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# An Improved Facial Recognition Framework for Regulation of Entry with Deep Learning Algorithm

Nikhil Rana
*B.Tech Computer Science and Engineering*
*Galgotias University*
Greater Noida, India

Aman Agrawal
*B.Tech Computer Science and Engineering*
*Galgotias University*
Greater Noida, India

Shivsansh Paliwal
*B.Tech Computer Science and Engineering*
*Galgotias University*
Greater Noida, India

N. Suresh Kumar
*Assistant Professor,School of Computing Science and Engineering*
*Galgotias University*
Greater Noida, India

***Abstract*— These days, the mainstream attendance management system used is time-consuming, clunky and /or can be exploited. Most of these devices out there, but sometimes both are either or cost-effective. This paper proposes a Dependent Attendance Method for Facial Recognition that aims to accomplish both. A machine learning system utilizes the Facial Recognition Based Attendance System to train and associate a model with a name. This method consists of four phases: development of the database, identification of faces, recognition of faces, updating attendance. The database is made up of pictures of students in the classroom. We can recognize the faces in the classroom from live streaming. This is done with the help of a python computer vision module named OpenCV. A UI component that uses the Tkinter UI module is also available for this framework. For the entire system, hardware such as small cameras and a computing unit will be required. The system's accuracy is good making it very viable. The system only needs one stage, that is a photo capture of an individual, once the model is trained to recognize a person. Thanks to its unique facial recognition-based Machine Learning solution, this proposed product provides a simpler, fool-proof, and cost-effective alternative to the mainstream attendance system.**

***Keywords*— *biometric; recognition system; Face Recognition; Deep Learning; Python; OpenCV; Machine learning; computer vision; management system.***

## I. INTRODUCTION

Face recognition is an aspect of biometric technologies which is rapidly developing and widely applied. The applications range From enforcement to consumer applications, efficiency of industry and solutions for monitoring. Departmental research focuses mainly on developing cost efficient GPUs and on building large face databases, with the development of dedicated neural networks, from the detection and pre-processing to feature representation to the classification of the verification and identification solutions in all respects.[1]

Occlusion, lighting, and pose invariance are other significant issues that influence face recognition, causing a significant drop precision in both conventional deep neural networks and handcrafted solutions.

In many schools and universities, the conventional form of attendance marking is a boring activity. The conventional form of marking attendance is a boring activity in many schools and universities. And it takes a lot of time at times, more than 10 minutes. Also, proxy attendance is risky. Therefore, some form of automated attendance system is used by many institutions. RFID device, Iris recognition, fingerprint censors, etc. for example. However, many of them require queue. The use of a vital biometric function, which can be easily achieved, has made face recognition possible. In essence, devices for face recognition are not impaired by traditional facial expressions. There are two groups of the face reconnaissance system: face authentication and recognition. Face search is a 1:1 matching technique comparing the face image of a query to the face image of a prototype and the face image of the query to a 1:N challenge.[14]

This method is designed to create an attendance system using face recognition techniques. A person's face is used to record a person's presence. Increasingly, face scanning is common and commonly used in recent years. In this paper, we propose a system for the identification and labelling in the database of the faces of students via streaming videos into the classrooms. This new method will take less time in comparison to conventional systems.

Traditional systems of attendance are sluggish, expensive and/or can easily be misled or have other issues. In the industry, there are few ways of attendance systems such as fingerprint, iris, smart card, punch card, etc. In saving copies of fingerprints and iris, fingerprints, iris and smart cards will take a lot of memory and take a decent amount of computing power to compare. Normally, these devices are very expensive. And it can only be used by one person at a time. Smart card system uses a card and these cards can be misplaced or lost easily. And if a person loses it even if he / she is present, he / she will not be able to get the attendance for the day. Not to mention that the cost of producing a smart card is high. Punch card systems are getting old and you can easily trick them.

This framework is going to be developed in Python because this language is simpler and easier to run. Since this is a device based on facial recognition, it will require some form of computer vision solution based on ML. And we will use a computer vision python module called OpenCV for this.[18] We will also be implementing a UI component. And you can use Tkinter for that as it is fast, simple, portable and stable. Industry requires a fast and effective attendance management system. This method is both cost-effective and fool proof compared to other attendance schemes, such as a punch card or a finger or a smartcard system. Since facial recognition is already widely used in a number of locations, it is already technically feasible. It can simultaneously detect multiple faces, making this device very fast. A device like this only needs to be trained once and can then extremely reliably identify faces. It just takes a small, inexpensive camera, a computer unit and an internet connection to make it cheap on the hardware side. Our system offers a wide range of benefits that goes past what typical standard participation system offers.

Contrasted with others, our system offers a serious level of robotization. A system like this naturally catches, identifies and record participation in a CSV document for sometime in the future. This system can likewise be expanded or coordinated with online participation entryway for a total mechanization. The mechanization slice down on time taken to take the participation so the educators can invest more energy instructing. Since this system has a GUI, the usability factor is high.[9] The staff just requirements to press a couple of catches to record the participation. This system can likewise recognize different faces on the double creation it very quick.

A subject of conversation may emerge with respect to the achievability of the system as far as its capacity to dependably recognize faces. This point can be disposed of on the grounds that our system utilizes a ML model, a Haar-Course Classifier, making it very dependable. Since we have set up that this system is exceptionally solid, we can likewise build up that checking intermediary participation will be close to inconceivable. Our system can likewise join a profundity detecting camera to recognize profundity and thus decern photographs. Ultimately, comes the worry of cost adequacy. Our system has three principle parts: show for the GUI, camera to catch faces and a figure unit to prepare. These segments exclusively are now exceptionally modest making it genuinely less expensive than some other biometric participation system. Our system can likewise utilize an IOT approach where the camera and show are associated with a concentrated processing unit making this system much less expensive.

## II. LITERATURE SURVEY

In the field of computer vision, there has been a lot of research that has helped to drive this technology forward. Modules such as OpenCV are premade modules that are optimized for computer vision and thus facial recognition with ML models. We can use this to make a scheme of attendance based on facial recognition. While there are many research and product ideas that use facial recognition, there is no one that uses it in this particular way.

There are several attendance programmers in the existing market that are being used. Smart card-based attendance system, Iris-based, fingerprint-based, Punch card-based are some of them. They are often clunky, old and/or can be abused. Most of these devices out there, but sometimes both are either fool-proof or cost-effective. This paper proposes a Dependent Attendance Method for Facial Recognition that aims to accomplish both.

Scale Invariant Feature Transform (SIFT), (LBP) Local Binary Patterns, and (HOG) Histogram of Oriented Gradients are used to extract shallow structures from facial images before Deep Learning. Nearest Neighbors (Support Vector Machines (SVMs)) are used to classify identity before Deep Learning. Though, with access to the most up-to-date computing tools and quick access to massive datasets, deep learning's findings for a variety of visual recognition tasks, including biometric face recognition, are exceptional.

Deep Face, a profound nine-layer model of CNNs that has two convolutionary layers and over 110 million parameters, is one of the networks which performs excellently in facet imaging with three million 3000 different identities. On the LFW and YTF datasets, this method, which relies on three-dimensional models and the Convolutional neural networks collective, achieved accuracy of 96.75 and 92.4 percent, respectively.

In developing facial recognition techniques, very exact deep learning methods such as DeepFace and DeepID have been introduced. Face verification in unconstrained settings was accomplished for the first time with accuracy exceeding human capability. This advancement was only possible due to significant advancements in hardware, such as high capacity GPUs. The development of facial recognition techniques has taken a major step forward with the introduction of high precision, deep methods like DeepFace[2] and DeepID[3].

Face check was performed for the first time with greater precision than human capacity in uncomplicated settings.

Only significant hardware developments such as high-capacity GPUs have made this progress possible. Since then, most focus of research was on developing deep-learning methods that attempt, through the convergence of non-linear filters, modeling the human brain by abstraction at a high level, resulting in feature invariances[19].

Deep Hidden Identity Features is a different form of common Deep learning technique that uses four convolutional layers and a nine-layer network to recognize and verify faces. This method in starting obtains weights from identifying the faces and mines features using the previous hidden layer outputs, then generalizes them to be checked for face verification.

Deep ID uses a parallel transition based on the centers of two eyes and the corners of two mouths to put faces into place. The Celeb Face dataset, also known as Celeb Faces, was used to train this network, which achieved an accuracy of 98.45% on the LFW dataset.

FaceNet is a single embedding that can be used for face recognition, authentication, and clustering. FaceNet has a one-of-a-kind architecture for tasks such as face recognition, authentication, and clustering. It achieves state-of-the-art accuracy by combining deep convolutional networks with triplet loss.

Face Net is a deep CNN focused on Google Net and educated on a 150–200 million photos and approximately 9 million identities face dataset. This algorithm learns to trace face-images in a dense Euclidean space, using three times the uneven faces derived from an online trio mining approach. FaceNet was tested with 99.73 and 96.12% accuracy on the YTF and LFW data sets.[1,2]

## III. METHODS

***Tkinter***

Tkinter is a toolkit that links Python with Tk GUI. It is basic Python interface which is used for the toolkit of Tk GUI and is a facto standard GUI for Python. Normal Linux, Microsoft Windows and Mac OS X installations of Python include Tkinter. The name Tkinter originates from the GUI of Tk. It was written by Fredrik Lundh Tkinter. The free software published under a Python license is Tkinter.

Here, the Tkinter module is liable for delivering the UI for our participation system. The clients can cooperate with the system utilizing a GUI.[20] Here clients will be chiefly furnished with three distinct choices, for example, understudy enrollment, personnel enlistment, and imprint participation. The understudies should enter all the necessary subtleties in the understudy enrollment structure. Subsequent to tapping on the register button, the web cam begins consequently and a window springs up and begins recognizing the countenances in the edge. At that point it consequently begins clicking photographs until 60 examples are gathered or CRTL+Q is pressed. These pictures at that point will be pre-handled and put away in preparing pictures envelope.

***OpenCV***

Open Source Computer Vision Library (OpenCV) is a library of programming capabilities focused on real-time computer vision. Originally designed by Intel, it was subsequently funded by Willow Garage and then by Itseez. In the open-source BSD license, the library is free to download and cross-platform. Here, face detection is carried out using the OpenCV Haar-Cascade Classifier.[20] We are using the OpenCVDetectMultiScale module here. This is needed in order to construct a rectangle in a picture around the faces. Three criteria must be taken into account: scaleFactor, minNeighbors, minSize.

The scaleFactor is used to show how much each image scale has to minimize. MinNeighbors determines the number of neighbors to have in each candidate rectangle. Higher values typically detect fewer faces, however high image quality is detected. A minimum object size is defined by minSize. It is by nature (30,30). ScaleFactor and minNeighbors are the parameters used in this method, with values of 1.3 and 5 respectively.

## IV. PROPOSED SYSTEM

Different kinds of data are taken from various pixel-sized databases with various face expressions, occlusions and occlusions. In two sessions, each participant participated separately by two weeks without limiting any supplies like scarf, maker, headwear, hairstyle and so forth.

The main objective is to test the solidity with a neutral image per subject of the deep CNN-based features against occlusion. So, with the help of facial recognition any student who is present in class will not be marked absent by mistake. If any student his present his face will be recognized and marked present. As we know, machine don't make mistakes a human can do.

***Dataset Creation***

To take photographs of the students, a webcam is used. A variety of gestures and angles are used to take various portraits of a single student. In such pictures, pre-processing is used. The photos are sliced to produce a field of interest used for recognition. The next step is to adjust the scale of the images in a pixel position. Those photographs are converted into grayscale from RGB. These pictures would then be stored under the teachers' names in the folder.

### *Face Detection*

In this case, the OpenCV Haar-Cascade Classifier is used to detect faces. Before it can be used for facial recognition, the The algorithm of Haar Cascade must first be trained to understand human face. This is known as feature extraction. The training data for the haar cascade is an xml file named haarcascade frontalface default.

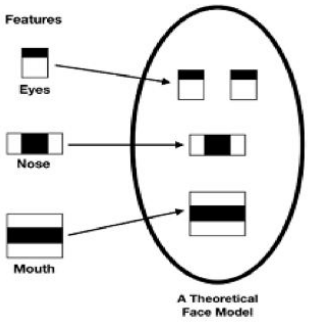


Fig 2. Features of Haar

The OpenCV DetectMultiScale module is used in this example. This is required when drawing a rectangle around the faces in a picture. Three conditions must be considered: scaleFactor, minNeighbors, and minSize. The scaleFactor describes how much each image scale decreases an image. MinNeighbors specifies the number of neighbors in each candidate rectangle. Higher values usually discern fewer faces, but with greater image precision. minSize determines the shortest possible object dimension. It all comes down to the heart of things (30,30). This system's parameters are scaleFactor and minNeighbors, which have values of 1.3 and 5, respectively.

### *Face Recognition*

We can split the process of face in three steps: preparation of training data, training face recognizer, prediction.
The photos found in the dataset will be the training data here. An integer mark of the student to whom it corresponds will be allocated to them. For face recognition, these images are then used. The Local Binary Pattern Histogram is the face recognizer used in this method. The Initially collected is the local binary pattern (LBP) list for the entire face. These LBPs translate into decimal numbers and are all histograms. For each image in the training data, one histogram will be generated at the end. Later, the histogram of the face to be identified is determined during the identification process and Then the better matched mark associated with the student to which it belongs is returned in comparison with the histograms already computed.

Fig 1. Architecture Diagram

The above architecture diagram describes the process/algorithm of the attendance system.

### *Attendance Updation*

After the face recognition process, the identified faces will be labeled as present on the excel sheet.

## CONCLUSION

This technology is designed to create a successful attendance system through facial recognition software. The proposed system can track attendance using face recognition. You can detect faces by using the camera. It marks the student's participation and updates the attendance record after acknowledgement.

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