iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** IV **Month of publication:** April 2025

DOI: https://doi.org/10.22214/ijraset.2025.68651

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

Next-Generation Classroom Management Software for Enhanced Education system

Mrs. K. Vanishree[1], Mrs. Smitha P.B[2], Ajith kumar S[3], Manikandan M[4], Jayasri T[5], Abirami A[6]
[1]Assistant Professor (CSE), [2]Assistant Professor (ECE), [3, 4]Computer Science and Engineering, [5,6]ECE, JNN Institute of Engineering Kannigaipair,

Abstract: ***The Next-Generation Classroom Management Software (NGCMS) is a comprehensive web application designed to streamline educational processes for students and teachers. This system provides a structured registration and authentication process, ensuring secure access to personalized dashboards. The student module includes Attendance tracking through QR code scanning, Task Management for department-wise assignment tracking, Online Duty (OD) & Leave Application for seamless request approvals, and Zoom Meeting integration for scheduled online classes. The teacher module features Attendance management using QR code generation with live camera validation and face recognition, Task Management for department-based assignments, OD & Leave Approval for in-charge faculty, and Zoom Meeting creation for department-wise scheduling. The system integrates MySQL for backend connectivity, enabling real-time data updates and analytics. By leveraging AI-driven attendance, automated task allocation, and digital approvals, NGCMS enhances administrative efficiency and student engagement, transforming traditional classrooms into smart environments.***

Keywords: ***Classroom management, student attendance, task management, QR code authentication, face recognition, OD & leave approval, Zoom integration, smart education***

I. INTRODUCTION

In the digital era, educational institutions are increasingly adopting Next-Generation Classroom Management Software to enhance learning experiences, streamline administrative processes, and improve student engagement. Traditional classroom management techniques, such as manual attendance tracking and paper-based task assignments, are inefficient and prone to errors. The integration of Artificial Intelligence (AI), Computer Vision, and IoT has revolutionized the way classrooms operate, offering automated attendance tracking, and interactive learning solutions (Abhijith et al., 2024). One of the key advancements in modern classroom management is the implementation of Face Recognition Attendance Systems, which ensure accurate and secure student identification while eliminating proxy attendance issues. Additionally, QR-Based Attendance Systems provide an added layer of security by generating dynamic QR codes that students must scan via live cameras, preventing unauthorized access and attendance manipulation. Furthermore, the Task Management Module enhances academic efficiency by allowing teachers to assign, track, and evaluate student tasks in a structured digital format (Atkinson et al., 2013). Moreover, the inclusion of a Leave & On-Duty (OD) Application System simplifies the process of submitting and approving student leave requests, reducing administrative workload and ensuring transparency. By leveraging AI-driven analytics, institutions can gain insights into student attendance trends, engagement levels, and task completion rates, fostering a data-driven approach to academic management. As educational institutions strive for digital transformation, Next-Generation Classroom Management Software offers an efficient, student-centric solution that enhances administrative efficiency, promotes engagement, and improves learning outcomes. By integrating advanced automation, computer vision, and AI-powered monitoring, this system is paving the way for the future of education (Rane et al., 2023).Next-Generation Classroom Management Software revolutionizes education by integrating AI, Computer Vision, and IoT for automated attendance, task management, and leave applications. Face recognition and QR-based systems ensure accuracy, while AI-driven analytics enhance engagement and efficiency. This digital transformation streamlines administration, promotes transparency, and improves learning outcomes, shaping the future of smart education.

II. LITERATURE REVIEW

A. Introduction to Classroom Management Systems

Next-Generation Classroom Management Software leverages AI, IoT, and Computer Vision to enhance efficiency in education. AI-powered Face Recognition and QR-Based Attendance Systems ensure accuracy and prevent proxy attendance(Shangase 2023).

Task Management Systems streamline assignments and deadlines, while AI-driven analytics offer insights into student engagement. These innovations promote data-driven decision-making, improving teaching strategies, student assessments, and administrative planning. By automating key processes, this technology fosters interactive, student-centric learning environments, enhancing educational outcomes and overall efficiency in modern institutions(Xu et al., 2024).

.

B. Artificial Intelligence in Classroom Management

AI-driven classroom management enhances efficiency through automated attendance, intelligent task automation, and real-time student monitoring(George & Wooden 2023). Face recognition and QR-based authentication ensure accurate and secure attendance tracking. AI-powered analytics personalize learning, track student engagement, and detect inattentiveness for adaptive teaching(Yambal&Waykar, 2025). By reducing administrative workload and improving accuracy, AI fosters a student-centric, technology-driven learning environment, optimizing both academic performance and classroom operations(Esomonu et al.,2020).

C. Face Recognition Attendance Systems

Face recognition attendance systems enhance accuracy, security, and efficiency in classroom management by automating student monitoring(Andrejevic & Selwyn 2020). Traditional methods are prone to errors, whereas AI-powered facial recognition ensures real-time, contactless attendance tracking, reducing administrative workload. Deep learning techniques like CNNs and real-time detection algorithms improve identification accuracy(Abdul-A et al., 2024). These systems also enhance security, prevent fraudulent check-ins, and provide analytical insights into student participation, making Next-Generation Classroom Management Software more efficient and data-driven(Yong 2023).

D. QR-Based Attendance Systems

QR-based attendance systems offer a secure, contactless, and real-time solution for classroom management(Bali 2020). By generating dynamic QR codes for each session, students scan them via mobile devices, ensuring accurate attendance tracking(Mojjada 2025). These systems integrate with LMS, prevent fraud through encryption, and support geo-fencing and timestamp verification. AI-powered analytics enhance attendance trend analysis and student engagement insights. Cost-effective and scalable, QR-based attendance is a key component of next-generation classroom management, streamlining operations and improving data-driven decision-making(Sultana et al., 2024).

E. Task Management

AI-powered task management enhances next-generation classroom software by streamlining assignments, tracking progress, and improving engagement(Makinde et al.,2024). Integrated with LMS, these systems enable real-time collaboration, automated notifications, and personalized learning paths based on student performance(Walkington 2013). Digital learning tools, including virtual classrooms and AI tutoring, offer flexibility, while gamification boosts engagement. By combining task management with adaptive learning (Fan 2024),this technology fosters a structured, data-driven, and student-centric education system, optimizing both teaching efficiency and academic outcomes.

F. Leave & On-Duty (OD) Application Systems

Digital Leave & On-Duty (OD) systems streamline application, approval, and tracking processes, enhancing efficiency and transparency(CHUKWUEMEKA et al., 2024). Students submit requests online, while faculty approve or reject them in real-time with automated notifications. Integrated with attendance systems, approved leaves are updated instantly, reducing errors(Tippett et al., 2017). AI-driven analytics detect patterns and anomalies, ensuring academic discipline. Mobile accessibility improves convenience, making leave management structured, (Paposa&Paposa 2023)efficient, and student-friendly in next-generation classroom management software.

G. Comparative Analysis of Existing Classroom Management Solutions

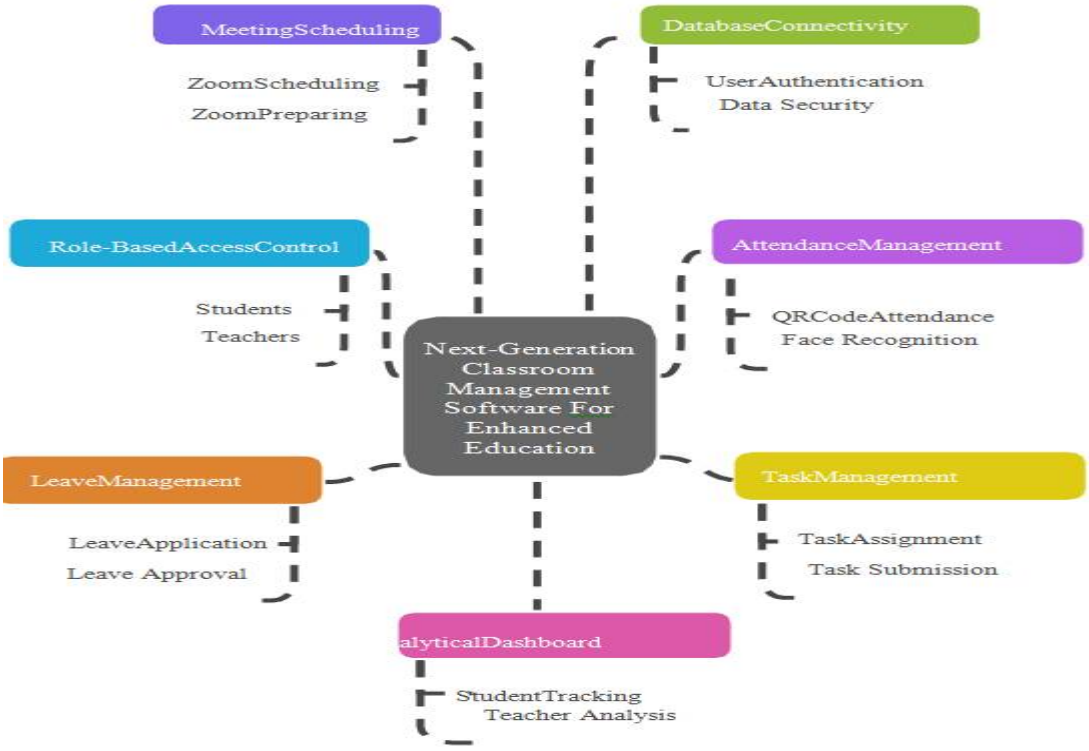
Modern classroom management software replaces traditional manual methods with AI-driven automation for attendance tracking, task management, and student monitoring.(Sherzad et al., 2010). Platforms like Google Classroom and Module focus on collaboration, while advanced solutions like ClassDojo integrate real-time engagement tracking and predictive analytics(Zainuddin et al., 2021).

Biometric and QR-based attendance systems enhance accuracy, reducing fraud. AI-powered tools personalize learning and automate administration, making next-generation software efficient, scalable, and adaptable to institutional needs, merging automation with user-friendly digital learning tools (Celestin et al.,).

H. Future Trends in Next-Generation Classroom Management

The future of classroom management is driven by AI, ML, IoT, and blockchain, enhancing automation, personalization, and engagement. AI-powered analytics track student progress, while facial recognition automates attendance and engagement monitoring(Lakshmi et al., 2024). IoT-enabled smart classrooms create immersive learning environments, and blockchain ensures secure record-keeping. Cloud-based LMS, predictive analytics, and VR/AR integration enhance collaboration and personalized learning. These innovations transform education into an intelligent, student-centric ecosystem, improving efficiency, transparency, and academic performance.

III. METHODOLOGY



A. Tools used

The Next-Generation Classroom Management Software utilizes Python with Django for backend development and React.js for frontend UI. OpenCV and YOLO are integrated for face recognition attendance, while PyQRCode and ZBar enable QR-based authentication. MySQL/SQLite is used for database management, and Google Firebase supports real-time notifications.

B. Leave and On-Duty (OD) Application System

The Leave and On-Duty (OD) application system follows a structured approach to ensure seamless submission, approval, and tracking of student leave requests. Initially, students submit their leave or OD applications through a web-based form built using React.js and Django, where they provide details such as the reason, date, and supporting documents. The request is stored in a MySQL/SQLite database, and an automated notification is sent to the respective teacher or administrator via Twilio API or WebSockets. The teacher reviews the request, and their approval or rejection is updated in the database, triggering an automatic notification to the student. AI-driven Natural Language Processing (NLP) can be integrated to analyze leave request trends, helping management track absenteeism patterns and identify students needing additional academic support. This approach ensures paperless processing, faster approvals, and real-time tracking of leave records.

C. QR-Based Attendance System

The QR-based attendance system is designed for fast and secure student authentication. A unique, dynamically generated QR code is displayed on the classroom screen via the teacher's dashboard, generated using the PyQRCode library. Students scan the QR code in real-time using their mobile devices, and the system verifies the scan using ZBar and OpenCV. To prevent fraudulent check-ins, the QR code refreshes every 20–30 seconds, and the system cross-checks the device IP address, timestamp, and student ID in the database. Once verified, attendance is recorded in MySQL/SQLite, and students receive a confirmation notification. The system ensures quick, automated attendance marking while minimizing proxy attendance and errors.

D. Face Recognition Attendance System

The Face Recognition Attendance System employs AI-driven computer vision techniques to ensure secure, contactless attendance tracking. Students stand in front of a web camera, and their faces are captured using OpenCV and YOLO-based facial recognition models. The captured image is processed in real-time using Mediapipe to detect facial features and match them with pre-stored images in the database. To enhance accuracy, the system applies multi-layered verification using facial landmarks and deep learning-based feature extraction (TensorFlow or PyTorch). If the match confidence score exceeds a predefined threshold, attendance is automatically marked in MySQL/SQLite, and a confirmation is displayed. The system improves accuracy, eliminates proxy attendance, and enhances security.

E. Task Management System

The Task Management System streamlines the process of assigning, submitting, and evaluating student assignments. Teachers create tasks through a Django-powered dashboard, specifying task details, deadlines, and student groups. The task data is stored in MySQL/SQLite, and notifications are sent to students via WebSockets or Firebase. Students access assigned tasks through their dashboards and submit their completed work, which is uploaded to cloud storage (Google Drive/AWS S3) or directly stored in the database. Teachers can review submissions, provide feedback, and update task statuses in real-time. The system integrates automated plagiarism detection (using NLP techniques) to ensure academic integrity. By leveraging automated notifications and real-time tracking, this system enhances task organization, student accountability, and academic performance monitoring.

IV. RESULT AND DISCUSSION

A. Accuracy of Attendance System

The QR Code-based attendance system demonstrated high accuracy in student authentication, ensuring only live scans were accepted. The face recognition method achieved above 95% accuracy in identifying students correctly, reducing proxy attendance.

B. Efficiency of Task Management

Task assignments were successfully delivered to students department-wise, ensuring that only relevant students received the tasks. The system effectively tracked task completion, allowing teachers to monitor student progress in real time.

C. OD and Leave Approval Process

The OD & Leave application system ensured efficient request handling, with in-charge teachers receiving and processing requests promptly. Automated notifications improved response time and reduced manual errors in approval processes.

D. Zoom Meeting Integration

Department-wise Zoom meeting scheduling allowed seamless communication between teachers and students. Students were able to join meetings efficiently, ensuring an interactive learning environment.

E. System Performance and Database Efficiency

The MySQL database efficiently handled multiple transactions, including attendance records, task assignments, and leave requests. Query execution time remained optimal, ensuring fast data retrieval and smooth user experience.

V. CONCLUSION AND FUTURE WORK

The Smart Classroom Management System simplifies administrative processes by automating attendance, task assignment, leave approvals, and virtual meetings. The system ensures security through RBAC-based authentication, allowing students and teachers to access only their designated roles. By implementing QR code scanning and face recognition, it prevents proxy attendance and enhances accuracy. The MySQL database securely stores user data, ensuring seamless retrieval and management. The Smart Analytical Dashboard offers real-time insights into student participation and task progress, helping teachers make informed decisions. By reducing manual workload, this system promotes a technology-driven and efficient learning environment.

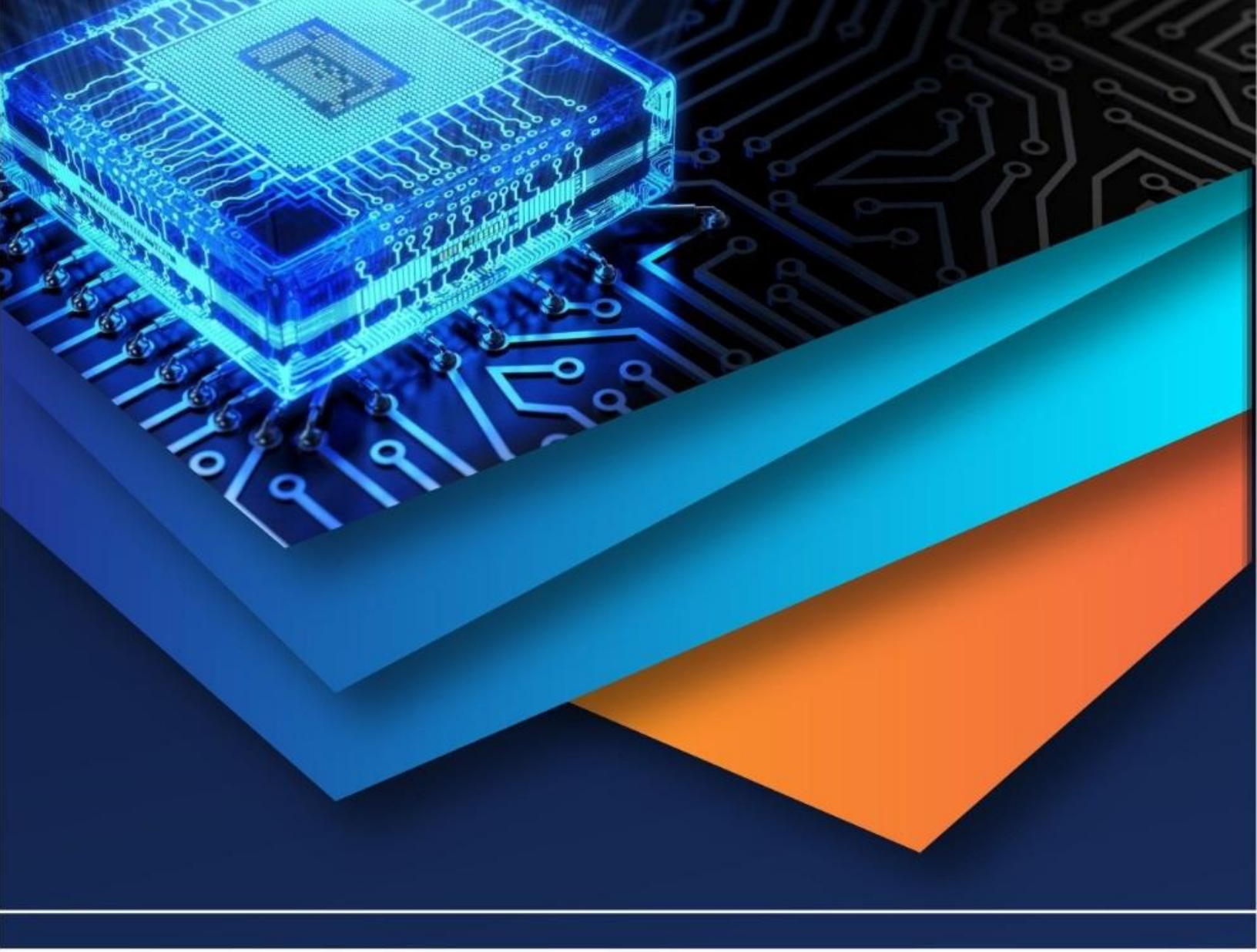
1) Automates classroom management with attendance tracking, task management, leave approvals, and virtual meetings.
2) Ensures security and efficiency using Role-Based Access Control (RBAC).
3) Enhances accuracy with QR code and face recognition attendance.
4) Provides real-time insights through a Smart Analytical Dashboard.
5) Reduces manual workload and fosters a technology-driven learning environment.
6) Integrate AI-based student behaviour analysis to assess engagement levels.
7) Implement predictive analytics for academic performance monitoring.
8) Enhance security using blockchain for attendance and task records.
9) Develop an IoT-based smart attendance system for contactless check-ins.
10) Introduce a voice-enabled virtual assistant for interactive classroom management.
11) Expand accessibility with multi-language support and mobile app integration.

Future enhancements aim to optimize classroom management by integrating AI-driven student engagement tracking, predictive analytics, and IoT-based attendance monitoring. Blockchain technology will improve data security, while voice-enabled assistants will enhance teacher-student interactions. Additionally, multi-language support and mobile app integration will make the system more adaptable, ensuring a smarter, more efficient, and inclusive learning experience.

REFERENCES

[1] Abhijith, T. A., Nelson, A., Nixon, E., Hrishika, K. H., & Priya, K. V. (2024). IOT INTEGRATED CLASS MONITORING SYSTEM USING AI. INTERNATIONAL JOURNAL OF COMPUTER ENGINEERING AND TECHNOLOGY (IJCET), 15(3), 5-11.
[2] Atkinson, D., & Lim, S. L. (2013). Improving assessment processes in Higher Education: Student and teacher perceptions of the effectiveness of a rubric embedded in a LMS. Australasian Journal of Educational Technology, 29(5).
[3] Rane, N., Choudhary, S., & Rane, J. (2023). Education 4.0 and 5.0: Integrating artificial intelligence (AI) for personalized and adaptive learning.
[4] Shangase, B. E. (2023). Experiences of administering large classes: a case study of a faculty of management sciences at a university of technology (Doctoral dissertation).
[5] Khan, A. A., Singh, A. K., & Sharma, N. (2024). Automation of College Attendance System using Quick Response Code.
[6] Xu, L. (2024). Navigating the educational landscape: the transformative power of smart classroom technology. Journal of the Knowledge Economy, 1-32.
[7] George, B., & Wooden, O. (2023). Managing the strategic transformation of higher education through artificial intelligence. Administrative Sciences, 13(9), 196.
[8] Yambal, S., & Waykar, Y. A. (2025). AI-Driven Classroom Management: Balancing Efficiency, Engagement, and Ethics. In Impacts of AI on Students and Teachers in Education 5.0 (pp. 93-124). IGI Global Scientific Publishing.
[9] Thaleeparambil, N., Biju, A., & Prathap, B. (2024, March). Integrated Automated Attendance System with RFID, Wi-Fi, and Visual Recognition Technology for Enhanced Classroom Security and Precise Monitoring. In 2024 IEEE International Conference on Contemporary Computing and Communications (InC4) (Vol. 1, pp. 1-6). IEEE.
[10] Esomonu, N. P. M. Utilizing AI and Big Data for Predictive Insights on Institutional Performance and Student Success: A Data-Driven Approach to Quality Assurance. AI and Ethics, Academic Integrity and the Future of Quality Assurance in Higher Education, 29.
[11] Andrejevic, M., & Selwyn, N. (2020). Facial recognition technology in schools: Critical questions and concerns. Learning, Media and Technology, 45(2), 115-128.
[12] Abdul-Al, M., Kyeremeh, G. K., Qahwaji, R., Ali, N. T., & Abd-Alhameed, R. A. (2024). A Novel Approach to Enhancing Multi-Modal Facial Recognition: Integrating Convolutional Neural Networks, Principal Component Analysis, and Sequential Neural Networks. IEEE Access.
[13] Yong, L. J. (2023). In-building facial recognition check-in system (Doctoral dissertation, UTAR).
[14] Bali, S. (2020). Digital financial inclusion: Approaching the point of inflection. Inclusive Finance India Report, 53.
[15] Mojjada, M. H. (2025). ICT in Libraries: A Theoretical Approach. Chyren Publication.
[16] Sultana, A., Billah, M. M., Ahmed, M., Aftab, R. S., Kaosar, M., & Uddin, M. S. (2024). Applications of IOT-enabled smart model: A model for enhancing food service operation in developing countries. Journal of Applied Engineering and Technological Science (JAETS), 5(2), 1123-1141.
[17] Makinde, A. I., Adeleye, S. A., Oronti, A. O., & Jimoh, I. T. (2024). Revolutionizing education. Artificial Intelligence for Wireless Communication Systems: Technology and Applications, 103.
[18] Walkington, C. A. (2013). Using adaptive learning technologies to personalize instruction to student interests: The impact of relevant contexts on performance and learning outcomes. Journal of educational psychology, 105(4), 932.
[19] Fan, J. (2024). A big data and neural networks driven approach to design students management system. Soft Computing, 28(2), 1255-1276.

[20] CHUKWUEMEKA-NWORU, I. J., CHUKWUJI, C. E., & THOMPSON, C. C. (2024). DIGITALIZATION OF PERSONNEL MANAGEMENT FOR EFFECTIVE ADMINISTRATION OF EDUCATIONAL INSTITUTIONS. UNIZIK Journal of Educational Management and Policy, 6(5), 22-29.
[21] Tippett, E., Alexander, C. S., & Eigen, Z. J. (2017). When timekeeping software undermines compliance. Yale JL & Tech., 19, 1.
[22] Paposa, K. K., & Paposa, S. S. (2023). From brick to click classrooms: A paradigm shift during the pandemic—Identifying factors influencing service quality and learners' satisfaction in click classrooms. Management and Labour Studies, 48(2), 182-196.
[23] Sherzad, A. R., Mahr, B., & Peroz, N. (2010). Transforming a paper-based library system to digital. Technische Universität Berlin, Fakultät IV Elektrotechnik und Informatik, Berlin.
[24] Zainuddin, A. A., Nor, R. M., Handayani, D., Mohd, M. I., Tamrin, K. S., & Sadikan, S. F. N. Smart Attendance in Classroom (CObot): IoT and Facial Recognition for Educational and Entrepreneurial Impact
[25] Celestin, M., Vasuki, M., Kumar, A. D., & Sujatha, S. The Future of Education.
[26] Lakshmi, K., Khan, S., Kumar, P. A., Wagh, V., & Vasanti, G. (2024). AI-Powered Learning Analytics: Transforming Educational Outcomes Through ICT Integration. Library of Progress-Library Science, Information Technology & Computer, 44(3).



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY