

Biometric Student Tracking Systems for Enhancing Educational Safety Management in Public Universities in Rivers State

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DOI: <https://doi.org/10.5281/zenodo.22147763>

Article History	Abstract
Original Research Article	<i>This study examined biometric student tracking systems for enhancing educational safety management in public universities in Rivers State. Three research objectives, three research questions, and three null hypotheses guided the study. The study adopted an analytic descriptive survey research design. The population of the study comprised 88,152 respondents, made up of 88,000 students and 152 security experts drawn from the three public universities in Rivers State, namely the University of Port Harcourt, Rivers State University, and Ignatius Ajuru University of Education. A sample of 550 respondents, comprising 398 students and 152 security experts, was determined using the Taro Yamane formula, while the multistage sampling technique was adopted in selecting the student respondents. The instrument used for data collection was a structured questionnaire titled “Biometric Student Tracking Systems for Enhancing Educational Safety Management in Public Universities Questionnaire”, validated by three experts in Educational Management and in Measurement and Evaluation from Rivers State University. The reliability of the instrument was established using the Cronbach Alpha method, yielding coefficients of 0.88, 0.76, and 0.82 for the three clusters respectively. The three research questions were answered using mean and standard deviation, while the three null hypotheses were tested using z-test statistics at the 0.05 level of significance. The findings revealed that fingerprint recognition systems (grand means of 3.20 for students and 3.12 for security experts), facial recognition systems (grand means of 3.07 for students and 3.12 for security experts), and iris recognition systems (grand means of 3.36 for students and 3.28 for security experts) all enhance educational safety management in public universities in Rivers State to a high extent. Based on the findings, the study recommended among others that university management, the Rivers State Ministry of Education, and the National Universities Commission should prioritise the phased deployment of fingerprint recognition systems as an accessible and cost-effective entry point for biometric safety management.</i> Keywords: Biometric Systems, Student Tracking, Educational Safety Management, Fingerprint Recognition.
Received: 24-06-2026	
Accepted: 29-07-2026	
Published: 28-08-2026	
Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited. Citation: ANITA, Fyeface, & WEY-AMAEWHULE, Blessing. (2026). Biometric student tracking systems for enhancing educational safety management in public universities in Rivers State. <i>UKR Journal of Arts, Humanities and Social Sciences</i>, 2(8), 231-240.	

Introduction

Safety and security in institutions of higher education have become one of the most pressing issues of educational governance in the twenty-first century. Universities across the world are expected to carry out their core mandates of teaching, research, and community service within environments that are free from violence, intrusion, and disorder. Unfortunately, physical security threats such as unauthorized access to campus facilities, cult-related violence, kidnapping, and other forms of criminal activity,

alongside identity-related fraud, continue to rise and pose a genuine challenge to the academic enterprise. These converging threats create a compelling case for the development of technologically advanced systems capable of tracking and managing, in real time, the physical presence and movement of persons within university premises. It is against this backdrop that a growing body of literature and research has been devoted to developing and evaluating biometric student tracking systems as a credible

response to the challenges of safety and security in educational institutions.

Biometric systems involve the automated measurement and analysis of distinct bodily or behavioural traits, including fingerprints, facial features, and iris patterns, to verify the identity of an individual and grant or restrict access in real time, offering advantages over conventional identity cards, passwords, and physical guards. Hernandez-de-Menendez, Morales-Menendez, Escobar, and Arinez (2021) reviewed existing literature on the use of biometric technology in education and reported that its most common applications are identification, access-point security, and attendance tracking, all of which enable educators to track students across school premises, including their arrivals, departures, and movements, thereby markedly improving institutional safety. When biometric technologies are combined with other digital technologies, such as cloud computing and the Internet of Things, they enable more sophisticated tracking capabilities in institutional settings; as Sahri, Karie, Ahmed, Wang, and Valli (2021) observed in their review of biometrics for Internet-of-Things security, biometric-based identification is considered reliable because it is difficult for an unauthorized person to obtain and use another individual's physical attributes to gain access to restricted systems.

Over the past decade, universities globally have increasingly adopted biometric access-control systems, with providers offering benefits such as real-time audit-trail reporting, enhanced security, and greater ease of access (Green, 2022). The demand for touchless, frictionless identity-verification systems accelerated during and after the COVID-19 pandemic, with facial recognition and fingerprint readers now commonly integrated with video surveillance and mobile credentials to provide multiple channels of authentication and real-time threat monitoring on campuses (Green, 2022). These global trends reflect a decisive shift toward the use of biometric technologies for safety management in educational environments.

In Nigeria, public universities continue to face serious challenges to effective learning as a result of campus insecurity. Cultism, armed robbery, kidnapping, and general criminal intrusion have been documented as recurring features of the Nigerian tertiary education landscape (GEN-Multidisciplinary Journal of Sustainable Development, 2023), with attendant fear, anxiety, and disruption of academic activities on many campuses. This challenge is particularly acute in the Niger Delta region, where oil-related socio-economic deprivation and a longstanding culture of militancy have compounded campus insecurity. Rivers State, at the heart of the Niger Delta and home to the University of Port Harcourt, Rivers State University, and Ignatius Ajuru University of

Education, among other institutions, exemplifies this vulnerability. Kpae (2019) linked the persistence of cult-related violence in the state to high youth unemployment and political patronage, noting that university campuses have increasingly become breeding and recruitment grounds for cult activity, while Amadi (2013) observed that cult-related violence around the University of Port Harcourt has, on occasion, disrupted academic activities and endangered the lives of students and lecturers alike.

Existing physical security arrangements in Nigerian public universities appear inadequate to address these evolving threats. Studies reviewing security infrastructure in Nigerian tertiary institutions have identified inadequate access-control systems, weak identity-verification mechanisms, and an absence of real-time monitoring as recurring institutional weaknesses, suggesting that reliance on security personnel and perimeter fencing alone is no longer sufficient given the complexity of contemporary security threats. The use of Information and Communication Technology to strengthen safety management in Nigerian public universities has therefore been recommended, with biometric student tracking systems standing out as a solution that combines technological sophistication, operational effectiveness, and the capacity for real-time safety management (Adebayo & Ojo, 2022). Although biometric technology has been investigated in the Nigerian higher education context primarily in relation to examination integrity and attendance management, empirical research examining biometric tracking specifically as a safety management strategy in Rivers State public universities remains scarce. It is this gap that the present study, drawn from a wider doctoral investigation, sought to address by examining the extent to which three widely deployed biometric modalities, namely fingerprint recognition, facial recognition, and iris recognition systems, enhance educational safety management in public universities in Rivers State.

Statement of the Problem

Public universities in Rivers State have in recent years experienced significant challenges in the management of student safety, arising from unauthorized access to campus facilities, inaccurate attendance tracking, and generally inadequate safety measures. These problems undermine the effective monitoring of student activities and create vulnerabilities that may result in security breaches, academic fraud, and compromised student safety. Traditional methods of student tracking, such as manual roll-calling and paper-based attendance systems, remain prone to error and manipulation and fail to provide the real-time data required to address the evolving security concerns of contemporary university environments. Biometric

systems, such as fingerprint, facial, and iris recognition, present a promising solution to these concerns; however, despite their potential advantages, there remains a lack of comprehensive empirical evidence on the extent to which these specific biometric modalities are perceived to enhance educational safety management in public universities in Rivers State. It is against this background that the study examined fingerprint recognition, facial recognition, and iris recognition systems as tools for enhancing educational safety management in public universities in Rivers State.

Purpose of the Study

The purpose of the study was to examine biometric student tracking systems for enhancing educational safety management in public universities in Rivers State. In specific terms, the study sought to:

1. find out the extent to which fingerprint recognition systems enhance educational safety management in public universities in Rivers State.
2. determine the extent to which facial recognition systems enhance educational safety management in public universities in Rivers State.
3. assess the extent to which iris recognition systems enhance educational safety management in public universities in Rivers State.

Research Questions

The following research questions guided the study:

1. To what extent does fingerprint recognition system enhance educational safety management in public universities in Rivers State?
2. To what extent does facial recognition system enhance educational safety management in public universities in Rivers State?
3. To what extent does iris recognition system enhance educational safety management in public universities in Rivers State?

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

1. There is no significant difference in the mean ratings of students and security experts on the extent to which fingerprint recognition system enhances educational safety management in public universities in Rivers State.
2. There is no significant difference in the mean ratings of students and security experts on the extent to which facial recognition system enhances educational safety management in public universities in Rivers State.

3. There is no significant difference in the mean ratings of students and security experts on the extent to which iris recognition system enhances educational safety management in public universities in Rivers State.

Methodology

The study adopted an analytic descriptive survey research design. The population of the study comprised 88,152 respondents, made up of 88,000 students across the three public universities in Rivers State, namely University of Port Harcourt (35,000), Rivers State University (28,000), and Ignatius Ajuru University of Education (25,000), and 152 security experts drawn from the same institutions. The sample of the study consisted of 550 respondents, comprising 398 students and 152 security experts, with the sample size determined using the Taro Yamane formula. The multistage sampling technique was adopted in selecting the student respondents: simple random sampling was first used to select four faculties from each institution; purposive sampling was then used to select final-year students within the selected faculties, on account of their longer exposure to campus security operations; and non-proportionate stratified sampling was thereafter used to select ten percent of final-year students in each selected faculty. The entire population of 152 security experts was studied as a census without further sampling, given its manageable size.

The instrument used for data collection was a structured questionnaire titled "Biometric Student Tracking Systems for Enhancing Educational Safety Management in Public Universities Questionnaire" (BSTSEESMPQ), comprising a section on the demographic characteristics of respondents and a section of structured items drawn from the research questions, rated on a four-point scale of Very High Extent (4), High Extent (3), Low Extent (2), and Very Low Extent (1). The face and content validity of the instrument was established by three experts, one in Educational Management and two in Measurement and Evaluation, all from Rivers State University, whose comments were incorporated into the final version of the instrument. The reliability of the instrument was determined through a test of internal consistency using the Cronbach Alpha method, following a trial administration to 20 students and security experts at Federal University Otuoke, Bayelsa State, an institution outside the sample of the study. Reliability coefficients of 0.88, 0.76, and 0.82 were obtained for the fingerprint recognition, facial recognition, and iris recognition clusters of the instrument respectively, indicating that the instrument was reliable for the purposes of the study.

The researcher, assisted by three trained research assistants, administered 550 copies of the questionnaire to the sampled respondents, out of which 532 valid copies were retrieved

and used for analysis, representing a 96.7 percent retrieval rate (380 from students and 152 from security experts). Data collected were analysed using mean, standard deviation, and z-test statistics. The three research questions were answered using mean and standard deviation, with item and cluster means interpreted using the following classification: Very High Extent (VHE) = 3.50–4.00; High Extent (HE) = 2.50–3.49; Low Extent (LE) = 1.50–2.49; and Very Low Extent (VLE) = 1.00–1.49. The three null hypotheses were tested using z-test statistics at the 0.05

level of significance; a null hypothesis was rejected where the calculated z-value exceeded the critical z-value, and retained where the calculated value was less than the critical value.

Results

Research Question 1: To what extent does fingerprint recognition system enhance educational safety management in public universities in Rivers State?

Table 1: Mean and Standard Deviation of Students and Security Experts on the Extent to which Fingerprint Recognition System Enhances Educational Safety Management in Public Universities in Rivers State

S/N	Items	Students (N=380)			Security Experts (N=152)		
		Mean	SD	Rmks	Mean	SD	Rmks
1	The implementation of a fingerprint recognition system significantly reduces unauthorized access to restricted areas on campus.	3.24	0.82	HE	3.16	0.74	HE
2	The use of fingerprint recognition systems enhances the accuracy of student attendance tracking, contributing to better safety management.	3.31	0.78	HE	3.22	0.69	HE
3	Fingerprint recognition systems help monitor student movement in real-time, improving campus security and safety protocols.	3.19	0.85	HE	3.12	0.71	HE
4	The integration of fingerprint recognition technology in university safety management systems improves the overall effectiveness of emergency response efforts.	3.27	0.79	HE	3.18	0.66	HE
5	The fingerprint recognition system enhances the identification of students in case of security breaches or emergencies, making it easier to ensure their safety.	3.42	0.73	HE	3.35	0.68	HE
6	The fingerprint recognition system provides a reliable and secure method of verifying student identity, reducing the risk of unauthorized access on campus.	3.15	0.81	HE	3.08	0.72	HE
7	The adoption of fingerprint recognition technology reduces the incidence of impersonation and proxy attendance, improving academic integrity alongside campus safety.	3.08	0.84	HE	2.97	0.75	HE
8	The use of fingerprint recognition systems creates a more secure campus environment, positively impacting the overall educational experience for students.	2.96	0.88	HE	2.89	0.77	HE
Grand Mean		3.20		HE	3.12		HE

Table 1 presents the mean and standard deviation ratings of students and security experts on the extent to which fingerprint recognition systems enhance educational safety management. All eight items were rated within the high-extent range by both groups. Students assigned their highest rating to item 5, on the enhancement of student identification during security breaches or emergencies (mean = 3.42, SD = 0.73), while security experts rated the same item highest (mean = 3.35, SD = 0.68). The lowest-rated item among students was item 8, on the creation of a more secure overall campus environment (mean

= 2.96, SD = 0.88), while security experts rated item 8 lowest as well (mean = 2.89, SD = 0.77). The grand mean of 3.20 for students and 3.12 for security experts indicates that fingerprint recognition systems are perceived to enhance educational safety management in public universities in Rivers State to a high extent.

Research Question 2: To what extent does facial recognition system enhance educational safety management in public universities in Rivers State?

Table 2: Mean and Standard Deviation of Students and Security Experts on the Extent to which Facial Recognition System Enhances Educational Safety Management in Public Universities in Rivers State

S/N	Items	Students (N=380)			Security Experts (N=152)		
		Mean	SD	Rmks	Mean	SD	Rmks
1	Facial recognition systems significantly improve access control to restricted areas on campus, ensuring that only authorized individuals can enter.	3.18	0.84	HE	3.22	0.71	HE
2	The use of facial recognition technology enhances the accuracy of student identification during attendance tracking, contributing to better safety management.	3.04	0.88	HE	3.14	0.75	HE
3	Facial recognition systems help monitor student movements in real-time, improving campus security and safety protocols.	3.12	0.82	HE	3.08	0.79	HE
4	The integration of facial recognition technology in university safety management systems improves the overall effectiveness of emergency response efforts.	2.97	0.87	HE	3.05	0.73	HE
5	Facial recognition systems enhance the identification of students in the event of security breaches or emergencies, making it easier to ensure their safety.	3.24	0.80	HE	3.19	0.68	HE
6	Facial recognition technology provides a reliable method of verifying student identity, reducing incidents of impersonation and unauthorized access to campus facilities.	3.09	0.83	HE	3.17	0.72	HE
7	The deployment of facial recognition systems deters potential security threats by increasing the perceived risk of detection and identification on campus.	2.88	0.91	HE	2.95	0.80	HE
8	The adoption of facial recognition systems creates a safer campus environment, positively impacting the overall educational experience for students.	3.05	0.86	HE	3.12	0.75	HE
Grand Mean		3.07		HE	3.12		HE

Table 2 presents the mean and standard deviation scores of students and security experts on the extent to which facial recognition systems enhance educational safety management. Both groups rated all eight items within the high-extent range, with security experts rating facial recognition systems marginally higher than students on most items. The highest-rated item among students was item 5, on enhanced identification during security breaches or emergencies (mean = 3.24, SD = 0.80), while security experts rated item 1, on

improved access control to restricted areas, highest (mean = 3.22, SD = 0.71). The lowest-rated item for both groups was item 7, on the deterrent effect of facial recognition on potential security threats (students mean = 2.88, SD = 0.91; security experts mean = 2.95, SD = 0.80). The grand mean of 3.07 for students and 3.12 for security experts indicates that facial recognition systems are perceived to enhance educational safety management in public universities in Rivers State to a high extent.

Research Question 3: To what extent does iris recognition system enhance educational safety management in public universities in Rivers State?

Table 3: Mean and Standard Deviation of Students and Security Experts on the Extent to which Iris Recognition System Enhances Educational Safety Management in Public Universities in Rivers State

S/N	Items	Students (N=380)			Security Experts (N=152)		
		Mean	SD	Rmks	Mean	SD	Rmks
1	The implementation of an iris recognition system significantly enhances access control to restricted areas on campus, ensuring only authorized individuals can enter.	3.35	0.79	HE	3.28	0.72	HE
2	Iris recognition technology provides highly accurate student identification for attendance management, reducing errors and improving safety records.	3.42	0.77	HE	3.34	0.68	HE
3	The use of iris recognition systems improves real-time monitoring of individual access across different university facilities and buildings.	3.29	0.82	HE	3.21	0.71	HE
4	Iris recognition systems contribute to more effective tracking of student movements, which enhances the overall safety management on campus.	3.47	0.74	HE	3.39	0.65	HE
5	The integration of iris recognition technology improves emergency response protocols by ensuring accurate identification during crises.	3.22	0.83	HE	3.15	0.74	HE
6	Iris recognition systems enhance the enforcement of campus security policies, ensuring only authorized individuals can access sensitive areas.	3.38	0.78	HE	3.30	0.69	HE
7	The adoption of iris recognition systems provides real-time data that supports proactive monitoring and risk management on university campuses.	3.44	0.76	HE	3.36	0.67	HE
8	The use of iris recognition technology fosters a safer campus environment, positively impacting the overall educational experience and security for students.	3.31	0.80	HE	3.24	0.72	HE
Grand Mean		3.36		HE	3.28		HE

Table 3 presents the mean and standard deviation ratings of students and security experts on the effectiveness of iris recognition systems for educational safety management. Iris recognition recorded the highest grand means among the three biometric modalities examined in this study, with students averaging 3.36 and security experts averaging 3.28, both within the high-extent range and approaching the very-high-extent threshold. Item 4, on the effective tracking of student movements, received the highest student rating (mean = 3.47, SD = 0.74), while security experts rated the same item highest as well (mean = 3.39, SD = 0.65). The lowest-rated item

among students was item 5, on the improvement of emergency response protocols (mean = 3.22, SD = 0.83), which was also the lowest-rated item among security experts (mean = 3.15, SD = 0.74). The consistently high ratings across all items from both groups indicate broad consensus that iris recognition systems, with their superior accuracy and non-contact functionality, are perceived as particularly effective tools for enhancing educational safety management in public universities in Rivers State.

Test of Hypotheses

1. There is no significant difference in the mean ratings of students and security experts on the extent to which fingerprint recognition system enhances educational safety management in public universities in Rivers State.

Table 4: Z-Test Analysis of Difference in Mean Ratings of Students and Security Experts on the Extent to which Fingerprint Recognition System Enhances Educational Safety Management in Public Universities in Rivers State

Respondents	N	Mean	SD	Df	z-cal	z-crit	Decision
Students	380	3.20	0.81	530	1.06	1.96	Accepted
Security Experts	152	3.12	0.91				

Table 4 shows that the calculated z-value of 1.06 is less than the critical z-value of 1.96 at the 0.05 level of significance with 530 degrees of freedom. The null hypothesis is therefore accepted. This means that there is no significant difference in the mean ratings of students and security experts on the extent to which fingerprint recognition system enhances educational safety management in public universities in Rivers State.

2. There is no significant difference in the mean ratings of students and security experts on the extent to which facial recognition system enhances educational safety management in public universities in Rivers State.

Table 5: Z-Test Analysis of Difference in Mean Ratings of Students and Security Experts on the Extent to which Facial Recognition System Enhances Educational Safety Management in Public Universities in Rivers State

Respondents	N	Mean	SD	Df	z-cal	z-crit	Decision
Students	380	3.07	0.91	530	0.66	1.96	Accepted
Security Experts	152	3.12	0.80				

Table 5 reveals that the calculated z-value of 0.66 is less than the critical z-value of 1.96 at the 0.05 level of significance with 530 degrees of freedom. The null hypothesis is therefore accepted. This implies that there is no significant difference in the mean ratings of students and security experts on the extent to which facial recognition system enhances educational safety management in public universities in Rivers State.

3. There is no significant difference in the mean ratings of students and security experts on the extent to which iris recognition system enhances educational safety management in public universities in Rivers State.

Table 6: Z-Test Analysis of Difference in Mean Ratings of Students and Security Experts on the Extent to which Iris Recognition System Enhances Educational Safety Management in Public Universities in Rivers State

Respondents	N	Mean	SD	Df	z-cal	z-crit	Decision
Students	380	3.36	1.01	530	1.15	1.96	Accepted
Security Experts	152	3.28	0.96				

Table 6 shows that the calculated z-value of 1.15 is less than the critical z-value of 1.96 at the 0.05 level of significance with 530 degrees of freedom. The null hypothesis is therefore accepted. This indicates that there is no significant difference in the mean ratings of students and security experts on the extent to which iris recognition system enhances educational safety management in public universities in Rivers State.

Discussion of Findings

The finding for research question one demonstrated that fingerprint recognition systems enhance educational safety management to a high extent, with grand mean scores of 3.20 for students and 3.12 for security experts. The corresponding hypothesis one confirmed no significant difference between the two respondent groups, indicating

broad stakeholder consensus on the value of fingerprint recognition. The highest-rated aspect was the ability of fingerprint systems to enhance student identification during security breaches or emergencies, reflecting the fundamental importance of reliable identity verification in crisis response scenarios. The reduction of unauthorized campus access and the improvement of attendance-tracking accuracy were also rated highly by both groups.

These findings are strongly supported by existing literature on biometric applications in educational institutions. Hernandez-de-Menendez, Morales-Menendez, Escobar, and Arinez (2021) reviewed biometric applications in education and reported that the most common uses include identification, access-point security, and attendance tracking, all of which were precisely the functions most

highly rated by respondents in the present study. Similarly, Badmus, Odekunle, and Oyewobi (2021) developed a smart fingerprint and RFID time-based attendance management system, demonstrating the practical effectiveness of fingerprint-based systems in institutional settings comparable to the public university environment in Rivers State. Wang, Gu, Liu, and Chen (2023) further confirmed that fingerprint sensors offer high accuracy, speed, and reliability for institutional security applications, providing empirical validation for the high-extent ratings recorded in this study. The lower ratings for items on reducing impersonation and creating a more secure campus environment overall, while still within the high-extent range, may reflect respondent awareness of the limitations of fingerprint systems, including susceptibility to spoofing and potential accuracy degradation under certain environmental conditions, highlighting the importance of deploying fingerprint systems as part of a multi-modal biometric framework rather than as a standalone solution.

The finding for research question two revealed that facial recognition systems enhance educational safety management to a high extent, with both students (grand mean = 3.07) and security experts (grand mean = 3.12) rating their effectiveness positively. The corresponding hypothesis two confirmed no significant difference between groups. Notably, security experts rated facial recognition systems marginally higher overall than students did, suggesting that professionals with security management experience perceive the operational benefits of facial recognition more acutely. The highest-rated item across both groups centred on facial recognition's capacity to enhance student identification during emergency situations, underscoring the technology's perceived value in high-stakes safety scenarios.

These findings align with recent international evidence on facial recognition in educational settings. Bugingo, Imbahafi, Umeonyirioha, Ahmad, and De La Croix (2025) presented a real-time face-tracking system for attendance management that demonstrates the operational maturity of facial recognition for institutional use. Ba, Nguyen, and Tran (2024) implemented a deep learning-based attendance-checking system at FPT University, reporting high accuracy and operational efficiency that directly supports the high-extent ratings recorded in this study. Ahmad, Zakariah, and Alotaibi (2025) likewise demonstrated the effectiveness of facial recognition modules in institutional safety management systems, with their results affirming the technology's reliability for access control and emergency identification. The relatively lower ratings for items on the deterrent effect of facial recognition may reflect concerns about algorithmic bias and accuracy disparities documented in prior research; Buolamwini and

Gebru (2018) demonstrated intersectional accuracy disparities in commercial facial recognition systems, particularly for darker-skinned individuals, a finding with direct relevance to the predominantly Afrocentric student populations of Rivers State universities and one that underscores the need for institution-specific validation testing before full-scale deployment.

The finding for research question three revealed that iris recognition systems enhance educational safety management to the highest extent among the three biometric modalities assessed in this study, with grand mean scores of 3.36 for students and 3.28 for security experts. The corresponding hypothesis three confirmed no significant difference between both groups, reflecting strong cross-stakeholder consensus. The highest-rated items concerned iris recognition's contribution to efficient tracking of student movements across campus, reflecting respondents' recognition of the technology's comprehensive monitoring capabilities.

These findings receive strong support from the scholarly literature on iris recognition in educational contexts. Haq and Saqlain (2023) conducted a machine learning-based iris detection study for attendance monitoring in educational institutions, finding exceptional accuracy and reliability that directly validates the high confidence ratings recorded in the present study. Ennajar and Bouarifi (2024) demonstrated the effectiveness of vision transformer-based iris recognition for student attendance monitoring, reporting accuracy levels that confirm iris recognition as a discriminatively powerful biometric modality for educational applications. Almomani, Al-Rawabdeh, and Abu-Shanab (2024) further documented the successful institutional deployment of iris recognition technology, with findings that affirm public acceptance and operational effectiveness in non-Western institutional contexts, providing a directly relevant precedent for Rivers State public universities. The fact that iris recognition recorded the highest grand means across both respondent groups is consistent with the widely documented superiority of iris recognition in terms of false match rates, template stability, and non-contact operation, though the comparatively lower rating on emergency response protocol improvement suggests that further attention should be paid to the speed and reliability of iris capture hardware under the conditions of stress, movement, and variable lighting that characterise genuine campus emergencies.

Conclusion

Based on the findings of the study, it was concluded that fingerprint recognition, facial recognition, and iris recognition systems each serve as effective tools for enhancing educational safety management in public universities in Rivers State to a high extent. Fingerprint

recognition systems provide an accessible and reliable foundation for access control and attendance verification; facial recognition systems offer non-contact, large-scale surveillance capabilities that are particularly valued by security professionals; and iris recognition systems, recording the highest grand means among the three modalities, stand out as the most consistently endorsed technology for high-security identification applications. The convergence of views between students and security experts on all three modalities, as confirmed by the corresponding hypothesis tests, indicates that biometric student tracking systems are recognised across stakeholder groups as a credible and effective mechanism for strengthening campus safety management. This positions biometric technology, and particularly fingerprint, facial, and iris recognition systems, as a foundational component of a broader strategy for safeguarding students and strengthening institutional resilience in Rivers State public universities.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. University management, the Rivers State Ministry of Education, and the National Universities Commission should prioritise the phased deployment of fingerprint recognition systems as an accessible and cost-effective entry point for biometric safety management in public universities in Rivers State. Fingerprint systems should be installed at main campus entry points, hostel gates, examination halls, and laboratory access points.
2. University administrators should invest in the deployment of facial recognition-enabled surveillance networks across campus public spaces, including lecture theatre corridors, administrative buildings, car parks, and perimeter zones. Implementation must be accompanied by transparent privacy governance frameworks that clearly communicate data collection purposes, retention periods, and access restrictions to all stakeholders.
3. Iris recognition systems should be adopted as the primary high-security biometric modality for access control to the most sensitive university facilities, including examination data management systems, postgraduate research laboratories, financial administration offices, and server rooms. Given its superior false match rate and long-term template stability, university management should accord iris recognition priority in security infrastructure investment plans.

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