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Artificial Intelligence and Counter-Piracy Operations in the Guinea: Assessing the Implications for Oceanic Security in Nigeria's Maritime Atmosphere

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Abstract

The Gulf of Guinea remains one of the world's most strategically significant maritime regions, serving as a vital corridor for international trade, energy transportation, and economic activities. Despite its importance, the region has experienced persistent maritime piracy and other transnational maritime crimes that threaten regional stability, economic development, and national security. This study examines the role of Artificial Intelligence (AI) in counter-piracy operations and assesses its implications for maritime security in Nigeria's maritime environment The study seeks to evaluate the extent to which AI-driven technologies have enhanced maritime surveillance, threat detection, situational awareness, and operational response to piracy incidents within the Gulf of Guinea. The study is anchored on Securitization Theory, which explains how piracy is constructed as an existential security threat requiring extraordinary measures, including the deployment of advanced technological solutions. A quantitative research design was adopted, utilizing structured questionnaires administered to personnel drawn from relevant maritime security agencies and stakeholders. Data were analyzed using descriptive and inferential statistical techniques. The findings reveal that AI-enabled technologies have significantly improved real-time maritime monitoring, predictive threat analysis, anomaly detection, and decision-making processes, thereby contributing to a reduction in piracy incidents and enhancing maritime domain awareness. However, the study also identified challenges such as inadequate indigenous technological capacity, fragmented data management systems, dependence on foreign technology providers, insufficient automation, and limited personnel training. The study concludes that AI has emerged as a critical force multiplier in Nigeria's maritime security architecture. It recommends increased investment in indigenous AI capabilities, enhanced inter-agency collaboration, sustained capacity building, and the development of a comprehensive national AI-maritime security framework to strengthen counter-piracy operations and maritime security in the Gulf of Guinea.

Background of the study

The Nigerian government, through the Nigerian Navy, has incorporated AI-driven technologies as well as drones and satellite surveillance, to enhance maritime domain awareness. For example, at the inauguration ceremony of the 12 British-made Ovation unmanned aerial vehicles (UAVs) by Comstrac Systems, the Chief of Naval Staff, Vice Admiral Emmanuel Ogalla, emphasized that in an era characterized by rapidly evolving warfare, the adoption of cutting-edge technologies is imperative for bolstering national security (Africa Defence Forum, 2024). These tools offer real-time intelligence, surveillance, and reconnaissance capabilities that facilitate continuous monitoring of Nigeria's territorial waters (Africa Defence Forum, 2024). The application of AI in analyzing data from UAVs and satellite imagery assists in identifying suspicious activities, counting individuals on vessels, and verifying compliance with maritime regulations (Maritimes Crimes, 2025). Additionally, AI enhances coordination among maritime agencies through integrated communication platforms, promoting a unified response to piracy threats (OAL Law, 2025).

The integration of AI into Nigeria's maritime security framework exemplifies a broader trend towards digital transformation in maritime operations, encompassing port security, cargo management, and cybersecurity (Maritimes Crimes, 2025). This technological advancement is essential for addressing the complex and evolving nature of maritime threats in the GoG, with the ultimate goal of mitigating the economic losses and human costs associated with piracy. Against this backdrop, the study aims to examine the impact of AI in combating piracy in the GoG using Nigeria's maritime environment from 2019 – 2023 as a case study.

In response to the increasing sophistication, adaptability, and transnational nature of maritime piracy, the Nigerian government and relevant maritime security agencies have implemented a range of conventional counter-piracy measures, including intensified naval patrols, maritime surveillance systems, regional security cooperation initiatives, and legislative reforms aimed at strengthening maritime governance and enforcement mechanisms. Although these interventions have yielded measurable successes in mitigating piracy incidents, pirate networks have continued to evolve in both operational capability and tactical sophistication by exploiting technological advancements, intelligence deficiencies, and structural vulnerabilities within existing maritime security architectures. Consequently, the dynamic and complex nature of contemporary maritime threats has underscored the need for innovative, technology-driven approaches capable of enhancing maritime domain awareness, predictive intelligence, threat identification, and rapid operational response capabilities (Maranyi, 2025).

Against this backdrop, Artificial Intelligence (AI) has emerged as a transformative technological innovation with significant potential to revolutionize maritime security operations. Through capabilities such as real-time surveillance, anomaly detection, predictive analytics, automated threat assessment, and intelligent decision-support systems, AI offers unprecedented opportunities for strengthening maritime security and

counter-piracy efforts. Consequently, several maritime nations have increasingly integrated AI-enabled technologies into their maritime security frameworks to improve operational effectiveness, situational awareness, and proactive threat mitigation. However, despite growing investments in advanced maritime security technologies, there remains limited empirical evidence regarding the extent to which AI has contributed to combating piracy within Nigeria's maritime environment, particularly within the strategically important Gulf of Guinea (Maranyi, 2025).

Furthermore, extant literature on maritime security in the Gulf of Guinea has predominantly concentrated on conventional anti-piracy measures, regional security cooperation mechanisms, naval operations, and legal-institutional frameworks. Comparatively little scholarly attention has been devoted to examining the effectiveness, operational implications, and strategic value of AI-driven technologies in counter-piracy operations. This gap in the literature has resulted in insufficient understanding of how AI can be leveraged to address emerging maritime security challenges and strengthen maritime governance in Nigeria.

Additionally, emerging evidence suggests that several structural and operational constraints continue to impede the effective deployment of AI technologies within Nigeria's maritime security architecture. These challenges include inadequate indigenous technological capacity, excessive dependence on foreign technology providers, fragmented and poorly integrated data management systems, limited automation capabilities, insufficient technical expertise, inadequate funding, and inconsistent training and capacity-building programmes for security personnel. Collectively, these limitations raise critical concerns regarding the sustainability, effectiveness, and long-term viability of AI-enabled maritime security initiatives in Nigeria.

It is against this backdrop that this study seeks to assess the role of Artificial Intelligence in counter-piracy operations and examine its implications for maritime security within Nigeria's maritime environment between 2019 and 2023. Specifically, the study evaluates the extent to which AI technologies have enhanced maritime surveillance, threat detection, situational awareness, and operational response to piracy incidents, while also investigating the challenges associated with their implementation and identifying strategies for strengthening AI-driven maritime security capabilities. Addressing these concerns is essential not only for enhancing maritime governance and protecting critical economic assets but also for strengthening national and regional security, promoting safe maritime commerce, and supporting sustainable development across the Gulf of Guinea region (Maranyi, 2025).

Research Objectives

To assess the role of Artificial Intelligence in counter-piracy operations and its implications for maritime security in Nigeria's maritime environment within the Gulf of Guinea between To identify the major piracy threats affecting Nigeria's maritime environment in the Gulf of Guinea To examine the application of Artificial Intelligence technologies in counter-piracy operations within Nigeria's maritime domain.

Literature review and theoretical framework

Certainly. Below is a PhD-standard scholarly rewrite of the section. I have enhanced the academic language, coherence, analytical depth, and logical flow while retaining the original meaning and citations.

Overview of the Gulf of Guinea within the Atlantic Maritime Domain

The Gulf of Guinea (GoG) constitutes a strategically significant segment of the Atlantic Ocean, extending along the western and central coasts of Africa from Liberia to Angola. As one of the world's most important maritime regions, the GoG serves as a critical source of livelihood for over 300 million people and forms the economic backbone of many coastal states within the region. Endowed with abundant natural and maritime resources, the Gulf has attracted considerable interest from regional and international stakeholders owing to its economic, geopolitical, and strategic significance. Beyond its role as a major hub for maritime commerce, the region has emerged as an increasingly important source of global energy supply, particularly through its vast offshore oil and gas reserves. Consequently, the socioeconomic well-being and sustainable development of the region are intrinsically linked to the effective management and protection of its maritime resources (Babatunde, 2022).

Geographically, the Gulf of Guinea is situated along the western coastline of Africa and encompasses an extensive maritime domain consisting of territorial waters, exclusive economic zones, subsea resources, and the associated airspace. Covering approximately 250,000 square nautical miles, the region possesses substantial deposits of hydrocarbons, solid minerals, fisheries resources, and forest products, making it one of the most resource-rich maritime environments globally (Ndayizaye, 2017). The Gulf's strategic location further enhances its importance as a major maritime transit route connecting Africa with Europe, Asia, and the Americas. The GoG comprises a diverse group of coastal and hinterland states across West and Central Africa, including Angola, Benin, Cameroon, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Liberia, Nigeria, Republic of Congo, São Tomé and Príncipe, Senegal, Sierra Leone, Togo, and several others (Babatunde, 2022). These countries exhibit considerable geographical, cultural, linguistic, and political diversity, encompassing Anglophone, Francophone, Lusophone, and Spanish-speaking communities. Collectively, the region represents a significant economic bloc with an estimated Gross Domestic Product (GDP) exceeding €500 billion and sustained economic growth rates averaging above six percent in several member states (Germany Trade and Invest, n.d.). This economic dynamism underscores the strategic importance of maintaining a secure and stable maritime environment.

Notwithstanding its immense economic potential, the Gulf of Guinea continues to face a multitude of complex maritime security challenges. The region is endowed with substantial reserves of crude oil, natural gas, gold, diamonds, and other valuable resources, positioning countries such as Nigeria, Angola, Equatorial Guinea, Cameroon, Gabon, Chad, and the Republic of Congo as major contributors to global energy markets. However, the exploitation and transportation of these resources are increasingly

threatened by a range of maritime crimes and transnational security challenges. According to the Friedrich Ebert Stiftung (2013), prominent threats within the region include piracy, armed robbery at sea, illicit trafficking of drugs and weapons, illegal, unreported and unregulated (IUU) fishing, environmental crimes, and other forms of organized transnational criminal activities.

A review of extant literature reveals that piracy remains the most persistent and widely studied maritime security threat within the Gulf of Guinea. Consequently, the region has frequently been compared to the Horn of Africa due to the prevalence and sophistication of pirate activities that undermine maritime safety, commercial shipping, and regional stability (Very, 2016). Scholars have attributed the persistence of maritime insecurity in the region to both structural and proximate factors. Structural drivers include weak governance, corruption, socioeconomic exclusion, unemployment, state fragility, and excessive dependence on natural resource revenues. Proximate causes encompass ineffective law enforcement mechanisms, porous maritime boundaries, transnational criminal networks, environmental degradation, illegal fishing practices, territorial disputes, and the scarcity of refined petroleum products (Very, 2016). Collectively, these factors create an enabling environment for organized criminal activities and undermine effective maritime governance (Babatunde, 2023).

Nigeria occupies a central position within the security and economic architecture of the Gulf of Guinea. Located within the northeastern segment of the tropical Atlantic Ocean, the Gulf extends from Cape Lopez in Gabon to Cape Palmas in Liberia and covers approximately 6,000 kilometres of coastline. As the largest economy and most populous state in the region, Nigeria serves as the principal maritime gateway for commercial activities within the Gulf. It is estimated that approximately 1,500 vessels, including cargo ships, oil tankers, and fishing vessels, transit the region daily, with more than 70 percent of maritime cargo destined for West and Central Africa passing through Nigerian waters (NIMASA, 2022).

Despite its strategic importance, the security of the Gulf of Guinea remains threatened by piracy, armed robbery at sea, kidnapping of seafarers, illegal fishing, smuggling, human trafficking, and other forms of transnational organized crime. These threats not only undermine maritime security and economic development but also pose significant risks to international trade, regional stability, and the sustainable exploitation of maritime resources. Consequently, strengthening maritime security governance and adopting innovative technological solutions have become critical imperatives for safeguarding the Gulf of Guinea and ensuring its continued contribution to regional and global prosperity.

Role of Artificial Intelligence

Artificial Intelligence (AI) represents one of the most profound technological revolutions of the contemporary era, fundamentally transforming the relationship between technological systems and the increasingly complex demands of human society. The rapid evolution and growing sophistication of AI technologies have accelerated their

integration across diverse sectors, thereby reshaping operational processes, institutional frameworks, and decision-making mechanisms. As a disruptive and enabling technology, AI offers a wide range of applications capable of enhancing efficiency, accuracy, adaptability, and innovation across multiple domains of human endeavour (Namatherdhala et al., 2022).

In recent years, the security and defence sectors have emerged as prominent beneficiaries of AI-driven innovations. The increasing complexity, dynamism, and transnational nature of contemporary security threats have necessitated the adoption of advanced technological solutions capable of supporting timely and informed decision-making. Consequently, AI technologies have become integral components of modern security architectures, facilitating enhanced surveillance, intelligence gathering, predictive threat assessment, and operational response capabilities. AI-powered surveillance systems, facial recognition technologies, predictive analytics, autonomous platforms, and unmanned aerial systems are increasingly deployed to support law enforcement agencies, intelligence organizations, border security operations, and military institutions in addressing both conventional and emerging security challenges.

According to Huang et al. (2022), AI has already generated transformative effects across numerous dimensions of human activity and is expected to continue reshaping social, economic, and political systems in the foreseeable future. Significant applications of AI can be observed in autonomous transportation systems, healthcare diagnostics and treatment, financial services, industrial automation, digital communication platforms, and internet-based services. The growing diffusion of AI technologies extends beyond isolated operational applications and reflects a broader integration into the foundational structures of modern societies. Consequently, AI has become instrumental in enhancing organizational productivity, optimizing resource allocation, improving decision-making processes, and generating substantial operational and strategic advantages. Its influence transcends technological innovation alone, positioning AI as a transformative force capable of redefining governance systems, institutional effectiveness, and societal interactions.

Garg (2021) conceptualizes AI as a transformative technological paradigm aimed at developing intelligent systems capable of replicating core human cognitive functions, including learning, reasoning, problem-solving, perception, and adaptive decision-making. Unlike conventional automation technologies, which operate primarily through predefined instructions, AI possesses the capacity to learn from experience, analyse complex datasets, and adapt to changing environmental conditions. Through the integration of machine learning algorithms, data analytics, and intelligent processing systems, AI applications provide solutions characterized by enhanced precision, scalability, and operational efficiency. By establishing an intelligent interface between data acquisition, analysis, and response mechanisms, AI enables systems not only to process information but also to generate insights and adapt their behaviour in response to evolving circumstances.

Hoadley and Lucas (2018) further argue that AI possesses distinctive characteristics that render its integration into national security architectures both strategically significant and inherently complex. One of the most notable attributes of AI is its pervasive applicability across virtually all sectors and operational domains, ranging from civilian infrastructure and commercial enterprises to intelligence agencies and military organizations. This versatility has positioned AI as a foundational technology with far-reaching implications for national defence, public safety, economic security, and the protection of critical infrastructure.

Furthermore, AI exhibits a pronounced dual-use character, enabling its application for both civilian and military purposes. For instance, AI-enabled surveillance systems may be utilized to enhance public safety, traffic management, and emergency response in civilian contexts, while simultaneously supporting military reconnaissance, intelligence collection, target identification, and battlefield awareness. This dual-use nature introduces complex ethical, legal, regulatory, and strategic considerations, particularly regarding technological proliferation, arms control, privacy protection, and international security governance.

Another critical characteristic of AI is its relative opacity in deployment and operation. The integration of AI technologies into platforms, systems, and products is often difficult to identify and evaluate without specialized technical expertise. This lack of transparency presents significant challenges for accountability, regulatory oversight, and risk assessment, particularly within security-sensitive environments. Consequently, while AI offers unprecedented opportunities for enhancing national security and operational effectiveness, it also raises important concerns regarding governance, ethical responsibility, and strategic stability.

Within the maritime security domain, AI has increasingly emerged as a strategic force multiplier capable of enhancing maritime domain awareness, threat detection, risk assessment, and operational decision-making. Through real-time data analysis, predictive modelling, anomaly detection, and automated surveillance systems, AI strengthens the capacity of maritime security agencies to monitor vast maritime spaces, identify suspicious activities, and respond proactively to emerging threats. As maritime security challenges such as piracy, armed robbery at sea, illegal fishing, trafficking, and other forms of transnational organized crime continue to evolve, the strategic role of AI in supporting effective maritime governance and counter-piracy operations has become increasingly indispensable.

Theoretical Framework

Securitization Theory was developed by Barry Buzan, Ole Wæver, and Jaap de Wilde in 1998 through their seminal work, *Security: A New Framework for Analysis*. The theory emerged from the Copenhagen School of Security Studies and has become one of the most influential frameworks for analyzing contemporary security issues. The centrality of the audience, whose acceptance legitimizes the securitizing move; The co-dependency of

agency and context, indicating that securitizing actors operate within specific social and political environments that enable or constrain their actions; The structuring force of the dispositif, which refers to the institutional and discursive frameworks shaping security practices (Balzacq, 2010). These assumptions allow empirical analysis of how security issues emerge, evolve, and sometimes dissolve through discourse and political action. In the context of the impact of AI in combating piracy in the GoG, particularly Nigeria's maritime environment (2019–2023), securitization theory is highly relevant. The theory helps to explain how piracy is framed as an existential security threat that requires exceptional responses, including the deployment of AI technologies for surveillance, threat detection, and rapid response. It highlights the role of Nigerian political and security actors in constructing piracy as a security issue demanding urgent action, and how the acceptance by domestic and international audiences legitimizes the use of AI-driven security measures. Furthermore, it allows analysis of how technological innovations become embedded within the securitization dispositif, influencing routine security practices (Bourbeau, 2014).

Discussion of Findings

According to the International Maritime Bureau (IMB) Piracy Reporting Centre, there were 162 recorded incidents of piracy and armed robbery against ships worldwide in 2019.

Figure 1: IMB Piracy Incident Report January-December 2019.
Source: Annual IMB Piracy Report (2020)

This figure represented a significant decrease from the 201 cases documented in 2018. The incidents in 2019 included four hijacked vessels, 11 vessels that came under gunfire, 17 attempted attacks, and 130 instances where vessels were boarded by unauthorized individuals. Although this downward trend in reported maritime security breaches might indicate progress in international efforts to combat piracy, the IMB has warned that significant threats remain in certain regions. Notably, the Gulf of Guinea continues to be a high-risk area, accounting for a substantial portion of attacks, many involving armed perpetrators and the kidnapping of crew members for ransom. Therefore, despite the global decline, the Gulf of Guinea still poses formidable security challenges to maritime operations and regional trade.

Figure 2: IMB Piracy Incident Report on Types of Vessels Attacked January-December 2019.
Source: Annual IMB Piracy Report (2020)

The IMB Piracy Reporting Centre (2019) drew attention to a troubling surge in crew kidnappings in the GoG, noting a rise of over 50% from 78 incidents in 2018 to 121 in 2019. This significant increase indicates that more than 90% of all maritime kidnappings worldwide during this period took place in the GoG. It is particularly alarming that the concentration of these events in the last quarter of 2019 when 64 crew members were taken hostage in six separate attacks.

The GoG also experienced 64 piracy-related incidents, establishing it as the most perilous maritime region globally for 2019. For instance, all four vessel hijackings reported in 2019 happened in the region, along with 10 of the 11 recorded instances of ships being directly fired upon.

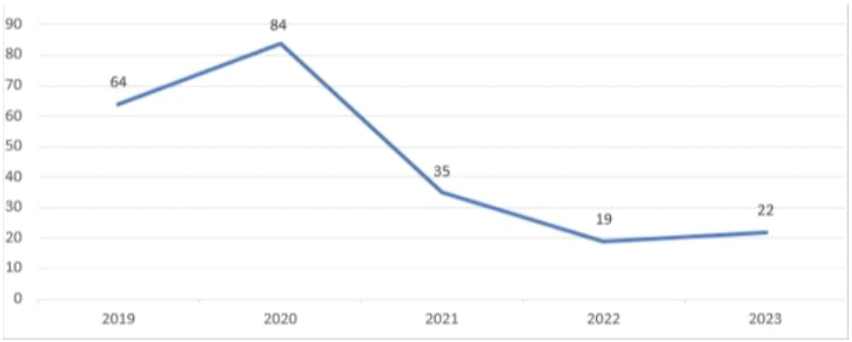

Figure 3: IMB Annual Report for 2023 Showing the Significant Reduction in the Incidence of Piracy Attacks from 2019.
Source: Japan P&I News, 2024

The International Maritime Bureau (IMB) Annual Report for 2023 documented 120 incidents of maritime piracy and armed robbery against ships worldwide. While this figure highlights the ongoing threat piracy poses to maritime security, the report drew attention to developments in the Gulf of Guinea (GoG). Although the number of reported

incidents in the GoG has significantly decreased from those in the previous years, examples from 84 incidents in 2020 and 35 in 2021, and 19 in 2022, the region however experienced an increase in 2023 to 22 cases, as shown in the figure above. The report notes that this upward trend raises a concern especially given the severity of the attacks. In 2023, the Gulf of Guinea was responsible for three out of the four hijackings reported globally. In addition, it accounted for all 14 crew kidnappings and 75% of the incidents involving crew being taken hostage.

The decline in piracy incidents from 2019 to 2023 can largely be attributed to the significant impact of Artificial Intelligence (AI)-driven technologies implemented by the Nigerian Navy and the Nigerian Maritime Administration and Safety Agency (NIMASA). These cutting-edge technologies, which include AI-enhanced surveillance systems and predictive threat analytics, have bolstered real-time monitoring, heightened situational awareness, and facilitated more efficient coordination of maritime security efforts. This technological advancement has not only strengthened the deterrence capabilities of security agencies but also aided in prompt interventions and the prevention of potential attacks. The noted improvements in maritime security provide empirical evidence supporting the feedback from the administered questionnaire, where respondents recognized the essential role of AI in reducing piracy risks and enhancing safety within Nigeria's maritime sector.

Dr. Bashir Jamoh, the former Director General of the Nigerian Maritime Administration and Safety Agency (NIMASA), stated, “Nigeria is the Gulf of Guinea, and the Gulf of Guinea is Nigeria.” This remark highlights Nigeria's pivotal roles in the security, economic, and geopolitical landscape of the GoG. By this statement, Dr. Jamoh has only acknowledged Nigeria's strategic maritime position and its significant influence on regional activities. Nigeria boasts the longest coastline in the GoG and plays a major role in maritime trade, oil exports, and naval operations in the area. Consequently, the country's stability and dedication to maritime security are crucial for the safety and economic health of the entire Gulf.

The GoG maritime region, particularly Nigeria's Exclusive Economic Zone, is abundant in mineral and food resources and also serves as a vital route for trade and transportation. However, the vastness of this maritime area, coupled with the limited policing capabilities of individual countries has led to numerous illegal activities, particularly, piracy. This challenging threat landscape has necessitated the development of a more comprehensive Maritime Domain Awareness System, resulting in the adoption of several AI systems, such as the Falcon Eye Alignment by the Office of the National Security Adviser (Martin, 2021).

The Falcon Eye System, though a foreign-developed maritime surveillance infrastructure, has become a critical asset in Nigeria's efforts to combat piracy and enhance maritime domain awareness. It is equipped with detection and intelligence features that can aid decision-making regarding shipping movements, safety, and

maritime law violations. It integrates various sensors, such as coastal radars, over-the-horizon radars, night vision cameras, the automatic identification system, and marine radios, to provide a detailed overview of Nigeria's maritime environment (Olorunniwa, 2022).

The Over the Horizon Radars extend up to 200 nautical miles (370.4 km), ensuring full coverage of Nigeria's Exclusive Economic Zone. Meanwhile, the Automatic Identification System allows the Nigerian Navy to identify all vessels passing through or operating within Nigeria's maritime domain, and the cameras offer live images of vessels within a 13 nautical mile (24.08 km) range, enhancing the analysis of vessel activities in the area. Data monitoring and analysis from sensor sites strategically positioned along the nation's coastline are facilitated through the four Falcon Eye Centres located in Abuja, Lagos, Bayelsa, and Rivers State.

The Falcon Eye System's sensor range extends beyond Nigeria's waters, reaching Côte d'Ivoire to the west, Cameroon to the east, and as far as Angola to the southeast. This extensive capability enhances the country's maritime projection and allows the Nigerian Navy to maintain strategic alliances with other naval forces, especially those of the GoG nations, as well as the Indian and Italian navies, particularly in terms of information exchange.

Future enhancements to the system could provide even broader sensor coverage globally. The Nigerian maritime domain has achieved greater success in combating illegal activities at sea by utilising the Falcon Eye facility. For example, on May 16, 2020, it directed a naval ship to capture pirates who had hijacked the Chinese motor fishing vessel HAILUFANG II in Ivory Coast and successfully rescued its 18 crew members. Notably, intelligence from the Falcon Eye System has led to the capture of 15 smuggling boats, 34 vessels involved in oil theft, 15 vessels engaged in illegal, unregulated, and unreported fishing, and the arrest of 31 pirates.

The Falcon Eye system enables the Nigerian Navy to effectively oversee shipping activities within Nigerian waters by providing real-time information that can be analysed before dispatching a Nigerian Navy Ship to intercept, investigate, and apprehend offending vessels as needed. This capability strengthens the Nigerian Navy's ability to combat maritime crimes within its domain. This study wishes to state that the system acts as a force multiplier, allowing the Nigerian Navy to optimize its limited resources in terms of available platforms and logistical needs.

The establishment of the Deep Blue Project in 2021 is another significant initiative. The Deep Blue Project, though initiated in collaboration with foreign technical partners, is a Nigerian-led maritime security initiative designed to address the persistent threats of piracy, robbery, kidnapping, oil theft, smuggling, and illegal trafficking of drugs and people in its territorial waters and exclusive economic zone. This ambitious endeavour includes the deployment of patrol vessels, aircraft, and advanced surveillance

technology, demonstrating a dedicated effort to improve monitoring capabilities and enhance response strategies against security threats (NIMASA, 2022).

The Deep Blue Project consists of two key elements: the supply of essential operational resources and extensive capacity-building programs. This comprehensive security strategy is crafted to bolster Nigeria's maritime security framework, especially in the GoG. Central to the project is the creation of the Command, Control, Computer, Communication, and Intelligence (C4i) Centre, which is backed by specialized training facilities and strategically positioned operational bases. The C4i Centre, which commenced operations in August 2019, is a crucial component of the Deep Blue Project. Its primary role is to ensure real-time awareness of the maritime domain, facilitating timely intelligence collection and improving decision-making for maritime law enforcement. And with the utilizing advanced surveillance technologies and integrated communication systems, the C4i Centre enables the coordination and execution of proactive security measures aimed at reducing piracy, sea robbery, smuggling, and other maritime crimes. In addition, the agency has assets comprising helicopters, interceptor boats, Unmanned Aerial Vehicles, Special Mission Aircraft, Special Mission Vessels, and armored vehicles, all managed by a standby intervention team and connected to the C4i Centre. The centre is equally integrated with the Maritime Intelligence System and the Nigerian Navy's Falcon Eye, enabling real-time monitoring and reporting of activities within the nation's maritime domain (NIMASA, 2022).

The truth is that even with the potential of the Deep Blue Project, doubts still persist about its efficiency and long-term sustainability. Although deploying assets is an essential phase, maintaining their readiness, upkeep, and ability to adapt to changing threats presents continuous obstacles. Moreover, the financial and logistical requirements to uphold such a sophisticated security framework raise questions about its enduring feasibility and the allocation of resources within NIMASA. Additionally, while the collaboration with other security entities like the Nigerian Navy and the Nigerian Police is praiseworthy, the success of joint operations and information-sharing systems remains in question. Issues related to inter-agency coordination, resource distribution, and communication protocols impede the smooth integration of efforts, thereby affecting response capabilities in critical situations.

Summary of the Major Findings

Based on the data analyzed, the following findings were made.

a) **Integration of AI into Nigeria's Maritime Security Strategies:** The research revealed that the Nigerian government has made significant progress in integrating AI into its maritime security strategies. Through partnerships with international allies and private tech companies, Nigeria has launched pilot AI-based surveillance initiatives like the Falcon Eye Alignment and the Deep Blue Project. However, the lack of a centralized data management system remains a barrier to full optimisation. The study highlights an emerging yet promising trend in the adoption of AI within Nigeria's maritime security policies.

b) **Use of AI-Driven Tools for Piracy Detection, Prevention, and Response:** Findings revealed that various AI-driven tools, including coastal radars, over-the-horizon radars, night vision cameras, the automatic identification system, and marine radios of the Falcon Eye Alignment, offer a comprehensive view of Nigeria's maritime environment. In addition, NIMASA's Deep Blue Projects, which include air, maritime, and land resources, as well as a Command, Control, Communication, Computers, and Intelligence (C4i) Operations Center, have been implemented to detect and prevent piracy. These technologies have enhanced real-time monitoring of maritime activities, allowing for quicker identification of suspicious movements and illegal entries.

c) **Impact of AI on Piracy Incidence and Severity:** The findings showed that there has been a significant reduction in the frequency and severity of piracy incidents in Nigerian waters during the study period (2019 – 2023), a proof of the integration of AI technologies. Enhanced surveillance capabilities and faster response mechanisms have thwarted several planned attacks, while AI-powered risk assessment tools have facilitated more strategic deployment of naval resources. The findings equally highlighted AI's crucial roles in enhancing maritime security.

d) **Recommendations for Enhancing AI Deployment in Maritime Security:** The study recommends a detailed approach to improving the deployment and effectiveness of AI in combating piracy. Recommendations include increased investment in AI infrastructure, capacity-building for maritime security personnel, and the creation of a unified maritime command center with advanced analytics capabilities. It also stresses the need for policy review and coherence, as well as the establishment of legal frameworks.

Conclusion

This study examined the role of Artificial Intelligence (AI) in counter-piracy operations and its implications for maritime security within Nigeria's maritime environment in the Gulf of Guinea between 2019 and 2023. The findings revealed that AI has significantly enhanced maritime domain awareness through improved surveillance, real-time monitoring, predictive threat analysis, anomaly detection, and rapid response capabilities. The study further established that the adoption of AI technologies has contributed to reducing piracy incidents and strengthening maritime security operations. However, challenges such as inadequate indigenous technological capacity, dependence on foreign technology providers, fragmented data management systems, insufficient funding, and limited personnel training continue to constrain the effective utilization of AI in maritime security. The study concludes that AI has become a strategic force multiplier in counter-piracy operations and remains indispensable for strengthening maritime security and safeguarding critical maritime assets in the Gulf of Guinea.

Recommendations

a) The Federal Government of Nigeria should develop a comprehensive national AI-Maritime Security Framework to guide the deployment and utilization of AI technologies in maritime security operations.

b) Relevant maritime security agencies should increase investment in indigenous AI-driven surveillance, threat detection, and predictive intelligence systems to reduce dependence on foreign technologies.
c) Continuous training and capacity-building programmes should be institutionalized to enhance the technical competencies of maritime security personnel in AI applications.
d) Greater collaboration should be encouraged among maritime security agencies, research institutions, technology firms, and international partners to promote knowledge sharing and technological innovation.
e) An integrated maritime data management system should be established to facilitate effective information sharing, intelligence fusion, and real-time operational decision-making.
f) Adequate funding should be provided to support the acquisition, maintenance, and modernization of AI-enabled maritime security infrastructure across Nigeria's maritime domain.

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