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FACE RECOGNITION FOR ATTENDANCE SYSTEM USING DEEP LEARNING AND NEURAL NETWORK

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Abstract : The existing attendance system requires students to manually sign the sheet every time they attend a class. This includes the more time consumed by the students to find their name on the sheet, some students may mistakenly sign another student's name and the sometimes sheet may get lost. For every College, attendance is the most important thing to record the presence of students in Classes. Usually, attendance is done manually, it can be signed or called one by one. So we introduce face recognition to record attendance for everyone present in the college. To developed a face recognition system we have used MTCNN and Facenet . This system can recognize a person's face and record attendance for that person to make attendance activities more efficient and faster.

Keywords - Image Processing, Deep Learning, Neural Network , MTCNN, FaceNet.

I. INTRODUCTION

Face Recognition is a technology capable of identifying or verifying a person's face with digital masking from image or video. Face recognition uses FaceNet to extract facial features from an image or video. Face recognition can help verify the personal identity from the face of a person. With these features of face recognition, we think face recognition can help people to verify attendance. In today's digital age, face recognition is very helpful in this era. Especially for work areas that require attendance verification. Maybe some parts are now relying on technology to verify attendance. But some still use traditional methods that take a long time. Therefore face recognition is very helpful in terms of verifying attendance to speed up the process of recording and verifying the person. Face recognition is one of the most intensively studied technologies in computer vision, with new approaches and encouraging results reported every year. Face recognition approaches are generally classified as feature-based and holistic approaches. In holistic based approaches, recognition is done based on global features from faces, whereas in feature-based approaches, faces are recognized using local features from faces.

II. RELATED WORK

From early ages, Face Recognition was an important trend for science. Provided an input image with different faces, Face Recognition first runs the Face Detection for face separation. Individual faces are preprocessed and eventually, a low-dimensional embedding is achieved. For a professional classification, a low-dimensional integration is important. For an intrapersonal variety of images, such as style, appearance, and age, face portraying should be powerful, while recognizing relationship image variations among different individuals. Face Recognition and verification are both popular in computer vision research and image processing . The neural frames that can be used for the task have made the subject more and more popular. Generally, more time is required for the preparation of neural networks, training data, and computer power; hence, a good deal of research has been undertaken to reduce these factors . For over two decades, the issue of Face Recognition

has been considered. The methodologies suggested in writing up until now are mainly classifiable as model and appearance-based.

*Proposed System :-

1] For Offline Classes:-The task of the proposed system is to capture the faces of each students with help of smartphone's camera by respective subject teachers . The capture image will then be transferred to server which performs business logic to detect and recognize faces of all the students from a single image and then returns the attendance of recognized students back to the teacher or instructor in the form of excel sheet.

2] Extention for Online Classes :-The proposed system will capture snapshot of all the students along with their faces and this snapshot will then be sent to the server to detect and recognize image in the snapshot and then returns the attendance of recognized students back to the teacher or instructor in the form of excel sheet.

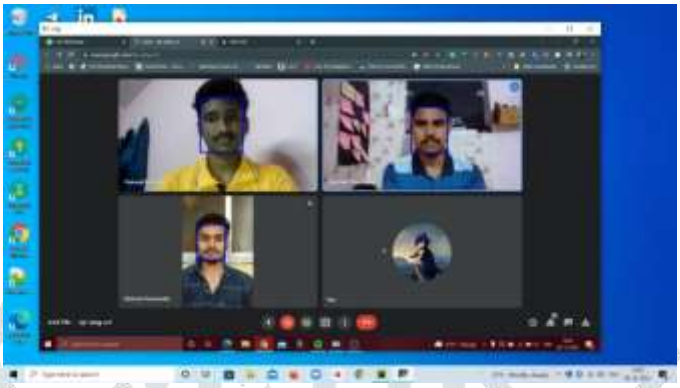


Fig. Face Detection using MTCNN

Automated Attendance System Using Face Recognition :- Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detects the student face when he/she enters the class and the system is capable to marks the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detect human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves the time and also helps to monitor the students

Face Recognition-based Lecture Attendance System :- This system proposes that it takes the attendance automatically recognition obtained by continuous observation. Continuous observation helps in estimating and improving the performance of the attendance. To obtain the attendance, positions and face images of the students present in the class room are captured. Through continuous observation and recording the system estimates seating position and location of each student for attendance marking. The work is focused on the method to obtain the different weights of each focused seat according to its location.

III. METHODOLOGY

To do Face Recognition for Attendance System there must be an input to be detected and verified and that input would ideally be an image. The idea of system was to make attendance system cost effective and reliable. So that extra IOT devices would not be required for the working of attendance system based on face recognition.
So in order to supply the input to our Attendance System we used camera of smartphone that most of the lecturers nowadays are possessing.
We will be having a React-Native Application which would at the end of the lecture will require the lecturer to provide details of current class and capture a group photo of all the students, that photo will then be sent to the backend using HTTP request . At Backend(Flask Server) , we will be using MTCNN model for Face Detection and FaceNet model will be used to create a face embedding for each detected face then we will develop a Linear Support Vector Machine(SVM) classifier model to predict the identity of a given face.
According to the result, attendance of the students will be stored in the excel sheet.

Fig. Face Recognition Process

#Technology Used :-

1] MTCNN :- We will be using Multi Task Convolutional Neural Network for Face Detection.
MultiTask Cascaded Convolutional Neural Network is a modern tool for face detection, leveraging a 3-stage neural network detector.

MTCNN work visualization (source):-

First, the image is resized multiple times to detect faces of different sizes. Then the P-network (Proposal) scans images, performing first detection. It has a low threshold for detection and therefore detects many false positives, even after NMS (Non-Maximum Suppression), but works like this on purpose.

The proposed regions (containing many false positives) are input for the second network, the R-network (Refine), which, as the name suggests, filters detections (also with NMS) to obtain quite precise bounding boxes.

The final stage, the O-network (Output) performs the final refinement of the bounding boxes. This way not only faces are detected, but bounding boxes are very right and precise.

An optional feature of MTCNN is detecting facial landmarks, i.e. eyes, nose, and corners of a mouth. It comes at almost no cost since they are used for face detection in the process, which is an additional advantage.

MTCNN is very accurate and robust. It properly detects faces even with different sizes, lighting and strong rotations.

Fig. Face Detection Using MTCNN

2]FaceNet :-

FaceNet uses convolutional layers to learn representations directly from the pixels of the face. This network was trained on a large dataset to achieve invariance to illumination, pose, and other variable conditions. This system was trained on the Labelled Faces in the wild(LFW) Dataset. This dataset contains more than 13,000 images of distinct faces collected from the web, and each face has a name (Label) to it.

FaceNet creates a 128-dimensional embedding from images and inserts them into a feature space, in such a way, that the squared distance between all faces, regardless of the imaging conditions, of the same identity, is small, whereas the squared distance between a pair of face images from distinct characters is large.

Model Structure: The model contains a batch input layer, followed by a Deep CNN architecture, and an L2 layer. This results in the creation of facial embeddings.

3]Triplet loss :-

This system employs a particular loss function called the triplet loss. The triplet loss minimizes the L2 distance between images of the same identity and maximizes the L2 distance between the face images of different characters.

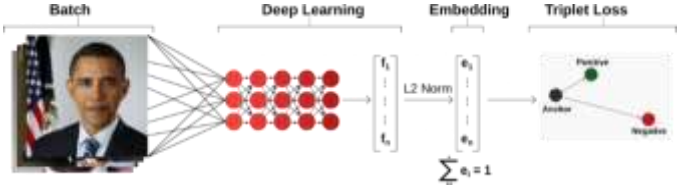
Triplet loss is employed by the system, as it is more suitable for facial verification. The motivation behind using triplet loss is that it encourages all the images of one identity to be projected into a single point in the embedding space.

Triplet loss: Before and after the learning process.

The creators devised an efficient triplet selection mechanism which smartly selects three images at a time. These images are of the following three types:

1. anchor: an image of a random person.
2. positive image: another image of the same person.
3. negative image: an image of a different person.

Two Euclidean distances are measured: One between the anchor and the positive image, let's call it A. Another between the anchor and the negative image, let's call this B. The training process aims to reduce A and maximise B, such that similar images lie close to each other and distinct images lie far away in the embedding space.



IV. CONCLUSION

The proposed system is capable of correctly marking the Attendance using Facial Recognition System without any purchasing any additional hardwares which in turn gives low-cost maintenance.

The proposed system is capable of correctly recognizing faces from videos as well as images. It can work with any sort of pictures and is sensibly strong to changes in face appearance and light conditions.

The Technology we are using aims at developing and understanding of the Attendance System with Face Recognition. Knowledge of the framework and critical success factors in the implementation of Deep Learning is critical to the successful implementation.

The face uses the concept of triplet loss. We classify the main research so that it will provide information about the algorithm for face recognition. Each algorithm has its use for face recognition. And until now the level of accuracy of the algorithm that is best used for face detection is a Deep Learning and Neural Network algorithm

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