques Up until recently, state-of-the-art technology was deep learning the most effective strategy for most computer vision applications, such as facial identification. The remainder of this text summarizes some of the most notable reviews Each of the aforementioned kinds of strategies is supported by a search.

2.2 Class Attendance System Using Viola-Jones Algorithm and Principal Component Analysis

The outcome in Viola and Jones depends on the data and unreliable classifiers. The uniformity of the training set has a significant impact on the final detection's quality. Important considerations include the size of the sets and the inter class variability. When numerous people with different sequences are considered, the analysis yields very poor results. Viola and Jones algorithm is the employed algorithm in this paper. The data's training process should be carried out properly in such a way that the quality of the final detection increase. The system overview ought to include the overall building design that will the concise and thorough details about the project.

2.3 Automatic attendance system using Deep Learning

The system is put into practice under the basic and fundamental tenet of a digital camera in the classroom. In a lecture that lasted 50 minutes, the digital camera would take 2 pictures every 25 minutes. The system will now get the image and extract all of the faces from it. Now, the existence of the face would be determined by comparison with the trained model of faces already in use. If a student's face is in the current database, the system will save their unique ID in the attendance database or discards them if the student isn't in the database. Student database We have tackled a number of issues in this study, including real-time face detection, multiple face detection, and integration with the computer learning algorithm. The actual challenge in putting an idea into practice was real-time face extraction from an image. In order to resolve this problem, we employed using the Deep Neural Network (DNN) of the Tensorflow estimator API, which is also trained from the instantaneously extracted photos. However, finding face-like patterns is only a small portion of the issue. You must use face recognition technology using an algorithm to successfully identify a student from a database of pupils. We used Google's face net, a model that has been pre-trained on 150 000 photos and was inspired by the Google Pixel, to deal with this problem.

2.4 Face Recognition Using Neural Network

The computation is slow and the detecting method is complicated. Performance compared to the Viola-Jones algorithm is typically worse. The algorithm is neural network-based. This strategy is only effective if the large size of the image was taught.

3. IMPLEMENTATION

3.1 Existing System

In the last few years, face recognition technology has embraced a wide range of methodologies, but the classical methodology still predominates. Component analysis, discriminating analysis, discrete transformation, and component analysis are categories for prestigious face recognition. It is considered to be the most important element in facial recognition technology. Numerous researchers in the field of facial recognition technologies employ the eigenfaces technique. The main element of this technique is eigenfaces. Basically, it divided a variety of input variables into several classes (Li & Hua, 2015). The PCA (Principal Component Analysis) algorithm can be used to extract the image data in its original form. One of the fundamental principles that PCA adheres to is that it can recreate the image's original form from the original collection by using eigenfaces. In face recognition technology, Eigenfaces are regarded as the key component. Eigenfaces typically depict the primary facial characteristics, which the original image may not have had.

3.2 Proposed System

An attempt is made to develop the automated facial attendance system utilizing SVM on the LBP feature taking into account the drawbacks of some of the systems listed in the previous works, as the LBP method provides good accuracy in comparison to other systems. The suggested method introduces an automated attendance system that incorporates a facial recognition algorithm and an Android app. Any device with a camera is capable of taking a picture or a video, which it may then upload using a web application. The received file is put through face detection and recognition processes, so the detected faces are extracted from the image.

3.3 Gap Identified

A few drawbacks of facial recognition are image quality, size, angle of facing, and processing time. performance of the facial recognition algorithm is first fundamentally influenced by the image quality. When compared to a digital camera, the video scanning of an image has inferior quality. The method of facial detection as a whole was impacted by the image quality. Face recognition poses considerable challenges in terms of storage and processing. To recognize a person's true appearance, a certain angle is chosen (Minaee & Wang, 2015). The process of detecting faces will be severely hampered by the several angles that must be used in order to obtain an adequate face while employing recognition software. In essence, they adopted the 2D facial type's photo structure. This format prevents facial recognition software from currently detecting numerous faces. The facial recognition technology will experience issues because of the person's movements, which resulted in erroneous photographs being captured. It is necessary to use current software, which is highly expensive on the market, for more accuracy. The detection method can occasionally run into trouble when the photos are blurry. The effectiveness of facial recognition technology is also influenced by the camera's perspective.

3.4 Principal Component Analysis (PCA)

It is derived from the transition of Karhunen-Loeve. Principal Component Analysis (PCA) often locates a t-dimensional subspace whose basis vectors correspond to the largest variance direction in the original image space giving a dimensional vector representation of each face in a training set of photos. Typically, this new subspace has a lower dimension (ts). The PCA basis vectors are defined as eigenvectors of the scatter matrix if the image elements are thought of as random variables. For dimensionality reduction, the Eigenface technique use PCA to identify the vectors that best capture the distribution of face pictures throughout the whole image space. The subspace of face images is defined by these vectors, and it is known as face space. To determine a set of weights that accurately represents the contribution of each vector in the face space, all of the faces in the training set are projected onto the face space. To generate the appropriate set of weights for identifying a test picture, the test image must be projected into the face space. The face in the test image can be recognized by comparing the weights of the test image with the set of weights of the faces in the training set. The foundation of PCA's primary method is the Karhumen-Loeve transformation. The image might be viewed as a sample of a stochastic process if the image's constituent parts are assumed to represent random variables. The eigenvectors of the scatter matrix ST, ST=Σ N i=1 (xi - μ)(xi - μ)T, are what are known as the PCA basis vectors.

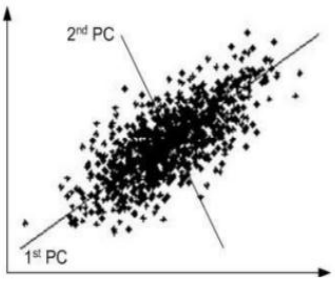
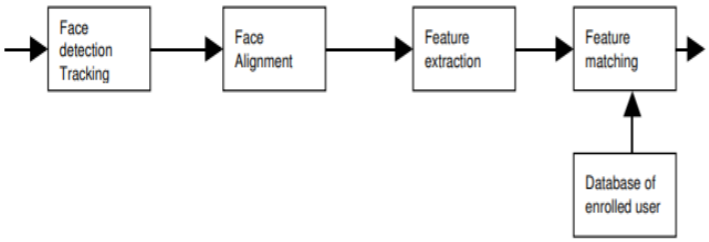


Fig.4.3.1. Principal Components (PC) of a two-dimensional set of points. The first principal component provides an optimal linear dimension reduction from 2D to 1D, in the sense of the mean square error.

4. SYSTEM OVERVIEW

The ultimate objective of a face recognition system is image understanding, or the ability to recognize an image's meaning in addition to its structure. A general definition of automatic face recognition is as follows: given still or moving photographs of a scene, identify or confirm one or more people in the scene using a database of faces that have as been previously recorded. The challenge can be solved by segmenting faces (facial detection) from cluttered scenes, extracting features from the face regions, and then identifying or verifying the faces. The input for identification is an unidentified face, and the system returns the identity it has deduced from a database of well-known people, whereas in issues with verification: the system must accept or reject the claim of the input's identity.



4.1 Data Set Creation

1. Obtain the class's student roster.

2. Look through each image folder associated with each student.

3. The parent folder name appears as the class label for each image.

4. Determine whether a face is there by applying a face detection algorithm to the face.

5. Get the bounding box coordinates if a face is found.

6. Crop the image so that it only contains a face using the bounding box coordinates.

7. Use Dlib to determine the direction of the face, then apply transforms to align the eyes, mouth, and other facial features at a specific angle. This guarantees the neural network's input is of high quality.

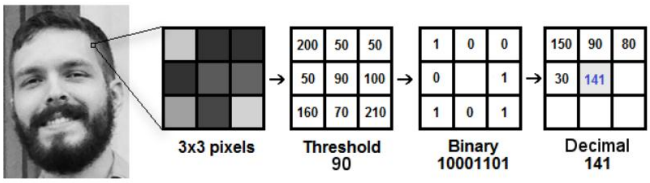
8. Feed the neural network with the aligned image. The network produces 128 measurements of each face.

9. At this point, the image's data have been extracted. Train a classifier using this embedding vector.

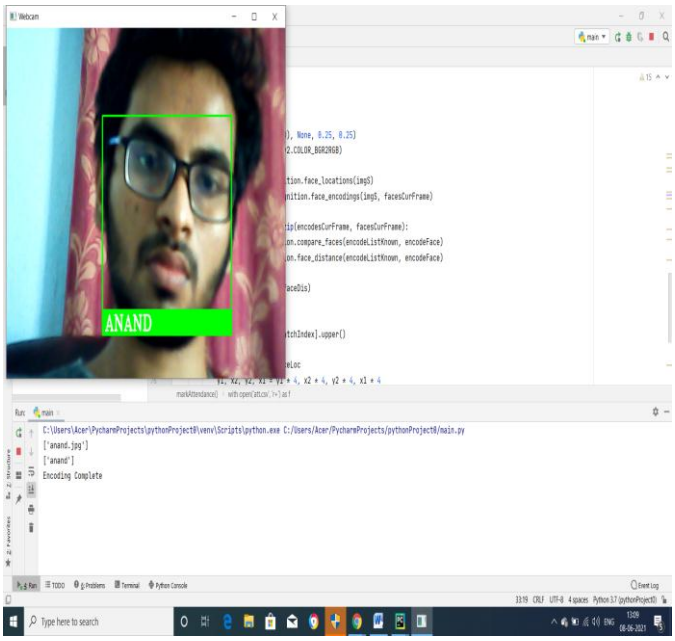
10. The classifier is finished off and saved as an object, which can later be imported from the database and used to make predictions.

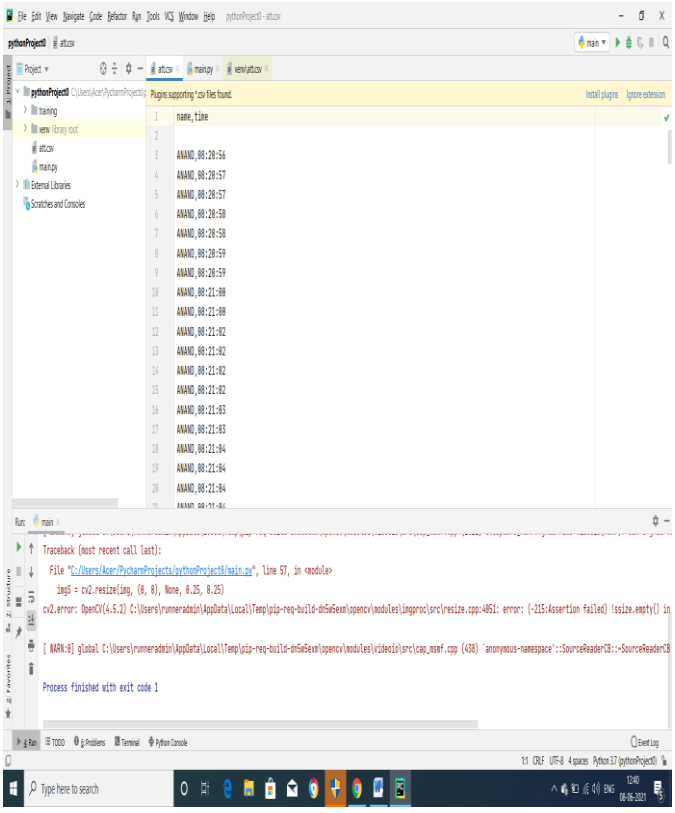
4.2 Applying the LBP operation

The initial computational stage of the LBPH is to produce an intermediate image that, by emphasizing the face features of the original image, more accurately describes the original image. The method does this by utilizing a sliding window idea depending on radius and neighbour. The procedure is shown in the image.



5. EXPERIMENTAL RESULTS





6. CONCLUSION

This method has been suggested to keep up attendance. The paperwork and stationery are replaced with an automated system that is quick, effective, cost-effective, and time-saving. The proposed system, however, is anticipated to produce the intended outcomes. Integrating other effective methods could also increase efficiency. Here, we've covered a variety of face identification techniques that the researcher utilized. These techniques might be applied by educational or business institutions to track students' attendance at lectures by identifying their faces. In order to classify faces, we are attempting to develop a system using Improved Support Vector Machines (IVSM) on LBP features in the following phase.

FUTURE DEVELOPMENT

In the future, we'll connect the system with the email address and mobile number so that if anybody doesn't show up, an automatic SMS or MAIL will be sent to them.

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