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REAL TIME FACE ATTENDANCE SYSTEM USING DEEP LEARNING

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ABSTRACT

One's face is a physical depiction of who they are. As a result, we have suggested a facial recognition-based automatic student attendance system. The usage of face recognition technology in everyday life is particularly beneficial for security control systems. Face recognition is used by the FBI (Federal Bureau of Investigation) for criminal investigations as well as the airport security system to identify criminals. In the first step of our suggested method, video framing, the camera is activated using a user-friendly interface. The Viola-Jones method is used to identify and segment the face ROI from the video frame. If necessary, image size scaling is done at the pre-processing step to prevent information loss. After using the median filter to reduce noise, color pictures are transformed into grayscale versions. Then, to improve the contrast of the pictures, contrast-limited adaptive histogram equalization (CLAHE) is applied. Principal component analysis (PCA) and improved local binary pattern (LBP) are used appropriately in the face identification stage to extract the characteristics from facial pictures. By minimizing the lighting impact and boosting identification rates, the improved local binary pattern outperforms the original local binary pattern in our suggested method. The features that were retrieved from the training pictures and the features that were extracted from the test images are then compared. The face pictures are then identified and categorized using the upgraded LBP, PCA, and algorithm that produced the best results.

The acknowledged student's attendance will then be recorded and saved in the excel file. A warning will be sent if a student signs in more than once. The student who is not enrolled will also be allowed to register right away. When two photographs per person are trained, the average recognition accuracy is 100% for high-quality images, 94.12% for low-quality images, and 95.76% for the face database.

1. INTRODUCTION

The primary goal of this project is to create an automated student attendance system based on facial recognition. The test pictures and training images of this suggested technique are restricted to frontal and upright facial images that only contain a single face to improve performance. To ensure no quality variation, the test photographs and training images must be taken using the same equipment. To be identified, the pupils must also register in the database. The user-friendly interface allows for immediate enrollment.

To recognize relatives, friends, or other people we are familiar with, face recognition is essential in daily life. We might not realize that several steps have been taken to recognize human faces. Our ability to acquire information and analyze it throughout the recognition process is a result of human intellect. The image that is transmitted to our eyes, and more particularly, the retina, provides us with information in the form of light. Electromagnetic waves take the shape of light, which is projected to human eyesight after being transmitted from a source onto an object. According to Robinson-Riegler, G., & Robinson-Riegler, B. (2008), when the human visual system has processed the image, we really identify the object's shape, size, contour, and texture in order to analyze the data. The analysed information will be compared to other representations of objects or face that exist in our memory to recognize.

In fact, it is a hard challenge to build an automated system to have the same capability as a human to recognize faces. However, we need large memory to recognize different faces, for example, in the Universities, there are a lot of students with different race and gender, it is impossible to remember every face of the individual without making mistakes. To overcome human limitations, computers with almost limitless memory, high processing speed and power are used in face recognition systems. The information that has been analyzed will be compared to other facial or object representations that

we have in our memory to identify them. Creating an automated system that can detect

looks, though, we need a strong memory. For instance, because there are so many students at universities of all racial and gender backgrounds, it is hard to recall every one of their faces without making a mistake. Face recognition systems leverage computers with nearly unlimited memory, fast processing speed, and power to overcome human limitations. The human face is a special illustration of personal identity.

Face recognition research has begun in 1960. A method created by Woody Bledsoe, Helen Chan Wolf, and Charles Bisson required the administrator to identify the eyes, ears, nose, and mouth from photographs. Next, a comparison is made based on the calculated distances and ratios between the located features and the shared reference points. Goldstein, Harmon, and Lesk expanded on the experiments in 1970 by automating the detection of other traits including hair color and lip thickness. Principle component analysis (PCA) was initially presented as a solution to the face identification problem by Kirby and Sirovich in 1988. Then, and up until the present day, several experiments on facial recognition have been undertaken (Ashley DuVal, 2012).

1.1. PROBLEM STATEMENT

The traditional method of recording student attendance frequently has a number of issues. By doing away with traditional student attendance marking methods like calling out student names or verifying individual identity cards, the facial recognition student attendance system highlights its simplicity. Not only do they obstruct the teaching process, but they also divert students' attention at test times. During lecture sessions, an attendance list is distributed around the classroom in addition to calling names. It may be challenging to circulate the attendance sheet around a lecture class, particularly one with a big number of pupils. The manual signing of students' presence, which is cumbersome and causes them to become distracted, is thus recommended to be replaced with a facial recognition student attendance system. Additionally, the automatic facial recognition-based student attendance system can overcome the issue of fraudulent approaches, and lecturers no longer need to count the number of students repeatedly to confirm their

attendance.

A blockchain-based online attendance system can eliminate the risks associated with traditional attendance systems, such as voter fraud, vote tampering, and hacking, while also providing a user-friendly interface that can be accessedfrom anywhere, at any time.

Therefore, the problem statement for this project is to develop an online attendance systemusing blockchain technology that can ensure the confidentiality, integrity, and availability of votes, while also providing transparency and accountability in the attendance process. The system must be user-friendly, accessible, and secure, and it must eliminate the risks associated with traditional attendance systems. The system must also be designed to be scalable and adaptable, allowing it to be used in various types of elections, from local to

1.2. OBJECTIVES

The goal of this project is to create an automated student attendance system based on facial recognition. The following are expected results to meet the objectives: To identify the facial segment in the video frame.

- To identify the useful aspects on the observed face.
- To categorize the traits in order to identify the observed face.
- To note the indicated student's attendance

1.3 REPORT ORGANIZATION

Chapter 2 includes a brief review of the approaches and studies that have been done previously by other researchers whereas Chapter 3 describes proposed methods and approaches used to obtain the desired output. The results of the proposed approach will be presented and discussed in Chapter 4. The conclusion, as well as some recommendations would be included in Chapter 5

2. REVIEW OF LITERATURE

Student Attendance System

The RFID (Radio Frequency Identification) card system, the fingerprint system, and the iris recognition system all have drawbacks, according to Arun Katara et al. (2017). The RFID card method is used because it is straightforward. If the user has their friend's ID card, they usually assist their pals with checking in. The fingerprint technology is efficient but not very quick because each user must stand in line and go through the verification procedure individually. The human face, however, is constantly visible and contains less data than the iris when used for facial identification. A more detailed iris recognition technology could violate the user's privacy. Although voice recognition is a possibility, it is not as precise as other approaches. Thus, it is advised that the student attendance system be upgraded to include face recognition technology

Face Detection

The distinction between face detection and face recognition is frequently erroneous. Face recognition identifies the owner of the facial picture, whereas face detection just determines the face segment or area from an image. Wei-Lun Chao (2007) and Sanjana devi et al. (2017) both listed a few variables that make face detection and identification challenging. These variables include the foreground, the lighting, the posture, the expression, the occlusion, the rotation, the scale, and the translation. In Table 2.2, each factor's definition is listed. There are a few face detection methods that the previous researchers have worked on. However, most of them used frontal upright facial images which consist of only one face. The face region is fully exposed without obstacles and free from the spectacles.

ackground	ariation of background and environment around people n the image which affect the efficiency of facerecognition.
lumination	lumination is the variation caused by various lighting nvironments which degrade the facial feature detection.
ose	ose variation means different angle of the acquired the facial nage which cause distortion to recognition process, specially for Eigen face and Fisher face recognition method.
xpression	ifferent facial expressions are used to express feelings and motions. The expression variation causes spatial relation hange and the facial-feature shape change.
cclusion	cclusion means part of the human face is unobserved. his will diminish the performanceof face recognition gorithms due to deficiency information.
otation, scalingand anslation	ransformation of images which might cause distortionof the riginal information about the images.

2.1. METHODOLOGY

The method uses a facial recognition-based attendance system for students. The technique starts with the picture capturing utilizing an easy-to-use interface, then moves on to pre- processing the facial photos that were collected, feature extraction from those images, subjective selection, and finally categorization of the facial images to be recognized. This suggested technique computes both LBP and PCA feature extraction algorithms, then compares their performance. With this method, LBP is improved to lessen the lighting impact. Moreover, a subjective selection method that combines improved LBP and PCA is created to improve accuracy. The next sections will go through the specifics of each level.

The proposed system's flow chart is divided into two sections, which are depicted in Figures 3.1 and 3.2, respectively. The first section is for training pictures, and the second is for testing images (recognize the unknown input image).

2.2. Overview of attendance Systems

Input Images

Real-time face recognition student attendance systems should utilize our own database, but the databases given by earlier researchers are also used to develop the system more effectively, efficiently, and for assessment.

To assess the performance, the Yale face database is employed as both a training set and a testing set. One hundred and sixty-five grayscale pictures of fifteen people may be found in the Yale face database. There are eleven photos for everyone, and each one is in a distinct state. The situations included right-light, sad, drowsy, astonished, and wink. They also included center-light, with glasses, joyful, left-light, without glasses, normal. The database's several variants enable the system to function consistently under a wide range of circumstances and settings.

The photographs of the kids are taken using the built-in camera on the laptop and the

student, two for the training set and two for the testing set. Images taken using a laptop's built-in camera are of low quality, but photographs taken with a mobile phone camera are of good quality. While there are twenty-six pupils in the poor-quality photographs, there are seventeen in the good quality ones. In Chapter 4, the recognition rates of low- quality and high-quality image sets will be compared to make conclusions about the performance of various image sets.

3.1 Input Images

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The photographs of the kids are taken using the built-in camera on the laptop and the camera on the phone for our own database. Four photographs were submitted by each student, two for the training set and two for the testing set. Images taken using a laptop's built-in camera are of low quality, but photographs taken with a mobile phone camera are of good quality. While there are twenty-six pupils in the poor-quality photographs, there are seventeen in the good quality ones. In Chapter 4, the recognition rates of low-quality and high-quality image sets will be compared to make conclusions about the performance of various image sets.

Sample of High Quality Images

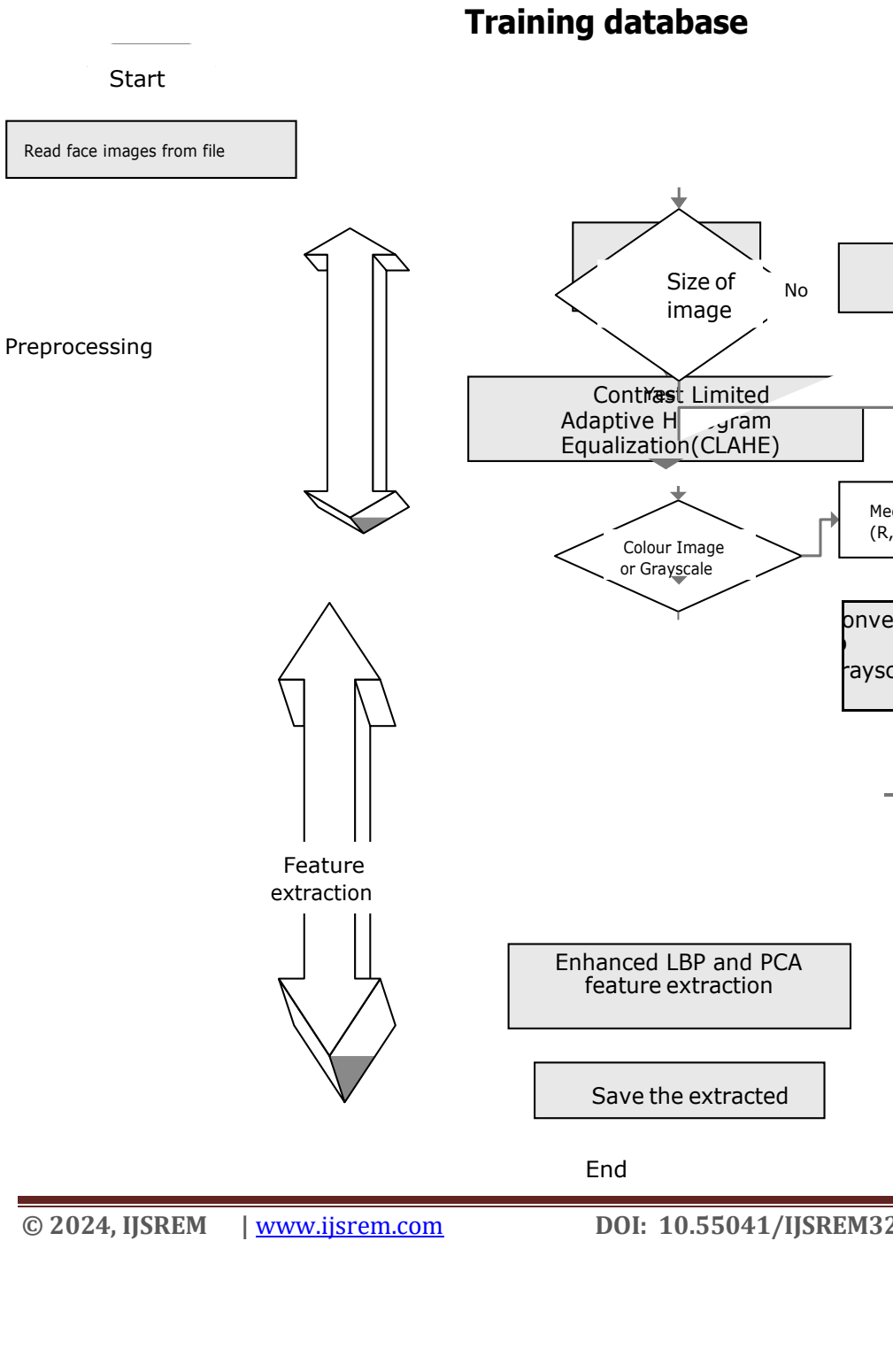


Figure 3.1 Flow of the Proposed Approach (Training Part

3.1.1 Limitations of the Images

The input image for the proposed approach must be frontal, upright and only a single face. Although the system is designed to be able to recognize the student with glasses and without glasses, students should provide both facial images with and without glasses to be trained to increase the accuracy to be recognized without glasses. The training image and testing image should be captured by using the same device to avoid quality difference. The students must register in order to be recognized. Enrolment can be done on the spot through the user- friendly interface. These conditions must be satisfied to ensure that the proposed approach can perform well.

Face Detection

The face will be identified from the video camera recording frame using the Viola-Jones object detection framework. Chapter 2 describes the Viola-Jones algorithm's operating system. The Viola-Jones framework is restricted by the requirement that the facial picture be a frontal upright image and that the subject's face in a video frame face the camera.

Pre-Processing

Images from the training set and testing set are taken with a camera. The photographs include unwelcome noise and inconsistent illumination. Hence, before moving on to feature extraction, several pre-processing processes are required. Scaling the picture, median filtering, converting color images to grayscale, and adaptive histogram equalization are all pre-processing techniques that might be used. The specifics of these actions will be coveredin the following sections.

3.1.1.1 Scaling of Image

One of the frequent jobs in image processing is picture scaling. Carefully adjusting the picture size is necessary to preserve spatial information. (2008) (Gonzalez, R. C., & Woods), Equalizing the size of the picture is necessary for facial recognition. It has become vital that the test pictures and training images be

the same size and dimension, especially throughout the feature extraction process, to guarantee an accurate result. As a result, the suggested technique standardized test and training pictures at a size of 250 250 pixels.

Median Filtering

A reliable technique for noise reduction is median filtering. It is frequently used in many applications because it can reduce unwanted noise while keeping important picture detail. As color photographs taken with a camera are RGB pictures, median filtering is applied to each of the image's three channels. The image before and after noise reduction using median filtering in three channels is shown in Figure 3.3. If the source picture is grayscale, the channels don't need to be separated before doing the median filtering.

Figure 3.6 Median Filtering Done on Three Channels

Figure 3.7 Median Filtering Done on a Single Channel

3. PLANNING AND FLOMULATION

3.1. PROJECT DEVELOP MODEL

Open CV

OpenCV is a large open-source library for image processing, computer vision, and machine learning.Python, C++, Java, and other programming languages are supported by OpenCV.

It can analyses photos and videos to recognise items, faces, and even human handwriting. When it'spaired with other libraries, like Numpy, a highly efficient library for numerical operations, the amount of weapons in your arsenal grows, as any operation that Numpy can be merged with OpenCV [27]. OpenCV is a cross-

platform library that may be used to create real-time computer vision apps. It mainly focuses on image processing video capture [28] and analysis including featureslike face detection and object detection. This module covers the basic data structures such as Scalar, Point, Range, etc., that are used to build OpenCV applications. In addition to these, it also includes the multidimensional array Mat, which is used to store the images. In the Java library of OpenCV, this module is included as a package with the name org.opencv.core. This module covers various image processing operations such as image filtering, geometrical image transformations, color space conversion, histograms, etc. In the Java library of OpenCV, this module is included as a package with the name org.opencv.imgproc.

4.2CSV

CSV (Comma Separated Values) is a simple file format used to store tabular data, such as a spread sheet or database. A CSV file stores tabular data (numbers and Each record consists of one or more fields, separated by commas. The use of the comma as a field separator is the source of the name forthis file format. A Comma Separated Values (CSV) file [29] is a plain text file that contains a list of data. These files are often used for exchanging data between different applications. For example, databases and contact managers often support CSV files. These files may sometimes be called Character Separated Values or Comma Delimited files. They mostly use the comma character to separate (or delimit) data, but sometimes use other characters, like semicolons. The idea is that youcan export complex data from one application to a CSV file, and then import the data in that CSV
file into another application. A CSV file has a fairly simple structure. It's a list of data separated by commas. For example, let's say you have a few contacts in a contact manager, and you export them as a CSV file [30].text) in plain text. Each line of the file is a data record.

V. SYSTEM DESIGN

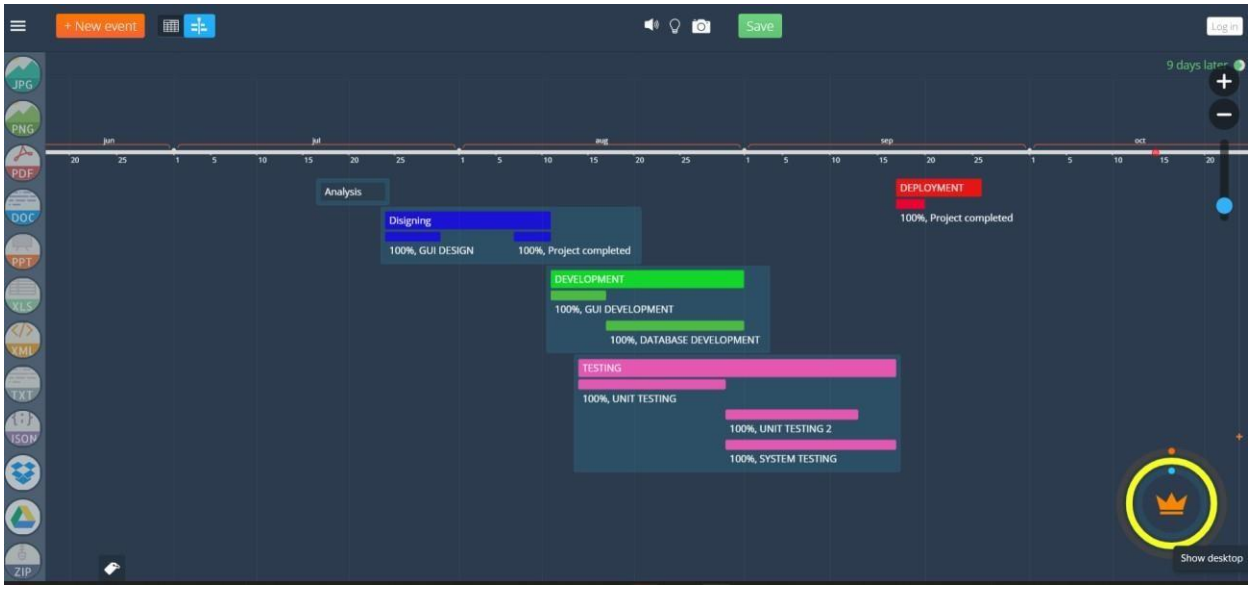
This is a window application developed in Python technology, MySQL is a backend database. Thisapplication

has two type of users one is Admin user who will upload the files to main storage with
annotation details. Another is an end user who is a real beneficiary of this system who can able to
search for the file by providing the query keyword. With this system end user can able to get most matching files in short time shown in figure 1. This system uses a Workload which is like a cache area with the help of the Workload space and Annotation technique this system help the end user to get his required file in short time. The usage period of any venture advancement is the most essential stage as ityields the last arrangement, which takes care of the current issue. The usage stage includes the real emergence of the thoughts, which were communicated in the examination report and grew in the configuration stage shown in figure 2. Execution must be an impeccable mapping of the outline record in a suitable programming dialect with a specific end goal to accomplish important last item shown in figure 3. The item may be destroyed because of off base programming dialect decided for usage or unsatisfactory system for programming. The coding stage must be straightforwardly connected to the outline stage in the sense if the configuration is as far as item situated approach then usage ought to be ideally done in the article arranged way. Usage of any product framework is constantly gone before by essential choice with respect to determination of stage, the dialect utilized and so forth shown in figure

4. These choices are regularly impact by a few variables, for example, environment in which the framework lives up to expectations, the rate that is needed, the security concerns, and other execution points of interest. The real execution choice that has been made before the usage of this venture is determination of the programming dialect for improvement of the application. The venture will be done in java, since it is an

adaptable dialect. This dialect has been decided for the execution since it giveobliged bundle to the security. The Project work is executed utilizing python. The IDE overshadowing is utilized, which streamlines the development of utilizations. Opencv is utilized to outline the all pages for sender and collector and Opencv code content the Python code at whatever point it obliged elementconduct. The Python advancement unit is utilized to actualize all the obliged bundles. The accompanying depictions layout the outcomes or yields that we are going to get once regulated execution of the considerable number of modules of the framework.

3.2. TIMELINE CHART



3.3. FUTURE WORK

Face recognition is the most biological features recognition technology, according to the cognitive

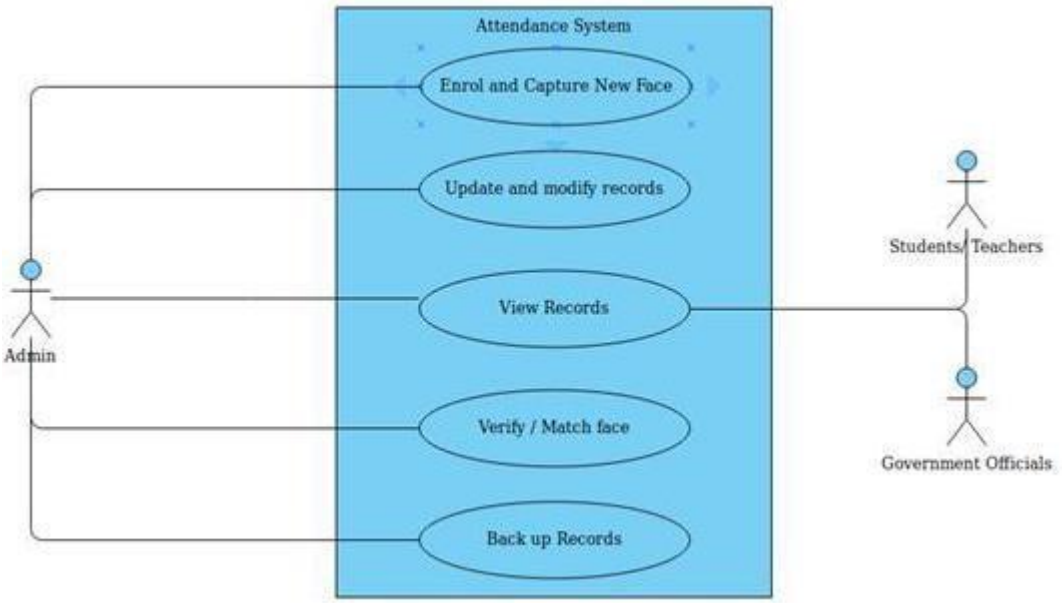
rule of human beings, its algorithm is ten times more complex than a fingerprint algorithm. The system will do its work even if one is not in touch with it or forget about it. Face recognition is featured by the following advantages compared to fingerprint: Using face recognition accurate and fast identification, industrial leading facial recognition algorithm matches more data than a fingerprint. High usability and security in this context failure to control and acquire rate is less than0.0001%, fingerprint technology will have problems for enrolment with cold, wet, desquamation, elder, and around 5% people cannot get enrolled with a photo which is captured by the camera, there is no evidence with fingerprint technology to track the incident and user

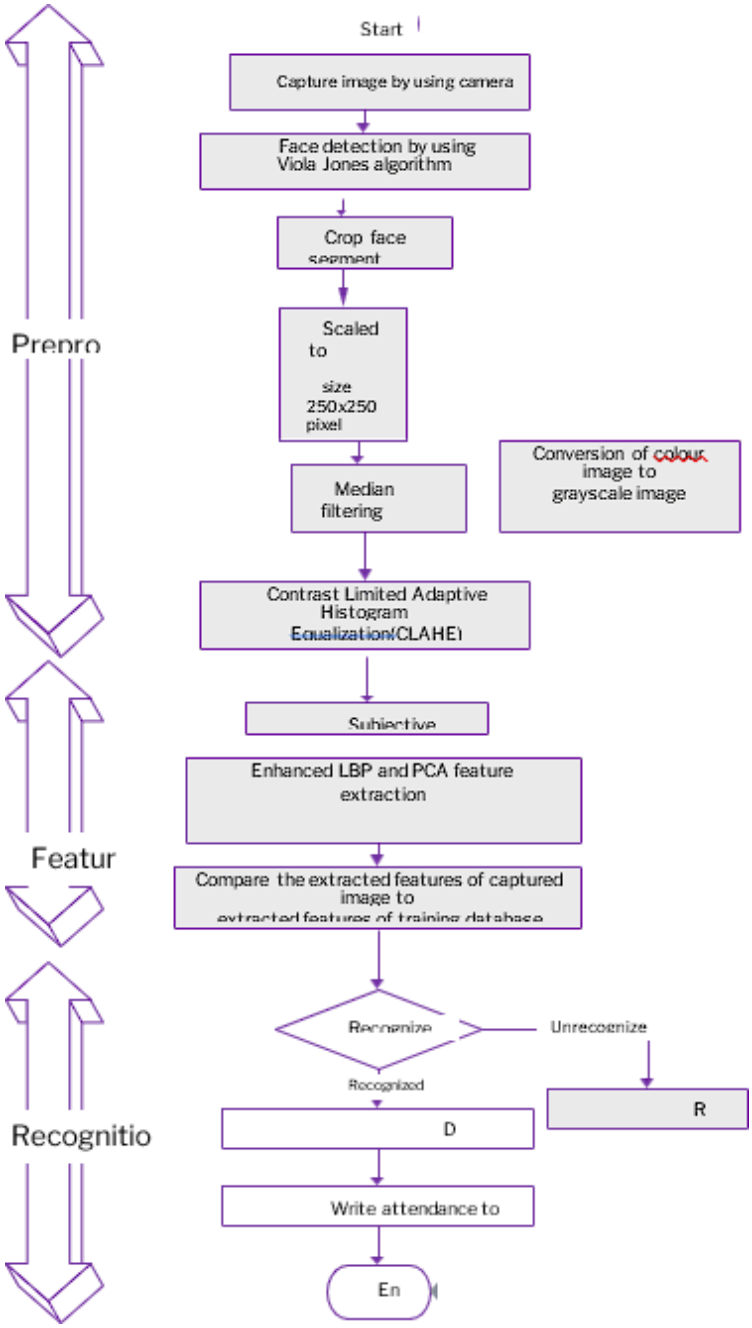
5. SYSTEM DESIGN

5.1 FLOW CHART

PHASE 1

(User Flow Diagram)




Start
Capture image by using camera
Face detection by using Viola Jones algorithm
Crop face
Scaled to size 250x250 pixel
Median filtering
Conversion of colour image to grayscale image
Contrast Limited Adaptive Histogram Equalization(CLAHE)
Subjective
Enhanced LBP and PCA feature extraction
Compare the extracted features of captured image to
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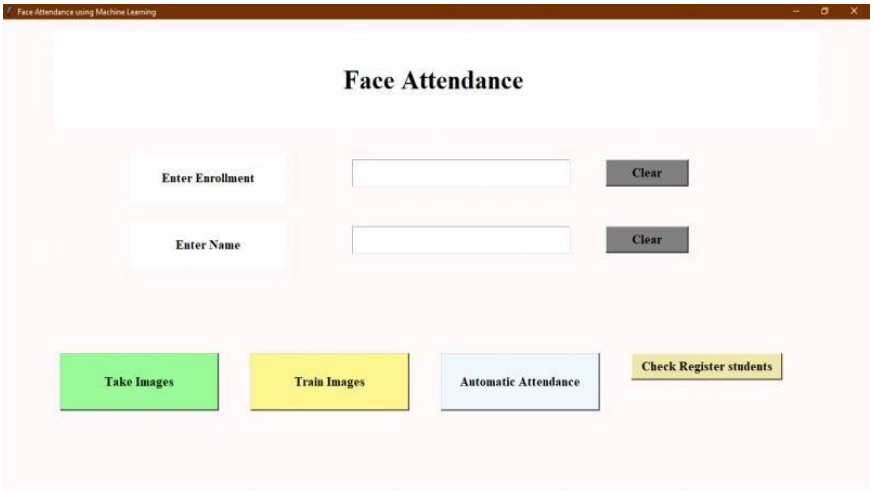
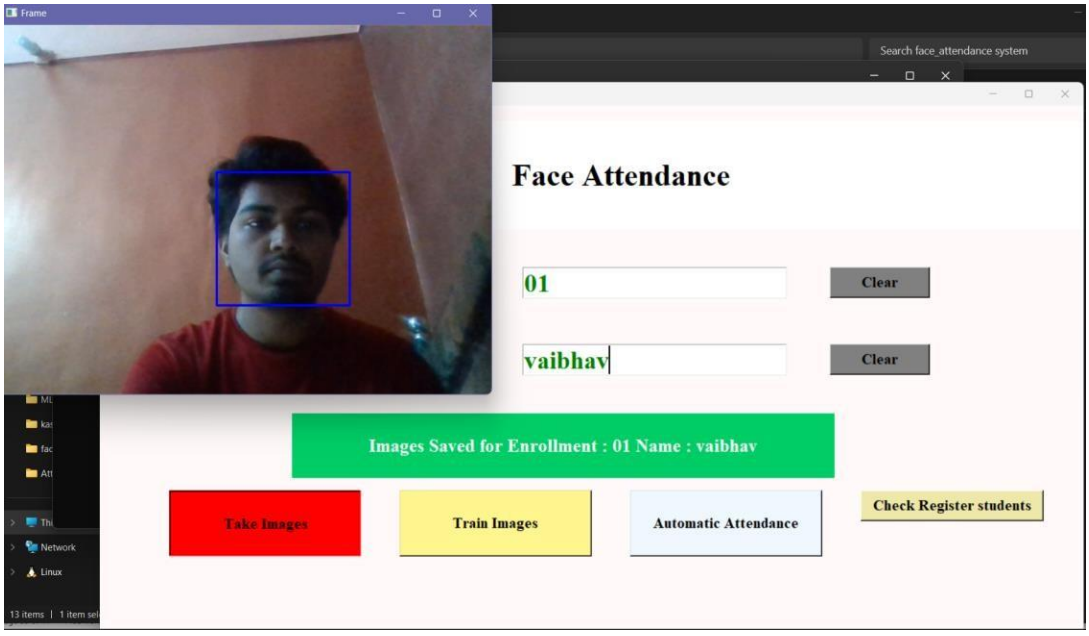
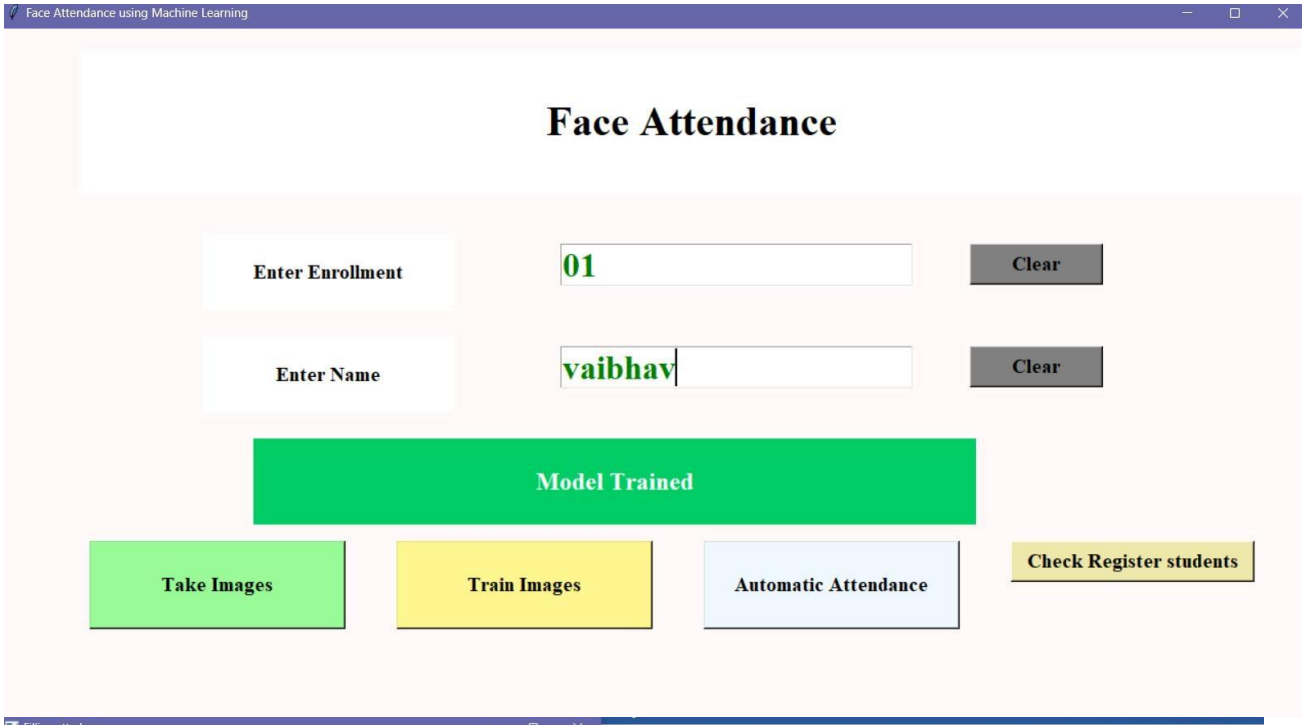
CHAPTER 6 IMPLEMENTATION






Face Attendance using Machine Learning
Face Attendance
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Take Images
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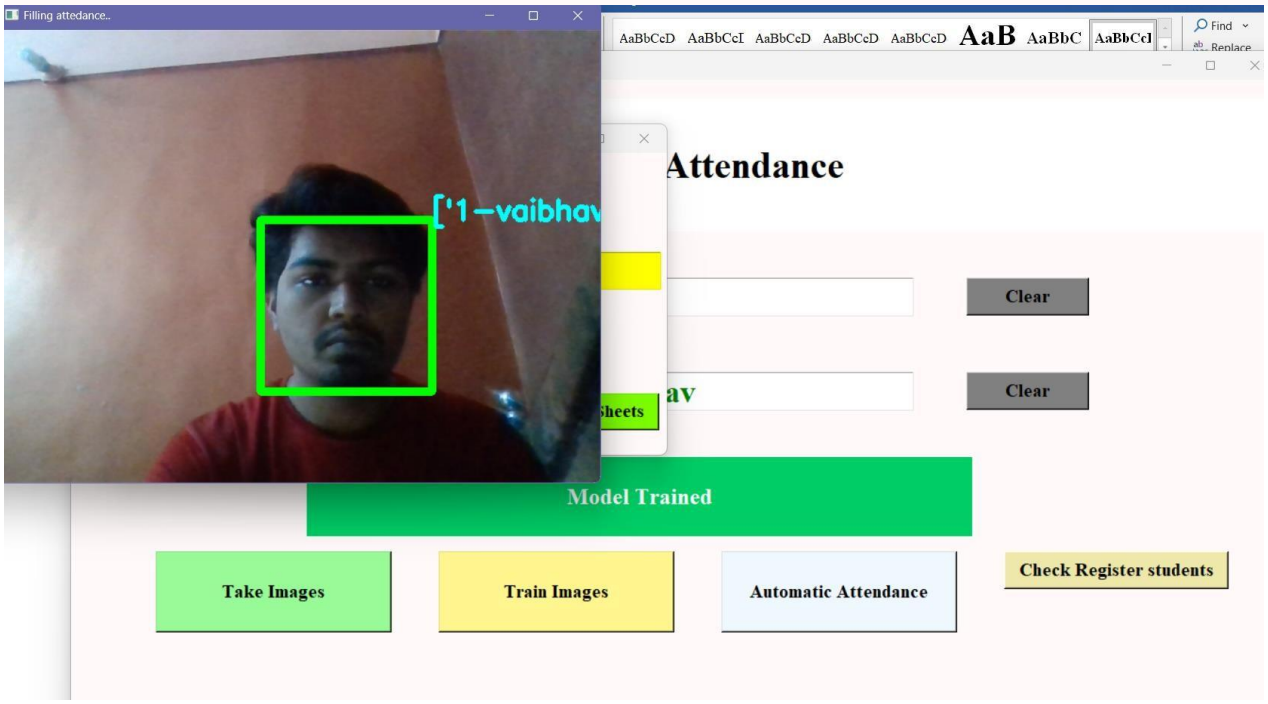
Check Register students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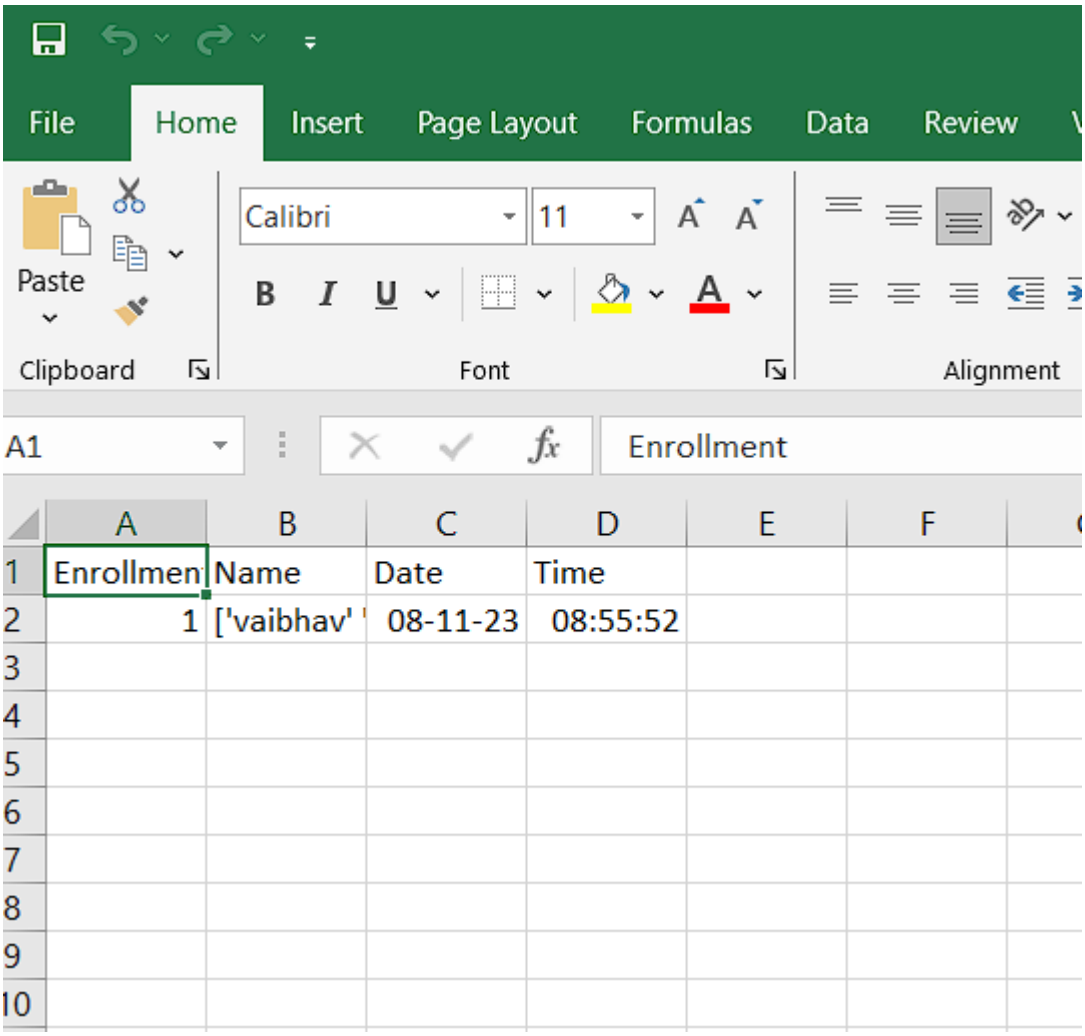
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CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This method provides a detailed description of an automated student attendance system based on facial recognition. With the help of a comparison between the input picture from a video frame that was recorded and the training image, the suggested strategy offers a way to recognize the persons. This suggested method is capable of locating a face from an input facial picture that is taken from a frame of the recorded video. Moreover, it offers a pre-processing technique to improve image contrast and lessen the lighting impact. Both LBP and PCA are used to extract characteristics from the face picture. The system may be stabilized by producing consistent results thanks to the method that combines LBP and PCA. When two photographs per person are taken, the accuracy of the suggested method is 100% for high-quality images, 92.31% for low-quality images, and 95.76% for the face database.

The extraction of face features may be difficult, particularly in variable lighting, as a conclusion to the investigation. Contrast Limited Adaptive Histogram Equalization (CLAHE), used in pre- processing, can lessen the lighting impact. When it comes to improving contrast, CLAHE outperforms histogram equalization. When compared to the original LBP operator, enhanced LBP with bigger radius sizes—specifically, radius size two—perform better, are less impacted by light, and are more consistent when compared to other radius sizes.

References

Robinson-Riegler, G., & Robinson-Riegler, B. (2008). *Cognitive psychology: applying thescience of the mind*. Boston, Pearson/Allyn and Bacon.

Margaret Rouse. (2012). *What is facial recognition? - Definition from WhatIs.com*. [online]Available at: http://whatis.techtarget.com/definition/facial-recognition [Accessed 25 Mar. 2018].