

Smart Campus: Based Automatic Attendance System Using Photo Face Recognition

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Abstract: This review examines a number of experiments that use the Smart Attendance system to record attendance using facial recognition. In many organizational and educational contexts, managing attendance effectively and accurately is essential. Manual attendance tracking using traditional methods is laborious and prone to mistakes. The suggested system recognizes and confirms the identity of people in a certain context by using computer vision and deep learning techniques. It enables smooth and effective attendance tracking by using facial recognition algorithms to capture and match facial features with records already in a database.

1. INTRODUCTION

Effective attendance management is essential for guaranteeing academic engagement and success in the fast-paced educational environment of today. Acknowledging this necessity, classic attendance tracking approaches have been transformed by incorporating cutting-edge technology like Python Flask and image processing techniques. This introduction explores the development of a dynamic online application specifically designed for educational institutions that uses creative automation to enable smooth attendance management. The main component of our solution is a website built with Python Flask that simplifies the attendance-taking procedure. Through the use of image processing algorithms, the application enables administrators to quickly record attendance by having students upload a photo. By utilizing advanced image recognition technology, the system correctly detects current pupils in the picture, removing the need for human input and reducing mistakes.

Importance of smart attendance system

We now live in a computer-driven age when every aspect of our life is reliant on computers, other electronic devices, and computer software. Every basic foundation, including the banking system, healthcare, financial terminology, governments, and manufacturing companies, uses Web-connected devices as a key component of their operations. Some of their data, including financial information, personal information, and mental property, may be sensitive to illegal access or introduction that could have unfavourable effects. This information provides gatecrashers with risk performance artists breaking in for financial gain, extortion, political or social ideas, or simple damage.

Protection, granting unauthorized access, asset loss, content alteration, illicit activity, information systems, technology, hardware (computers, media, etc.), and other systems that rely on data, software, and information are the components that are essential to cyber security. These days, cyber attacks that compromise the system and other security breaches appear to be endangering the global economy. In this way, having a fantastic cyber security process is essential to protecting sensitive data from well-publicized security breaches. Additionally, as the number of cyber attacks increases, businesses and organizations especially those that deal with information pertaining to national security, health, or financial records must use strong

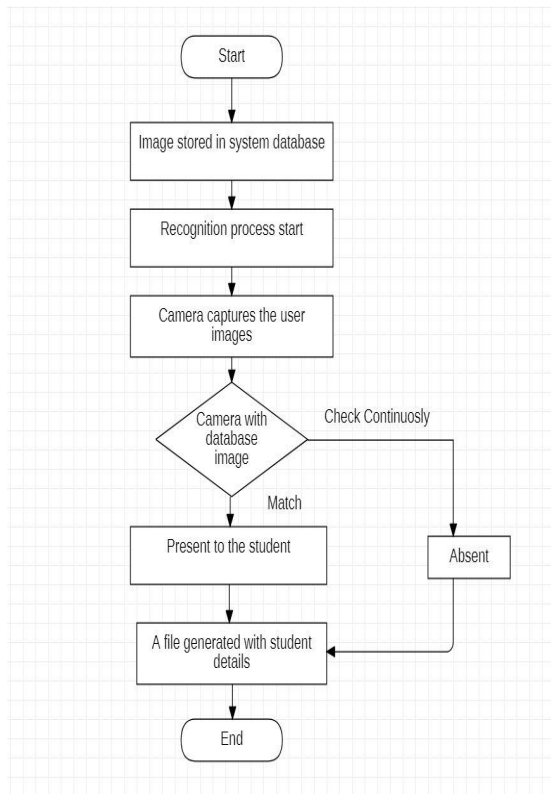
2. LITERATURE REVIEW

A thorough evaluation of four machine-learning methods for facial recognition was provided in the paper by Hajar Filali et al. [1]. GF-SVM, GF-NN, LBP-AdaBoost, and Haar-AdaBoost were assessed on their capacity to learn and perform tasks that are difficult for traditional algorithmic approaches. The Boosting technique was used by Haar-AdaBoost and LBP-AdaBoost to produce the best classifier for a cascade classification. In contrast, the Gabor filter was used by GF-SVM and GF-NN to weed out particular traits during the classification process. Because the detection times differed among the assessed approaches, the research findings highlighted the significance of taking system-specific parameters into account. Significantly, the Haar-AdaBoost method demonstrated its superiority by outperforming the other approaches in terms of production rate. Consequently, Haar-AdaBoost was determined to be the best method for facial recognition within the framework of an intelligent attendance system. This emphasizes how important it is to select the best machine learning algorithm for attendance tracking applications in order to achieve the best results. Arun Katara et al. carried out a thorough examination of several attendance methods, such as RFID cards, fingerprint, iris, and face recognition, in Paper [2]. The study evaluated each method's shortcomings critically, pointing out problems including fingerprint verification's time commitment and card-sharing in RFID systems. The researchers contended that because face recognition software is more straightforward and the human face is always visible, it is a more effective substitute for student attendance. to iris recognition. The necessity for attendance systems that strike a balance between security and usability is shown by this comparative analysis. The study offers insightful information about the drawbacks of current approaches and suggests using facial recognition software to solve these issues in relation to student attendance. M.H. Modh Kamil's third work [3] investigates how to include facial recognition and RFID into an intelligent student attendance system. The study highlights the two benefits of using an Android-based system for effective reporting and RFID for speedy attendance registration. By tracking pupils as they enter and exit the classroom, the system's facial recognition integration attempts to offer a complete attendance management solution. This study supports the current trend of using Android-based educational technology and highlights Face recognition and RFID technology integration shows a forward-thinking strategy that takes into account how attendance management in educational institutions is changing. G.B. Harish's Paper [4] focuses on how crucial it is to keep correct attendance records in order to assess student performance. The study recognizes the range of strategies used by institutions, from manual, paper-based procedures to the implementation of biometric solutions for automated attendance. The study highlights how important face recognition is to updating attendance tracking techniques, which is in line with the main objective of increasing accuracy and efficiency in educational settings. The importance of implementing cutting-edge biometric methods, particularly face recognition, as a way to improve the overall performance evaluation procedure at educational institutions is highlighted in this Dept. Of Information Technology of Greater Noida Institute of Technology research, which adds to the body of knowledge. A mobile-based attendance system that combines face recognition and NFC technology is presented by Neela A. Kumar [6]. The paper discusses the drawbacks of conventional attendance techniques, including human error and the impracticability of fingerprint scanning under specific circumstances. In keeping with the larger trend of incorporating mobile and cloud technology into attendance management, the suggested system makes use of a Raspberry Pi and cloud storage to address these issues. Face recognition combined with NFC technology provides a complete solution that embraces the convenience of mobile devices while also improving accuracy. The study emphasizes how these technologies have the potential to completely transform attendance tracking, especially in situations when more conventional approaches are ineffective.

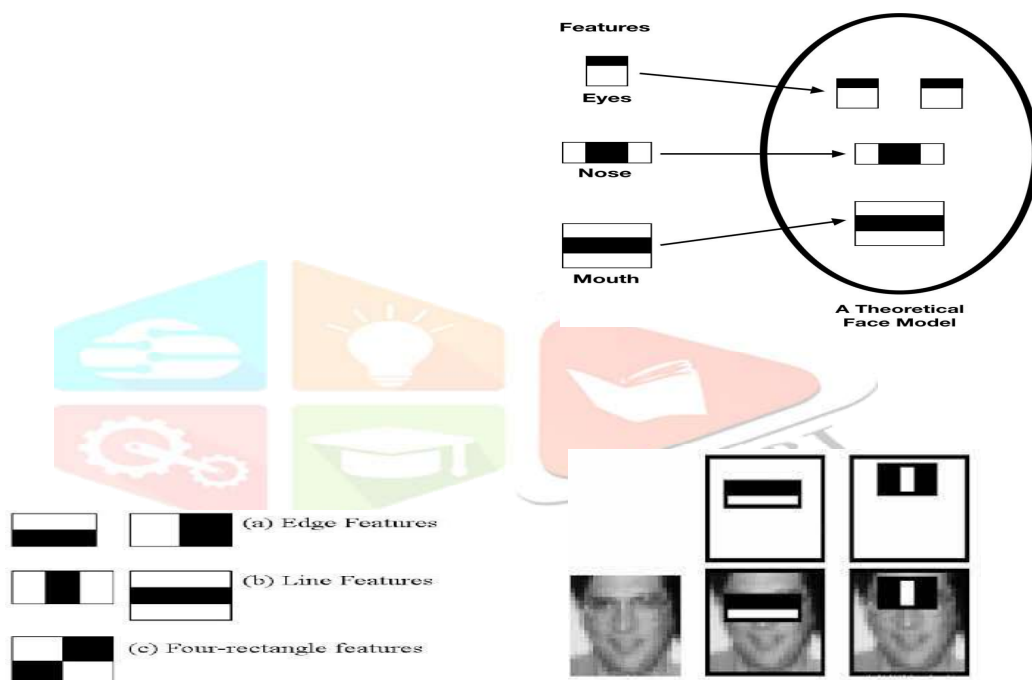
METHODOLOGY

- 1. Requirement analysis:** Gain a complete understanding of the needs, taking into account the functionalities (uploading photographs, processing attendance, sending emails), user roles (admin, students), and restrictions (security, scalability).
- 2. Design and Planning:** Create the database structure needed to hold attendance logs, user credentials, and other pertinent information. Create the Flask application's architecture, specifying pathways for various features like email sending, image uploading, user authentication, and attendance processing.
- 3. Environment Setup:** Install Flask, Python, and any required libraries, such as OpenCV for image processing and yagmail for emailing, in a development environment. Set up the database (Postgre SQL, MySQL, or SQLite) to hold user data and attendance logs.
- 4. Frontend Development:** Use HTML, CSS, and maybe JavaScript to create an interactive user interface.
- 5. Backend Development:** Use Flask routes to manage picture uploading, user authentication, and attendance tracking. To indicate attendance, use OpenCV for image processing tasks like face identification and recognition. Provide a feature that allows attendance records to be stored in the database.
- 6. Admin Dashboard:** Create an admin dashboard that allows the administrator to send email alerts, add photos, and view attendance data.

- 7. Email Notification:** Send email alerts to pupils whose attendance is less than 50% by integrating the Yagmail library. Use logic to retrieve attendance logs, determine the attendance percentage, and pinpoint low-attendance pupils.
- 8. Testing and Debugging:** To guarantee correct operation and find any faults or errors, thoroughly test every module and feature. Based on the findings of testing, debug and improve the application.
- 9. Deployment:** Install the Flask application on a web server, such as Digital Ocean, Heroku, or AWS. Make sure the right security measures are in place and configure the server environment.
- 10. Maintenance and Documentation:** For future reference, record the code base, usage guidelines, and application setup. Continued support and maintenance should be given, taking care of any problems or updates as required.



Sr. No.	Paper title	Author Name	Summary
1.	AUTOMATIC ATTENDANCE MANAGEMENT SYSTEM USING FACE DETECTION	E.Varadharajan,R.Dharani, S.Jeevitha, B.Kavinmathi, S.Hemalatha	- Methodology 1. Background Subtraction 2. Face detection and cropping - Removes the risk of Manual Errors - Automated plus Accurate - Decreases the Loss of Output - Saves Time
2.	CLASS ATTENDANCE MANAGEMENT SYSTEM USING FACE RECOGNITION	Omar Abdul Rhman Salim, Rashidah Funke Olanrewaju, Wasii Adebayo Balogun	- Methodology 1. Haar Feature-based Cascade algorithm 2. Local Binary Patterns (LBP) 3. Algorithm - This system saves time. - Decreases the Loss of Output
3.	ATTENDANCE MONITORING SYSTEM USING FACIAL RECOGNITION WITH AUDIO OUTPUT AND GENDER CLASSIFICATION	Poornima , Sripriya , Vijayalakshmi,Vishnupriya .	- It is cumbersome to maintain a huge set of records. As and when the class strength increases, the number of records also keeps increasing. - It is time consuming. Every time, the teacher in-charge has to take time out from his/ her class to mark attendance, thereby consuming time other than knowledge transfer.
4.	ATTENDANCE MANAGEMENT USING FACIAL RECOGNITION	Rajath S Bharadwaj, Tejus S Rao, Vinay T R	- Existing algorithms: 1) Eigen face 2) Line Edge Map 3) Histogram of oriented gradients (HOG) - The disadvantage of this is that, it makes the attendance marking process slower and less efficient.



COMPARISON OF FACERECOGNITION TECHNIQUES

Technical papers regarding the face recognition-based attendance management system have been updated. We looked at a few studies that employed modified approaches or strategies. Below is the chart of instant of some papers. We studied more than five research paper to make our project and this paper support us to solve various problems and concepts regarding how to make project more efficient and also less time consuming.

BLOCK DIAGRAM

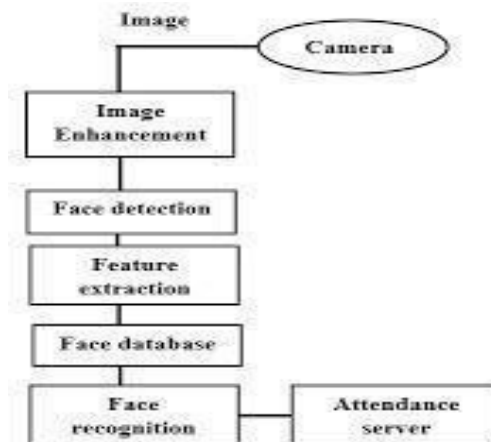


IMAGE ENHANCEMENT

In the image enhancement process, user-provided photos are inspected for quality and then improved using machine learning techniques. The Haar Cascade method is particularly adaptive for the image enhancement and improvement process because image quality is the most important component when identifying a certain individual.

FEATURE EXTRACTION

In order to generate a template using facial recognition, all of the data will be taken out of the sample in this phase.

FACE DATABASE

In this stage system can employ the dataset that is earlier present-day in the database of system for parallel an entered carbon copy with database photos. Save all student information in a database so that the system can quickly and accurately record each student's presence.

FACE RECOGNITION

The final step of face recognition determines whether or not the facial structures of the samples that were gathered resemble those from a facial database. It will only take a moment. We can use the Haar Cascade approach to this system. An artificial neural network type called a Haar Cascade is specifically made for pixel data and is utilized in image processing and recognition.

ATTENDANCE MARKING

Attendance marking is the last step of the system procedures in this stage mark the attendance of student if overall above development are done and identify a copy suitably, then it will be marked as a current otherwise it will be marked as an absent in the server of system.

ADVANTAGES

- The convenience of the face recognition attendance management system is just one of its many advantages.
- The face recognition attendance management system is simple to use and can be operated without a human.
- The Face Recognition Attendance Management System provides a quick and precise attendance report.
- When seen from various angles, this method has become faster and more precise.
- Face recognition technology for attendance saves time and eliminates human error. Missing attendance from either the teacher's or the students' perspective can occasionally occur, therefore it will be quite beneficial for those who find this kind of disadvantage hard to believe.
- It is beneficial for the health security of teachers and students during pandemics.

RESULT

The face-acknowledgment attendance management system is really easy to use and operates well in a short amount of time. Since this system is automated, if an administrator creates a student profile in the database once, it will use it automatically based on how many times the face detection and identification procedure occurs. Haar Cascade techniques are the foundation of this system. The administrator initially creates each student's profile with their name, department, and roll number in order to initialize this system.

CONCLUSION

The superior approach for managing student attendance in the classroom and other locations is the suggested Attendance Management System Using Face Recognition. Although there are several technologies accessible in this day and age, such as biometrics or other techniques, facial recognition is the most accurate choice. The system can be implemented without the need for any specific hardware. To create a face recognition-based attendance management system, all you need is a camera laptop and database.

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