A

Project Report

On

Face Recognition Attendance Marking System

Submitted in partial fulfillment of the requirements

For the degree of

Bachelor of Engineering
in
Computer

By

Gautam Sudhir Baghel	**Roll-04**
Kush Kshamanath Sharma	**Roll-55**
Chinmay Ramakant Deolekar	**Roll-15**
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Supervisor

Prof. Nilesh yadav

Technology Personified

Department of Computer Engineering

Innovative Engineers' and Teachers' Education society's

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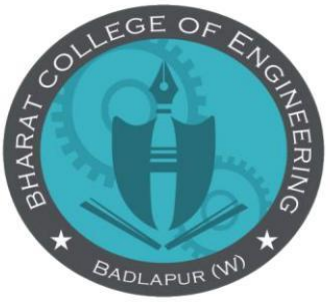

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CERTIFICATE

This is to certify that, the Project titled

"Face Recognition Attendance Marking System "

is a bonafide work done by

Gautam Sudhir Baghel	Roll-04
Kush Kshamanath Sharma	Roll-55
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and is submitted in the partial fulfillment of the requirement for the degree of

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In
Computer
To the
University of Mumbai

_____

Supervisor

(Prof.Nilesh Yadav)

Project Co-ordinator	Head of Department	Principal
(Prof.Nilesh Yadav)	(Prof.Deepa Athawale)	(Prof.Dinesh Bhere)

Project Report Approval for B.E.

This is to certify that the project entitled *" Face Recognition Attendance Marking System"* is a bonafide work done by *Gautam Sudhir Baghel , Kush Kshamanath Sharma, Chinmay Ramakant Deolekar, Nasir Meraj Ahmed Khan* under the supervision of *Prof. Nilesh Yadav***.** This project has been approved for the award of *Bachelor's Degree in Computer Engineering, University of Mumbai.*

Examiners:

1. .....

2. .....

Supervisors:

1. .....

2. .....

Principal:

.....

Date:

Place:

Declaration

I declare that this written submission represents my ideas in my own words and where other's ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Gautam Sudhir Baghel	Roll-04
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Nasir Meraj Ahmed Khan	Roll-30

Date:

Acknowledgement

It is an opportunity of immense pleasure for me to present the project report on "**Face Recognition Attendance Marking System**" expressing my heart left gratitude to all those who have generously offered their valuable suggestions towards the completion of this report.

It's rightly said that we are built on the shoulders of others for all our achievements. The credit goes to my guide **Prof. Nilesh Yadav** Department of Computer Engineering, Bharat College of Engineering, Badlapur, Thane whose positive attitude; moral support and encouragement lead to the success of the report. Her generous help, excellent guidance, lucid suggestions and encouragement throughout the course of this work have greatly helped me in successful completion of this work.

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Gautam Sudhir Baghel
Kush Kshamanath Sharma
Chinmay Ramakant Deolekar
Nasir Meraj Ahmed Khan

ABSTRACT

Automatic face recognition (AFR) technologies have seen dramatic improvements in performance over the past years, and such systems are now widely used for security and commercial applications. Recording the daily attendance of students in all educational institutions is a major concern. In the traditional attendance system, a person has to check one by one if someone is absent or not which is very time-consuming. In other ways, everyone puts their signature on an attendance sheet which is not also appropriate as anyone can easily copy signatures for others. So Smart Attendance using Real Time Face Recognition is a real world solution which comes with day to day activities of handling employees/students. The task is very difficult as the real time background subtraction in an image is still a challenge. In the era of modern technologies emerging at rapid pace there is no reason why a crucial event in education sector such as attendance should be done in the old boring traditional way. Attendance monitoring system will save a lot of time and energy for the both parties teaching staff as well as the students. Attendance will be monitored by the face recognition algorithm by recognizing only the face of the students from the rest of the objects and then marking the students as present.

The goal of the proposed system is to provide complete face recognition system capable of working on group of images. The haar-cascade detects the face from camera for training and testing dataset. The LBPH algorithm recognizes the faces from training model. The system will be pre feed with the images of all the students enrolled in the class and with the help of this pre feed data the LBPH algorithm will recognize the students by matching its features with the features of the already trained images of the students.

KEYWORDS- Local Binary Pattern Histogram (LBPH), Face Detection, Face Recognition, Haarcascade Classifier, Python, Student Attendance.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Recording the daily attendance of students in all educational institutions is a major concern. In the traditional attendance system, a person has to check one by one if someone is absent or not which is very time-consuming. In other ways, everyone puts their signature on an attendance sheet which is not also appropriate as anyone can easily copy signatures for others [1]. An automatic attendance system can reduce all the complexities. In this work, we have developed a face recognition based system that will be advantageous in educational/official sectors where regular attendance is greatly needed.

A facial recognition system is a technology which can identify or authenticate a person from a digital image or a video stream from a video source. These systems operate in different methods. Usually, they compare extracted facial features from an input image of human faces within a database to recognize a person. It can also be defined as a biometric AI based application which can recognize a person uniquely by investigating the texture patterns and shape of the person's face. Through face recognition models, the application identifies a person and saves the record.

In recent years, face recognition from stationary and moving images has been an active and demanding research area in the field of image processing, pattern recognition and so on [2-6]. At first, images with different postures of an individual are collected as a training dataset. After that, face recognition is done for input facial images depending on their intensity value estimation. As a form of computer application, face recognition is being widely used in recent times on mobile platforms [7, 8]. It has also seen wider uses in other technological forms, such as robotics [9, 10]. It is generally applied as access control in security systems.

Here, in this work, the intention was to detect faces and recognize them in real-time for effortless recording of attendance. The main objectives of this work are:

- To detect faces from real-time video stream.
- To develop a machine learning model to recognize a person from a pre-trained dataset.
- To record attendance after recognition for future use.

1.2 Problem Statement

It becomes more difficult to mark attendance for each student when there are so many students in a organisation and it is a time consuming. The Existing system of any institute is manual entry for the students. This system faces the issue of wasting time and it becomes complicated when the strength is more. It is very tedious job to carry out the attendance in log books and to maintain the records. Face recognition is a difficult issue in computer vision. Some of the problems to deal with include lighting issues, posing issues, scale variability, low image capture accuracy, and partially occluded faces are all issues that need to be addressed. As a result, face recognition algorithms must be resistant to changes in the above parameters. The proposed system goal is to design and construct a system that is less vulnerable to light, rotates invariantly, scales invariantly, and is robust enough to be used in real-world scenarios.

1.3 Scope of Project

Student Attendance Management System is of great importance when verbalized in terms of productivity of an institution.

Automated Attendance System can be implemented in larger areas like in a seminar hall where it helps in sensing the presence of many people. Sometimes the poor lighting condition of the classroom may affect image quality which indirectly degrades system performance, this can be overcome in the latter stage by improving the quality of the video or by using some algorithms.

Almost all academic institutions require attendance record of students and maintaining attendance manually can be hectic as well as time consuming task. Hence maintaining attendance automatically with the help of face recognition will be very helpful and less prone to errors as compared to manual process. This will also reduce manipulation of attendance record done by students and it will save time as well. The future scope of the proposed work can be, capturing multiple detailed images of the students and using any cloud technology to store these images. The system can be configured and used in Atm machines to detect frauds. Also, the system can be used at the time of elections where the voter can be identified by recognizing the face.

1.4 Organization of Report

The main body of the report is preceded by detailed contents including lists of figures, tables and annexes followed by units used in the report. This is followed by executive summary giving briefly the scope and objectives of the study, importance of the topic, methodology, limitations, major observations / findings, and recommendations and action plan.

Chapter 1 Introduction
Chapter 2 Review of Literature
Chapter 3 Planning and Formulation
Chapter 4 Methodology
Chapter 5 Design of System
Chapter 6 Experimental Results and performance analysis
Chapter 7 Conclusion

All chapters are preceded by a brief synopsis of the chapter, and key words. The main report is followed by glossary, giving the acronyms and abbreviations used in the report, a listing of all the key words corresponding to various chapters. References which have been used for certain inputs are listed after the key words. Wherever these references have been quoted / data or technical specifications taken in the text, these have been cross-referred by their serial number (appearing as superscripts in the report) in the list of References.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Review of Literature

Hajar Filaliet. al. [11] had compared four methods based on machine learning that allows a machine to evolve through a learning process, and to perform tasks that are quite difficult to fill by more conventional algorithmic mean (HaarAdaBoost, LBP-AdaBoost, GF-SVM, GFNN).The first two methods ”Haar-AdaBoost, LBP-AdaBoost” are based on the Boosting algorithm, which is used both for selection and for learning a strong classifier with a cascade classification. While the last two classification methods ”GF-SVM, GF-NN” use the Gabor filter to extract the characteristics. From this study, we found that the detection time varies from one method to another. in terms of performance rate, the Haar-AdaBoost method remains the best of the four methods. So, we will be using Haar-AdaBoost.

In [12] the authors have proposed a system to avoid drawbacks of traditional manual attendance system. This paper describes how real time face detection and recognition can prove useful for marking attendance of students. The paper illustrates an automated attendance system which consists of a camera, installed in the classroom for capturing images, followed by the detection of multiple faces.This system consists of multiple steps such as Face Database Creation of Students, HOG features, Face Detection and Eye Detection, SVM Classifier, Comparison/ Recognition, Attendance marking. The algorithms like Viola- Jones and HOG features along with SVM classifier are used to acquire the desired results. The paper7 had certain drawbacks where the system may be sensitive to lighting. The proposed system may eliminate this drawback by using the algorithms which may not be sensitive to lighting and also by using advanced high-resolution cameras.

E.Varadharaja et.al [13] proposed a system for automatic attendance system using face recognition.The system is divided into four parts. First one is the Background Subtraction in which background of image is subtracted and only face remains in image. Second part is face detection and cropping of images i.e. only faces are cropped and stored. Third step is recognizing images with the help of Eigenvalue method. In this method Eigen vectors are calculated using formulae and to recognize images Euclidean distance is calculated between stored images and testing image. Then attendance is marked for matching student. This method requires simple hardware installation but face recognition is difficult. Eigen vector method used in this paper gives an accuracy of 60- 70%.Hence instead of using eigen vector, proposed system will use Haar features for face detection which gives better result than eigen vector method.

Shireesha Chintalapati, M.V. Raghunadh et.al [14] had described the different techniques to implement the attendance monitoring system using face recognition. The process is divided into two main parts. First one is the face detection technique and the second one is face recognition

technique. Face detection can be implemented using Viola-Jones face detection algorithm which includes four main components i.e. Haar-features, integral image, Adaboost algorithm, cascade feature. Face recognition can be implemented using LBP (local binary patterns). LBP helps to convert the image into machine understandable formats i.e. in binary format. Before face detection and recognition, the captured image should be converted into grey scale to simplify the calculation. Face detection technique first capture the image (student dataset) and detect faces from the images, the detected faces are stored for further reference. Face recognition technique capture the images from classroom and try to recognize it by comparing it with a earlier detected faces.

Soumitra Chowdhury, Sudipta Nath, Ashim Dey and Annesha Das et.al [15] the development of a face recognition based automatic student attendance system using Convolutional Neural Networks which includes data entry, dataset training, face recognition and attendance entry. The system can detect and recognize multiple person's face from video stream and automatically record daily attendance. The proposed system achieved an average recognition accuracy of about 92%. Using this system, daily attendance can be recorded effortlessly avoiding the risk of human error.

CHAPTER 3

PLANNING AND FORMULATION

3.1 Planning and Formulation

The proposed work comprises of various steps where each steps take some estimated amount of time. Following are the various steps taken into consideration while developing the proposed system.

1. Collecting data:

machines initially learn from the data that you give them. It is important to collect reliable data so that your machine learning model can find the correct patterns. The quality of the data that you feed to the machine will determine how accurate your model is.

2. Preparing the Data:

After you have your data, you have to prepare it.

- Image size reduction.
- Separating positive and negative image.
- Splitting Training and testing dataset.
- And finally, analyze the data.

3. Choosing a Model:

A machine learning model determines the output you get after running a machine learning algorithm on the collected data. It is important to choose a model which is relevant to the task at hand.

4. Training the Model:

Training is the most important step in machine learning. In training, you pass the prepared data to your machine learning model to find patterns and make predictions. It results in the model learning from the data so that it can accomplish the task set. Over time, with training, the model gets better at predicting.

5. Evaluating the Model:

After training your model, you have to check to see how it's performing. This is done by testing the performance of the model on previously unseen data. The unseen data used is the testing set that you split our data into earlier. If testing was done on the same data which is used for training, you will not get an accurate measure, as the model is already used to the data, and finds the same patterns in it, as it previously did. This will give you disproportionately high accuracy. When used on testing data, you get an accurate measure of how your model will perform and its speed.

6. Parameter Tuning:

Once you have created and evaluated your model, see if its accuracy can be improved in any way. This is done by tuning the parameters present in your model.

7. Making Predictions:

In the end, you can use your model on unseen data to make predictions accurately.

CHAPTER 4

METHODOLOGY

4.1 Proposed System

The goal of the proposed attendance system is to detect the faces of each student from a video stream and then recognize the faces by cross-referencing the detected faces with the ones on which our model is trained. Proposed System Architecture is shown in Fig. 5.1

All the students of the class must register themselves by entering the required details and then their images will be captured and stored in the dataset.

While marking the attendance faces will be detected from webcam. The detected faces features will be compared with features of already trained images of students. If match found, attendance will be marked for the respective student.

4.2 Proposed Methodology

The different parts of the proposed system can be grouped together into six main stages. These are:

- Data Entry
- Face Detection
- Dataset Generation
- Dataset Training
- Face Recognition
- Attendance Entry

These stages are discussed in the following section.

1) Data Entry: The first step is to include the faces of the students in the system for creating a dataset, which is shown in Fig. 4.2.1. For this, continuous photos of each of the enrolled students are taken by the system from a Camera one person at a time, along with their names and IDs. The default setting is set to take 50 pictures. It is preferred that the students have different head positioning during this time to create a better dataset. The setting can be changed to increase the number of pictures taken to make a more accurate dataset. A folder is created with name TrainingImage and all the pictures of students are stored in that folder.

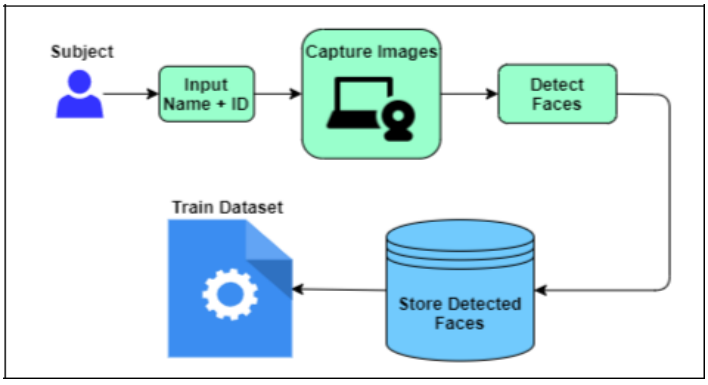

Fig.4.2.1 Data Entry

2) Face Detection: Face detection here is performed using HaarCascade Classifier with OpenCV[16] Fig. 5.2.1. Haar Cascade algorithm needs to be trained to detect human faces before it can be used for face detection. This is called feature extraction. The haar cascade training data used in our proposed system is an xml file haarcascade frontalface default. Our xml file is a strong classifier which is a collection of 50 weak classifier were, each weak

classifier contains certain no. of features. The haar features shown in Fig. 4.2.2. will be used for feature extraction. Initially the colored image frame is captured from webcam i.e 3d array, which then get converted into grayscale image i.e. 2d array that simplifies the algorithm and reduces computational requirements. In next step grayscale image is converted into the integral image. Now in integral image value of each pixel of image is equal to the sum of all pixel toward its left and above. Then a sliding window is generated which start scanning frames from top left corner to bottom right corner. For each frame several weak classifier test cases are applied if any of the test fails then sliding window will discard the frame and move towards next frame. The frame that pass all the test is a face region. Sliding window continue this process of applying test cases for all the frame until it reaches end frame. In the end of this process classifier obtain all the face region to get the coordinates of actual face. Here we are using detectMultiScale module from OpenCV. This is required to create a rectangle around the faces in an image. It has got three parameters to consider- scaleFactor, minNeighbors, minSize. scaleFactor is used to indicate how much an image must be reduced in each image scale. minNeighbors specifies how many neighbors each candidate rectangle must have. Higher values usually detects less faces but detects high quality in image. minSize specifies the minimum object size. By default it is (30,30) . The parameters used in this system is scaleFactor and minNeighbors with the values 1.3 and 5 respectively.

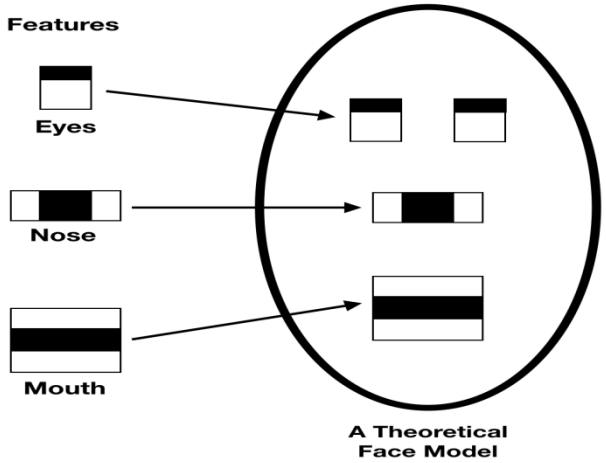

Fig. 4.2.2 Haar Features

3) Dataset Generation: Once face detection is completed, the rectangle gets drawn over the detected face. After that, the face inside the rectangle is cropped and the cropped face img get saved in the TrainingImage folder which act as our dataset for model training purpose. The default setting is set to take 50 pictures per person. The setting can be changed to increase the number of pictures taken to make a more accurate dataset.

4) Dataset Training: Images in TrainingImage folder are assigned to lbph classifier for training purpose. we are training the Algorithm with the help of facial images of the students. we also need an unique identification number for each image which helps in recognition. All the images of the student should have a unique identification number. During training initially the list of local binary patterns (LBP) operator of entire face is obtained. To make it easier to understand the algorithm uses 4 parameters Radius, Neighbors, GridX, GridY. Default values are 1,8,8,8. Assume we have a grayscale picture of a face, We can get a 3x3 pixel window of a portion of this image Fig. 4.2.3.

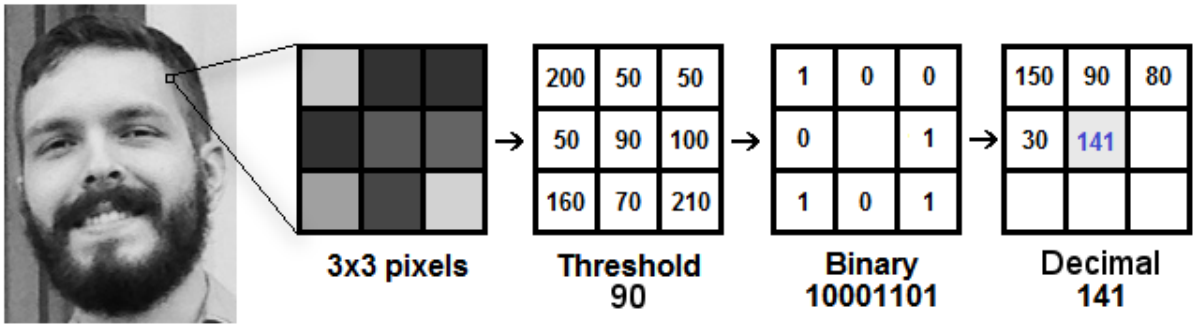

Fig. 4.2.3 LBP operation

It can also be interpreted as a 3x3 matrix with each pixel's intensity (0-255). Then, we need to take the central value of the matrix to be used as the threshold. This value will be used to define the new values from the 8 neighbors. For each neighbor of the central value (threshold), we set a new binary value. We set 1 for values equal or higher than the threshold and 0 for values lower than the threshold. Now, the matrix will contain only binary values (ignoring the central value). We need to concatenate each binary value from each position from the matrix line by line into a new binary value (e.g. 10001101). Then, we convert this binary value to a decimal value and set it to the central value of the matrix, which is actually a pixel from the original image. At the end of this procedure (LBP procedure), we have a new image which represents better the characteristics of the original image Fig.4.2.4. we can use the Grid X and Grid Y parameters to divide the image into multiple grids. We will extract the histogram of each region Fig. 4.2.4.

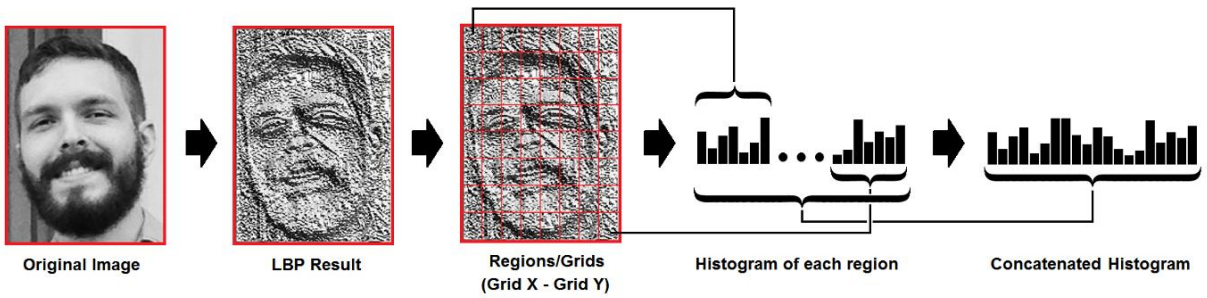

Fig. 4.2.4 Histogram Extraction

Since we're working with a grayscale picture, each histogram (from each block of grid) will only have 256 positions. Then, to make a new, larger histogram, we must concatenate each histogram. In the case of 8x8 grids, the final histogram would have 8x8x256=16384 locations. The characteristics of the original image are represented by the final histogram. Once histogram is generated for one image then it will repeat the same steps for other images in folder, at the same time it use to calculate Euclidean distance between the histogram to check whether the features of new histogram matches with previous obtained histogram. If features got matched then algorithm get to know that the histogram belongs to same person in that case algorithm tries to find out different patterns to recognize that person/student. Since we are training 50 img per person those images will have same features but there may be changes in face angles, face sides, texture, marks which are nothing but patterns that algorithm learns while training the images of person/students.

5) Face Recognition: In this step Fig. 5.2.3, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image. So to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram. We can use various approaches to compare the histograms (calculate the distance between two histograms), for example: euclidean distance, chi-square, absolute value, etc. So the algorithm output is the ID from the image with the closest histogram. The algorithm should also return the calculated distance, which can be used as a ‘confidence’ measurement. Note: don’t be fooled about the ‘confidence’ name, as lower confidences are better because it means the distance between the two histograms is closer. We can then use a threshold and the ‘confidence’ to automatically estimate if the algorithm has correctly recognized the image. We can assume that the algorithm has successfully recognized if the confidence is lower than the threshold defined.

6) Attendance Entry: Steps of attendance entry are shown Fig. 4.2.5. Once face is recognized the name and the ID of the recognized student is automatically logged on daily attendance spreadsheet.

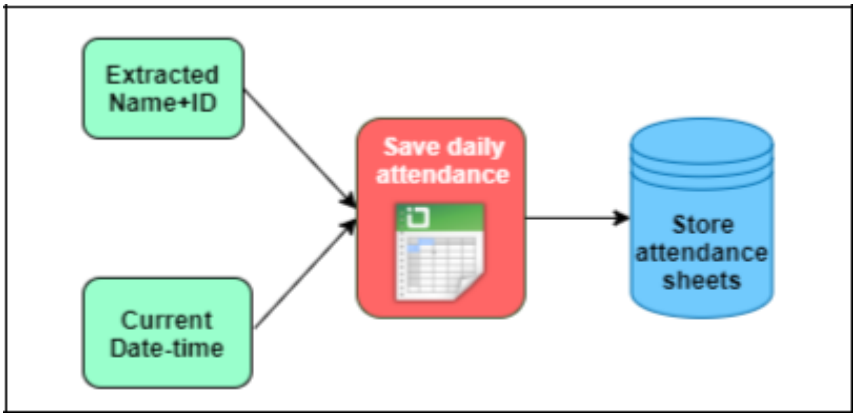

Fig. 4.2.5 Attendance Entry

4.3 System Requirements

Software Requirements:

a) Python 3:

Python is a popular programming language. It was created by Guido van Rossum, and released in 1991. It is widely used for web development, data science, machine learning and AI applications.

b) Window 8 or above/ linux/ mac os:

Windows/ linux / mac os is a computer operating system.

c) Jupyter notebook:

JupyterLab is the latest web-based interactive development environment for notebooks, code, and data. Its flexible interface allows users to configure and arrange workflows in data science, scientific computing, computational journalism, and machine learning.

d) Opencv:

OpenCV is a great tool for image processing and performing computer vision tasks. It is an open-source library that can be used to perform tasks like face detection, objection tracking, landmark detection, and much more.

e) Dlib:

It's a landmark's facial detector with pre-trained models, the dlib is used to estimate the location of 68 coordinates (x, y) that map the facial points on a person's face .

f) Cmake:

It is used to control the software compilation process using simple platform and compiler independent configuration files, and generate native makefiles and workspaces that can be used in the compiler environment of your choice.

g) Haar Cascade:

It is an Object Detection Algorithm used to identify faces in an image or a real time video. The algorithm uses edge or line detection features proposed by Viola and Jones in their research paper “Rapid Object Detection using a Boosted Cascade of Simple Features” published in 2001.

h) Pandas:

Pandas is mainly used for data analysis and associated manipulation of tabular data in Dataframes. Pandas allows importing data from various file formats such as comma-separated values, JSON, Parquet, SQL database tables or queries, and Microsoft Excel.

i) Numpy:

NumPy can be used to perform a wide variety of mathematical operations on arrays. It adds powerful data structures to Python that guarantee efficient calculations with arrays and matrices and it supplies an enormous library of high-level mathematical functions that operate on these arrays and matrices.

j) Tkinter:

Tkinter is Python's de-facto standard GUI (Graphical User Interface) package. It is a thin object-oriented layer on top of Tcl/Tk. Tkinter is not the only GuiProgramming toolkit for Python. It is however the most commonly used one.

k) Pillow and CSV:

Pillow is used for accessing and managing images and csv is used for managing csv files.

Hardware Requirement:

- Intel i3 processor 7200 2.5GHz (Minimum)
- Intel i5 processor 8300 3.0GHz (Recommended).
- Intel i7 processor 8300 3.0GHz (Best preferred).
- Webcam (High Quality for better performance).
- Recommended 4GB of RAM and more for faster execution.

CHAPTER 5

DESIGN OF SYSTEM

5.1 System Architecture

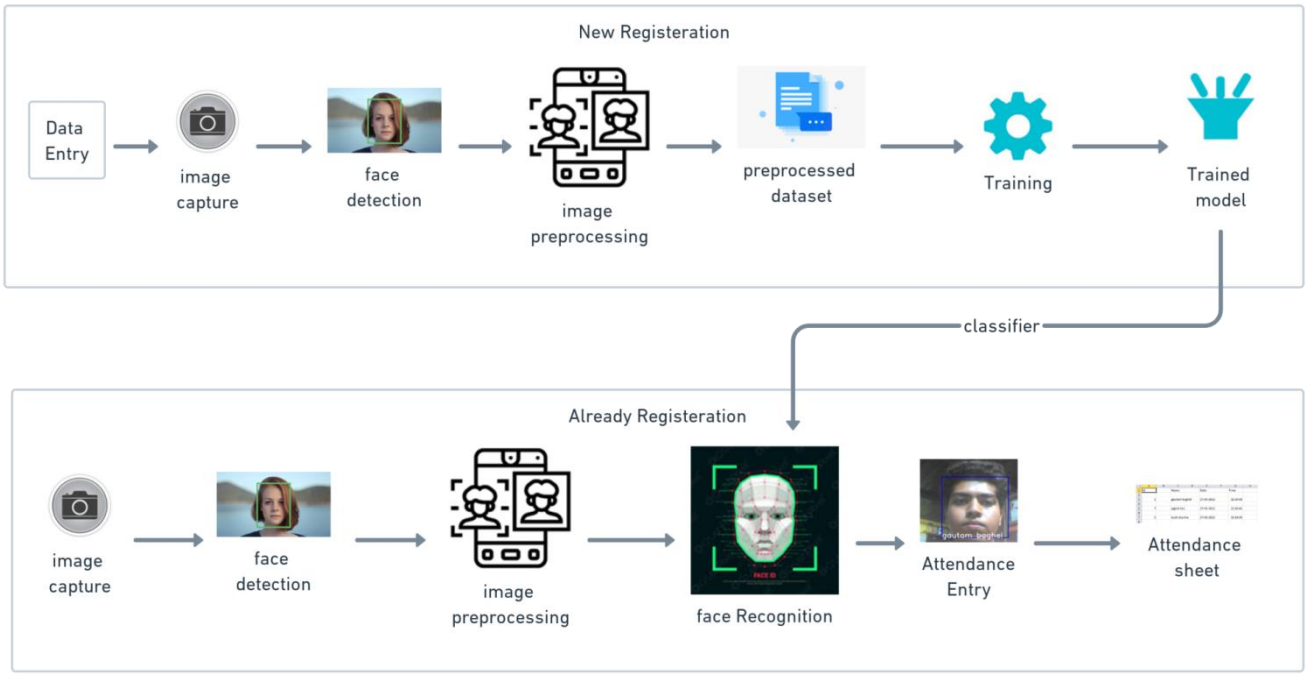

Fig. 5.1 System Architecture

The user can perform two functions:

1) New registration for new user.
2) Attendance marking for already registered user.

New Registration:

User first feed the data like id and name to the system, then system will capture 50 image of the user. System will capture only those images in which face is detected, then image preprocessing is performed on those 50 images to create a preprocessed dataset for training.
In next step, algorithm get trained on the preprocessed dataset to create a final trained model which works as a classifier for prediction.

Already registered/existing user:

User click on Attendance button to mark Attendance. This tells the camera to start recognizing the student and once it identify the student it will draw a rectangle over the face and show the name of student in live stream. Student need to press q to mark attendance and at the same time student name, id, date, and time get registered in the current day attendance sheet. Our system will automatically generate new attendance sheet for each date.

5.2 Flowchart

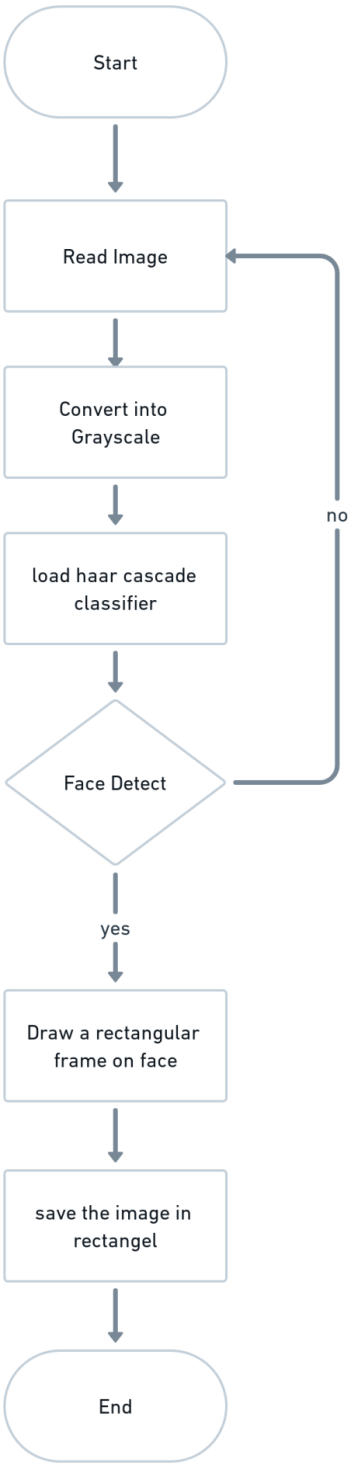

Fig. 5.2.1 Face Detection

Flowchart of Face Detection is like initially camera read the image frames then convert the captured rgb frame into grayscale. After that load haar cascade classifier which will detect face and once face is detected then detect multiscale function draw rectangle over the face and crop the face image inside rectangle and save that as preprocessed dataset.

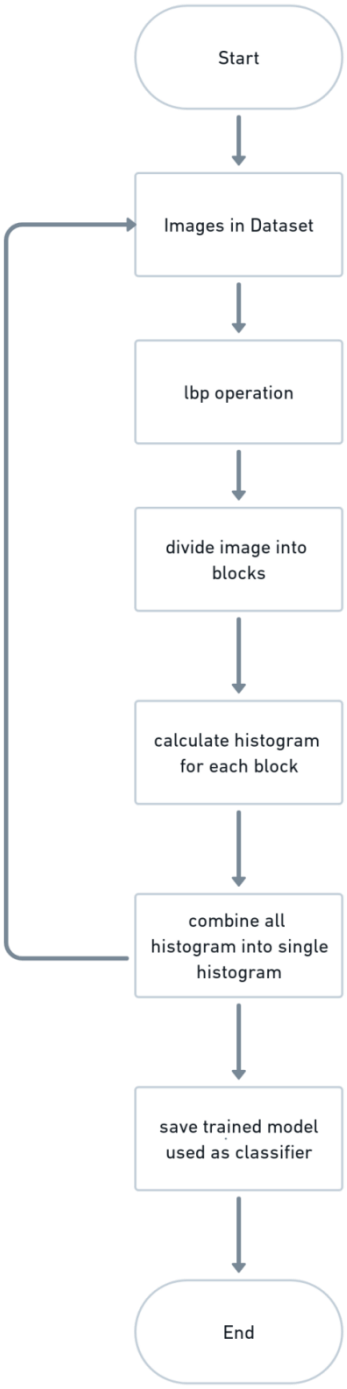

Fig. 5.2.2 Train images

Flowchart of Train images is like images in preprocessed dataset is passed to the algorithm for training. initially while training list of lbp operator of entire image is obtained then, lbp image get divide into 8x8 blocks. After that histogram of block is obtained then a final histogram is created which is a combination of all other histogram previously obtained. The final histogram is called as featrure vector which represent features and patterns of original image.

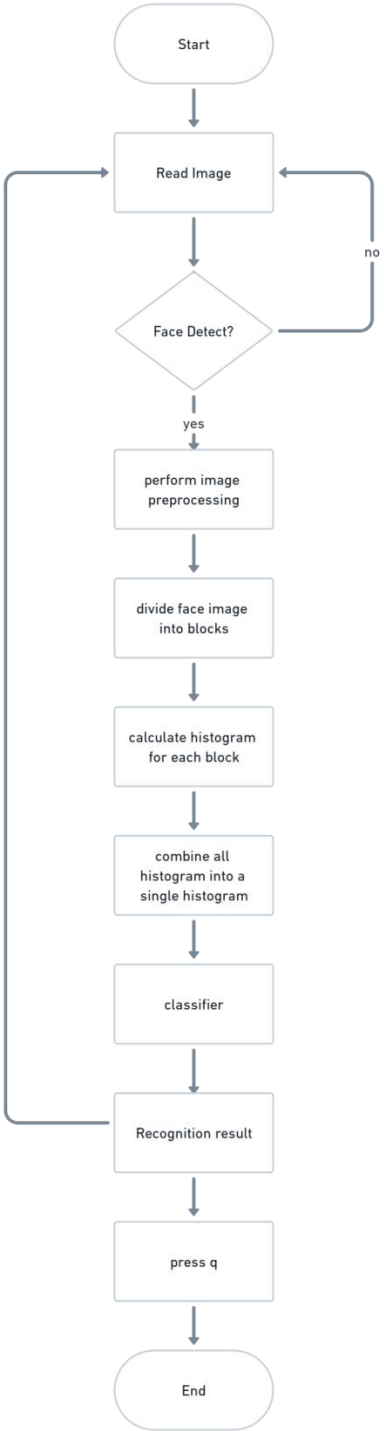

Fig. 5.2.3 Face Recognition

Flowchart for face detection is like firstly face detection occurs. Once face is detected then histogram for that test image is obtained. After that claasifier compare the histogram of test image and the trained images if match found that it reflect the name of person which is predicted as a result of recognition.

5.3 Sequence Diagram

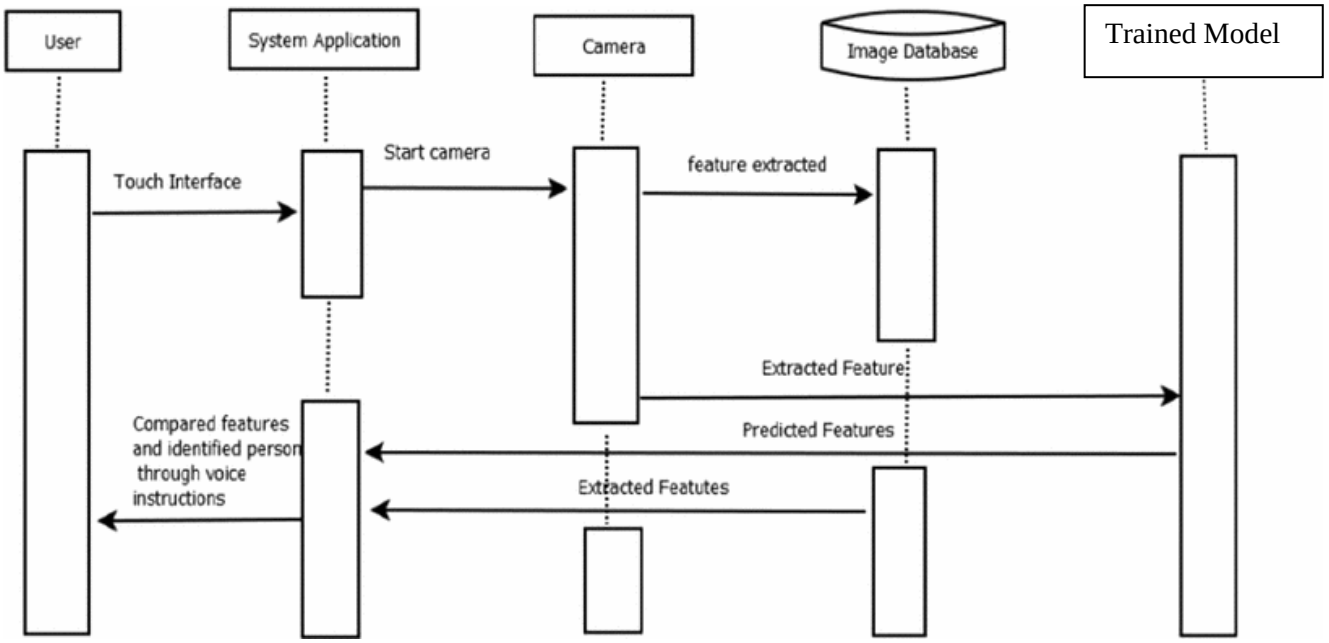

Fig. 5.3 Sequence Diagram

The above diagram depicts the flow of module that is working of attendance system which has a interaction between the user and the system. When user enter the data, system open up the camera to capture images then preprocessed images are stored in database. After that features of those images are extracted and save in model which then works as a classifier for prediction. When user mark the attendance again system open up the camera, extract the image features then trained model compare it with already trained images and return the result to the user.

CHAPTER 6

EXPERIMANTAL RESULT AND PERFORMANCE ANALYSIS

6.1 Experimental Result

The proposed system is generated using python. We have used tkinter for creating the GUI and different pages of the developed application are presented next.

A. Home :

The homepage of the created system is shown in Fig 6.1.1.

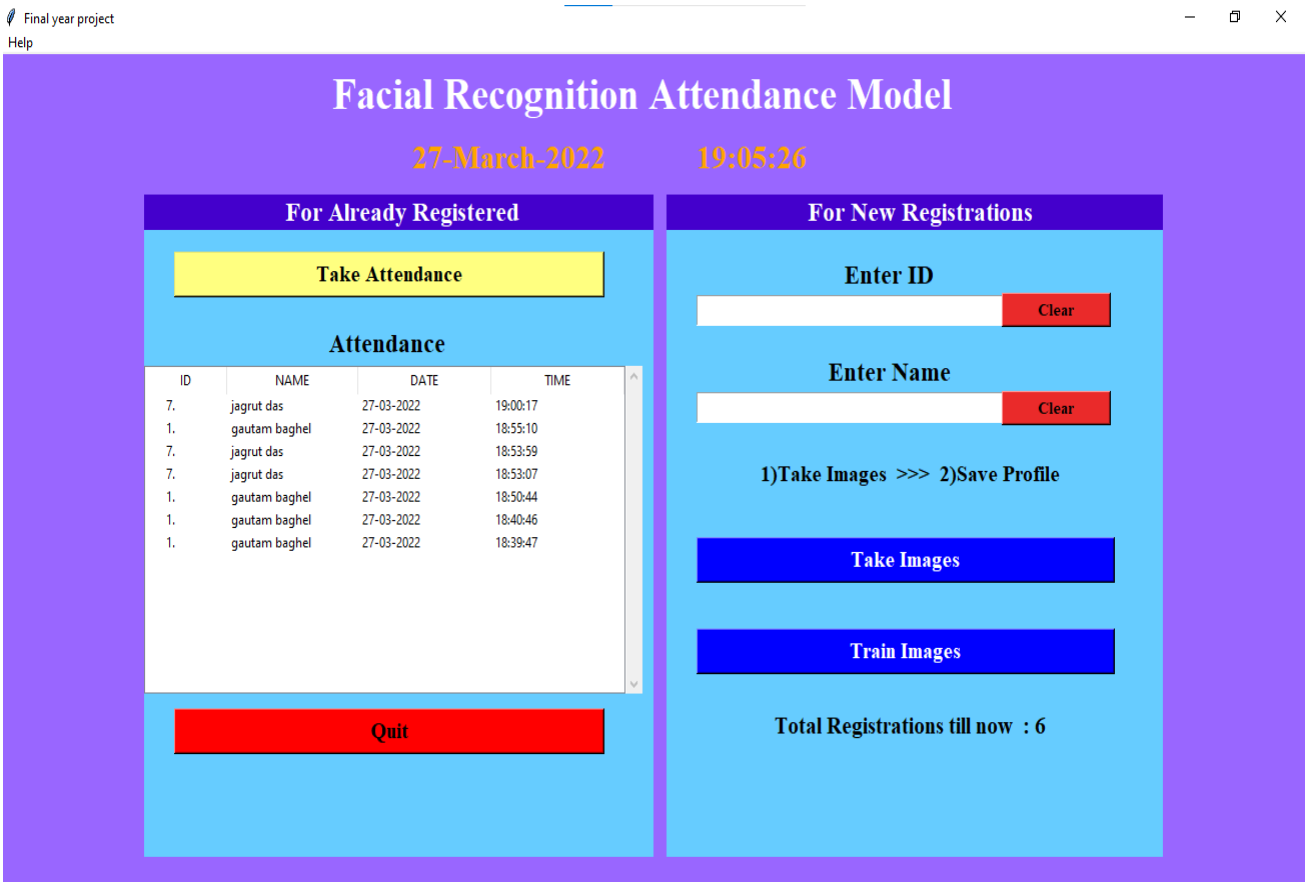

Fig. 6.1.1 Homepage

B. Data Entry:

Student needs to add their name and id in the respective field and take images by clicking on take image button.

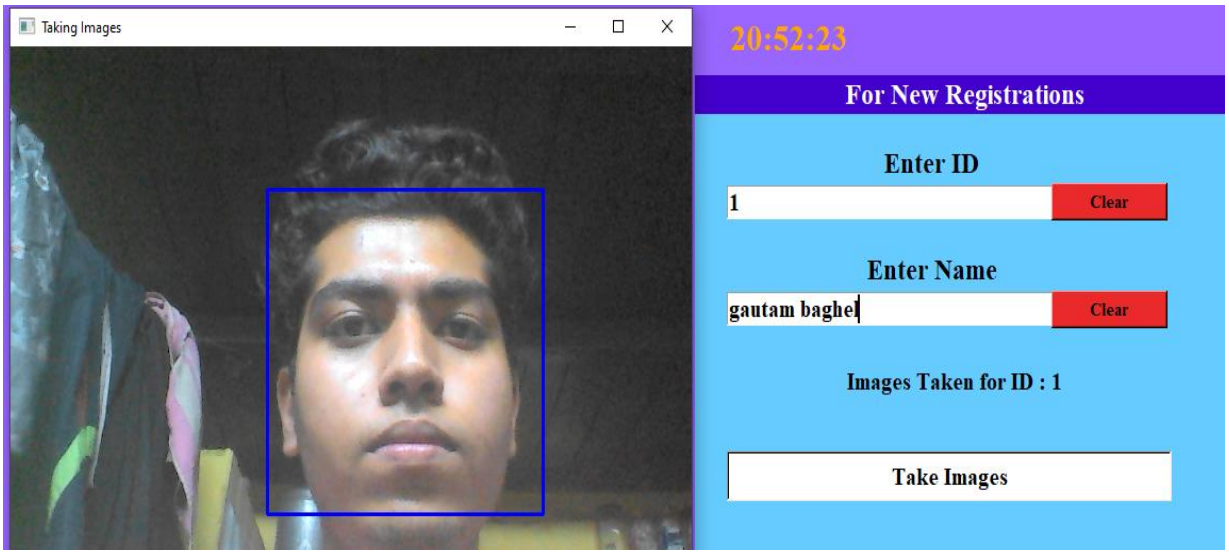

Fig. 6.1.2 Adding the data

C. Training Image:

After the images of a student have been added to the dataset, the entire dataset is trained by clicking on train image button. Once training is completed notification will get displayed images are trained successfully.

Fig. 6.1.3 Training the Dataset

D. Mark Attendance :

A student can simply mark his/her attendance by clicking on Attendance button. This tells the camera to start recognizing the student and once it identify the student it will draw a rectangle over the face and show the name of student in live stream. Student need to press q to mark attendance and at the same time student name, id, date, and time get registered in the current day attendance sheet. Our system will automatically generate new attendance sheet for each date.

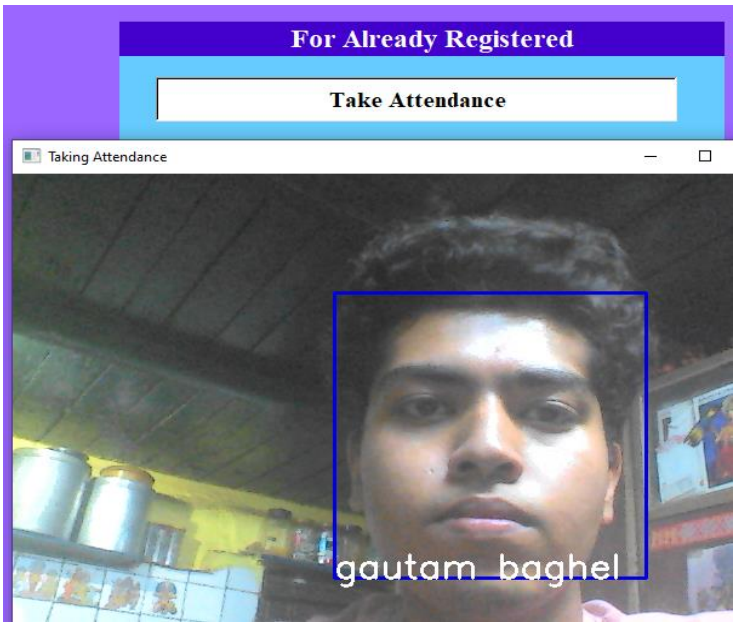

Fig. 6.1.4 Marking Attendance

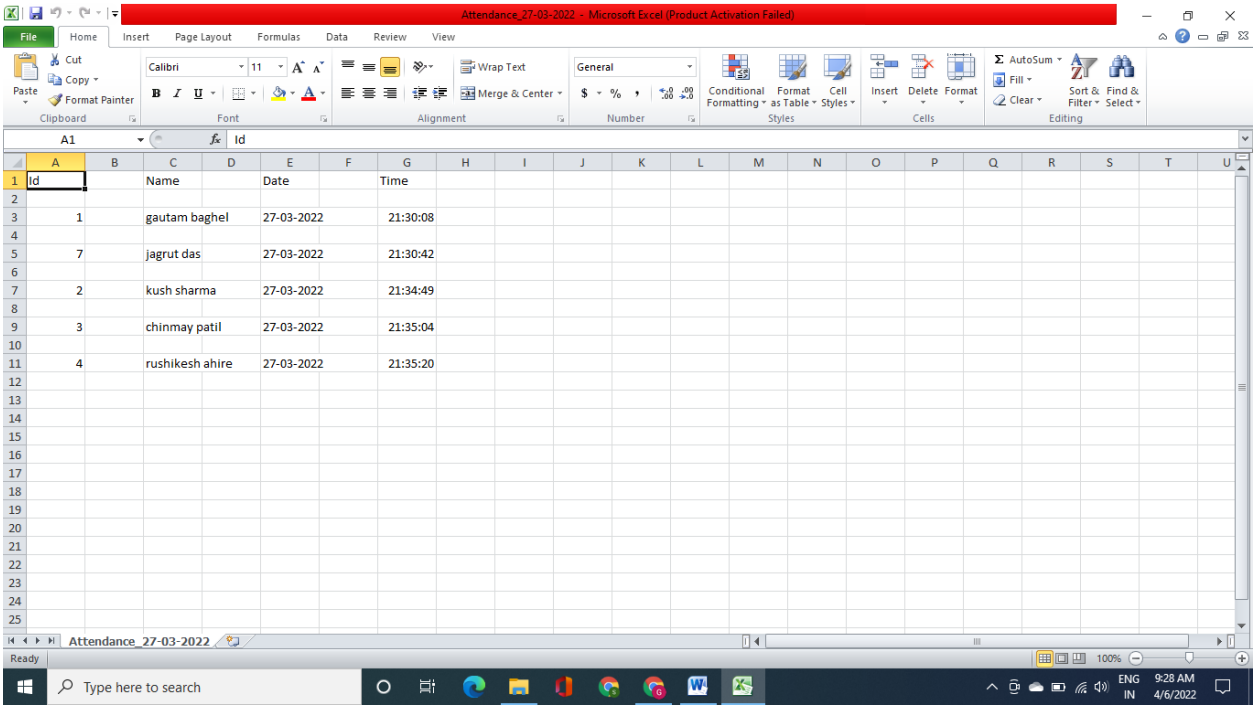

Fig. 6.1.5 Total Attendance

6.2 Performance Analysis

The primary goal of the system is to flawlessly mark and record attendance. For doing that, the main focus is to elevate the accuracy of the facial recognition system which is the cornerstone of this work.

The built-in webcam of a laptop is used as a default video recorder for testing the system. The accuracy of the system in relation to the number of input images per person in the dataset is calculated in TABLE I. The dataset consists of various number of images of 7 distinct people. The accuracy was measured by training a certain number of images per person. This experiment was repeated four times while increasing the number of images per person during the training stage.

TABLE 6.2.1. ACCURACY COMPARISON

Index	Inputs Per person	No. of images in Training dataset	No. of images in Testing Dataset	Result				
				Precision	Recall	F1 score	Accuracy	Training time
1	10	70	84	0.95	0.94	0.94	0.94	1.3s
2	20	140	84	0.97	0.97	0.96	0.96	2.6s
3	50	350	84	0.98	0.98	0.98	0.976	5.6s
4	100	700	84	0.98	0.98	0.98	0.976	12s

We can see that the accuracy of the system is rising with the increase of input images. It is also observed that increasing input images for training the dataset also increases the accuracy of the system. This accuracy increases swiftly when the number of image per person in the dataset is between 10 –50. But it gradually slows down and stabilizes at around 96.4 ~ 97.6 %, despite increasing the number of images per person in the dataset. In machine learning the good dataset leads to better accuracy. So, we conclude that 50 images per person are sufficient to create a good

dataset that contains variety of images of a person which we cannot achieve in 10 or 20 images per person.

We have also found from our experiments, that if there is a discrepancy among the number of inputs for each student, the system sometimes becomes flawed and the student with a higher number of inputs is selected to be the one recognized by the system. To stop this error, the same number of inputs should be chosen during data entry stage. It is also perceived that the time taken to train the dataset increases drastically with the increase of the dataset. The time can be reduced if the system is running on a relatively high-performance computer. We also found that the system can't detect the faces of people who are too far away from the camera. So, it is recommended to place the camera where it can have the best view. Also the system can't detect the faces of people in extreme dark condition whereas it can detect faces of people in bright and medium dark conditions. To overcome this problem one can use external light or simply place the system in good lighting environment.

CHAPTER 7

CONCLUSION

7.1 Conclusion

In this work, a system for automatically marking and storing the attendance of a class has been implemented. Implementation process includes entering data of the students, training dataset, recognizing faces and marking attendance automatically. The HAAR-LBPH model used in this study can detect and recognize a person by their facial features. The proposed system can detect and recognize the students of the class with maximum accuracy of about 97% and saves the teachers time and hassle by automatically marking and storing the attendance of the present students. For the system to be most effective, it has to contain a satisfactory and consistent amount of images of each person during the training stage. Also, the camera has to be positioned in a way that it has clear view of the students. Furthermore, this system can be used in any organization for automatic attendance marking of staffs.

CHAPTER 8

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8.1 References

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