

ARTIFICIAL INTELLIGENCE ADOPTION AND JUDICIAL FORENSIC INVESTIGATIONS PERFORMANCE

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Abstract

The study ascertained the relationship between artificial intelligence adoption and judicial forensic investigations performance in Rivers State. The objective of the study was to empirically unravel how artificial intelligence adoption relates with judicial forensic investigations performance in Rivers State in terms of accuracy and objectivity. The study adopted the cross-sectional explanatory survey research design. The target population of the study consisted of accessible two hundred and nine (209) respondents, which consisted of judicial officers, law enforcement officers, forensic analysts and IT experts, public prosecutors and legal practitioners, and court clerks and registrars, across Rivers State who are directly involved in handling computer forensics in the judicial system. The sample size of the study consisted of the entire population of two hundred and nine (209) respondents in the State. Hence, the study was a census research. The test of hypotheses was done using Pearson Product Moment Correlation through the Statistical Package for Social Sciences (SPSS) version 27.0. Drawn from the analysis of data carried out, the study revealed that there is a very strong positive relationship between artificial intelligence adoption and judicial forensic investigations performance in Rivers State, especially in terms of accuracy and objectivity. The study concluded that adopting artificial intelligence has a strong and positive relationship with judicial forensic investigations, particularly in strengthening evidentiary accuracy, neutrality, and credibility. Among others, the study recommended that judicial institutions in Rivers State should invest strategically in advanced AI-driven forensic tools, such as machine learning algorithms for evidence classification, digital trace analysis, and pattern recognition, to enhance the precision and reliability of evidentiary findings.

Keywords: Artificial Intelligence Adoption, Judicial Forensic Investigations Performance, Accuracy, Objectivity.

Background to the Study

The growing sophistication of crime and evidence manipulation in Nigeria has intensified the need for precision, objectivity, and technological integration in judicial forensic investigations. Judicial forensic investigations performance refers to the efficiency and reliability of scientific and technological methods used to gather, analyze, and interpret digital or physical evidence in judicial proceedings (Amadi & Ekanem, 2023). In Rivers State, lapses such as mismanaged evidence, delayed analyses, and subjective expert opinions have often undermined the credibility of forensic findings, thereby threatening the delivery of justice. Forensic credibility and evidentiary reliability are central to fair adjudication, as noted by Chukkol et al. (2021), who emphasized that forensic science strengthens judicial accuracy and transparency when properly managed. However, as courts increasingly handle technologically complex crimes, human-led investigative methods alone have proven insufficient. This reality underscores the relevance of adopting artificial intelligence (AI), a system capable of simulating human reasoning and learning, to improve evidence accuracy, streamline forensic processes, and minimize bias in judicial decision-making. By integrating AI-driven tools into forensic procedures, investigators can achieve higher data precision and enhance overall performance in judicial processes across Rivers State.

Artificial intelligence adoption, the integration of machine-based cognitive technologies into existing legal and forensic workflows, offers a transformative pathway to judicial efficiency. Defined as the systematic use of intelligent systems that perform tasks requiring human-like reasoning, perception, and learning (Okoye & Dike, 2022), AI has begun reshaping how forensic investigations are conducted worldwide. In the context of Rivers State, where case backlogs, evidence tampering, and poor data management have hindered justice delivery, AI adoption could revolutionize case handling by improving digital evidence authentication, predictive analysis, and documentation accuracy. Scholars such as Ayotunde and Adedokun (2020) stressed that the admissibility and integrity of electronic evidence depend on credible validation processes, an area where AI technologies such as pattern recognition, natural language processing, and machine learning can play decisive roles. Similarly, Wogu and Nwankwo (2021) argued that digital tools enhance transparency and speed in legal adjudication when applied to evidence examination. Hence, AI adoption not only modernizes forensic processes but also ensures impartiality and consistency in legal interpretations, ultimately strengthening the credibility of judicial outcomes.

Though there are obvious advancements in technology, but there remains a notable research gap in empirical studies that link AI adoption directly with forensic performance indicators such as accuracy and objectivity within Nigeria's judicial system, particularly in Rivers State. Previous studies have primarily examined electronic evidence admissibility (Ayotunde & Adedokun, 2020), digital forensic practice (Amadi & Ekanem, 2023), and the general role of forensic science in justice administration (Chukkol et al., 2021). While these works acknowledge the importance of digital innovation, none have empirically explored how AI integration influences measurable outcomes in judicial forensic investigations. Moreover, Eboibi and Mac-Barango (2020) observed that despite the legal recognition of digital forensics, its technological application remains inconsistent and underutilized across Nigerian courts. Similarly, Suleiman (2024) noted that AI-driven forensic models could significantly enhance crime detection and evidence interpretation but are yet to be systematically evaluated within the judicial setting. Therefore, this study fills a critical void by examining how artificial intelligence adoption relates with judicial forensic investigation performance in Rivers State, with a focus on accuracy and objectivity, two essential pillars of judicial integrity and evidentiary reliability.

Statement of the Problem

Judicial forensic investigations in Rivers State still suffer from low accuracy, poor evidence management, and limited objectivity due to overreliance on manual procedures and inadequate digital tools. These gaps often lead to inconsistent judgments, delayed justice, and questionable evidentiary integrity. Chukkol et al. (2021) observed that the limited integration of modern forensic technologies in Nigeria's justice system undermines the reliability of case outcomes. Similarly, Okoye and Dike (2022) found that the absence of digital verification mechanisms weakens the credibility of electronic evidence. Amadi and Ekanem (2023) also noted that the Niger Delta's judicial institutions lack sufficient forensic infrastructure, affecting investigative precision. Artificial Intelligence (AI) adoption, through predictive analytics, automated validation, and machine learning, offers a viable solution by improving accuracy, minimizing bias, and strengthening evidentiary reliability. As Ayotunde and Adedokun (2020) assert, AI-driven systems promote judicial integrity by reducing human error and enhancing objectivity. Hence, this study seeks to examine how AI adoption can improve the performance of judicial forensic investigations in Rivers State.

A major gap that motivated this study is the limited empirical investigation into how artificial intelligence (AI) adoption relates with the performance of judicial forensic investigations in Rivers State. Earlier studies have largely examined digital forensics, electronic evidence, and forensic science in general, but few have explored the direct impact of AI on crucial indicators like accuracy and objectivity in forensic processes. For instance, Amadi and Ekanem (2023) focused on digital forensics and evidentiary value in the Niger Delta, emphasizing procedural efficiency rather than AI-

based improvement; Ayotunde and Adedokun (2020) examined electronic evidence admissibility without considering AI-driven tools; and Chukkol et al. (2021) discussed the contribution of forensic science to justice administration without integrating AI as a variable. Likewise, Okoye and Dike (2022) analyzed forensic computing and evidence credibility but omitted AI adoption as a performance enhancer, while Chima and Eze (2020) explored electronic evidence and transparency without addressing intelligent technologies in forensic work. Collectively, these studies reveal a clear research void, none empirically examined how AI adoption enhances the accuracy and objectivity of judicial forensic investigations in Rivers State. Filling this gap is the distinctive contribution of the present study.

Conceptual Framework

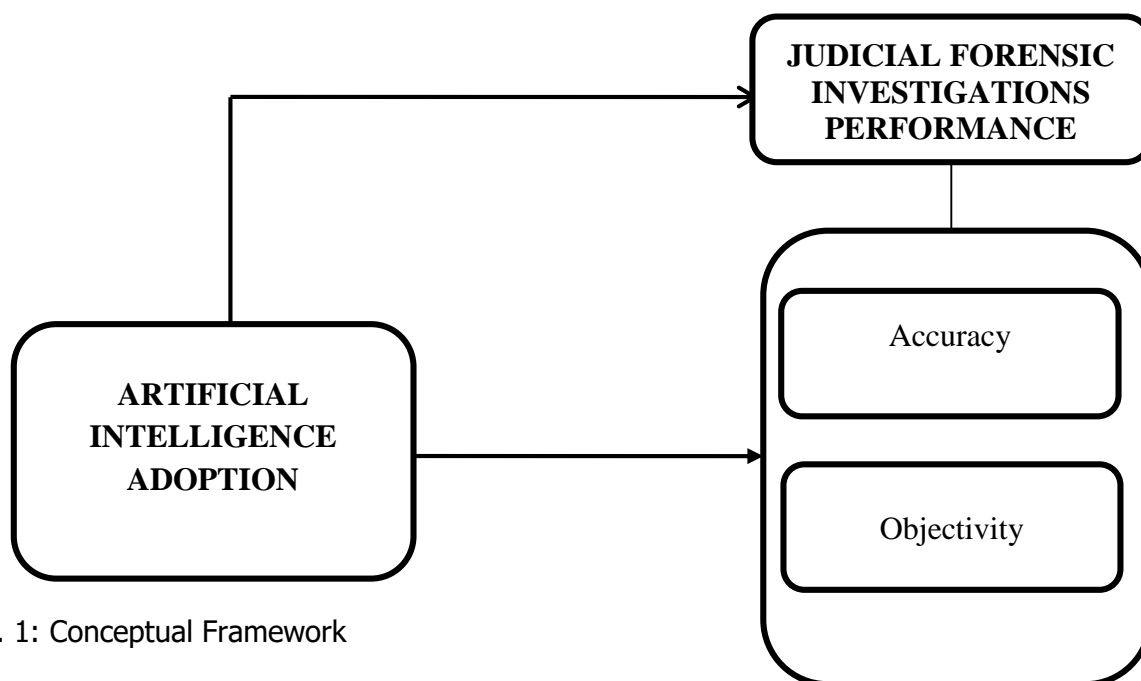


Fig. 1: Conceptual Framework

Source: The Researcher's Conceptualization (2026).

Aim and Objectives

The aim of the study was to ascertain the relationship between artificial intelligence adoption and judicial forensic investigations performance in Rivers State. The objectives of the study were to:

1. evaluate the relationship between artificial intelligence adoption and accuracy of judicial forensic investigations in Rivers State;
2. investigate the relationship between artificial intelligence adoption and objectivity of judicial forensic investigations in Rivers State.

Research Hypotheses

From the above research questions, the research hypotheses below were tested at 0.05 level of significance:

- Ho₁: There is no significant relationship between artificial intelligence adoption and accuracy of judicial forensic investigations in Rivers State.
- Ho₂: There is no significant relationship between artificial intelligence adoption and objectivity of judicial forensic investigations in Rivers State.

Theoretical Foundation

Theoretical Framework

This study is cemented on Technology Acceptance Model. The Technology Acceptance Model, proposed by Davis and Bagozzi (1989), is an information systems theory that models how users come to accept and use a technology. It is a well-established theory used to predict how users come to accept and use technology. The technology acceptance model has its roots in the Theory of Reasoned Action (TRA) and is widely applied to explain the behavioral intention of individuals to use technology in various organizational settings. The main idea of technology acceptance model is centered on two key assumptions: perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness refers to the degree to which a person believes that using a particular system will enhance their job performance, while perceived ease of use refers to the degree to which a person believes that using the system will be free of effort (Davis, 1989). Together, these factors predict whether an individual will adopt and use a particular technology. The theory assumes that:

- i. perceived usefulness directly influences the intention to use a technological system.
- ii. perceived ease of use, suggests that technology adoption is more likely if staff members find the system user-friendly.

The application of the Technology Acceptance Model (TAM) in digital forensic investigations, particularly in the context of AI-driven automated evidence analysis, has significant implications for understanding how forensic professionals adopt emerging technologies. Technology Acceptance Model focuses on the perceived usefulness and ease of use of new technologies, both of which are critical in high-stakes environments like digital forensics where timeliness and accuracy are non-negotiable. In a recent study by Liu *et al.* (2025), it was found that AI adoption in digital platforms is heavily influenced by the users' trust in system reliability and the perceived enhancement in decision-making speed. This aligns well with forensic settings, where investigators must quickly extract and interpret digital artifacts, often under legal scrutiny. Naqvi *et al.* (2025) further emphasize that when AI systems are integrated into investigative workflows with clear interfaces and explainable logic, users are more likely to rely on and internalize these tools. Hence, the model provides a robust framework for predicting whether investigators will accept AI tools based on their tangible contributions to task efficiency and forensic accuracy

The Concept of Artificial Intelligence Adoption

Artificial intelligence (AI) adoption has emerged as a defining feature of twenty-first-century digital transformation, reshaping how organizations analyze information, make decisions, and execute tasks that once depended solely on human intelligence. In its broadest sense, artificial intelligence adoption refers to the process through which individuals, institutions, or societies integrate AI systems, such as machine learning, natural language processing, and expert algorithms, into operational frameworks to enhance efficiency, accuracy, and decision quality (Dwivedi et al., 2023). This adoption process involves not only technological implementation but also strategic alignment, human readiness, and ethical governance. Similarly, Maroufkhani et al. (2022) define AI adoption as the systematic acceptance and utilization of AI technologies within organizations to improve performance, automate complex reasoning, and support predictive and prescriptive analytics. As emerging economies embrace Industry 4.0, AI adoption is increasingly viewed as a capability-building mechanism that transforms data into actionable intelligence, empowering professionals to handle tasks requiring speed, precision, and interpretive depth. However, successful adoption is often contingent on institutional trust, data infrastructure, and digital literacy, factors that determine whether AI serves as an empowering tool or a disruptive challenge (Mikalef et al., 2022).

In the judicial forensic landscape, AI adoption represents a paradigm shift from conventional investigative models to intelligent, data-driven justice systems. As courts and law enforcement agencies grapple with complex digital evidence, AI tools now assist in facial recognition, voice pattern analysis, cyber-forensics, and predictive analytics for case linkages and fraud detection.

Scholars such as Adediran and Bada (2024) argue that integrating AI in forensic processes enhances evidentiary reliability and accelerates legal adjudication by reducing human error and bias in expert testimony. Likewise, Bassey and Okon (2023) note that AI-driven forensic tools enable cross-referencing of digital artefacts and metadata in real time, improving case resolution rates and transparency in judicial review. Yet, the adoption of AI within forensic investigation in Nigeria and similar jurisdictions remains limited by ethical dilemmas, infrastructural deficits, and legal ambiguities surrounding algorithmic accountability. Thus, while AI adoption offers the promise of a smarter, more efficient judiciary, it simultaneously demands strong regulatory oversight and professional upskilling to balance innovation with justice integrity.

The Concept of Judicial Forensic Investigations Performance

Judicial forensic investigations performance refers to the efficiency, accuracy, and integrity with which the justice system employs scientific and technological methods to collect, analyze, and present evidence in court. It reflects not only the operational strength of forensic institutions but also their ability to transform scientific data into credible and admissible legal proof. According to Ngugi and Mwangi (2023), judicial forensic investigations performance denotes the extent to which forensic processes contribute to credible and timely case resolutions through systematic investigative science. Likewise, Ofori and Boateng (2022) define it as the measurable effectiveness of forensic operations, covering evidence accuracy, procedural compliance, and analytical precision, in improving justice outcomes. In modern judicial systems, performance in forensic investigations has evolved to include digital capability, institutional collaboration, and adherence to ethical standards (Afolabi & Ibrahim, 2024). Furthermore, the infusion of artificial intelligence, digital forensics, and automated case analysis now strengthens the speed and validity of judicial processes (Adeyemi & Chukwu, 2023). Hence, judicial forensic investigations performance represents a multidimensional framework capturing how science-driven justice upholds both legal efficiency and moral integrity. As seen in this study, judicial forensic investigations performance is measured using accuracy and objectivity.

Accuracy: Accuracy refers to the extent to which a measurement, observation, or analytical result reflects the true value or fact under investigation. Mensah and Okorie (2023) define accuracy as the degree to which investigative findings are free from error and faithfully represent objective reality within forensic and judicial contexts. As a key indicator of judicial forensic investigations performance, accuracy determines the reliability and admissibility of evidence presented in court (Nguyen & Aluko, 2024). When forensic processes achieve high accuracy, whether in digital evidence authentication or physical trace analysis, they enhance judicial credibility and prevent miscarriages of justice. Kibet and Adebayo (2022) emphasize that precision in documentation and interpretation strengthens trust in legal institutions, while technological innovations such as AI-driven forensic tools further improve accuracy by automating validation and reducing human error (Raji & Chukwu, 2024).

Objectivity: Objectivity represents the principle of impartiality and evidence-based reasoning that ensures findings are not influenced by personal bias, emotion, or external pressure. According to Daniels and Eze (2023), objectivity is the disciplined adherence to verifiable facts and standardized procedures in forensic practice, where conclusions are drawn solely from empirical data rather than subjective judgment. As an indicator of judicial forensic investigations performance, objectivity underscores the credibility and fairness of forensic outcomes, ensuring that the integrity of evidence is maintained throughout the investigative and judicial processes (Rahman & Ojo, 2024). When forensic analysts and investigators uphold objectivity, the likelihood of evidential contamination, procedural manipulation, or partisan interpretation is significantly reduced (Tsegaye & Mensah, 2022). Moreover, as Ndlovu and Akinyemi (2024) observe, the integration of digital tools and automated forensic systems further reinforces objectivity by minimizing human interference and

providing reproducible results that stand the test of legal scrutiny. Ultimately, objectivity anchors judicial forensic investigations on transparency and scientific neutrality, strengthening public trust in the justice system.

Methodology

The study adopted the cross-sectional explanatory survey research design. The target population of the study consisted of accessible two hundred and nine (209) respondents, which consisted of judicial officers, law enforcement officers, forensic analysts and IT experts, public prosecutors and legal practitioners, and court clerks and registrars, across Rivers State who are directly involved in handling computer forensics in the judicial system. This information was obtained from the HR units of the courts across Rivers State. The sample size of the study consisted of the entire population of two hundred and nine (209) respondents in the State. Thus, the study was a census research. The instrument was validated by the project supervisors and other experts in Office and Information Management, Ignatius Ajuru University of Education, Port Harcourt. Cronbach Alpha was used to ascertain the reliability of the instrument. The administration of the instrument was done by the researcher and two research assistants. Out of 209 copies of the questionnaire administered, 195 copies were retrieved.

The test of hypotheses was done using Pearson Product Moment Correlation through the Statistical Package for Social Sciences (SPSS) version 27.0. The test was used to analyze the relationship between independent and dependent variables at $P < 0.05$ (two-tailed test). The decision guiding the acceptance or rejection of the hypotheses was stated thus: The null hypothesis will be rejected if the significance value (p value) is below the alpha level of 0.05 level of significance, if otherwise, the null hypothesis will be rejected. In determining the strength of relationship, the correlation values were used based on the following interpretation scheme: (a) No Relationship = 0, (b) Low/Weak Relationship = 0.1-0.3 (c) Moderate or Relatively Strong Relationship = 0.4-0.6, (d) High/Strong Relationship = 0.7-0.9, (e) Perfect Relationship = 1.

Results

Ho₁: There is no significant relationship between artificial intelligence adoption and accuracy of judicial forensic investigations in Rivers State.

Table 1: Correlation between Artificial Intelligence Adoption and Accuracy

		Correlations	
		Artificial Intelligence Adoption	Accuracy
Artificial Intelligence Adoption	Pearson Correlation	1	.831**
	Sig. (2-tailed)		.000
	N	195	195
Accuracy	Pearson Correlation	.831**	1
	Sig. (2-tailed)	.000	
	N	195	195

** . Correlation is Significant at the 0.01 level (2-tailed).

Source: SPSS Output, 2026.

Table 1 above shows r value of 0.831 at a significance level of 0.00 which is less than the chosen alpha level of 0.05 for the hypothesis relating artificial intelligence adoption and accuracy. Since the significance value is less than the alpha level of 0.05, the null hypothesis (H₀₁) which states that there is no significant relationship between artificial intelligence adoption and accuracy of judicial

forensic investigations in Rivers State, was rejected. The correlation (r) of 0.831 implies that there is a very strong positive relationship between artificial intelligence adoption and accuracy of judicial forensic investigations in Rivers State.

H_{02} : There is no significant relationship between artificial intelligence adoption and objectivity of judicial forensic investigations in Rivers State.

Table 2: Correlation between Artificial Intelligence Adoption and Objectivity

		Correlations	
		Artificial Intelligence Adoption	Objectivity
Artificial Intelligence Adoption	Pearson Correlation	1	.884**
	Sig. (2-tailed)		.000
	N	195	195
Objectivity	Pearson Correlation	.884**	1
	Sig. (2-tailed)	.000	
	N	195	195

** . Correlation is Significant at the 0.01 level (2-tailed).

Source: SPSS Output, 2026.

Table 2 above shows r value of 0.884 at a significance level of 0.00 which is less than the chosen alpha level of 0.05 for the hypothesis relating artificial intelligence adoption and objectivity. Since the significance value is less than the alpha level of 0.05, the null hypothesis (H_{02}) which states that there is no significant relationship between artificial intelligence adoption and objectivity of judicial forensic investigations in Rivers State, was rejected. The r value of 0.884 implies that there is a very strong positive relationship between artificial intelligence adoption and objectivity of judicial forensic investigations in Rivers State.

Discussion of Findings

The tests of hypothesis one revealed that there is a very strong positive relationship between artificial intelligence adoption and accuracy of judicial forensic investigations in Rivers State. The analysis revealed that integrating artificial intelligence into forensic processes significantly improves the precision and reliability of judicial investigations in Rivers State. This aligns with growing evidence that AI systems, through machine learning and pattern recognition, reduce human error and enhance the accuracy of evidence analysis. Amadi and Ekanem (2023) found that digital forensic technologies in the Niger Delta improved evidentiary precision and reduced inconsistencies in litigation. Similarly, Okoye and Dike (2022) observed that forensic computing enhanced the credibility of electronic evidence by ensuring standardized data handling. Chukkol et al. (2021) further reported that intelligent forensic tools accelerated evidence validation and strengthened case outcomes in Nigeria's justice system. Likewise, Chima and Eze (2020) noted that AI-based automation promotes judicial transparency by producing objective, data-supported findings. Altogether, these studies confirm that artificial intelligence enhances accuracy, evidential integrity, and the overall credibility of judicial investigations in Rivers State.

The tests of hypothesis two revealed that there is a very strong positive relationship between artificial intelligence adoption and objectivity of judicial forensic investigations in Rivers State. The results demonstrate that the application of artificial intelligence in forensic practice greatly enhances impartiality and evidence-based judgment in judicial investigations within Rivers State. This outcome resonates with earlier findings emphasizing that AI-driven forensic tools reduce subjective biases and human inconsistencies in evidence evaluation. Amadi and Ekanem (2023) observed that the

integration of digital forensics in Niger Delta courts has minimized investigator bias by relying on algorithmic data analysis rather than intuition. Similarly, Okoye and Dike (2022) affirmed that forensic computing strengthens the credibility and neutrality of electronic evidence by providing traceable, reproducible outcomes. Chima and Eze (2020) further established that AI-enabled systems foster judicial transparency by standardizing case assessment procedures, ensuring fairness in rulings. Moreover, Chukkol et al. (2021) highlighted that objectivity in forensic science improves when advanced technologies guide evidence interpretation rather than human predisposition. Collectively, these studies reinforce that adopting artificial intelligence in forensic investigations promotes data-driven objectivity, thereby deepening judicial integrity and public confidence in the legal process across Rivers State.

Conclusion

This study has underscored the transformative role of artificial intelligence (AI) in enhancing the standards of judicial forensic investigations in Rivers State. The findings revealed that integrating AI technologies greatly improves the accuracy and objectivity of forensic processes, ensuring evidence handling and analysis are guided by data-driven precision rather than human bias. Conclusively, the study affirms that adopting artificial intelligence has a strong and positive relationship with judicial forensic investigations, particularly in strengthening evidentiary accuracy, neutrality, and credibility. These results emphasize the importance of sustained investment in AI-based forensic infrastructure, professional training, and supportive legal reforms to align justice delivery with global technological progress. Ultimately, the study reveals that the future of forensic excellence and judicial integrity in Nigeria rests on how effectively AI innovations are utilized to promote fairness, reliability, and efficiency within the justice system.

Recommendations

Based on the findings and conclusion, the following recommendations were made:

1. Judicial institutions in Rivers State should invest strategically in advanced AI-driven forensic tools, such as machine learning algorithms for evidence classification, digital trace analysis, and pattern recognition, to enhance the precision and reliability of evidentiary findings.
2. Judicial authorities should integrate AI-based decision-support systems that employ algorithmic neutrality and transparency in evidence evaluation to reduce personal or institutional bias in judicial determinations.
3. The Federal Ministry of Justice and relevant judicial oversight agencies should develop ethical and procedural frameworks governing AI use in forensic investigations to ensure that machine-assisted evidence evaluation remains impartial, verifiable, and compliant with legal and human rights standards.

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