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Smart Employee Attendance System Using Face Recognition with Automated Check-In and Check-Out Logging

MOHAMMED ABDUL UBED[1], Dr.CH. BUCHI REDDY[2]
[1]Student, Department of Computer Science and Engineering, Ellenki College of Engineering and Technology, Patelguda, Patancharu, Hyderabad, Telangana.
[2]Assistant Professor & HOD, Department of Data Science, Ellenki College of Engineering and Technology, Patelguda, Patancharu, Hyderabad, Telangana.
[2]Email: buchireddy2017@gmail.com

***Abstract*— Employee attendance management is an important task in every organization, and traditional methods such as manual registers or ID card systems are often time-consuming and prone to errors. This project presents a smart Employee Face Recognition System that automatically records employee check-in and check-out details using facial recognition technology. The system captures employee images through a webcam, detects and recognizes faces in real time, and records attendance without any physical contact. Employee information and facial data are securely stored in a MySQL database, while attendance logs are maintained for future reference. The system minimizes proxy attendance, improves accuracy, and reduces the effort required for manual record keeping. Built using Python, OpenCV, Django, and MySQL, the application provides a simple and user-friendly interface for employee management and attendance monitoring. The proposed solution offers a reliable, secure, and efficient approach to modern workplace attendance management while saving both time and administrative effort.**

***Keywords* — Face Recognition, Employee Attendance System, Check-In/Check-Out Logging, Computer Vision, OpenCV, Facial Authentication, Real-Time Monitoring, Python, Django, MySQL.**

I. INTRODUCTION

In recent years, face recognition technology has become one of the most widely adopted biometric authentication techniques due to its accuracy, speed, and contactless operation. Organizations are increasingly replacing traditional attendance methods with automated face recognition systems to improve efficiency and eliminate manual errors. Conventional attendance systems such as paper registers, RFID cards, and fingerprint scanners are time-consuming, require physical interaction, and are vulnerable to proxy attendance and fraudulent activities. These drawbacks have created the need for intelligent attendance management systems that provide secure and reliable employee authentication [1].

Face recognition is a computer vision technique that identifies individuals based on their unique facial characteristics. Unlike other biometric systems, it does not require users to touch any device, making it more convenient and hygienic. With the rapid advancement of machine learning, deep learning, and image processing techniques, modern face recognition systems have achieved high recognition accuracy even under different lighting conditions, facial expressions, and viewing angles [2], [4]. These improvements have made face recognition a practical solution for employee attendance monitoring in corporate organizations and educational institutions.

The proposed Employee Face Recognition System with Check-In/Check-Out Logging automates the attendance process by capturing employee facial images through a webcam and verifying their identity using face recognition algorithms. Once an employee is recognized, the system automatically records the check-in and check-out time, thereby eliminating manual intervention. Employee details and attendance records are securely maintained in a MySQL database, allowing administrators to manage employee information and generate attendance reports efficiently. This automated approach significantly reduces administrative workload while improving attendance accuracy and transparency [3], [5].

The system is developed using Python, OpenCV, Django, and machine learning techniques to perform real-time face detection and recognition. OpenCV provides efficient image acquisition and face detection capabilities, while machine learning algorithms improve the recognition performance by learning facial features from registered employee images. Several researchers have demonstrated that combining OpenCV with machine learning algorithms results in highly accurate and reliable attendance systems suitable for real-world applications [6], [8].

Furthermore, automated attendance systems help organizations prevent proxy attendance, reduce human errors, and improve workforce management. Accurate attendance records also simplify payroll processing and employee performance monitoring. With the growing adoption of artificial intelligence in organizational management, face recognition-based attendance systems offer a secure, scalable, and user-friendly solution for modern workplaces. Therefore, the proposed system aims to provide an efficient employee attendance management platform that enhances security, improves operational efficiency, and supports digital transformation in organizations [9], [11], [12].

II. RELATED WORK

"LBPH Based Improved Face Recognition At Low Resolution," Aftab Ahmed, Fayaz Ali, Jiandong Guo, Farha Deeba, and Awais Ahmed, May 2018. [8]

This study proposed an improved Local Binary Pattern Histogram (LBPH) algorithm to enhance face recognition performance, particularly for low-resolution facial images. The authors focused on overcoming the challenges of poor image quality, illumination variations, and facial distortions that often reduce recognition accuracy. The proposed method extracts local texture features from facial images and classifies them efficiently while maintaining low computational complexity. Experimental evaluation showed that the enhanced LBPH approach provides higher recognition accuracy than conventional face recognition methods when working with low-quality images. The research highlighted that LBPH is computationally efficient and suitable for real-time applications because it requires less training time and hardware resources. The proposed system demonstrated stable performance under different environmental conditions, making it appropriate for surveillance, authentication, and attendance management applications where image quality cannot always be guaranteed.

"Facial Recognition Attendance System Using Python and OpenCV," Dr. V. Suresh, Srinivasa Chakravarthi Dumpa, Chiranjeevi Deepak Vankayala, Haneesha Aduri, and Jayasree Rapa, Volume 5, Issue 2, 2019. [5]

This research presented an automated attendance system developed using Python and OpenCV for real-time facial recognition. The proposed system captures images through a webcam, detects employee faces, and compares them with registered facial data stored in a database. Once a match is identified, attendance is recorded automatically along with the corresponding date and time. The authors emphasized that the system reduces manual attendance errors, eliminates proxy attendance, and minimizes administrative effort. OpenCV was utilized for image acquisition and face detection, while Python provided an efficient environment for implementing the recognition algorithms. Experimental results indicated that the proposed attendance system achieved reliable performance with satisfactory recognition accuracy under normal lighting conditions. The research concluded that integrating computer vision with attendance management offers a practical, cost-effective, and user-friendly solution for educational institutions and corporate organizations.

"Attendance Monitoring System using Facial Recognition with Audio Output and Gender Classification," Poornima S., Sripriya N., Vijayalakshmi B., and Vishnupriya P., IEEE, 2017. [9]

This paper introduced an intelligent attendance monitoring system that combines facial recognition, gender classification, and audio output to improve user interaction and attendance management. The proposed system automatically identifies individuals using facial features and records attendance without requiring manual verification. Additionally, the system provides voice-based confirmation after successful recognition and classifies gender as an additional verification parameter. The authors employed image processing techniques to improve recognition accuracy while reducing processing time. The attendance records were stored digitally for future reference, making administrative management more efficient. Experimental analysis demonstrated that the system performs effectively in real-time environments with acceptable recognition accuracy and fast response time. The study highlighted that integrating facial recognition with audio feedback creates a more interactive and user-friendly attendance management system suitable for schools, colleges, and office environments.

"Automated Attendance Management System Based on Face Recognition Algorithms," Shireesha Chintalapati and M. V. Raghunadh, IEEE International Conference on Computational Intelligence and Computing Research, 2018. [11]

This study proposed a face recognition-based attendance management system to automate the process of recording employee and student attendance. The system detects human faces from live video streams and compares facial features with stored templates using face recognition algorithms. Once authentication is completed successfully, attendance is recorded automatically in the database. The authors focused on reducing manual intervention, eliminating attendance fraud, and improving the overall efficiency of attendance

management. The proposed solution also supports real-time recognition and provides faster processing compared to traditional attendance systems. Experimental results demonstrated that the system achieved high recognition accuracy with reduced computational complexity, making it suitable for practical implementation. The research concluded that automated facial recognition significantly improves attendance monitoring while ensuring better security, reliability, and operational efficiency in educational institutions and workplaces.

"Face Recognition for Automated Attendance using HOG & Machine Learning," Sakina and Sehrish Larik, January 2021. [4]

This paper presented an automated attendance system that utilizes Histogram of Oriented Gradients (HOG) for feature extraction along with machine learning algorithms for face recognition. The proposed approach extracts important facial texture information using HOG descriptors and applies machine learning techniques to accurately recognize registered individuals. The system was designed to perform efficiently under varying lighting conditions and facial orientations while maintaining high recognition accuracy. Attendance is recorded automatically after successful identification, reducing manual work and preventing proxy attendance. The authors emphasized that HOG features provide computational efficiency while preserving important facial characteristics required for reliable recognition. Experimental evaluation showed that the proposed system achieved accurate real-time performance with lower computational cost than several conventional approaches. The research demonstrated that combining HOG with machine learning provides an efficient and practical solution for automated attendance management systems.

III. DATASET DETAILS

The dataset used in this project consists of facial images collected from employees for developing an automated face recognition-based attendance system. Each employee is enrolled by capturing multiple face images through a webcam under different facial expressions and slight pose variations. These images are stored in separate folders corresponding to each registered employee and are used to train the face recognition model. The dataset contains labeled facial images where each label represents a unique employee identity. Since the images are captured in real-world environments, they may contain variations in lighting conditions, facial expressions, background, and image quality. Therefore, preprocessing techniques such as face detection, image resizing, grayscale conversion, and normalization are applied to improve image consistency and recognition accuracy. The prepared dataset serves as the foundation for training the facial recognition model, enabling the system to accurately identify employees and automatically record their check-in and check-out times. By using a well-organized facial image dataset, the proposed system provides a secure, contactless, and efficient attendance management solution while minimizing proxy attendance and manual errors.

Before training the recognition model, the collected facial images undergo several preprocessing steps to improve data quality and system performance. Initially, facial regions are detected using OpenCV-based face detection algorithms, and unnecessary background information is removed. The detected face images are resized to a fixed dimension and converted into grayscale to reduce computational complexity while preserving essential facial features. Image normalization is then performed to minimize the effects of illumination variations and improve recognition consistency. After preprocessing, the dataset is divided into training and testing subsets using an 80:20 ratio, where 80% of the facial images are used for model training and 20% are reserved for performance evaluation. The processed dataset is utilized by the face recognition algorithm to learn unique facial characteristics of registered employees. During testing, the trained model identifies employees in real time through a webcam and automatically logs their attendance with corresponding check-in and check-out timestamps. This dataset enables the development of a reliable, accurate, and real-time employee attendance management system using facial recognition technology.

IV. PROPOSED METHODOLOGY

The proposed methodology introduces an Employee Face Recognition System with Check-In/Check-Out Logging that automates employee attendance using facial recognition technology. Initially, the administrator registers employees by entering their basic details and capturing multiple facial images through a webcam. These facial images are stored in a structured dataset and associated with a unique employee ID in the MySQL database. Before model training, the captured images undergo preprocessing operations such as face detection, image cropping, grayscale conversion, resizing, and normalization to improve image quality and recognition accuracy. The processed facial images are then used to train the face recognition model, enabling the system to learn the unique facial characteristics of each registered employee. This training process creates a facial database that serves as the reference for future authentication. By using computer vision and image processing techniques, the proposed system eliminates the need for manual attendance marking

and reduces errors caused by proxy attendance or identity fraud.

After the training phase, the administrator starts the webcam to perform real-time employee authentication. The webcam continuously captures live video frames and detects human faces using OpenCV-based face detection algorithms. Once a face is detected, the trained recognition model compares the extracted facial features with the registered employee database to identify the employee. If a matching face is found, the employee's identity is verified, and the system automatically records the corresponding check-in or check-out time in the attendance log. The attendance details, including employee ID, employee name, date, check-in time, and check-out time, are securely stored in the MySQL database as well as exported to an Excel file for reporting purposes. The administrator can also view and update employee information whenever required through the web interface. The system provides a completely contactless attendance solution that improves security, minimizes administrative workload, and ensures accurate attendance recording.

The overall system architecture [1] illustrates the complete workflow of the proposed employee attendance management system. It includes employee registration, facial image acquisition, image preprocessing, face recognition model training, real-time webcam-based employee identification, automatic check-in/check-out logging, database storage, attendance report generation, and employee management. The architecture also supports viewing attendance history, updating employee information, and exporting attendance records for organizational use.

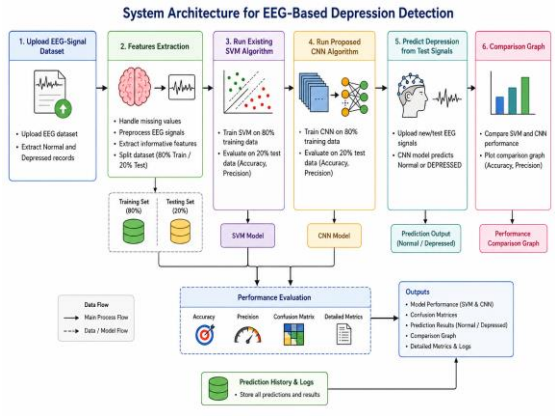

Figure 1. System Architecture for Employee Face Recognition with Check-In/Check-Out Logging

The proposed employee attendance system is designed to automate attendance management using computer vision, image processing, and facial recognition techniques. Initially, the administrator registers employees by entering employee details and capturing facial images through a webcam. The collected images are preprocessed to improve recognition quality by detecting facial regions, resizing images, converting them into grayscale, and normalizing pixel values. These processed facial images are then used to train the face recognition model and create a facial database for registered employees. During attendance marking, the webcam continuously captures live video frames and detects employee faces in real time. The trained recognition model compares the detected face with the stored facial templates to identify the employee. Once authentication is successful, the system automatically records the employee's check-in or check-out time and stores the attendance information in the MySQL database and Excel log file. Finally, the administrator can view attendance reports, update employee details, and monitor employee check-in/check-out history through the web application, providing a secure, accurate, and efficient attendance management solution.

V. RESULT AND DISCUSSION

The experimental results demonstrate the successful implementation of the proposed Employee Face Recognition System with Check-In/Check-Out Logging. Initially, the administrator registered employees by entering employee details and capturing facial images through a webcam. The captured facial images were successfully stored in the database and used to train the face recognition model. During real-time execution, the webcam continuously detected employee faces and compared them with the registered facial database. Whenever a matching face was identified, the system automatically recorded the employee's check-in and check-out time without requiring any manual interaction. The attendance records were securely stored in the MySQL database and simultaneously exported to an Excel log file for future reference. The View Logging module enabled the administrator to monitor attendance history, verify employee check-in/check-out records, and manage attendance efficiently. Experimental observations indicate that the proposed system provides accurate employee authentication, minimizes proxy attendance, reduces administrative workload, and offers a secure and contactless attendance management solution.

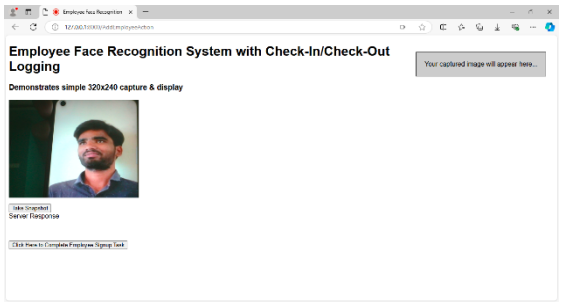

Figure 2: Employee Registration Module

Figure 2 illustrates the employee registration module of the proposed system. The administrator enters employee information and captures multiple facial images through a webcam. These facial images are stored in the database along with a unique employee ID and are used to train the face recognition model for future employee identification.

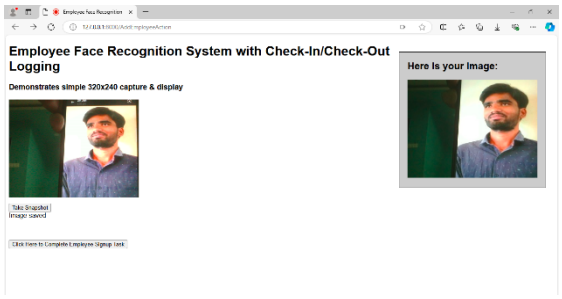

Figure 3: Real-Time Face Recognition

Figure 3 presents the real-time face recognition module. After activating the webcam, the system continuously detects employee faces from the live video stream. The detected facial features are compared with the trained facial database, and once a match is found, the employee is successfully recognized. The recognized employee ID is displayed on the screen before attendance is recorded.

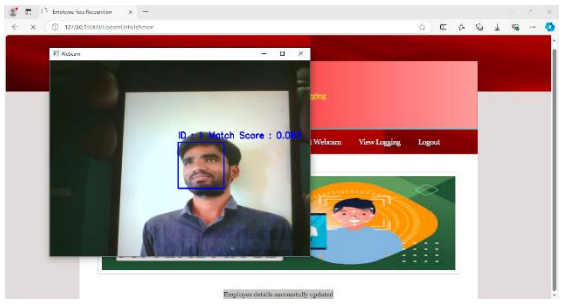

Figure 4: Automatic Check-In and Check-Out Logging

Figure 4 shows the automatic attendance logging process. After successful face recognition, the system records the employee's check-in or check-out time along with the attendance date. The attendance information is stored automatically without requiring manual intervention, ensuring accurate and reliable attendance management.

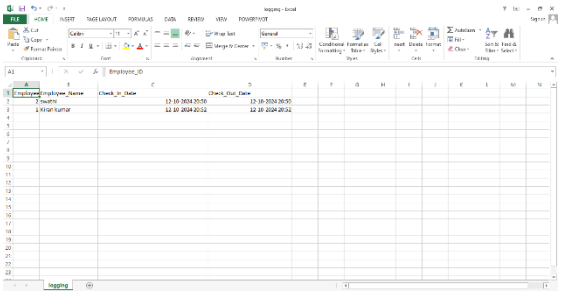

Figure 5: Attendance Report (Excel Log)

Figure 5 illustrates the attendance report generated by the proposed system. The Excel sheet contains employee ID, employee name, attendance date, check-in time, and check-out time. This report helps administrators monitor employee attendance and maintain attendance records efficiently.

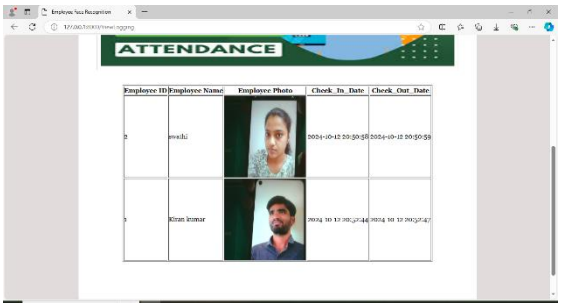

Figure 6: View Logging Module

Figure 6 presents the attendance history module. The administrator can view all recorded attendance details through the web application. The module displays employee names, attendance dates, check-in times, and check-out times, allowing easy monitoring and verification of employee attendance records.

DISCUSSION

The experimental findings demonstrate the effectiveness of the proposed Employee Face Recognition System with Check-In/Check-Out Logging for automated attendance management. The system successfully registered employee details by capturing multiple facial images through a webcam and storing them in a structured facial database. Image preprocessing techniques such as face detection, grayscale conversion, and normalization improved the quality of the captured facial images, enabling the face recognition model

to accurately learn the unique facial characteristics of each employee. During real-time execution, the recognition module successfully identified registered employees and automatically recorded their check-in and check-out times without requiring any manual interaction. This automated process significantly reduced administrative effort and eliminated the possibility of proxy attendance commonly observed in traditional attendance systems.

The attendance logging module accurately maintained employee attendance records in both the MySQL database and Excel reports, allowing administrators to monitor attendance history efficiently. The employee management module also enabled updating employee information without affecting the recognition process, improving the flexibility of the system. The real-time webcam-based authentication demonstrated reliable performance under normal operating conditions and provided a secure, contactless method for employee verification. Furthermore, the automatic generation of attendance reports simplified attendance tracking and payroll management by maintaining accurate time records. Overall, the obtained results indicate that the proposed face recognition-based attendance system provides a reliable, efficient, and user-friendly solution for modern employee attendance management. The integration of computer vision, facial recognition, and automated logging enhances workplace security, improves attendance accuracy, and supports organizations in maintaining transparent and efficient attendance records.

VI. CONCLUSION

A face recognition application for employee attendance system using the One-Shot algorithm is made. The application is capable of analyzing and extracting facial features from every live image. These extracted features are then compared with the already trained images present in the database. These features are then compared and based on the similarity of the two images the attendance is posted. The application also provides option to the user to update the training image, but the permission to update the image must be given by the administrator in control. By applying the method described in the paper, accurate algorithm and quality based face recognition results ca be obtained. With the help of one-shot algorithm only one training image is required for the authentication. Due to this one can achieve high performance level in recognizing human faces and analyzing facial features which is supported by the Haar cascade. It extracts several features from the training image that can be easily used to compare and authenticate the user even in the scenes containing complex backgrounds and low resolutions, this technique is sufficiently secure, dependable, precise and productive. There is no requirement for specific equipment for introducing the framework in the system. It tends to be built utilizing a device camera

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