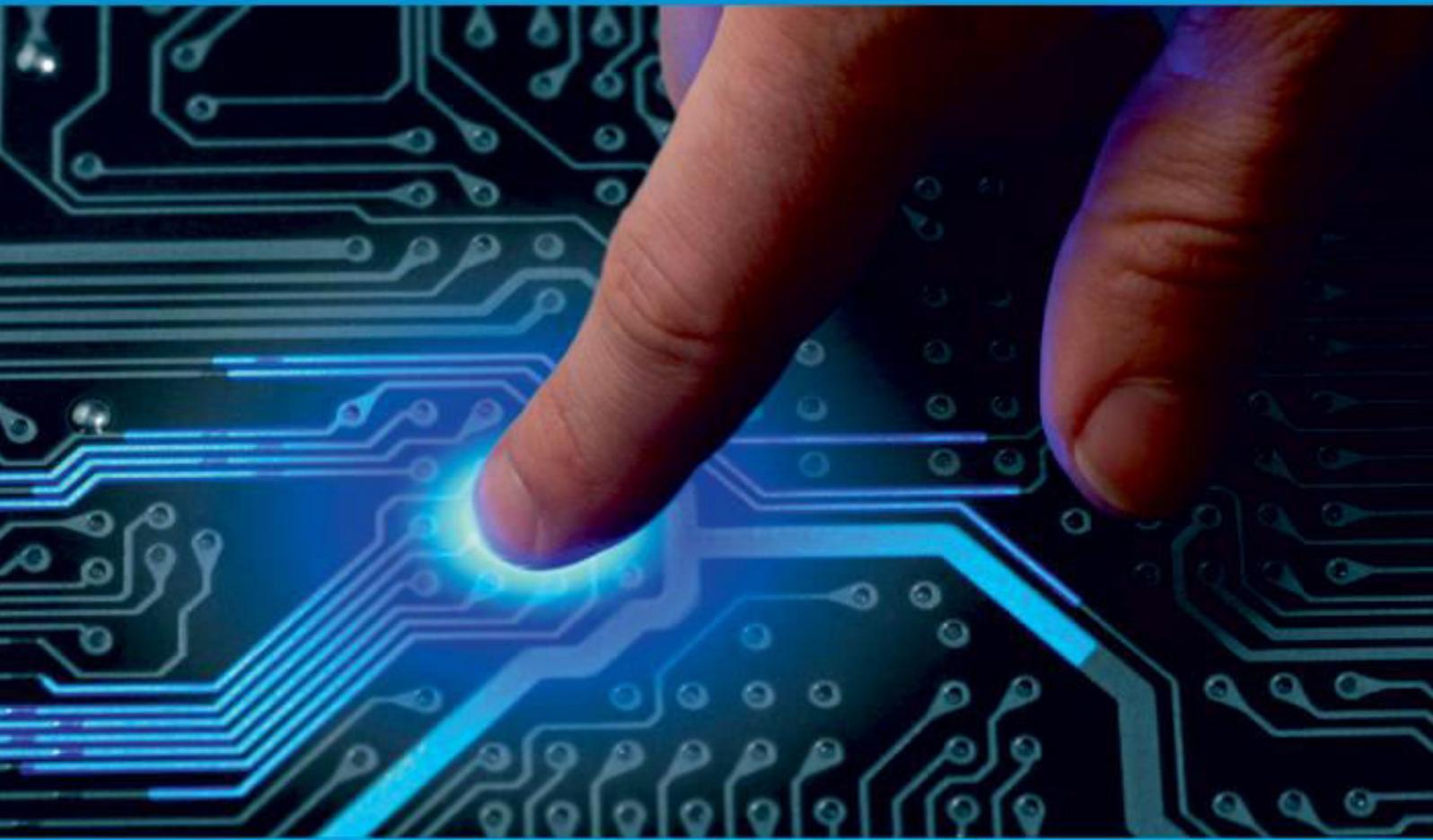




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Smart Attendance Using Face Recognition

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ABSTRACT: Nowadays, as computers are powerful enough for implementing complex algorithms, there are numerous applications that people utilize computers to run. In which, facial recognition is one of the most active fields of applications. In fact, computers can not only automatically identify who a person is, but also operate 24/7, which human beings cannot endure. This leads to the replacement of people by computers in some repetitive and real-time applications. In this work, we apply facial recognition into an attendance checking system that uses faces of registered people to check their attendance. This system has a GUI, which allows user-to-system interaction and attendance marking will be easy through recognizing the face of the student with the help of the recognition algorithm and mark the attendance. Cascade classifier is using to detect face. The Local Binary Pattern Histogram algorithms for this technology using face recognition, this system saves time more time and also monitor students and they can verify their attendance status with the help of the Register Number. A camera installed in the college campus captures the face of all the student in the classroom and other places too. This face image is processed using FRCNN algorithms to detect faces and to mark the attendance automatically in an excel sheet.

KEYWORDS: Face Recognition, HAAR Cascade classifier, LBPH, PCA.

I. INTRODUCTION

To check the performance of students in all colleges and institutions, among this system, the maintenance and monitoring of an attendance system are very much essential. Every person who will enter a room or building must go through several authentication processes first, that later this information will be used to monitor every single activity in the room for a security purpose. The biometric-based authentication technique becomes one of the most promising methods. Nevertheless, the biometric authentication method used is still lacking and takes relatively more time. The human face is an important entity which plays a crucial role in our daily social interaction, like conveying individual's identity. Face recognition is a biometric technology that extracts the facial features mathematically and then stores those features as a face print to identify the individual. Biometric face recognition technology gained a lot of attention during the past few years due to its wide range of applicability in both law enforcement and other civilian areas, institutes and organizations. Face recognition technology has a slight edge on other biometric systems like finger-print, palm-print and iris due to its non-contact process. Face recognition system is also able to recognize the person from a distance without touching or any interaction with the person. Moreover, the face recognition system also helps in crime deterrent purpose, because the captured image can be stored in a repository and later can be helpful in many ways like to identify a person. Currently, face recognition applications are deployed in social media websites like Facebook, in the entrance of Airports, Railways Stations, Bus Stop, highly secured areas, advertisement, and health care. The purpose of these applications is to minimize criminal activities, fake authentication, tracking addictive gamblers in casinos, whereas Facebook is using face recognition system for automatic tagging purpose. For face recognition purpose, there is a need for large data sets and complex features to uniquely identify the different subjects by manipulating different obstacles like illumination, pose and aging. During the recent few years, a good improvement has been made in facial recognition systems.

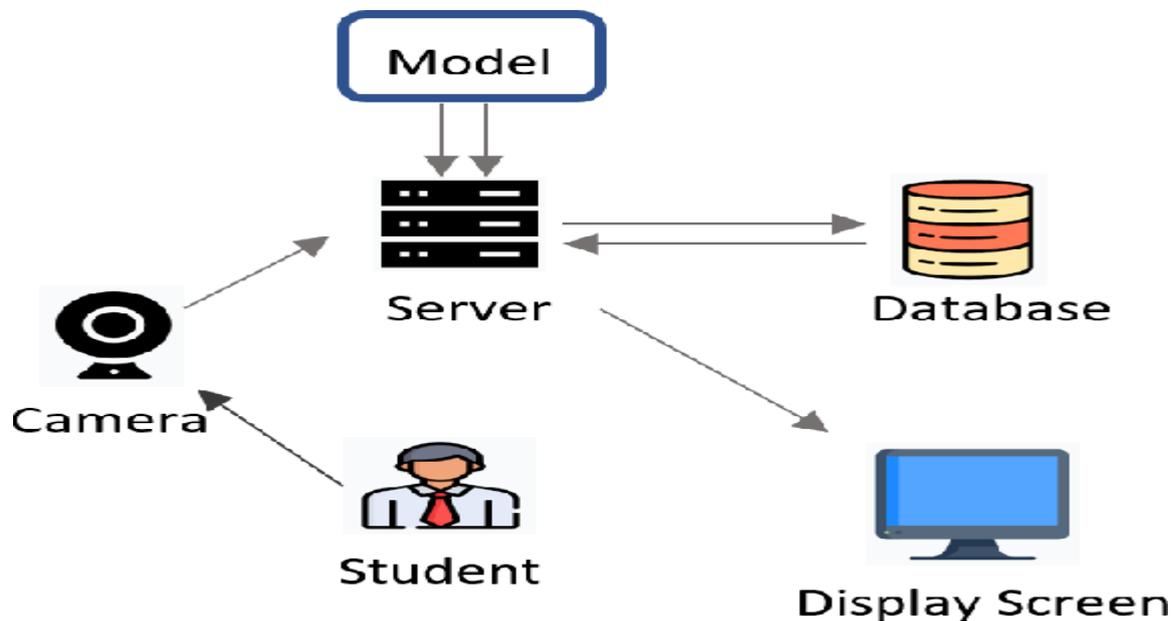


Fig 1: Smart Attendance Management System Based on Face Recognition Using CNN

Deep Learning is a subset of Machine Learning, which on the other hand is a subset of Artificial Intelligence. Artificial Intelligence is a general term that refers to techniques that enable computers to mimic human behaviour. Machine Learning represents a set of algorithms trained on data that make all of this possible.

A deep neural network is simply a shallow neural network with more than one hidden layer. Each neuron in the hidden layer is connected to many others. Each arrow has a weight property attached to it, which controls how much that neuron's activation affects the others attached to it. The word 'deep' in deep learning is attributed to these deep hidden layers and derives its effectiveness from it. Selecting the number of hidden layers depends on the nature of the problem and the size of the data set. The following figure shows a deep neural network with two hidden layers.

II. LITERATURE SURVEY

The traditional method of marking attendance is very time consuming and consists of a lot of complicated work, and strength is more. Automation of Attendance System has the strength over the traditional method as it saves a lot of time, and it can also be used for security purposes. This method also helps us to find fake attendance and to prevent it. The monitoring of student attendance in classrooms is sophisticated when we use the face recognition method. The attendance marking system with face recognition, image processing using the stream, and keeping the attendance in the excel. There are no efforts for the user side. This system makes active with intrusive nature is absent this system.

The current biometric methods begin to evolve into one of the promising authentication methods compared to conventional authentication methods. The conventional authentication process is done by writing the name, address, and signature, or assigning someone by giving access to a physical or virtual realm using a password, PIN (Personal identification number), smart card, plastic card, token, key, etc. Password and PIN are difficult to remember and in several cases, those are easy to steal or suspect. One of the biometric authentication methods is by using face recognition method. Research on face recognition process has been done for a quite long time and continue to be developed until now. According to Viola and Jones, there are 3 important keys for object detection in machine learning.

The first one is the image representation that able to create object features being detected in a short period of time. The second one is the algorithm based on AdaBoost that select important features in an object. The last one is to build a classifier according to a cascade that can override the background object in a short period of time. In 2003, Viola and Jones resumed their research based on their past research in 2001 about face detection not in an upright position but at an angle of 60o. They used a decision tree for the face detection and got satisfactory results.

Lienhart and Maydt conducted a research based on the research conducted by Viola and Jones before. They included Haar-like features to the detector and obtained a 10% error reduction compared to the previous research and after the optimization, the error reduction increased up to 12.5%. One of the deficiencies that still existed in face detection method is the heavy computation during the classifier training. This problem was overcome by Minh-Tri Pham and

Tat-Jen Cham who conducted a research to reduce the time required for training using statistical principles. The results obtained were quite significant in reducing the required computational time.

III. METHODS

The system proposed based on face recognition. When a student comes across the camera module, then his/her image/photo will be captured and recognize with validation. When recognition and validation is succeeded, then his/her attendance will mark automatically. This proposed work is based on the following block diagram in which the attendance of the particular student is marked as present when his face is matched.

Here the Face recognizer using LBPH (Local Binary Pattern) such that for an input image, the algorithm generates a new number of histograms and compares it with the generated histograms, and thus, it returns the labels of the histogram associated with it and associated. And hence the histogram faces recognize, a 3X3 window moves it by one image. Almost at each move of each local part of an image, the center pixel will be compared with its neighbor pixels on the image. One is denoted by neighbor pixel quantity is less, or it equals the center pixel, and also 0 is meant for others. Then, the picture under 3X3 window, read values 0 or 1 in clockwise order and will have a binary pattern like for the 11000011. The pattern is in local to some area of the image in it. We will have a list of local binary models after performing the recognized on the whole picture.

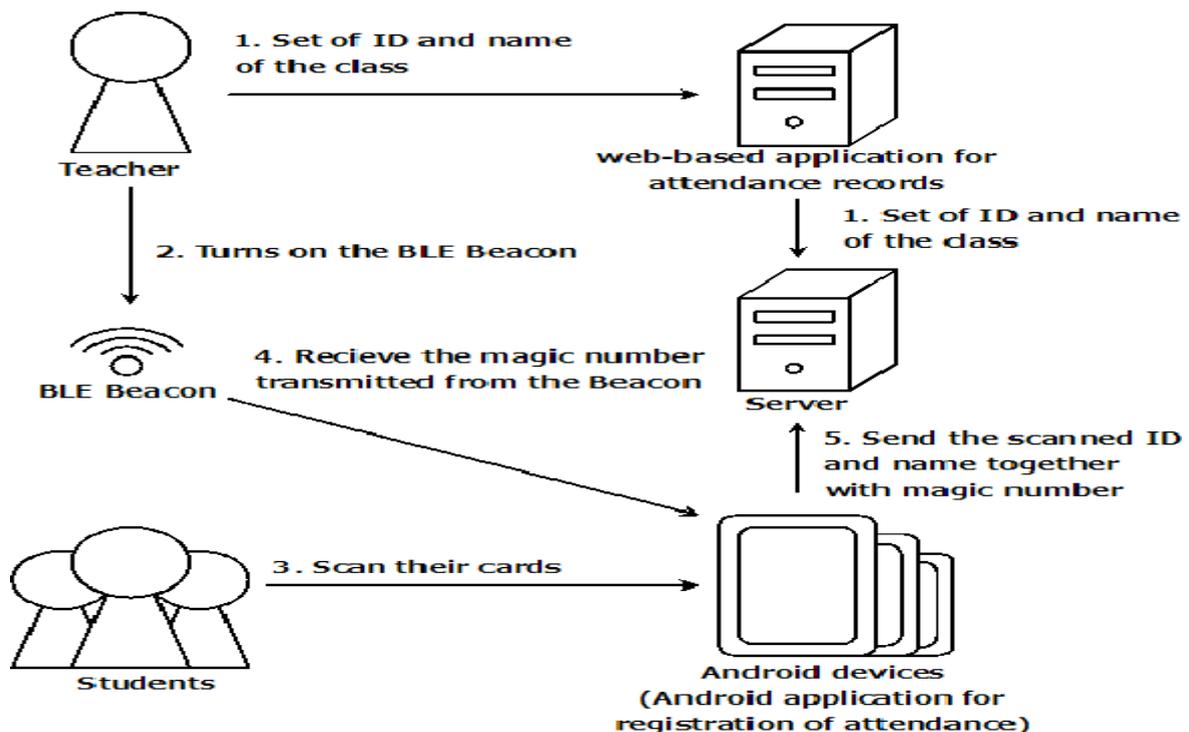


Figure 1. Overview of the system

Fig 2: Work Flow

The Scientist Paul Viola and Michael Jones are proposed the effective object detection method Haar cascade classifier. This is an applied machine learning and in-depth learning-based approach. From the many cascade algorithm, a cascade method analyzes from the positive and negative images. Then it will use in other images to detect objects. Here, without faces to explain the classifier, face detection algorithms will be applied. Here there is a need for a lot of positive and negative face frames in the video. There is different type of haar cascading feature, which analyzes the function in the existing image. From this, the image of crop image into the 24X24 window in each operation subtracts the sum of white region pixels with the number of black region pixels in it. Therefore, there will be an integer value as the output. It also determines the validation of the features in it.

IV. EXPERIMENT RESULT ANALYSIS

Experimental analysis of the proposed Smart Attendance Management System based on face recognition and email integration using deep learning involves evaluating its performance, accuracy, and efficiency in a real-world setting. Here are key aspects that could be considered in the experimental analysis Conduct experiments to measure the accuracy of the face recognition model. Use a diverse dataset with variations in facial expressions, lighting conditions, and backgrounds to simulate real-world scenarios. Evaluate the system's ability to correctly identify individuals and minimize false positives or negatives. Define and measure performance metrics such as recognition speed, response time, and system throughput. Assess how quickly the system can process attendance for a given number of users and compare it with acceptable performance benchmarks.

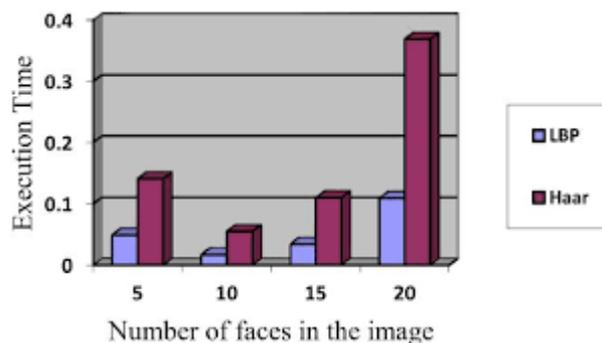


Fig 3: Student Result analysis

Identifying features in a Smart Attendance Management System based on Face Recognition and Email Integration using Deep Learning involves specifying the system's characteristics and functionalities. These features are essential to meet the system's objectives. Here are the key identifying features of the system. The system utilizes deep learning-based face recognition technology to accurately identify and verify individuals. It offers high accuracy in recognizing individuals based on their facial features. The system provides real-time attendance tracking, recording individuals' presence or absence as they enter or leave a location. The system detects and localizes faces in images or video streams. It extracts deep embeddings or features from detected faces using CNN-based models. Compares face embeddings to known individuals to recognize and verify attendance.

V. CONCLUSION

We have implemented an automatic attendance management system using face recognition for students' attendance. It helps in reducing the time and effort of staff, especially in the case of a large number of students present and the attendance to be marked. The whole system is implemented using the python programming language. Some facial recognition techniques used in order for the purpose of marking attendance to the students. And the record of the student is maintained correctly. It can also be used in any exam issues. In this project, some further work is to be added, such that the attendance percentage is mailed to the parents or guardian. For this purpose, we use the GSM module. So that parents are the guardians who get SMS alert regarding the attendance of the student.

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