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Face recognition based attendance management system by using machine learning

Salman Baig [1*], Kasuni Geetadhari [2], Mohd Atif Noor [3], Amarkant Sonkar [4]
[1-4] Department of Computer, Science and Engineering, Lovely Professional University, Jalandhar, Punjab, India

* Corresponding Author: **Salman Baig**

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Abstract
Attendance is an important need of every organization. Maintaining daily attendance register is a tough and time consuming task. There are many alternative methods for marking the attendence like Biometric, RFID, eye detection, voice recognition, and many more. But Facial Recognition is 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 deals with the ambiguities like proxy in attendance, high cost, and time consumption. This system uses face recognizer library for facial recognition and storing attendance. It has a camera that takes an 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/laptop clicks the image and sends it to the server where faces are recognized from the database and attendance is calculated on basis of it.
The aim of reducing the errors that occur in the older attendance marking system has been achieved by implementing the automated attendance system using deep learning. Face recognition system has been presented using deep learning which shows robustness towards recognition of the users with accuracy of 98.3% and result is converted into a PDF File.
Index Terms- Android application, Biometric, Recognition system, Face Recognition, Deep Learning, PDF.

Keywords: Attendance, management system, Face recognition based, machine

1. Introduction

Taking attendance in the schools and colleges consumes a lot of time and effort of both the students and lectures. We, as a human being is made to do all of this automatically and instantaneously. Computers are impotent of this kind of high-level generalization, so we 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 technique is face detection and recognition. Mostly this facial detection/recognition reduces the manual work for human. Images are captured from camera and we apply the face detection techniques. We mostly see the ears, hair, nose, eyes, mouth and also different pose/angles of faces in images. After applying face detection methods we detect the faces or objects in image and crop that image and apply Face Recognition technique.
Face detection involves detecting the face location and presence of face in images. If the image is not present in data base then we store that image as new person in database. Next time the same image of that new person appear in image and recognition the face or else taking as new image and storing in database process is repeating Some of the Face recognition techniques are Viola Jones Face Detection Algorithm, (LBP), and Ada Boost for Face Detection. While some face recognition techniques are Hog features, Haar features, Machine learning. Among the different biometric techniques facial recognition may be the most trusted one but it has several advantages over the others.
It is being widely used in many fields such as security and access control, forensic medicine, police controls and in attendance management system.

To avoid the difficulty of taking attendance of huge number, there is a need of automated advanced system attendance.

2. Aim

Our 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 of today that we are owing to the difficulty in the manual as well as other older means of Attendance systems.

3. Scope

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

4. 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 the cropped faces, we get similarity between taken image and the database image. PAC algorithm is mainly used for face recognition and detection.

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

C. The Performance of the Haar Cascade Classifiers (HCC) is applied to the Face and Eyes Detection

The Haar Cascade is applied to the face and eyes for detection/observation. The system is based on real time face recognition which is reliable and fast and needs improvisation of images in various lighting environments.

5. System Configuration

5.1 Python

Python is a popular and powerful programming language. It has high-level data structures. Its interpretation is easy. Its data types are implemented in C. Python's syntax is elegant and dynamic typing makes it an ideal language for developing scripts.

5.2 Open CV

It supports a wide range variety of systems analysis. C++, Python, Java etc and is available on various platforms just like Windows, OS X, Linux Android, iOS etc. Interfaces based Open CV are likewise under active development. (Open CV Python is Python API of Open CV). It's a combination of Open CV, C++ API and Python language

5.3 Tensor Flow

Tensor Flow is a open-source free software library for dataflow and differentiable programming. It is a symbolic math library. It is popularly 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.

6. System Architecture

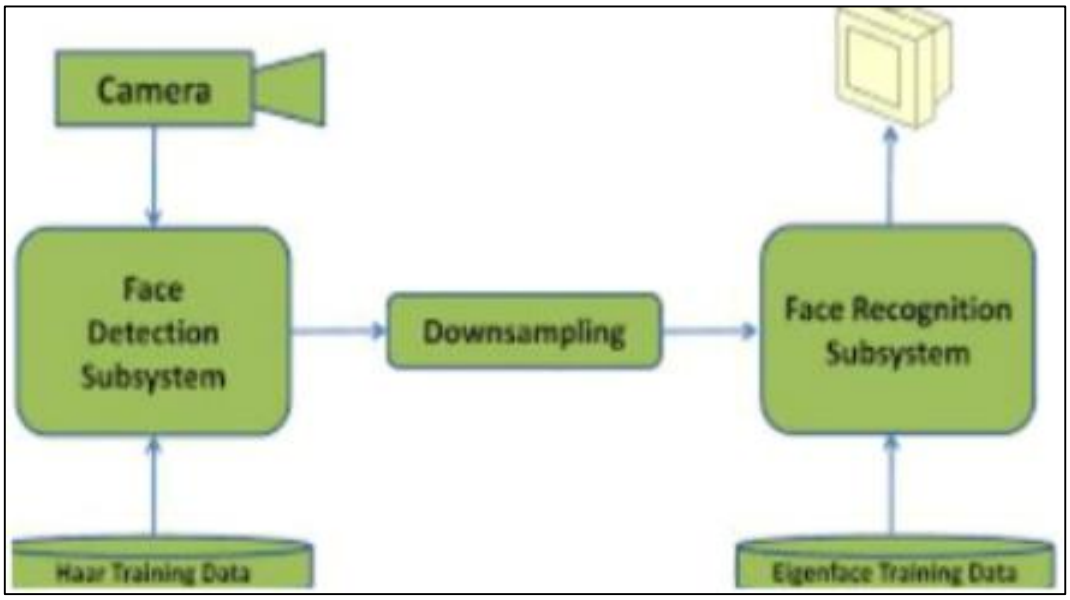

Fig 1: System Architecture

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 very 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 because there is no defined set of classes. It can be considered as a classification problem with infinite classes, each person being one.

Therefore, there is no point in training a classifier with the older features. The method 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 available, in which a set of image pairs are provided, and the system needs to determine whether they belong to the same person or not. We decided to expand it to be able to identify people. In order to do so, we require a distance metric between the feature vectors. In the Deep Face paper they proposed 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 question exists in knowing the one is skilled knowledgeable, whereas in the former, likely two pictures, the aim is to decide either they apply or not to the different persons. Therefore, in the LFW dataset, they specify two lists of pairs of images. Each pair of concepts can concern the alike human a suggestion of correction, and skilled is the unchanging number of each of them. One list is used for preparation, and the added one for experiment. The number of pairs each of them is 2000 and 1000, individually. As this dataset is usual as a benchmark, we could authorize nearly that result we cherished to solve. We did not want to reach Deep Face level due to the dissimilarity in dataset length, but we wanted not to completely disturb 90% of veracity, accompanying 95% being the complete happiness scenario.

6.4. Data Augmentation

For the 1st generated dataset, we decided to use data augmentation. The usual methods of data augmentation consist in changing the illumination, scaling, rotating or translating the image. From these, we were only interested in the first one. The other 2 made no sense in our case 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, in another way, was an attempt of making the question easier for the CNN. All the figures secondhand earlier were RGB, accompanying 3 channels. We argued that, if the CNNs could deal with a sole channel, they maybe capable to discard few variability, and acquire better results. Therefore, look the improved dataset with 1M images, and turned all of it into grayscale, resulting in 140 3 images. The CNN had expected modified correspondingly to be able to acknowledge this new image shape. In the end, we finished up having 3 datasets accompanying which to train our CNN, and 2 for the distances metrics (even though we take care of produce more if wanted). The only surplus think we necessary was a habit of evaluating the face recognition problem.

6.5. Face Recognition

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

The performance in face verification could not always be directly related with the 1 in face recognition. This recognition system is capable of uniquely identifying or verifying an object using Deep learning based AI/ML techniques. The unique advantage about this solution is the capability to do it at the source 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 instructed to directly optimize the embedding itself. To train, use triplets of roughly aligned matching / non-matching input patches generated employing a novel on-line triplet mining methodology. The advantage of this method is much greater representational efficiency. CNN are deep artificial neural networks that are used mainly to classify images.

The project environment is on Open CV, tensor flow using python. Open CV is an popular Machine learning software library. Open CV was made 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 that supports dataflow programming across a variety of tasks. It is a symbolic mathematics library, and it's additionally used for Machine learning applications like neural networks. Most commonly used for Computer Vision and Machine Learning.

7. Conclusion

The facial recognition part has been tested using 2 different sized datasets, and we have got steady results around the 90% of accuracy, reaching a maximum of 95%. These results are better than the ones we hoped, and they allow for some real life use cases.

Two real applications of the FR technology have also been shown. The first one is an online web tool that allows for easy 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 identifying people in the videos. After processing the video, it draws the bounding box of each person in it, following them around the screen and identifies people. It is already being upgraded to allow for multiple people recognition.

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