

# Face Recognition Attendance System

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## I. INTRODUCTION

This paper presents summary of various literature we studied to start implementing our project Face Recognition Attendance System, we have learned and explain about the Purpose of the Machine learning techniques ,tools used ,Experiment conducted with the each deep learning model and conclusion of each model.

## II. LITERATURE SURVEY FACE RECOGNITION ATTENDANCE SYSTEM

### A. FaceTime – Deep Learning Based Face Recognition Attendance System

In [1] this Paper,new deep learning based face recognition attendance system is proposed.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.

The first step of the face recognition process is face detection.Face detection presents the well-studied field in the computer vision .CNN cascade is used for a face detection task.The third step presents the embedding process using the FaceNet.The final step of developing the face recognition model for tracking employees’ attendance consists of training the classifier based on the previously generated embedding from employees dataset by the deep CNN.The entire procedure of developing a face recognition component by combining state of-the-art methods and advances in deep learning is described.

The future work could involve exploring new augmentation processes and exploiting newly gathered images in runtime for automatic retraining of the embedding CNN. One of the unexplored areas of this research is the analysis of additional solutions for classifying face embedding vectors.

### B. FaceNet: A Unified Embedding for Face Recognition and Clustering

In [2] this paper they present a system, called FaceNet, that directly learns a mapping from face images to a compact Euclidean space where distances directly correspond to a measure of face similarity. Once this space has been produced, tasks such as face recognition, verification and clustering can

be easily implemented using standard techniques with FaceNet embeddings as feature vectors.

This Paper uses a deep convolutional network trained to directly optimize the embedding itself, rather than an intermediate bottleneck layer as in previous deep learning approaches. To train, they use triplets of roughly aligned matching / non-matching face patches generated using a novel online triplet mining method. The benefit of our approach is much greater representational efficiency: they achieve state-of-the-art face recognition performance using only 128-bytes per face.

FaceNet uses a deep convolutional network. We discuss two different core architectures: The Zeiler and Fergus style networks and the recent Inception type networks.The Triplet Loss minimizes the distance between an anchor and a positive, both of which have the same identity, and maximizes the distance between the anchor and a negative of a different identity.In all the experiments they train the CNN using Stochastic Gradient Descent (SGD) with standard backprop and AdaGrad. In most experiments they start with a learning rate of 0.05 which they lower to finalize the model.They evaluate method on four datasets and with the exception of Labelled Faces in the Wild and YouTube Faces they evaluate method on the face verification task.

### C. Face Recognition-based Lecture Attendance System

In [3] this paper face recognition based on continuous observation is used for face recognition-based Lecture Attendance System.The procedure of the system consists of three steps, seats information processing, shooting plan and the attendance information processing.

Active Student Detection method (ASD) has been adopted for this system to estimate the existence of a student sitting on the seat.Pan/Tilt/Zoom is used in the camera to locate the position of a particular student in the classroom without effecting the attendance of rest of the students. Face detection and recognition module detects faces from the image captured by the camera.Face detection data and face recognition data are recorded into the database, which is stored in the image and stored in an image database.

There is also a possibility that the image captured is of the student sitting in the next seat, making this system less accurate.To solve the problem of ineffectiveness,author integrated the student’s seat information into the camera planning. In this way,they can solve problems such as nonrecognition of faces

and seats by constraints on the relationship between them and faces students' seat information. We assume that every seat has a vector of values that represent the relationship between it and each student. In the case that the module of face image processing recognizes Student A's face image from the image of Seat B, our module votes for Student A's component of the vector of the seats in the neighbouring neighbourhoods of the seat B. The cost of the edge is defined as the inversely the score of the value of the edges between the students and the scores of the students. Linear sum assignment Problem (LSAP) is solved to estimate the correspondence.

In this research paper, the system estimates the attendance and position of each student by continuous observation and recording. The system can be improved by integrating video-streaming service and lecture archiving service. Also, there is a need to discuss the approach of camera planning based on the result of the preliminary research shows continuous observation improved the performance for estimation of the attendance. of the students, the teacher, and the face images in classroom lectures. We intend to improve face detection effectiveness by using the interaction among our system, the students, and the teacher.

#### *D. Real-Time Smart Attendance System using Face Recognition Techniques*

This research [4] provides a model for using facial recognition techniques, Eigenface values, Principal Component Analysis (PCA), and Convolutional Neural Networks to construct an automated attendance management system for students in a class (CNN). Following that, a link of identified faces should be possible by comparing them to a database of student faces. This strategy will be an effective method of managing student attendance and records.

The proposed automated attendance system using facial recognition is an excellent example for recording student attendance in a classroom. This technique also helps to eliminate the possibility of proxies and phone attendance. A great number of biometric systems are available in today's society. Face recognition, on the other hand, proves to be a feasible choice due to its high accuracy and little human interaction. The goal of this system is to provide a high level of security. As a result, a very efficient attendance system for classroom attendance must be designed, one that can recognize numerous faces at once. Furthermore, no extra hardware is required for its implementation. The smart attendance system may be built with just a camera, a PC, and database servers.

The major goal of this article is to create a smart attendance management system that uses facial recognition to solve the difficulties that other automated systems in today's society have. The fundamental strategy that must be followed is to compare a recent image of a student to certain photographs that were intentionally captured and kept in a database, which can then be used to record attendance if the images in the database match the real-time image, which is linked to two databases. One is for the faces, and the other is for keeping track of attendance. The camera is utilised to click the student's facial

image and perform background and noise reduction before the detection and recognition phase.

#### *E. Smart Attendance Monitoring System (SAMS): A Face Recognition based Attendance System for Classroom Environment*

In [5] article presents the automatic attendance management system for convenience or data reliability. The system is developed by the integration of ubiquitous components to make a portable device for managing the students' attendance using Face Recognition technology.

Attendance is crucial in deciding a child's or adolescent's academic achievement in schools and institutions. Students who attend class on a regular basis are less likely to participate in delinquent or disruptive behaviour. Chronic absences raise the probability of failure in school and early dropout. Manual attendance records are inefficient for the following reasons: i) They waste a lot of lecture time; and ii) They are vulnerable to proxies or impersonations.

For better accuracy of face-log generation, face tracking technique is employed. Since people move around and look at different directions in front of the real-time camera, it is possible to have a wide range of head poses oriented at different angles. To compute the sharpness of an image, they utilized the variance of an image Laplacian. Face representation is the core of the recognition algorithm used in this system. The face image captured after the quality assessment is needed to be represented in form of feature for further processing. The preprocessed images are too high-dimensional for a classifier to take directly on input. To obtain a low-dimensional distinct feature from the face images they used Convolution Neural Network.

These systems perform satisfactorily with different facial expressions, lighting and pose of the person. There is room for improvement since these systems sometimes fail to recognize every face student present in the classroom. They have made the device portable for easy use even when the sessions are on, without disturbing the class. There are future scopes to make a more compact ergonomics to make it a more user-friendly product to make an impact in building a more healthier academic environment.

#### *F. Implementation of Classroom Attendance System Based on Face Recognition in Class*

In [6] this paper, face recognition distinguishes faces from non-faces, which is necessary for correct attendance. The alternative method is to use facial recognition to track a student's attendance. Face detection and identification are performed using the Raspberry Pi module. The Raspberry Pi module will be attached to the camera. The student database has been compiled. The database contains the names of the pupils, as well as their photos and roll numbers. This Raspberry Pi module will be placed at the front of the classroom so that we can record the whole lesson. As a result, time will be saved by using this technique. It is easy to keep track of attendance with the aid of this method.

Face recognition comes after the face detection process. This may be accomplished by cropping the image's first recognised face and comparing it to the database. This is referred to as region of interest selection. The Eigen Face technique is used to verify each student's face against the face database, and attendance is recorded on the server. The camera in the system takes photos of the classroom and feeds them to the image improvement module. After the image has been enhanced, it is sent to the Face Detection and Recognition modules, where it is recognised and the attendance is recorded on the database server. The Facial database stores templates of individual students' face photos at the moment of enrolling. The algorithm detects all of the faces in the input image and compares them one by one to the face database. When teachers enter the classroom, they just click a button to begin the attendance procedure. Attendance is kept on the server, so anybody with access to it, including administration, parents, and students, may use it. The camera continually captures photos in order to detect and identify all of the students in the classroom. The skin categorization approach is being used to avoid erroneous detection. This approach improves the detecting process' efficiency and accuracy.

This technique may be used to identify criminals at bus stops, train stations, and other public locations. This will give the cops a helping hand. The GSM module will be used in this system. If a suspect is identified, the signal may be relayed to the police station's central control room via a GSM module. The culprit surviving area will be identified using the GSM ISDN number.

#### *G. Student Attendance System in Classroom Using Face Recognition Technique*

In [7] Two different types of Student Attendance system have been discussed in this research paper, namely manual attendance system (MAS) and automated attendance system (AAS). The issues of MAS like difficulty in maintaining student attendance records can be solved by AAS. AAS mainly uses Human Face recognition (HFR) technique. HFR has been further classified into two different approaches, feature-based and brightness based. Feature based approach has some limitations due to limited parts of the images are considered. Whereas brightness-based approach calculates all parts of the image and is known as holistic or image-based approach.

In Discrete Cosine Transforms, DCT coefficients can be computed in two steps through successive 1-D operations which are applied on rows and columns of an image. Such a transformation is called a symmetric transformation. This implies that all images used, either for training or identification, must be uniform in size. By separating ability, it means that the DCT coefficients can't be computed by two steps. This means that all images used for training and identification must be uniform. In Radial Basis Function Network (RBFN), the training or learning process of RBFN is known to be very fast.

An automated student attendance system in the classroom using the human face recognition technique works quite well. The success rate of the proposed system in recognizing facial images of the students who are seated in a classroom is about 82 percent. The improvement may help the recognition process become more robust. This improvement may help us learn to use the feature extraction or recognition process technique to be used in this research. It can be concluded that an automated system in the classroom uses the human face recognition technique. Future work will focus on better understanding of the error cases, further improving the model, and also reducing model size and reducing CPU requirements. We will also look into ways of improving the currently extremely long training times, e.g. variations of our curriculum learning with smaller batch sizes and offline as well as online positive and negative mining

#### *H. An android based course attendance system using face recognition*

In [8] Student attendance system is needed to measure student participation in a course. Several automated attendance systems have been proposed based on biometric recognition, barcode, QR code, and near field communication mobile device. However, the previous systems are inefficient in term of processing time and low in accuracy. This paper aims to propose an Android based course attendance system using face recognition. To ensure the student attend in the course, QR code contained the course information was generated and displayed at the front of classroom. The student only needed to capture his/her face image and displayed QR code using his/her smartphone.

The materials used to develop the proposed attendance system consisted of hardware, software, and face image data set. Every student in a course needed to register his/her face image and student registration number to the attendance system. The face image of every student was captured 10 times in the perpendicular direction to the smartphone camera with different expression, including normal, smiling, laughing, and sad using a menu in the Android application for student. The attendance process for the proposed attendance system consisted of several steps starting from system opening, followed by QR code generation, face capturing, face recognition, and attendance processing. An experiment has been carried out in the laboratory to find the best classifier in two training scenarios. The first scenario, a classifier was used in attendance system for all courses. In this scenario all face image samples from all students registered at all courses were used to train the classifier. The second scenario, a classifier was only used in attendance system for a certain course. Therefore, if there were  $n$  courses, face image samples were divided into  $n$  sub samples according to the list of course participants.

The experimental result shows that the proposed attendance system achieved face recognition performance of 97.29 percent by employing LDA and only needed 0.000096 s for face recognition process in the server. For future work, the investigation of the using of Bluetooth devise for measuring

the distance between student's smartphone and Raspberry Pi located in classroom, to ensure students attend in a course, will be considered to minimize the possibility of cheating performed by students in attendance process.

### *I. Automatic Attendance System for University Student Using Face Recognition Based on Deep Learning*

In [9] This paper proposed a web-based student attendance system that uses face recognition. In the proposed system, Convolutional Neural Network (CNN) is used to detect faces in images, deep metric learning is used to produce facial embedding, and K-NN is used to classify student's faces. Thus, the computer can recognize faces. From the experiments conducted, the system was able to recognize the faces of students who did attend and their attendance data was automatically saved. Thus, the university administration is alleviated in recording attendance data.

This stage is done to prepare a dataset for training the neural network and classify student based on his or her face. In this test, three students' photo was taken, with five photos each. In next stage, This stage is done to scan the input image and determine the location of the student's face in the image. To find out whether a face exists in the input image, Convolutional Neural Network (CNN) is used. In this last step, a classifier is trained based on the face embedding that has been generated. In this system, K-NN is used. The result of the classifier is the student's ID number. The system created is a web-based system. Raspberry Pi 3 model B+ is used by students to record attendance.

The attendance system created is a web-based system. HTML, PHP, and CSS are used to build the system. XAMPP is used as a web server, and MySQL is used as the database for the attendance system. This system created many web pages like student, Lecturer web pages. This system makes the student attendance process done automatically and is expected to be able to replace the old manual attendance process, which is currently used. For future work, the plan is to use cloud-based face recognition in order to speed up the face recognition process. The use of another more sophisticated face recognition method is planned in order to be able to compare the performance, and hopefully gives better performance (speed and accuracy) than the method that has been used, in this case, the Convolutional Neural Network.

### *J. Design and Implementation of Classroom Attendance System Based on Video Face Recognition*

In [10] This paper presents a classroom attendance system based on video face recognition technology. The system uses a camera installed in the classroom to obtain classroom video information. For the collected video information, it is first divided into a frame of static pictures, and from the pictures, several pictures with clear face and better light are selected for face recognition, and finally the recognition results are aggregated and merged. In order to solve the influence of the location of the camera on the recognition results, the system can be combined with the platform control system to control

the rotation and focusing of the camera through the platform, and further improve the recognition accuracy.

According to the main functions and different locations, the system designed in this paper can be divided into two parts: camera acquisition terminal and server computing terminal. The camera acquisition terminal is installed in the classroom. Its main function is to collect real-time student portrait videos in the classroom, and transmit the collected portrait videos to the server through the line for storage and processing. By observing 82 students table data, we can see that the highest recognition accuracy of this class can reach 99 percent, and 81 of 82 students can be identified when the highest recognition accuracy is achieved. By analyzing 16 pictures and 32 pictures of 81 students' two experiments, we find that one of the 16 and 32 pictures in the two experiments has been in a low position.

System designed in this paper has following Advantages:- Save time. The classroom attendance system designed in this paper is real-time in the classroom. It will not interfere with the classroom. When the system is used for classroom attendance, it will not produce factors such as voice that interfere with the classroom order, so it will not affect the classroom order. It can improve students' learning efficiency. The system uses face recognition to check attendance. In future, this paper will exclude the Interval time of the classroom as it will reduce recognition rate.

## CONCLUSION

In this Paper we have studied approaches used by 10 papers. Some papers developed their own Algorithm, some used CNN and some deep learning. Some of the papers used FaceNet Technique and some Used deep learning Machine learning Classifiers generated by Data.

## REFERENCES

- [1] Marko Arsenovic, Srdjan Sladojevic, Andras AnderlaDarko Stefanovic. FaceTime — Deep learning based face recognition attendance system In: 2017 IEEE 15th International Symposium on Intelligent Systems and Informatics (SISY)
- [2] Schroff, Florian Kalenichenko, Dmitry and Philbin, James. (2015). FaceNet: A unified embedding for face recognition and clustering. 815-823. 10.1109/CVPR.2015.7298682.
- [3] TY - Kawaguchi, Yohei, Shoji, Tetsuo. Face Recognition-based Lecture Attendance System In: INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH TECHNOLOGY (IJERT)
- [4] Shreyak Sawhney, Karan Kacker, Samyak Jain, Shailendra Narayan Singh and Rakesh Garg Real-Time Smart Attendance System using Face Recognition Techniques In: 2019 9th International Conference on Cloud Computing, Data Science Engineering
- [5] Shubhobrata Bhattacharya, Gowtham Sandeep Nainala, Prosenjit Das, Aurobinda Routray. Smart Attendance Monitoring System (SAMS): A Face Recognition Based Attendance System for Classroom Environment. In: 2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT)
- [6] Yong-zhen Li, Zhi-heng Lin. Implementation of Classroom Attendance System Based on Face Recognition in Class In: 2019 International Conference on Intelligent Transportation, Big Data Smart City (ICITBS)
- [7] Samuel Lukas, Aditya Rama Mitra, Ririn Ikana Desanti, Dion Krisnadi. Student attendance system in classroom using face recognition technique In: 2016 International Conference on Information and Communication Technology Convergence (ICTC)
- [8] Dwi Sunaryono, Radityo Anggoro, Joko Siswantoro. An android based course attendance system using face recognition. In: Journal of King Saud University - Computer and Information Sciences

- [9] - Sutabri, Tata,Pamungkur, Pamungkur Kurniawan, Ade Saragih, Automatic Attendance System for University Student Using Face Recognition Based on Deep Learning.In: International Journal of Machine Learning and Computing
- [10] -Yong-zhen Li,Zhi-heng Lin.Design and Implementation of Classroom Attendance System Based on Video Face Recognition In: 2019 International Conference on Intelligent Transportation, Big Data Smart City (ICITBS)