

# **Automatic Attendance System using Face Recognition Technique**

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# **Automatic Attendance System using Face Recognition Technique**

*Project report submitted in partial fulfillment*

*of the requirements in the subject of*

***Product Development Lab***

*in*

***Computer Science and Engineering***

*by*

***Manukumar Rudresh, C.Lalnunchama***

(Roll Number: 116CS0157,116CS0197)

*based on Project work carried out*

*under the supervision of*

***Prof. Arun Kumar***



October, 2018

Department of Computer Science and Engineering  
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**Prof. Arun Kumar**

Professor

October 21, 2018

## **Supervisor's Certificate**

This is to certify that the work presented in the project report entitled *Automatic Attendance System using Face Recognition Technique* submitted by *Manukumar Rudresh, C.Lalnunchama* , Roll Number 116CS0157,116CS0197, is a record of original project work carried out by them under my supervision and guidance in partial fulfillment of the requirements in the subject of *Product Development Lab* in *Computer Science and Engineering*. Neither this project report nor any part of it has been submitted earlier for any degree or diploma to any institute or university in India or abroad.

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Arun Kumar

# Declaration of Originality

I, *Manukumar Rudresh, C.Lalnunchama* , Roll Number *116CS0157,116CS0197* hereby declare that this project report entitled *Automatic Attendance System using Face Recognition Technique* presents my original work carried out as a undergraduate student of NIT Rourkela and, to the best of my knowledge, contains no material previously published or written by another person, nor any material presented by me for the award of any degree or diploma of NIT Rourkela or any other institution. Any contribution made to this research by others, with whom I have worked at NIT Rourkela or elsewhere, is explicitly acknowledged in the dissertation. Works of other authors cited in this dissertation have been duly acknowledged under the sections “Reference” or “Bibliography”. I have also submitted my original research records to the scrutiny committee for evaluation of my dissertation.

October 21, 2018  
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# Abstract

Attendance taking is a tedious process and becomes much tougher with the increase in the number of students registered for the class. Many times this may lead to the teacher skipping the whole process of attendance or they end up calling out only few random names from the list to save their time. This is bad due to the fact that the school/institute won't be able to maintain a proper record on the student's attendance. But taking attendance for the whole class may also waste few minutes of the subject. There should be a solution to tackle it.

To tackle the above mentioned problem, we plan to implement Automatic Attendance Management System using Image Recognition technique. To build this, we will use MATLAB and its GUI built in functionality. To make use of this technique, we will first build a database consisting of the student's details and then store the images of each student who has registered for that particular subject. By using the facial features of the person, our proposed system will automatically mark the attendance. Hence, we will be able to maintain a proper database and reduce the time wastage.

***Keywords: Facial Recognition; Automatic Attendance; Image Recognition; Face Detection; Feature Extraction.***

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# Chapter 1

## Introduction

The recent years has witnessed a lot of progress in various fields of technology. One such field is Image Recognition. Image Recognition and Image Processing is being used in various field of research and it has been providing better and faster results too. Image processing which deals with extracting useful information from a digital image plays a unique role in the advent of technological advancements. There are two tasks which are primarily focused on, improvement of pictorial information for human interpretation processing of image data for storage, transmission and representation for autonomous machine perception. With the applications of Image Processing being vast, extensive work and research have been carried out to utilize its full potential to make new innovative applications. Facial recognition has been the earliest of the application derived from this technology, which is one of the most fool proof methods in human detection. With the release of the iPhone X, millions of people now have face recognition technology in the palms of their hands, protecting their data and personal information. While mobile phone access control might be the most recognizable way of face recognition being used, it is being employed for a wide range of use including preventing crime, diagnosing diseases.

Face is a typical multidimensional structure and needs good computational analysis for recognition. Biometrics methods have been used for the same purpose since a long time now. Although it is effective, it is still not completely reliable for purpose of detecting a person. Every school, college and university maintains the attendance of every student. Reports have shown that there is a significant correlation between students' attendances and their academic performances. There is also a claim which states that the students who have poor attendance records will generally link to poor retention. Due to this reason, a faculty should maintain a proper record of the attendance. The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. One alternative to make student attendance system automatic is provided by facial recognition.

Traditionally, attendances are taken manually in the class room using attendance registers given to the faculty members. But it is a time consuming event. It becomes much tougher

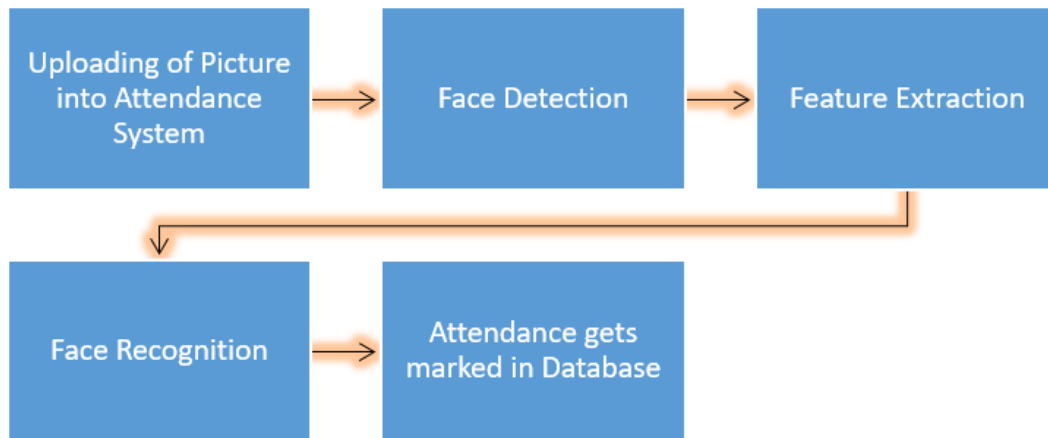


Figure 1.1: Process under Automatic Attendance System

with the increase in the number of students registered for the class. Many times this may lead to the teacher skipping the whole process of attendance or they end up calling out only few random names from the list to save their time. This is bad due to the fact that the school/institute won't be able to maintain a proper record on the student's attendance. But taking attendance for the whole class may also waste few minutes of the subject. It is also very difficult to verify students one by one in a large classroom environment, whether they are present or not. The primary purpose of developing attendance management system is to computerize the traditional way of taking attendance. Automated Attendance Management System performs the daily activities of attendance marking and analysis with reduced human intervention. At the time of enrollment for a course, the images of face of individual students is captured and stored in the Face Database.

The system consists of uploading of images of the students sitting in the classroom. This is followed by sending the image into the Face Detection module where individual faces are detected in the image, and this is followed by Recognition modules which will recognize the student and then the attendance is marked on the database server. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database. If any face is recognized the attendance is marked on the server and stored in the database. The image will be captured twice, once at the beginning of the class and once at the end to ensure that the student has attended the whole class.

Face Database is the collection of face images and extracted features at the time of enrollment. The attendance database contains the details about the students and it is also used to mark attendance. In case a student is present whose face is not recognized, the lecturer can update the system manually.

## 1.1 Making of GUI

An user interface is made with MATLAB built in tools. It consists of two axes, one for input image of the classroom and the other for output after it detects faces. Two push button were made for opening image and detect button.

Table 1.1: Information for GUI

Item	Type	Size	Color
Load	Push Button	1 x 3	Grey
Detect	Push Button	1 x 3	Grey
Title	Static Text	1 x 10	Grey
Image Viewer	Axes	8 x 8	White
Face Detection viewer	Axes	8 x 8	White

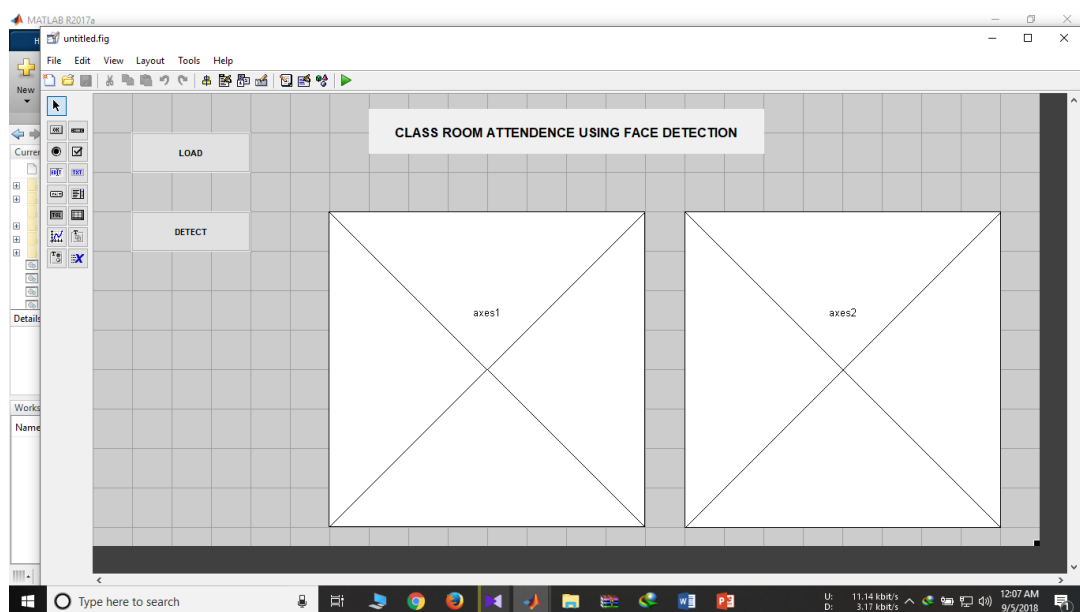


Figure 1.2: GUI raw file sample

## 1.2 Image Insertion

Images are inserted in the GUI file from the button and it can take any type of images.

### a. Image type

Any common image file format like JPEG, BMP etc. are accepted for insertion with this option.

## b. Loading

Certain error message and invalid selection message is also made for unsupported types of files and the button.

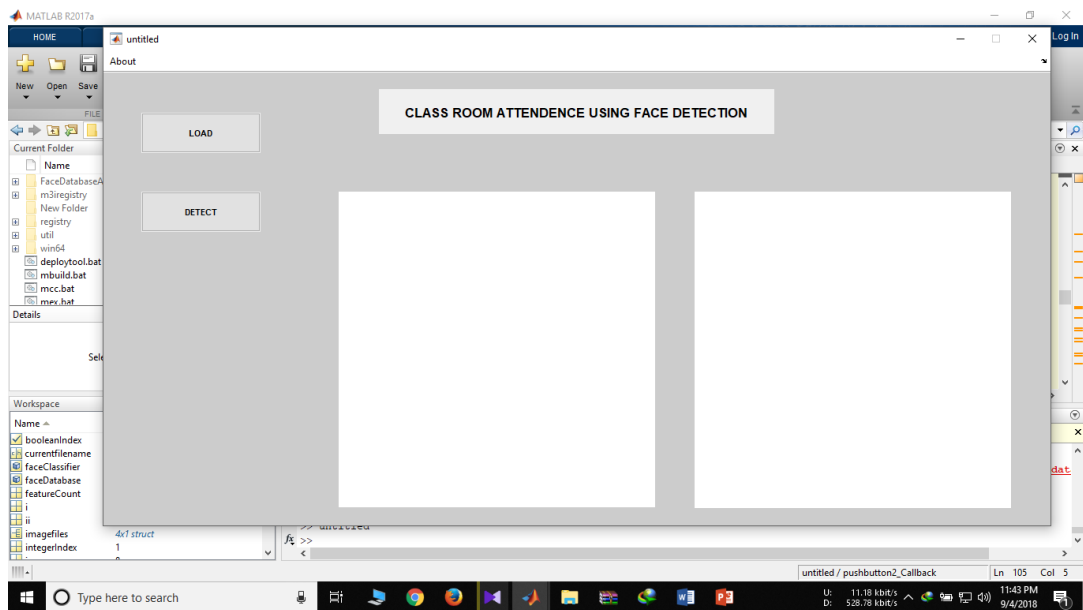


Figure 1.3: GUI output sample

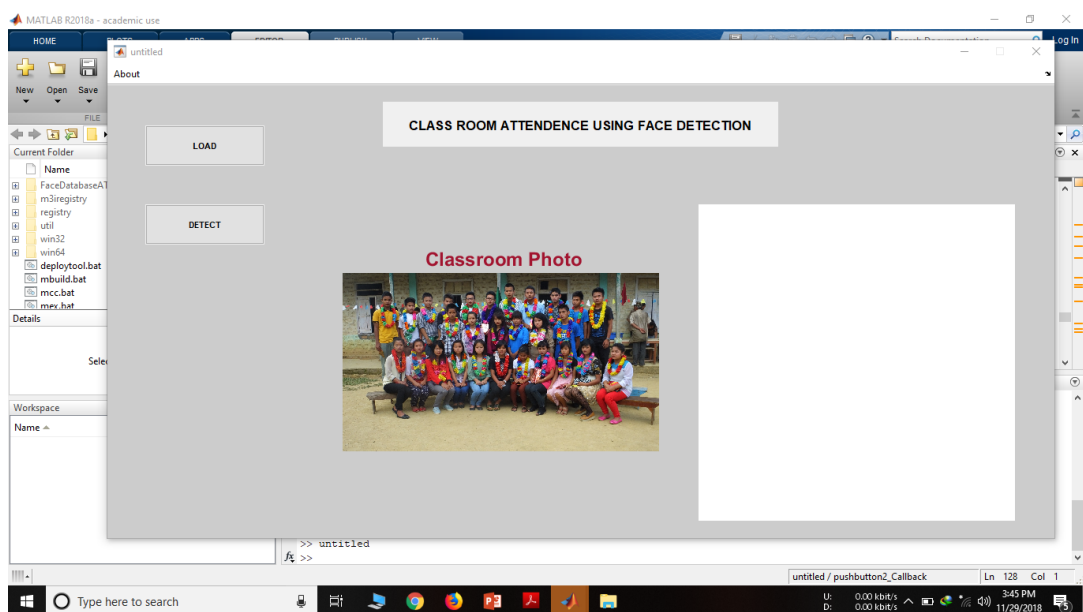


Figure 1.4: Inserting image

## Chapter 2

# Face Detection and Extraction

Face Detection is the one of the most important part in this project which helps the students to detect their faces and automatically search for them in the database without having to sign a paper for attendance or to shout out 'present sir' which takes a lot of time. In this chapter, you'll know about how face detection and extraction is working in this project.

### 2.1 Face Detection

Face Recognition is done using Viola-Jones Algorithm. The Viola-Jones Algorithm is mainly used mechanism for object detection. The main property of this detection is that even though the training is slow, yet the detection is fast. The main feature of the algorithm is – Robust – very high detection rate (true-positive rate) and very low false-positive rate always. Real time – For practical applications at least 2 frames per second must be processed. Face detection only (not recognition) - The goal is to distinguish faces from non-faces (detection is the first step in the recognition process).

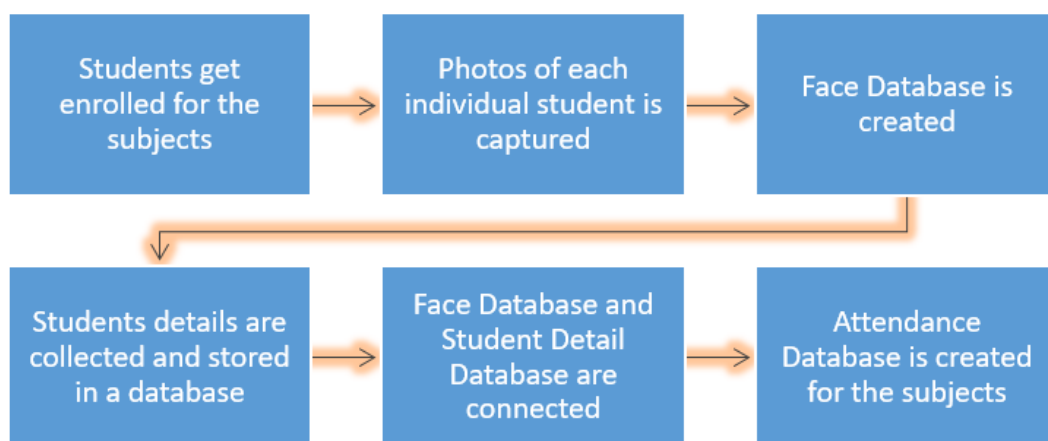


Figure 2.1: Flowchart of Student Database and Face Database Creation Procedure

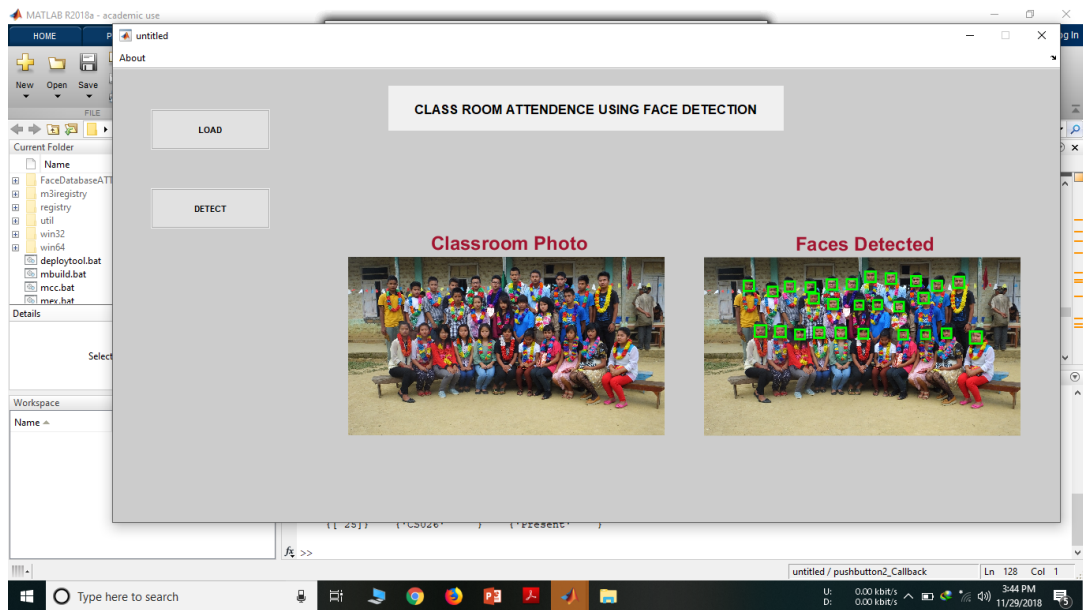


Figure 2.2: Detection of faces

## 2.2 Face Database

A database of faces is made in the general folder path. The main folder consists of different folders for each of the student. In the sub folder of each students, eight photos of different shape and angle is made so that the faces of the student could be recognize in any angle and direction.

## 2.3 Face Extraction

The faces in the database is extracted using Histogram of Oriented Gradient algorithm. HOG is a popular technique to discover shapes within an image. How it works is by sampling sub regions of the image using a kernel. It then checks the slope (aka orientation gradient) and puts it in a bin. Then it samples another region until entire image been sampled. It then looks in the bin and tries to determine a consensus of slopes to determine where the edges are. HOG can be used to detect any shape but it is not robust. But it's pretty fast and does a decent job. Like the faces of the database, same is done on the detected faces in the image.

## 2.4 Comparision of Faces

In the extraction of faces, each faces has different unique features and the features are indexed in an array called 'personindex'. This is done in both the faces in database and the detected face. Same faces has similar personindex, so that feature is used to get the similar faces of the detected face in the faces of the database.

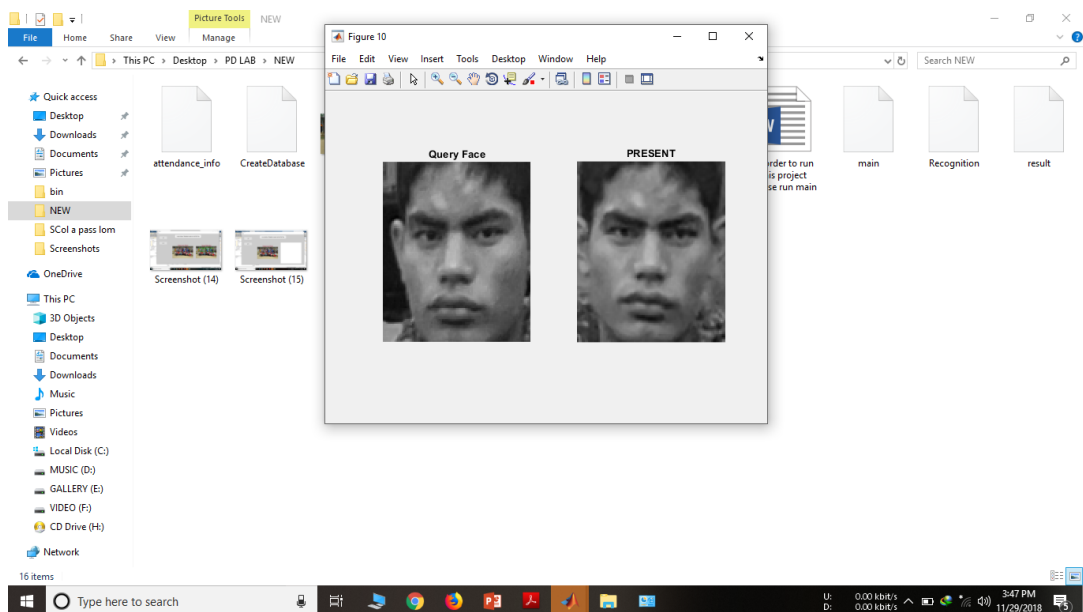


Figure 2.3: Recognition of Face from Database

## Chapter 3

# Face Database and Attendance System

A specific type of face database is required in this project based on the code use in the programs. Here, a folder consisting of 8 different faces of one student is made.

A database consisting of faces of different students is made in the directory path of the executable file. After face is detected from the classroom images given in the input, it will automatically detect faces and compare with the faces stored in the database.

### 3.1 Database Creation

A database made is shown in the figure 3.2. Here, every folder consists of 8 different photos of a single student. The photos need not to be similar each other. The algorithm will check for the folder and finds its similar type of face. And one folder is for one student.

### 3.2 Making of Sheet

An MS excel sheet is made from Matlab itself containing name of students and roll numbers and dates. When the face is detected and recognized, it will automatically mark them as 'Present' in the excel sheet.

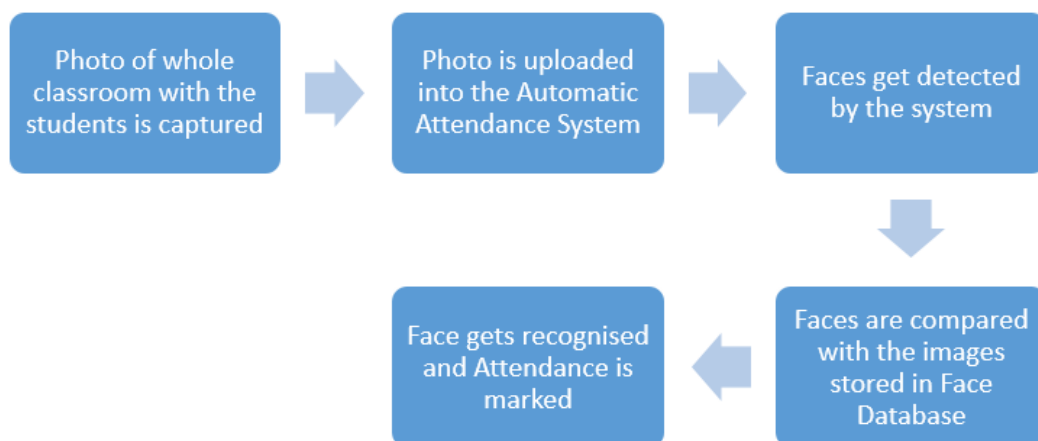


Figure 3.1: Attendance Procedure



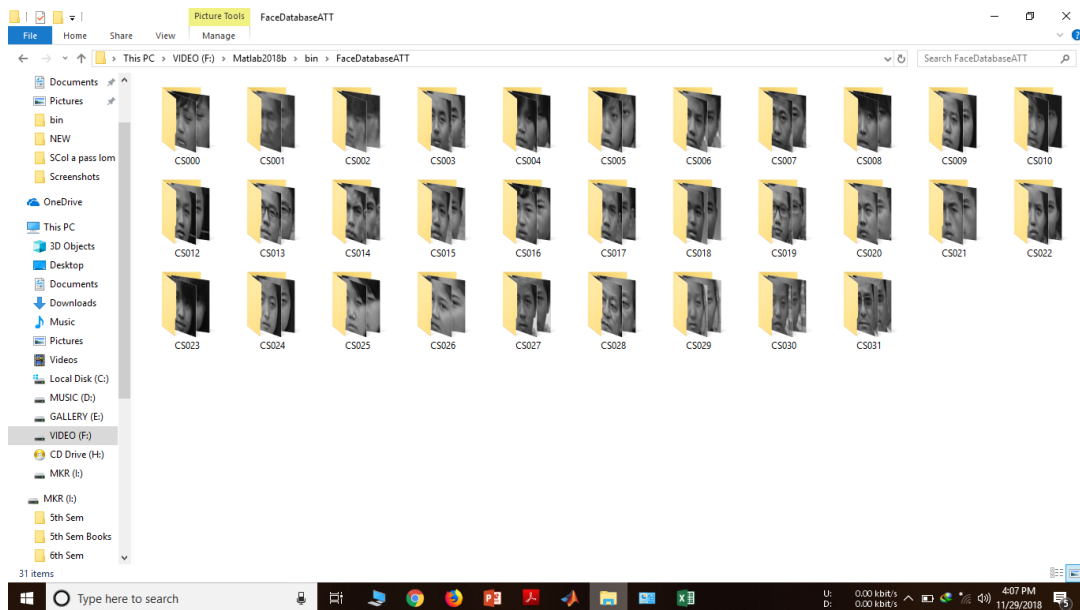


Figure 3.2: Database sample

No.	RollNumber	29-Nov-18
1	CS008	Present
2	CS009	Present
3	CS005	Present
4	CS018	Present
5	CS000	Present
6	CS004	Present
7	CS017	Present
8	CS003	Present
9	CS014	Present
10	CS013	Present
11	CS012	Present
12	CS027	Present
13	CS010	Present
14	CS016	Present
15	CS020	Present
16	CS019	Present
17	CS007	Present
18	CS006	Present
19	CS021	Present
20	CS022	Present
21	CS025	Present
22	CS024	Present

Figure 3.3: Attendance Sheet

### **3.3 Output File**

The attendance sheet of the students will be available in the selected directory path in Matlab. Here, if any mistakes is made by the algorithm or due to technical problems, teachers can physically write and manipulate the data which is stored in the directory path.

## Chapter 4

# Accuracy and Comparison

The accuracy of the algorithms used is mentioned here and comparison of the algorithm used for Face Recognition with other algorithms and other papers is also shown in this section. The formula for calculating accuracy of detection is given by

$$\text{accuracy of detection} = \frac{\text{detected faces}}{\text{total faces}} \times 100\%$$

The formula for calculating accuracy of recognition is given by

$$\text{accuracy of recognition} = \frac{\text{recognized faces}}{\text{total faces}} \times 100\%$$

### 4.1 Accuracy of Face Detection

The algorithm used for face detection which is Viola Jones Algorithm works very well and has a high accuracy rate in terms of detecting faces. It detected almost every faces but it has some detection problem when it encounters low light and bad quality of photos. It has above 90% accuracy in most of the photos. The accuracy graph is shown in Fig 4.1 and the information table is shown in Table 4.1.

Table 4.1: Detection Information.

No.	Students	Detected	Percentage
1.	4	4	100%
2.	9	9	100%
3.	14	13	93%
4.	19	16	89%
5.	25	22	88%

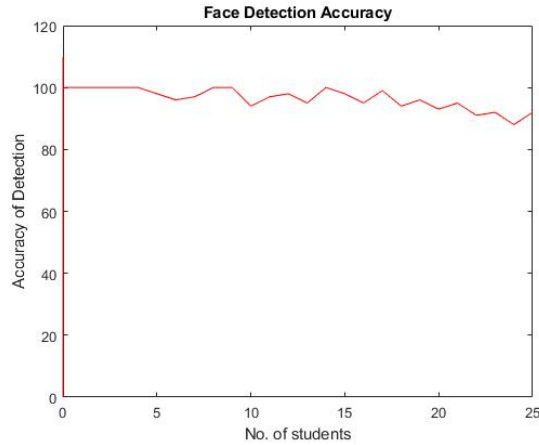


Figure 4.1: Accuracy of Face Detection.

## 4.2 Accuracy of Face Recognition

We tested out two algorithms – HOG (Histogram of Oriented Gradient) and PCA (Principal Component Analysis) for Face Recognition and found out that they both provided almost similar results. Hence, we chose to use Histogram of Oriented Gradient as it works great with proper faces. But it does not work well with a blur image and improper face shape. So below graph i.e Fig 4.2 shows the graph for the accuracy of face recognition using this algorithm and Table 4.2 shows the information of face recognition.

Table 4.2: Recognition Information.

No.	Faces	Recognized	Percentage
1.	4	4	100%
2.	9	8	90%
3.	14	12	86%
4.	19	14	74%
5.	25	19	78%

## 4.3 Comparison with existing papers.

The algorithms used for Face detection and recognition may not be the best algorithm. It is compared with the existing projects done by other students in other institute. There are many projects related like this but we could not find a proper accuracy test of those projects. Here is the information of the comparison with the projects done by students of M.S Ramaiah Institute of Technology, Bangalore. The outcomes are almost same and accuracy of both of

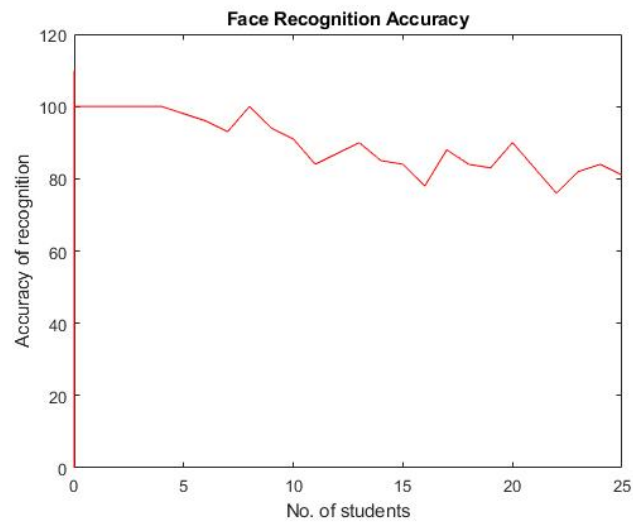


Figure 4.2: Accuracy of Recognition

them are also shown here. Table 4.3 shows the information of comparison and Fig 4.3 shows the graph of comparison between the previous work and our work.

Table 4.3: Comparison with existing project.

No.	Students	Recognized		Accuracy	
		Existing	Current	Existing	Current
1.	4	4	4	100%	100%
2.	10	10	9	100%	90%
3.	14	11	12	79%	86%
4.	20	14	17	70%	85%

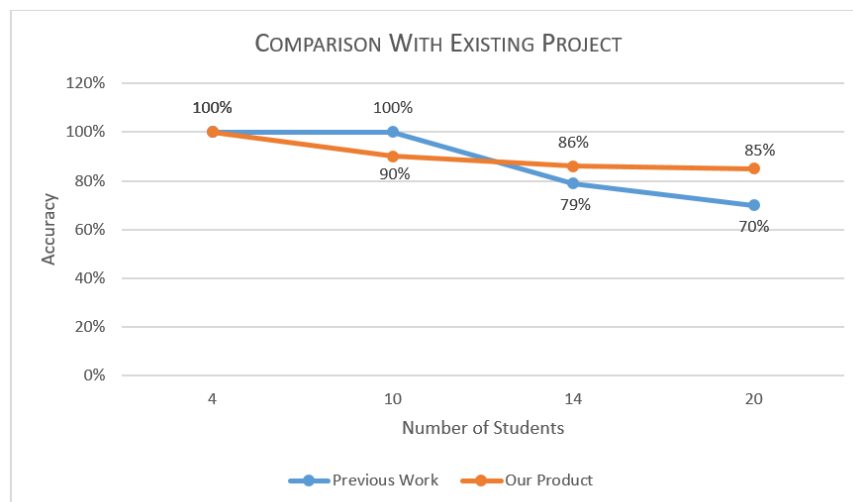


Figure 4.3: Accuracy comparison with existing work

## **Chapter 5**

# **Conclusion**

In this project, we aimed on reducing the burden and time consumption of the process of attendance. We managed to do this through the usage of Face Recognition technique by initially creating an Attendance Database and Face Database and this followed by uploading the picture of the classroom by the professor/teacher. The system uses Face Detection, Feature Extraction and Face Recognition using Viola Jones algorithm and matches the faces of the students enrolled for the subject with the faces detected in the classroom. The attendance is then directly marked for each of the students in Attendance Database. This method of attendance shows an improved amount of accuracy as students can't give proxy to other students. Another advantage of this method is the fact that picture is captured at both the start and end of the class. Thus, from the testing of the system, it has proven to be faster, more reliable and more efficient. The system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus and reduces the amount of human resource required for the purpose. Hence a system with expected results has been developed but there is still some room for improvement.

### **5.1 Scope of the Work**

Face detection and Face recognition is very important in our daily lives not just for attendance. It can be extended to detect criminals in public faces, robbers, and unidentified strangers using CCTV camera. In many developed countries like China, Japan etc, it has already been used but in developing country like India, an effective product is not used due to lack of technical facilities and bad algorithms. Therefore, this kind of projects could be used as a startup for these problems and could be helpful in these kinds of related works.

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