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# Development of a Contactless Attendance System using Image Sensors and AI

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**Abstract:** This paper presents the development of a contactless attendance system leveraging image sensors and artificial intelligence techniques for accurate and efficient identification. Traditional attendance methods are time-consuming prone to errors and manipulation. The proposed system utilizes facial recognition algorithms to automatically detect and mark attendance in real time systems. An Image acquisition are performed through high-resolution sensor and AI-based models like NVIDIA jetson nano microcontroller are used for face detection and recognition. Experimental results demonstrate improved accuracy, reduced processing time and enhanced security compared to conventional methods. The system is suitable for applications in educational institutions, workplaces and public environments especially in post pandemic scenarios where contactless solutions are essential used. Additionally the proposed approach minimizes human intervention and ensures reliable data management. The scalability of the system makes it adaptable for large-scale deployments across diverse environments.
**Keywords:** Contactless Attendance System, Face Recognition, Image Sensors, Artificial Intelligence, Real-Time Monitoring, Automated Attendance, Pattern Recognition.

## 1. INTRODUCTION

An Attendance monitoring plays a vital role in educational institutions, corporate organization and public sectors by ensuring discipline, accountability and accurate record of data management. Traditional methods such as manual registers are simple to implement but are often time-consuming including the possibility of proxy attendance. To overcome issue biometric of systems such as fingerprint and face recognition were introduced offering improved reliability and automation functions. These methods still require physical interaction and specialized with hardware which can raise hygiene concerns and reduce user convenience. Advancement of artificial intelligence and computer vision contactless solutions are emerged as an effective alternative for attendance management. These technologies facial recognition are gained significant importance due to its non-intrusive nature and high accuracy. By using image sensors such as cameras are used to gather facial data can be captured in real time without requiring physical contact have enhancing both efficiency and safety. The integration of image sensors with AI-based algorithms enables automatic face detection feature extraction and recognition making system capable of identifying individuals under varying conditions such as changes in lighting, facial expression and orientation. A contactless attendance system not only reduces human effort but also ensures accurate and secure data handling. This paper presents development of a contactless attendance system using image sensors and artificial intelligence as focusing on real-time identification of high accuracy and ease of use. The proposed system captures facial images are processes using advanced algorithm are compares them with a stored database to automatically mark attendance through web page. The overall objective is to provide a reliable, efficient and scalable solution that can be deployed in various environments with minimal human intervention.

## II. CONVENTIONAL ATTENDANCE TECHNIQUES

The most basic method is manual attendance register where individuals sign their names or mark a checkbox to indicate presence. While method is simple and cost-effective it is highly time-consuming human error attendance.

To improve efficiency for electronic attendance system such as RFID-based methods were introduced. In system individuals are issued ID cards that they scan at a reader to mark attendance. Although more efficient than manual register RFID systems can still be misused through card sharing or loss require the maintenance of additional hardware. Biometric systems including fingerprint and face recognition have been implemented to enhance security and reliability. These systems utilize unique physical characteristic of individual to authenticate identity of reducing possibility of fraudulent attendance. Despite advancement conventional attendance techniques generally suffer from delays in processing. They often lack integration with real-time data management and reporting systems making it difficult to maintain accurate with timely attendance records for large groups of organization. These limitations highlight need for a modern, contactless and automated attendance system without the drawbacks of traditional methods.

## III. PROPOSED SYSTEM FOR CONTACTLESS ATTENDANCE SYSTEM

The proposed contactless attendance system is designed to automate attendance tracking by integrating advanced hardware components with artificial intelligence enabled efficient and identification without physical contact. The block diagram shown in the figure 3.1 represents control flow of data and control signals. At center of system is ESP32 microcontroller coordinates inputs from sensors and manages communication between different modules. System begins with ultrasonic sensor which continuously monitors presence of a person near device. sensor detects a subject within a predefined arrangements it triggers image sensor ( high resolution camera) to capture facial images. This selective triggering optimizes power usage and reduces unnecessary image processing. Captured images are forwarded from the microcontroller to AI module powered by NVIDIA Jetson Nano. This module handles computationally intensive tasks such as face detection and facial recognition using deep learning model particularly convolution neural networks (CNNs). The AI module processes the input images to extract unique facial features and compares them with stored facial database for identification.

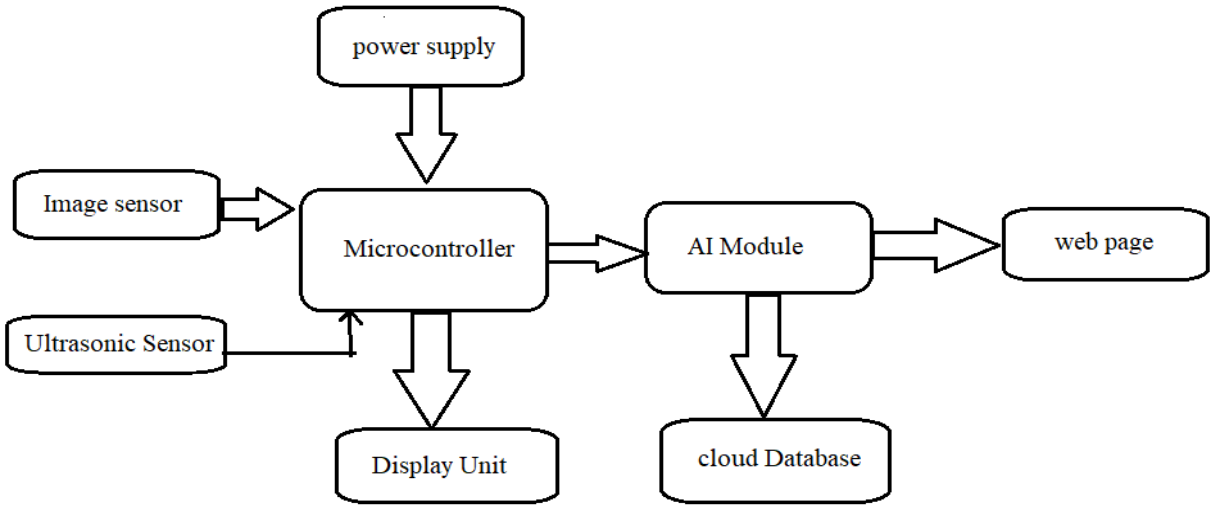


**Figure 3.1** Block Diagram for Proposed System

Once identification process is completed attendance data is updated stored securely in a cloud database enabling remote access and management. AI module also communicate attendance status to a web page interface providing administrator real time monitoring and reporting capabilities.

### Working Principle for Proposed System

An AI-based facial recognition to automate attendance recording without physical interaction between the user interfaces. An ultrasonic sensor continuously monitors area in front of the device to detected presence of a person. When an individual approaches within a predefined path range of particular distances of sensor send as signal to the ESP32 microcontroller it will process the data then activates image sensor to capture a facial image. This selective triggering conserves power improves system efficiency by avoiding unnecessary image captures. The captured image is transmitted to AI module powered by the NVIDIA Jetson Nano where advanced deep learning algorithms process image to detect and recognize user face. Using convolutional neural networks. System extracts unique facial features and compares them with a pre-registered database to accurately identify and compare individual. Upon successful recognition attendance record is automatically updated and stored securely in a cloud database.

## 4. HARDWARE RESULTS

The hardware implementation shown in the figure 4.1 of proposed contactless attendance system successfully integrates all components to deliver reliable and efficient performance. An image sensor produces high-quality images that are processed by NVIDIA Jetson Nano AI module performs facial recognition quickly and accurately. The system maintains real-time responsiveness with minimal latency enabling prompt attendance marking. LCD display provides clear and immediate feedback by showing recognized names and confirmation messages. Testing under various conditions including different lighting and angles shows the system robustness and accuracy in identifying individuals. Overall hardware setup proves to be scalable, reliable and suitable for deployment in educational and corporate environments meeting demands of contactless attendance monitoring.

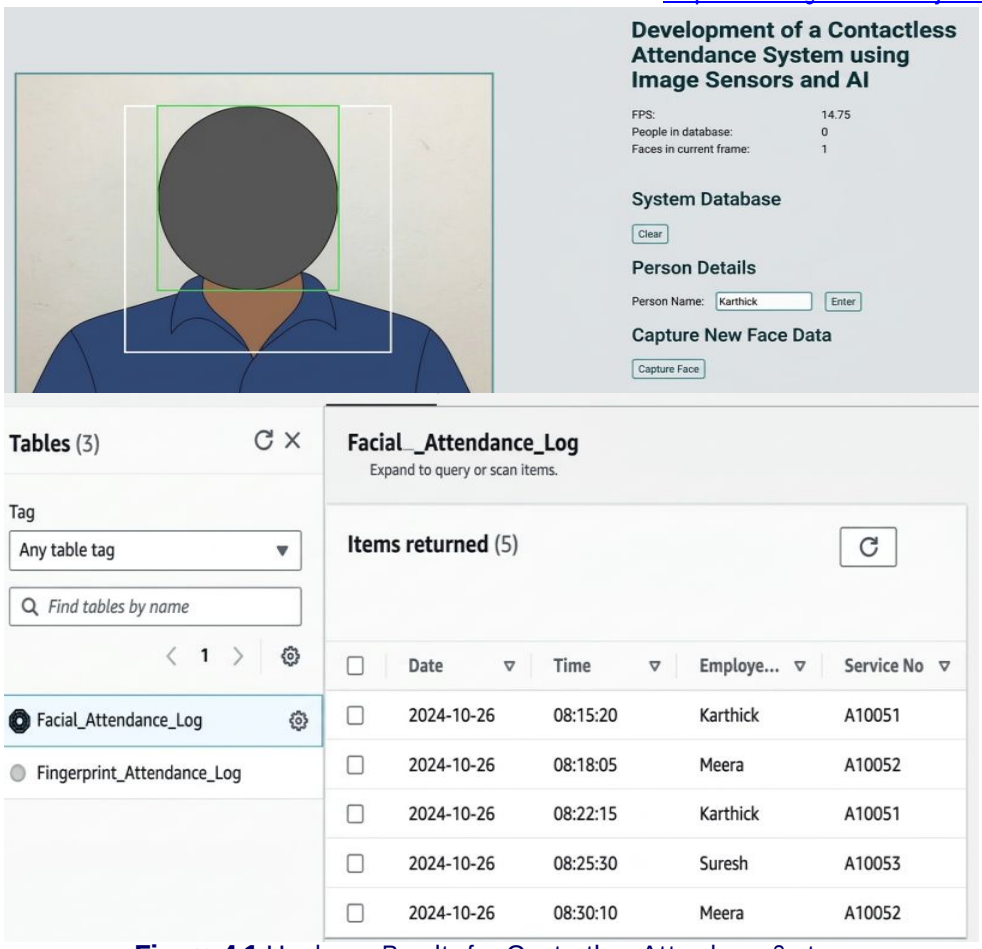


**Figure 4.1** Hardware Results for Contactless Attendance System

## 5. CONCLUSION

This paper proposed contactless attendance system demonstrates an effective integration of advanced hardware and artificial intelligence to automate attendance monitoring with high accuracy and efficiency. By utilizing image sensors, ultrasonic detection and AI-powered facial recognition system eliminates need for manual registers, ID cards or physical biometric devices ensuring a hygienic and contactless solution. Testing shows that the system performs consistently with minimal errors, fast processing and low latency. Its modular design allows scalability and adaptability for secure approach to attendance management, reducing human intervention and supporting large-scale deployment while maintaining accuracy and reliability.

## REFERENCE

1. S.Kothari, T.Kumthekar, M.Mulla, N.Bukane and T.A.Rane, "Intelligent Video-Based Attendance Tracking With Machine Learning," 2024 15th International Conference on Computing Communication and Networking Technologies (ICCCNT), Kamand, India, 2024, pp. 1–10, https://doi.org/10.1109/ICCCNT61001.2024.10724841
2. G.R.Venkatakrishnan, K.Karthick, S.S.Praveen, A.Balasubramanian, and M.Vignesh, "Design and Implementation of Automated Attendance System Using Contactless Facial Recognition," 2024 International Conference on Power, Energy, Control and Transmission Systems (ICPECTS), Chennai, India, 2024, pp. 1–6, https://doi.org/10.1109/ICPECTS62210.2024.10780113.
3. S.Pichetjamroen, E.Rattanalerdnusorn, C.Vorakulpipat, and A.Pichetjamroen, "Multi-Factor Based Face Validation Attendance System with Contactless Design in Training Event," 2021 18th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), Chiang Mai, Thailand, 2021, pp. 637–640, https://doi.org/10.1109/ECTI-CON51831.2021.9454779.
4. M.Joshi, S.Sikka, M.Pandey, and S.Tripathi, "Advance Attendance Management Through Face Recognition," 2025 7th International Conference on Signal Processing, Computing and Control (ISPCC), Solan, India, 2025, pp. 954–959, https://doi.org/10.1109/ISPCC66872.2025.11039556.
5. G.V.V. Reddy, Y.Manvitha, G.R.Teja, G.Maresh, and A.De, "Development of Attendance Monitoring System Using Facial Recognition," 2025 2nd International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE), Chennai, India, 2025, pp. 1–6, https://doi.org/10.1109/RMKMATE64874.2025.11042456.
6. Y.Alfiyya, A.Diamah and E.Sandi, "Attendance Detection System Using Bluetooth Low Energy Based on ESP32 with Realtime Monitoring Through Website," 2024 International Conference on Informatics Electrical and Electronics (ICIEE), Denpasar, Bali, Indonesia, 2024, pp. 1–6, https://doi.org/10.1109/ICIEE63403.2024.10920464.

7. A.D.Alexander, R.Salkiawati, H.Lubis, F.Rahman, H.Herlawati and R.T.Handayanto, "Local Binary Pattern Histogram for Face Recognition in Student Attendance System," 2020 3rd International Conference on Computer and Informatics Engineering (IC2IE), Yogyakarta, Indonesia, 2020, pp. 152–156, https://doi.org/10.1109/IC2IE50715.2020.9274621.
8. S.A.Alex, A.M.Alves, G.G.de Oliveira, G.C.Vaz and E.C.Cheng, "Face Attendance: Leveraging Facial Features for Attendance Tracking System," 2024 2nd International Conference on Information Network and Computer Communications (INCC), Hong Kong, China, 2024, pp. 22–30, https://doi.org/10.1109/INCC64392.2024.00013.
9. A.S.Olagoke, H.Ibrahim and S.S.Teoh, "Literature Survey on Multi-Camera System and Its Application," in IEEE Access, vol. 8, pp. 172892-172922, 2020, https://doi.org/10.1109/ACCESS.2020.3024568
10. L.Zheng et al., "A New Mutual Authentication Protocol in Mobile RFID for Smart Campus," in IEEE Access, vol. 6, pp. 60996-61005, 2018, https://doi.org/10.1109/ACCESS.2018.2875973.
11. A.Raj, A.Raj and I.Ahmad, "Smart Attendance Monitoring System with Computer Vision Using IOT," in Journal of Mobile Multimedia, vol. 17, no. 1-3, pp. 115-126, January 2021, https://doi.org/10.13052/jmm1550-4646.17135.
12. Â.Costa, P.Novais, J.M.Corchado and J.Neves, "Increased performance and better patient attendance in an hospital with the use of smart agendas," in Logic Journal of the IGPL, vol. 20, no. 4, pp. 689-698, Aug. 2012, https://doi.org/10.1093/jigpal/jzr021.
13. H.D.Thai,Y.S.Seo and J.H.Huh, "Enhanced Efficiency in SMEs Attendance Monitoring: Low Cost Artificial Intelligence Facial Recognition Mobile Application," in IEEE Access, vol. 12, pp. 184257-184274, 2024, https://doi.org/10.1109/ACCESS.2024.3504858.
14. S.M.Anzar, N.P.Subheesh, A.Panthakkan, S.Malayil and H. A. Ahmad, "Random Interval Attendance Management System (RIAMS): A Novel Multimodal Approach for Post-COVID Virtual Learning," in IEEE Access, vol. 9, pp. 91001-91016, 2021, https://doi.org/10.1109/ACCESS.2021.3092260.
15. V.Erdélyi et al., "Detecting Subtle Signs of School Attendance Issues Using Smartphone-Based Sensing," in IEEE Access, vol. 13, pp. 4652-4669, 2025, https://doi.org/10.1109/ACCESS.2024.3523108.
16. P.Yang, G.Dumont and J.M.Ansermino, "Adaptive Change Detection in Heart Rate Trend Monitoring in Anesthetized Children," in IEEE Transactions on Biomedical Engineering, vol. 53, no. 11, pp. 2211-2219, Nov. 2006, https://doi.org/10.1109/TBME.2006.877107