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SMART ATTENDACE SYSTEM BASED ON FACIAL RECOGNITION

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Abstract - *Attendance is basically a process of counting the number of individuals attend-ing a class in schools or employees in offices or may be used in some other fields too. However, most of the prevailing approaches are time-consuming, intrusive and it requires manual work from the users. Since we all know that facial recognition has been playing a vast role in the field of image processing. And an attendance system has been a sub part of this field where an automated attendance replaces the traditional method by recognizing the individuals and storing their datas respectively. During this project we'll be designing an atten-dance system that can recognize the face of the scholar and checks the presence of the scholar face within the database and marks it as a present. An automatic message is shipped to the parent just in case of the absence of the scholar. An automatic mail is shipped to the staff reporting the amount of present and absent students. Thus, this project helps in saving time of the people also as automates the records which helps in saving manual maintenance. Implementation of this project also gives rise to several applications like biometric scanning in bank lockers, etc.*

Key Words: **CNN, MFN, RNN, Gb, FC, SMTP.**

1. INTRODUCTION

Attendance Management System is a specific application tool developed for counting the individuals in schools, colleges and institutes. It processes the counting of all the individuals based on the input data's provided to be stored. Image processing is the ideology behind developing such kinds of system. This system also will help in evaluation of attendance is students in schools, colleges and institutes. The aim of developing an attendance management system is to remove the physical counting process and make it an automated one. The main purpose of building of this system is to bring some minor technological advances in the field of our education as this is only field with slow advancements in recent technologies still relying on the traditional methods of processing.

1.1 Practicality of proposed model

1. In Economical terms
2. In Technical terms
3. In Behavior terms

1.1.1 In Economical terms

The proposed model is absolutely economical in reference of all schools and colleges. It is cost-effective model that eliminates the use of high end processing. Moreover the system proposed above is effective in time saving as all the counting and processing calculations are automated. The accuracy of the system is very high in prediction and calculations with least amount of errors.

1.1.2 In Technical terms

Technically this system is adaptable in all the systems with a bit of advancement processing and the main feature is that is does not require high end hard-wares.

1.2 Disadvantages of traditional model

1. Being adaptable.
2. Problem in generation of report.
3. Manual Processing.

1.2.1 being adaptable

The existing model is not at all adaptable as it takes a lot of time to compute the results with some inaccuracies too.

1.2.2 Problem in generation of report

Since it is a real time application model so the computation if results must be fast and accurate so that proxy attendance can be prevented.

1.2.3 Manual –processing

When results are purely based on human calculation it's a chance of occurrence of human errors which can be proved to be fatal in real time applications.

1.3 Merits of Attendance Management Network

1. Ease of Use
2. Ease of Generation of Report

1.3.1 Ease of Use

Our developed system is highly user-centric as, the storing of the data as well as its retrieval is quick and efficient and the database is managed efficiently. Moreover client is provided with a user interface in our system which in turn results in higher efficiency and their interacting becomes easy.

1.3.2 Ease of Generation of Report

The log reports generated within our developed system varies according to our clients need the.log-reports generated can be generated either on a weekly or a monthly basis or on a quarterly basis, we can also send a reminder to the users if they become irregular.

1.4 Technologies Used:

The technologies used here are mainly based on Deep Learning. Deep learning is basically a computer software that can be related or com pared to the network of neurons in the brain. Being one of the subsets of the machine learning its called as deep learning because as it uses deep neural

networks as their primitive source. Its divided in terms of layers which are in mentioned below as follows:

> The Input Layer as the first layer and Output layer as the Second Layer.

> All the layers which are laying in between these layers are termed as the Hidden Layers

>Each of the hidden layer comprises of the before named Neurons which are connected to each other.

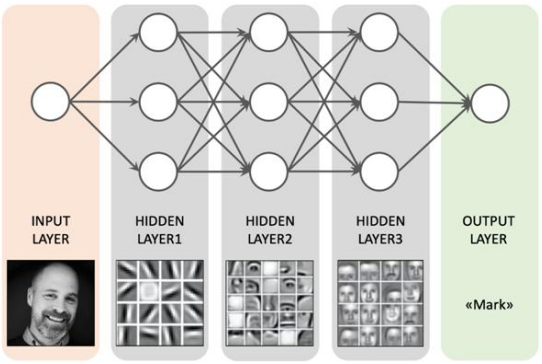

Fig1.Deep Learning Layer.

This neuron's basic task is to process the signal which it receives from the layer which is above it.The strength which is to be passed to the next layer depends on weight, bias and the activation function. One of the main functions of these networks is that it can process large amount of data and can even learn increasingly complex features of the data which is present at each layer.

1.5 Process of Deep Learning:

Speaking about Deep learning it provides the best accuracy and precision even in performing the basic tasks to the most hectic tasks , for instance from Object Detection to Speech Recognition. One of their main advantages is that they can learn automatically without any predefined knowledge which has to be coded by the programmers.Ok , to learn how this Deep Learning Basically works lets take an example of a Family with their child. Coming to this child what basically happens is that whenever he points out something at his home the parents or the adults the present at the home teach him what that object is by repeating the name of the object like " that's a Ball ", or "that;s not a Ball". The child keeps on persistingly pointing towards many objects but gets familiarized with the Ball .This little child doesn't know deep inside why he can say it a ball or not. He has just learned or can say that has been taught that something which is spherical in shape

Fig2.Deep Learning Process.

and can bounce can be called as a Ball. So by knowing the features like this which are taught to him he can identify the object whether its a ball or not. Same thing happens for a physical object I.e a living object which is present in front of him.For example when he sees a dog he just specializes its tail, body, face etc and makes his mind that it is a dog which is in front of him. This the way in which the neural Networks works. As we know it comprises of layers containing data it basically represents a deeper level of data. For instance a neural network with 4 layers will learn more complex features when compared to two layers. The learning basically occurs in two phases which are mentioned in the image.

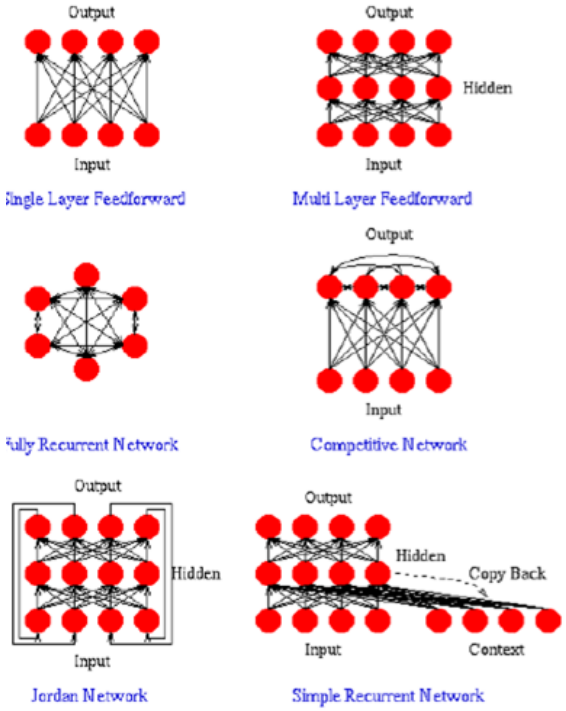

Fig3.Types of Deep Learning Networks.

1.6 Convolutional Neural Network (CNN)

Convolutional neural networks have the following layers

- Convo-lution
- Re LU layer
- Pooling layer
- Fully-connected layer

Each image is denoted in form of a matrix grid and the positions with the images are marked with 1 and the remaining portions are marked as -1. Generally in normal technique computer matches the original image with a deformed image and the resulting a deformed image. Thus random patches of an input image is taken denoted as filters and the same patch is matched with the deformed image.

3. System Design

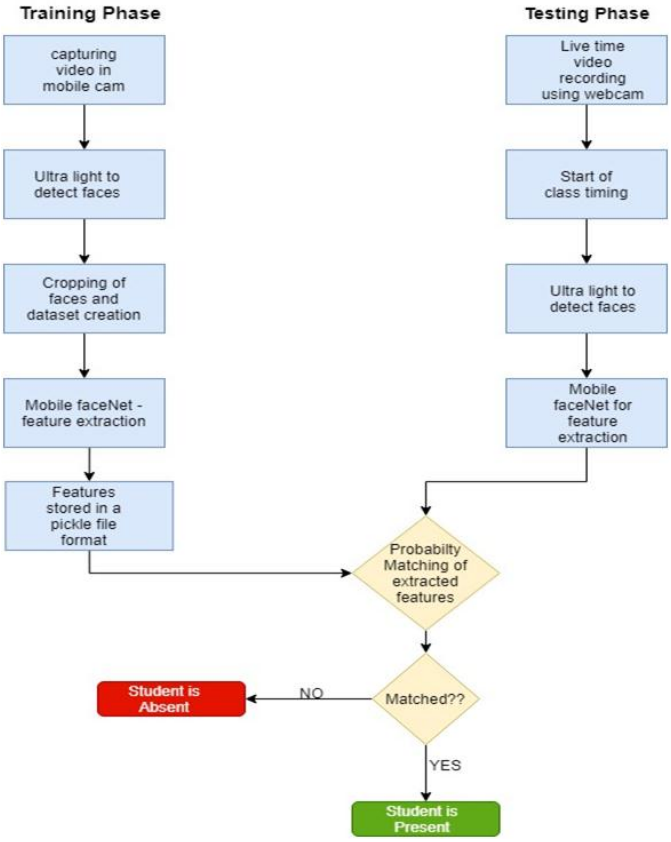

Fig4.System Design

The 3 basic steps that are necessary to build this system are

1. Database creation.
2. Feature Extraction of images.
3. Comparing the training and testing phases to obtain results.

3.1 Database Creation

Before marking the attendance of the students we must procure their details otherwise machine can not be able to understand whose face has been detected. Thus database creation is the fundamental step towards facial recognition. The entire Image processing algorithms needs the database to work on. More the number of datasets more the accuracy of recognition. In our model too first we created the datasets of students by capturing them in a video frame. The video must be for at least 30 seconds for obtaining more number of face images. While capturing the video the subject is asked to rotate the face in left, right, upward, downward directions to obtain their side angle views for dataset creation. The captured video is copied in a folder naming " Testing". We use a pre trained model called ultralight which crops only the face images from the video and store them separately. In ultra light the boundary boxes also known as bboxes are used to mark the boundaries across the face by getting the co ordinates. The rectangular shaped boxes capturing the face are cropped out and stored as datasets for our model.

3.2 Feature Extraction

This is the second most important phase in an image processing. In CNN the system reads the image based on their RGB density values. The RGB density values will be different across different parts of our face image. A matrix is formed using these density values and are passed to the first layer of CNN called convolution layer where filters are applied. Then it is passed to ReLu layer where applied filters are processed and activation is obtained. Then it is further passed to Max pooling layer where system model gets reduced. Then after few process at last everything is passed to fully connected layer for probability matching with testing images. We used Mobile Facenet {MFN} which extracts the features of images and store them in a pickle file format that contains only the coordinates of the extracted features. The size of pickle file is very less as it only contains the co ordinates of features not the image as a whole.

3.3 Comparison of training and testing images

This is the last phase of this model where the image at real time is obtained and same process is followed to obtain the extracted features. Then it is compared to the pickle file where probability of matching is computed and the face is recognized following the marking of the attendance of that particular student.

4. Working

The Intel processor is configured to work in the Linux OS. The required libraries are installed in the Linux using the terminal command prompt, the terminal command prompt is used to run all the command used in the project as well as the overall project. The dataset consists of the faces of the students extracted from a short 30 seconds video the datasets contain the faces of the student at different angles. Now the dataset generated is used to train the intel processor so that the student can be marked as present or absent automatically, now as the processor is ready to detect the face the camera module is switched on, the live feed from the camera is being initiated, as the face of the student comes in front of the camera the feature is extracted. The MobileFaceNet and Ultralight are used during the live streaming for recognizing the faces during the live streaming from the camera. The extracted facial feature is then matched with the features from the datasets present already is the match is successful the student is marked as present, this process continues until the attendance time closes. At last, a report is generated which is sent to the faculty email id of the corresponding class with the detailed report of the attendance of the class. The project focuses on effective implementation of automatic attendance marking which

uses facial recognition for its aid, it also helps in effective time saving and management for the institution.

4.1 Module Description

1. Collection of the data-sets.
2. Augmentation of the data.
3. Object Detection Module.
4. Face Recognition Module.
5. E-Mail System integration.

4.1.1 Collection of the data-sets

The deep learning is the method for solving many real-world challenges or problems. With enough training deep network can be used to identify the key factors or points of every person in the image. The deep learning is the method for solving many real-world challenges or problems. With enough training deep network can be used to identify the key factors or points of every person in the image.

4.1.2 Augmentation of the data

Data augmentation is the process of generating new datasets or the transformed version of the datasets from the current one it involves the generation of new images or datasets from the existing ones which belong to the same class.

4.1.3 Object Detection Module

The "Ultra-Light-Fast-Generic-Face-Detector" satisfies all our needs. This model is used for face detection in low-power computing devices and can be used with both Android and IOS devices as well as PCs.The Ultra-lightweight face detection model is designed for low powered devices and can be used for real-time face detection.

4.1.5 Face Recognition Module

Or recognizing of the face we use the mobile face-net, the mobile face-net is highly accurate in classifying face, it uses neural networks to obtain the accuracy up to 99 percentage. The network uses million of parameters taking only a few milliseconds to run and produce results. The mobile face-net network uses 0.99 million parameters.as to reduce the computational costs the input resolution is reduced to 112 x 96.the accuracy of our primary MobileFaceNet is boosted to 99.55 percent.

4.1.6 E-Mail system integration

For integrating of the E-Mail we use the SMTP protocol which would be used to send and receive mail configured by us.in our project , we share the output of the marked attendance that is we send the concerned teacher an Electronic-Mail by setting up an Simple Mail Transfer Protocol server using our Intel processor. Simple Mail Transfer Protocol server operates by initiating a link or a transfer between the host and the stored server**.**

5. Realistic Constraints

The following mentioned are some of the realistic constraints that we encountered while testing our project in various aspects

1. High quality web cam required for better accuracy.
2. Better Lightning conditions always preferred.
3. Higher the frame count high is the efficiency of matching thus a little bit fraction of time consumption.
4. High processing system required to mark attendance of all the students in one go.
5. Decentralized system in some cases

6. Software Description

6.1 Python

Python involves significant level general programming language Python three. was free in 2008. The python isn't completely in reverse good and far of the python a couple of code doesn't run on Python three except if it's changed. Python bolsters Object-situated programming and organized programming.

6.2 Libraries used in Python

1. TensorFlow.
2. Keras.
3. Numpy.
4. OpenCV.
5 .SciPy.
6. MatplotLib.

7. Result and Analysis

7.1 Creating of datasets

In order to proceed with our attendance marking system, the first step is to collect the datasets of the students whose attendance is going to be marked and the collected datasets is stored in the system.

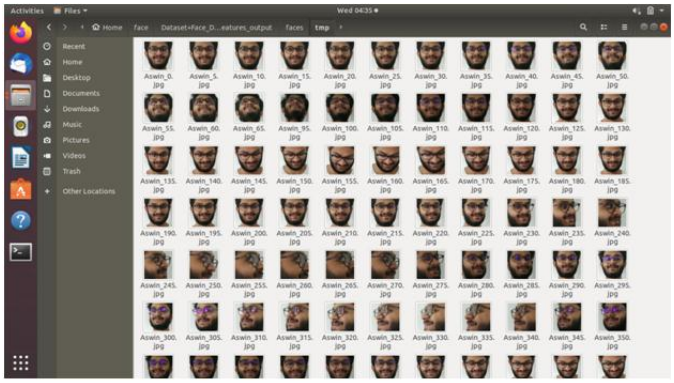

Fig5.Dataset creation

A video of approx 30 seconds is Recorded and ultralight is used to detect the faces from the video and the face images are stored in a folder called faces inside the system.

7.2Face Detection

Ultralight is a pretrained model that is used to detect a face in an image and used for drawing a boundary box across the face image.

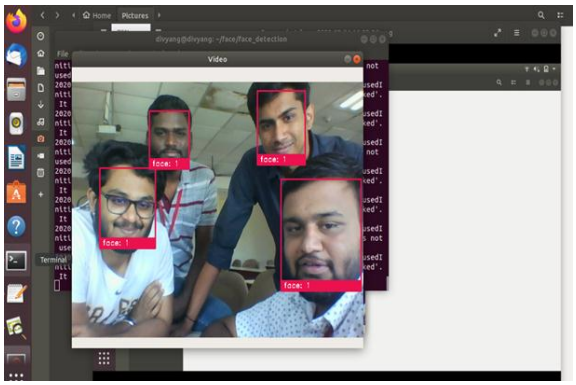

Fig6.Face Detection

7.3Face Recognition

Or face recognition first we set a class timer in the config. menu then runs the main code in the terminal to obtain the below result For marking of the attendance a student has to come and stand in front of the camera . The class timer will be running and simultaneously the attendance of the student is marked by displaying along side the name of the student.

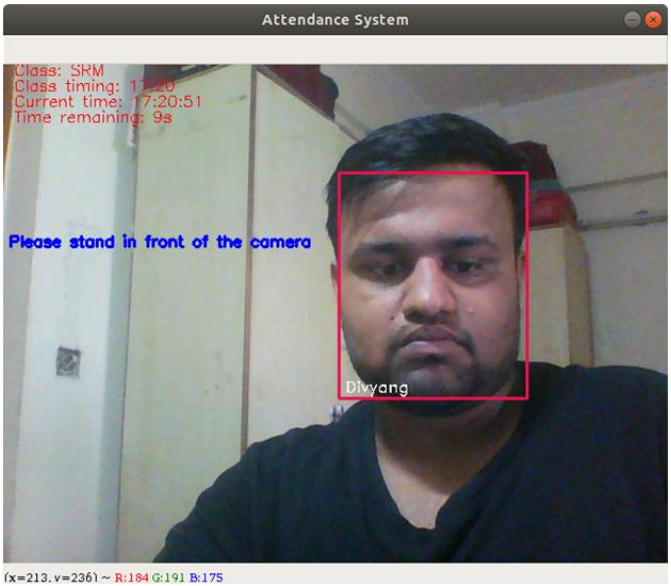

Fig7 .Face Recognition

7.4 Sending Results

The attendance result is sent to the teacher's mail id once the class timer stops and attendance of the students are marked.

Fig8.Result

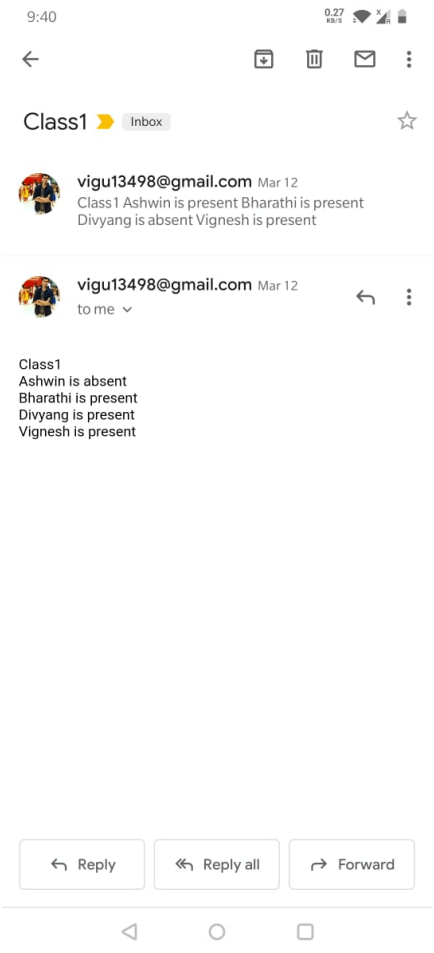

Fig9. Email Result

8. Conclusion

We as a team kept in mind to reduce the amount of time spend and wasted by each faculty in taking the attendance in manual way, with the successful implementation of our project we aim to reduce the burden on teachers and faculty across all the teaching institutes. Since our system does not

or consist of very little human intervention the chances of error are reduced drastically and increases the accountability in the system. As the system is completely human intervention free we save time and avoid manual work to a larger extend. Since this system increases accountability this project helps in monitoring the students how effectively they are attending the classes and how regular they are in that.

9. Acknowledgment

I would like to express my deepest gratitude to my guide, Dr. T.Deepa for her valuable guidance, consistent encouragement, personal caring, timely help and providing us with an excellent atmosphere for doing research. All through the work, in spite of her busy schedule, she has extended cheerful and cordial support to us for completing this research work.

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