

# An AI Based Face Recognition System to Mark the Attendance of the Student Using CNN Algorithm

Sukanya R<sup>1</sup> Riza ur Rehaman<sup>2</sup> D R Nagamani<sup>3</sup>

<sup>1,2</sup>Student <sup>3</sup>Assistant Professor

<sup>1,2,3</sup>Department of Computer Science and Engineering

<sup>1,2,3</sup>Bangalore Institute of Technology, Bangalore, India

*Abstract*— At present, attendance marking system involves manual attendance it is tedious and time-consuming, it is inherently vulnerable to proxies and manual errors. The proposed system will work on face recognition where each student in the class will be photographed and their details will be stored in a server. The teacher can then record the attendance by just clicking some pictures of the classroom. The system will recognize the faces and verify the presence or absence of each student. Face recognition, attendance system and biometric system which enrolls the unique and permanent facial fine points of students and records them in the database as stencils. The face recognition, attendance system is an accurate technology for managing attendance as it hardly gives errors in proper environment with good quality of dataset. The face detection is done through OpenCV Haar cascade and its dlib to detect facial landmarks, face recognition is done through convolution neural network.

**Keywords:** Face Recognition System, CNN Algorithm

## I. INTRODUCTION

The issue of attendance management has continued to gain attention in the academia, resulting in the development of biometric methods which are based on features such as the fingerprint, iris, palm print, and handwritten. Many of them suffer from, false negative and false positive recognition process, long queues, and inappropriate device used to collect information. In face recognition systems are referred to as intelligent, feasible and non-intrinsic models. The inappropriate modelling of the system could compromise the purpose of monitoring attendance, bearing in mind that student attendance behaviour can affect academic results significantly.

A key factor of improving the quality of education is having students attend classes regularly. Traditionally students are stimulated to attend classes using attendance points which at the end of a semester constitute a part of a student's final grade. However, traditionally this presents additional effort from the teacher, who must make sure to correctly mark attending students, which at the same time wastes a considerable amount of time from the teaching process. Furthermore, it can get much more complicated if one has to deal with large groups of students. Maintaining the attendance is very important and compulsory in all the institutes for checking the performance of students. Every institute has its own method in this regard. Some are taking attendance manually using the old paper or file-based approach and some have adopted methods of automatic attendance using some biometric techniques. There are many automatic methods available for this purpose i.e. biometric attendance. All these methods also waste time

because students have to make a queue to touch their thumb on the scanning device.

The monitoring of student attendance remains a fundamental and vital part of any educational institution. Although some automated biometric-based attendance monitoring systems have been proposed in the literature, poor system modelling has negatively affected their performance. There is, hence, a need to address the various needs associated with the development of an AI-based attendance monitoring system. This project proposes the conceptual model for a smart attendance monitoring system that uses face recognition to monitor students' attendance during lectures. The front and back-end system architectures, as well as a full view camera structure aimed at effectively capturing and detecting of faces, are presented. The model achieved a recognition accuracy of 80%.

Attendance for the students is an important task in class. When done manually it generally wastes a lot of productive time of the class. This proposed solution for the current problem is through automation of attendance system using face recognition. Face is the primary identification for any human. We propose a model for implementing an automated attendance management system for students of a class by making use of face recognition technique, by using OpenCV's built-in particular Haar Cascades to detect the faces and it's dlib is used to detect facial land marks. Convolution neural network is used to recognize and compare faces. After these, the connection of recognized faces ought to be conceivable by comparing with the database containing student's faces. This model will be a successful technique to manage the attendance and records of students.

## II. LITERATURE SURVEY

There are many papers works that propose automated face recognition attendance management systems. These keep track of attendance and also monitor it. [1] Face detection is concerned with finding whether or not there are any faces in a given image and, if present, returns the image location and content of each face. Security and surveillance are the two important aspects of human being. In this paper we propose face detection and recognition system that will capable of processing images very fast while acquiring very high true positive face detection rate. Most face detection algorithms are designed in the software domain Band have a high detection rate, but they often require several seconds to detect faces in a single image, a processing speed that is insufficient for real-time applications. This paper describes a simple and easy hardware implementation of face detection system using Raspberry Pi, which itself is a minicomputer of a credit card size and is of a very low price. The system is programmed using Python programming language. Both real

time face detection and face detection from specific images, i.e. Object Recognition, is carried out and the proposed system is tested across various standard face databases, with and without noise and blurring effects. Efficiency of the system is analysed by calculating the Face detection rate for each of the database. The results reveal that the proposed system can be used for face detection even from poor quality images and shows excellent performance efficiency

[2] It is time-consuming and laborious for classroom attendance methods in Chinese universities, and the attendance costs are too high. In this paper, we use the deep learning related ideas to improve the AlexNet convolutional neural network, and use the WebFace data set to improve the network training and test. The Top-5 error rate is only 6.73%. We applied this model to face recognition and combined with RFID card reading technology, which developed a smart classroom attendance system based on face recognition. Research shows that the system is efficient and stable, which effectively reduce classroom attendance costs.

[3] Currently, industries, organisations are using personal identification strategies such as RFID, Iris recognition, Fingerprint identification is used for taking attendance. Among of all these personal identification strategies including face recognition is most natural, less time is taken and highly efficient one despite being difficult to implement, a continuous observation for overcoming it. It has several applications in attendance management systems and security systems. In this work, a system is implemented that takes attendance for students during lecture, employees in industries and etc. using face detection and recognition technology. A time period is set for taking attendance and the database is automatically uploaded into the web server through the internet connectivity. This process is done without any human intervention. In the system a Raspberry Pi installed with OpenCV library and a Raspberry Pi Camera module is connected for facial detection and Recognition. The data is stored in the memory card connected to Raspberry Pi and it can be accessed through the internet. The results show that a continuous observation increases accuracy and maximizes the output.

[4] IN recent year, biometric based and RFID based attendance system are exist and popular. In this paper proposed a face recognition attendance system with IOT and high accuracy it access and control IOT devices, which is always, low cost and low power. Main aim to reduced documentation cost and efforts to the human are generated the digital classroom and offices. To The proposed face recognized system include three part face detection, feature extraction and face recognition. Find the face detection find out the face information. The extended local binary pattern then extracts the local features of the face. Use the various algorithm identify and verify haar algorithm for identification face and stored database model. Iot device raspberry pi use for face reorganization and communicate the cloud databases. Iot recent technology to generate live project.

[5] In present academic system, regular class attendance of students' plays a significant role in performance assessment and quality monitoring. The conventional methods practised in most of the institutions

are by calling names or signing on papers, which is highly time-consuming and insecure. This article presents the automatic attendance management system for convenience or data reliability. The system is developed by the integration of ubiquitous components to make a portable device for managing the students' attendance using Face Recognition technology.

[6] Attendance for the students is an important task in class. When done manually it generally wastes a lot of productive time of the class. This proposed solution for the current problem is through automation of attendance system using face recognition. Face is the primary identification for any human. This project describes the method of detecting and recognizing the face in real-time using Raspberry Pi. This project describes an efficient algorithm using open source image processing framework known as OpenCV. Our approach has five modules – Face Detection, Face Pre-processing, Face Training, Face Recognition and Attendance Database. The face database is collected to recognize the faces of the students. The system is initially trained with the student's faces which is collectively known as student database. The system uses user friendly User interface to maximize the user experience while both training and testing which are collecting student images and taking attendance with the system. This project can be used for many other applications where face recognition can be used for authentication. Raspberry Pi usage helps in minimizing the cost of the product and the usability as it can be connected to any device to take the attendance. This project uses modified algorithm of Haar's Cascades proposed by Viola-Jones for face detection and uses LBP histograms for face recognition and uses SQLite (lite version of SQL in raspberry pi) along with MYSQL to update the database. The system will automatically update the student's presence in the class to the student's database and sends message to guardians of absentees and also to Head of department.

[7] The monitoring of student attendance remains a fundamental and vital part of any educational institution. Although some automated biometric-based attendance monitoring systems have been proposed in the literature, poor system modeling has negatively affected their performance. There is, hence, a need to address the various needs associated with the development of an AI-based attendance monitoring system. This paper proposes the conceptual model for a smart attendance monitoring system that uses face recognition to monitor students' attendance during lectures. The front and back-end system architectures, as well as a full view multi-camera structure aimed at effectively capturing and detecting of faces, are presented. Thee different feature extraction techniques - PCA, LDA, LBP and a combination of PCA and LDA were investigated. The model achieved a recognition accuracy of 90%.

[8] Biometric authentication is one of the most popular and accurate technology. Now days, it is used in many real time applications. However, recognizing finger prints in Linux based embedded computers (raspberry pi) is still a very complex problem. This entire work is done on the Linux based embedded computer called raspberry pi, in which database creation, fingerprint reader access,

authentication and recognition using python were entirely done on raspberry pi This paper discusses on the standardized authentication model which is capable of extracting the finger prints of individual and store that in database . Then the use of final finger print to match with others in finger prints present in the database to show the capability of this model and also updating the database obtained to the organisation by creating an application through cloud.

[9] Classroom attendance check is a contributing factor to student participation and the final success in the courses. Taking attendance by calling out names or passing around an attendance sheet are both time-consuming, and especially the latter is open to easy fraud. As an alternative, RFID, wireless, fingerprint, and iris and face recognition-based methods have been tested and developed for this purpose. Although these methods have some pros, high system installation costs are the main disadvantage. The present paper aims to propose a face recognition-based mobile automatic classroom attendance management system needing no extra equipment. To this end, a filtering system based on Euclidean distances calculated by three face recognition techniques, namely Eigenfaces, Fisher faces and Local Binary Pattern, has been developed for face recognition. The proposed system includes three different mobile applications for teachers, students, and parents to be installed on their smart phones to manage and perform the real-time attendance-taking process. The proposed system was tested among students at Ankara University, and the results obtained were very satisfactory.

[10] 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. An automated system for human face recognition in a real time background for a college to mark the attendance of their employees. So Smart Attendance using Real Time Face Recognition is a real world solution which comes with day to day activities of handling employees. The task is very difficult as the real time background subtraction in an image is still a challenge . To detect real time human face are used and a simple fast Principal Component Analysis has used to recognize the faces detected with a high accuracy rate. The matched face is used to mark attendance of the employee. Our system maintains the attendance records of employees automatically. Manual entering of attendance in logbooks becomes a difficult task and it also wastes the time. So we designed an efficient module that comprises of face recognition to manage the attendance records of employees. Our module enrolls the staff's face . This enrolling is a onetime process and their face will be stored in the database. During enrolling of face we require a system since it is a onetime process. You can have your own roll number as your employee id which will be unique for each employee. The presence of each employee will be updated in a database. The results showed improved performance over manual attendance management system. Attendance is marked after employee identification. This product gives much more solutions with accurate results in user interactive manner rather than existing attendance and leave management systems.

[11] The face detection is performed on live acquired images without any application field in mind. Processes utilized in the system are white balance correction, skin like region segmentation, facial feature extraction and face image extraction on a face candidate. Then a face classification method that uses Feed-Forward Neural Network is integrated in the system.

### III. PROPOSED SYSTEM

Proposed system sends the images of the students sitting in the classroom to the server using the web service and captured image sent to the Face Detection and Recognition modules and then the attendance is marked in the database. At the time of enrolment, templates of face images of individual students are stored in the Face database. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database. If any face is recognized the attendance is marked in the database from where anyone can access and use it for different purposes. Teachers come in the class and just press a button to start the attendance process and the system automatically gets the attendance without even the intensions of students and teacher. In this way a lot of time is saved and this is highly securing process one can mark the attendance of other .

#### A. ARCHITECTURE

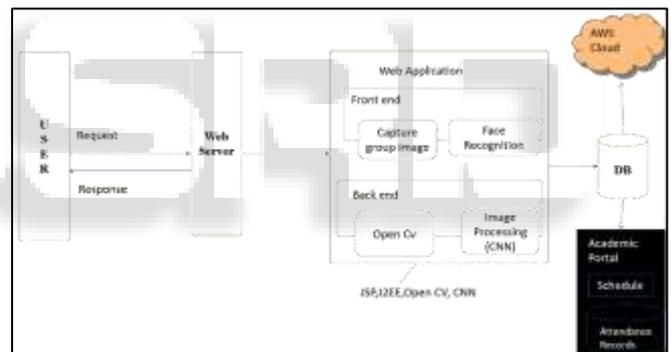


Fig. 1: Architecture of the System

The proposed plan for An Automatic Attendance System using image processing includes:

- Enrolment of student faces.
- Face detection and feature extraction
- Face recognition and marking attendance

#### 1) Enrolment of student

Student must register itself with all the details. During registration student have to provide there photo and other details. Student will be assigned to class.

#### 2) Face Detection

Where the input image is searched to find any face, then image processing cleans up the facial image for easier recognition. Then splitting each human face to individual image. In this steps OPEN CV is used.

Face detection: This module is used to recognize human face in an image. A face detection system determines is there any face present in image or not, if present then it determine the presence, location, scale, and (possibly) orientation of any face present in a still image . We have used open CV algorithm to detect multiple faces in an image and draw a rectangle on each detected face. The face images

are extracted and resized to 100x100. Detecting facial landmarks is a subset of the shape prediction problem. Facial landmarks such as eyes, eyebrows, nose, mouth, jaw line were used to localize and represent salient regions of the face. Given an input image, a shape predictor attempts to localize key points of interest along the shape. In the context of facial landmarks, our goal was to detect important facial structures on the face using shape prediction methods.

Detecting facial landmarks is therefore involves localizing the face in the image and detecting the key facial structures on the face ROI. Dlib and OpenCV were used to detect facial landmarks in an image.

Face detection has been achieved by us in two ways.

- 1) Using Opencv's built-in particular Haar Cascades.
- 2) Using a model for predicting facial landmarks.
- 3) Face Recognition – where the detected and processed face is compared to the database of known faces to decide who that person is and mark the attendance. In this steps Deep learning based neural network using JAVA AWS.

The difference between face detection and recognition is that in detection we just need to determine if there is some face in the image, but in recognition we want to determine whose face it is. Features extracted from a face are processed and compared with similarly processed faces present in the database .

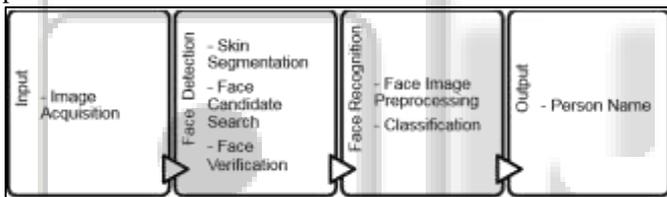


Fig. 2: Block diagram of process

Algorithms used in this project:

The Convolutional Neural Networks (CNN) are very similar to ordinary Neural Networks. They are made up of neurons that have learnable weights and biases. Each neuron receives some inputs, performs a dot product and optionally follows it with a non-linearity. The whole network still expresses a single differentiable score function: from the raw image pixels on one end to class scores at the other. They still have a loss function (e.g. SVM/ Softmax) on the last (fully-connected) layer and all the tips/tricks we have developed for learning regular Neural Networks still apply We have used CNN algorithm for face recognition. The algorithm is use to determine if enrolled face template stored in the database is found in the acquired classroom image or not.

Below are steps involved in this module :

- •Preprocessing of Image Data : Here we will fetch all the student images stored during student registration and these images are preprocessed in this first we resize all the images to the same size , then the RGB image is converted to grey scale image, then from the grey scale image we extract the features.
- •Build the Model : Features extracted in last step are loaded into CNN for training the model. This model will be used for face comparison later.
- •Face Comparison : In this step CNN model will use images acquired during face detection module and start

comparison of each student image, if it match mark the student as present or else mark it as absent.

### B. Flow diagram

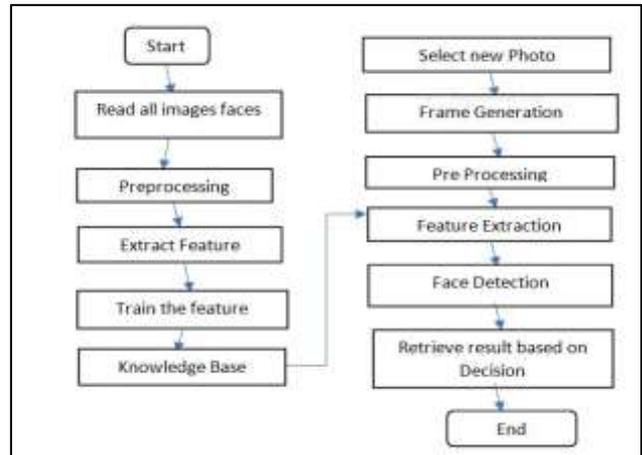


Fig. 3: flow of system

### C. METHODOLOGY

For taking the image

1. open the camera using class videoCapture camera=new videoCapture(0);

if(!camera.isopened)

```

{
System.out.println("error");
}

```

2. Read image from camera by mat class

```
Mat frame=new Mat();
```

```
Camera.read(frame);
```

3. write image using class imgcodes

```
Imgcodes.inwrite();
```

4. saveimage using path

```
path("some path.jpg");
```

```
Imgcodes.inwrite(path,Frame);
```

For splitting the image

1. input -> image

2. Read image using class buffered image.

3. Declare variable for row and column.

4. get image width and hight using functions

```
Image.getwidth();
```

```
Image.gethigh();
```

5. get the hight and width in row and column using for loop

```
for (int x=0;x<rows;x++)
```

```
{
```

```
for (int y=0;y<column;y++)
```

```
{
```

```
Imgs[count]=newBufferedImage(chunkwidth,chunkheight,i
```

```
mage.gettype())
```

```
}
```

```
}
```

6. Call the class graphics27 for write the image in row and column.

```
Graphics27 gr=imgs[count++].creategraphics();
```

7. Output:split image in row and column.

For comparing faces amazon web server is used where in its credentials are obtained and then faces are compared

```
Image source = getImageUtil(photo1);
```

```
Image target = getImageUtil(photo2);
Float similarityThreshold = 80F;
CompareFacesResult compareFacesResult = callCompareFaces(source, target, similarityThreshold, recognitionClient);
```

**D. REQUIREMENT**

**1) Software Requirement**

Operating System : Windows (Any Version) ,Programming, Language : JAVA ,IDE : Eclipse ,GUI : AWT, Swing ,Data Base : MySql ,JDBC Connection : Type 4 Amazon Web Services

Amazon Web Services offers a wide range of different business purpose global cloud- based products. The products include storage, databases, analytics, networking, mobile, development tools, enterprise applications, with a pay-as-you-go pricing model. Here, are essential AWS services. We use this tool to access it from every device we use.

**2) Hardware Requirement**

Processor: Intel Core 2 Duo , RAM : 2 GB , Hard Disk : 5 GB. Testing was done in the laboratory and the test cases are below:

**IV. TESTING AND RESULTS**

Cases are below:

Test Case :-	1
Name of Test :-	Login Functionality
Item being tested:-	Login Page
Sample Input:-	Enter User id and Password
Expected output:-	Successfully Login i.e. home page is displayed
Actual output:-	Login
Remarks:-	Pass

Fig. 4: Test case 1

Test Case :-	2
Name of Test :-	Login Functionality
Item being tested:-	Login Page
Sample Input:-	User id, Password
Expected output:-	Successfully Login
Actual output:-	Display Message " Invalid Credential"
Remarks:-	Fail

Fig. 5: Test case 2

Test Case :-	3
Name of Test :-	Student Registration
Item being tested:-	Student Register Page
Sample Input:-	Enter All the fields
Expected output:-	Successfully Created
Actual output:-	Successfully Created
Remarks:-	Student record created in DB

Fig. 6: Test case 3

Test Case :-	4
Name of Test :-	Faculty Registration
Item being tested:-	Faculty Register Page
Sample Input:-	Enter All the fields
Expected output:-	Successfully Created
Actual output:-	Successfully Created
Remarks:-	Faculty record created in DB

Fig. 7: Test case 4

**V. RESULT**



Fig. 8: Attendance marked in the database

**VI. CONCLUSION**

In previous papers the RFID methods are used which time are consuming. The biometric systems are time consuming and may cause manual errors which are a additional work on the handlers. In this paper the system recognises the faces and marks the attendance. This system gives up to 80% accuracy and it also send the attendance copy in the mail to teacher and the principal. It sends mail to the parent when the student is absent to the class. The software can be used for security purposes in organizations and in secured zones. The software stores the faces that are detected and automatically marks attendance. The system is convenient and secure for the users. It saves their time and efforts. It prevents manual errors Automatically sends the message if absent. The system can be used for places that require security like bank, military etc. It can also be used in houses and society to recognize the outsiders and save their identity

**VII. FUTUREWORK**

The future work shall entail tracking the attendance of students during the course of the whole module and checking the correlation between students' attendance and their academic performance. Since our system is modular and can extend effortlessly, the future work ambitions are to make the system takes attendance by other methods such as face recognition and using Biometrics (fingerprint) techniques, NFC mobile devices, or RFID Systems. Furthermore, we would like to make the system to manage and record the attendance for the staff of the university

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