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The Application of Deep Learning to Face Recognition for an Attendance Tracking System

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ABSTRACT

The human face is the feature that most clearly identifies a person. The face recognition system can be developed to use facial characteristics as a biometric. The most difficult task is frequently keeping track of attendance. The conventional method of keeping track of attendance is calling out the pupils and accurately documenting their presence or absence. However, these conventional methods require a lot of time and effort. The Open CV-based facial recognition technique is presented in this work. The model consists of a camera that captures input photos, a face detection algorithm, face encoding and identification, and attendance tracking in a spreadsheet. By teaching the system with the faces of the authorised pupils, the training database is established. A deep learning system was used in this study to identify a person's face. A deep learning method utilised in this is convolution neural networks. The LBPH offers good accuracy when compared to other currently employed approaches.

Keywords—Face Attendance,Face detection, Training, Face Recognition, Computer Vision, Deep Learning,

1. INTRODUCTION

A method for recognising someone or verifying their identification by looking at their face is facial recognition. In addition to still images and moving pictures, face recognition technology can recognise people in real time. The fundamental supervised classification job entails optimising the logistic classifier utilising gradient descent, stochastic gradient descent, momentum, and the adaptive sub-gradient technique. Historical data and motivation for in-depth learning Deep networks, regularising model exploration, and hyper parameter tweaking are a few examples of neural networks. Convolution neural networks are used to classify text and images, stack data, stride data, and pool data, among other things. Face verification, also known as facial recognition, involves comparing two faces to see if they match. Therefore, it is common practise to utilise face verification to compare a candidate's face to that of another. This can be used to confirm that the face on an ID and a physical document are the same[1]. By matching the faces of people passing by particular cameras with those on a watch list, facial recognition technology can also be used to unlock phones. The photos on the watch lists might be from anywhere, including our social media accounts, and they could feature anyone, including those who are not suspected of having committed a crime. Despite possible differences, facial technology systems frequently work.

2. LITERATURE SURVAVEY

This section assesses the research studies conducted by diverse researchers that are pertinent to the proposed endeavour. Using a software development kit and any of the available programming languages, such as Java, to create the mobile application is common (SDK). Databases are where information used or processed by an application is kept [2]. The following mobile application developers have had experience utilising structured query language to create databases to track student attendance (SQL). A mobile-based attendance system built with Visual Basic.Net (VB.NET) and a SQL server was presented by Somasundaram et al. This system is used to manage, find, save, and organise student information. It also facilitates the development of reports utilising student data. An android-based mobile app was suggested by K. Akhila et al. for tracking student attendance. [3] Android smartphones provide dependability and time savings in addition to making it simple to manage and take attendance. The effort put forward by staff employees to maintain attendance can be reduced. It is a trustworthy and simple Android app for managing attendance. An android-based attendance management with smart learning system was created by Rakhi Joshi et al. A SQL server is used in the development of the web-based mobile application. This technology tracks student attendance using a smart phone and notifies students through SMS when their attendance falls below the required threshold. Amita Dhale and coworkers also conducted a poll on smart connect, Android, and the web. Businesses and offices utilise the mobile application-based attendance management solution to track staff attendance. A mobile application for employee registration and mobile attendance was developed by S.P. Avinash Ram and J. Albert Mayan. It is used to track and update personnel attendance on a regular basis [4]. Taking attendance has advantages for both the authorities and the personnel. The number of employees and if they are long-term workers are simply tracked using this method as well. Additionally, this system provides data about each employee.

3. EXISTING METHOD

Support vector machines (SVMs) are a binary classification method that may be used to classify data, and face recognition is a K class issue, where K is the number of known persons [5]. We created an SVM-based face recognition algorithm by rephrasing the face recognition problem and reevaluating the SVM classifier's output. To model the differences between two facial photographs, the face recognition problem is framed as a difference space problem. Face recognition is formulated as a two class issue in difference space. The categories include distinctions between the faces of the same individual and differences between the faces of different people. In order to create a similarity metric between faces that is learned from instances of differences between faces, we modified the concept of the decision surface created by the SVM. On a challenging set of photos from the FERET database, the SVM-based method and a PCA-based methodology are contrasted. Performance was evaluated in a variety of circumstances
, including identification and verification [6]. SVM's identification performance is between 77 and 78 percent compared to PCA's 54 percent. The verification error rates for SVM and PCA are 7% and 13%, respectively. In order to overcome the difficulty of two-class pattern recognition, support vector machines are used (SVMs). By altering the way an SVM classifier reads its output and creating a representation of facial images that is compatible with the two class problem, SVM can be utilised for face recognition. The object's class is returned as a binary value by conventional SVM [7].

DISADVANTAGES OF EXISTING METHOD

- The support vector machine method is unsuitable for large data sets.
- It performs poorly when the target classes overlap and there is greater noise in the data set.
- When there are more attributes for each data point than there are training data samples, the support vector machine will not perform well.
- Due to the support vector classifier's placement of data points above and below the classifying hyperplane, there is no such probabilistic justification for the classification.

4. PROPOSED METHODLOGY

The human face is the feature that most clearly identifies a person. The face recognition system can be developed to use facial characteristics as a biometric. Always maintaining track of attendance is the most challenging task to perform. In the conventional way of taking attendance, the teachers summon the students forward and properly record their presence or absence. These traditional approaches are time- and labor-intensive, nevertheless. In this study, the Open CV-based facial recognition method has been proposed. This method comprises a camera that captures a picture as input, a face-detection algorithm, encoding and recognising the face, and recording attendance in a spreadsheet. The training database is created by educating the system using the authorised students' faces.

4.2 Use Case Diagram

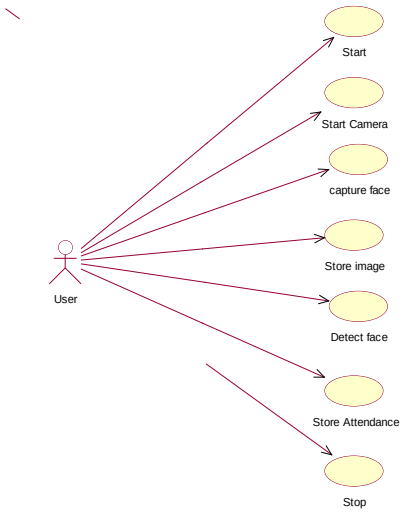

Figure 1 Overview of Attendance System

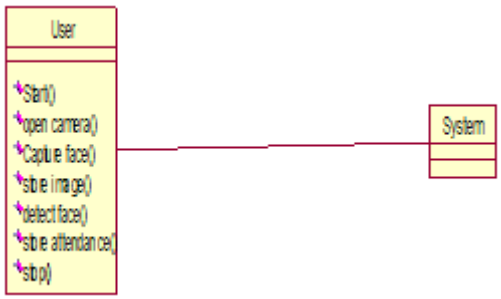

Figure 2 Class diagram for attendance system

4.3 ALGORITHM

Step 1
A photo of the student's face will be taken and stored in the files for a defined amount of time. The input size determined the maximum 256*256 size of the image that was recorded.
Step 2
The captured image will first run through a face detection algorithm to make sure the system can recognise a face in every portrait.

Step 3
If a specific face is detected in the taken image, cropping will then be applied. Color conversion occurs before the files are actually saved.
Step 4
The path to each saved image was then used to produce a csv file with the relevant labels for each image. The csv file is created to assist with list insertion of the labels that correspond to the photographs (80% training).
Step5
The photographs in the created list that were taken from the csv will then be sent to a recognizer known as the eigen face recognizer (library provided by open CV) to carry out the training.
Step 6
Once the relevant student has been located through the capturing procedure, a record of the current attendance will be added to the attendance table kept by the database (20 percent testing).

4.4 FLOW CHART
The following figure shows the working procedure of the algorithm.

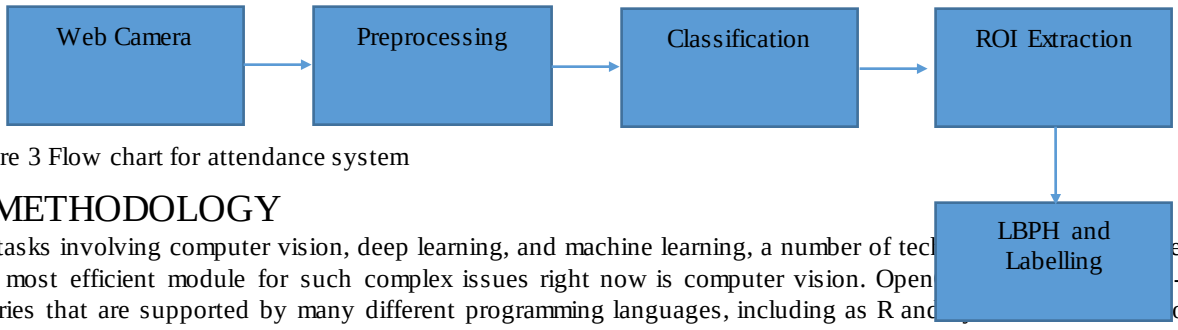

Figure 3 Flow chart for attendance system

5. METHODOLOGY

For tasks involving computer vision, deep learning, and machine learning, a number of tech essible. The most efficient module for such complex issues right now is computer vision. Open -source libraries that are supported by many different programming languages, including as R and oubt, it works with many other operating systems, including Windows.

Figure 4 Capturing image

Make sure the photographs have a resolution that is sufficient. In images with a quality of up to 1920 x 1080 pixels, Amazon Recognition can detect faces as small as 50 x 50 pixels. A larger minimum face size is necessary for photos with higher resolution. The collecting of facial comparison data is more accurate for faces that are larger than the minimum size.

Gray scaling is the process of translating an image from multiple colour schemes, including RGB, CMYK, HSV, and others, to different tones of grey. There are several tones of the colours black and white.

The first step is to train the algorithm. We need a dataset containing the facial photographs of the people whose identities we want to obtain in order to accomplish this. In order for the algorithm to identify between input and output photographs, each image must additionally contain an ID (which might be a number or a name). The same ID must appear on every image of the same person. Let's investigate the LBPH computations using the trained data.

Figure 5 Trained images

By giving the input image as a parameter and using the selectROI() function, the user can choose the region of interest by drawing a bounding box around the desired object. The image enclosed within the bounding box created by the selectROI() method can then be cropped using the imCrop() function. The cropped image can then be displayed as the only output on the screen.

6. RESULTS

Figure 6, 7 and 8 shows the GUI of proposed method output. The proposed system capturing the student face and automatically detecting there face image and processing the detected image. Finally its updating their attendance details in excel sheet.

Figure 6 Attendance on display (GUI)

Figure 7 Attendance Taking

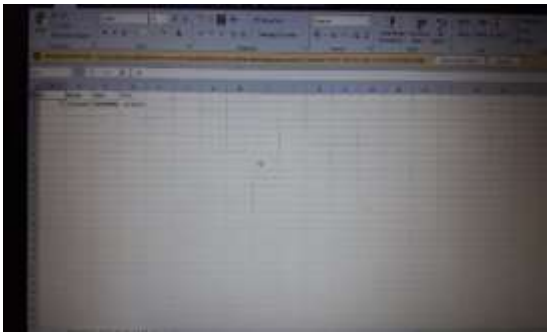

Figure 8 Attendance stored in csv file

7 .CONCLUSION

For this reason, the goal of the project is to capture student video, convert it into frames, connect it to the database to confirm their presence or absence, and mark attendance for a particular student in order to maintain a record. The Automated Classroom Attendance System assists in enhancing accuracy and speed, ultimately reaching high-precision real-time attendance, to satisfy the demand for autonomous classroom evaluation. In this project, we are using a deep learning algorithm (CNN) to recognise a student's face in order to take attendance. Deep learning can correctly identify a student's face 80% of the time. The majority of the photos, or 64 of them, are utilised for training, while the remaining 20% are for testing. The accuracy of the algorithm can be improved by applying different deep learning techniques.

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