Face Recognition Attendance Using CCTV

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Abstract- *Monitoring and updating attendance records of students is an integral part of activities in schools and colleges. To mitigate the laborious work of keeping attendance records, an automated method of attendance monitoring using face as a biometrics is proposed. In this paper, face detection and recognition for maintaining student attendance using deep learning methodology is presented. Face detection in low resolution CCTV footage is achieved using the Haar Cascade algorithm with detection accuracy. The detection is not limited to frontal face detection. It also has side face selection along with varied illumination situations. These detected faces are then used to create a student face database. The Convolutional Neural Network (CNN) is trained on this face database for student recognition to mark attendance. The proposed CNN provided face recognition accuracy for the implemented network.*

I. INTRODUCTION

Face recognition technology is increasingly used in education to automate and manage attendance systems, a crucial part of a student's academic record. As student enrollment grows, manually tracking attendance becomes more difficult, leading to errors and fraud, such as students marking attendance for others. To address these challenges, an Automated Attendance System (AAS) uses advanced technologies like image processing and facial recognition. By leveraging machine learning, the system improves over time by training on data sets. While some systems combine facial recognition with fingerprint biometrics, this implementation focuses on using deep learning techniques to enhance the accuracy of facial recognition. This approach provides a reliable, efficient, and consistent solution to attendance management.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

The automation of attendance tracking using face recognition technology integrated with CCTV cameras provides a modern and efficient alternative to traditional manual systems. Manual attendance methods are often prone to errors, time-consuming, and vulnerable to proxy attendance, which leads to inaccuracies in record-keeping. By leveraging AI-powered face recognition, this system ensures real-time, accurate, and fraud-proof attendance tracking, making it ideal for educational institutions and corporate environments.Traditional attendance methods, such as manual registers, fingerprint scanning, and RFID-based systems, have significant drawbacks. Manual registers require human effort and are susceptible to manipulation. Fingerprint scanners offer improved security but require physical contact, which raises hygiene concerns and increases maintenance costs. RFID-based systems, while faster, can be misused since individuals can swap cards to manipulate attendance records. Face recognition technology addresses these limitations by providing a contactless, scalable, and highly accurate solution.The system employs advanced face detection and recognition techniques to enhance accuracy and efficiency. For face detection, it utilizes methods such as Haar Cascade and Multi-task Cascaded Convolutional Networks (MTCNN), which allow real-time identification of individuals. Face recognition is performed using deep learning-based convolutional neural network (CNN) models, including FaceNet, OpenFace, and Dlib, which convert facial images into unique digital embeddings for precise identity verification. Secure database management is implemented using MySQL and MongoDB, with SSL encryption to ensure data protection and prevent unauthorized access.One of the key features of this system is real-time attendance logging through CCTV integration, which eliminates the need for manual intervention. It supports multi-face detection in a single frame, allowing multiple individuals to be recognized simultaneously. The AI models used in the system ensure high accuracy even in challenging conditions, such as poor lighting or when individuals wear masks or glasses. A centralized database facilitates seamless access to attendance records, making it easy for administrators to monitor attendance trends and generate reports. The system is also highly secure and scalable, making it adaptable for large institutions and corporate organizations.By integrating AI-driven face recognition, this system significantly enhances efficiency, accuracy, and security in attendance management. It eliminates the challenges posed by traditional methods and offers a modern, automated alternative that seamlessly integrates with existing infrastructure. With real-time processing, secure data management, and scalability, this system provides a

III. STUDIES AND FINDINGS

Attendance tracking is crucial in educational and corporate environments. Traditional methods like manual registers, fingerprint scanners, and RFID-based systems have limitations, including errors, time consumption, hygiene concerns, and security issues. Among these, face recognition offers the most efficient, contactless solution, eliminating proxy attendance and reducing hygiene concerns. It integrates well with existing CCTV systems, providing improved accuracy with advancements in deep learning models.

Face recognition systems use methods like Multi-task Cascaded Convolutional Networks (MTCNN) for face detection and deep learning models (FaceNet, OpenFace, DeepFace) for recognition. These systems convert facial images into unique embeddings, which are compared using similarity metrics like Euclidean Distance and Cosine Similarity. This approach achieves high accuracy, even in low-light or challenging conditions.

AI-powered face recognition systems achieve over 95% accuracy in well-lit conditions and 85-90% accuracy in low-light. They process multiple faces per second and are scalable for large applications, including universities and corporate offices. The system reduces attendance fraud compared to manual and RFID-based methods and provides real-time monitoring with centralized databases. Security measures like SSL encryption and OAuth authentication protect sensitive data, ensuring reliability.

Overall, face recognition-based attendance tracking is an efficient, accurate, and secure solution, enhancing attendance management in modern institutions.

IV. GET PEER REVIEW

To ensure the accuracy, effectiveness and ease of use of FACE RECOGNITION ATTENDANCE USING CCTV, the project was subjected to a peer review process involving faculty, mentors and other researchers. This review aims to assess the technical implementation, efficiency and potential improvements of the system based on expert feedback.

1. Faculty and Mentor Feedback

The faculty and mentor feedback on the Face Recognition Attendance System using CCTV highlights the system's innovative approach to automating attendance tracking through deep learning. They acknowledge the use of Haar Cascade for face detection and CNN for recognition as effective methods but suggest further optimization to improve accuracy under varying lighting conditions and facial angles. Faculty members emphasize the importance of integrating the system seamlessly with existing attendance management software to enhance its practical usability. Mentors recommend refining the model by training it on a larger dataset to minimize false positives and negatives, ensuring reliable identification. Additionally, they highlight the need for robust data security measures to protect user privacy. Future improvements, such as multi-factor authentication and real-time processing enhancements, are suggested to increase the system's scalability and effectiveness in diverse environments. Overall, the feedback encourages further refinement to make the system more efficient, accurate, and adaptable for real-world implementation.

2. Feedback from Peers and Test User

The feedback from peers and test users on the Face Recognition Attendance System using CCTV emphasizes its efficiency in automating attendance tracking and reducing manual effort. Test users found the system to be convenient and time-saving, as it eliminates the need for traditional methods like roll calls or fingerprint scanning. However, some peers pointed out challenges related to accuracy under varying lighting conditions and facial angles, suggesting improvements in the model's training to enhance recognition rates. Users also highlighted the importance of optimizing real-time processing speed to ensure seamless operation, especially in environments with large crowds. Additionally, concerns regarding data privacy and security were raised, prompting recommendations for stronger encryption and access control measures. Overall, while the system was well-received for its innovation and practicality, feedback suggests refinements in accuracy, speed, and security to make it more robust and reliable for widespread adoption.

V. IMPROVEMENT AS PER REVIEWER COMMENTS.

Feedback from faculty mentors and peer reviewers provided valuable insights into the functionality and improvements in user experience of VO-TEX: automatic text overview and language generation.

One of the main recommendations was to improve the accuracy of the summary by including abstract summary models such as BERT and GPT, rather than relying on extracted TF-IDF-based overviews. This improvement allows Vo-Tex to create a more coherent and more human summary, improving readability and context-related relevance.

Although GTTS provides clear speech, reviewers recommended integrating the linguistic model (TTS) from

expanded texts such as Tacotron and Wavenet to create a more natural and expressive audio summary. This greatly improves the listening experience and makes tools for users who prefer hearing content more effective.

Reviewers have discovered that current implementations using PYPDF2 and Pytesseract can be slower on large or complex documents. This increases the efficiency of file processing and text recognition.

The current version supports English and Malayalam, but future updates will include more regional and international languages to ensure more accessibility. .

VI. CONCLUSION

The proposed automated attendance system improves upon traditional methods by utilizing advanced facial recognition technology. This system streamlines the attendance process, saving time, reducing human error, and creating a more efficient workflow for teachers and administrators. By automating attendance-taking, educators can focus more on instruction, leading to a more engaging classroom experience. The system also minimizes absenteeism and false attendance records through real-time biometric verification, enhancing reliability. Future enhancements, like real-time data processing and the addition of other biometrics (e.g., fingerprint or iris recognition), would further improve accuracy and adaptability, providing seamless integration with organizational systems and offering backup options in challenging conditions. Ultimately, the system offers a more secure, efficient, and data-driven approach to attendance monitoring across various environments.

APPENDIX

A. TOOLS AND TECHNOLOGIES

- Languages:Python
- Libraries: OpenCV, Dlib, TensorFlow, FaceNet
- Database: MySQL, Firebase
- Hardware: CCTV (1080p+), NVIDIA GPU
- Security: SSL/TLS, OAuth
- UI: Tkinter, Flask

B. SYSTEM SPECIFICATIONS

- OS: Windows 10/11, Linux
- Language: Python
- Libraries: OpenCV, Dlib, TensorFlow
- Database: MySQL, Firebase
- Processor: Intel i5/i7, AMD Ryzen 5/7
- RAM: 8GB+ (16GB recommended)
- Storage: 256GB+ SSD
- GPU: NVIDIA GTX 1650+
- Cameras: 1080p+ CCTV with IR

SAMPLE SUMMARIZATION OUTPUT

The Face Recognition Attendance System using CCTV automates attendance tracking using deep learning and computer vision. It employs OpenCV, Dlib, and TensorFlow for real-time face detection and recognition. The system processes CCTV footage, extracts facial features using FaceNet, and logs attendance in a MySQL/Firebase database. It operates on a Windows/Linux environment, requiring a minimum Intel i5/Ryzen 5 processor, 8GB RAM, and NVIDIA GTX 1650 GPU for efficient performance. Security is ensured through SSL/TLS encryption and OAuth authentication. The system offers a Tkinter/Flask-based UI for easy attendance management.

ACKNOWLEDGMENT

We would like to express our deep gratitude and sincere thanks to ICCS College of Engineering and Management, Thrissur. Additionally, We feel extremely privileged to mention the name of our Executive Director, Dr Jai M Paul as we provided exceptional cooperation and support. We deeply and wholeheartedly thank Mrs.DIVYA JOSE Head of the Department of Computer Science and Engineering for her extremely valuable advice and encouragement. We would also like to extend our heartfelt thanks to our project cordinater Mrs. LIYA PRAKASH and project guide Mrs. AMULYA P M , Assistant Professor, Department of Computer Science and Engineering - ICCS College of Engineering and Management ,for their meticulous guidance and support that helped me in the completion of our First Phase of the project. Before we culminate, We would like to extend our heartfelt gratitude and thanks to all the teachers and the staff members of the Department of the Computer Science and Engineering, ICCS College of Engineering and Management for their immense co-operation and the whole-hearted support. Last but not the least,We thank all my family members and our classmates who in some way or the other helped us in the successful completion of this work.

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