Classroom Attendance based on Face Recognition

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INTRODUCTION

Attendance is an important part of daily classroom evaluation. At the beginning and ending of class, it is usually checked by the teacher, but it may appear that a teacher may miss someone or some students answer multiple times. It ensures that there is a proper correlation between the instructor and the students. Classroom attendance records provide a way for the instructors to identify students who are lagging behind and need help in the course.

Face recognition-based attendance system is a problem of recognizing face for taking attendance by using face recognition technology based on high-definition monitor video and other information technology.

The concept of face recognition is to give a computer system the ability of finding and recognizing human faces fast and precisely in images or videos. Deep learning has been highly explored for computer vision applications. The face recognition is an integral part of biometrics. Facial features are extracted and implemented through algorithms, which are efficient and some modifications are done to improve the existing algorithm models. Computers that detect and recognize faces could be applied to a wide variety of practical applications including criminal identification, security systems, identity verification etc.

Classroom attendance records provide a way for the instructors to identify students who are lagging behind and need help in the course. Lack of attendance leads to increased risks of:

1. Careless or Destructive behaviour
2. School failure
3. Early dropout

However, we noticed that the current attendance is systems have many flaws and are not quite efficient. For example, even the fingerprint recognition system which is considered most efficient of all of the present systems is quite slow. So, we worked on a better more efficient attendance system based on facial recognition system which is neither time-consuming nor vulnerable to malpractices, is accurate and is automated.

METHODOLOGY

Detection of Faces

Dlib's frontal face detector uses Histogram of Oriented Gradients (HOG) for detection of faces in the image and the HOG matrix of several faces were used as a training dataset for classification of regions of the image as containing a face or not. Then a shape predictor, specifically a facial landmark detector is applied to obtain (x,y) coordinates of the face regions in the face ROI .

Data Collection

All Students will have to report at the ERP Office where a video of their face will be recorded from which images will be extracted for input into the detection code which will use the pre-trained HOG face detector available in the dlib library. These generate a set of images of the faces which are saved in each Student Directory in the Central Image Database. In each Subject Directory, the contents of the Student Directories of all the students enrolled in that particular course will be copied from the Central Image Directory. This list will then be used to access the individual student directories for training the model.

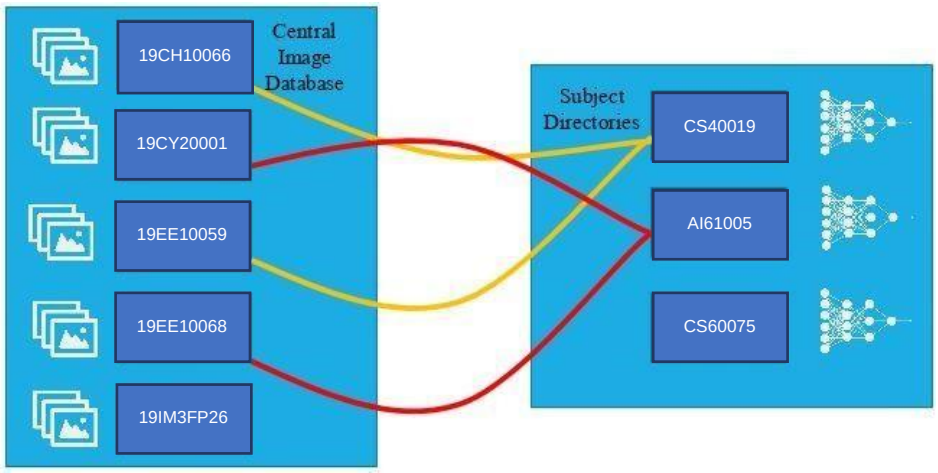

Fig 2. Arrangement of Data

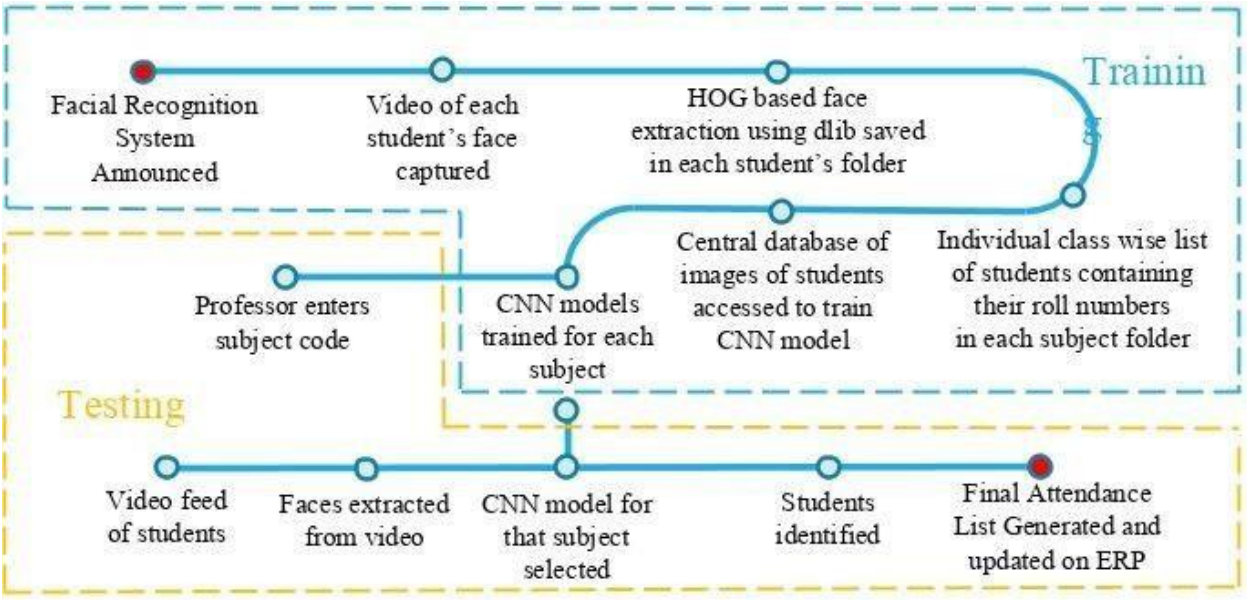

Fig 3. Workflow

Training

After receiving the images of faces of each student after accessing the student directories from that particular subject, we train our CNN model with these images as our training set.

The steps involved in our CNN model are:

1. Convolution
2. Pooling
3. Flattening
4. Fully Connected Network

Testing

After the models have been trained for each subject, for every class, the professor inputs the subject code to begin the attendance. This allows for that specific CNN model to be selected then for the attendance. Images of each student entering the class will be captured by a camera on the door, and then the image will be tested and ultimately all the students present in the class will be marked present.

Some of the correctly classified test datasets will be added to the training dataset from time to time to ensure that model keeps on adapting to any possible changes in the face.

RESULTS

Before getting the list of names of names of students present in the class, a threshold value is set for prediction accuracy score. If the photo resembles more than the threshold value, it is going to be marked as present. After testing, we found out our result to be 100 % accurate.

REFERENCES

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2. https://www.learnopencv.com/histogram-of-oriented-gradients/
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4. http://cs.wellesley.edu/~vision/slides/Qianli_summary_deep_face_models.pdf

Link to the code: https://github.com/hh-hassan/Classroom-Attendance-based-on-Face-Recognition

Responsibility of each group member:-

Hassanul Haque (19EE10068): prepared the face_detection.py file using dlib library's get_frontal_face_detector() method using HOG matrix, created the training and testing dataset and prepared the final report of this assignment.

Varshitha P (19IM3FP26): built the CNN testing model, filtering and pooling of the train images, input to multi-layer Neural Networks, trained the whole CNN model.

Subir Gupta (19EE10059): fed the Test images in CNN, filter and pooling of the test images, optimization using iterations, defined Threshold Function, model evaluation on testing dataset, prepared the interim report of the assignment.