

INTEGRATING IOT WITH FACE RECOGNITION FOR ENHANCED ATTENDANCE MONITORING: A COMPREHENSIVE STUDY AND IMPLEMENTATION ANALYSIS

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The realm of attendance tracking within academic institutions has long been entrenched in manual processes, demanding substantial time and labor investments while upholding accuracy and deterring fraudulent practices. However, the emergence of automated systems harnessing technologies such as radio frequency identification (RFID), fingerprint scanning, face recognition, and iris scanning has ushered in a new era of streamlined attendance management. Despite these advancements, challenges persist, particularly concerning human intervention and scalability for large student populations. To bridge the gaps inherent in both manual and automated attendance systems, this study presents an innovative approach: a robust and efficient attendance marking system leveraging a single group image and sophisticated face detection and recognition algorithms. The system operates by capturing a high-resolution group image using a fixed-location camera, encompassing all students within a classroom environment. Subsequently, facial images are extracted from the group photo utilizing the renowned Viola-Jones algorithm, followed by recognition through a convolutional neural network trained on a comprehensive student face database. Experimental trials conducted on diverse group images and databases showcase the superior efficacy of the proposed framework concerning efficiency, implementation simplicity, and user accessibility compared to existing attendance systems. Notably, the system significantly reduces human-machine interactions, making it highly suitable for integration into smart classrooms, thereby augmenting automation and alleviating administrative burdens associated with attendance monitoring. This innovative approach heralds a transformative leap in attendance management, aligning with the ethos of digital transformation in educational ecosystems.