

Leveraging Face Recognition Technology for Efficient and Secure Attendance Management in Educational Institutes

NANSI JAIN¹, HARSHITA², NANCY SEHGAL³, MOHD. KAIF⁴, NEHAL CHAUDHARY⁵

^{1,2,3,4,5} Inderprastha Engineering College, Sahibabad, Uttar Pradesh

Abstract- *With the fast-changing digital era, enterprises and schools are looking for novel ways to increase efficiency and security. Facial Recognition Technology (FRT) and QR system appears as a revolutionary step forward, redefining attendance tracking and analysis in corporate and education sectors. The article delves into FRT's and QR's immense influence, highlighting its attendance management revolutionizing role. Duty par's Attendance mobile application, with high-tech facial recognition, guarantees accurate records. The selfie function in the app hastens roll calls in classrooms, maximizing teaching time. QR-based attendance system to automate the attendance process for educators and administrators alike. All these technologies work together to simplify operations, increase data accuracy, and improve security, transforming the landscape of attendance management across different environments.*

Indexed Terms- *Facial Recognition Technology, QR code Technology, Mobile Computing, Attendance System, Educational System.*

I. INTRODUCTION

Technology has transformed every sector of society including education. Yet, a lot of educational institutions are stuck with old-fashioned attendance tracking methods that are inefficient and riddled with errors. In an age characterized by technological progress and digital evolution, conventional ways of monitoring employee attendance are being made irrelevant. As companies pursue efficiency, precision, and ease, the use of advanced solutions is a necessity. One such solution that has gained considerable traction is the QR code-based attendance system along with facial recognition technology.

Revolutionizing the Way organizations monitor their workforce, this system leverages the power of face recognition to streamline attendance management processes. This attendance system offers a seamless and efficient alternative to conventional methods such as manual attendance registers by harnessing the ubiquity of smartphones and the simplicity of face recognition technology, employers can effortlessly track employee attendance in real-time, irrespective of the workforce's size or location. At its essence, This attendance system functions on a simple mechanism. This technology is used electronically, reducing administrative overheads and wastage of paper.

II. LITERATURE REVIEW

Historically, attendance management relied on manual processes such as paper registers and verbal roll calls. These methods were time-consuming and prone to errors, leading to inefficiencies in record-keeping.

Attendance tracking has changed dramatically, moving from old manual techniques to modern technological solutions. This review examines this evolution, highlighting the evolution to QR-based attendance systems for their convenience and efficiency.

The paper set out to transform how attendance is managed in schools and colleges, tackling the issues that come with traditional manual systems, like high costs, the risk of falsification, and inconsistent accuracy. It pointed out the shortcomings of conventional face recognition methods and pushed for a blend of biometric and face recognition technologies. The suggested approach aimed to

simplify attendance tracking by using face recognition techniques, capturing images through cameras or CCTV systems in educational environments. It also highlighted how the attendance system operates based on facial recognition.

The research study outlines a safe door locking system that utilizes facial recognition technology to grant access to educational institutions. The system allows authorized personnel to gain access to the facility and track the activity log through a web-based server. The authors prove the system to be effective and can be extended to other facilities and properties. This study is a preliminary one towards the development of a facial recognition based smart security door system.

Many educational institutions have implemented automated systems to take students' attendance through facial recognition. widely used method for verifying a technique to identify an individual's identity.

Most of the existing studies in literature have addressed algorithm accuracy and other technical aspects of an automated attendance recording system. There's little interest in post-processing of attendance data, which is critical to monitoring and audit, management of absenteeism, and reporting. User preference, acceptance, and satisfaction with these technologies have also not been adequately studied. Our work attempts to fill the gap by developing a web-based attendance management system using facial recognition. Reduce hardware installation and long-term maintenance, thus helpful in offering an economically viable solution with flexibility.

A deep need is given that the technological infrastructure establishment is entirely needed within the educational institutions as far as the connection to the internet, hardware, platforms, as well as a level of competence of the staff are concerned to bring within the walls of the institution's dimensions or capacity.

Our literature survey, thus, by a summarization of indicated emerging patterns, trends, and insights from this vast review. These observations are the underpinnings of our project, bridging the chasm between the review of the existing literature and

development of our facial Recognition attendance system.

III. METHODOLOGY

After diving deep into a thorough literature review that explored various topics closely tied to our project, we're now ready to come up with a solid solution. In this section, we'll lay out our proposed methodology, giving you a clear picture of how we plan to tackle the project and the strategic paths we intend to follow. The gaps in previous research have motivated us to approach this project in the most practical and effective way possible.

In schools, colleges our app simplifies the attendance management process for teachers and administrators. The group selfie feature revolutionizes roll call, eliminating the need for manual calling of names and saving valuable instructional time. This streamlined process improves efficiency, enhances classroom management, and maximizes teaching time. facial recognition APIs can be seamlessly integrated into the existing Education ERP software. This integration allows for the automatic updating of attendance records, eliminating the need for manual data entry and reducing administrative tasks for teachers and administrators.

It comprised four components, such as: image acquisition, face detection, feature extraction and classification with database matching. The face detection module identifies and locates the face area in the image features which will be extracted from the regions of interest within the image. The module matches the extracted faces with known or unknown faces using a classifier trained on these faces. Feature Extraction module analyzes personal identity information and derives characteristics detected from the area in the face of the human. The Face Recognition Module uses the open source computer vision library popularly known as OpenCV and integrates the face recognition algorithms easily. The available algorithms were Haar cascade classifier and LBPH Face Recognizer for face detection and recognition.

Facial recognition adds a new layer of security so that only authorized people can take attendance. This

limits the threat of identity fraud and improves overall campus or security.

Our application automates administrative procedures for corporate bodies as well as learning institutions. Automating the process of managing attendance, the app does away with the requirement of manual attendance books, thereby lowering paperwork and bureaucratic hassles. Teachers and human resource personnel can view attendance details in real time, removing the necessity of data entry by hand and maintaining precise and updated records.

Moreover, the integration of facial recognition enhances security and fraud prevention measures. The facial technology verifies individual identities, reducing the risk of impersonation or proxy attendance. This feature promotes accountability and accuracy in attendance management, ensuring that organizations have reliable data for payroll calculations, resource allocation, and decision-making processes. Additionally, organizations can take advantage of the comprehensive reporting and analytics capabilities provided by facial recognition solutions. Attendance data captured through facial recognition can be analyzed to identify attendance patterns, track punctuality rates, and generate customized reports.

IV. WORKING SYSTEM

Our approach uses Haar features along with the AdaBoost classifier to get the job done. Right now, we're in the process of developing a Graphical User Interface (GUI) that will keep track of each student's name and roll number in a designated file.

At the same time, as we gather student information, we're also putting together a dataset filled with images of student faces, which we'll store in a specific folder. After that, the trained images will be saved in another folder, which is essential for the face recognition process that follows. In a real-time scenario, a camera placed strategically near the classroom door will continuously capture live data.

This camera pulls images from its live feed and compares them to the ones we saved during registration. When it finds a match, the system

displays the student's name and roll number on the recognized face. This information is automatically recorded in an attendance sheet, complete with the date and time. Any images that don't match are kept in a separate unknown folder. This attendance system is a fantastic tool for faculty members, making it super easy to track student attendance for each lecture, along with the corresponding time-stamps.

The proposed system is quite adaptable, making it suitable for a variety of attendance situations, including lab attendance, visits to government offices, participation in institutional or organizational events, and library check-ins. The data we gather is organized and stored in a file. After that, we create a dataset that includes student information.

The process of using face recognition techniques, particularly Haar features along with the AdaBoost classifier, is as follows. Live images are captured from a video stream and stored in a specific file. While saving, the system checks these images against those of registered students. If there's a match, the system marks the student as present and logs the time and date. If no match is found, the image is saved in an unknown file for future reference. A smart attendance system that uses face recognition is a cutting-edge solution designed to make tracking attendance a breeze. This system harnesses facial recognition technology to identify and verify individuals, doing away with old-school methods like manual roll calls or swiping cards. Typically, it includes a camera or a series of cameras set up to capture facial images, which are then analyzed by the facial recognition software.

100% of your text is likely AI-generated

New version:

The way our smart attendance system, which uses face recognition, is set up is designed to make attendance management smooth and efficient. We've harnessed cutting-edge technology, employing sophisticated algorithms like Haar features and the AdaBoost classifier to accurately detect and recognize faces. At the heart of this system is a user-friendly Graphical User Interface (GUI) that simplifies the entire process, enabling quick capture of facial images, easy dataset creation, and one-click

training. Once a student's face is recognized, the system automatically logs essential details, such as the student's name and roll number, neatly organizing them along with the date and time. This automated method tackles the issues that come with traditional attendance tracking, offering a more streamlined and precise solution for schools and educational institutions.

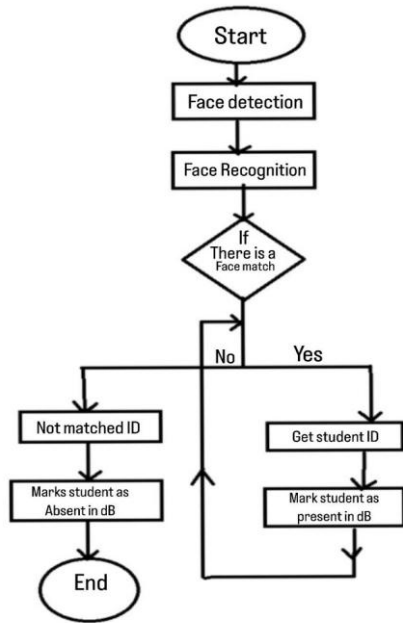


Fig.1 Flowchart for proposed system

The system works by comparing captured faces against a pre-existing database of authorized individuals, effectively marking attendance for those who are recognized. This not only boosts accuracy and efficiency but also offers real-time monitoring and reporting capabilities.

Moreover, the system can include features like access control, ensuring that only authorized individuals can enter. Overall, a face recognition-based smart attendance system delivers a reliable, secure, and convenient solution for modern attendance management in various settings, such as schools and corporate offices.

To track an image, users simply click on the “Track Image” icon, which displays the name and ID of the detected student based on their face. This information

is then saved in the database by clicking the “Quit” icon, leading to the creation of an Excel file that contains details of the students present. The system’s functionality can be illustrated through different scenarios.

Additionally, organizations can take advantage of the comprehensive reporting and analytics capabilities provided by facial recognition solutions. Attendance data captured through facial recognition can be analyzed to identify attendance patterns, track punctuality rates, and generate customized reports.



Fig.2. Web app Dashboard

The login form includes a video feed of the user. Below the video, there are input fields for Name, Email (pre-filled with "jerry@gmail.com"), Phone Number (pre-filled with "123456789"), and Class (pre-filled with "jshd"). A "Student Registration" button is located at the bottom.

Fig.3. User Login info

Name	Email	Phone Number	Class	Authorized	Action
jerry	jerry@gmail	1234	12	Yes	View

Back to Home

Fig.4. Credentials stored in a database

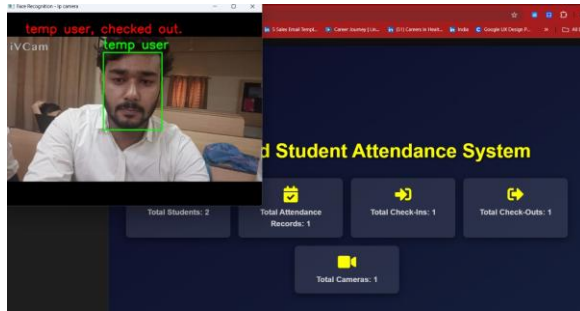


Fig.5.

V. RESULTS

Set of faces are needed to evaluate the system. Testing and evaluating face detection algorithms is provided with different face database standards. Standardized facial databases become necessary for the uniformity of images for algorithm developers as well as meeting a minimum level of images for conducting tests. Accurate evaluation or comparison of facial recognition algorithms cannot be carried out without the database and standards. Most of the experiments conducted in this module are based on a real-time face database.

The system presents a complete solution to the problem of conventional attendance tracking. Its user-friendly interface, solid features, and flawless integration of technology make our system capable of changing the way educational institutions take attendance. The embracing of innovation is the best way to remain at the top of the game in this era of digitalization, and our system is a step in the right direction towards contemporary sizing education practices for the teachers and students to benefit from it.

The system was well accepted by students, who reported a marked increase in satisfaction with their learning experience. Such a positive response is likely due to the enhanced flexibility and autonomy the system offers in handling learning, coupled with real-time access to appropriate information.

CONCLUSION

This paper does a detailed review of all face recognition methods as applied to still images and video sequences. The traditional method demands a

perfectly aligned face image and works with still image recognition or video-to-video matching; thus, it is not applicable for surveillance face recognition. Existing techniques have several limitations including pose, illumination variations, and poor video quality of the very few images extracted from each video as well as insufficient computational resources for real-time processing. Accordingly, we will present a local facial feature-based framework for still image and video face recognition under surveillance conditions.

This framework will make real-time video-to-face matching possible, trained on static images while applied to video sequences, resulting in much higher recognition rates. The overall conclusion from the study states that indeed a secure attendance system based on animated QR code has been effective in ensuring the maximum possible security and accuracy that could be possible in tracking attendance in our institution. The study indicates reliability and ease of convenience in usage for both students and instructors.

Attendance web app, along with the establishment of facial recognition APIs, provides end-to-end attendance tracking and analytics solutions to corporates, schools, and colleges.

REFERENCES

- [1] Simran B. Wanjare et al. Contactless Attendance System Using Facial Recognition and QR Code Technology, IEEE Conference on Artificial Intelligence Applications in Education, 2024.
- [2] Bao-Thien Nguyen-Tat et al. Automated Attendance Management Using Facial Recognition in HR Systems, ACM Transactions on Intelligent Systems and Technology, 2024.
- [3] Gopi H. et al. Student Information System with QR Code and Face Biometric Authentication, International Conference on Smart Systems and Technologies, 2023.
- [4] Nesma Abd El-Mawla et al. IoT-Based Smart Attendance Management System Using Face Recognition and QR Code, Journal of Advanced Technology Solutions, 2022.

- [5] Ashwin Rao AttenFace Real-Time Face Recognition-Based Attendance Management, International Journal of Computer Vision Applications, 2022.
- [6] Sarker D.K. et al. Smart Attendance System Using QR Code Verification, Journal of Educational Technology Innovations, 2021.
- [7] Gurwinder Singh Digitizing Attendance Management: A Review of QR Code and Face Recognition Technologies, International Journal of Emerging Trends in Technology, 2018.
- [8] Chen R. et al. Adaptive Binarization for QR Code Scanning in Low-Light Environments, Journal of Mobile and Wireless Systems, 2019.
- [9] Hung S.H. & Yao C. Enhanced QR Code Generation Using Letter Warping and Font Weight Adjustment, IEEE Transactions on Visual Computing, 2021.
- [10] Saraswat C. & Kumar A. Fingerprint-Based Attendance System for Educational Institutes, International Journal of Digital Education Tools, 2020.