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Face Recognition with Machine Learning

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Abstract: *In this paper, we proposed a facial recognition system using machine learning, specifically support vector machines (SVM). First, a training set of different persons' faces has to be collected and used to train a face recognizer. The resulting face model can be utilized to classify people in specific individuals or unknowns. It is called a Biometric Identification based application that uniquely identifies each individual by analysing their facial expression, face. Even though it was initially used as a computer application, it has gained broader uses in mobile platforms and other technology sectors. Facial recognition technology has become very popular and is being used everywhere from shopping centre, airports, venues, and by law enforcement. This technology can also be used to prevent crimes such as shoplifting by identifying ex-cons. Although this technology is gaining widespread use, there are many concerns about privacy and safety. Online examinations have turned out to be the new normal. However, it is not that easy to proctor the students as rigorously as in in-centre examinations. It is essential to find an approach to proctor the online examinations too as rigorously as possible.*

Keywords: Machine Learning, Support Vector Machine. Face Detection and Recognition and Monitoring of Students During Online Examination

I. INTRODUCTION

Today's pandemic situation has transformed the way of educating a student. Education is undertaken remotely through online platforms. In addition to the way the online course contents and online teaching, it has also changed the way of assessments. In online education, monitoring the attendance of the students is very important as the presence of students is part of a good assessment for teaching and learning. Educational institutions have adopting online examination portals for the assessments of the students. These portals make use of face recognition techniques to monitor the activities of the students and identify the malpractice done by them. This is done by capturing the students' activities through a web camera and analysing their gestures and postures.

Image processing algorithms are widely used in the literature to perform face recognition. Despite the progress made to improve the performance of face detection systems, there are issues such as variations in human facial appearance like varying lighting condition, noise in face images, scale, pose etc., that blocks the progress to reach human level accuracy. The use of m-learning or other remote education continue to increase due to its ability to reach people who don't have access to campus. Exams are important components of educational programs as well as on an online learning program. In an exam, a proctoring method to detect and reduce the cheating possibility is very important to ensure that the students have learned the material given. Various methods had been proposed to provide an efficient, comfortable online exam proctoring. Start with implementing an exam design with hard constraints in a no proctoring exam, a remote proctoring using a webcam, a machine-based proctoring and finally research on automated online proctoring. A visual verification for the whole exam session is needed in an online exam, therefore a face verification is needed. A remaining problem in face recognition area is the system robustness for pose and lighting variations. In this paper, we proposed a method to enhance the robustness.

The improvement of e-learning and online evaluation frameworks is increasing rapidly. The Main Goal is to develop a model which is intended to distinguish the ordinary examples for activities of concern, for example, conversations during a test or the pivoting, processes more exactness and computes more accuracy. Certain presumptions about normal behaviour with regards to delegating tests are made. In the existing system, it takes more computational power and speed is less. Even though it computes not much more accuracy and with the system only able to manage one invigilator for

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twenty students. Thus, it is important to develop a framework which is high precision and less the manual force. As a result, the basics of the proposed method is presented in this paper.

II. Literature Review

Due to the significant development of machine learning, the computing environment, and recognition systems, a lot of investigators have closely work with recognition algorithms and identification using different building modelling strategies. Here are some of the most common recent works on FR systems

1. In [1] to execute face detection calculation on an equipment stage, which is basic, yet productive in utilization is haunted. the merchandise source codes for both detection and recognition of countenances are composed utilizing OpenCV
2. Automated method of face recognition using a machine learning SVM
3. In this Real Time Face Detection and Tracking Using OpenCV writer used three distinctive algorithms like Haar cascade, Adaboost, template matching was once described. all through this paper, they symbolize a method for face detection robustly in actual time environment. Here Used of Harr-like-classifier and adaboost algorithm in this it tracks to faces on OpenCV module to detect.

III. Face Detection

Facial Recognition: We have face embedding for each face in the system. Whenever we pass a new face to the system, it calculates its face embedding and compares it with the ones we already have. The face is recognised, if its face embedding closely matches any other face embedding in the database.

Face Detection: To recognise a face, it is first important that we detect/locate a face in an image/video. There are various facial detection software's that can detect a Human face in an image. We extant a human face and then move on to the next step. Viola-Jones algorithm is one of the polar face detection algorithms.

Feature extraction using face embedding: The next step is to extract features from a face using a face embedding model. A face embedding is a vector that represents the features extracted from the face and we can use these vectors to recognise faces. Note that face embedding for the same face may be really close in the vector space, whereas the face embeddings of two different faces may be really far away. We get a face embedding after passing the image through a face embedding model.

Facial detection via the Viola-Jones algorithm is a common method used due to its high detection rate and fast processing speed. The algorithm can be summed up in four steps: feature selection, feature evaluation, feature learning to create a classifier, and cascading classifiers.

Simple features are used, inspired by Haar basis functions, which are essentially rectangular features in various configurations. A two-rectangle feature represents the difference between the sum of the pixels in two adjacent regions of identical shape and size. This idea can be extended to the three-rectangle and four-rectangle features. In order to quickly compute these rectangle features, an alternate representation of the input image is required, called an integral image. The integral image can be represented by the following equation:

$$ii(x, y) = \sum_{x \le x, y \le y} i(x , y)$$

where the integral image is ii(x, y) and the original image is i(x, y). Essentially the integral image at the locations x, y is the sum of all the pixels to the left and above, including the point itself. The integral image representation can be computed with only one iteration through the entire input image, and allows a sum of a rectangular feature to be computed using only four points. In reference to Figure

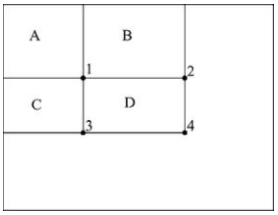

Figure 1: Four array references are required in order to determine the sum of rectangle D.

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equal to the sum of the pixels in A, 2 is equal to the sum of pixels in A and B, 3 is is the sum of pixels in A and C, and lastly 4 is the sum of pixels in A, B, C and D. Knowing this, we can see that to compute the sum of pixels in D, it is simply (4+1) - (2+3). Instead of summing all of the in- dividual pixels within the original image, we can simplify this computation by taking advantage of the integral image and thus reduce the time needed for the feature evaluation part of the algorithm. The learning portion of the face detection algorithm uses Ad boost which basically uses a linear combination of weak classification functions to create a strong classifier. Each classification function is determined by the perceptron which produces the lowest error. However, this is characterized as a weak learner since the classification function does not classify the data well. In order to improve results, a strong classifier is created after multiple rounds of re-weighting a set weak classification functions. These weights of the weak classification functions are inversely proportional to their errors. The goal of this stage is to train the most relevant features of the face and to disregard redundant features. The last step of the Viola-Jones algorithm is a cascade of classifiers. The classifiers constructed in the previous step form a cascade. In this set up structure, the goal is to minimize the computation time and achieve high detection rate. Sub-windows of the input image will be determined a face or non-face with classifiers of increasing complexity. If a there is a positive result from the first classifier, it then gets evaluated by a second more complex classifier, and so on and so forth until the sub-window is rejected. By doing this, the structure utilizes the early stages of the cascade in order to reject as many negatives as possible. Figure 2 below shows a general diagram of the process.

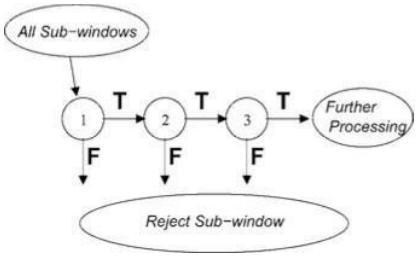

Figure 2: Schematic of the classifier cascade process flow

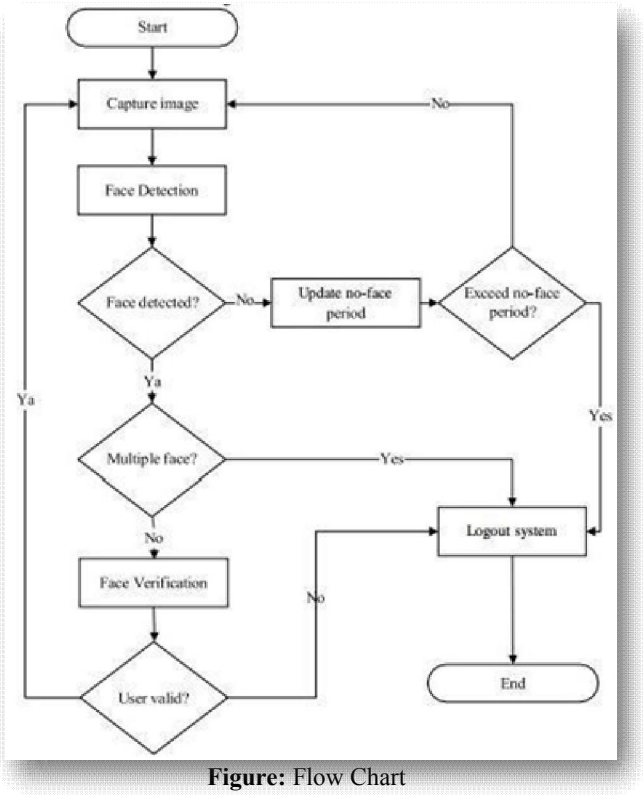

Figure: Flow Chart

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As expected, there is an associated trade-off between the detection performance and the number of false positives. The perceptron's created from the AdaBoost can be tuned to address this trade-off by changing the threshold of the perceptron's. If the threshold is low, the classifier will have a high detection rate at the expense of more false positives. Conversely, if the threshold is high, the classifier will have a low detection rate however with fewer false positives. Adjusting this threshold may not keep the guarantees and training from AdaBoost therefore it is better to address the training process as a whole. This time a trade-off exists between performance in terms of high detection with low false positives and computation time. In general, higher detection rates and lower false positives are the result of classifiers which have more features. However, this also increases computation time. The detector is designed with specific constraints provided by the user which inputs the minimum acceptable detection rate and the maximum acceptable false positive rate. More features and layers are added if the detector does not meet the criteria provided.

IV. METHOD

To solve the problem of online exam cheating we are also add some more features mobile detection, detection of more than one person in the exam, Gaze Estimation: Estimating the position of student body & eyes movements, Taking Students images logs at every 5 seconds, CUT, COPY, PASTE, Taking Screenshots Function is disabled.

4.1 Requirements

1. OpneCV
2. Dlib
3. Tenseflow
4. Speech Recognition

For counting mobile devices and persons during the exam periods on web cam, we used the pre-defined weights of YOLOv3 trained on COCO data set to detect people and mobile phones Also, we have aim to track eyeballs of the test-taker and report if he looks back or left and right using the Gaze tracking Module.

V. APPLICATIONS

The Facial Recognition system has been used in a variety of fields for many applications. Day by day, the use of this technology is increasing. It is used from business solutions to solutions for the home. One of the most important use of the face detection and recognition is monitoring student during online exam. Also used in attendance of students in class. This technology also use big tech company's like apple, one plus, mi to make system of face lock to unlock phones. Its perfect way to protect private information in case phone stolen or lost. Another critical use of Biometric technology is to grant only authorized people entry to sensitive areas of offices, labs, boardrooms, bank vaults, government buildings, and public events for security reasons.

Face recognition can also be used in customs to keep any unnecessary visitors out of the country. We can use this to compare the face with passport photo. Many countries are using this technology. This must be used in India where many people use others I.D for voting this is illegally for money

VI. CONCLUSION

This paper gives an overall information about Facial recognition system for online proctoring system using global approach to feature extraction based on Histogram-Oriented Gradient. An approach this paper for real-time face detection and tracking which can be very useful for machine interaction systems. In a machine interaction environment this system starts with accurate Realtime learning process and then allows the machine to follow the person and to be sure it is always interacting with the right one under a wide range of conditions including: scale, pose and camera variation. The face tracking system works as a pre-processing stage to the face detection system, which allows it to concentrate the face detection task in a sub-window previously classified as face. Then we also extracted the of SVM (support vector machine). Running the model on both train and test database , resulted in over 90% accuracy in matching the input face to face correct person from the screen. face recognition with the its confidence level these all will be possible future enhancement for Face Detection with Machine Learning

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