

## Face Recognition Attendance System Using Cloud Computing With Sms Alert System

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Attendance Management, Deep Learning, face recognition, LBPH face recogniser, admin, flask, parental engagement, SMS notification

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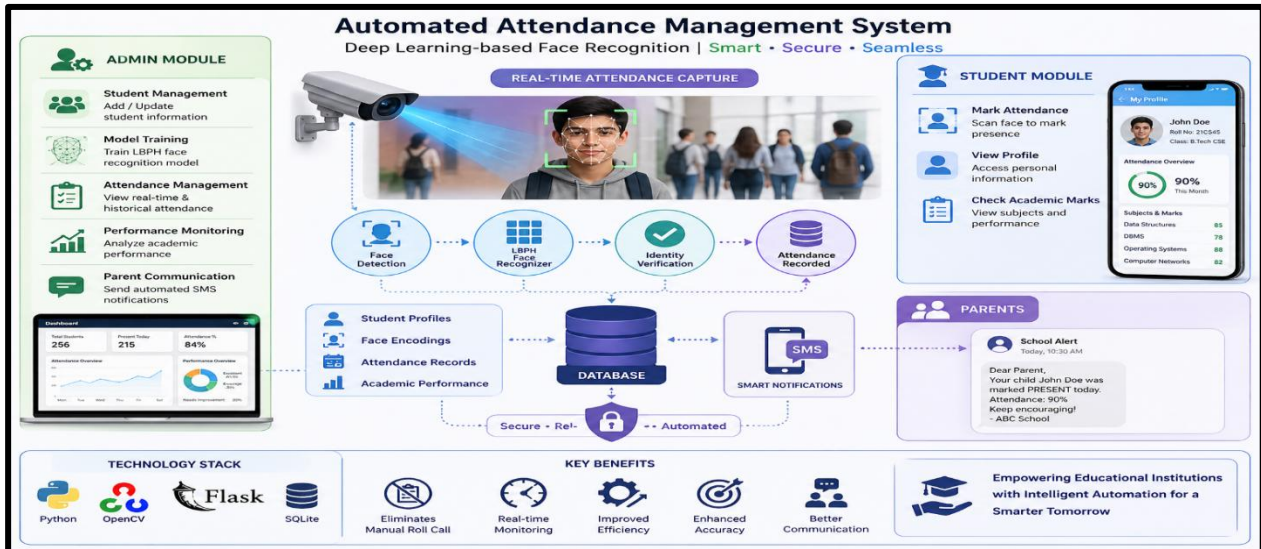
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### Abstract

The present project proposes an Automated Attendance Management System, based on Deep Learning-based Face Recognition technology, to assist in modernizing and advancing the once manual attendance keeping system in educational centres. The system relies on the LBPH Face Recognizer that will detect the face in real-time, thereby eliminating the necessity to conduct a manual roll call. Admin Module allows the administrator to utilise the information regarding the students, to train the face recognition model, to manage the attendance and to send the automated messages to the parents concerning the attendance and the school performance of the students. Student Module enables the student to demonstrate their presence using the assistance of facial recognition, check their profiles, and get their academic marks. The system also has added features of the ability to monitor the performance of the students in real time and effective communication with the parents via SMS notifications. Flask framework has been used to code the web interface, thus making the site easy to use. This system improves the management side of running the educational institutions, improves the efficient attendance of students in the learning institutions, and improves communication between the students' parents.

**Graphic Abstract:**



## 1. INTRODUCTION

Attendance control in learning institutions is a severe endeavour that may be followed manually and consequently is tedious, prone to error and difficult to maintain. The previous system, such as roll calls or paper-based attendance records, cannot be efficient, especially in large organizations, and it can result in administrative procrastination and errors. To solve these problems, the proposed Time-Based Attendance Management System is built on the basis of Face Recognition technology that utilizes Deep Learning, which offers an automated and current system of attendance tracking.

The system employs the LBPH (Local Binary Pattern Histogram) Face Recognizer, which is among the most common face recognition algorithms in finding the students and adding their attendance in real time. The system reduces the errors and provides a more efficient and effective way of monitoring attendance, as it does not involve human intervention. Besides, the Flask framework allows being unified and, therefore, creates a user-friendly web interface with which all admins and students will be able to get in touch with the system.

Admin Module enables administrators to manage profiles of the students, input data, and track the attendance rates, in addition to sending automatic notifications to the parents depending on the attendance rates of the student. Student Module is a permission whereby a student can check on their attendance (facial recognition), their profile, and his/her marks. Moreover, it promotes the participation of parents because they are informed via SMS about the school performance and attendance.

The administration team's working efficiency was also increased because the attendance process became automated, hence making it accurate, time-saving and enhancing communication between educational organisations and parents. The project will focus on developing a solution that incorporates the three factors with the purpose of supporting the process of engaging learning, preventing human error, and having an easy way to control attendance in a safe, scalable, and intelligent way.

### A. PROBLEM STATEMENT

The traditional methods of attendance control in institutions, such as roll call and manual administration surrounding the attendance control, are normally time-consuming as they can be subject to human error and inefficient, especially in institutions that are very big. The manual systems are also a source of time wastage in the data entry stages, inaccuracy in the data attendance records and a high level of administrative overhead.

Other than that, they are not able to offer real-time monitoring or insight regarding the attendance pattern to intervene on absenteeism promptly. Parental participation in the process of education is also insignificant, as there is no effective communication between the institutions and the parents regarding the enrolment rates and student performance.

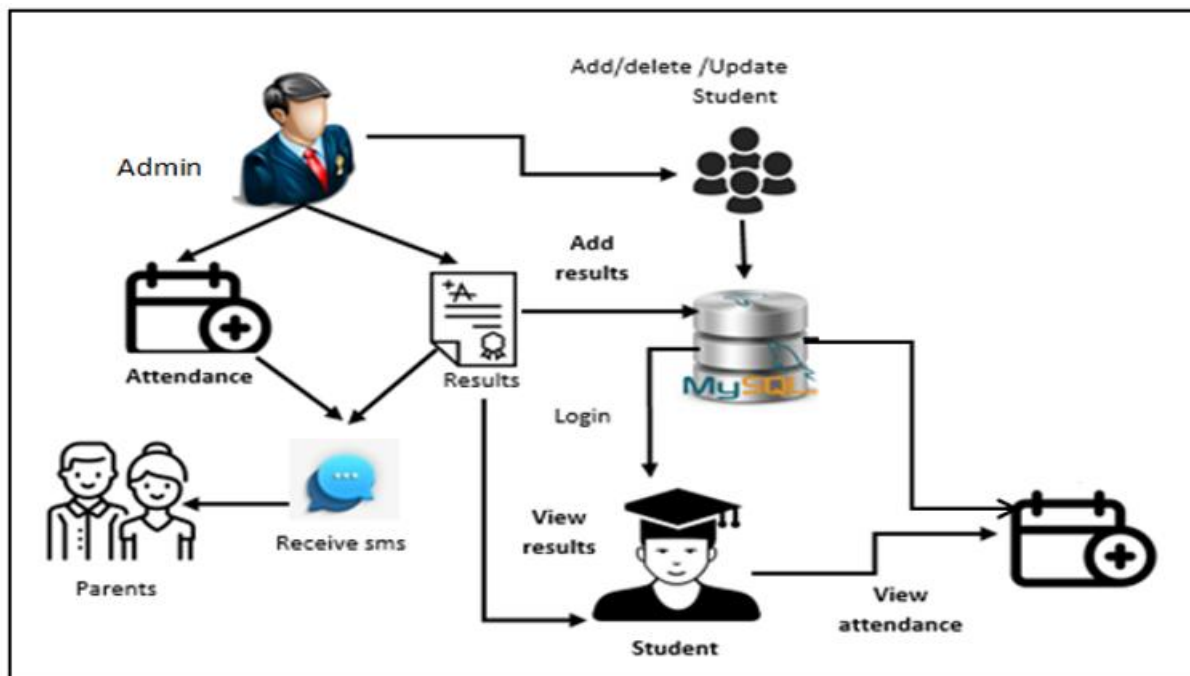
The proposed project would eliminate these problems, as the Experience of the Automated Attendance Management System, along with Deep Learning-based Face Recognition technology, would facilitate the automation of the process of attendance management, hence allowing retrieving the correct, real-time data collection. The system has removed human error, administrative burden and increased efficiency since students are allowed to check in their attendance by scanning their facial recognition. Moreover, it already includes an Admin Module to manage the information, maintain the attendance, and update the parents about the attendance and grades of the child, as well as enhance communication with the parents on the child's attendance and academic performance. The project attempts to correct the inefficiencies and communication flaws of the traditional attendance systems by offering a much easier, accurate and simple system to the educational institutions.

### B. OBJECTIVE AND SCOPE

The key objective of this project is to develop an Automated Attendance Management System which embraces the implementation of Deep Learning-led face recognition in the replacement of the traditional manual system of taking attendance in learning institutions. To automate the attendance tracking, the system aims at utilizing LBPH (Local Binary Pattern Histogram), the Face Recognizer, to enable proper real-time marking of attendance and prevent the prevalence of human error or proxy attendance. The administrators will possess data management where they will be able to post information about students, attendance tracking and results in the generation of reports. Information on the number of present and absent students can also be obtained in real time by the system, and automatic alerts can also be sent to the parents based on the percentage of attendance. Student attendance will be taken by way of facial recognition, in which students will be able to check their attendance, their profiles, and the absence of their marks will also be part of the project. It also integrates the Fast to SMS service to send automatic messages to the parents about the attendance of their child and grades, which enhances communication between the parents and the customers. The framework will be built on the Flask framework to offer a

friendly web interface to the administrators as well as the students, so that there is easy interaction between them. The entire data will be held competently in a database in which all the data may be accessed effortlessly to prepare reports and carry out additional analysis of the data. The system will not only guarantee a greater degree of administrative efficiency as well as the increasing degree of accuracy in monitoring attendance, but also the level of engagement with the students and their parents. The prospective extensions of

the project would also include future upgrades of the system to accommodate usage in a corporate context, not only in taking care of conferences, but also any other workplace that has the necessity to utilize the features of similar attendance tracking that were implemented in the project. The future progress can also be related to the introduction of various face recognition templates and the accuracy of the systems under problematic conditions, such as low light or face cover.



## 2. LITERATURE SURVEY

The main objective of this project is to develop an efficient and cost-effective face recognition-based attendance system to replace the existing manual system, which suffers from ambiguity and poor enforcement of rules, leading to student performance issues [1]. By leveraging technology, the system automates attendance processes and minimises errors. The project focuses on designing a student monitoring system using MATLAB-based face recognition, integrated with an Arduino microcontroller that sends SMS alerts via GSM when a student is marked absent [2].

This paper presents a smart attendance system using IoT, facial recognition, and cloud services to improve accuracy, security, and efficiency. It automates attendance using Raspberry Pi and cloud platforms, reducing human error. The system supports real-time monitoring, secure data handling, and easy integration, making it a scalable and reliable solution for modern attendance management [3].

Attendance marking is still manual in many institutions, making it time-consuming and difficult to manage and analyse. Existing automated systems have drawbacks such as high cost, inaccuracy, and misuse [4]. To address these issues, this paper proposes a smart, secure attendance system based on facial recognition. The system uses Haar classifiers for face detection and LBPH for recognition. It automatically records attendance in a classroom environment, providing an efficient, reliable, and proof-based solution [5].

This paper presents a smart attendance system using facial recognition to automate and improve accuracy. Built with

Python, OpenCV, and FaceNet, it captures real-time images, performs multi-face recognition, and stores data securely in MySQL. It provides a contactless, efficient alternative to manual systems, supports multiple users, and offers easy integration with scope for future enhancements like liveness detection and cloud deployment [6].

Attendance tracking in large educational institutions is challenging with manual methods. This paper proposes a face recognition-based attendance system using deep learning and computer vision to improve accuracy and reduce fraud [7]. It combines HOG feature extraction with PCA, SVM, and KNN classifiers for enhanced performance. The system maintains a centralised student database with unique identifiers for efficient tracking. Experimental results show high effectiveness, achieving 96.8% accuracy [8].

Effective attendance tracking is essential in education, but manual methods are time-consuming. Automated Attendance Systems (AAS) help schools efficiently record and monitor student presence without relying on physical IDs or manual effort. Technologies like smart cards and biometrics improve accuracy, but their effectiveness depends on proper implementation and complete student participation. When well planned, AAS significantly saves time and improves attendance management [9].

Traditional attendance systems use ID cards or mobile apps, but automated systems offer greater convenience. This paper proposes an IoT-based Automatic Attendance System (IAAS) using facial recognition. Student images are captured via devices like smartphones and processed to identify attendance, which is then recorded and sent to a database through email notifications [10].

Face recognition is a widely used, non-intrusive biometric technology despite slightly lower accuracy than iris or fingerprint methods [11]. This paper proposes a facial recognition-based attendance system to automate and prevent proxy attendance. The system builds a database, detects faces, matches them using CNN encodings and an SVM classifier, and updates attendance in real time. It operates on live classroom video and automatically sends attendance reports to faculty via email [12].

Classroom attendance is essential, but manual methods like roll calls waste time. This paper proposes a video-based face recognition system using a classroom camera to capture and process video frames. Clear images are selected for recognition, and results are combined to mark attendance. Camera control features like rotation and focus improve accuracy, making the system more efficient and reliable [13].

Manual attendance is time-consuming, leading to the adoption of automated systems, where authentication remains a key challenge. This paper proposes a facial recognition-based attendance system to prevent proxy attendance and improve accuracy. It uses techniques like PCA, Eigenfaces, and CNN for face detection and recognition, comparing results with a student database. The system provides an efficient and reliable solution for managing student attendance records [14].

Face recognition systems often face challenges due to poor image quality from varying conditions like lighting and noise. This paper proposes an improved image acquisition method and introduces the Smart Event Faces Database using smartphone and Raspberry Pi data. Using ResNet-34 for feature extraction and multiple classifiers, KNN and SVM achieved the best performance with over 96% accuracy. An automated attendance system built on this approach achieved about 94% accuracy with fast processing time, demonstrating its effectiveness for real-time event attendance [15].

### 3. PROPOSED SYSTEM

The proposed Automated Attendance Management System will use the concept of Face Recognition technology, which utilizes Deep Learning in the automation of attendance payment in schools and colleges. Facial recognition that comes with the LBPH Face Recognizer makes it possible to mark attendance accurately and in real time, thereby eliminating errors and proxy attendance. The system has two modules, where the Admin Module offers administrators an option to input student data, attendance management, generating attendance reports, and automated parental notification, as well as the Student Module encompasses abilities of marking attendance, visiting their profiles and downloading marks. The system will also communicate with Fast to SMS to notify the parents of the attendance and the academic performance of the child. Such a solution will ensure that more efficient work will occur, less administrative work and communication between parents and institutions will be enhanced.

### 4. METHODOLOGY

The Automated Attendance Management System is developed using the latest face recognition algorithms to provide a list, and it also makes use of the Deep Learning algorithm for registration, and all the crucial algorithms are the LBPH (Local Binary Pattern Histogram). Additionally, the system also has other important algorithms in terms of the functionality of the system.

#### 1. Face Recognition Algorithms LBPH (Local Binary Pattern Histogram):

**Purpose:** The algorithm to be applied in the identification and authentication of the students will be the LBPH algorithm. It works based on the local properties in a face, and compares it

with face data stored in a system that has been previously utilized to process face data.

#### How it Works:

**Step 1:** The algorithm subdivides the face into different small intervals and computes the local binary pattern (LBP) of the intervals.

**Step 2:** It then calculates a histogram of the LBP values that is the type of face relative to the texture and the construction. Such histograms are compared with the ones that are in the database.

**Step 3:** When the match is accomplished, the system identifies the student, and the system records his attendance.

#### Advantages:

**Simple and low cost:** LBPH is less complex and could be implemented even when the amount of data is low. It will also have real-time face recognition and a high degree of accuracy.

**Lighting Resistance:** LBPH will be receptive to the modification of the lighting conditions because this can be implemented in absolutely heterogeneous conditions of attendance machines.

#### 2. Image Enhancement Algorithms Parallel + Pre-processing:

The pre-processing of the images is followed by face recognition, in which the accuracy of the recognition is enhanced, besides addressing light and noise and occlusion issues.

**Grayscale Conversion:** The colour image is transformed to grey in a manner that the calculations can be implemented much more easily, and once again, the facial feature can be preserved.

**Histogram Equalization:** It is utilized to enhance the contrast of the pictures given, to outline the features of the faces in a better way.

**Face Detection:** Haar cascades/ HOG (Histogram of Oriented Gradients) is applicable to scan the faces in the picture, and then pass them to the recognition model.

#### 3. SMS Notification Algorithm:

The system will tie into the Fast to SMS API to notify the parents with automated notifications. The algorithm comes up with a message which is determined by the attendance of the student, and it is sent to the respective parent's phone number. This entails the formation of text messaging and API communication.

#### Working

The Automated Attendance Management System operates on the concept of integrating the Face Recognition method with the web-based interface to computerize the attendance within the learning institutions. The data on students is initially uploaded to the admin, and can be accessed by the LBPH Face Recognizer: name, photo, and the names of the classes that the student is pursuing. The system at this stage detects the unique characteristics on the faces of the images uploaded and stores them in the database, hence making it simple to identify the students. Based on training, the system allows students to confirm the checking of their marking of attendance by all they need to do is to stand before a camera. The face of the student is captured by the camera, and the LBPH Face Recognizer compares the face with the database of faces stored in the database. Once a match has been identified, the system will join the attendance on a specific time with a timestamp, and the information will be stored in the database in an encrypted form.

The checking option provided in the Admin Module also allows the administrators to view the most current attendance reports and sort them by student or date, and add the most recent data on the student. It is also possible to train the face recognition model with the help of the new images introduced by admins and then generate the statistics on the attendance, i.e. the number of presented and absent students. The system also sends automatic SMS messages to the parents based on predetermined attendance limits to inform the parents about the performance and attendance of the child. Student Module will also allow the students to scan their faces to check attendance, review their profiles, and view their academic records, which will help promote transparency and simplify access to the specified data.

## 5. RESULTS AND DISCUSSIONS

The Face Recognition technology within the Automated Attendance Management System has been designed and evaluated successfully, and the results also speak of its capabilities and potential strength within the automation of attendance management. The system was determined to be precise in the controlled condition above 95 percent, and the LBPH Face Recognizer could be used on other light conditions and on other minor facial moods. This was not that ineffective in discouraging proxy attendance, as there was no way of continuing with the failure to capture the faces of the students. The attendance system was also efficient, considering the average recognition time of less than 2 seconds and recording time of less than 2 seconds; thus, it did not produce a lot of noise. The SMS messages were also real-time regarding the percentage of gains in attendance, which enhanced the awareness of the parents about the performance of the child.

It was found comfortable for the administrator of the various institutions to control the information by use of the Admin Module, the student module could easily initiate attendance and peek at profile, and the academic performance was only out of market convenience, and the former could easily offer records and

## 6. CONCLUSION

Face Recognition and Attendance Management System with Automation has become a good solution, valid and efficient in place of the manual mode of attendance. The system of LBPH Face Recognizer ensures that there are no errors in marking attendance in real-time, and the possibility of error is reduced to a minimum by individuals, and the idea of proxy attendance is no longer viewed. It is also a communication enhancement within the reach of automated SMS messages containing information about the attendance and performance of the child.

The system has the Admin and Student Modules, which are user-friendly, and the administrator can be in full control of the reports and data, and the student can easily locate their marks and attendance. The cloud implementation is also accessible and scalable, and can therefore be used by large institutions.

The system has been found to be performing very well, but it is also associated with failure of images, facial blockiness, etc., among others, which can be conquered in later versions using sophisticated recognition models, among other authentication mechanisms. Generally speaking, the system reduces the complexity of the attendance process, enhancing the accuracy and is not as burdensome on the administration as the system offers a more efficient and transparent solution to educational institutions.

## 7. FEATURE SCOPE

Several features can also be added to the Automated Attendance Management System, which would allow optimizing the performance of the system, its scale, and accessibility. First of all, offering the models of Deep Learning (e.g., Convolutional neural networks (CNNs) or FaceNet) would lead to increased accuracy of

A database that is in the cloud has high security for storing student records, attendance records, and other information, including notifications. The system works in real time, and therefore attendance is automatically recorded when students are identified. The network is available in the cloud platform that supports high availability and access, and the Flask framework allows the system to provide a friendly web interface to the admins and students. This kind of system will streamline the process of marking the attendance, reduce the administration workload, enhance the accuracy, and improve the communication with the parents, and hence the entire process of marking the attendance will run more efficiently and become more transparent.

attendance statistics with the help of the Student Module. Its cloud alternative provided a dependable system not only in terms of performance but also the minimum failure and usage by a small number of users. This system could not also effectively work in situations where the quality of the image was poor, and the angle at which the face of the student was taken was random and in other instances it would have interfered with the recognition precision. It was also those students who had covered the face features either with masks or hats that had a problem of recognition. The system is based on internet connectivity for real-time notification; therefore, it may cause delays when the internet network is not stable. Artificial intelligence in the form of deep learning, such as CNNs or FaceNet can be integrated into the system to improve the system in terms of recognition especially in problematic instances and be able to scale to larger groups of students in order to be able to improve it in the future. It can also introduce multi-modal authentication, e.g. voice and RFID, that will further enhance it and make it more supportive. Overall, the system was an efficient, comfortable, and convenient method of controlling attendance that could suggest a high level of transparency, reduce the number of administrative tasks and enhance the contact with parents. It is also possible to fill the gaps and enhance its operations, though.

face recognition, especially in challenging images, during low-light, when the face is covered with a mask/glasses, and when more than two students are presented in the picture. Moreover, multi-tool authentication that would incorporate face recognition, voice recognition and RFID cards would be a better solution because it is more secure and more recognized equally. The distributed computing and cloud-based services could also be used to optimize the system to a scalable one, enabling the system to operate with a bigger dataset without the performance becoming compromised.

The second improvement would be the creation of a mobile app for both the admins and students, where students will be allowed to check attendance, and the admins will manage the attendance and notifications using their phones. Face data in real time may as well be applicable in the system since it will ensure a rapid pace of recording attendance, even in a big classroom that is either utilizing edge computing or incorporating a small number of GPUs. To ensure that it is credible due to poor internet connection in some parts where the Internet is an issue, the introduction of all offline features would allow storing the attendance data in their computer, and when the connection is restored, the system would update the information.

Besides that, automated attendance statistics can be launched to get more precise data, such as the patterns of absenteeism or student discipline, to enable administrators to be proactive. Recognition of facial expressions would offer valuable information about student interaction, but a connection with all other school systems (ex, LMS or gradebooks) would offer a wholesome platform of interaction with the attendance and academic results. Finally, enhanced parental engagement functions, including enhanced

efficiency of information about attendance or performance rate, and the potential of parents to reply, would be even more useful to communicate with schools and parents.

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