# Artificial Intelligence and Machine Learning Techniques for Face Recognition

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## Abstract

There is no justification for handling an important educational event like attendance in the antiquated, tedious manner in the age of rapidly advancing current technologies. Both the pupils and the class teachers will benefit greatly from the time and energy savings provided by the attendance monitoring system. The face recognition algorithm will keep track of attendance by identifying each student's face apart from the other objects and marking them as present. All of the students' photographs will be pre-fed into the system, and using this pre-feed data, the algorithm will identify the students who are there and compare their attributes to previously saved images of them present in the database.

**Keywords:** MachineLearning, DecisionTree, Random Forest, K NearestNeighbour.

## 1.Introduction:

The purpose of the attendance monitoring system using face recognition is to ease the attendance process which consumes lot of time and efforts , it is a convenient and easy way for 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 routine security 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 vary. 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.



## 2. Literaturesurvey:

| YEAR | AUTHOR | OBJECTIVES | METHODOLOGY | FINDINGS | PROBLEMS |
|---|---|---|---|---|---|
| 2017 | Monica.C, Nithya.R, Prarthana.M, Sonika.S.V, Dr.M.Ramakrishna | Data of student has been computerized without using any manual effort. | The design is expressed in sufficient detail so as to enable all the developers to understand the underlying architecture of Attendance system. | The Existing system is a manual entry for the Admin and also Faculty. Here the attendance will be carried out in the hand written registers. Maintaining the records for the Faculty is a tedious job. | The requirements for the Software to work are much (Python, Tomcat, My SQL,) etc. |

## 3. Methodology:

This project consistsof three parts the front end, the back end andthe database the use of HTML, CSS, JavaScript isdone for making the front end and for the backend python is used, django is used as adatabase. The prediction of the disease will bedone using various machine learning algorithmslikerandomforest, decisiontree andK Nearestneighbour.

The steps that are needed to implement this areas follows:

## 1.HAAR CASCADE ALGORITHM

The core basis for Haar classifier object detection is the Haar-like features. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are used to determine relative light and dark areas. Two or three adjacent groups with a relative contrast variance form a Haar-like feature. Haar-like features as shown in figure are used to detect an image. Haar features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to detect objects of various sizes. The cascading of the classifiers allows only the sub-images with the highest probability to be analyzed for all Haar-features that distinguish an object. It also allows one to vary the accuracy of a classifier. One can increase both the false alarm rate and positive hit rate by decreasing the number of stages. The inverse of this is also true. Viola and Jones were able to achieve a 90% accuracy rate for the detection of a human face using only 100 simple features. Detecting human facial features, such as the mouth, eyes, and nose require that Haar classifier cascades first are trained. In order to train the classifiers, this gentle AdaBoost algorithm and Haar feature algorithms must be implemented. Fortunately, Intel developed an open source library devoted to easing the implementation of computer vision related programs called Open Computer Vision Library (OpenCV). The OpenCV library is designed to be used in conjunction with applications that pertain to the field of HCI, robotics, biometrics, image processing, and other areas where visualization is important and includes an implementation of Haar classifier detection and training. Thus with help of this algorithm system will detect the person's face in the video. Face of the person gets Green Square as an indication of detection process. As soon as the face gets detected user can paused the video and enters the data of detected person such as person's name, address, profession, criminal record if any. If the detected person has criminal record then it can be defined as suspect. Check box option is given in the system where user can tick whether the person is suspect on not. This is the working of first module in which sample video is browsed and face is detected.



image

**Fig 3. Haar Features**

## 2. Applying the LBP operation:

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**.
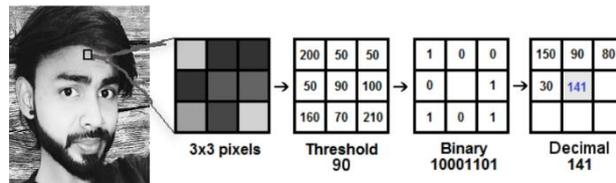
The image below shows this procedure:

**Fig 4. Applying the LBP operation**

3.**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: Euclideandistance, chi-square, absolutevalue, 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.

**4.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.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**.

4.**CONCLUSION AND FUTURE WORK**

**Conclusion:**

- 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.

- 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.

**Future Work:**

I have planned to create the application for multiple college campuses and for the multiple schools.

## 5.REFERENCES:

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