Face Recognition Based Attendance Management System Using Machine Learning

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***Abstract*- Attendance is a compulsory requirement of every organization. Maintaining attendance register daily is a difficult and time consuming task. There are many automated methods for the same available like Biometric, RFID, eye detection, voice recognition, and many more. This paper provides an efficient and smart method for marking attendance. As it is known that primary identification for any human is its face, face recognition provides an accurate system which overcomes the ambiguities like fake attendance, high cost, and time consumption. This system uses face recognizer library for facial recognition and storing attendance. It has a camera that captures input image, an algorithm to detect a face from the input image, encode it and recognize the face and mark the attendance in a spreadsheet. The system camera of an android phone captures the image and sends it to the server where faces are recognized from the database and attendance is calculated on basis of it. The purpose of reducing the errors that occur in the traditional attendance taking system has been achieved by implementing this automated attendance system using deep learning. Face recognition system have been presented using deep learning which exhibits robustness towards recognition of the users with accuracy of 98.3% and result is converted into a PDF.**

Index Terms- Android application, Biometric, Recognition system, Face Recognition, Deep Learning, Portable Document Format

I. INTRODUCTION

Taking attendance in the schools and colleges is being a waste of time and effort for both the students and lectures. Our brain, as a human is made to do all of this automatically and instantaneously. Computers are incapable of this kind of high-level generalization, so we need to teach or program each Step of face recognition separately.

A biometric such as finger print recognition, facial recognition, iris scanning recognition, voice recognition, signature recognition etc are used. One of those biometric categories is face detection and recognition. Mostly this facial detection and recognition decreases the manual work for human. Images are captured from camera and we apply the face detection techniques. We mostly see the nose, hair, ears, mouth, eyes and also different pose of faces in images. After applying face detection techniques we detected the faces or objects in image and crop that image and apply Face Recognition technique. Face detection includes detecting the face location and presence of face in images. If the image is not in data base then we store that image as new person in database. Next time same image of that new image person appear in image and recognition the face or else taking as new image and storing in database process is repeating Some Face detection techniques are Viola Jones Face Detection Algorithm, (LBP), and Ada-Boost for Face Detection. Some face recognition techniques are Hog features, Haar features, Machine learning. Among the different biometric techniques facial recognition may be the most reliable but it has several advantages over the others. It is widely used in various areas such as security and access control, forensic medicine, police controls and in attendance management system. To avoid the difficulty of taking attendance of large number, there is a need of automated advanced system attendance.

II. AIM

The basic aim is to design an effective and secure technique for personal authentication using facial recognition and also evaluate the performance of the desired framework by comparing performance with other existing systems owing to the difficulty in the manual as well as other traditional means of Attendance systems.

III. SCOPE

- Face Recognition Algorithms
- Image Processing using Open CV
- Use of CV toolbox such as image acquisition toolbar
- Accessing MS-Excel spreadsheet in CV

IV. RELATED WORKS

A. Face Recognition Based on HOG and Fast PCA Algorithm Xiang-Yu Li(&) and Zhen-Xian Lin By using hog features and PCA algorithms face is recognition. By applying recognition algorithm to cropped faces, we get similarity b/w taken image and database image. PAC algorithm used for face detection and recognition.

B. Attendance Marking System Using Biometrics
Biometric are characteristics of human being that can be used to recognize an individual or verify an individual's identity. Attendance is taken electronically with the help of a fingerprint device the record is stored in the database. Attendance is marked after student Identification.

C. The Performance of the Haar Cascade Classifiers Applied to the Face and Eyes Detection
The Haar Cascade is applied to the face and eyes for detection. The system is based on real time face recognition which is fast and reliable and needs improvisation of images in various lighting environments.

V.SYSTEM CONFIGURATION

5.1Python

Python is a powerful programming language. It has efficient high-level data structures. The Python interpreter is easily. It is extended data types implemented in C.
Python is easy to learn. Python's elegant syntax and dynamic typing. They make it an ideal language for scripting and rapid application development in many areas on most platforms.

5.2 OpenCV
It supports a wide variety of programming languages. C++, Python, Java etc and is available on different platforms such as Windows, Linux, OS X, Android, iOS etc. Interfaces based OpenCV are also under active development.
OpenCV-Python is the Python API of OpenCV. It is a combination of OpenCV, C++ API and Python language.

5.3 Tensor Flow
Tensor Flow is a free and open-source software library for dataflow and differentiable programming . It is a symbolic math library. It is used for machine learning applications such as neural networks. It is used for both research and production at Google in Tensor Flow to work in machine learning.

VI. SYSTEM ARCHITECTURE

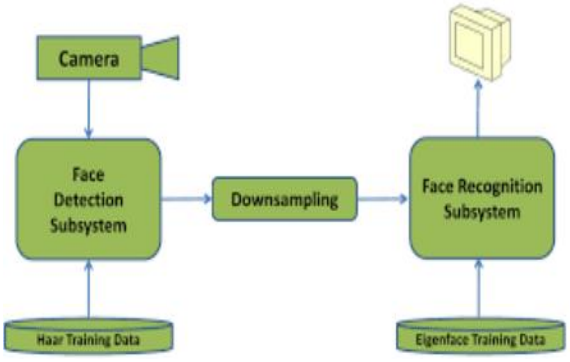

Fig: System Architecture

6.1. Feature Extraction
The first part of the system consists in automatically extracting relevant features from the image. These features will later be used to determine whether two images belong or not to the same person. As such, it is extremely important for it to work properly.

6.2. Person Identification

Even after having the compact representation of each face, we were not even close to finish. The problem of face recognition is difficult precisely because there is no defined set of classes. It could be considered a classification problem with infinite classes, each person being one.

Therefore, there is no point in training a classifier with the aforementioned features. The approach we followed was to try to address the issue by means of the Face Verification approach: given these two pictures, do they belong to the same person? This is the kind of problem for which benchmark results are avail-able, in which a set of image pairs are provided, and the system needs to determine whether they belong or not to the same person. We decided to expand it to be able to recognize people. In order to do so, we required a distance metric between the feature vectors. In the Deep Face paper they pro-posed a distance metric called Weighted 2 distance. The key feature of this distance is that it has a weight wi for each feature in the vector.

6.3. Face Verification

Face verification differs from the face recognition in that, in the latter, the problem consists in knowing who is there in the picture, whereas in the for-mer, given two pictures, the goal is to determine whether they belong or not to the same person. Therefore, in the LFW dataset, they provide two lists of pairs of images. Each pair of images can belong to the same person or not, and there is the same number of each of them. One list is used for training, and the other one for testing. The number of pairs for each of them is 2000 and 1000, respectively. As this dataset is widely used as a benchmark, we could establish approximately which result we wanted to achieve. We did not expect to reach Deep Face level due to the difference in dataset size, but we expected to at least get to 90% of accuracy, with 95% being the complete success scenario.

6.4. Data Augmentation

For the first generated dataset, we decided to use data augmentation. The usual methods of data augmentation consist in changing the illumination, rotating, scaling, or translating the image. From these, we were only interested in the first one. The other two made no sense in our case, as we already locate, centralize, and resize the faces. On the contrary, even with the normalization step applied to the feature vector, we considered that it could be interesting to use illumination changes to better train our CNN. In order to do so, we decided to double the size of our training dataset, effectively reaching over a million images, by randomly modifying the illumination, both brightening and darkening them.

The second one, on the contrary, was an attempt of making the problem easier for the CNN. All the images used until now were RGB, with 3 channels. We reasoned that, if the CNNs could deal with a single channel, they could be able to discard some variability, and obtain better results. Therefore, look the augmented dataset with 1M images, and turned all of it into grayscale, resulting in 140 3 images. The CNN had to be modified accordingly to be able to accept this new image shape.

In the end, we ended up having 3 datasets with which to train our CNN, and 2 for the distances metrics (although we could produce more if needed). The only remaining think we required was a way of assessing the face recognition problem.

6.5. Face Recognition

Face Recognition is one of the areas from Computer Vision. The practical applications for it are many, ranging from biometrical security, to automatically tagging your friends pictures, and many more. Because of the possibilities, many companies and research centers have been working on it.

The performance in face verification could not always be directly related with the one in face recognition. This recognition solution is capable of uniquely identifying or verifying an object using Deep learning based AI/ML techniques. The unique advantage about this solution is the ability to do it at the source (edge) without the need for expensive streaming and storing. This is basically an Artificial Intelligence based engine for edge computing.

This system uses a deep convolution network trained to directly optimize the embedding itself. To train, use triplets of roughly aligned matching / non-matching input patches generated using a novel online triplet mining method. The benefit of this approach is much greater representational efficiency. CNN are deep artificial neural networks that are used primarily to classify images.

The project environment is on opencv, tensor flow using python. OpenCV is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.

Tensor Flow is an open-source software library. It is used for dataflow programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. Most commonly used Computer Vision /Machine Language learning packages comes with a Python interface and a C++ interface.

VII. CONCLUSION

The facial recognition part has been tested using two different sized datasets, and we have obtained steady results around the 90% of accuracy, reaching a maximum of 95%. These results are better than the ones we expected, and they allow for some real life use cases.

Two real applications of the FR technology have also been presented. The first one is an online web tool that allows for easily training and testing a whole FR system by simply providing sets of images. Even though it is still an alpha version, with limited functionality, it is fully operational and has proven to be useful for demonstration purposes. The other application consists in recognizing people in videos. After processing the video, it draws the bounding box of each person in it, following them around the screen, and writes the name of identified people. It is already working for videos with one person in it, and it is currently being upgraded to allow for multiple people recognition.

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