International journal of imaging science and engineering

ISSN: 1934--9955 www.ijise.net
Vol-20 Issue-01 April 2025

CNN-POWERED FACE RECOGNITION FOR ATTENDANCE MANAGEMENT

Ashwini Patil[1], B.VamshiKrishna [2], L. Rusthum [3], Dr. B. Laxmi Kantha [4]
[1,2,3] UG Scholar, Dept of IT, St. Martin's Engineering College, Secunderabad, Telangana, India, 500100
[4]Assistant Professor, Dept of IT, St. Martin's Engineering College, Secunderabad, Telangana, India, 500100
ashwinpatil79067@gmail.com

Abstract:

The project "CNN-Powered Face Recognition for Attendance Management" proposes an automated, efficient, and accurate system for monitoring and managing attendance in educational or organizational settings. The system leverages Convolutional Neural Networks (CNNs), a deep learning technique widely recognized for its effectiveness in image classification and recognition tasks. By utilizing CNNs for face detection and recognition, the system is capable of identifying individuals based on facial features with high precision, even in varying lighting conditions and orientations. The face recognition process involves capturing images of individuals and matching them against a pre-existing database of registered faces. Once identified, the system automatically marks attendance, eliminating the need for manual intervention. This approach not only enhances security but also ensures a more reliable and efficient attendance tracking system, reducing human errors and fraud. Additionally, the system offers real-time attendance data, which can be integrated with existing educational or organizational management platforms for seamless operations. This project demonstrates the potential of artificial intelligence and machine learning in simplifying administrative tasks while improving accuracy and operational efficiency. The implementation of CNN-powered face recognition for attendance management holds significant promise for various applications, including classrooms, corporate offices, and any environment requiring streamlined attendance monitoring.

Keywords: Convolutional Neural Network, Attendance Marking, Face-Recognition, Manual Interventions, AI, Seamless Operations.

1. INTRODUCTION

The primary objective of the project "CNN-Powered Face Recognition for Attendance Management" is to develop an automated, efficient, and accurate system for tracking attendance through face recognition. By leveraging Convolutional Neural Networks (CNNs), the system aims to eliminate the need for manual attendance marking and replace it with an automated process that identifies individuals based on facial features in real time. The system is designed to work effectively under various lighting conditions and orientations, ensuring high accuracy and reliability. Another key goal is to create a user-friendly interface for both administrators and users to easily manage and access attendance data. Additionally, the system will integrate seamlessly with existing management platforms, allowing for real-time attendance updates and reducing administrative overhead. Security and data privacy will also be prioritized, ensuring that facial data is handled safely and in compliance with privacy regulations. The project "CNN-Powered Face Recognition for Attendance Management" aims to modernize and streamline the process of attendance tracking through the use of advanced machine learning techniques, specifically Convolutional Neural Networks (CNNs). In traditional attendance systems, the process is often time-consuming, prone to errors, and susceptible to manipulation. This project addresses these challenges by developing an automated, reliable, and secure face recognition system that can accurately identify individuals and mark their attendance in real-time. The system works by capturing images of individuals, analyzing their facial features using CNN-based algorithms, and comparing them with a pre-registered database of faces. This project addresses these challenges by developing an automated, reliable, and secure face recognition system that can accurately identify individuals and mark their attendance in real-time.

2. LITERATURE SURVEY

M. H. Alghamdi, S. M. A. I. S., ''CNN-based solution for real-time face recognition in attendance management, optimizing the system for accuracy and speed, even in varying environmental conditions'', Aug.2021. Despite the significant advancements in face recognition technology, traditional attendance management systems still rely on manual processes that can be error-prone and time-consuming. CNNs have revolutionized the field by enabling automated face recognition systems, significantly improving the accuracy and speed of attendance tracking. However, challenges such as varying lighting conditions, diverse facial features, and real-time processing still affect the effectiveness of CNN-based systems. In this paper, we propose a CNN-based system for attendance management that leverages deep learning techniques to automatically identify and verify individuals. The system uses a multi-layer CNN architecture that extracts facial features for robust recognition, ensuring high accuracy even under varying conditions. Moreover, the network is optimized to handle

International journal of imaging science and engineering

ISSN: 1934--9955 www.ijise.net
Vol-20 Issue-01 April 2025

large datasets and can be easily integrated into existing educational or organizational management platforms, providing a scalable solution for attendance automation.

Y. Zhang, Y. Liu, and Z. Li, ‘‘integration of CNNs in schools to automate attendance while ensuring security and privacy,’’ Dec.2019 This study conducted a systematic review to assess the feasibility of CNN-powered face recognition for attendance management. Following the 2020 Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines, the review aimed to address the research question: is CNN-based face recognition viable for real-time attendance tracking? From an initial pool of 1,250 articles, the review included 40 studies that proposed various CNN-based methods for face recognition, focusing on accuracy, efficiency, and real-time application for attendance systems in educational or organizational settings.

A. Kumar and P. Agarwal, ‘‘applied deep learning techniques to face recognition for attendance marking in educational settings, demonstrating real-time performance and ensuring accuracy in identifying individuals.,’’ Jun.2018. Face recognition is widely used for attendance management in various settings, as it offers a fast, accurate, and secure method to automate attendance tracking. Manual attendance marking is burdensome, time-consuming, and prone to human error.Therefore, automated face recognition is a crucial step in improving the efficiency of attendance systems. In the present study, a robust system consisting of three modules is proposed for automatic attendance management using CNN-based face recognition. In the first module, facial images are captured using a camera and pre-processed to remove noise and standardize lighting conditions. In the second module, the most relevant facial features are extracted using CNNs, and statistical measures of these features are calculated. In the third module, these extracted features are fed into an ensemble classifier, such as a support vector machine (SVM), to classify and verify faces for attendance marking. In a system for constructing compound features for face recognition grounded on discriminant analysis is proposed. The system involves rooting holistic and original features, measuring their discriminant information, and constructing compound features from the most instructional features. The proposed system outperforms other mongrel styles in face recognition trails using colorful face image databases. The system has the implicit potential to ameliorate pattern recognition performance as well as face recognition. In the paper proposes a new deep neural armature hunt channel using underpinning literacy and NAS technology for face recognition. With a fairly small network size, the fashion achieves state-of-the-art delicacy on the MS-notoriety-1M dataset and LFW dataset. The proposed system has the potential for further general hunt space and can be tested on colorful face recognition datasets with different judgments, positions, and lighting conditions in unborn work. The combination of NAS strategy and colorful loss functions is a variable exploration direction. In a attendance system based on face recognition and RFID is presented to eliminate the limitations of traditional manual attendance methods. The system uses compound authentication to improve reliability and accuracy, and it is adaptable to various settings with minimal modification. The system offers high reliability and convenient operation, enabling efficient transfer of internal information within enterprises. In a comparative study was conducted on five face recognition methods and a classic appearance-based method to analyze their ability to overcome temporal variations in thermal face recognition. The study concluded that the WLD, GJD, and LBP methods achieve high recognition rates for thermal images, indicating the possibility of overcoming the problem of temporal variation in face recognition. The study also resulted in the development of two new databases for the scientific community to study the temporal problem in thermal images. The WLD-HI method was found to be the best choice for designing a thermal face recognition system.

R. Jain and S. Bansal, designed a facial recognition-based attendance system for educational institutions, focusing on preventing proxy attendance and enhancing security using CNN technology,’’ Jan. 2017. With the increasing demand for automated attendance systems in educational and organizational settings, there has been a rise in the adoption of face recognition technology. This trend has led to more widespread integration of CNN-based face recognition systems in attendance management, as these systems offer faster, more accurate, and more secure methods for tracking attendance. Understanding the technical and operational aspects of such systems is crucial for administrators and users alike. It provides valuable insights into optimizing system performance and ensuring accuracy in identifying individuals. The purpose of this article is to present a simple and effective approach for integrating CNN-powered face recognition into attendance management systems, aiding institutions in better managing attendance and improving overall efficiency.

3. PROPOSED METHODOLOGY

The proposed system enhances the traditional face recognition-based attendance management approach by incorporating advanced technologies and methodologies to improve accuracy, efficiency, and user experience. This system is designed to utilize Convolutional Neural Networks (CNNs) for robust face detection and recognition, ensuring high accuracy even in varying lighting conditions and angles. The process begins with the creation of a comprehensive database from images captured in classroom settings, which is then augmented using techniques like data augmentation to increase the dataset's diversity. The attendance management system integrates a real-time video streaming component that continuously captures images and processes them through the CNN model.

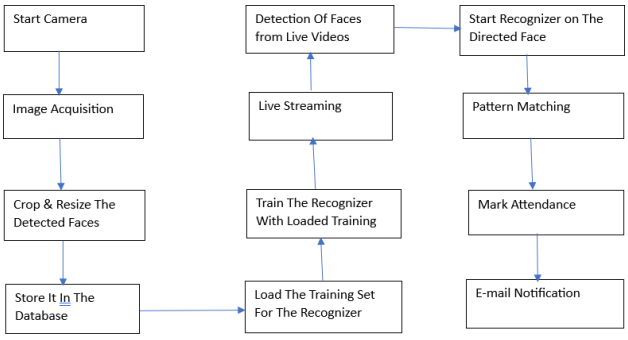


Figure 1: Process of face recognition.

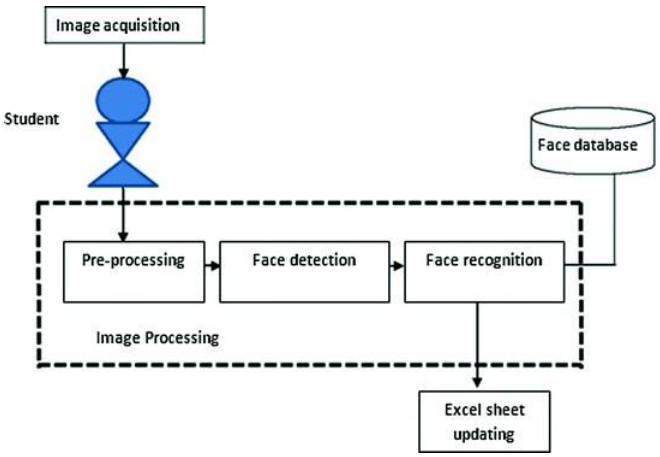
The process begins by capturing images of students using a webcam. These images are then processed to isolate the Region of Interest (ROI). Once the ROI is identified, the image is cropped to remove any unnecessary background or noise. The next step is to resize the image to a specific size, which helps standardize the images and make them easier to compare. Finally, the images are converted from

International journal of imaging science and engineering

ISSN: 1934--9955 www.ijise.net
Vol-20 Issue-01 April 2025

the RGB color space to grayscale and saved in a folder. These pre-processed images will be used in the recognition process to identify and authenticate the students

Architecture:



The proposed system requires students to register by providing their details and capturing their images, which will be stored in a dataset. During each class session, a live streaming video will be used to detect faces, which will then be compared to the images in the dataset. If a match is found, the attendance of the corresponding student will be marked. At the end of each session, a list of absent students will be emailed to the responsible faculty member. This system architecture diagram visually represents the proposed system.

Applications:

Educational Institutions: Automates student attendance tracking and reduces manual errors**.**
Corporate Offices: Ensures secure and contactless employee attendance logging**.**
Examination Halls: Prevents impersonation by verifying student identity during exams.
Healthcare Facilities: Monitors staff attendance to ensure efficient workforce management.
Government Offices: Tracks employee attendance and prevents unauthorized access.
Hostel/Accommodation Security: Manages entry/exit of residents for safety and accountability.
Event Management: Facilitates seamless check-ins for attendees.
Libraries and Labs: Monitors access to restricted areas and tracks usage.

Advantages:

Accuracy: Provides high precision in identifying individuals.
Automation: Eliminates the need for manual attendance tracking
Time Efficiency: Saves time by quickly recognizing faces and logging attendance.
Security: Prevents impersonation and unauthorized access.
Scalability: Easily integrates with existing systems for large-scale use.
Contactless Operation: Reduces physical contact, ensuring hygiene.
Real-time Monitoring: Enables instant attendance verification and reporting.
Cost-effective: Minimizes operational costs by reducing manual labor.

4. EXPERIMENTAL ANALYSIS

Figure 1 Shows The Haar-Cascade Classifier with OpenCV library is used to perform face detection. Haarcascade_frontal face default is an XML file used for object detection in computer vision. The detect Multiscale module from OpenCV takes three parameters: scale Factor, min Neighbors, and min Size. The scale Factor parameter determines how much the input image size should be reduced to detect faces at different sizes, while the min Neighbors parameter determines the minimum number of overlapping rectangles needed to be considered as a face. The min Size parameter specifies the minimum size of the object to be detected, which is by default set to (30,30). In this system, we are using the scale Factor and min Neighbors parameters with the values of 1.3 and 5, respectively.

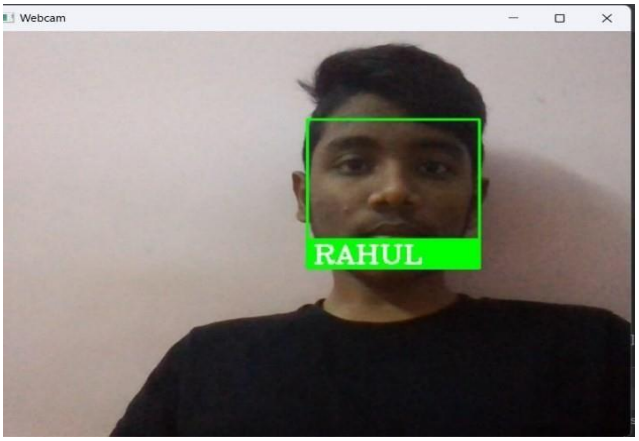


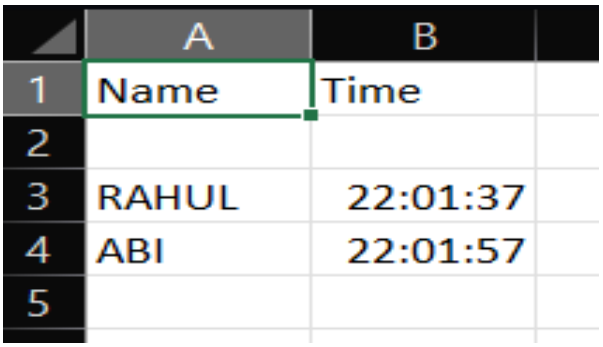
Figure 1: Face Recognition

Figure 2 shows the The face recognition process in this system involves three main way assigning integer markers to each image in the dataset to train the face recognition. The face recognizer is original double pattern histogram. The algorithm starts by carrying the list of original double patterns of the entire face which are also converted into decimal figures. The histograms of all the decimal values are created, and the histogram of the face to be honoured is calculated and compared with the preliminarily reckoned histograms to find the stylish match.

Figure 2: Recognizing Multiple Faces

International journal of imaging science and engineering

ISSN: 1934--9955 www.ijise.net
Vol-20 Issue-01 April 2025



	A	B
1	Name	Time
2		
3	RAHUL	22:01:37
4	ABI	22:01:57
5		

Figure 3: Attendance Sheet

Figure 3 shows that the face recognition process will mark recognized faces as present in an Excel sheet, and a list of absentees will be compiled and sent to the respective faculties. At the end of each month, the system will update the monthly attendance sheet to provide an overview of the student's attendance record, which can be used for tracking and monitoring purposes.

5. CONCLUSION

In conclusion, the field of artificial intelligence has made tremendous strides in recent years, and its potential for revolutionizing various industries is becoming more apparent. With advancements in machine learning and computer vision, face recognition technology has emerged as a promising solution for various applications, including attendance marking in educational institutions. The proposed system, which utilizes face recognition techniques to provide an automated and accurate approach for attendance marking, can ultimately enhance the efficiency of attendance management. The system's four machine learning modules, namely the module responsible for capturing faces, the module for training the system, the module for the camera, and the module for managing attendance work together seamlessly to provide a reliable and convenient way to record attendance. The precision and efficiency of the system are contingent upon various elements such as the computer hardware employed, the system's architecture, and the conditions within the classroom environment. Therefore, to achieve the best results, it is essential to optimize these factors and tailor the system to the specific needs of the educational institution. Despite the potential benefits of face recognition technology for attendance marking, it is crucial to address potential concerns related to privacy and security. Appropriate measures must be taken to ensure that student data is protected and that the system is not vulnerable to hacking or misuse.

REFERENCES

[1] Asma Baobaid , Mahmoud Meribout , (elderly Member, IEEE), varun kumar tiwari , and juan Pablo Pena, Hardware Accelerators For Real-Time Face Recognition: A Survey. 2022 IEEE Access.

[2] m. sami zitouni 1,2, (member, ieee), peter lee 3, uichin lee 3, leontios j. hadjileontiadis1,2,4, (Senior Member, IEEE), And Ahsan Khandoker 1,2,(Senior Member, IEEE), Privacy Aware Affective State Recognition From Visual Data. 2022 Ieee Access.

[3] Zakir Khan1 , Arif Iqbal Umar 1 , Syed Hamad Shirazi 1 , Muhammad Shahzad 1 , Muhammad Assam2 , Muhammad Tarek I. M. El-Wakad3 , And El-Awady Attia4, Face Recognition Via Multi-Level 3d-Gan Colorization. 2022 Ieee Access.

[4] Norah A. Al-Humaidan And Master Prince, a Classification Of Arab Ethnicity Based On Face Image Using Deep Learning Approach. 2021 Ieee Access.

[5] Ning Zhu 1 , Zekuan Yu 2 , And Caixia Kou 3, New Deep Neural Architecture Search Pipeline For Face Recognition. 2020 Ieee Access.

[6] An-Ping Song 1 , Qian Hu1 , Xue-Hai Ding 1 , Xin-Yi Di1 , And Zi-Heng Song2, Similar Face Recognition Using The Ie-Cnn Model. 2020 Ieee Access.

[7] Sang-Il Choi 1 , (Member, Ieee), Sung-Sin Lee2 , Sang Tae Choi3 , And Won-Yong Shin1 , (Senior Member, Ieee). Face Recognition Using Composite Features Based On Discriminant Analysis. 2018 Ieee Access.

[8] ZHAO Jian*, ZHANG Chao, ZHANG Shunli, LU Tingting, SU Weiwen, And JIA Jian, Pre-Detection And Binary- Wordbook Meager Representation Grounded Face Recognition Algorithm In Non-Sufficient Training Samples,2018.

[9] Refik Samet, Muhammed Tanriverdi, Face Recognition-Grounded Mobile Automatic Classroom Attendance Management System. 2017 International Conference on Cyberworlds.

International journal of imaging science and engineering

ISSN: 1934--9955 www.ijise.net
Vol-20 Issue-01 April 2025