

Artificial Intelligence-based Face Recognition: An Application of Attendance Management

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ABSTRACT

Artificial intelligence and Computer Vision are some of the fields which have shown rapid growth in recent years. These technologies have greatly reduced the effort we used to put in our day to day work and facial detection and Recognition are such revolutionary technologies. While many approaches are possible, on base, this technology works by recognizing the features of an individual face and matches it with the data which is stored in the database. Face is the representation of one's identity. Hence, we have proposed a full-fledged automated attendance system based on facial detection and recognition. Smart Attendance using Real-Time Face Recognition is a real-world solution which comes with day to day activities capable of handling everyday student / employee attendance systems. Using feature mapping, this system is capable of detecting multiple faces, saving the facial features using feature mapping and at last recognition based on the database. The Computer vision will be able to find and recognize human faces fast and precisely in images or videos that are being captured through a surveillance camera or webcam. Numerous algorithms and techniques have been developed for improving the performance of face recognition but to get the best results we have created a compounded deep learning model. Directly streaming the live video, faces will be detected, mapped and recognized and automatically saved into the database with the date and time of entry. Later the authorities can easily check the database for the complete information. Improving upon the existing systems and creating a more robust model for better and more efficient processes.

Keywords

Artificial Intelligence, Facial Recognition, Facial Detection, Deep Learning, Computer Vision.

1. INTRODUCTION

To verify the student attendance record, the personnel staff ought to have an appropriate system for approving and maintaining the attendance record consistently. By and large, there are two kinds of student attendance framework, i.e. Manual Attendance System (MAS) and Automated Attendance System (AAS). Practically in MAS, the staff may experience difficulty in both approving and keeping up every student's record in a classroom all the time. In a classroom with a high teacher-to-student ratio, it turns into an extremely dreary and tedious process to mark the attendance physically and cumulative attendance of each student. Consequently, we can execute a viable framework which will mark the attendance of students automatically via face recognition. AAS may decrease the managerial work of its staff. Especially, for an attendance system which embraces Human Face Recognition (HFR), it normally includes the students' facial images captured at the time he/she is entering the classroom, or when everyone is seated in the classroom to mark the attendance. Generally, there are two known methodologies to deal with HFR, one is the feature-based methodology and the other is the brightness-based methodology. The feature-based methodology utilizes key point features present on the face, called landmarks, of the face, for example, eyes, nose, mouth, edges or some other unique attributes, as shown in fig.1. In this way, out of the picture that has been extricated beforehand, just some part is covered during the calculation process. Then again, the brightness-based methodology

consolidates and computes all parts of the given picture . It is also called holistic-based or image-based methodology. Since the overall picture must be considered, the brightnessbased methodology takes longer handling time and is likewise more complicated .There are different advances that are done during the process of this face recognition framework, yet the essential steps of these are face detection and face recognition. Firstly, to mark the attendance, the images of students' faces will be required. This image can be captured from the camera, which will be installed in the classroom at a position from where the entire classroom is visible. This image will be considered as an input to the system. For efficient face identification, the picture should be upgraded by utilizing some image processing methods like grayscale conversion and histogram equalization. After image quality upgrade, the image will be passed to perform face detection. The face identification process is trailed by face recognition process. With the assistance of the element extractor, different face highlights are extracted. Utilizing these faces as Eigen features, the student is recognized and by coordinating with the face database, their attendance is marked . Developing the face database is required with the end goal of comparison.

2. LITERATURE SURVEY

Student Attendance System in Classroom Using Face Recognition Technique S. Lukas, A. R. Mitra, R. I. Desanti and D. Krisnadi

Authentication is one of the significant issues in the era of information system. Among other things, human face recognition (HFR) is one of known techniques which can be used for user authentication. As an important branch of biometric verification, HFR has been widely used in many applications, such as video monitoring/surveillance system, human-computer interaction, door access control system and network security. This paper proposes a method for student attendance system in classroom using face recognition technique by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT) to extract the features of student's face which is followed by applying Radial Basis Function (RBF) for classifying the facial objects. From the experiments which is conducted by involving 16 students situated in classroom setting, it results in 121 out of 148 successful faces recognition.

Attendance System based on Face Recognition using Eigen face and PCA Algorithms P. Wagh, S. Patil, J. Chaudhari and R. Thakare

The attendance maintaining system is difficult process if it is done manually. The smart and automated attendance system for managing the attendance can be implemented using the various ways of biometrics. Face recognition is one of them. By using this system, the issue of fake attendance and proxies can be solved. In the previous face recognition based attendance system, there were some disadvantages like intensity of light problem and head pose problem. Therefore to overcome these issues, various techniques like illumination invariant, Viola and Jones algorithm, Principle component analysis are used. The major steps in this system are detecting the faces and recognizing them. After these, the comparison of detected faces can be done by crosschecking with the database of student's faces. This smart system will be an effective way to maintain the attendance and records of students.

Convolutional Neural Network Approach for Vision Based Student Recognition System N. M. Ara, N. S. Simul and M. S. Islam

Taking attendance of students during class time is one of the foremost tasks for teachers and it's pretty much complicated at the same time. The manual attendance system takes an enormous amount of time over the number of students and has a prospect of being a proxy. Day by day it's getting intimidating because the number of students is increasing. A previous couple of year's automated biometric systems like a fingerprint, QR-code technology is using in smart attendance systems.

However, time makes the difference here, at present face recognition technology is using to identify the student's participation in the classroom. So, we proposed a smart attendance system to take attendance by detecting and recognizing the face. Our main motivation is to make the attendance system easier, less time-consuming, and also protect from being proxy. The old manual-based attendance system was an arduous process and had a chance of proxy but we will be able to ameliorate the situation. This system can make a crystal clear concept to the machine whether it's a legal attendance or proxy. This system is a more secure and hassle-free system. In this system, all the student's data are recording in the cloud database with time and class schedule. So that teachers can easily evaluate the students in marking on attending. Also, help the teacher to inform individuals' parents whether or not their son/ daughter is irregular in the class. In this system, we used an effective machine learning-based object detection method Haar Cascade classifiers proposed by Paul Viola and Michael Jones for classifying extracting images and recognizing LBPH to this system.

Algorithm for efficient attendance management: Face recognition based approach N. Khan and Balcoh

Students attendance in the classroom is very important task and if taken manually wastes a lot of time. There are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time because students have to make a queue to touch their thumb on the scanning device. This work describes the efficient algorithm that automatically marks the attendance without human intervention. This attendance is recorded by using a camera attached in front of classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the data base and mark the attendance. The paper review the related work in the field of attendance system then describes the algorithm and results

Face Recognition-based Lecture Attendance System KAWAGUCHI and Yohei

In this paper, we propose a system that takes the attendance of students for classroom lecture. Our system takes the attendance automatically using face recognition. However, it is difficult to estimate the attendance precisely using each result of face recognition independently because the face detection rate is not sufficiently high. In this paper, we propose a method for estimating the attendance precisely using all the results of face recognition obtained by continuous observation. Continuous observation improves the performance for the estimation of the attendance. We constructed the lecture attendance system based on face recognition, and applied the system to classroom lecture. This paper first review the related works in the field of attendance management and face recognition. Then, it introduces our system structure and plan. Finally, experiments are implemented to provide as evidence to support our plan. The result shows that continuous observation improved the performance for the estimation of the attendance.

Smart Application For AMS using Face Recognition MuthuKalyani.K

Attendance Management System (AMS) can be made into smarter way by using face recognition technique, where we use a CCTV camera to be fixed at the entry point of a classroom, which automatically captures the image of the person and checks the observed image with the face data base using android enhanced smart phone. It is typically used for two purposes. Firstly, marking attendance for student by comparing the face images produced recently and secondly, recognition of human who are strange to the environment i.e. an unauthorized person. For verification of image, a newly emerging trend 3D Face Recognition is used which claims to provide more accuracy in matching the image data bases and has an ability to recognize a subject at different view angles.

FaceTime- Deep Learning Based Face Recognition Attendance system M. Arsenovic, S. Skadojevic and A. Anderla

In the interest of recent accomplishments in the development of deep convolutional neural networks (CNNs) for face detection and recognition tasks, a new deep learning based face recognition attendance system is proposed in this paper. The entire process of developing a face recognition model is described in detail. This model is composed of several essential steps developed using today's most advanced techniques: CNN cascade for face detection and CNN for generating face embeddings. The primary goal of this research was the practical employment of these state-of-the-art deep learning approaches for face recognition tasks. Due to the fact that CNNs achieve the best results for larger datasets, which is not the case in production environment, the main challenge was applying these methods on smaller datasets. A new approach for image augmentation for face recognition tasks is proposed. The overall accuracy was 95.02% on a small dataset of the original face images of employees in the real-time environment. The proposed face recognition model could be integrated in another system with or without some minor alternations as a supporting or a main component for monitoring purposes.

Face Detection and tracking using OpenCV K. Goyal, K. Agarwal and R. Kumar

An application for tracking and detecting faces in vide-os and in cameras which can be used for multipurpose activities. The intention of the paper is deep study of face detection using open CV. A tabular comparison is performed in order to under-stand the algorithms in an easier manner. It talks about various algorithms like Adaboost, Haar cascades. This paper aims to help in understanding the best prerequisites for face detection

Robust real-time face detection Viola, M. J. Jones and Paul

This paper describes a face detection framework that is capable of processing images extremely rapidly while achieving high detection rates. There are three key contributions. The first is the introduction of a new image representation called the "Integral Image" which allows the features used by our detector to be computed very quickly. The second is a simple and efficient classifier which is built using the AdaBoost learning algorithm (Freund and Schapire, 1995) to select a small number of critical visual features from a very large set of potential features. The third contribution is a method for combining classifiers in a "cascade" which allows background regions of the image to be quickly discarded while spending more computation on promising face-like regions. A set of experiments in the domain of face detection is presented. The system yields face detection performance comparable to the best previous systems (Sung and Poggio, 1998; Rowley et al., 1998; Schneiderman and Kanade, 2000; Roth et al., 2000). Implemented on a conventional desktop, face detection proceeds at 15 frames per second.

3. PROBLEM ANALYSIS

3.1 EXISTING SYSTEM

To verify the student attendance record, the personnel staff ought to have an appropriate system for approving and maintaining the attendance record consistently. By and large, there are two kinds of student attendance framework, i.e. Manual Attendance System (MAS) and Automated Attendance System (AAS). Practically in MAS, the staff may experience difficulty in both approving and keeping up every student's record in a classroom all the time [1]. In a classroom with a high teacher-to-student ratio, it turns into an extremely dreary and tedious process to mark the attendance physically and cumulative attendance of each student. Consequently, we can execute a viable framework which will

mark the attendance of students automatically via face recognition. AAS may decrease the managerial work of its staff.

3.1.1 Disadvantages:

- High cost

3.2 PROPOSED SYSTEM

The automated attendance management system has a very simple and easy to implement the architecture. The system consists of two databases, a student database, and an attendance database. The student database is for storing the details of the student in a particular class. On the other hand, the attendance database, as the name suggests, is for marking and maintaining the attendance records of students attending a particular lecture. For the accomplishment of marking attendance, this system will have a high-definition camera installed outside the classroom. Students will avail the access to enter the classroom, by scanning their faces in that camera. Another camera will be installed inside the classroom in such a way that every student in the class will be visible to the lens of the camera. Facial detection and recognition algorithms will be applied to both the cameras to analyze the faces and mark their attendance accordingly.

3.2.1 Advantages

- High accuracy
- Less time taking

5. IMPLEMENTATION

5.1 SYSTEM STUDY

5.1.1 Feasibility Study

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are,

- Economical Feasibility
- Technical Feasibility
- Social Feasibility
- Economical Feasibility

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

5.1.1 Technical Feasibility

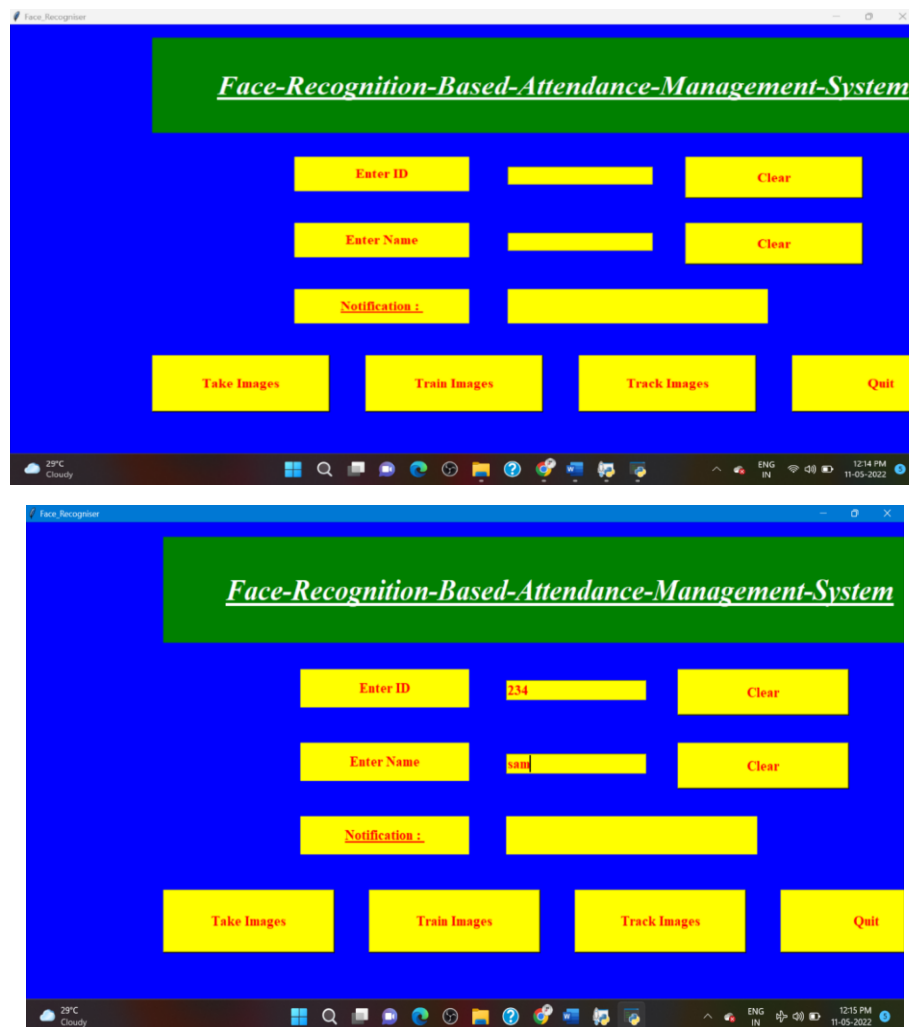
This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources.

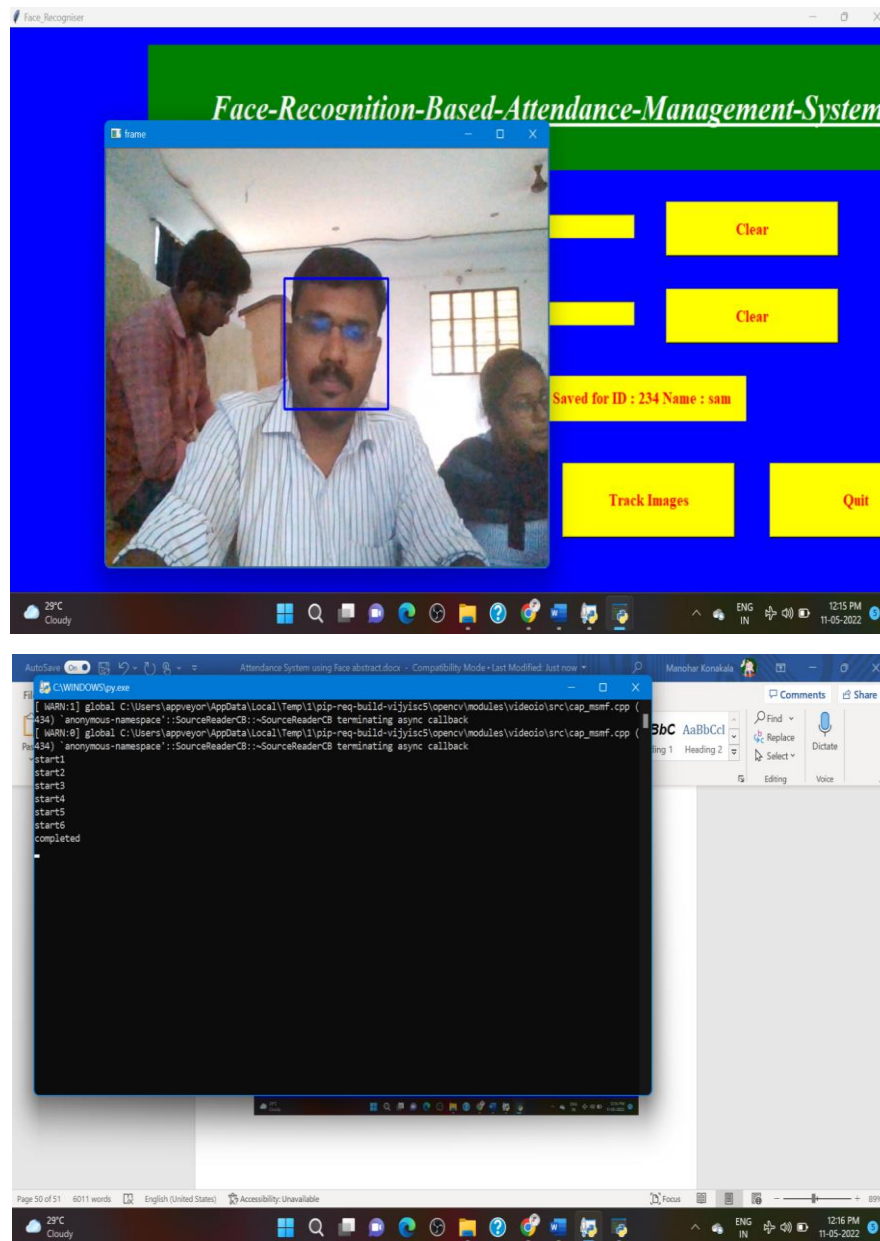
This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

5.1.2 Social Feasibility

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

6. RESULTS





7. CONCLUSION

This paper proposes a model for implementing an automated attendance management system for students of a class by making use of face recognition technique, by using Eigen face values, Principle Component Analysis (PCA) and Convolutional Neural Network (CNN). After these, the connection of recognized faces ought to be conceivable by comparing with the database containing student's faces. This model will be a successful technique to manage the attendance and records of students.

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