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Face Recognition Attendance System

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Abstract - *In today's Digital world almost, everything is getting automated. Marking Attendance in school and college using the conventional method is also now slowly and outdated method, which is overtaking by an automated system. While marking attendance manually, it is more time-consuming and is also not a reliable method. In the last few years, face detection and recognition technology have improved a lot due to much research in this field. So smart attendance management system using face detection in real-time is the best suitable system for managing attendance using today's smart technologies. So we have proposed a prototype model of a smart attendance management system that is based on facial recognition and detection method. This model will produce a more accurate result and also saves time.*

***Key Words*: Face Recognition, open CV, deep learning, CNN, Face Detection**

1.INTRODUCTION

The current method which is used for marking the attendance is quite class disturbing and also time-consuming.

In the current method, the attendance is marked manually on the paper sheet which is further updated to an excel sheet.

This process is hectic and also very time-consuming.

So it's better to change this system into automated ones by using a modern solution like face recognition and detection.

So there will be no need for manual intervention, all the processes of marking the attendance will be done by a smart attendance system.

So the reason behind this proposed prototype model is the slow and inefficient current attendance system.

Nowadays face detection and recognition are widely used and also famous concepts.

Even government agency like Raw and IB are using this concept for detecting the criminal and terrorist.

So we have gone through some well-known projects which are using face recognition in their project and found it is the best way to use this concept in the attendance marking method.

This prototype model will capture the face and recognize it during the attending classes and mark their respective.

2. LITERATURE SURVEY

E.Varadharajan et al., proposed an attendance management system which is using biometric to mark attendance. This system automatically replaces the existing traditional method. Traditional methods are a time-consuming process and maintenance of the system is also very difficult. This proposed system makes the attendance process with human contact. The camera is placed in the classroom to gather the student's face image, which is matched to the saved image, and then the student's attendance is recorded. The student is absent in the class, the system will automatically send the SMS message to the stored contact people like parents. In this system, the Eigenface method is used to identify the faces problem of face recognition[1].

C.B.Yuvaraj, et al., is working on a new technology that uses face features to track student attendance. The process is broken into four steps in this manner. The phases are face detection, label the faces, train the data and label the dataset based on labeled data. The classifier is used to identify the faces. The input images are received from the classroom [2].

Smit Hapani et al., proposed a system that collects the images from video and identifies the student using their facial features. The main objective of this system is to take attendance automatically without any human help. In this system, faces are recognized using Viola reliable. On the other hand, such systems are very time-consuming.

So our proposed model is based on facial recognition and detection, named "Face recognition attendance system" that is completely based on the modern concept of image processing.

In this model, the face will be recognized by using a face recognition and detection algorithm.

The captured image will be processed using a face recognition algorithm. The face recognition algorithm will process the extracted facial data and then it will be recognized in a later post-processing stage by the face

recognition algorithm. The main benefit of this model is that when more than one student is in front of the camera, the algorithm will process the data and recognize more than one student at a time.

Fig.1 describes the system flow of our proposed system. In this attendance system, there are four important phases throughout the termination of the process, which can be accessed by some administrators. Every student or faculty member has to first complete registration before starting this recognition service. So all the students or any beneficiaries have to fill out a registration form in which they have to give some basic information. While registering on this model, 65-80 images will be captured automatically by this model and stored in the taring module within that particular student folder. While completing this process, the face is detected by the trainer.

And then, after registering, the images will be encoded. Also, training of the images will occur inside the training set. And after this process, the two files .csv and .pkl will be encoded with each recognized image.

And now, the camera will be installed either inside or outside the class, and when any student goes in front of a camera, the images will be captured, and if the face is recognized, then the attendance will be marked on the excel sheet which will be stored in the database. And those faces which will not be recognized by the system, those images will be treated as unknown, and the model will be shown as unknown.

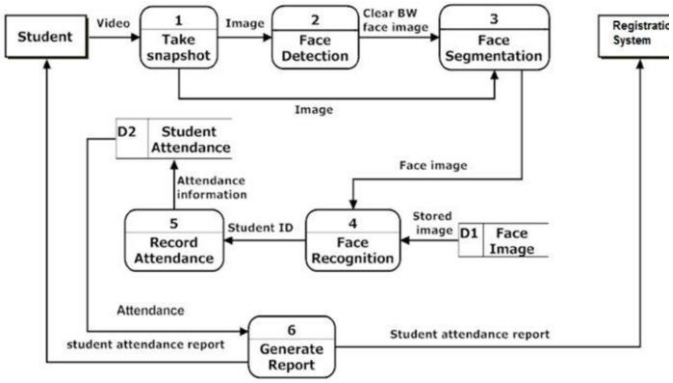

Fig -1: Architecture of Proposed Model

5. Module specification

5.1 Face detection

Face landmark detection is a subset of the shape prediction issue. Facial features such as the eyes, brows, nose, mouth, and jaw line were utilized to identify and portray important facial regions. A shape predictor uses an input image to try to locate significant spots of interest along the shape. Our goal in the context of facial landmarks was to use shape prediction methods to discover significant facial structures on the face Localizing the face in the image and determining the important facial structures on the face ROI are thus required for detecting facial landmarks. To recognize facial landmarks in an image, Dlib and OpenCV were utilized. We have used two methods to detect the face:

1.Using Open CV built-in particular Haar Cascades.

2.Using a model for predicting facial landmarks

5.1.1 Using OpenCV built-in particular Haar Cascades:

Paul Viola and Michael Jones suggested the Haar feature-based cascade classifiers as an effective object recognition method in their work "Rapid Object Detection with a Boosted Cascade of Simple Features" in 2001.

It's a machine-learning approach in which a cascade function is learned using a large number of positive and negative photos. After then, it's utilized to find items in other photos.

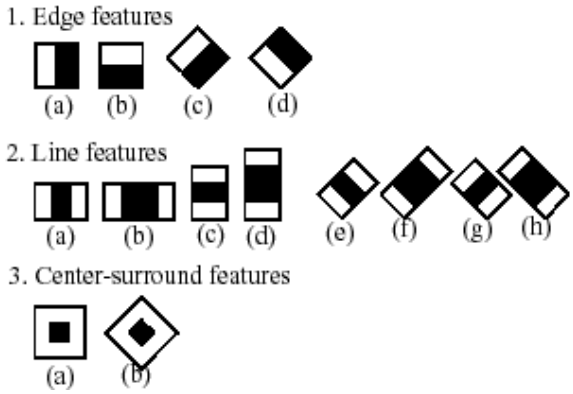

Fig -2: Haar cascade Feature

5.1.2 Using a model for predicting facial landmarks:

What matters is that we are provided the face region where we can apply facial landmark detector, not the algorithm used to recognize the face in the image. We employed a pre-trained facial landmark detector to detect major facial structures in the face area, which predicts the location of 68 (x, y) -coordinates that correspond to facial structures on the face.

Other facial landmark detectors exist, but they all aim to locate and label the following facial regions: Mouth, Right brow, Left brow, Right eye, Left eye, Nose, Jaw, and so on.

The 68 coordinates' indexes can be seen in the diagram below:

Fig -3: 68 Coordinates on the faces

These annotations are from the 68-point iBUG 300 -W dataset, which was used to train the dlib face landmark predictor. It's worth noting that there are alternative facial landmark detectors available, such as the 194 point model trained on the HELEN dataset. The same dlib framework may be used to train a shape predictor on the input training data, regardless of which dataset is utilized, which is beneficial if one wants to train face landmark detectors or custom form predictors.

5.2 Face Recognition

5.2.1 Using the Convolutional Neural Network:

CNNs are a type of deep, feed-forward artificial neural network that has been effectively applied to image analysis. CNNs help in image and video identification, recommender systems, and natural language processing.

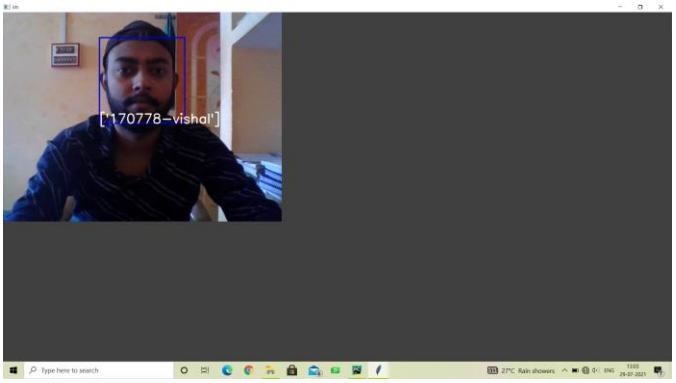

Fig -4: Recognizing the faces

CNNs are built up of neurons with learnable weights and biases, just like other neural networks. Each neuron takes a weighted sum of many inputs, passes it through an activation function, and reacts with an output. The entire network has a loss function, and all of the neural network tips and tricks still apply to CNNs. In contrast to neural networks, where the input is a vector, the input in this case is a multi-channeled picture (3 channelled in this case).

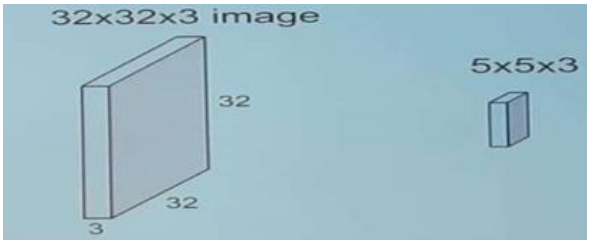

Fig -4.1: Multi channeled image

The 5*5*5 filter is moved through the entire image, taking the dot product between the filter and section of the input image along the way.

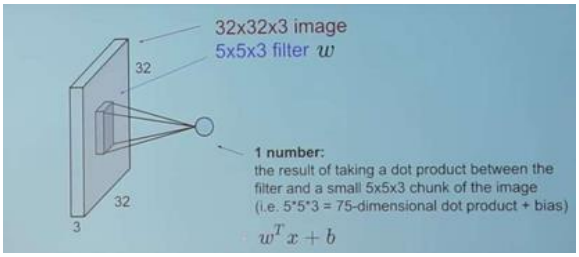

Fig -4.2: Multi channeled image

The outcome of every dot product taken is a scalar. So, what happens when we apply the filter to the entire image?

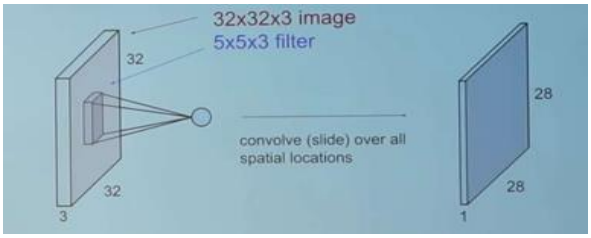

Fig -4.3: Multi channeled image

5.2.2 Residual Networks

According to what we've observed so far, raising the depth should improve the network's accuracy as long as over-fitting is avoided. However, as the depth of the network grows, the signal required to modify the weights, which emerges from comparing ground-truth and prediction at the network's end, becomes very little at the earlier layers. It basically indicates that the learning of preceding levels is nearly non-existent. This is referred to as a vanishing gradient. The second issue with training deeper networks is that the optimization is done on a large parameter space, resulting in blindly adding layers and increasing training error. The validation error of the plain 34 layer network was higher than the 18 layer plain network. This is when we notice the issue with deterioration.

When transformed to a residual network, the identical 34 layer network has a substantially lower training error than the 18 layer residual network.

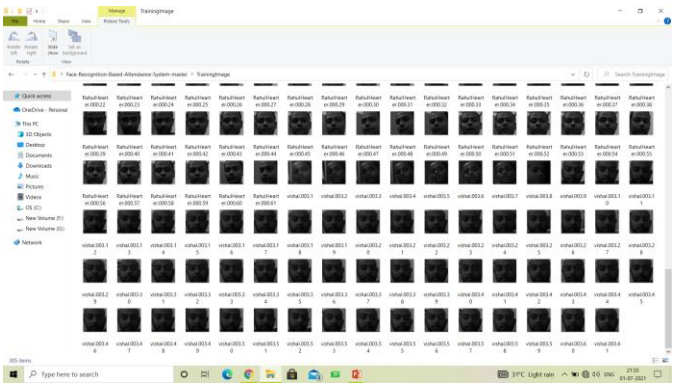

Fig -5: Training Dataset Images

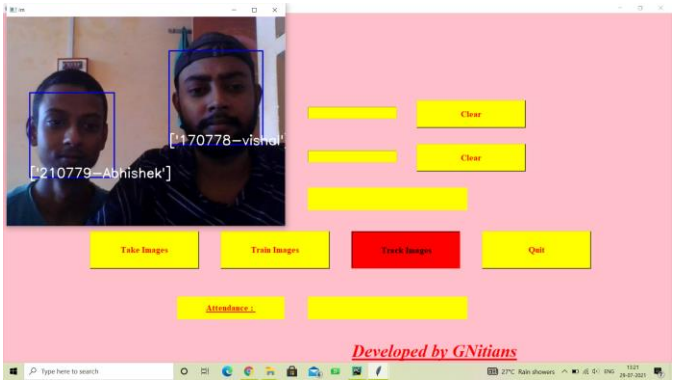

Fig -6: Final working model

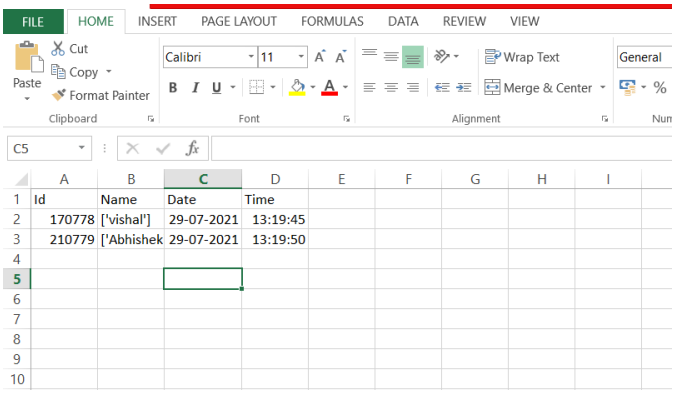

Fig -7: Attendance Excel sheet

6. CONCLUSIONS

The main use of this model is to mark students' attendance automatically. This automatic attendance system, which is based on face recognition, will be a time saver, reliable and secure system.

In the future, the aim is to increase the rate of recognizing the person when there are any unwanted changes in the person, like wearing a cap, spectacles, or keeping a beard, etc. Also, the system may recognize up to 1-5 students at a time, which has to be improved further. Also, poor lighting may affect recognition accuracy, so it can also be further improved.

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