

Artificial Intelligence and Machine Learning: A Review of Literature and Challenges

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ABSTRACT

Artificial Intelligence (AI) refers to the development and programming of computer systems and machines capable of simulating human reasoning, decision-making, and problem-solving processes. Machine Learning (ML), a subset of AI, involves the design of algorithms and computational models that enable systems to learn, adapt, and perform tasks with minimal human intervention. The financial sector has significantly benefited from the adoption of AI and ML through enhanced technological integration and automation in service delivery. The primary objective of this study is to examine the intricacies of existing research on the application of AI and ML within the financial industry. Specifically, the study undertakes a systematic literature review and explores the challenges associated with the adoption of AI and ML in financial service delivery. The paper adopts a systematic approach to critically review research articles published between 2011 and 2025, in line with established reporting standards on AI and ML applications in the financial sectors of both developed and emerging economies. Qualitative analysis was employed to validate and interpret the findings of the study. The findings reveal that AI and ML have emerged as disruptive technologies with immense potential to transform financial services by enhancing operational efficiency, accuracy, and effectiveness. Furthermore, the study highlights emerging trends in the application of AI and ML across the financial sector.

Keywords: Artificial intelligence, machine learning, financial sector, Chatbots, Internet of Things

INTRODUCTION

Globally, technological advancement has transformed virtually every sphere of human endeavour. Among the most transformative innovations are Artificial Intelligence (AI) and Machine Learning (ML), which have emerged as revolutionary technologies within the financial sector. The advent of AI in finance has fundamentally reshaped the conceptualization, development, and delivery of banking and financial services, thereby fostering a paradigm shift toward more intelligent, personalized, secure, and efficient financial systems. Artificial Intelligence refers to the branch of computer science concerned with the development of systems and machines capable of performing

complex tasks that typically require human intelligence. It is widely defined as the science of designing computer systems that can execute tasks involving reasoning, learning, problem-solving, and decision-making processes ordinarily associated with human cognition. In the banking and financial industries, AI plays a pivotal role in promoting the delivery of reliable, cost-effective, and innovative financial services. Consequently, AI has emerged as a disruptive technology with immense potential to revolutionize financial operations and service delivery. AI applications may exist in the form of intelligent machines or software systems, depending on organizational and operational requirements.

Machine Learning, as a subset of AI, emphasizes the development of algorithms and models capable of processing and analyzing large volumes of data, commonly referred to as Big Data. These systems possess the ability to learn automatically, adapt to changing patterns, and improve predictive accuracy and operational performance over time. Through continuous modification and optimization, ML enhances the efficiency and effectiveness of predictive analytics and decision-making processes (Abedin et al., 2021). Like many other industries, the financial sector extensively utilizes AI and ML technologies to support and optimize daily operations (Udodiugwu, Enramada, Onunkwo, Onyia, & Gloria, 2024).

The primary objective of financial institutions is to minimize liabilities while maximizing asset portfolios and profitability. In this regard, AI technologies assist banks and other financial institutions in inventory management, risk assessment, cash and cheque reconciliation, and overall operational efficiency. AI systems simulate human intelligence to create advanced technological solutions capable of executing tasks with remarkable speed and precision. In contemporary finance-driven environments, AI and ML are increasingly employed in routine operations, including customer service automation through chatbots, identification of investment opportunities, facilitation of international trade transactions, enhancement of lending models, and the detection and prevention of fraud within financial systems (Tieno, 2024).

Furthermore, the adoption of AI and ML enhances accessibility, improves accuracy, reduces operational costs, saves time, and strengthens regulatory compliance within financial institutions. Tieno (2024) identified several critical functions of AI and ML applications in finance, including improving operational efficiency, increasing profitability, supporting decision-making processes, enhancing analytical forecasting, managing risks, and facilitating credit underwriting. Examples of AI applications in the financial sector include Risk Management AI, Customer Service AI,

Fraud Detection and Cybersecurity AI, Process Automation AI, Predictive Analytics AI, and Regulatory Compliance AI, among others (Volovici, Syn, Ercole, Zhao, & Liu, 2022; Gruener & Raastad, 2018).

Artificial Intelligence and Machine Learning have undeniably revolutionized the financial industry through the automation of complex operations, enhancement of fraud detection mechanisms, and provision of highly personalized customer experiences. By analyzing extensive datasets in real time, these technologies enable financial institutions to mitigate risks more accurately and make informed, data-driven investment decisions. Ultimately, the integration of AI and ML is transforming the financial sector from a reactive industry into a proactive, highly efficient, and technologically driven ecosystem. Therefore, the primary objective of this study is to undertake a comprehensive literature review of Artificial Intelligence and Machine Learning and their applications within the finance-driven environment.

STATEMENT OF THE PROBLEM

AI and ML have emerged as transformative technologies with significant applications across sectors such as finance, education, agriculture, manufacturing, and governance. Despite the rapid advancement and widespread adoption of these technologies, several challenges continue to hinder their effective implementation and sustainability in financial sector. Existing literature reveals that issues such as data privacy and security concerns, algorithmic bias, lack of transparency and interpretability, inadequate technical infrastructure, and ethical dilemmas remain persistent obstacles in the development and deployment of AI and ML systems. Furthermore, many developing countries, including Nigeria, face additional constraints such as limited access to quality datasets, shortage of skilled professionals, weak regulatory frameworks, and insufficient investment in digital technologies, which reduce the potential benefits of AI-driven innovation.

Although numerous studies have examined the applications and benefits of AI and ML, there remains a gap in comprehensive literature that critically reviews both the technological advancements and the associated challenges affecting their adoption and performance. Most existing studies focus primarily on the opportunities presented by AI and ML, with limited attention given to the practical, ethical, and socio-economic barriers confronting their integration into modern systems. Consequently, there is a need for a detailed review of literature that synthesizes current knowledge on AI and ML while identifying the major challenges, limitations, and emerging concerns surrounding these technologies. This study therefore seeks to bridge this

gap by providing a critical review of the literature on AI and ML with emphasis on their challenges and future prospects.

THEORITICAL FRAMEWORK AND LITERATURE REVIEW

Several theories are connected to technology development. The study anchored on the following two theories of technology currently used in AI and ML studies:

Computational Intelligence Theory (Lotfi A. Zadeh, 1994)

The concept of Computational Intelligence (CI) was formally popularized by Zadeh in the 1990s as an alternative to traditional Artificial Intelligence. It focuses on adaptive systems such as fuzzy logic, neural networks, and evolutionary computation that can learn and evolve in uncertain environments. Computational Intelligence Theory explains how intelligent behavior can be simulated through computer systems using techniques such as neural networks, fuzzy logic, evolutionary computation, and machine learning algorithms. The theory emphasizes adaptive learning, pattern recognition, and decision-making under uncertainty, which are central to AI and ML systems. Computational Intelligence (CI) is highly relevant to modern AI and ML because it provides the foundation for systems that learn and adapt in uncertain and complex environments. It combines techniques such as fuzzy logic, neural networks, and evolutionary algorithms, which are core tools in machine learning. In AI, CI enables systems to make decisions even when data is incomplete, imprecise, or noisy. For example, fuzzy logic helps AI systems handle ambiguity in human language and real-world data, while evolutionary algorithms optimize machine learning models automatically. Therefore, CI supports the development of intelligent systems that mimic human reasoning and adaptive problem-solving.

Artificial Neural Network (ANN) Theory (Warren McCulloch, 1943)

The foundation of ANN theory was laid in their paper "*A Logical Calculus of Ideas Immanent in Nervous Activity*" (1943), which introduced the first mathematical model of artificial neurons. Later, researchers like Frank Rosenblatt expanded it through the Perceptron model in 1958. Artificial Neural Network Theory is one of the most important foundations of machine learning and deep learning. It is inspired by the structure and functioning of the human brain, where interconnected neurons process information and learn from experience. ANN theory supports technologies such as speech recognition, image classification, natural language processing, and predictive analytics. ANN theory is one of the most fundamental pillars of machine learning and deep learning. It provides the structure for building systems that learn from data in a way similar

to the human brain. In AI, ANN is used for pattern recognition, classification, prediction, and decision-making tasks. It powers technologies such as image recognition, speech processing, recommendation systems, and autonomous vehicles. Modern deep learning models, including convolutional and recurrent neural networks, are advanced extensions of ANN theory, making it central to today's AI revolution.

Many a plethora of literature on AI and ML in financial industry in Nigeria and other nations of the World are reviewed in this paper. Adejola (2024) investigated the effect of artificial intelligence (AI) investments on the performance of deposit money banks (DMBs) in Nigeria. The independent variable was AI investments, proxied by computer software expenses and computer software book value while the return on equity (ROE) was dependent variable. The findings of the study indicated that software expenses have an insignificant effect on ROE, while software book value has a significant negative impact. However, collectively, AI investments significantly affect the performance of DMBs.

Udodiugwu et al, (2024) examined the impact of artificial intelligence on the performance of selected commercial banks in Nigeria. The study conducted a survey of 128 employees from Access Bank, Fidelity Bank, Guaranty Trust Bank, and First Bank of in Awka, Nigeria, using a five-point Likert-scale questionnaire. It was found that implementing AI in customer service improves banks' non-financial aspects, while strong cyber security measures enhance financial performance.

Habashneh (2022) investigated the impact of cloud computing on the protection of financial application programs in the thirteen (13) commercial banks in Jordanian. The study population was limited to a category (branch manager, head of department, head of division and administrative) of employees in Jordanian commercial banks. The researcher distributed the 357 questionnaires to respondents. The results of the study confirmed the existence of significant impact of cloud computing on the protection of electronic financial application programs.

Ajayi (2022) investigated the impact of blockchain on financial technology in Nigeria using a systematic review. The search method began with the identification of digital libraries and web resources that were screened for relevant materials. Data were retrieved and organized into four major themes; concept, importance, impact, and challenges of blockchain on financial technology in Nigeria. It was discovered that blockchain technology has the potential to improve the efficiency of numerous areas of the financial industry such as cross-border payment, trade

finance, capital markets, as well as financial reporting and compliance. Blockchain deployment is expected to disrupt the banking and financial systems by enabling a new method of payment, speedier trade execution, a secure ledger, smart contracts, and a variety of other advances.

Parida (2021) x-rayed usage of Internet of Things in digital banking to enhance the customer experience. The objective of this article was to illustrate the smart contract applications of IoT in banking can be leveraged to optimise the customer service and risk management. The study focused on approach of these new initiative and developments for digital transformations of banks with these new technologies like Internet of Things.

Shemeis and Kamel, (2024) examined the impact of Artificial Intelligence (AI) applications (expert systems, genetic algorithms, artificial neural networks, intelligent Agents) on financial services quality dimensions (tangibility, reliability, responsiveness, assurance, empathy) and financial performance in the Egyptian bank sector. The researchers designed a questionnaire to collect data from the research sample which represented in (384) managers from the Egyptian bank sector. The researchers used an online survey through a snowball sample. Data was analyzed by SEM (structural equation modeling) using Smart PLS 4.0 and IBM SPSS 26 software. The results found that AI applications affect financial services quality except there is no significant effect of Artificial neural networks on tangibility and reliability.

Unuesiri & Adejuwon (2024) investigated the effect of artificial intelligence expert system on the financial performance of deposit money banks in Nigeria. The study analysed the secondary data of selected DMBs for the period 2015 -2023. The data were sourced from the Annual Reports of the DMBs, the Central Bank of Nigeria (CBN) Statistical Bulletin and World Development Indicators. The selected banks were five (5) DMBs (Access Bank, Zenith Bank, UBA, First Bank and GT Bank). The sampling technique used was the non-probability convenience sampling method. The study employed Error Correction Model (ECM) for time series regression to analyse equilibrium relationships in short run and long run behaviours. The findings showed that the resultant coefficients were positive and significant both during pre-expert system adoption.

Alqahtani (2024) investigated the impact of technological advancements on firm performance within the Islamic banking sector in Saudi Arabia. The study aimed at the role of Internet of Things (IoT) capabilities, Cloud Computing Capabilities (CCC), and Artificial Intelligence (AI) capabilities and explores how these technological dimensions influence operational efficiency, customer engagement, and competitive positioning. The research further

investigates the mediating role of digital innovation in translating technological capabilities into performance outcomes and examines the moderating effects of digital capabilities and IT flexibility on this relationship. The study demonstrated that IoT, CCC, and AI capabilities are crucial drivers of firm performance, offering significant opportunities for process optimization, service innovation, and market differentiation. Digital innovation is identified as a key mediator that enables Islamic banks to harness the full potential of these technologies. suggesting that the strategic integration of digital innovation practices is vital for realizing performance gains.

Hinge (2022) investigated the impact of artificial intelligence in banking sector. The scholar noted that artificial intelligence is not limited to usage of computer only in the banks for transactions but customers are also using net banking, mobile banking for day-to-day transactions. At the same time one step more ahead that use of artificial intelligence, robotics, block chain system in banking are the climax of technology. Artificial intelligence is necessary for banking sector to be competition in the world to meet expectations and competitive in ever changing (dynamic) world. It was recommended that banks need to have expansion and adaption regarding activities for sustaining the customers and acquiring new customer especially young customers.

Deepthi (2024) focused on artificial intelligence and machine learning techniques and its role in banks. The study found that banks and financial institutions are using various AI and ML services for the benefit of their customers to ensure that customers are satisfied with the services provided by banks and financial institutions. The results also suggested that customers are showing greater commitment to banking and financial services sector personnel by delivering developments and innovations to improve AI and ML practices in the workplace.

Horani, Khatibi, AL-Soud, and Tham (2023) reviewed the rise of business analytics adoption in banking and its impact on performance. The study presented an overview of business analytics as well as its adoption and impact on performance of banking industry. The scholars noted that banking is now interacting with customers over many internet channels or touchpoints. This progression into the digital realm is leading to a proliferation of big data, warranting advanced analytic methods to manage service systems effectively for banks. The study noted that Business Analytics (BA) techniques harness insights from data to improve customer experience and risk management in the banking industry.

Daniel (2024) examined the effect of cloud accounting on financial performance of listed deposit money banks in Nigeria. The judgmental sampling techniques was employed in selecting

the 15 firms out of 19 deposit money banks in Nigeria as at 2022. The finding revealed that computerized accounting system and accounting software has positive significant effect on return of asset. The study concludes that cloud accounting has a significantly positive effect on financial performance of deposit money banks in Nigeria. The study therefore recommended Central Bank of Nigeria and other banks' regulatory agents should evolve policies that aim at enhancing the use of computerized accounting system in deposit money banks in Nigeria as it helps boost their return on asset.

Habashneh (2022) examined the impact of cloud computing on the protection of financial application programs in the commercial banking sector in Jordan. Financial application was used as dependent variable while cloud computing was independent variable. The study population was limited to a category (branch manager, head of department, head of division and administrative) of employees where the researcher distributed the questionnaire. The results of the statistical analysis showed the existence of the impact of cloud computing on the protection of electronic financial application programs, and this effect is considered statistically significant, and the results showed that commercial banks are based on the application of cloud computing in their activities through financial programs.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN FINANCIAL SERVICES

Biometrics Authentication: A Biometric authentication device (BAD) is gradually gaining ground in Nigeria, as almost all commercial and microfinance banks have started implementation. The main benefit of a biometric authentication device is that, unlike traditional banking methods, where customers must wait in line for extended periods to withdraw money, a biometric authentication device (BAD) can be used at any time of the day and is not restricted to being located within banking premises. Debit cards are not used; the machine only recognizes and verifies the face and fingerprints of customers who intend to withdraw cash from the automatic teller machine. Biometric authentication is used in automated teller machines through fingerprint recognition and facial recognition (Okoi et al., 2025).

Regulatory technology (Rentech): This is the use of technology to meet regulatory compliance and other data reporting. AI and ML could also be used in supervising technology. That is, the regulators and supervisors may use it to oversee companies, firms, and financial institutions in their jurisdiction.

Chatbots: Chatbots are computer programs that intermingle with persons online by simulating human conversation through text and voice commands. AI chatbots are trained on large amounts of data and use ML to intelligently generate a wide range of unscripted conversational responses to human text and voice input. By integrating chatbots into banking apps, banks can make chatbots available to customers 24/7. By understanding customer behavior, chatbots can provide personalized customer support and recommend appropriate financial services and products. These chatbots and virtual assistants use Natural language Processing (NLP) and machine learning algorithms to understand customer requests, offer personalized solutions, and perform tasks like money transfers, balance inquiries, and account opening. These applications not only reduce waiting times but also improve the overall customer experience by offering personalized and targeted solutions. Secondly, AI-based chatbots can handle a high volume of customer requests simultaneously, providing a seamless and frictionless customer experience. Third, they can reduce operational costs for banks, as they require less staff to handle customer inquiries.

Marketing: Success in retail is about meeting customer needs. Any offer from the bank must address the customer's specific needs and concerns. ML in banking allows you to create personalized schemes to market your bank. A good way to identify customers for new products is data mining. Data analysis and machine learning projects require training datasets. This allows training of the algorithm. By looking at demographics, purchasing behavior, and history, data scientists can determine how likely a customer is to purchase a new product. Machine learning solutions for revenue forecasting analyze external and internal business data to create accurate demand and revenue forecasts for banking products. With bank deposit forecasting, banks are more likely to develop more personalized schemes to attract new customers. This also allows banks to improve their relationship with each customer. (Deepthi,2024)

INTERNET OF THINGS: The IoT aims at extending benefits of the internet, data sharing, remote control ability, constant connectivity and so on, to goods and services in the physical world (Peoples et al., 2013). Traditional banking operations such as Know your costumer, lending records management, collateral management, trade finance, payments, and insurance might be impacted by IoT. IoT can generate new P2P business models that have the potential to disrupt banking in a few sectors when combined with other upcoming technologies like digital identification and smart contacts. Smart contracts are computer programmes that help in contract negotiation, verification, and enforcement. Payments can be partially or entirely self-executing and

self-enforcing. For example, the product can be financed by bank and the contract can be linked to product. If customer does not pay regular monthly payments, then product usage can be stopped. The product can remind customer to make payment on time to keep usage intact. (Parida,2021)

Credit underwriting: It is used to assess the risk of potential borrowers defaulting on loan payment. AL and ML are employed to handle a number of challenges such as maximizing profit and minimizing cost as well as reducing risk. The new AL models can learn by themselves and make inferences and recommendations not identified by modelers in advance (Tieno, 2024)

AI Expert Systems: AI Expert Systems as software that uses artificial intelligence to replicate the expertise and problem-solving abilities of human professionals in specific domains (Cioffi, 2020; Ononokpono et al., 2023). Artificial Intelligence (AI) expert systems are digital intelligence, functioning as advanced computational tools designed to emulate the decision-making capabilities of human experts. An Expert System is a branch of AI that leverages sophisticated algorithms and machine learning techniques to simulate human expertise in problem-solving and decision-making processes. These systems have seen a surge in adoption across global banking institutions due to their ability to enhance operational efficiency, improve customer service, and optimize risk management (Unuesiri & Adejuwon, 2024). ES represents a sophisticated form of AI, in that it mimics the decision-making process of human experts to deliver superior performance in specific domains. The banking sector in Nigeria has deployed ES in augmenting decision-making processes to enhance operational efficiency and improve customer experiences. Expert Systems have also been used by the banks in risk management and credit rating/assessment and in fraud detection and management.

Portfolio Management and Robo-Advisory: The application of AI and ML in portfolio management has the potential to improve operational workflow efficiency and accuracy, improve performance, increase profits, and enhance customers (Lakhchini,2022). AI technologies help portfolio managers make better investment decisions and better use their vast amount of historical data. One example is the employment of robo-advisors, which are algorithms that adapt a financial portfolio to the user's goals and risk tolerance as well as automated financial advice and support.

Risk Management and Financial Distress: Financial risk management (FRM) is the process of managing a firm's economic value by reducing risk exposure through the application of financial instruments, particularly market risk and credit risk. Forecasting default risk by Machine learning (ML) algorithms is altering the way we think about risk management by revolutionizing all

elements of risk knowledge and control (Tatsat et al., 2020). Hence, finance-based scheduling maximizes project gains and creates schedules that guarantee the contractor's debt is kept within the credit limit at any point throughout the building process. For financial failure problems, ML models based on a given set of attributes describing a company's financial position, predict the probability that a company can face or fail the financial crisis. Pan (2012) constructed a financial distress model with a very good classification of Taiwan's companies and a good prediction capability using the robust Fruit Fly Optimization Algorithm.

Financial Fraud Detection and Anti-money laundering

In auditing and investigation, intelligent financial statement fraud detection technologies have been created to assist institutions and stakeholders in making decisions. Recent studies have discovered fraudulent distortion of financial statements in managerial statements. Omar, Johari and Smith (2017) proved the effectiveness of the ML model in detecting fraudulent enterprises and many other researchers have focused their analysis on structured data using data mining models (Lakhchini,2022). Yadav (2011) in Lakhchini (2022) employed text-mining techniques to propose the computational fraud detection model (CFDM), which is regarded as a fresh and effective computer model for identifying fraud tactics with a quantitative approach. Machine learning is used in banking and helps in fraud detection. It is also used to prevent fraud related to credit cards and insurance. Customers only want to work with banks that offer the best cybersecurity.

Data protection and Cyber Security

Introduction of deep learning systems, the costs of data engineering and data pre-processing are decreasing. Recently, a huge number of banks and financial institutions have begun to use AI in their applications to provide an exceptional level of customer experience, hence dismissing personnel since operations such as creating accounts, transferring money between accounts, and paying bills are all handled through mobile banking apps. These AI chatbots, powered by natural language processing, are serving banking and organizational clients swiftly and efficiently by noting regular questions and providing data in minutes without leaving their current location. Commercial banks may use AI to decrease loan losses, improve payment security, automate compliance-related tasks, and improve consumer targeting. However, data protection problems are inextricably connected to data security concerns, and not only in AI, but cybersecurity is also a long-standing issue in information and communication technology. In the cybersecurity world,

malware identification is another difficult issue. Thus, anti-malware, anti-spyware, personal firewalls, vulnerability assessment, and host-based intrusion prevention are all required in organizations. System vulnerabilities become a significant weapon for malware developers, despite the high-level security procedures in place. Anomaly-based detection and signature-based detection are the two types of malware detection approaches.

Algorithmic Stock Market Prediction and High-frequency Trading

The stock market is one of the routes where individual investors may generate substantial gains. As a result, trustworthy stock market predictions are required so that investors may make smart decisions about where and when to invest. In this case, ANN is a frequently utilized soft computing approach. Recognizing the inability of various traditional econometric methods to measure the fluctuations in currency exchange rates. Individual traders may use AI to make decisions related to purchasing, holding, or selling a stock. In this context, trading strategies to evaluate the performance of random forests networks as training approaches for forecasting out-of-sample directional movements of component stocks. Support Vector Regression (SVR) could also be used to forecast stock prices in three separate markets with high and small capitalizations. With high-frequency trading, automation conquers the long decision process differently. By adjusting for order size, fuzzy logic minimizes trading uncertainty in turbulent markets and trading expenses by requiring decision-making that is more consistent and conservative than buy or sell suggestions.

Business analytics: Business analytics has no direct definition. Horani et al, 2023 opined that business analytics involves the extensive use of diverse analytical tools complemented by a query and reporting mechanism to aid decision and policymakers in making well-informed and thoughtful decisions within a closed-loop framework, aiming for continuous process improvement through monitoring and learning from big data. BA is a set of technological solutions that provides powerful mechanisms for obtaining, generating, integrating, selecting, and disseminating knowledge relevant to the decision-making process. BA employs statistical and mathematical models, as well as advanced technologies like Artificial Intelligence (AI) algorithms. These tools facilitate optimal decision-making, trend prediction, and effective handling of other related tasks. BA has emerged as a crucial set of techniques that effectively harness insights from data, leading to notable improvements in customer experience and risk management within the banking industry.

Blockchain: It is a decentralized digital ledger technology that records transactions and data in a secure, transparent, and immutable manner across a network of computers. A blockchain is an organized, decentralized, unchangeable database that facilitates the recording of network transactions. Instead of storing information in a single central database, blockchain distributes data across multiple nodes, making it difficult to alter, hack, or manipulate records without consensus from the network participants. Each block in the chain contains a set of verified transactions linked cryptographically to the previous block, thereby ensuring data integrity, accountability, and trust. Blockchain technology is widely associated with cryptocurrencies such as Bitcoin, but its applications extend to areas such as supply chain management, healthcare, finance, voting systems, and digital identity management. Blockchain helps ensure that such data are authentic, traceable, and protected from unauthorized alterations. This improves the quality and trustworthiness of machine learning models. Blockchain also supports decentralized AI systems by enabling secure sharing of datasets among organizations without compromising privacy.

Cloud accounting (computing): Cloud computing is the method by which the application software is operated, and the data related to it is stored in mainframe computer systems, while providing customers or users access to it via the Internet (Habashneh, 2022). Cloud computing expresses services that are carried out through devices and software connected to a network of servers that carry their data in a virtual cloud that ensures their connection permanently and at all times without interruption, with different devices and all ports, by granting permissions to users from both parties. Cloud accounting simply is the entry of accounting software and information via the internet (Daniel, 2024). End users use cloud-based apps through a web browser or a variety of different applications, while the software and data are stored on typically third-party servers (Daniel, 2024). Cloud accounting is the process of accessing accounting software and data over a web application. The programme is available on a subscription basis, and the data is saved on a remote server (Tahmina, 2017). According to Adwan and Alsaeed (2022), Cloud Computing (CC) is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. The transformation of the banks into cloud computing has eight advantages. This includes optimized environments, overcoming challenges, high speed bandwidth, multichannel

integration, new offerings, high revenue gain, low cost of data centers, flexible platforms for advanced banking services. Sriram (2011) and Korizma (2019) noted that applications in the cloud can be accessed via web browser, thin clients or mobile devices because the data (software, platform and infrastructure) is stored on hardware at a remote location. . Examples of Accounting Software are SAGE, Peachtree, QuickBooks, Wave Accounting to mention a few.

E-Tax and Digital Revenue Platforms with AI Integration: Lagos State uses digital tax systems such as e-tax platforms that are increasingly being enhanced with AI and ML features. These systems automate tax filing, payment processing, and compliance tracking. The model reduces manual tax processing errors, speeds up tax collection, enhances automation and efficiency.

ISSUES AND CHALLENGES IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN FINANCIAL SECTOR

The major issues affecting Artificial Intelligence (AI) and Machine Learning (ML) in Nigeria include technological, economic, institutional, ethical, and human-capital challenges. These issues significantly limit the development, adoption, and effectiveness of AI and ML technologies in the country. Moreover, many consumers, entrepreneurs, intrapreneurs and other small businesses oppose adoption of AI and ML on the grounds that it introduces bias , risk, and potential for manipulation, cut down jobs and is not economically viable for a developing economy.

Inadequate Infrastructure: One of the biggest issues is poor technological infrastructure. AI and ML systems require stable electricity, fast internet connectivity, cloud computing services, and advanced computing hardware. However, frequent power outages, poor broadband penetration, and limited digital infrastructure in Nigeria hinder efficient AI operations and innovation.

Shortage of Skilled Professionals: Nigeria faces a shortage of experts in AI, machine learning, data science, robotics, and software engineering. Many universities still lack modern AI-focused curricula, research facilities, and practical training programs. Additionally, skilled professionals often migrate abroad in search of better career opportunities, resulting in brain drain.

Poor Data Availability and Quality: Machine learning models depend heavily on large, reliable, and organized datasets. In Nigeria, data collection systems are often weak, fragmented, and poorly managed. Many institutions still rely on manual record-keeping, making it difficult to obtain quality data for AI training and analysis.

Limited Funding and Investment: AI research and innovation require substantial financial investment. In Nigeria, government funding for technological research is limited, while private-

sector investment in AI startups and innovation hubs remains relatively low. This slows research development, commercialization, and adoption of AI technologies.

Weak Regulatory and Policy Framework: There is inadequate regulation and policy guidance governing AI and ML usage in Nigeria. Issues relating to data privacy, cybersecurity, algorithmic accountability, and ethical standards are not yet fully addressed through comprehensive legal frameworks. This creates uncertainty and potential misuse of AI systems.

Ethical and Security Concerns: AI systems may produce biased or unfair outcomes if trained on poor-quality or discriminatory data. There are also concerns about cybercrime, surveillance, misinformation, identity theft, and misuse of AI technologies. Many organizations lack strong cybersecurity systems to protect sensitive information.

High Cost of Technology: The cost of acquiring AI software, hardware, cloud services, and specialized tools is very high for many Nigerian businesses, institutions, and researchers. Small and medium-sized enterprises (SMEs) particularly struggle to afford AI integration into their operations.

Low Awareness and Resistance to Adoption: Many organizations and individuals in Nigeria still have limited understanding of AI and ML technologies. Some businesses resist adopting AI due to fear of job displacement, lack of trust in automated systems, or uncertainty about the benefits of digital transformation.

Limited Research and Development: Research output in AI and ML from Nigerian institutions remains relatively low compared to global standards. Factors such as inadequate funding, poor laboratory facilities, and weak collaboration between academia and industry reduce innovation and technological advancement.

Digital Divide: The unequal access to digital technologies between urban and rural areas creates disparities in AI adoption. Rural communities often lack internet access, digital literacy, and technological infrastructure, making inclusive AI development difficult.

CONCLUSION

The study reviewed existing literature and empirical contributions from various scholars concerning the applications of Artificial Intelligence (AI) and Machine Learning (ML) in financial services, as well as the associated issues and challenges surrounding their adoption and implementation. The findings of the study revealed the critical need for the integration of AI and

ML tools within financial institutions in order to enhance operational efficiency, improve service delivery, and strengthen overall organizational performance.

Artificial Intelligence and Machine Learning technologies are extensively utilized across the financial industry in areas such as biometric authentication, regulatory technology (RegTech), chatbots, the Internet of Things (IoT), financial surveillance, risk management, marketing, data retention, data management, electronic tax administration, and algorithmic trading, among others. These technologies have significantly transformed the operational landscape of financial institutions by enabling automation, improving analytical capabilities, and facilitating real-time decision-making processes. Furthermore, the study underscored the importance of encouraging bank customers and other financial service users to adopt and leverage AI-driven solutions to enhance service accessibility, efficiency, customer interaction, and overall user experience within the financial ecosystem.

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