



e-ISSN:2582-7219



# INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 5, Issue 5, May 2022



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 7.54



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ijmrset@gmail.com



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# AI Based Smart Attendance System with Face Recognition

**Dnyanesh Shivram Nawale, Adesh Kailas Ugale, Mayur Ganesh Autade, Priti Atmaram Landge,  
Prof. Shital Patil**

Dept. of Information Technology, SVIT, Nashik, Maharashtra, India

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**ABSTARACT:** In the era of modern technologies emerging at rapid pace there is no reason why a crucial event in educational sector such as attendance should be done in the old boring traditional way. Real time Face recognition based Attendance system will save a lot of time and energy for the both parties students as well as the class teachers. Attendance will be Calculated by the face recognition algorithm by recognizing only the face of the students from the rest of the objects and then marking themes present. The system will be pre feed with the images of all the students and with the help of this pre feed data the algorithm will detect them who are present and match the features with the already saved images of them present in the database.

## I. INTRODUCTION

The purpose of the Real Time Face Recognition Based Automated Students Attendance System is to erase the attendance process which consumes lot of time and efforts it is a convenient and easy way for both students and teacher. The system will capture the images of the students and using face recognition algorithm mark the attendance in the sheet. This way the class-teacher will get their attendance marked without actually spending time in traditional attendance marking. The identification process to determine the presence of a person in a room or building is currently one of the routinesecurity activities. Every person who will enter a room or building must go through several authentication processes first, that later these information's can be used to monitor every single activity in the room for a security purpose. Authentication process that is being used to identify the presence of a person in a room or building still varies. The process varies from writing a name and signatures in the attendance list, using an identity card, or using biometric methods authentication as fingerprint or face scanner.

## II. LITERATURE SURVEY

- i.The Existing system is a manual entry for the Admin and Faculty. Here the attendance will be carried out in the handwritten registers. Maintaining the records for the Faculty is a tedious job.
- ii.The new system has been designed as per the user requirements to fulfil almost all them. -User friendly -Report Generation -Less paperwork.

## III.THEROTICAL BACKGROUND

According to Literature, Student Attendance System by Face Detection, maintaining attendance is very important and compulsory in all the institutes for checking the performance of students. Every institute has its method in this regard. Some are taking attendance manually using the old paper or theold file-based approach and some have adopted methods of automatic attendance using some biometric techniques [3].

An automated attendance system based on face recognition is a biometric system where typically, it registers the attendance of each student present in a class by detecting and identifying all of their faces, and then this recorded information is ideally transmitted to a server device which may compute the attendance of each student and store and update the corresponding data in a database. Automated attendance systems are more reliable, rigid, and efficient than



the traditional attendance systems and other biometric attendance systems, leading to better productivity and output of both the teachers and students, as well as better consumption of time [10].

According to Literature, SVM classifies data based on the plane that maximizes the margin. The SVM decision boundary is straight. SVM is a really good algorithm for image classification. Experimental results show that SVMs achieve significantly higher search accuracy than traditional query refinement schemes after just three to four rounds of relevance feedback. This is also true for image segmentation systems, including those using a modified version SVM that uses the privileged approach[1].

#### IV.ALGORITHM

Local Binary Pattern Histogram (LBPH):

##### Introduction to LBPH algorithm

Local Binary Pattern (LBP) is a simple yet every efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number.

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbours.

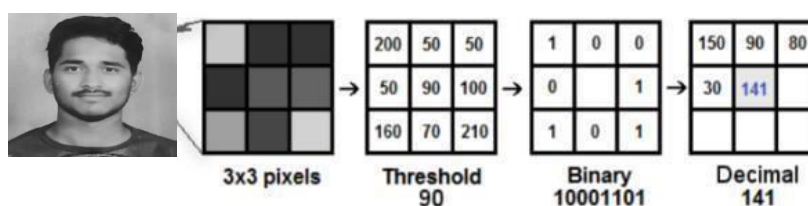


Fig1.Applying the LB Poperation

##### Performing the face recognition:

In this step, 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. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^n (hist1_i - hist2_i)^2}$$

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.



**APPLYING LBH OPERATIONS**

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters **radius** and **neighbors**.

**IMPORTANT POINTS**

- Suppose we have a facial image in grey scale.
- We can get part of this image as a window of 3x3 pixels.
- It can also be represented as a 3x3 matrix containing the intensity of each pixel
- 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 neighbours.

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.

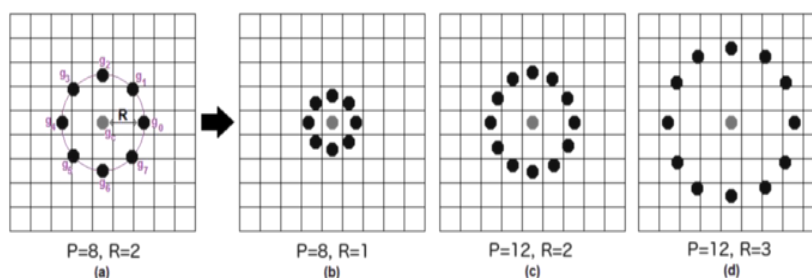


Fig.2 Radius of central pixel

**Training The Algorithm:**

First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let’s see the LBPH computational steps.

**5.1 EXTRACTING THE HISTOGRAM**

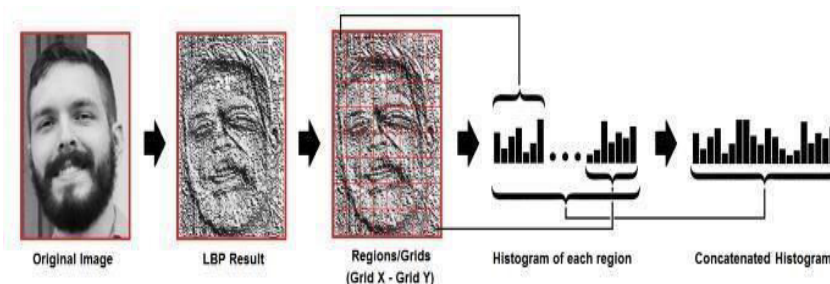


Fig .3 grid image

Based on the image above, we can extract the histogram of each region as follows:

- As we have an image in grayscale, each histogram (from each grid) will contain only 256 positions (0~255) representing the occurrences of each pixel intensity.



- Then, we need to concatenate each histogram to create a new and bigger histogram. Supposing we have 8x8 grids, we will have 8x8x256=16.384 positions in the final histogram. The final histogram represents the characteristics of the image original image.

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In this step, 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. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^n (hist1_i - hist2_i)^2}$$

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

- ‘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

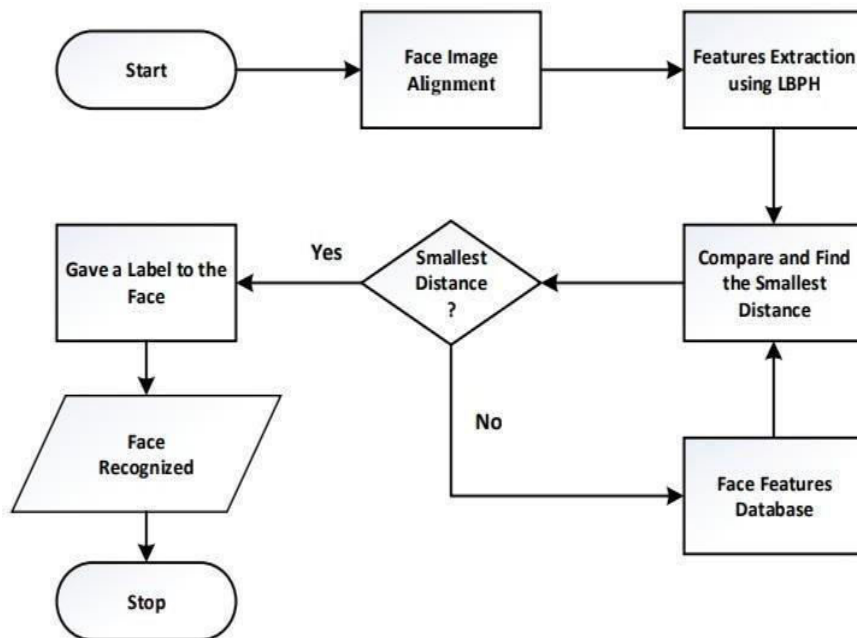


Fig .4 flowchart diagram



#### IV. GRAPHICAL USER INTERFACE

- A graphical user interface (GUI) is developed using the Python library Tkinter and PyQt. The proposed automatic attendance system has the following capabilities
- "Student Details" to enter the names, Roll No, face images and other information of the students to the database
- "Face Detector" to compare face encoding in the image captured by the camera with the encodings available in the database and generate the attendance list
- "Attendance" to save the attendance details of the student
- "Train Data" to create student face encodings from their face
- "Photo" it contain all sample image for training



In this system system, administrator have their own usernames and passwords to enter the system. the username and password. If the information provided by the user is correct, user can login the system by clicking the login button and use the provided features. On the other hand, if the provided information is incorrect, a window with an error message will be opened and all functions will be deactivated.



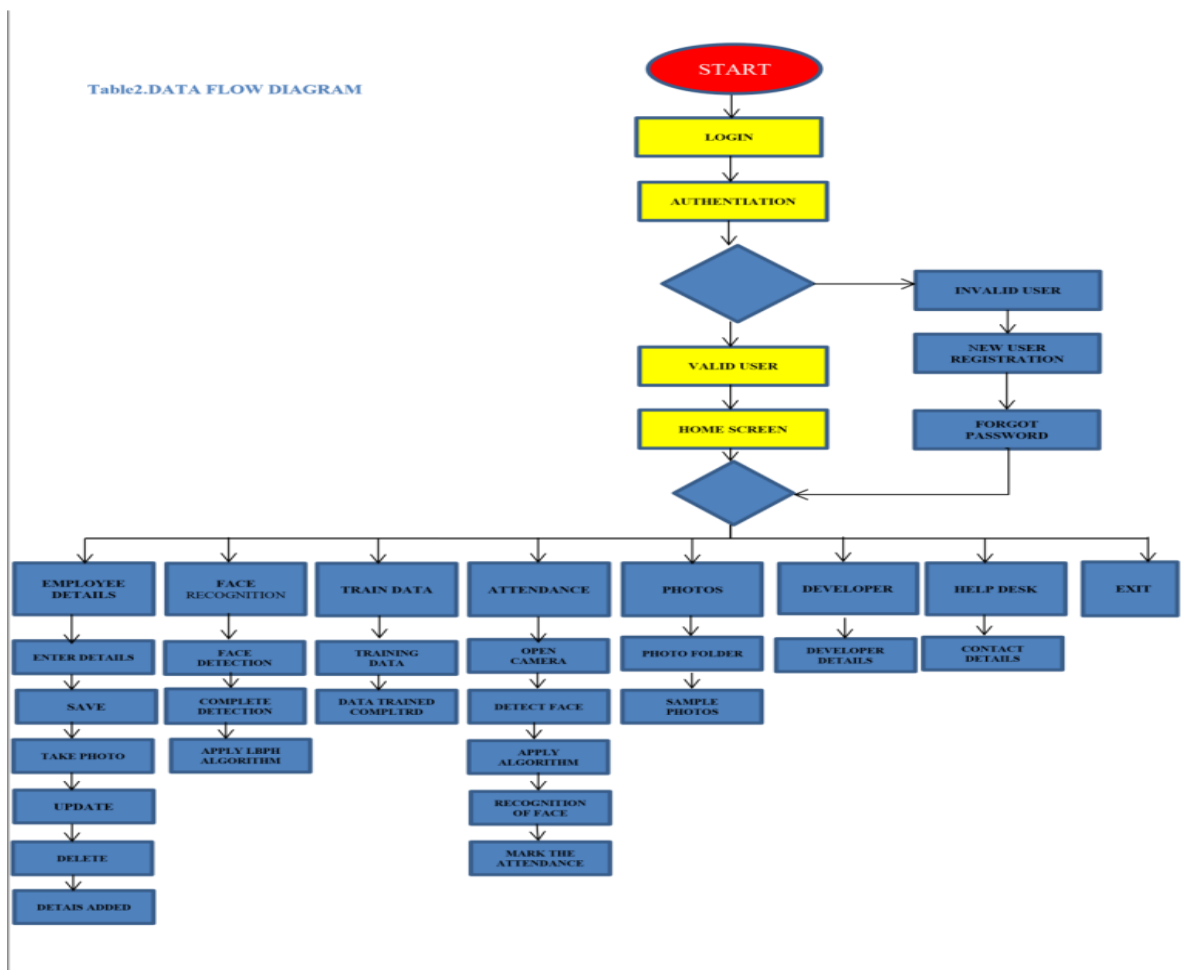
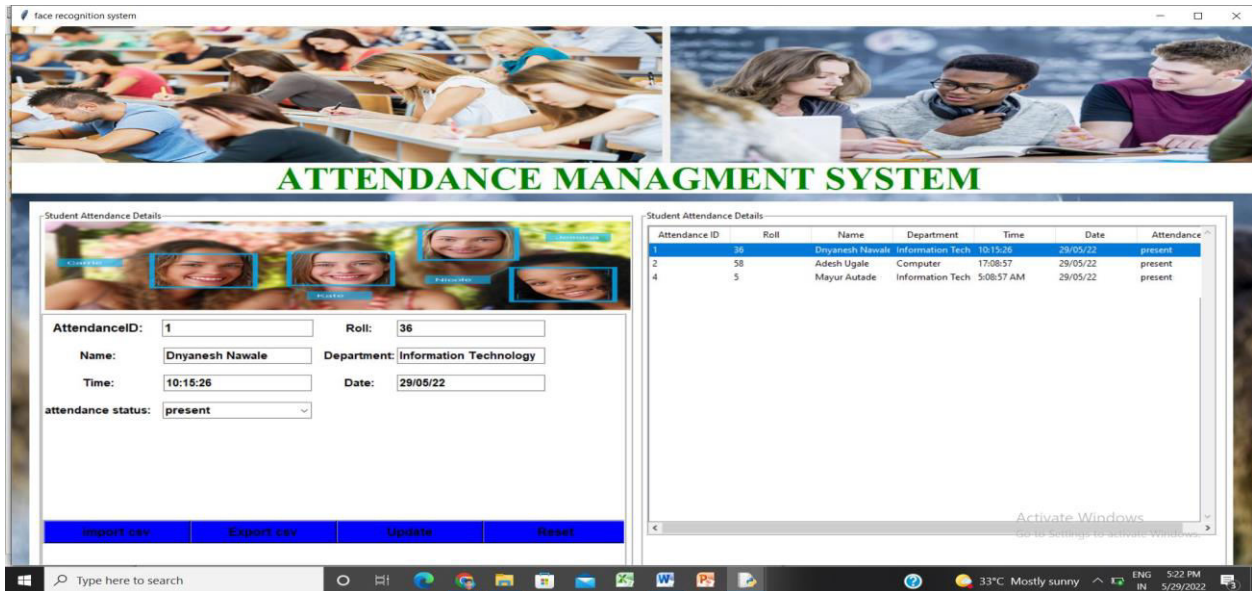


Fig.5. Flowchart For the GUI



The flow chart of the GUI operations is presented in figure

## V. CONCLUSION

1. The Attendance Management System is developed using Machine Learning meets the objectives of the system which it has been developed. The system has reached a steady state where all bugs have been eliminated. The system is operated at a high level of efficiency. The system solves the problem. It was intended to solve as requirement specification.
2. The system can recognize and identify the face well with an accuracy of 85%, at a face distance 40 cm from the camera with adequate lighting.

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**ISSN**

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