# Online Student Attendance System Via Face Recognition using Python

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***Abstract:*** We reside during a world where everything is automated and linked online. the web of things, image processing, and machine learning are developing day by day. The attendance system may be a typical example of this transition, ranging from the standard signature on a paper sheet to face recognition. The face is one among the best ways to tell apart the individual identity of every other. Face recognition is a identification system that uses personal characteristics of a person to identify the person's identity. Human face recognition approach basically consists of two phases, first phase is face detection, where this phase takes place very rapidly in humans, except under conditions where the object is located at a short distance away, the next phase is the introduction, which recognize a face as individuals. Stage is then recreated and developed as a model for facial image recognition (face recognition) is one of the much-studied biometrics technology and developed by experts.

## I. INTRODUCTION

The main aim of this project is to create a face recognition-based attendance monitoring system for institution to extend and upgrade this attendance system into more coherent and effective as compared to before. this existing system includes a lot of ambiguity that caused imperfect and unsuitable of attendance taking. Many problems arise when the authority is unable to use the regulation that exist within the old system. Thus, by means of technology, this project will resolve the failings existed within the current system while bringing attendance taking to an entire new level by automating most of the tasks. The technology working behind are the face recognition system.

Face recognition is crucial in lifestyle so as to spot family, friends or someone we are aware of. we would not perceive that several steps have actually taken so as to spot human faces. Human intelligence allows us to receive information and interpret the data within the recognition process. We receive information through the image projected into our eyes, by specifically retina within the style of light.

The main objective of this project is to develop face recognition based automated student attendance system. so as to realize better performance, the test images and training images of this proposed approach are limited to frontal and upright facial images. The test images and training images should be captured by using the identical device to confirm no quality difference. additionally, the scholar should register within the database to be recognized. The enrolment may be done on the spot through the user-friendly interface.

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Light could be a type of electromagnetic waves which are radiated from a source onto an object and projected to human vision. Robinson-Riegler, G., & Robinson-Riegler, B. (2008) mentioned that after visual processing done by the human sensory system, we actually classify shape, size, contour and also the texture of the item so as to analyze the data. The analyzed information are going to be compared to other representations of objects or face that exist in our memory to acknowledge. In fact, it's a tough challenge to make an automatic system to own the identical capability as a person's to acknowledge faces However, we'd like large memory to acknowledge different faces, as an example, within the College, there are plenty of scholars with different name and gender, it's impossible to recollect every face of the individual without making mistakes. so as to beat human limitations, computers with almost limitless memory, high processing speed and power are utilized in face recognition systems.

The face may be a unique representation of individual identity. Thus, face recognition is defined as a biometric method during which identification of a personal is performed by comparing real-time capture image with stored images within the database of that person .

Nowadays, face recognition system is prevalent thanks to its simplicity and awesome performance. as an example, airport protection systems and FBI use face recognition for criminal investigations by tracking suspects, missing children and drug activities. aside from that, Facebook which may be a popular social networking website implement face recognition to permit the users to tag their friends within the photo for entertainment purposes.

The work on face recognition began in 1960. Woody Bledsoe, Helen Chan Wolf and Charles Bisson had introduced a system which required the administrator to locate eyes, ears, nose and mouth from images. the space and ratios between the located features and therefore the common reference points are then calculated and compared. The studies are further enhanced by Goldstein, Harmon, and Lesk in 1970 by using other features like hair color and lip thickness to automate the popularity. In 1988, Kirby and

Sirovich first suggested principle component analysis (PCA) to resolve face recognition problem. Many studies on face recognition were then conducted continuously until today.

## II. LITERATURE SURVEY

The paper states that the system takes the attendance automatically recognition obtained by constant observation. Continuous observation helps in evaluating and improving the performance of the attendance. To get the attendance, positions, and face images of the students present within the classroom are captured. Through constant observation and recording the system estimates the seating position and location of each student for attendance marking.[1]

In this paper, the Open CV-based face recognition perspective has been proposed. This model integrates a camera that captures an input image, an algorithm for detecting a face from an input image, encoding and identifying the face, marking the attendance in an exceeding spreadsheet, and converting it into a PDF file. The training database is formed by training the system with the faces of the authorized students. The cropped images are then stored as a database with appropriate labels. The features are extracted using the LBPH algorithm.[2]

Face recognition technology has also been used for both verification and identification of students present in a classroom. This paper is aimed at developing a less interfering, cost-effective, and more efficient automated student attendance management system using face recognition, resistance CC infrastructure.[3]

Face recognition technology relies on the face expression of the person, and therefore the input face image or video stream. First determine whether there's a personality's face, if there's somebody's face, then further give the position, size of every face, and therefore the position information of every major facial organ. supported this information, the identity features contained in each face are further extracted and compared with known faces to spot the identity of every face.[4]

## III. PAPOSED SYSTEM OVERVIEW

Traditional student attendance marking technique is frequently facing a lot of trouble. The face recognition student attendance system emphasizes its simplicity by eliminating classical student attendance marking technique such as marking attendance on paper. There causes distraction for students during exam sessions and there are human errors many times. The lecture class particularly the class with a large number of students might find it hard to have the attendance sheet being passed within the class . Hence, face recognition student attendance system is presented in order to replace the manual signing of the presence of students which are troublesome and causes teachers to get distracted in order to sign maintain student attendance. Furthermore, the face recognition based automatic student attendance system is able to control the problem of fraudulent approach.

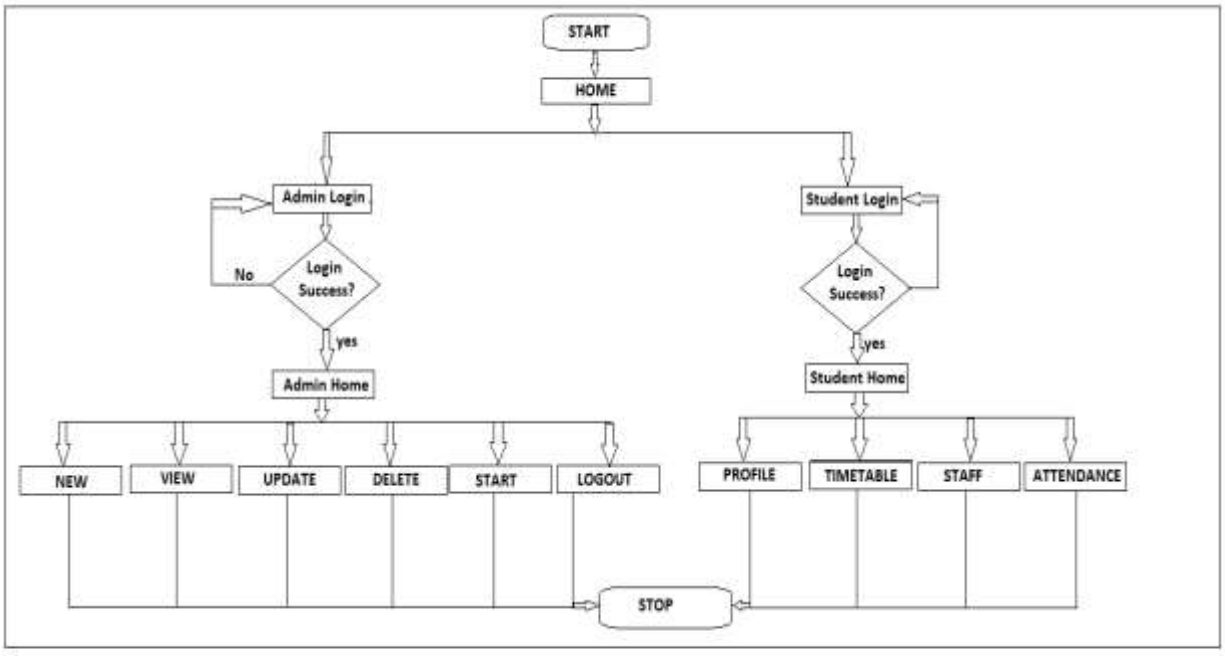


Fig 3.1 : Architecture Diagram of Face Recognition based Attendance System

One of the difficulties of facial identification is that the identification between known and unknown images. additionally, paper proposed by Pooja G.R et al. (2010) discovered that the training process for face recognition student attendance system is slow and time-consuming. additionally, the paper proposed by Priyanka Wagh et al. (2015) mentioned that different lighting and head poses are often the issues that would degrade the performance of face recognition based student attendance system.

Hence, there's a requirement to develop a real-time operating student attendance system which suggests the identification process must be done within defined time constraints to stop omission. The extracted features from facial images which represent the identity of the scholars need to be consistent towards a change in background, illumination, pose, and expression. High accuracy and fast computation time are going to be the evaluation points of the performance.

The aim of this project is to develop a face recognition-based automated student attendance system. Expected accomplishment in order to fulfill the objectives are:

- To detect the face segment from the video frame.
- To extract the useful features from the face detected.
- To classify the features in order to recognize the face detected.
- To record the attendance of the identified student .

**Pre-Processing:**

Cropping of detected face and color image was converted to grayscale for pre-processing. They also proposed affine transform to be applied to align the facial image supported coordinates within the middle of the eyes and scaling of the image to be performed. histogram equalization to be applied to a facial image, and scaling of images was performed for pre-processing.

Pre-processing enhances the performance of the system. It plays a necessary role to boost the accuracy of face recognition. Scaling is one amongst the important preprocessing steps to control the scale of the image. The reducing of a picture increases the processing speed by reducing the system computations since the quantity of pixels is reduced. the dimensions and pixels of the image carry spatial information. spatial information may be a measure of the littlest discernible detail in a picture. Hence, spatial information needs to be manipulated carefully to avoid distortion of images to forestall the checkerboard effect. the dimensions should be the identical for all the photographs for normalization and standardization purposes. PCA (Principal Component Analysis) to extract features from facial images, same length and width of the image are preferred, thus images were scaled to 120 × 120 pixels.

Besides scaling of images, a color image is typically converted to a grayscale image for pre-processing. Grayscale images are believed to be less sensitive to illumination conditions and take less computational time. A grayscale image may be an 8-bit image which a pixel range from 0 to 255 whereas the color image is a 24-bit image within which pixel can have 16 77 7216 values. Hence, the color image requires more space for storing and more computational power compared to grayscale images. If a color image isn't necessary for computation, then it's considered as noise. additionally, pre-processing is very important to reinforce the contrast of images. Histogram equalization is one of the methods of pre-processing so as to boost the contrast of the image. It provides uniform distribution of intensities over the strength axis, which is ready to scale back uneven illumination effect at an identical time.

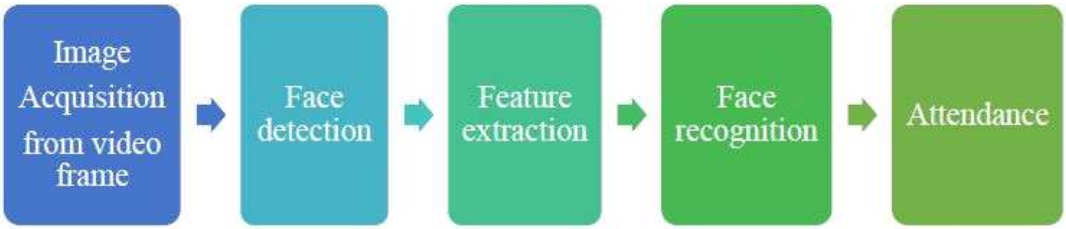


Figure 3.2 Block Diagram of the General Framework

**Feature Extraction:**

The feature could be a set of knowledge that represents the data in a picture. Extraction of face expression is most essential for face recognition. However, the choice of features can be an arduous task. The feature extraction algorithm needs to be consistent and stable over a range of changes so as to provide high accuracy result.

There are some feature extraction methods for face recognition. PCA is known for its robust and high-speed computation. Basically, PCA retains data variation and removes unnecessary existing correlations among the initial features. PCA is largely a dimension reduction algorithm. It compresses each facial image which is represented by the matrix into a single-column vector.

Furthermore, PCA removes the common value from the image to centralize the image data. The Principle Component of the distribution of facial images is understood as Eigenfaces. Every single facial image from the training set contributes to Eigenfaces. As a result, Eigenface encodes the most effective variation among known facial images. Training images and test images are then projected onto Eigenface space to get projected training images and projected test images respectively. Euclidean distance is computed by comparing the space between projected training images and projected test images to perform the popularity. PCA feature extraction process includes all trained facial images. Hence, the extracted feature contains a correlation between facial images within the training set and also the results of the popularity of PCA highly depends on the training set image.

LDA (Linear discriminant analysis) also referred to as Fisher's face is another popular algorithm for face recognition, LDA was proposed face recognition. LDA extracts features by grouping images of the identical class and separate images of various classes. LDA is in a position to perform well even with different facial expressions, illumination, and poses thanks to its class separation characteristic. the identical class is defined by facial images of the identical individual, but with different facial expressions, varying lighting or pose, whereas facial images of someone with a unique identity are categorized as different classes. Same class images yield within-class scatter matrix meanwhile different class images yield between-class scatter matrix. LDA manages to maximize the ratio of the determinant of the between-class scatters matrix over the determinant of the within-class scatter matrix. LDA is believed to own lower error rates compared to PCA provided that more samples per class are trained and a little size of special classes.

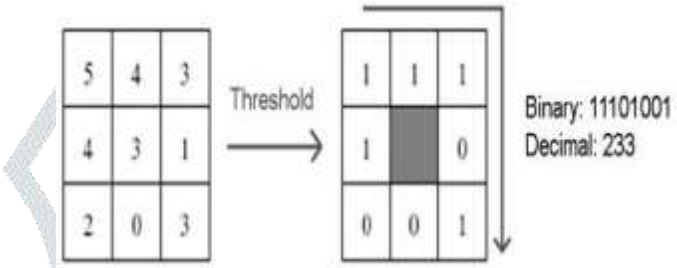


Figure 3.3 Class Separation in LDA

The original LBP (Local Binary Patterns) operator was introduced by the paper of Timo Ojala et al. (2002). proposed LBP to extract both texture details and contour to represent facial images. LBP divides each facial image into smaller regions and a histogram of every region is extracted. The histograms of each region are concatenated into one feature vector. This feature vector is that the representation of the facial image and Chi-square statistic is employed to live similarities between facial images. the littlest window size of every region is 3 by 3. it's computed by thresholding each pixel during a window where the center pixel is that the threshold value. The neighborhood larger than the edge value is assigned to 1 whereas the neighborhood under the brink value is assigned to 0. Then the resulting binary pixels will form a byte value representing the middle pixel.

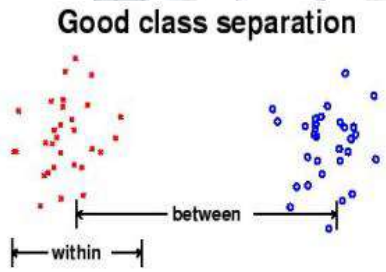


Figure 3.4 LBP

LBP has a few advantages which make it popular to be executed. It has high patience against monotonic illumination changes and it is able to deal with a variety of facial expressions, image rotation, and aging of persons. These massive characteristics cause LBP to be extensive in real-time applications. The study comprised of non-financial companies listed at KSE-100 Index and 30 actively traded companies are selected on the bases of market capitalization. And 2015 is taken as base year for KSE-100 index.

## IV. ADVANTAGES OF PROPOSED SYSTEM

- The proposed system is very useful to take attendance of students.
- It saves time as compared to traditional attendance systems.
- It saves cost.
- Physically handicap person can also use this system.
- No extreme manpower is required.
- It is very easy to handle.

## V. FUTURE SCOPE OF SYSTEM

For future work, a stronger camera and a higher lighting source are often utilized in order to get better results. this may reduce the dependency on the brightness of the environment, especially the places to capture test and train images. Furthermore, a face recognition system that has more faces apart from one facial image may be designed. this will increase the efficiency of the system. The test image and train image during this approach are highly associated with one another and highly smitten by the image captured device. The capture device needs to be the identical for this approach to perform better.

## VI. CONCLUSION

In this approach, a face recognition-based automated student attendance system is perfectly described. The proposed approach provides a technique to spot the individuals by comparing their input image obtained from recording video frames with relevancy train images. This proposed approach able to detect and concentrate face from an input facial image, which is obtained from the recording video frame. Besides, it provides a technique in pre-processing stage to reinforce the image contrast and reduce the illumination effect. Extraction of features from the facial image is performed by applying LBP. The algorithm designed LBP able to stabilize the system by giving consistent results. The accuracy of this proposed approach is one hundred pc for high-quality images, 92.31 you look after low-quality images.

As a conclusion for analysis, the extraction of facial features could be challenging mostly in different lighting areas. In the pre-processing phase, Contrast Limited Adaptive Histogram Equalization (CLAHE) able to reduce the illumination effect. CLAHE performs better compared to histogram equalization in terms of contrast improvement.

## VII. ACKNOWLEDGMENT

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