

LUNE

Abstracts

A compilation of abstracts of research in progress across interdisciplinary fields



AI. Humanities.
Social Sciences

2025



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Artificial Intelligence Network



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RESEARCHROUND

LUNE

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AI. Humanities.
Social Sciences

2025



LUNE AI AI. Humanities. Social Sciences Fellowship 2025

LUNE Abstracts

A compilation of abstracts of research in progress on the intersections of artificial intelligence, humanities and social sciences research.

RESEARCH PROGRAMS LEAD
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DESIGNER
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Compiled by ResearchRound Institute
Lagos, Nigeria

Program Overview

LUNE AI. Humanities. Social Sciences Fellowship provided Nigerian graduate and postgraduate students in humanities and social sciences with an exploration of artificial intelligence through assignments, research projects, and coursework in NLP, machine learning, creative computing, learning technologies, and AI ethics.

The program offered remote delivery and data stipends. Fellows, through the support of expert facilitators and personalized mentors, examined the development, implementation, social implications, and real-world impacts of AI technologies to develop interdisciplinary approaches and critiques for region-specific research, methodologies, and tools in low-resource graduate education settings focusing on intersections between AI and linguistics, literary and creative arts, communication and digital media, public interest research, education, community engagement, and legal frameworks.

The fellowship aims to establish a post-fellowship collaborative network of Nigerian graduate students conducting technology-focused humanities and social sciences research.

Scan the QR Code to read more about the fellowship



Letter from the CEO

Since the beginning of ResearchRound, our goal has been to catalyse researchers to deliver high quality research. The LUNE Abstracts is one of the first steps, among many others, that help us get to that goal. While much of the research works published herein are work in progress, they point to the diversity of approaches and questions that local researchers are investigating across a wide range of disciplines.

I very much appreciate and am grateful for the tireless efforts of our amazing team, including Ololade Faniyi, Khadijah Alade, Waliyah Oladipo, Malik Kolade, Uchenna Eke-Awa, Kamal Abudu, Adam Yakub, who supported the program's delivery directly or indirectly.

None of the work here would have been possible without the support of the fellowship's primary sponsors - Atlanta Interdisciplinary Artificial Intelligence Network and Global Center on AI Governance, and partners UK International Development, IDRC Canada and the Africa Observatory on Responsible Artificial Intelligence. I am also unreservedly grateful to our faculty, who were unselfish with their knowledge and guidance to the fellows and navigators in the program. We couldn't thank you enough.

Finally, I'm proud of all the fellows and navigators, whose commitment to delivering excellent research, embodies our vision at ResearchRound. The group formed a memorable community supporting one another, sharing information, having healthy conversations and debates, exploring new perspectives, questioning existing perspectives, and taking methodological approaches to reach facts that align with local realities. I wish them all the best in their future as they continue to take steps to becoming research leaders.

ResearchRound Institute will continue on its mission to building platforms and tools for closer and productive relationships among researchers and others who are working towards breakthrough ideas that move us forward or breakthrough understandings that unlock profound clarity about our local realities.

Yours in the mission,

Habeeb Kolade
Founder and CEO, ResearchRound Institute

Letter from the Research Lead

I am proud and excited to present this book of abstracts from the LUNE AI. Humanities. Social Sciences Fellowship. The fellowship was an 8-week journey that brought together 22 Nigerian postgraduate students to explore the intersections between artificial intelligence and humanities and social sciences research. Apart from the 15 technology-focused humanities and social sciences fellows, during our review process, we identified some standout STEM students who joined us as navigators. They supported our fellows with their technical skills while advancing their own interdisciplinary research in the humanities/social sciences.

We created this fellowship to bridge the void in critical AI research amidst the AI hype globally. We found that the voices and cultural contexts of African scholars, particularly those in the humanities and social sciences, remain critically underrepresented in global AI discourse.

This LUNE Fellowship was not designed just to teach AI tools to humanists and social scientists, like the “adapt or lose” ventures feeding the hype of this moment in our history. But we wanted to provide Nigerian emerging scholars with the support, community, and platform to lead conversations about how AI can be developed, implemented, and critiqued through distinctly African intellectual frameworks.

Over eight intensive weeks, our fellows engaged with exceptional facilitators and mentors, who shared our vision and generously shared their expertise: Dr. Chinasa Okolo, Ayantola Alayande, Olanrewaju Samuel, Tejumade Afonja, Timilehin Durotoye, Nelson Olanipekun, Frank (Onyeka) Onu, Joy Victor, Dr. Najeeb G. Abdulhamid, Kauna Malgwi, Dr Samuel Segun, Paschal Ukpaka, Dr Abiodun Modupe, and Dr Ridwan Oloyede. We cannot thank you enough!

Together, we explored fundamental questions such as: How can natural language processing technologies reflect the linguistic diversity of Nigeria's 500+ languages? What does ethical AI development look like from an African point of view? How might machine learning algorithms be trained to recognize and preserve rather than erase cultural nuances? Can AI be deployed ethically and in the service of community and justice? How might AI be mapping onto existing global inequities to dehumanize African workers?

The research proposals and projects in this abstract book, therefore, represent the early stages of our fellows and navigators' visions and offerings for a digital future that is authentically representative and ethical. Our fellows and navigators examined some of the most pressing questions in Nigeria today in their projects: from their approaches to digital preservation of oral traditions to AI-assisted policy framework error and harm detection, from AI-assisted text mining of Nigerian literature to community-centered AI governance through feminist decolonial critiques, from applications in healthcare like personalized Alzheimer's treatment and seizure recovery frameworks to decision-making bias in large language models, from multimodal frameworks for misinformation detection on social media platforms to climate messaging across Nigeria's major languages, as well as philosophical investigations into AI ethics and human dignity.

Overall, our fellows and navigators have demonstrated that the intersection of AI and humanities/social sciences is not just a new hyped direction for research for the 2020s, but an important interdisciplinary attempt to mesh fields whose academic separation deeply affects our lives and society.

To our fellows and navigators: Your drive and commitment have been so inspiring. We saw your deep sense of responsibility to your communities and cultures, as you approached AI not as a neutral tool but as a sociotechnical system that must be actively interrogated to reflect African values, epistemologies, and aspirations.

To the Nigerian and global research community: As you engage these abstracts, I invite you to see them not as final projects but as opening statements in ongoing conversations about encouraging interdisciplinary research, decolonizing AI, and centering African thought in technology development. I also encourage you to engage with these works, collaborate with these emerging scholars, and support the continued development of technology-focused research that offers alternative models of sustainable development beyond overrepresented Euro-American methods.

This fellowship further represents ResearchRound's model for capacity building in low-resource settings. Through remote delivery, data stipends, and personalized mentorship, we showed that geographical barriers should not limit access to research community-building and interdisciplinary education. We hope the collaborative network that emerged among participants, facilitators, and mentors will continue to drive this community long after the formal fellowship has concluded.

In conclusion, this fellowship is one proof that the wisdom, creativity, and ethical

grounding of humanities and social sciences scholars, especially from Africa, must be central, not optional, to technological research and development.

Ololade Faniyi

Research Programs Lead

LUNE AI.Humanities.Social Sciences Fellowship

ResearchRound

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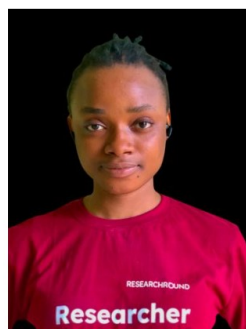
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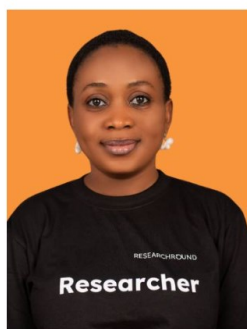
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* The information above was valid at the close of the fellowship. Fellows' education status and affiliations may have changed since the conclusion of the fellowship.

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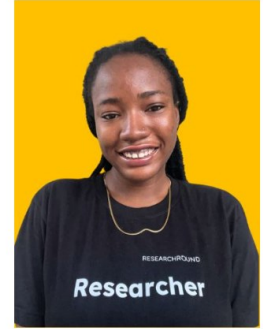
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Fellows have domain background in humanities and social sciences and are exploring the intersections of their field with AI. Fellows collaborate with navigators to provide domain expertise to participants with background in AI while gaining perspectives for their own research projects from them

Navigators at the Fellowship are fellows who have technical background in computer science, AI or related fields and are exploring intersections of humanities and social sciences with their field. Navigators also collaborate with fellows to provide technical direction while gaining perspectives for their own research projects from them.

* The information above was valid at the close of the fellowship. Fellows' education status and affiliations may have changed since the conclusion of the fellowship.

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GROUP 1

LANGUAGE & COMPUTATIONAL LINGUISTICS

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Navigator: Olubusolami Sogunle

Primary Mentor: Olanrewaju Samuel

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Development of a Parallel Climate Messaging Dataset in Igbo, Yoruba, and Hausa with Clustering Analysis

Olubusolami Sogunle, Habib Sani Yahaya, Chukwuma Oluebube Peace

SCAN TO READ ONLINE



Abstract

Effective climate change communication requires inclusive, linguistically representative datasets to ensure equitable access to climate-related knowledge. In Nigeria, a multilingual and multi-ethnic nation home to over 500 languages, climate information is often disseminated primarily in English, systematically excluding large segments of the population, especially those with limited English proficiency or literacy. As climate change increasingly impacts indigenous and low-resource language communities, the need for localised, culturally relevant climate messaging grows more urgent. Yet, existing multilingual natural language processing (NLP) and machine translation systems lack the domain-specific accuracy and contextual sensitivity required for such high-stakes communication.

Our work responds by presenting a parallel climate messaging dataset in English and Nigeria's three major indigenous languages (Yoruba, Igbo, and Hausa). It contains over 700 climate-related messages, including themes like rainfall warnings and flood

risks. Multilingual sentence embeddings were generated using XLM-RoBERTa, followed by K-Means clustering to examine cross-linguistic patterns. Exploratory clustering across language pairs (Igbo-Yoruba, Hausa-Yoruba, Hausa-Igbo) showed observations consistent with linguistic typology regarding language families. This work advances climate adaptation efforts while also laying the groundwork for developing similar datasets in other low-resource Nigerian and African languages, promoting greater linguistic inclusivity in climate resilience initiatives.

Keywords: climate messaging, NLP, machine translation, indigenous languages, parallel dataset

Introduction

In many African countries, including Nigeria, indigenous language speakers face growing threats from extreme weather events, often without access to early warnings or critical safety information. With climate alerts typically issued in English, millions are excluded,

making the need for inclusive, localised communication increasingly urgent ([Oramah, Ngwu, and Odimegwu 2025](#)).

Nigerian languages are often classified as low-resource (Nekoto et al. 2020) and lack domain-specific corpora in critical fields such as climate communication. While advances in African natural language processing (NLP) have improved tasks like named entity recognition (Adelani et al. 2021) and sentiment analysis (Muhammad et al. 2022), efforts have largely focused on general applications, leaving a gap in resources for lifesaving, localised climate alerts. This paper addresses that gap by developing a parallel corpus of climate-related messages in Hausa, Yoruba, and Igbo, three of Nigeria’s most widely spoken languages.

Methodology

The methodology follows these steps:

1. **Data Collection and Curation:** A 715-sentence dataset of climate alerts was compiled, focusing on key categories such as rainfall warnings, flood risks, and so on. English source texts were crafted and translated by native speakers (the authors), with external reviewers assessing cultural and linguistic appropriateness.
2. **Preprocessing:** All texts were cleaned and standardised using Python, removing inconsistencies in punctuation, spacing, and formatting. Basic checks ensured translations remained semantically faithful to the original English.
3. **Model selection and Embedding**

Generation: This was required to perform analysis on the created dataset. XLM-RoBERTa was selected for this task as it outperformed AfriBERTa and LaBSE in clustering and qualitative analysis, which were performed on the embeddings generated from each model.

4. **Unsupervised Clustering:** To explore structural and topical similarities across languages, K-Means clustering was applied to the sentence embeddings with a K=2 value. Pairwise comparisons (e.g., Igbo-Yoruba, Hausa-Yoruba) were analysed visually and statistically to observe language alignments and divergences.
5. **Visualisation:** Dimensionality reduction techniques (PCA) were used to visualise clustering outputs. These plots offered insight into which language pairs exhibited higher structural similarity in the climate messages.

Ethical Considerations

To ensure linguistic accuracy and cultural sensitivity, the Hausa, Yoruba, and Igbo translations were produced by native translators (the authors) and reviewed externally by other native speakers. The dataset will be released under an open license to promote inclusivity and broader access for researchers, developers, and policymakers working to reach non-English-speaking communities. Clear documentation of the dataset’s scope and limitations is also provided to support responsible use and highlight the urgent need for greater investment in Nigerian NLP and climate communication resources.

Findings

Exploratory clustering analysis on the generated sentence embeddings (from **XLM-RoBERTa**), using Principal Component Analysis (PCA), revealed patterns in how the climate-related messages are structured across the three languages. Visualisations of the embeddings showed that Yoruba and Igbo translations tended to form clusters in closer proximity, suggesting a higher degree of structural similarity. In contrast, Hausa messages often appeared more distant from both, indicating divergence in sentence construction or lexical choice. Figures 1,2,3, and 4 show these results.

Figure 1. Hausa-Igbo sentence embedding clusters showing divergence

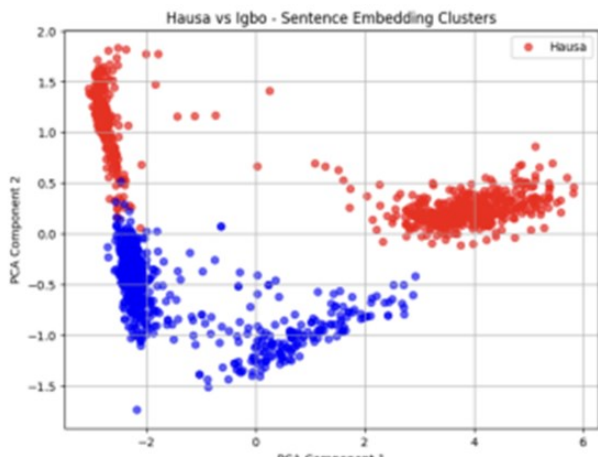


Figure 2. Yoruba-Hausa sentence embedding clusters showing divergence.

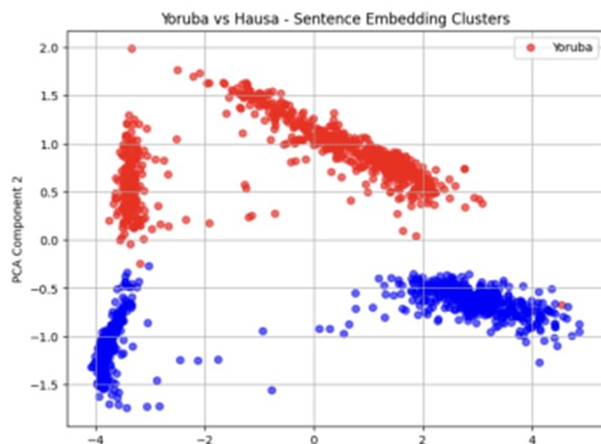


Figure 3. Yoruba-Igbo sentence embedding clusters showing similarity in structure

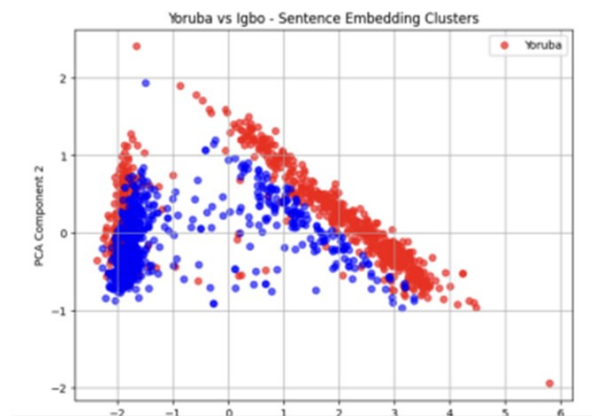
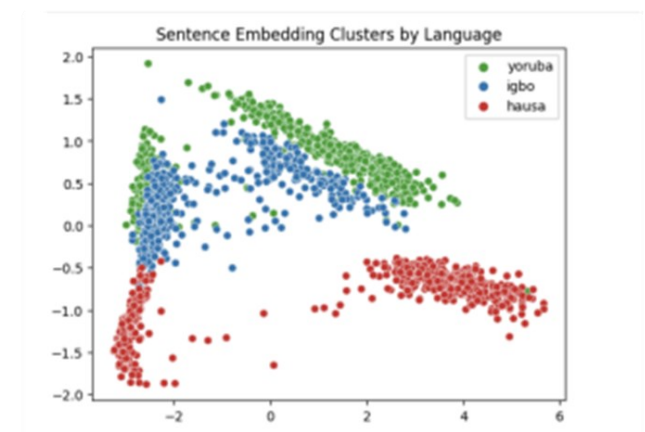


Figure 4. All three sentence embedding clusters showing varying degrees of structural similarities



This observation aligns with linguistic theory: Yoruba and Igbo are both Niger-Congo languages, while Hausa belongs to the Afroasiatic family. These typological differences likely influence how even concepts such as weather events and safety instructions are encoded. Also, all sentences were ultimately grouped into two primary clusters despite structural differences, suggesting shared semantic themes or the influence of dataset construction choices.

Interdisciplinary implications

This work operates at the intersection of artificial intelligence, linguistics, disaster risk reduction, and public policy. From a linguistic standpoint, it shows the feasibility of applying AI tools to indigenous languages for socially impactful use cases, such as early warning systems. In climate adaptation and public communication, the dataset offers a localised tool that enables government agencies and civic technology developers to send alerts in the dominant languages of Nigeria. From a policy perspective, this work suggests that open, multilingual climate datasets should become part of Nigeria’s national disaster preparedness strategy. For education and research, this dataset can serve as a resource for research and discussion in computational linguistics, AI ethics, and applied machine learning within and outside Nigeria.

Conclusion

This study presented the development of a parallel climate messaging dataset in Nigeria’s three major indigenous languages as a step toward addressing the digital language gap in climate communication. While the dataset is limited in size and scope, it lays the foundation for more inclusive, localised climate communication systems and future research on climate adaptation tools.

Acknowledgements

We gratefully acknowledge the invaluable support of our mentors, Olanrewaju Samuel and Dr Abiodun Modupe, and the Research Round team for providing the platform and community to pursue this work.

References

- Adelani, David Ifeoluwa, Jade Abbott, Graham Neubig, Daniel D’souza, Julia Kreutzer, Constantine Lignos, Chester Palen-Michel, et al. 2021. “MasakhaNER: Named Entity Recognition for African Languages.” arXiv.Org. March 22, 2021. <https://arxiv.org/abs/2103.11811>.
- Muhammad, Shamsuddeen Hassan, David Ifeoluwa Adelani, Sebastian Ruder, Ibrahim Sa’id Ahmad, Idris Abdulmumin, Bello Shehu Bello, Monojit Choudhury, et al. 2022. “NaijaSenti: A Nigerian Twitter Sentiment Corpus for Multilingual Sentiment Analysis.” ACL Anthology. June 1, 2022. <https://aclanthology.org/2022.lrec-1.63/>.
- Nekoto, Wilhelmina, Vukosi Marivate, Tshinondiwa Matsila, Timi Fasubaa, Tajudeen Kolawole, Taiwo Fagbohunge, Solomon Oluwole Akinola, et al. 2020. “Participatory research for low-resourced machine translation: a case study in African languages.” arXiv.Org. October 5, 2020. <https://arxiv.org/abs/2010.02353>.
- Oramah, Chinwe P., Tochukwu A. Ngwu, and Chinwe Ngozi Odimegwu. 2025. “Addressing the Impact of Complex English Use in Communicating Climate Change in Nigerian Communities Through Contextual Understanding.” *Climate* 13 (3): 56. <https://doi.org/10.3390/cli13030056>.

GROUP 2

CULTURAL, LITERARY & DIGITAL HUMANITIES

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Navigator: Richard Oveh

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Leveraging AI to Preserve and Advance the Hyumbe System through Community-Led Participation

Josephine Doofan Gande

SCAN TO READ ONLINE



Abstract

The Hyumbe system is a traditional cultural practice of the Tiv in central Nigeria that blends social cohesion with agricultural wisdom, serving as both a knowledge-sharing platform and a unifying activity within communities. However, this important system is increasingly at risk due to the pressures of modernisation, rural-urban migration, farmer-herder conflict, and declining interest among younger generations. This study explores the potential of artificial intelligence (AI) as a tool to preserve, revitalise, and reimagine the Hyumbe system for future generations. The study aims to document existing knowledge, amplify community voices, and foster interactive learning experiences that resonate with the youth. Key AI tools will be used to collect oral histories, simulate traditional practices, and support accessible education. The outcomes include a rich digital archive of the Hyumbe system, renewed youth participation, and stronger cultural and agricultural continuity. Ultimately, the study seeks to bridge tradition and innovation, ensuring that the Hyumbe system remains a living, evolving part of community life.

Keywords: Hyumbe system, artificial intelligence, community-led participation, cultural preservation, digital archive

Introduction

Modernisation, globalisation, rural-urban migration, and recurring farmer-herder conflicts have contributed significantly to the erosion and abandonment of various African cultural practices. These dynamics often lead to traditional systems being perceived by younger generations as outdated or irrelevant (Gyekye 1997). The Hyumbe system, a dynamic age-grade farming practice, involves individuals of the same age group working together on each other's farms, boosting productivity, ensuring food security, and reducing reliance on mechanised farming and harmful agricultural chemicals. Hyumbe also integrates cultural activities such as singing, dancing, and storytelling, which strengthen community bonds and provide psychological resilience, foster social cohesion, agricultural expertise, and communal responsibility in specific African communities.

Like many indigenous practices, the Hyumbe system has seen a steady decline due to socio-

economic and political pressures. Among Tiv youths, there is a growing disconnection from communal traditions such as the Hyumbe, which are increasingly viewed as incompatible with modern lifestyles and aspirations. According to Akor and Okwori (2016), this represents a cultural loss but also disrupts local knowledge-sharing mechanisms and communal resilience. This study therefore aims to integrate AI technologies with community-led efforts to preserve and advance the Hyumbe system. The objectives are: to document traditional Hyumbe practices, enhance community engagement through digital platforms, and encourage continuity of the practice.

Literature Review

Existing studies highlight the importance of preserving indigenous agricultural systems for cultural identity and sustainable development. The Hyumbe system, as an age grade based practice, aligns with other African communal farming traditions that emphasise collective responsibility (Mafeje 1991). However, research indicates that modernisation and migration threaten such systems, with younger generations showing reduced interest (Ncube 2018). AI technologies, including NLP, machine learning, and AR/VR, have been successfully applied in cultural preservation, such as digitising oral histories and creating virtual heritage experiences (Smith and Jones 2022). Yet, few studies have explored AI's potential in preserving African agricultural practices through community-led approaches, presenting a gap this study aims to fill.

Theoretical/Conceptual framework

This study is grounded on a proposed theory: the Artificial Intelligence for Indigenous Knowledge Systems (AIIKS) framework. The AIIKS framework is built on an emerging theory that blends indigenous knowledge systems and artificial intelligence in order to make diverse, indigenous, non-Western and non-White epistemologies AI's

centre (Lewis, Whaanga, and Yolgörmez 2025). The AIIKS framework is suitable for this research because it provides a structured way to use AI technologies to document, preserve, and revitalise traditional practices like the Hyumbe system. It supports the recording and archiving of oral histories, traditional knowledge, and cultural practices, aligning with the study's goal of creating a rich digital archive. AIIKS also focuses on amplifying indigenous voices by empowering communities to tell their own stories through digital tools, ensuring the Tiv people maintain control over how the Hyumbe tradition is represented and shared. Additionally, AIIKS emphasises that indigenous knowledge systems are living and evolving, promoting innovation that respects tradition while adapting to modern realities, which fits the study's broader goal of bridging tradition and innovation to keep the Hyumbe system vibrant and relevant.

Methodology

This study adopts a mixed-methods approach to collect qualitative and quantitative data from Hyumbe custodians. Oral narratives, farming techniques, and social structures will be gathered through interviews and participatory workshops with community elders, members, and practitioners. NLP tools will transcribe and translate oral narratives into a digital archive, ensuring accessibility (Johnson, Lee, and Patel 2023). Machine learning models will analyse agricultural patterns, such as crop rotation and soil management, to document best practices. The study will be conducted in collaboration with local Hyumbe communities, prioritising their input and leadership.

Ethical Considerations

Ethical considerations are central to this study, especially given that the study area is one of the regions most affected by the Fulani herdsmen conflict. Many participants are displaced and currently living in IDP camps. Their safety, dig-

nity, and privacy will be prioritised at all times. Participation will be fully voluntary and informed consent will be obtained before any data is collected. Participants will be clearly informed about how their data, audio, visual, or written, will be used and stored, and only what they explicitly permit will be included in the final work. No material will be shared without their approval, especially where individuals are identifiable. The study will also respect cultural sensitivities and ensure restricted knowledge is handled appropriately. Data privacy will be maintained through secure storage and anonymisation where necessary. To avoid extractive practices, the research will be community-led and participatory, giving local stakeholders a voice in shaping the process. Any technological gaps will be addressed through training and access to tools to ensure full and fair participation.

Interdisciplinary Implications

This study bridges cultural anthropology, computer science, and agricultural studies, demonstrating the potential of interdisciplinary approaches to cultural preservation. By integrating AI with indigenous knowledge systems, the project contributes to global discourse on digital heritage and sustainable development. It also highlights the role of technology in empowering marginalised communities, offering a model for preserving other endangered cultural practices. The findings may inform policy on integrating technology into rural development and education, fostering cross-sectoral collaboration.

Findings

The anticipated findings include a comprehensive digital archive of the Hyumbe system, encompassing oral histories, farming techniques, and social structures. The use of AI-driven tools is expected to enhance community engagement, with increased participation in digital platforms and workshops. Preliminary data suggests that community-led approaches strengthen local

ownership, ensuring the system's relevance and resilience.

Conclusion

Leveraging AI to preserve and advance the Hyumbe system through community-led participation offers a scalable and innovative solution to cultural preservation. By documenting practices, enhancing engagement, and revitalising interest, this study aims to ensure the Hyumbe system's resilience and continued contribution to cultural identity and sustainable agriculture. The project underscores the power of combining technology with grassroots efforts, paving the way for future initiatives to safeguard indigenous knowledge systems.

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References

Adebayo, K., and O. I. Oladele. 2020. "Indigenous Knowledge Systems and Sustaina-

ble Agriculture in Africa." *Journal of Agricultural Extension* 24 (3): 45–56.

Akor, L., and J. Z. Okwori. 2016. "Culture and Identity among the Tiv People of Nigeria." Makurdi: Aboki Publishers.

Gyekye, K. 1997. "Tradition and Modernity: Philosophical Reflections on the African Experience." Oxford: Oxford University Press.

Johnson, R., M. Lee, and S. Patel. 2023. "Natural Language Processing for Cultural Preservation: Opportunities and Challenges." *Digital Humanities Quarterly* 17 (2): 112–130.

Mafeje, A. 1991. "The Theory and Ethnography of African Social Formations." Dakar: CODESRIA.

Lewis, J. E., H. Whaanga, and C. Yolgörmez. 2025. "Abundant Intelligences: Placing AI within Indigenous Knowledge Frameworks." *AI & Society* 20: 2141–2157. <https://doi.org/10.1007/s00146-024-02099-4>

Ncube, M. 2018. "Youth Disengagement from Traditional Agricultural Practices in Sub-Saharan Africa." *African Studies Review* 61 (1): 89–105.

Reclaiming Power in an Africanfuturist Age: Technology and Ecological Consciousness in Nnedi Okorafor's *Remote Control*

Olawale Famodu

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Abstract

The convergence of ecological consciousness and technological agency within Africanfuturism is garnering significant scholarly attention, reflecting a nuanced exploration of Africa's environmental and technological narratives. This research investigates the intersection of ecological consciousness and technology in Nnedi Okorafor's *Remote Control*, through the lens of Africanfuturism. The study explores how Africanfuturist literature reimagines Africa's environmental and technological futures by blending traditional African ecological values with speculative representations of advanced technologies. It aims to highlight how the novel reflects decolonial narratives, spiritual ecology, and resistance to dominant Western paradigms of progress and development. Methodologically, the research adopts a qualitative approach, employing close textual analysis of *Remote Control* to examine thematic patterns, narrative strategies, and symbolic elements. In addition to human-led interpretation, the study incorporates AI-assisted reading tools, specifically large language models, to support the identification of recurring themes, structural pat-

terns, and stylistic elements in the text. The use of AI in this research is methodological rather than critical; it does not examine AI as a subject of study or critique its application in literature, but rather employs it to augment literary analysis. Findings from the study show that *Remote Control* uses Africanfuturist storytelling to challenge the binaries of nature and technology, centring African spiritual and environmental worldviews while envisioning a future shaped by indigenous innovation and ecological balance. The narrative positions its protagonist as both empowered by and alienated from technology, reflecting broader tensions within African modernity.

Keywords: Africanfuturism, ecology, technology, African literature, AI

Introduction

The interplay between ecological consciousness and technological agency has emerged as a pivotal area of inquiry, reflecting society's evolving relationship with the environment and technological advancement. Ecological consciousness refers to an awareness of and ethical consideration for the interconnectedness between human activities and the natural

world, emphasising sustainability and environmental stewardship. Technological agency, on the other hand, pertains to the capacity of technology to act and influence both human and ecological systems, shaping behaviours, decisions, and environmental outcomes (Zhang and Mace 2021). In the broader context, this intersection manifests in various ways, from the development of green technologies aimed at reducing environmental footprints to the ethical debates surrounding artificial intelligence and its impact on ecological systems. Scholars have explored how technological innovations can both mitigate and exacerbate environmental issues, highlighting the dual role of technology as a tool for conservation and a potential source of ecological disruption (Zhang and Mace 2021).

Within African literature, these themes are intricately woven into narratives that reflect the continent's unique environmental and technological experiences. African writers have long engaged with ecological themes, addressing the impacts of colonialism, modernisation, and globalisation on the natural environment. For instance, Henry Ole Kulet's works critically examine the effects of British colonialism and modernity on African natural environments, shedding light on the ecological consequences of external interventions (Muriungi and Muriiki 2020, 40). Kulet's novels, such as *Vanishing Herds* (2011) and *The Hunter* (2016), depict the exploitation of natural resources and its detrimental effect on local communities and ecosystems, emphasising the agency of African communities in resisting ecological degradation and advocating for sustainable practices (Nyongesa 2021).

Moreover, contemporary African literature often portrays the complex dynamics between technological progress and environmental sustainability. This is evident in narratives like *Vanishing Herds* and *The Hunter*. Such works not only raise awareness about environmental injustices but also emphasise the agency of African communities in resisting ecological degradation and advocating for sustainable practices (Muriungi

and Muriiki 2020).

The integration of ecological consciousness and technological agency in African literature serves as a critical lens through which authors explore the continent's challenges and aspirations. By examining the multifaceted relationships between humans, technology, and the environment, African writers contribute to a global dialogue on sustainability, ethics, and the future of our planet (Zhang and Mace 2021, 10). This research therefore investigates how Nnedi Okorafor, a Nigerian-American science fiction and fantasy writer, uses Africanfuturist storytelling, a science fiction subcategory, to challenge dominant narratives on technological power and environmental sustainability. It examines the intersections of ecological consciousness and technological agency in *Remote Control* (2021), Okorafor's science fiction novella, particularly in the way the protagonist's journey reflects resistance, reclamation, and adaptation in a rapidly changing world.

Research Questions

This study aims to answer the following questions:

1. How does *Remote Control* portray the relationship between technology and ecological consciousness?
2. How does Okorafor's narrative engage with traditional African spiritual and ecological perspectives while envisioning a technological future?

What role does *Remote Control* play in shaping discourses on Africa's technological and environmental futures?

Literature Review

The convergence of ecological consciousness and technological agency within Africanfuturism has garnered significant scholarly attention, reflecting a nuanced exploration of Africa's environ-

mental and technological narratives. Previous scholarship on Okorafor's work has explored themes of technoculture, postcolonial resistance, and ecofeminism (Adesanmi and Dunton 2005; Ndibe 2019). Scholars like Eshun (2003) and Talabi (2020) have examined the role of African science fiction in reimagining technology beyond Western-dominated paradigms.

Africanfuturism, a term coined by Nnedi Okorafor, is characterised by its foundation in African culture, history, mythology, and perspectives, extending into the African diaspora without centring the West. This genre envisions futures that are deeply rooted in African contexts, often incorporating elements of technology and space exploration while maintaining a strong connection to African traditions and worldviews. Okorafor (2020) emphasises that Africanfuturism is "concerned with visions of the future, is interested in technology, leaves the earth, skews optimistic, is centred on and predominantly written by people of African descent (black people) and it is rooted first and foremost in Africa."

A salient theme within Africanfuturist literature is ecological consciousness, reflecting a deep awareness of environmental issues and the interdependence between humans and nature. Authors utilise speculative fiction to address environmental degradation, climate change, and sustainable practices, often intertwining these themes with African spiritualities and philosophies that emphasise harmony with the natural world. For instance, Okorafor's novel *Lagoon* (2014) combines Africanfuturism with environmental activism, highlighting how traditional knowledge and futuristic visions can promote ecological sustainability (Ogunsiji 2024).

Technological agency in Africanfuturist works explores how technology influences and is influenced by African societies. This includes narratives where technology serves as both a tool for empowerment and a potential source of conflict, reflecting the complex dynamics between technological advancement and cultural preservation. In Okorafor's *Noor* (2021), the protagon-

nist's journey as a cyborg woman delves into themes of identity, technology, and environmentalism, prompting readers to reconsider human relationships with the environment and advocating for sustainable technological advancements (Aja 2022).

Africanfuturism also functions as a decolonial framework, challenging Western-centric narratives by asserting African perspectives on technology and ecology. This genre reimagines development and progress through an African lens, often portraying futures where African societies lead in technological innovation while maintaining ecological balance. Such narratives perform "decolonial dreamwork," envisioning futures that break away from colonial legacies and redefine development as a form of rebellion against imposed structures (Hanchard 2022).

In film, Africanfuturism continues to explore these themes. Wanuri Kahiu's short film 'Pumzi' portrays a dystopian future Kenya where natural resources are scarce, and a scientist ventures beyond her controlled community to nurture a plant, symbolising hope and ecological restoration. The film challenges pessimistic representations of African realities by showcasing African-led creativity and resilience in addressing environmental challenges (Nyawalo 2016).

The literature on Africanfuturism reveals a rich tapestry of narratives that intertwine ecological consciousness with technological agency. By centring African experiences and perspectives, these works offer alternative visions of the future that challenge dominant paradigms, promote environmental sustainability, and celebrate technological innovation rooted in cultural authenticity. This genre not only redefines science fiction but also contributes to broader discussions on decolonisation, environmentalism, and the role of technology in shaping societies. Therefore, this research builds on these discussions by analysing how *Remote Control* contributes to Africanfuturist thought, focusing on the novel's representation of technology as both a tool of oppression and liberation, as well as its engage-

ment with environmental ethics and sustainability.

Theoretical Framework

This study draws from:

1. Africanfuturism (Okorafor 2019) to analyse the novel's reimagining of Africa's technological destiny; and
2. Postcolonial Ecocriticism (Huggan and Tiffin 2010) to explore the intersection of environmental degradation, colonial histories, and speculative futures.

Methodology

This study adopts a qualitative research design grounded in literary analysis to examine the intersection of ecological consciousness and technological agency in Nnedi Okorafor's *Remote Control*. The primary method of analysis is close reading, where I will critically engage with the text to uncover themes, symbols, and narrative strategies related to Africanfuturism, environmental ethics, and technological agency. This method will be complemented by the use of AI chatbots (specifically, large language models) to assist in identifying recurring motifs, character dynamics, and stylistic patterns. The AI tools will serve as supplementary aids, offering textual insights and comparative interpretations that support human-led analysis while preserving the integrity of scholarly interpretation.

Significance of the Study

This study contributes to ongoing discussions on African science fiction and its role in shaping narratives about Africa's future. This study is significant as it expands the discourse on Africanfuturism by examining its intersection with ecological consciousness and technological agency. While African speculative fiction is often explored through themes of identity and postcolonialism, this research highlights African speculative fiction's engagement with environmental

sustainability and ethical technology use. By analysing *Remote Control*, the study situates Nnedi Okorafor's work within the broader African literary tradition that integrates folklore, science fiction, and contemporary ecological concerns. It contributes to African literary studies by showcasing how Africanfuturist narratives offer alternative visions of the future, blending indigenous knowledge systems with speculative technology to challenge Eurocentric perspectives on development and progress.

Beyond literature, this study bridges environmental humanities and technological discourse, demonstrating how fiction can serve as a platform for addressing pressing global issues such as climate change, sustainability, and digital ethics. It holds relevance for educators, policymakers, and environmental advocates, offering insights into how African narratives can inform discussions on ecological justice and responsible technological advancement. Ultimately, this research affirms the role of African speculative fiction in shaping decolonial and sustainable futures, emphasising the power of storytelling in reimagining Africa's relationship with technology and the environment.

Conclusion

This research explores the intersections of ecological consciousness and technological agency in Nnedi Okorafor's *Remote Control* within the framework of Africanfuturism. By situating the novel in the broader discourse of African speculative fiction, the study examines how Okorafor challenges conventional narratives about Africa's technological and environmental futures. Africanfuturism, as a genre, not only reimagines the continent's engagement with technology but also foregrounds indigenous ecological knowledge, spiritual cosmologies, and alternative models of sustainability. Through an analysis of *Remote Control*, this research investigates how Okorafor portrays power, environmental awareness, and the ethical implications of technological ad-

vancement in a rapidly changing African landscape.

The study contributes to African literary scholarship, environmental humanities, and decolonial theory by demonstrating how African speculative fiction serves as a medium for exploring global concerns from an African perspective. It underscores the significance of literature in addressing ecological crises and ethical technology use while offering alternative visions of sustainable and decolonial futures. Ultimately, this research affirms the role of Africanfuturism in reclaiming power by reimagining Africa's relationship with nature, technology, and agency, positioning storytelling as a vital tool for shaping more equitable and sustainable worldviews.

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References

Eshun, K. 2003. "Further Considerations on Afrofuturism." *CR: The New Centennial Review* 3 (2): 287–302.

Haraway, D. 1985. "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century." *Socialist Review* 80: 65–108.

Huggan, G., and H. Tiffin. 2010. "Postcolonial Ecocriticism: Literature, Animals, Environ-

ment." New York: Routledge.

Okorafor, N. 2019. "Africanfuturism Defined." *nmedi.com*.

Talabi, W. 2020. "African Science Fiction and the Politics of Imagination." *African Identities* 18 (3): 215–229.

Kulet, H. O. 2011. "Vanishing Herds." Nairobi: Longhorn Publishers.

Kulet, H. O. 2016. "The Hunter." Nairobi: Longhorn Publishers.

Muriungi, P., and P. Muriiki. 2020. "The Subdued Nature: Reading Henry Ole Kulet's Vanishing Herds through Eco-Marxist Lenses." *Research Journal in Modern Languages and Literatures* 9 (1): 35–47.

Nyongesa, A. 2021. "Humanity and Mother Nature: Ecological Reading of Ole Kulet's Blossoms of the Savannah." *Kenya Studies Review* 9 (1): 35–47.

Zhang, W., and G. M. Mace. 2021. "Ecological Civilization: Perspectives from Ecology and Economics." *Ecosystem Health and Sustainability* 7 (1): 1–11.

Aja, E. 2022. "Africanfuturism and Climate Fiction: Nnedi Okorafor's Noor." *Journal of African Literature and Culture* 15 (2): 123–135.

Hanchard, M. 2022. "Africanfuturism as Decolonial Dreamwork and Developmental Rebellion." *Journal of Postcolonial Writing* 58 (1): 45–59.

Nyawalo, M. 2016. "Afrofuturism and the Aesthetics of Hope in Bekolo's *Les Saignantes* and Kahi's *Pumzi*." *Journal of the African Litera-*

ture Association 10 (1): 31–45.

Ogunsiji, A. 2024. "Reimagining Futures: Environmental Activism and African Futurism in Nnedi Okorafor's Lagoon." *American Journal of Environment and Climate* 3 (2): 35–47.

Okorafor, N., editor. 2020. "Africanfuturism: An Anthology." Lagos: Brittle Paper.

Uncovering AI's Bias in Language Prompts and Generation of African Images using ChatGPT and Midjourney

C.I. Atumah

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Abstract

This research critiques the application of AI in African beauty representation by examining biases in language prompts and AI-generated images. It investigates how AI models, specifically ChatGPT and Midjourney, interpret and generate African identities based on textual prompts (*Hu, 2023; Shin et al., 2024*). The study is divided into two parts: First, it explores how AI processes demographic cues through prompt engineering. By analysing AI's responses to varied language inputs, the research reveals how stereotypes are embedded and reinforced within these systems. It also examines how linguistic nuances influence AI's assumptions about African beauty and identity. Second, it assesses AI's accuracy in generating images of Black individuals, focusing on features such as 4C hair, facial structures and body types. The study highlights inconsistencies in AI-generated representations, shedding light on the technology's limitations in reflecting the diversity of African beauty. Findings suggest that AI models rely heavily on pre-existing datasets that may

lack authentic African representation, leading to stereotypical and sometimes inaccurate depictions (*NPR, 2023; Brookings Institution, 2024; Vellum Kenya, 2025*). This research contributes to discussions on AI ethics, representation and the need for more inclusive datasets in machine learning models.

Keywords: AI bias, African beauty, representation, image generation, prompt engineering

Introduction

Artificial Intelligence (AI) models like ChatGPT and Midjourney are increasingly used to create cultural representations, yet they often carry biases that misrepresent African identities. This paper examines how these models respond to language prompts and generate images related to African beauty, with the objective of exposing embedded stereotypes and inaccuracies. Although previous studies have documented AI's racial and gender biases, few have focused specifically on African contexts, leaving a gap this research addresses (*Vellum Kenya, 2025; Edoigiawerie, 2024*).

Using prompt engineering to analyse ChatGPT's text outputs and evaluating Midjourney's generated images for features such as 4C hair, facial structures and body types, the study reveals how AI often defaults to narrow or exoticised portrayals. Findings suggest that these biases stem from reliance on non-diverse datasets, leading to limited and sometimes inaccurate representations of African beauty (*Hall et al., 2024; Edoigiawerie, 2024*). Positioned at the intersection of AI technology, cultural studies and social science, this research highlights the urgent need for more inclusive AI practices and inclusivity in datasets. Its relevance to Nigerian contexts lies in the urgent need for AI technologies that accurately reflect local identities, languages and beauty standards, rather than recycling Western-centric stereotypes. By exposing these biases, this research advocates for the development of more inclusive datasets and ethical AI practices that are attuned to Nigeria's cultural realities and aspirations.

Methodology

This research was conducted in two parts. In the first phase, I employed prompt engineering by designing a list of structured questions intended to guide the creation of language prompts that would highlight African beauty characteristics. I then analysed the AI-generated responses from ChatGPT to observe how demographic cues influenced the system's assumptions and descriptions. Although the second phase involving image generation using Midjourney is yet to be completed due to time constraints, it will be incorporated into the final research to provide a fuller picture of visual biases. Throughout the process I carefully observed patterns of bias, stereotyping and cultural misrepresentation in the AI outputs (*ACM, 2023; Brookings Institution, 2024*). Ethical considerations were central to this study, including concerns about the reinforcement of biased narratives, the erasure or distortion of cultural identities and the need for

heightened cultural sensitivity when using AI systems to represent marginalised groups.

Ethical Considerations

Ethical considerations in this study included concerns about bias, misrepresentation and cultural sensitivity. Since the research focused on analysing AI responses rather than involving human participants, data privacy and consent were not major issues. However, it was important to note how AI systems can reinforce stereotypes and overlook the range of African identities (*NPR, 2023; Vellum Kenya, 2025*). I also considered how AI models often reflect ideas shaped by Western perspectives, which can limit how African cultures are seen. Finally, I reflected on resource limitations, recognising that Nigeria and other low-resource settings need more support to build AI tools that represent their own realities.

Findings

The findings from the first part of the study show that AI systems like ChatGPT often rely on narrow ideas when describing African beauty. When given prompts based on specific African features, ChatGPT sometimes responded with stereotypes or incomplete generations. For example, traits like 4C hair or wider facial features were either generated vaguely or replaced with more Western beauty standards (*Brookings Institution, 2024; NPR, 2023*). These results highlight a major limitation in how AI models are trained, as their data often lacks a full range of African examples. Although the second part of the research, which involves image generation through Midjourney, is still in progress, early observations suggest similar issues of misrepresentation. No completely unexpected results were recorded, but the depth of the bias was stronger than anticipated.

Interdisciplinary implications

The main goal of this research is to be used in educational settings to encourage critical thinking about AI and its impact on cultural representation. By exploring how AI systems represent African beauty, this work bridges technology and humanities, showing how machine learning can shape or distort identity. The findings are particularly relevant to Nigeria and Africa, where there is a need for more inclusive AI tools (*Hall et al., 2024; Edoigiawerie, 2024*). This research can also inform policy by advocating for better data standards and promote community awareness about the biases embedded in technologies.

Conclusion

The research highlights significant biases in AI systems when representing African beauty, showing how these technologies often reinforce stereotypes due to limited and unrepresentative datasets. Theoretical implications suggest that AI models need to be re-evaluated for cultural sensitivity, while practically, this work calls for more inclusive training data. The findings stress the importance of developing AI systems that respect and accurately reflect African identities. It is recommended that AI developers prioritise diverse datasets and collaborate with local communities to ensure more accurate and fair representations (*Edoigiawerie, 2024; Hall et al., 2024*).

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References

- Brookings Institution. (2024). Rendering misrepresentation: Diversity failures in AI image generation. *Brookings Review*. <https://www.brookings.edu/articles/rendering-misrepresentation-diversity-failures-in-ai-image-generation/>
- Hall, M., Bell, S. J., Ross, C., Williams, A., Drozdal, M., & Soriano, A. R. (2024). Towards geographic inclusion in the evaluation of text-to-image models. In *Proceedings of the 2024 ACM Conference on Fairness, Accountability, and Transparency (FAccT'24)* (pp. 1–17). ACM. <https://doi.org/10.1145/3630106.3658927>
- Hu, J. (2023). Bias in Midjourney — It's not just the representation, it's the art direction. *Medium*. <https://medium.com/%40hujason/race-and-gender-bias-in-midjourney-c43e92f515f>
- NPR. (2023, October 6). AI was asked for images of Black African docs treating White kids. How'd it go? *NPR Goats and Soda*. <https://www.npr.org/sections/goatsandsoda/2023/10/06/1201840678/ai-was-asked-to-create-images-of-black-african-docs-treating-white-kids-howd-it->
- Shin, P. W., Ahn, J. J., Yin, W., Sampson, J., & Narayanan, V. (2024). Can prompt modifiers control bias? A comparative analysis of text-to-image generative models. *ResearchGate*. https://www.researchgate.net/publication/381308275_Can_Prompt_Modifiers_Control_Bias_A_Comparative_Analysis_of_Text-to-Image_Generative_Models
- Srinivasan, K., et al. (2023). Easily accessible text-to-image generation amplifies demographic stereotypes at large scale. *ACM Digital Library*. <https://dl.acm.org/doi/10.1145/3593013.3594095>

Vellum Kenya. (2025). Uncovering the contextual bias in AI: You still need your camera for realistic African images. *Vellum Kenya*. <https://vellum.co.ke/uncovering-the-contextual-bias-in-ai-you-still-need-your-camera-for-realistic-african-images/>

Edoigiawerie, O. (2024). Africa's role in generating indigenous content to shape AI narrative, address algorithm bias. *ThisNigeria*. <https://thisnigeria.com/africas-role-in-generating-indigenous-content-to-shape-ai-narrative-address-algorithm-bias/>

Simulated Care or Real Presence? Ontological Reflections on AI Therapists

Richard Oveh

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Abstract

As artificial intelligence (AI) technology advances, the possibility of AI-based therapists is increasingly being explored as a solution to addressing global mental health challenges. However, this development raises significant questions about the ontological foundations of therapy, particularly its relational and existential aspects. This paper examines the role of AI in therapeutic contexts, focusing on the distinction between therapy-as-technique (symptom management) and therapy-as-relation (relational, ethical, and embodied interaction). Using a qualitative method, the study critically engages with existing literature and philosophical frameworks to explore the implications of AI in therapy. The results suggest that while AI can replicate therapeutic techniques such as cognitive-behavioural interventions, it falls short of embodying the relational presence essential to human therapeutic practice. Furthermore, AI's inability to engage in ethical attunement, vulnerability, and mutual recognition limits its effectiveness in replicating the therapeutic experience. Findings indicate that AI therapy, while promising in certain technical capacities, can-

not replace the deep, existential engagement between therapist and client. The study concludes that AI can serve as a supplementary tool in therapy but cannot substitute the human connection that is fundamental to the healing process. This paper also explores the potential for AI-based therapy in low-resource settings, such as Nigeria and other African contexts, where access to trained mental health professionals is limited. It calls for a balanced approach to integrating AI in mental health care, emphasising the importance of maintaining the human-centric nature of therapy while exploring innovative solutions to address mental health disparities.

Keywords: Artificial intelligence, AI-based therapy, therapy-as-technique, therapy-as-relation, ontological foundations, existential therapy, relational presence

Introduction

As AI technology advances, there is a growing push to deploy AI-based therapists. However, without a clear ontological understanding of therapy as existential and relational, the evaluation of AI's role risks overlooking the very as-

pects that make therapy transformative and human. Existing definitions of therapy emphasise its role in addressing emotional, mental, or even physical distress. Smith (2024) describes therapy as a treatment process aimed at resolving psychological issues through defined modalities, such as cognitive-behavioural or psychodynamic interventions. Emerson and Lavoie (2023) expand this, framing therapy as addressing both mental and physical disorders. Jed (n.d.) and Cherry (2024) centre their definitions on psychotherapy (or talk therapy) as a dialogical process where a professional helps clients navigate their feelings. Bhatia (2023) highlights therapy's dual aims: symptom reduction and understanding the deeper psychological roots of suffering. BetterHelp (2025) frames therapy as a "journey" of uncovering and healing. While these definitions converge on therapy's purpose (addressing distress), they diverge, often implicitly, on what therapy is at its core. Is therapy primarily a technical intervention for symptom management, or is it fundamentally a relational, ethical, and existential encounter? This distinction is crucial because how we conceptualise therapy fundamentally shapes whether we believe AI can authentically perform therapeutic work.

The various approaches pose a slippage problem, as the discourse collapses two distinct conceptions of therapy (i.e. therapy-as-a-technique and therapy-as-relation). Therapy-as-technique is defined as a set of skills, interventions, and procedures (e.g., CBT methods, thought reframing, prompting emotional insight), while therapy-as-relation is defined as an existential mode of being-with-another, involving ethical presence, vulnerability, mutual recognition, and affective attunement (Talens 2024). When we treat therapy only as a technique, it seems plausible that AI could replicate it by executing predefined strategies. However, if therapy is fundamentally relational and existential, then AI's inability to embody subjective presence and relational being places insurmountable limits on its capacity to be a therapist (Hurley et al. 2023). Without a clear separation of these two conceptions, any

ethical or philosophical critique of AI therapy weakens, allowing a false equivalence between simulated competence and genuine therapeutic presence.

The research gap rests on the fact that existing discussions often evaluate AI's ability to perform therapeutic tasks but neglect the deeper ontological foundations of therapy as a relational being. Without addressing this, critiques of AI therapy remain superficial. The fundamental research question is: can AI authentically replicate the relational, ethical, and embodied dimensions that are fundamental to human therapeutic practice? This paper argues that while AI may imitate the technical procedures of therapy, it cannot embody the relational, ethical, and existential dimensions that constitute authentic therapeutic practice.

Methodology

This study adopts a qualitative case study design to explore whether free versions of AI language models (ChatGPT and DeepSeek) can simulate core therapeutic competencies, specifically *active listening* and *empathy*, within a mental health support context. The case under examination is the simulated therapy conversation generated by each AI model in response to a controlled prompt. ChatGPT and DeepSeek were chosen because they are widely accessible, popular large language models (LLMs) available to the public at no cost. The choice of free versions reflects an exploration of realistic, publicly available AI tools, rather than specialised or fine-tuned therapeutic AI models. However, it is acknowledged that the free versions of these LLMs are not fine-tuned for the complexity required in real-world therapeutic simulation, which limits their performance in replicating nuanced therapeutic practices. The free version was chosen due to its availability in a low- and medium-income country as Nigeria.

To initiate the simulations, the following prompt was developed: "Show a mental therapy session

conversation where a licensed therapist is engaging with a client in a calm and supportive environment. The session focuses on discussing anxiety management techniques, with the therapist using active listening and cognitive behavioural therapy (CBT) strategies." This prompt was chosen to elicit a conversation that emphasises critical therapeutic techniques (active listening and CBT). No additional tuning or system prompts were provided beyond the initial instruction. Both ChatGPT and DeepSeek were given the identical prompt to ensure comparability.

Ethical Considerations

In conducting this study, ethical considerations were carefully evaluated, particularly given the absence of human participants and the use of AI-generated data. Since no personal data was involved, concerns surrounding privacy and consent were significantly reduced. However, we were keenly aware of the inherent biases and limitations in the AI systems used, recognising that these could affect the accuracy and depth of simulated therapeutic interactions.

Result

The questions and the obtained results from ChatGPT and DeepSeek are shown in Table 1, while the thematic analysis of the results is shown in Table 2.

Table 1: Therapy session using large learning models

SEE TABLE ON NEXT PAGE

| S/N | Client | ChatGPT | Client | DeepSeek |
|-----|--|---|--|---|
| 1 | "It's just... everything feels overwhelming. Work, relationships, even small things like answering messages—it all piles up, and I don't know how to handle it." | It sounds like you're carrying a lot at once, and even the little things are starting to feel heavy. Would you like to talk about which part feels the heaviest right now? | "It's just... everything feels overwhelming. Work, relationships, even small things like answering messages—it all piles up, and I don't know how to handle it." | <p>"It sounds like the weight of all these responsibilities—work, relationships, even the small daily tasks—has become almost suffocating. That kind of overwhelm can make even the simplest things feel impossible. Let's slow down and unpack this together. When you feel the pile-up starting, where does it show up in your body? Does your chest tighten, or does your mind start racing with 'what-ifs'?</p> <p>I wonder, when you say you don't know <i>how</i> to handle it, does it feel like there's no clear starting point, or like no matter what you do, it won't be enough? Sometimes overwhelm isn't just about the tasks themselves but the stories we attach to them—like fearing judgment if we can't 'keep up.' What do you think is underneath the fear of not handling it all?</p> <p>What if we tried something small, like picking <i>one</i> thing from the pile that feels slightly lighter? Not to 'fix' it all, but to see what happens when we touch just one part. For example, could you reply to a single message with just 'I'll circle back later'—no apology, no explanation? Sometimes reclaiming a tiny bit of agency can loosen the grip of the bigger storm. How does that land for you?"</p> |
| 2 | "That I'm not doing enough. That I'm failing. And then I just freeze instead of doing anything." | That feeling of freezing when the pressure builds up is so real—it's like your mind and body are just trying to protect you. Would it help to break things down into really small steps together? | "That I'm not doing enough. That I'm failing. And then I just freeze instead of doing anything." | <p>"That fear of 'not doing enough' can feel like a shadow that follows every step, whispering doubts even when you're trying. When you say you freeze, does it feel like your mind and body are shouting '<i>What's the point?</i>' or '<i>It won't be perfect, so why try?</i>'</p> <p>I wonder—when you freeze, is it possible your system is actually protecting you? Like a part of you is saying, '<i>If I stop moving, maybe I won't drown?</i>' That doesn't make the freeze <i>helpful</i>, but it might make it <i>understandable</i>.</p> <p>What if we tried something counterintuitive? Instead of pushing yourself to <i>do more</i>, could you give yourself permission to <i>do less</i>—even just for 10 minutes? For example, what if you sat with the thought '<i>I'm failing</i>' and asked it: '<i>What's the cost of believing this right now?</i>' Sometimes naming the fear loosens its grip enough to let a sliver of air in.</p> <p>How does that feel to consider?"</p> |
| 3 | "Well... I guess not really. I do finish tasks, even if it takes longer than I want." | "That's actually really important—you <i>are</i> finishing things, even when it's hard. Do you ever give yourself credit for getting through it, even when it's slower than you'd like?" | "Are you suggesting I do less when that feeling comes | <p>"Great question. When I suggest 'doing less,' I don't mean giving up or ignoring responsibilities long-term. I mean <i>temporarily</i> dialling back the pressure you're putting on yourself in moments of overwhelm.</p> <p>Here's why: When we feel like we're 'failing,' our nervous system often floods with stress hormones (like cortisol), which can trigger that freeze response—like a car stuck in neutral. Trying to 'do more' in that state can deepen the cycle of panic and paralysis.</p> <p>'Doing less' in this context means:</p> <ol style="list-style-type: none"> 1. Pausing to interrupt the stress spiral. 2. Resetting your nervous system (e.g., taking 3 slow breaths, stepping outside for 2 minutes). 3. Choosing one tiny action that feels <i>just barely possible</i> (e.g., "I'll open my email and stare at it for 30 seconds—no reply needed"). <p>It's not about lowering standards, but about <i>creating space</i> for your brain to shift from 'I can't' to 'Maybe I can try this small piece.'</p> <p>How does that idea sit with you? Does it feel dismissive, or like it might loosen the grip of that freeze?"</p> |

Table 2: Thematic analysis of a therapy session with large learning models

| S/N | Client | ChatGPT Response (Theme) | DeepSeek Response (Theme) |
|-----|---|---|---|
| 1 | Feeling overwhelmed by work, relationships, small tasks. | Active Listening: Reflects back the client's overwhelm without judgment; Empathy: Offers a simple, open-ended question inviting the client to focus on what feels heaviest. | Active Listening: Deep paraphrasing, capturing emotional nuance (e.g., "suffocating"); Empathy: Validates emotional experience, normalises overwhelm, invites somatic awareness (body response), and gently explores underlying fears with layered, supportive questioning. |
| 2 | Feeling like a failure, freezing instead of acting. | Active Listening: Normalises the freezing as a self-protective response; Empathy: Suggests a collaborative, small-step approach to avoid pressure. | Active Listening: Explores the emotional landscape of "freezing" more deeply (narrative of failure); Empathy: Offers compassionate reinterpretation of freezing as protection, proposes gentle, counterintuitive strategies (doing less), and invites reflection on the internalised cost of harsh self-judgment. |
| 3 | Acknowledging task completion, but frustration at slowness. | Active Listening: Recognises and affirms the achievement of completing tasks even when slow; Empathy: Encourages self-compassion and credit-giving. | Active Listening: Carefully clarifies earlier suggestion ("doing less") to avoid misunderstanding; Empathy: Provides psychoeducation (stress response), suggests concrete nervous system reset techniques, emphasises that the goal isn't giving up but creating manageable steps from a place of care. |

Findings

Both responses show active listening and empathy, but DeepSeek leans into trauma-informed, deeper emotional engagement, whereas ChatGPT provides a gentler, surface-level empathetic connection with practical suggestions. DeepSeek frames client struggles within a compassionate, explanatory model (e.g., nervous system protection), aiming for transformational empathy, while ChatGPT aims for supportive validation and gentle action orientation.

The findings show that:

- ChatGPT practices basic active listening and light empathy—reflecting client feelings, normalising experiences, offering small invitations for progress without overwhelming.
- DeepSeek demonstrates deep active listening and therapeutic-level empathy—paraphrasing with emotional depth, exploring bodily sensations, uncovering narratives beneath behaviour, providing psychoeducation, and proposing trauma-informed strategies.

Interdisciplinary implications

The ontological inquiry into therapy challenges the boundaries between philosophy (particularly existential philosophy) and technology. It raises critical questions about the nature of being, presence, and relationality in an era of increasing AI integration. This invites philosophers, technologists, and ethicists to rethink how AI can (or cannot) replicate the nuances of human interaction. Also, considering potential applications, especially in resource-constrained settings like Nigeria and many parts of Africa, where there is a shortage of mental health professionals, AI-based therapy tools could provide preliminary support. These tools could help bridge the gap in access to mental health care, offering basic interventions while maintaining awareness of the limitations of AI in fostering true relational therapy.

Conclusion

This study directly engages with the critical question posed in using AI for therapy. Through the analysis of therapy sessions facilitated by AI systems like ChatGPT and DeepSeek, the findings reaffirm that while AI can simulate aspects of therapy-as-technique, it fundamentally falls short of providing the real presence that defines authentic therapeutic encounters. While AI can replicate certain procedures of active listening and emotional validation, it is unable to embody the ethical vulnerability, embodied presence,

and existential mutuality that make therapy a deeply human, relational experience. The analysis reveals that therapy, when treated only as a technical intervention, risks neglecting the essential relational and ontological dimensions that constitute healing. While AI may excel in mimicking the surface-level actions of therapy, it cannot replicate the lived, relational experience of therapy as a profound being-with-another. The inability of AI to embody true relational presence demonstrates the limits of AI as a therapist, no matter how sophisticated its algorithms may become.

This paper ultimately underscores that the distinction between simulated care and real presence is not just philosophical, it has practical and ethical implications. For communities, educational settings, and policy development, particularly in low-resource contexts such as Nigeria and broader Africa, this study calls for a cautious approach to AI therapy. AI can extend access to basic mental health support but should not replace the deeply human aspects of care that are necessary for transformative therapy. Moving forward, AI therapy systems must prioritise real presence by acknowledging the relational and ontological boundaries that AI cannot cross.

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References

Ackerman, S. J., and M. J. Hilsenroth. 2003. "A Review of Therapist Characteristics and Techniques Positively Impacting the Therapeutic Alliance." *Clinical Psychology Review* 23 (1): 1-33. [https://doi.org/10.1016/S0272-7358\(02\)00146-0](https://doi.org/10.1016/S0272-7358(02)00146-0).

Alagos, G. 2024. "Characteristics of a Good Therapist." *CarePatron*. [https://](https://www.carepatron.com/blog/characteristics-of-a-good-therapist)

www.carepatron.com/blog/characteristics-of-a-good-therapist.

Bhatia, R. 2023. "What Is Psychotherapy?" *American Psychiatric Association*. <https://www.psychiatry.org/patients-families/psychotherapy>.

BetterHelp. 2025. "What Is A Therapist? Common Questions About Mental Health Professionals." *BetterHelp*. <https://www.betterhelp.com/advice/therapy/what-is-a-therapist-meaning-mindset-and-expertise/>.

Bell, N. 2024. "The 8 Characteristics That Research Says Are to Be Found in the Best Therapists." *Noel Bell*. <https://noelbell.net/the-8-characteristics-that-research-says-are-to-be-found-in-the-best-therapists/>.

Cherry, K. 2024. "Psychotherapy Types and Techniques." *Verywell Mind*. <https://www.verywellmind.com/psychotherapy-4157172>.

Emerson, A., and S. Lavoie. 2023. "Therapy | Definition & Different Types." *Study.com*. <https://study.com/academy/lesson/therapeutic-approaches-in-psychology-definition-lesson-quizz.html>.

Fiske, A., P. Henningsen, and A. Buyx. 2018. "Your Robot Therapist Will See You Now: Ethical Implications of Embodied Artificial Intelligence in Psychiatry, Psychology, and Psychotherapy." *Journal of Medical Internet Research* 21 (5): e13216. <https://doi.org/10.2196/13216>.

Grodniewicz, J. P., and M. Hohol. 2023. "Waiting for a Digital Therapist: Three Challenges on the Path to Psychotherapy Delivered by Artificial Intelligence." *Frontiers in Psychiatry* 14: 1190084. <https://doi.org/10.3389/fpsy.2023.1190084>.

Hurley, Meghan E, Benjamin H Lang and Jared N Smith. "Therapeutic Artificial Intelligence: Does Agential Status Matter?" *The American Journal of Bioethics* 23 (2023): 33 - 35.

Indeed. 2024. "What Does a Therapist Do? (With Salary and Skills)." *Indeed*. <https://www.indeed.com/career-advice/finding-a-job/what-does-therapist-do>.

JED Foundation. n.d. "What Is Therapy and Will It Work?" *JED Foundation*. <https://jedfoundation.org/resource/what-is-therapy-and-will-it-work/>.

Post. 2025. "Counselling 101: Counsellor Skills and Techniques to Make a Difference." *Post University*. <https://post.edu/blog/the-traits-that-will-help-you-thrive-as-a-counselor/>.

Pereira, R., A. Pires, and D. Neto. 2024. "Therapist Self-Awareness and Perception of Actual Performance: The Effects of Listening to One Recorded Session." *Research in Psychotherapy* 27 (1). <https://doi.org/10.4081/ripppo.2024.722>.

Schwartz, E. 2024. "The Global Mental Health Crisis: 10 Numbers to Note." *The Hope Project*. <https://www.projecthope.org/news-stories/story/the-global-mental-health-crisis-10-numbers-to-note/>.

Smith, A. 2024. "Types of Therapy for Anxiety, Depression, Trauma, PTSD, and More." *Medical News Today*. <https://www.medicalnewstoday.com/articles/types-of-therapy>.

Talens, P. 2024. "The Shaping Force of Technology in Psychotherapy." *European Journal of Psychotherapy & Counselling* 26 (1-2): 34-47. <https://doi.org/10.1080/13642537.2024.2312289>.

Queensland Brain Institute. 2023. "Half of World's Population Will Experience a Mental Health Disorder." *Harvard Medical School*. <https://hms.harvard.edu/news/half-worlds-population-will-experience-mental-health-disorder>.

GROUP 3

EDUCATION & HUMAN DIGNITY

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Measuring and Modeling Educational Inequality with AI: A Lorenz and Gini Coefficient Approach in Nigeria's Post-Primary Sector

Oluremi Morakinyo Alao

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Abstract

In this work, we construct a new framework for measuring and modelling educational inequality at the post-primary level of education in Nigeria by combining classical economic tools like the Lorenz curve and Gini coefficient with AI methodologies. The study uses AI-augmented algorithms, such as machine learning and explainable AI, to tackle deep-rooted learning resource disparities through pattern recognition, policy outcome pre-simulation (equitable teacher deployment, ICT investment), and real-time equity tracking. The initial projections provide evidence of entrenched inequalities, with Gini coefficients within the range of 0.52-0.68, exceeding the levels of income inequality in the country. AI-based policy modelling, as demonstrated within this research, can reduce inequality margins by approximately 20%. The international development work scrutinises the applicability of AI from polar perspectives, instrument and target, offering actionable policies towards sustaining SDG4 framed for Nigeria's development needs.

Keywords: Inequality in education, Gini coefficient, AI education, post-primary level

Introduction

Educational inequality manifests as a persistent problem in Nigeria, with a severe impact on post-primary education, learning outcomes, and access to educational resources, which are not uniform across geographical and socio-economic regions. While reported using conventional techniques, there is no reliable, holistic, and consistent methodology for measurement.

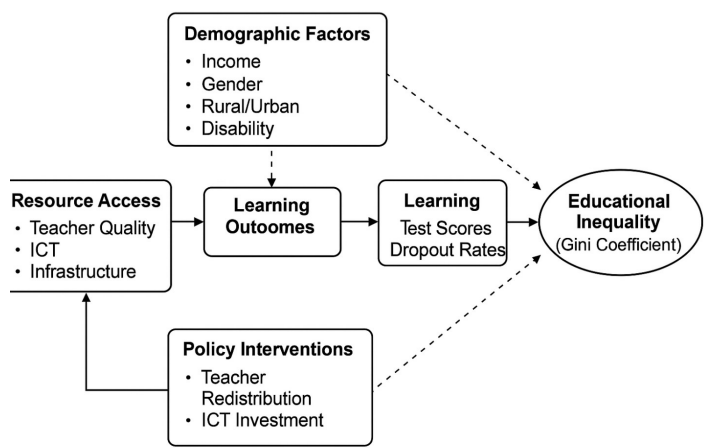
Traditional economic measures like Gini coefficients and Lorenz curves, concerning education inequity, have been improved by artificial intelligence (AI) techniques motivated by the study. This research sits at the intersection of social AI and educational humanities to investigate how AI both quantifies and influences educational inequality. This is of particular importance to Nigeria, where infrastructural bottlenecks are simultaneously present with digitisation.

Using AI-based analytics to reveal hidden trends and project policy outcomes, the study is quantitative, correlational, and postdictive in design. It offers new perspectives on educational reforms focused on Nigeria's socio-economic context.

Literature Review

AI possesses significant potential to transform educational inequity by enhancing access, quality, and equity, particularly in resource-limited areas. Opesemowo (2024) conceptualises AI as both a classroom companion and an equalising instrument, effectively addressing common obstacles such as insufficient educators and deteriorating infrastructure. Theoretically, the study adopts a phenomenological perspective, utilising the authentic, lived experiences of educators to better understand the implications of AI integration in conventional classrooms. Empirically, interviews with Nigerian secondary school educators indicate that AI can customise teaching and enhance student engagement; nonetheless, challenges such as unstable infrastructure and a decline in personal contact persist. In summary, these findings align with the broader perspective that technology serves dual functions, creating opportunities but occasionally, unintentionally, establishing new obstacles to genuine educational gap.

Conceptual Model



Research Design and Framework

This quantitative, correlational, and non-experimental analysis is enhanced by predictive modelling. It achieves a comprehensive understanding of a complex phenomenon like educational inequality by merging traditional statisti-

cal approaches with AI-driven processes.

Data Sources

- a. **Educational Outcomes:** WAEC/NECO results, dropout rates, course completion, and transition rates (2015-2024).
- b. **Resource Availability:** Teacher experience, infrastructure like electricity and internet services, and funding lines.
- Socio-economic Information:** Family income, urban/rural status, level of parental education, age, and ethnicity.

Sampling

- Multi-stage Sampling:
 - Stratified by political zones as well as urban and rural locations.
 - Deliberate selection of certain states based on educational ranking.
 - Systematic selection of individuals within schools.
- Sample size: 500 schools and at least 11 states.

Analytical techniques

- The study used the following techniques in analysing its data:
- a. Calculation of Lorenz curve and Gini coefficient.
 - b. Descriptive analysis of correlation and regression.
 - c. Estimation of educational results using machine learning algorithms (Random Forest, XGBoost).
 - d. Projecting the effects of intervention through policy simulation models.
- Clustering and anomaly detection through AI for real-time monitoring.

Ethical considerations

- a. Anonymity and protection of data.
- b. Prevention and mitigation of biased algorithms.
- c. Subjective evaluation of AI systems to ensure that existing inequities are not perpetuated.

Policy recommendations require interpretation of data with cultural respect.

Findings

Preliminary analysis and projections indicate:

- a. **Biases:** Analysis indicates high inequities; preliminary estimates of Gini coefficients suggest severe inequalities, which have no bounds; prediction shows ranges from 0.52 up to 0.68, applying the Gini model of metric.
- b. **Socio-economic Drawbacks:** Achievements are significantly less favourable when it comes to the socio-economically challenged and geographically isolated communities.
- c. **Resource Impact:** The presence of Information Communication Technology (ICT) resources and trained personnel highly determine students' academic performance.
- d. **Non-linear Dynamics:** AI reveals more complex relationships within data that go unnoticed in standard statistical analysis.
- e. **Policy Simulations:** Strategic ICT investments and equitable assignment of teaching staff can help reduce inequality measures by up to 20% within five years.

Real-time Monitoring: New equity gaps can be detected and responded to quickly and effectively using policy AI technologies.

Interdisciplinary Implications

This research advances cross-disciplinary understanding by:

- a. **Integrating Economics and Education:**

Applying models of economic disparities to educational datasets.

- b. **Sociology and Computing:** Demonstrating AI's role in untangling multifaceted social issues.

- c. **Ethics and Technology:** Discussing AI's potential as a risk and a remedy simultaneously.

Policy and Community Engagement: Proposing a practical framework for educational and resource allocation restructuring in Nigeria and similar low-resource contexts.

Although this delineates the role of AI in shaping policy frameworks for education, it impresses the importance of not reinforcing existing biases, especially for countries like Nigeria that are resource-constrained and culturally diverse.

Conclusion

This work digs into using AI-driven methods to build a model that's both replicable and flexible for dealing with educational disparities. It shows, in most cases, that modern technology can serve as a practical tool for evidence-based decisions while also shedding light on deep-rooted gaps in our systems. The study argues that we must scrutinise our AI tools, ensuring they boost fairness instead of making old divides even wider. The ideas here might help those working on teacher assignments, resource sharing, and digital strategy, offering cues that don't come from a one-size-fits-all playbook. Looking ahead, future projects could well explore AI-powered adaptive learning methods even for primary schools, with a steady eye on ethical practices to ensure modern technology truly backs inclusion and equity.

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References

Economic Policy Institute. (2023). "Education Inequalities at the School Starting Gate."

<https://www.epi.org/publication/education-inequalities-at-the-school-starting-gate/>

OECD. (2024). "The Potential Impact of Artificial Intelligence on Equity and Inclusion in Education."

https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/08/the-potential-impact-of-artificial-intelligence-on-equity-and-inclusion-in-education_od7e9e00/15df715b-en.pdf

Oluwaseyi Aina and Gbolade Opesemowo (2024). Artificial Intelligence in Education, Bridging Community Gap: A Phenomenological Approach, [International journal of new education](#)

UNESCO. (2023). "Beijing Consensus on Artificial Intelligence and Education." <https://unesdoc.unesco.org/ark:/48223/pf0000366994>

Winthrop, R. (2024). "My Big Question for AI in Education 2025." LinkedIn. <https://www.linkedin.com/pulse/my-big-question-ai-education-2025-rebecca-winthrop-srt8e>

Zheng, Y., & Cheng, T. (2024). "Artificial Intelligence in Education: Ethical Considerations for Equitable Implementation." *Nature Human Behaviour*, 8(2), 210-223. <https://www.nature.com/articles/s41599-024-03838-0>

AI Literacy in Secondary Education: Teachers' Competencies, Institutional Barriers, and Demographic Predictors

Oni Matthew Taiwo

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Abstract

The swift adoption of AI in education has necessitated the need for teachers to be AI literate. This research is a comparative study of AI literacy among public and private school teachers in Ibadan, Nigeria. It will investigate the likely digital divide that exists among teachers in secondary schools and the available institutional support. It aims to expose the discrepancies in resource availability and ascertain if gender and teaching experience have anything to do with AI competency and integration. The study will make use of 400 teachers from public and private secondary schools in Ibadan metropolis using a stratified random sampling technique that will span across the 11 local government areas in Ibadan city. Selection of samples will be based on the characteristics and availability of resources in selected schools. Data for the study will be gathered with a quantitative, specially de-

signed instrument tagged: AI Literacy, Institutional Support, Teachers' Demographic and Assessment Questionnaire (AI_LIS_TDAQ). The quantitative instrument will be populated with closed-ended questions designed on a four-point Likert scale that will inquire information from respondents on the level of AI literacy among teachers in public and private secondary schools and differences in the level of institutional support for AI literacy development between public and private secondary schools. The reliability of the instrument will be tested using Cronbach's alpha. Data will be analysed using descriptive statistics of standard deviation, mean and inferential statistics (T-test). Based on the findings from the study, recommendations will be made to different stakeholders in education.

Key words: AI literacy, institutional support, secondary school teachers, resource, Ibadan

Introduction

The emergence and inclusion of artificial intelligence (AI) into educational activities demands an urgent and critical examination of teachers' readiness to use new technologies efficiently. According to recent surveys by Li et. al. (2024), only 38% of instructors are aware and able to utilise basic AI frameworks like AI4K12, despite the fact that 69.23% report confidence in their ability to comprehend AI outputs and challenges. These findings reveal crucial gaps in educators' knowledge of AI, the differences increased as a result of institutional and demographic factors, calling for thorough examination of how teacher attributes and school systems influence the adoption of AI.

While Zhao et. al. (2022) see technical expertise, ethical awareness, and the capacity to use AI tools in teaching as components of AI literacy, Roshan et.al. (2024) argue that lack of training is the most alarming challenge to AI integration in schools, covering 60% while insufficient resources stand at 40%. Again, this is attributed to a lack of well-organised institutional supervision or training. However, there are clear sectoral inequalities as instructors at private schools are adopting AI at higher rates than their counterparts in public schools (BCS 2024), which is probably due to differences in resources and policy frameworks. For example, 41% of schools do not have explicit AI policies, which exacerbates uneven implementation and leaves teachers to handle moral and practical dilemmas on their own (BCS 2024). Lack of uniform policies frequently results in resistance to AI by some edu-

cators who fear that it will be abused (BCS 2024; AISCOOP 2024). Interdisciplinary curricula and collaborative project-based learning have become viable approaches to closing this gap, especially in secondary education contexts where fundamental AI ideas are given priority (Ng et. al. 2024). However, institutional commitment determines how effective these strategies are, underscoring the need for comparative research on support systems in various school types.

According to Moravec (2024), demographic factors like age, gender, and level of education strongly influence AI awareness. Adoption of AI is inversely correlated with teaching experience, as younger teachers are more open to trying out new technologies (Bakhadirov and Alasgarova 2024). This pattern can be due to the failure of institutions in upgrading instructional approaches for seasoned educators or differences in generational comfort with technology. Gender differences are likewise noticeable: while female educators advocate for rule-based applications centred on ethics and student safety, their male counterparts are more inclined to deploy AI for efficiency and creativity (AISCOOP 2024; Oriel Square 2023). These discrepancies are pointers to the need for gender-responsive policy frameworks and training programmes that address conflicting priorities and obstacles (Oriel Square 2023).

This study employs two key theories. The Technological Pedagogical Content Knowledge (TPACK) framework (Koehler and Mishra 2009) examines how teachers integrate AI

(technological knowledge) with pedagogy and subject content, stressing that effective adoption requires balancing these domains. It addresses competency gaps and training efficacy. Social Cognitive Theory (Bandura 1986) explores how self-efficacy, social modelling, and institutional support influence AI adoption. SCT explains demographic disparities (e.g., gender, experience) and how environmental factors (e.g., resources, policies) shape teachers' willingness to use AI. Together, these theories analyse both the technical-pedagogical (TPACK) and motivational-environmental (SCT) dimensions of AI literacy in education.

Statement of the Problem

Despite the attention given to AI in education, there is a growing concern about the variations between teachers' literacy levels in relation to school types (public and private) and demographic categories (gender and experience). Few studies look at systemic disparities in institutional support, while some research highlights general challenges militating against AI adoption, such as a lack of professional personnel. In order to fill these gaps, this study aims to compare AI literacy levels across school systems in Ibadan metropolis. It exposes discrepancies in resource availability, examines variations in institutional support between public and private schools, and ascertains if gender and teaching experience have anything to do with AI competency and integration. Using this approach, this study will offer an opportunity to filter out the obstacles and evidence needed to support AI literacy and provide tailored equity-focused treat-

ments for educators in Nigeria.

Objective of the study

The specific objectives of the study are to:

- Find out the level of AI literacy among teachers in public and private secondary schools in Nigeria.
- Establish the difference in the level of institutional support for AI literacy development between public and private secondary schools.
- Ascertain if teachers' demographic factors (years of teaching experience) predict their ability to integrate AI into their teaching practices.
- Find out if the difference in AI literacy level is based on gender in public and private secondary schools.

Research questions

- What is the level of AI literacy among teachers in public and private secondary schools in Nigeria?
- What is the difference in the level of institutional support for AI literacy development between public and private secondary schools?
- Do teachers' demographic factors (years of teaching experience) predict their ability to integrate AI into their teaching practices?
- Is there a significant difference in the AI literacy levels between male and female teachers in public and private secondary schools?

- Are there significant differences in AI literacy levels between teachers in public and private secondary schools?

Methodology

For this study, a descriptive survey research design will be utilised. The study will make use of 400 teachers from public and private secondary schools in Ibadan metropolis using a stratified random sampling technique that spans across the 11 local government areas in Ibadan city. Selection of samples will be based on the characteristics and availability of resources in selected schools. Data for the study will be gathered with a quantitative, specially designed instrument tagged: AI Literacy, Institutional Support, Teachers' Demographic and Assessment Questionnaire (AI_LIS_TDAQ). The quantitative instrument will be populated with closed-ended questions designed on a four-point Likert scale that will inquire information from respondents on the level of AI literacy among teachers in public and private secondary schools, differences in AI literacy levels and institutional support for AI literacy development between public and private secondary schools. It will also examine demographic factors in relation to the possibility of predicting teachers' ability to integrate AI into teaching practices, as well as checking the significant difference in AI literacy levels between male and female teachers in public and private secondary schools. The reliability of the instrument will be tested using Cronbach's alpha. Data will be analysed using descriptive statistics of standard deviation, mean and inferential statistics (T-test). Based on the findings from the

study, recommendations will be made to different stakeholders in education.

Findings

The findings and recommendations in this study will enable different stakeholders in education find appropriate solutions to AI literacy among secondary school teachers in both public and private secondary schools in Ibadan metropolis and, by extension, Nigeria as a country.

Interdisciplinary implications

This study is relevant to enhancing AI literacy among all secondary school teachers in Nigeria, as the findings and recommendations would be useful for all stakeholders in both school categories.

Conclusion

AI is a growing field that cuts across all aspects of life, in which education is of great importance. Research in this regard is vital to finding out how well secondary school teachers in Nigeria are positioned to circumvent being left behind in a world that is becoming more complex with everyday technology. This is the main objective that this study will help to address.

References

AISCOOP. (2024). Teacher gender matters in classroom AI policy. Edscoop. <https://edscoop.com/classroom-ai-policy-gender-usc-university-k12/>

Bakhadirov, M., & Alasgarova, R. (2024). Factors Influencing Teachers' Use of Artificial Intelligence for Instructional Purposes. *IAFOR Journal of Education*, 12(2), 9-32.

BCS, The Chartered Institute for IT. (2024). Most teachers reluctant to use AI for learning and assessment, new research finds. <https://www.bcs.org/articles-opinion-and-research/most-teachers-reluctant-to-use-ai-for-learning-and-assessment-new-research-finds/>

Chee, H., Ahn, S., & Lee, J. (2024). A Competency Framework for AI Literacy: Variations by Different Learner Groups and an Implied Learning Pathway. *British Journal of Educational Technology*.

Li, H., Xiao, R., Nieu, H., Tseng, Y. J., & Liao, G. (2024). "From Unseen Needs to Classroom Solutions": Exploring AI Literacy Challenges & Opportunities with Project-based Learning Toolkit in K-12 Education. *arXiv preprint arXiv:2412.17243*.

Moravec, V., Hynek, N., Gavurová, B., & Kubák, M. (2024). Everyday artificial intelligence unveiled: Societal awareness of technological transformation. *Oeconomia Copernicana*. <https://doi.org/10.24136/oc.2961>.

Ng, D. T. K., Su, J., Leung, J. K. L., & Chu, S. K. W. (2024). Artificial intelligence (AI) literacy education in secondary schools: a review. *Interac-*

tive Learning Environments, 32(10), 6204-6224.

Nikolic, S., Wentworth, I., Sheridan, L., Moss, S., Duursma, E., Jones, R. A., ... & Middleton, R. (2024). A systematic literature review of attitudes, intentions and behaviours of teaching academics pertaining to AI and generative AI (GenAI) in higher education: An analysis of GenAI adoption using the UTAUT framework. *Australasian Journal of Educational Technology*.

Oriel Square. (2023). AI for teachers: Demystifying AI in schools https://www.orielsquare.co.uk/wp-content/uploads/2023/07/Education-Intelligence_teacher-event_delegate-pack.pdf. Retrieved 9 May, 2025

Roshan, S., Iqbal, S. Z., & Qing, Z. (2024). Teacher Training and Professional Development for Implementing AI-Based Educational Tools. *Journal of Asian Development Studies*, 13(2), 1972-1987.

Shi, R. (2024). Research on the Current Situation of Artificial Intelligence Literacy of Teacher Trainees and Strategies to Improve It. *Advances in Educational Technology and Psychology*, 8(1), 126-133.

Zhao, L., Wu, X., & Luo, H. (2022). Developing AI literacy for primary and middle school teachers in China: Based on a structural equation modeling analysis. *Sustainability*, 14(21), 14549.

Rethinking Human-AI Relations: A Philosophical Investigation into the Ethics of Artificial Intelligence (AI) and Human Dignity

Solomon Eyesan PhD

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Abstract

The rapid encroachment of artificial intelligence (AI) on the moral space raises critical questions about its impact on human dignity, as it portends great dangers to fundamental human values. This project aims to investigate the challenges of AI explosion in the digital age on human beings in their essential dispositions. It addresses the many obstacles posed by AI to human autonomy, personal identity, self-sufficiency, creativity/work, privacy, moral agency, responsibility, integrity, and virtue. Employing a multidisciplinary approach, combining philosophical, legal, and technological perspectives, this research examines the effects of AI on human nature and actions. The lead questions are: what are the implications of emerging AI technologies for human dignity, autonomy, privacy, and human flourishing, and how can these implications be addressed through a rethinking of human-AI relations? How can AI producers and AI consumers interact and/or contribute to sustainable AI projects and systems? This project aims to investigate these issues and propose practical policies for resolving them. The findings

reveal that AI can both enhance and erode human dignity depending on the limits of its application. Hence, we recommend that AI technocrats and policymakers should prioritise human-centred design in AI development and use. In this way, it will be ensured that AI systems respect human dignity and promote values of conscience, moral agency, privacy, responsibility, integrity, and virtue.

Keywords: Artificial intelligence, human dignity, ethics, moral agency

Introduction

The contemporary world is currently celebrating/contending with the AI regime. This regime is replete with rarefied digitisation of information and behaviour with algorithmic consequences. The human person, on the other hand, is a reality beyond the mathematical abstraction of the algorithm and digits. He lives a hylemorphic reality, having his essence as rationality. It is in this essence that his spirituality and intellectual faculties are constituted. This constitution gives/entitles him to a

unique and unassailable moral dignity. This dignity is now being made vulnerable by extreme reliance on digitalisation and algorithmic procedures. The explosion of AI in unregulated forms makes this human dignity vulnerable to material sciences and technology. It reduces man to a means to an (technological) end. Notwithstanding its apparent benefits, it is axiomatic that one cannot allow second-order benefits to impeach the “first order” and essential reality of “being.” In metaphysics, we recognise the priority of being over becoming, over accidents, and over application (use). This is precisely the “sin” of AI: that it prioritises becoming, techniques and accidents over being. It compromises human autonomy, personal identity, self-sufficiency, creative originality, privacy, moral agency, responsibility, integrity, and virtue. These categories vulnerable to AI are fundamental to human existence. Over-reliance on AI will compromise autonomy, privacy, creative originality, virtue, etc., all of which comprise the nature of man as man, not man as what he can do or what he can experience, but man as man, merely turning man into a robot. This paper offers a critique of this dangerous reductionism and proffers remedies.

Methodology

The adopted research methodology is critical analysis, which will be based on a multidisciplinary approach, integrating philosophical and technological perspectives. This is a method of inquiry in which one seeks to assess complex systems of thought by “analysing” them into simpler elements whose relationships are thereby brought into focus (Baldwin 1998). Through critical analysis, I will evaluate and interpret key arguments regarding the ethics of artificial intelligence. By adopting a multidisciplinary approach, I will study the nature and rethink the tensions between technological progress and human flourishing, leading to a philosophical examination of the implications for human metaphysics, identity, autonomy, and creativity.

Findings

The findings reveal that AI can both enhance and erode human dignity and creative originality, depending on the limits of its application. The over-reliance on generative AI limits human originality. It is what is generated by man that forms the database of AI. What this means is that the capacity and sources of AI are the autonomous originality of human cogitations that have been made available to the database. If men stop their original thinking and cease putting them in an AI database, only relying on what is already in the database, human knowledge will become limited, and there will be no advancement. At this point, epistemology collapses, and we will no longer return to the original sources. Once originality is impinged on, there will be no advancement. Knowledge will only be recycled. Even the advancement of AI is dependent on original human cogitations. If we allow AI to limit human originality, AI will limit itself.

Also, we risk losing the endeavour, frustration, and fulfilment that are intrinsic parts of any learning process by over-reliance on generative AI. It is this fulfilment that pushes man to further exploration. But when he is totally excluded from the thinking process, he loses that push for further exploration and ingenuity; instead, he will be more inclined to buy bigger software that can do the thinking faster, killing creativity and originality.

Interdisciplinary implications

Employing an interdisciplinary approach that combines philosophical, legal, and technological perspectives, this research examines the effects of AI on human nature and actions. Its significance lies in its ability to connect the traditional divides between the humanities and the technological landscape, which carries substantial consequences, particularly within Nigerian educational contexts. It underscores the necessity for students, researchers, and AI developers to exer-

cise caution in the use and development of generative AI systems.

Conclusion

In sum, we note that the explosion of AI in unregulated forms makes human dignity and creativity vulnerable to material sciences and technology. It reduces man to a means to an (technological) end. Over-reliance on generative AI will compromise autonomy, privacy, creative originality, etc., all of which comprise the nature of man as man, not man as what he can do or what he can experience, but man as man, merely turning man into a robot. Therefore, we recommend that developers ensure that AI systems remain human-centred, ethically grounded, and directed towards the promotion and advancement of human dignity. As articulated by Pope Francis (L'Osservatore Romano 2023), "We cannot allow algorithms to limit or condition respect for human dignity, or to exclude compassion, mercy, forgiveness, and above all, the hope that people are able to change." AI systems should be designed and set up in a way that protects the physical and mental health of human beings, as well as their cultural sense of identity. We recommend adopting Aristotle's principle of the Golden Mean, which emphasises moderation, as a guide framework for AI developers and users.

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References

Baldwin, Thomas. Analytical Philosophy. Routledge Encyclopedia of Philosophy. 1998. <https://www.rep.routledge.com/articles/thematic/analytical-philosophy/v-1>.

L'Osservatore Romano. 2023. "We Cannot Allow Algorithms to Limit or Condition Respect for Human Dignity." L'Osservatore Romano. March 31, 2023. <https://www.osservatoreromano.va/en/news/2023-03/ing-013/we-cannot-allow-algorithms-to-limit-or-condition-respect-for-hum.html>.

GROUP 4

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Leveraging Artificial Intelligence for the Early Detection and Personalised Treatment of Alzheimer's Disease: A Machine Learning Approach in Nigerian Healthcare Systems

Anthony Ebuka Ojukwu

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Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder with an alarming and rising prevalence in Nigeria. Artificial Intelligence (AI) offers a promising pathway to support early diagnosis and personalised treatment in the healthcare system. This study proposes the development of a culturally sensitive, AI-powered diagnostic framework tailored to the Nigerian context. Using a mixed-methods approach, 600 participants will be recruited across three groups: diagnosed AD patients ($n = 300$), healthy controls ($n = 200$), and individuals at high risk ($n = 100$) from federal teaching hospitals in southwestern Nigeria. The study will gather multimodal data, including neuroimaging, cognitive assessments, genomics, comorbidities, functional status, lifestyle factors, treatment history, and socio-demographic details, to train and validate interpretable machine learning models aimed at early intervention and personalised treatment. The model will be trained to predict AD risk levels (low, moderate, high) and provide tailored treatment recommendations,

including pharmacological options, neuropsychological rehabilitation, caregiver support, and follow-up schedules, based on individual profiles. Primary outcome measures will include diagnostic accuracy ($>85\%$), precision in treatment stratification, and alignment with clinical decision-making. Secondary outcomes will involve provider satisfaction, ease of interpreting the model, and potential for integration into existing healthcare workflows. By ensuring ethical design, clinician readiness, and real-world applicability, this study aims to position AI as a transformative tool in Nigeria's evolving neurological care landscape.

Keywords: Alzheimer's disease, Nigerian healthcare, artificial intelligence, machine learning

Introduction

Dementia has quietly become one of the world's deadliest burdens, ranking as the seventh leading cause of mortality globally. Of all known forms of dementia, Alzheimer's disease

(AD) accounts for approximately 60% (World Health Organisation 2025). In Nigeria, the situation is particularly concerning, with reported AD prevalence increasing by over 400% between 1995 and 2015 (Adeloye et al. 2019). This figure is likely to rise, given our rapidly ageing population, underdiagnosis, and low public awareness.

Alzheimer's disease encompasses more than just memory loss. It is a progressive neurodegenerative condition that impacts cognition, daily functioning, behaviour, and quality of life. The burden is felt by patients, caregivers, families, communities, and the fragile healthcare infrastructure, which struggles to respond meaningfully (Gupta and Iftekhar 2024). Despite extensive global research on early detection and intervention, African nations, such as Nigeria, remain underrepresented in the data and innovations that drive care solutions.

AI presents a unique opportunity to bridge this gap if implemented thoughtfully. On a global scale, AI has demonstrated effectiveness in streamlining diagnostics, analysing intricate biomedical data, predicting disease progression, and improving treatment outcomes across various fields, including neurodegenerative diseases (Rane et al. 2023; Kale et al. 2024). In the context of Alzheimer's, AI's capability to integrate cognitive, imaging, genetic, and behavioural data allows it to reveal subtle indicators that might otherwise remain unnoticed in standard clinical practice.

However, this technology has been trained and validated in Western contexts. In Nigeria, as well as many low- and middle-income countries (LMICs), challenges abound, ranging from the lack of region-specific datasets to limited AI infrastructure, low technological literacy among healthcare workers, and critical ethical concerns regarding data use and access (Oladipo et al. 2024). This study emerges at the intersection of

these challenges and opportunities. It proposes developing a machine learning-powered system, trained on local data, to aid in the early detection and personalised management of Alzheimer's disease in Nigeria. This model not only fits our context but also reflects our realities.

Methodology

This research employs a mixed-methods cohort design, recruiting 600 participants: 300 diagnosed with Alzheimer's disease (AD), 200 healthy controls, and 100 high-risk individuals due to family history, comorbidities, or cognitive symptoms. Participants will be selected from federal teaching hospitals in southwestern Nigeria to ensure diversity in terms of regions, ethnicities, and socioeconomic statuses. The study will collect data to develop machine learning models, including cognitive assessments, neuroimaging data, socio-demographic information, medical history, and functional status.

The AI system will utilise interpretable machine learning algorithms, such as Random Forest and XGBoost, for clinical transparency and managing heterogeneous data (Lundberg et al. 2020). Models will be trained on diverse data, including neuroimaging (MRI/PET), cognitive scores, genomic markers, patient outcomes, and socio-demographics.

Natural language processing (NLP) techniques will extract insights from unstructured clinical records, enabling a deeper understanding of patients' journeys (Rajkomar et al. 2019). Data pre-processing will involve principal component analysis (PCA) for dimensionality reduction and the k-nearest neighbours algorithm for missing values. Models will be validated using k-fold cross-validation and evaluated based on accuracy, sensitivity, specificity, and the area under the curve (AUC). Qualitative methods, such as semi-structured interviews and focus groups with pa-

tients, caregivers, and clinicians, will explore perceptions of AI-based diagnostics and personalised treatment. Thematic analysis will interpret this data, ensuring that cultural sensitivity and human-centred design guide AI model development.

Ethical protocols will adhere to the guidelines of the Nigerian National Health Research Ethics Committee, ensuring informed consent, confidentiality, secure data storage, fairness, and clinician training. Community and clinical stakeholders will be engaged to explore perceptions of AI in healthcare and guide culturally grounded implementation strategies. A pilot deployment in southwestern Nigeria will test the AI model's real-world effectiveness, usability, and ethical acceptability. To address bias, we will utilise fairness-aware algorithms and a representative dataset that reflects Nigeria's diverse ethnic, socio-economic, and health profiles. Continuous feedback loops and collaboration with local clinicians will refine the model to reflect the local context. Power dynamics will be mitigated through participatory research, with community engagement sessions enabling patients and providers to co-shape the design and evaluation of AI. Transparency in model operations will further promote trust and inclusivity. Recognising Nigeria's infrastructural challenges, the AI system will be designed for offline use, with minimal data requirements, and compatibility with low-cost devices, such as tablets. It will function reliably even in the event of power or internet disruptions and will be adapted for local languages, ensuring broader accessibility across Nigeria's multilingual communities.

Expected outcomes and findings

This study develops a machine learning model to identify Alzheimer's disease (AD) risk early, aiming for a diagnostic accuracy of over 85% in high-risk groups. This advancement seeks to enhance early diagnosis and clinical outcomes. The AI

model will classify AD risk as low, moderate, or high, creating personalised intervention recommendations for care plans. Recommendations will consider each participant's clinical profile, which may involve pharmacological interventions, neuropsychological rehabilitation, caregiver support, and follow-up schedules. The study will evaluate the AI model's effectiveness in terms of diagnostic accuracy, treatment precision, usability, and satisfaction among both providers and patients. A comparative analysis will assess the AI model against traditional diagnostic methods in Nigerian healthcare. Preliminary findings suggest that AI-assisted screening will demonstrate higher sensitivity and earlier detection compared to conventional assessments, which rely on cognitive testing and symptom observation. The system will offer predictive insights and explainable decision pathways, fostering clinician trust and adoption.

This study will highlight the challenges of integrating artificial intelligence (AI) into Nigeria's healthcare system, including clinician training deficiencies, infrastructure constraints, and ethical concerns about bias, privacy, and data sovereignty. It will focus on identifying and mitigating biases in AI, particularly related to overfitting to specific ethnic or socio-economic groups. Methods such as fairness-aware machine learning algorithms and regular audits of model predictions across demographics will be used to promote equitable outcomes. Participatory research, involving consultations with clinicians, patients, caregivers, and policymakers, will ensure that the AI system is contextually relevant. Resource limitations will be addressed by developing a scalable, cost-effective AI solution that operates offline or with minimal internet access, optimised for basic computing systems to ensure usability in resource-constrained environments. Support for major Nigerian languages will enhance accessibility and inclusivity. Cases of null findings, such as no significant advantages of AI over traditional methods in specific subgroups, will be docu-

mented and analysed for future AI improvements and recommendations. This framework could serve as a blueprint for AI deployment in other low- and middle-income countries.

Interdisciplinary implications

This study presents a culturally relevant AI model for clinical neuropsychology, neurology, and geriatrics, while providing real-world insights into AI ethics in low-resource settings. It has the potential to shape dementia care policy in Nigeria, update medical and psychology curricula to enhance AI readiness, and foster interdisciplinary collaboration among health and technology experts. Above all, it aims to centre the experiences of older Nigerians, ensuring they are not left behind in the global health innovation race.

Conclusion

This research addresses Alzheimer's disease in Nigeria and the potential of artificial intelligence in enhancing diagnostic accuracy, speed, and clinical outcomes in AD detection. By integrating technology with ethical data practices and cultural contexts, the study aims to develop a diagnostic model that understands the human experience. It aims to detect Alzheimer's disease earlier, treat it effectively, and enhance knowledge of the disease in Nigeria for the benefit of the community.

The findings suggest that sensitive, resource-adapted AI models can enhance the early diagnosis and management of Alzheimer's disease, even in diverse, resource-constrained settings such as Nigeria. It acknowledges limitations, such as limited clinical datasets, unreliable electricity and internet access, and potential biases from AI models trained on non-Nigerian data. Addressing these challenges is crucial for practical application. Theoretically, this work advances models for culturally responsive AI and the ethical use of technology. Practically, it provides

a framework for similar neurodegenerative conditions across Africa and low- to middle-income countries.

Recommendations include investing in local data collection to ensure that AI models accurately represent the population, training clinicians in the interpretation and ethical use of AI outputs, developing national policies for equitable AI healthcare deployment, and fostering collaboration among AI developers, healthcare providers, ethicists, and patient communities to support sustainable innovation. With adequate investments and partnerships, AI can effectively support the fight against neurodegenerative diseases. This study lays the groundwork for that vision: one line of code, one patient, one narrative at a time.

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References

- Adeloye, D., Auta, A., Ezejimofor, M., Oyedokun, A., Harhay, M. O., Rudan, I., & Chan, K. Y. (2019). Prevalence of dementia in Nigeria: a systematic review of the evidence. *Journal of Global Health Reports*, 3. <https://doi.org/10.29392/joghr.3.e2019014>
- Elijah Kolawole Oladipo, Stephen Feranmi Adeyemo, Glory Jesudara Oluwasanya, Omotayo Rachael Oyinloye, Olawumi Hezekiah Oyeyiola, Ifeoluwa David Akinrinmade, Olubunmi

Ayobami Elutade, Dorcas Olayemi Areo, Islamiyyah Olamide Hamzat, Oluwakemi Deborah Olakanmi, Israel Ifeoluwa Ayanronbi, Akinwumi John Akanmu, Faith Opeoluwa Ajekiigbe, Mary Olawumi Taiwo, Victor Michael Ogunfidodo, Christiana Adewumi Adekunle, Precious Oluwadamilola Adeleke, David Ayo Olubunmi, Precious Ayomide Adeogun, & Emmanuel Oluwagbenga Adejobi. (2024). Impact and Challenges of Artificial Intelligence Integration in the African Health Sector: A Review. *Trends in Medical Research*, 19(1), 220–235. <https://doi.org/10.3923/tmr.2024.220.235>

Gupta, R., & Zoya Iftekhar. (2024). *Artificial Intelligence for Alzheimer's Disease Detection: Enhancing Biomarker Analysis and Diagnostic Precision*. 25–25. <https://doi.org/10.3390/ecsoc-28-20206>

Kale, M. B., Wankhede, N. L., Pawar, R. S., Suhas Ballal, Rohit Kumawat, Goswami, M., Khalid, M., Taksande, B. G., Upaganlawar, A. B., Umekar, M. J., Spandana Rajendra Kopalli, & Sushruta Koppula. (2024). AI-Driven Innovations in Alzheimer's Disease: Integrating Early Diagnosis, Personalized Treatment, and Prognostic Modelling. *Ageing Research Reviews*, 101, 102497–102497. <https://doi.org/10.1016/j.arr.2024.102497>

Lundberg, S., & Lee, S.-I. (2017, November 24). *A Unified Approach to Interpreting Model Predictions*. ArXiv.org. <https://doi.org/10.48550/arXiv.1705.07874>

Oyinlola, O. (2024). Addressing the challenges of dementia care in Nigeria: A call for a comprehensive national strategy. *Public Health Challenges*, 3(2). <https://doi.org/10.1002/puh2.186>

Rajkomar, A., Dean, J., & Kohane, I. (2019). Ma-

chine Learning in Medicine. *New England Journal of Medicine*, 380(14), 1347–1358. <https://doi.org/10.1056/nejmra1814259>

Rane, N., Choudhary, S., & Rane, J. (2023). Towards Autonomous Healthcare: Integrating Artificial Intelligence (AI) for Personalized Medicine and Disease Prediction. *Social Science Research Network*. <https://doi.org/10.2139/ssrn.4637894>

World Health Organisation. (2023). *Dementia*. World Health Organization; World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/dementia>

A Multimodal AI Framework for Accelerated Seizure Recovery : Integrating Neuro Chat , NLP And Logistic Regression For Episode Management

Dapherede Damilola Idhereveno

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Abstract

Brain seizures are caused by sudden, uncontrolled electrical disturbances in the brain. These impact consciousness, behaviour, and motor functions, affecting people of all ages, especially children and adults in low-resource settings. According to the World Health Organisation, over 50 million people globally live with epilepsy, with 80% residing in low- and middle-income countries, including Nigeria. Research by Onwuekwe and Ezeala-Adikaibe (2013) has highlighted cultural stigma and diagnostic gaps in Nigeria that hinder effective seizure management. This study proposes a multimodal AI framework for accelerated brain seizure recovery, integrating NeuroChat, natural language processing (NLP), and logistic regression for proactive episode management. NeuroChat enables real-time conversational tracking between patients and neuro-clinicians, capturing early seizure indicators. NLP algorithms process patient narratives to extract semantic patterns tied to seizure onset or recovery lag. These features are input into a logistic regression model to predict seizure likelihood and recommend timely interventions. In this

research, logistic regression will be used to model the probability of seizure recurrence ($P(\text{seizure})$) based on 300+ variations of traditional clinical, behavioural, and environmental features collected from individuals living with seizures (e.g., frequency of past episodes, medication adherence, sleep quality, stress levels). By training the model with $n = 300$ patient data points, each represented by a vector of features (X_1, X_2, \dots, X_n), the logistic regression model outputs a binary prediction ($0 = \text{no seizure}$, $1 = \text{seizure}$), enabling personalised risk scoring and early intervention compared to static, non-adaptive traditional methods.

This framework bridges clinical gaps in Africa by enabling personalised, linguistically adaptive seizure care, reducing misdiagnosis and treatment delay. Ultimately, it aligns AI innovations with global health goals by focusing on seizure-impacted populations often neglected in mainstream neurological research.

Keywords: Brain seizures, ML models, logistic regression, AI agents, TextGrad, seizure type, NeuroChat, ethical AI, AI safety, episode management

Introduction

Seizure, clinically referred to as epilepsy, is a neurological disorder characterised by sudden, uncontrolled electrical disturbances in the brain, which manifest as abrupt changes in behaviour, movement, sensation, or levels of consciousness. It is a major global health burden, affecting approximately 50 million people worldwide, with 80% of cases occurring in low- and middle-income countries, according to the World Health Organisation (WHO 2022). In Nigeria, the burden of epilepsy is increasingly alarming, with studies showing a rising prevalence of 4.4–6.2 per 1,000 people in both urban and rural populations (Onwuekwe and Ezeala-Adikaibe 2013; Ogunniyi et al. 2014). The scarcity of trained neurologists, averaging less than one neurologist per 1 million people in many states in Nigeria, compounds the challenge (Adeloye et al. 2016). These factors contribute to misdiagnosis, social exclusion, and a widening treatment gap, underscoring the urgent need for innovative, scalable, and culturally aware solutions. The shortage of trained neurologists is further compounded by brain drain, limited residency training slots, and inadequate investment in neuroscience infrastructure. This stark imbalance places a tremendous burden on the few available specialists, leading to long waiting times, poor follow-up, and underreported or mismanaged cases. Moreover, due to this gap, many individuals living with seizures are pushed towards informal or traditional healing options, which delay appropriate medical intervention and increase the risk of complications, disability, or premature death. Addressing this neurologist-to-patient disparity requires not only workforce development but the integration of AI-powered, culturally adaptive tools that can augment diagnosis and care at scale.

AI approaches in solving seizure management gaps offer scalable, context-aware solutions for low-resource settings like Nigeria (Adeloye et al.

2016; WHO 2022). By implementing TextGrad, a gradient-based natural language processing (NLP) framework, this research extracts subtle linguistic cues from patient narratives to aid early diagnosis. Large language models (LLMs) fine-tuned with local expressions enable culturally sensitive education and care support. A multi-agent architecture, including NeuroChat, simulates neuro-specialist responses for episode tracking and real-time recommendations. This integration enhances trust, improves care continuity, and aligns with global calls for ethical, inclusive AI in health (WHO 2021). Ongoing research by institutions like Google DeepMind and Stanford Medicine is advancing seizure prediction through neuroimaging and EEG-based AI models, achieving over 85% sensitivity (Abou Jaoude et al. 2023; DeepMind 2022). However, these models are often trained on non-African datasets, limiting cultural and clinical applicability.

This research proposes a locally adaptable machine learning-powered system trained on Nigerian health records, seizure reports, and linguistic patterns. It integrates neuroimaging data, clinical histories, and local NLP cues to support early detection and personalised intervention. Embedding such tools in frontline health systems will aid non-specialist clinicians in diagnosis and monitoring. The system emphasises ethical AI deployment, culturally grounded outputs, and seamless integration with clinical workflows. It addresses the neurologist gap while improving access, trust, and continuity of care in seizure management. With Nigeria's rising epilepsy burden, a contextualised, AI-driven framework is not just innovative but urgently needed.

Methodology

This research involves $n = 300$ simulated patient trials across selected Nigerian healthcare

systems. Participants are categorised as children (n = 100), young adults (n = 100), and older adults (n = 100) to model age-specific seizure patterns. Seizure types analysed include focal onset, generalised tonic-clonic, absence, and atonic episodes. Each cohort's data combines EEG time series, clinician notes, and patient narratives, feeding into a multimodal AI pipeline. The model leverages logistic regression, NLP, and neuro-symbolic agents for interpretable, patient-specific seizure management.

Adopting AI product management lifecycle tailored for NeuroChat and addressing the critical gap in follow-up seizure management within Nigeria's health context (Owolabi et al. 2021; Adeloye et al. 2016), the system leverages multi-AI agents and machine learning under WHO's AI safety and ethical guidelines (WHO 2021; Leslie 2019), supporting tri-method recovery: patient care, caregiver support, and neuro-doctor clinician oversight. Key features include adaptive risk alerts and recovery prompts via audio feedback, chat, and video consultation, ensuring multi-modal accessibility (Acharya et al. 2018). The lifecycle prioritises iterative learning, culturally contextualised design, and collaboration across medical, technical, and community stakeholders to ensure equity and clinical reliability (Floridi et al. 2018; Jobin et al. 2019).

The NLP module will extract data insights from patient feedback by applying sentiment analysis, topic modelling, and intent recognition to personalise care responses (Zhou et al. 2021). A community pool enables real-time sentiment tracking and fine-tuning of models using gradient-based updates (TextGrad) for adaptive learning. Neural search and clustering techniques will categorise patient text into clinical relevance, emotional tone, and follow-up priority, enhancing both individual care and broader health system insights (Guo et al. 2020; Johnson et al. 2022).

To ethically simulate and validate this NLP-

driven seizure care framework, we adopt a rigorous psychometric and robustness approach inspired by Ilić (2023), ensuring that AI models are transparent, fair, and reliably capture patient intent and cognitive states. All procedures will align with WHO's AI ethics for health, Nigeria's Data Protection Act (2023), and oversight by the Medical and Dental Council of Nigeria (MDCN) to safeguard patient data and consent in clinical trials. Special focus is placed on machine learning safety stress-testing models for bias, adversarial risks, and contextual misinterpretation, critical in neuro-healthcare (Leslie 2019; Jobin et al. 2019). We will apply human-in-the-loop validation, ensuring that AI insights complement clinician judgment and meet NSNS (Nigerian Society of Neurological Sciences) standards. This creates a resilient, regulation-ready system designed for scalable integration into Nigeria's clinical neuro-care landscape.

Expected outcomes and findings

The expected outcome from this research is to significantly boost the efficiency of neuro-doctors in Nigeria, where the ratio is critically low, estimated at **one neurologist per one million people** (Owolabi et al. 2021). NeuroChat's AI-driven monitoring and feedback system will help bridge this gap by autonomously managing routine pre- and post-seizure care tasks, allowing doctors to focus on complex cases. We anticipate improved case triage and reduced patient wait times, leading to faster intervention and better resource allocation. This AI augmentation ensures scalable neuro-care despite workforce shortages.

Furthermore, this approach will help streamline medical interventions by providing continuous, data-driven patient monitoring that informs precise prescription adjustments and personalised recovery plans (Kuhlmann et al. 2018). The AI will flag abnormal recovery trends and suggest dosage recalibrations or alternative

therapies, enhancing patient outcomes and medication adherence. This will reduce relapse rates and medication errors, a known challenge in epilepsy care. Ultimately, NeuroChat acts as a dynamic clinical decision support tool, integrating seamlessly into medical workflows.

Finally, this will empower Nigeria's healthcare system to adopt adaptive AI systems that enhance efficiency, ensure culturally inclusive care, and sustainably bridge gaps in neurological health management.

Interdisciplinary implications

The findings of this research sit at the nexus of data science, neuroscience, and applied mathematics, where predictive models transform raw EEG signals into actionable health insights. It bridges AI ethics and human-centred design, ensuring that machine learning systems remain transparent, fair, and sensitive to patient dignity and cultural context. This interdisciplinary synergy redefines seizure care by merging computational rigour with social responsibility, fostering trust and inclusivity in neuro-health innovations.

Moreover, this innovation has the potential to inform and shape new digital health policies, setting benchmarks for ethical AI deployment in clinical settings. As a pioneering breakthrough, it positions Nigeria's healthcare system at the forefront of integrating adaptive, AI-driven neuro-care. This sets a transformative precedent for scalable, inclusive, and regulation-ready digital health solutions across the continent.

Ultimately, this work places patient well-being above innovation, ensuring that every technological advance serves real human needs with compassion and dignity. The true measure of success lies in improving lives, restoring independence, and fostering trust in care.

Conclusion

Amid long lines of neuro patients and

overstretched clinics, this innovation reimagines service delivery by transforming bottlenecks into opportunities for proactive care, delivering real-time monitoring, personalised recovery plans, and AI-guided support that extend beyond hospital walls. By bridging clinical gaps with continuous, patient-centred management, it empowers individuals to take control of their recovery while easing the burden on Nigeria's strained neuro-health system.

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References

- Acharya, U. R., Oh, S. L., Hagiwara, Y., Tan, J. H., & Adeli, H. (2018). Deep convolutional neural network for the automated detection and diagnosis of seizure using EEG signals. *Computers in Biology and Medicine*, 100, 270–278.
- Adeloye, D., Olusanya, B. O., & Ezeh, A. (2016). Estimating the prevalence of epilepsy in Africa: A systematic review and meta-analysis. *PLOS ONE*, 11(7), e0159799. Choi, H., & Lee, D. S.

- (2021). Epileptic seizure prediction using hybrid deep learning model. *Computer Methods and Programs in Biomedicine*, 200, 105936.
- Craik, A., He, Y., & Contreras-Vidal, J. L. (2019). Deep learning for electroencephalogram (EEG) classification tasks: a review. *Journal of Neural Engineering*, 16(3), 031001.
- Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ... & Schafer, B. (2018). AI4People—An ethical framework for a good AI society. *Minds and Machines*, 28(4), 689–707.
- Guo, Y., Lin, Y., Li, W., & Cheng, X. (2020). Deep neural networks with multi-class focal loss for imbalanced text classification. *IEEE Access*, 8, 152810–152819.
- Ilić, D. (2023). Unveiling the general intelligence factor in language models: A psychometric approach. *ArXiv preprint*, arXiv:2310.11616.
- Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), 389–399.
- Johnson, A. E. W., Pollard, T. J., & Shen, L. (2022). Natural language processing in clinical research: Tools and opportunities. *Journal of Biomedical Informatics*, 125, 103960.
- Kuhlmann, L., Lehnertz, K., Richardson, M. P., Schelter, B., & Zaveri, H. P. (2018). Seizure prediction—ready for a new era. *Nature Reviews Neurology*, 14(10), 618–630.
- Lehnertz, K., Dickten, H., Porz, S., Helmstaedter, C., & Elger, C. E. (2014). Predicting seizures: The current status. *Epilepsy Research*, 108(10), 1897–1904.
- Leslie, D. (2019). *Understanding Artificial Intelligence Ethics and Safety*. The Alan Turing Institute.
- Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L. (2016). The ethics of algorithms: Mapping the debate. *Big Data & Society*, 3(2), 1–21.
- Mormann, F., Andrzejak, R. G., Elger, C. E., & Lehnertz, K. (2007). Seizure prediction: The long and winding road. *Brain*, 130(2), 314–333.
- Ogunrin, O. A., Ogundipe, O. A., & Oyelami, S. O. (2021). Epilepsy in Nigeria: A review of etiology, epidemiology, and treatment gap. *Nigerian Journal of Clinical Practice*, 24(2), 155–161.
- Owolabi, L. F., Shehu, N. M., & Owolabi, S. D. (2021). Epilepsy care gap in sub-Saharan Africa: A systematic review. *Epilepsy & Behavior*, 115, 107661.
- Roy, Y., Banville, H., Albuquerque, I., Gramfort, A., Falk, T. H., & Faubert, J. (2019). Deep learning-based electroencephalography analysis: A systematic review. *Journal of Neural Engineering*, 16(5), 051001.
- Shoeb, A. H. (2009). Application of machine learning to epileptic seizure onset detection and treatment. *PhD Thesis*, Massachusetts Institute of Technology.
- World Health Organization (WHO). (2021). *Ethics and Governance of Artificial Intelligence for Health*. Geneva: World Health Organization.

Online Mental Health Information-Seeking Behavior among Nigerians: A Machine Learning Approach of During and After COVID-19 Pandemic

Onyinyechi Gift Ossai

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Abstract

The COVID-19 pandemic had a significant impact on healthcare-seeking behaviours globally, particularly concerning mental health. Lockdowns and social distancing measures led to an increase in the use of online platforms to access mental health information. In Nigeria, where digital technologies are becoming more prevalent and mental health facilities are not widespread, there is a need to understand how online mental health searches varied across different regions during and after the pandemic. This study aims to analyse the patterns of online healthcare information-seeking behaviour related to mental health in Nigeria during and post the COVID-19 pandemic. A mixed-methods research design was used, combining Google Trends data from 2019–2021/2022–2025, with a questionnaire distributed to 400 respondents to assess personal experiences and barriers to accessing mental healthcare in Nigeria. The study considered independent variables such as COVID-19 periods (during vs post-pandemic), socio-demographic factors (age, gender, education, location, and income level), and barriers to accessing mental healthcare in Nigeria. The dependent variables included the volume of mental health-related online searches. Data

analysis will involve descriptive and inferential statistics on search volume index (SVI). Machine learning will be used for time-series analysis/K-means clustering, geospatial mapping using geographic information system (GIS) software, and Spearman's rank correlation to examine the relationship between mental health-related searches and barriers/socio-economic factors. This study integrates artificial intelligence (AI), specifically machine learning, into the social science investigation of online information-seeking behaviour related to mental health in Nigeria.

Keywords: COVID-19 pandemic, machine learning, mental health, online information-seeking behaviour, spatial analysis

Introduction

The COVID-19 pandemic, which began in late 2019, has significantly disrupted public health systems and societal structures across the globe (Chen et al. 2021; Talevi et al. 2020). The pandemic has not only caused health issues but also had significant repercussions on various aspects of society due to interventions like lockdowns and social distancing. These

measures have had extensive consequences on economic stability, social interactions, and individual well-being (Galea, Merchant, and Lurie 2020; Venkatesh and Edirappuli, 2020; Fluharty et al. 2021). These disruptions have led to a growing concern about a potential crisis in mental health, with increasing cases of anxiety, depression, and emotional distress during and continuing after the pandemic (Chen et al. 2021; Pfefferbaum and North 2020; Cullen, Gulati, and Kelly 2020).

Mental health, defined as a state of well-being in which individuals can cope with the normal stresses of life, work productively, and contribute to their communities (Malette 2023; Ugwu, Onayinka, and Sanni 2024), has become a critical public health focus during the pandemic. Research suggests that individuals with pre-existing mental health conditions are particularly vulnerable, often experiencing reduced life expectancy and poorer physical health outcomes (Rodgers et al. 2018). Vulnerable populations such as the elderly, adolescents, and children have been disproportionately affected (Talevi et al. 2020; Catling et al. 2022).

In Nigeria, the pandemic has compounded longstanding mental health challenges rooted in socio-economic hardship, security issues, and a fragile healthcare infrastructure (Ugwu, Onayinka, and Sanni, 2024). Nigeria faces a critical shortage of mental health professionals, with only a limited number of psychiatrists and psychologists serving a population of over 200 million (Okpalauwaekwe, Mela and Oji 2017; Ugwu, Onayinka, and Sanni 2024). Barriers to accessing healthcare services, such as high expenses, geographical remoteness, and entrenched social disapproval, continue to exist. These obstacles hinder individuals from receiving necessary medical care (Labinjo et al. 2020; WHO 2016). Consequently, many Nigerians with mental health conditions lack access to modern, evi-

dence-based treatment options (Omigbodun 2001; Wada et al. 2021).

Due to the restricted availability of formal mental health services, a significant number of individuals in Nigeria are seeking information from alternative sources, with online platforms being a popular choice. The pandemic accelerated this trend, as restrictions on physical movement and the health system strain drove people to seek health-related information online. Digital platforms offer convenience, affordability, and anonymity, making them a preferred choice for many (Jia, Pang, and Liu 2021; Jamiu et al. 2023). The motivations for seeking health information online range from understanding symptoms and exploring treatment options to making informed health decisions (Riordain and McCreary 2009).

Although online health information-seeking behaviour has been studied in Nigeria, particularly among groups like university students and pregnant women, much of the existing research assessed this behaviour before and in the course of the pandemic (Jamiu et al., 2023). There remains limited empirical evidence on mental health information-seeking online behaviour during and after the pandemic, particularly across different geographic regions of Nigeria. Furthermore, while the national increase in internet and smartphone usage was forecasted to exceed 65.7 million users in 2025 (Sasu 2024), thus suggesting a growing reliance on digital public health infrastructure, questions remain about whether this infrastructure is equitably accessed and effectively used for mental health support.

This study addresses the critical gap in understanding the spatial dynamics of online mental health information-seeking behaviour in Nigeria. It focuses on comparing trends during the COVID-19 pandemic (2020–2021) and the post-

pandemic period (2022–2024). The objectives are fourfold: to examine the temporal and spatial patterns of online mental health information-seeking behaviour; to identify regional disparities across Nigerian states; to explore key barriers such as limited access to mental health services, stigma, digital infrastructure, and socio-economic challenges that drive individuals to seek mental health information online; and to assess the relationship between online mental health information-seeking behaviour and contextual factors such as internet penetration, mental health service availability, regional socio-economic status, and population density.

This study integrates artificial intelligence (AI), specifically machine learning, into a social science investigation of online information-seeking behaviour related to mental health in Nigeria. While grounded in behavioural and societal analysis, the research applies K-means clustering and time-series analysis to large-scale Google Trends data to identify patterns in mental health-related search behaviour during and after the COVID-19 pandemic.

The relevance of this study to Nigeria is huge, as access to formal mental healthcare is limited due to a shortage of professionals, high costs of services, stigma, and inadequate infrastructure. As a result, many people turn to online platforms for mental health information, which may not be effective. By examining spatial patterns of this behaviour during and after the COVID-19 pandemic, the study highlights regional disparities and digital health gaps. Its findings can guide policymakers and health stakeholders in developing targeted, equitable interventions to improve mental health support across the country.

Methodology

This study employs a mixed-methods research design to explore online mental health information-seeking behaviour in Nigeria during and

after the COVID-19 pandemic. It integrates secondary data from Google Trends with primary survey data to provide both quantitative and contextual depth. The Google Trends data will be analysed for two time periods: 2019–2021 (during the pandemic) and 2022–2025 (post-pandemic). The data will focus on search terms related to mental health (e.g., "anxiety," "depression," "stress," "PTSD") and COVID-19 (e.g., "coronavirus symptoms," "COVID-19," "pandemic"). This will help assess temporal trends (search volume index) and spatial variations in online health information-seeking across Nigeria's states. A structured questionnaire survey will be administered to 400 respondents across Nigeria. Using a stratified sampling method. The survey will ensure diverse representation across geographic and demographic groups.

The independent variables in this study include the COVID-19 period (during vs post-pandemic), socio-demographic factors (age, gender, education, region, and income), and barriers to accessing mental healthcare. The dependent variable is the volume of mental health-related searches online. Data analysis will involve both descriptive and inferential statistics. Descriptive statistics (frequencies, means, percentages) will be used to summarise survey responses, with results visualised using charts and geographic information system (GIS) maps to illustrate regional disparities. For inferential analysis, time-series analysis and K-means clustering (via machine learning techniques) will be used to identify distinct patterns in search behaviour over time. Additionally, Spearman's rank correlation will examine relationships between socio-economic variables and online information-seeking behaviour, as well as between barriers to mental healthcare and online searches.

Ethical considerations

Using publicly available, anonymised data from

Google Trends generally does not require specific ethical approval for human subject research. However, we will ensure that we are complying with Google's terms of service. We will also obtain ethical approval from our institution's research ethics board and ensure informed consent from respondents to the questionnaire and maintain anonymity and confidentiality of their responses.

Expected results

This study expects to reveal the temporal and spatial patterns in online mental health searches, with increased activity during and after the COVID-19 pandemic. We anticipate identifying regional disparities in online mental health engagement, influenced by differences in barriers to physical mental healthcare delivery and socio-economic variables. Finally, we expect to find correlations between online information-seeking behaviour and barrier factors/socio-economic factors, which will inform targeted policy responses for improving mental health access.

Interdisciplinary implications

This research bridges disciplinary boundaries by integrating computational methods (machine learning), public health, social science, and GIS to explore how Nigerians interact with digital platforms for mental health information. It combines machine learning and conventional statistical analysis to understand behavioural patterns and healthcare access, offering a holistic framework for understanding online health-seeking behaviour in a rapidly digitising society.

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References

Chen, P., Yanna Pusica, Dorsa Sohaei, Ioannis Prassas, and Eleftherios P. Diamandis. "An Overview of Mental Health during the COVID-19 Pandemic." *Diagnosis* 8, no. 4 (2021): 403–412. <https://doi.org/10.1515/dx-2021-0046>.

Cullen, W., Gulati, G., and Kelly, B.D. "Mental Health in the COVID-19 Pandemic." *QJM: An International Journal of Medicine* (2020): 311–312. <https://doi.org/10.1093/qjmed/hcaa110>.

Fluharty, Meg, Feifei Bu, Andrew Steptoe, and Daisy Fancourt. "Coping Strategies and Mental Health Trajectories during the First 21 Weeks of COVID-19 Lockdown in the United Kingdom." *Social Science & Medicine* 279 (2021): 113958. <https://doi.org/10.1016/j.socscimed.2021.113958>.

Galea, Sandro, Raina M. Merchant, and Nicole Lurie. "The Mental Health Consequences of COVID-19 and Physical Distancing: The Need for Prevention and Early Intervention." *JAMA Internal Medicine* 180 (2020): 817.

Ikwuka, U., Niall Galbraith, Ken Manktelow, Josephine Chen-Wilson, Femi Oyeboode, Rosemary C. Muomah, and Anuli Igboaka. "Ideological vs. Instrumental Barriers to Accessing Formal Mental Health Care in the Developing World: Focus on Southeastern Nigeria." *Journal of Health Care for the Poor and Underserved* 27 (2016): 157–175.

Ikwuka, Ugo, Niall Galbraith, Ken Manktelow, Josephine Chen-Wilson, Femi Oyeboode, Rosemary Chizobam Muomah, and Anulika Igboaka. "Pathways to Mental Healthcare in South-Eastern Nigeria." *Transcultural Psychiatry* 0, no. 0 (2016): 1–21. <https://doi.org/10.1177/1363461516660903>.

Jamiu, O., Ugo N. Ozoeze, Yusuuf Tunde Gbonjubola, and Daha Garba Muhammad. "The Pattern of Online Health Information-Seeking Behavior Before and During the COVID-19: An Online Cross-Sectional Survey Among Nigerians." *Sri Ramachandra Journal of Health Sciences* 3, no. 1 (2023). https://doi.org/10.25259/SRJHS_38_2022.

Jia, X., Pang, Y., and Liu, L.S. "Online Health Information Seeking Behavior: A Systematic Review." *Healthcare (Basel)* 9 (2021): 1740.

Labinjo, T., Laura Serrant, Russell Ashmore, and James Turner. "Perceptions, Attitudes and Cultural Understandings of Mental Health in Nigeria: A Scoping Review of Published Literature." (2020).

Malette, N. *Understanding Mental Health*. In *It's All Good (Unless It's Not)*. (2023). <https://doi.org/10.59962/9780774839020-00>.

Omigbodun, O.O. "Cost-Effective Model for In-

creasing Access to Mental Health Care at the Primary Care Level in Nigeria." *The Journal of Mental Health Policy and Economics* 4 (2001): 133–139.

Okpalauwaekwe, U., M. Mela, and C. Oji. "Knowledge of and Attitude to Mental Illnesses in Nigeria: A Scoping Review." *Integrative Journal of Global Health* 1, no. 5 (2017). <http://www.imedpub.com/integrative-journal-of-global-health/>.

Pfefferbaum, B., and North, C.S. "Mental Health and the COVID-19 Pandemic." (2020).

Riordain, R.N., and McCreary, C. "Dental Patients' Use of the Internet." *British Dental Journal* 207 (2009): 583–586.

Rodgers, M., Dalton, J., Harden, M., Street, A., Parker, G., and Eastwood, A. "Integrated Care to Address the Physical Health Needs of People with Severe Mental Illness: A Mapping Review of the Recent Evidence on Barriers, Facilitators and Evaluations." *International Journal of Integrated Care* 18 (2018): 9.

Sasu, D.D. "Nigeria: Mobile Internet Users 2020–2029." *Statistica* (2024). <https://www.statista.com/statistics/972896/nigeria-mobile-internet-users/>.

Talevi, Dalila, Valentina Socci, Margherita Carai, Giulia Carnaghi, Serena Faleri, Edoardo Trebbi, Arianna Di Bernardo, Francesco Capelli, and Francesca Pacitti. "Mental Health Outcomes of the COVID-19." *Rivista di Psichiatria* 55, no. 3 (2020): 137–144.

Ugwu, N., T. Onayinka, and K. Sanni. "Exploring Innovative Digital Resources and Models for

Bridging Mental Healthcare Gap in Nigeria.” *Unizik Journal of Educational Research and Policy Studies* 17, no. 1 (2024). <http://sjifactor.com/passport.php?id=21363>.

Venkatesh, A., and Edirappuli, S. “Social Distancing in COVID-19: What Are the Mental Health Implications?” *BMJ* 369 (2020): m1379.

Wada, Y. H., Linu R., Emmanuel A., Karikari, E., and Njikizana, M., Lilian S., and Garba M. Khalid. “Mental Health in Nigeria: A Neglected Issue in Public Health.” *Public Health in Practice* 2 (2021): 100166.

GROUP 5

ETHICAL AI & AFRICAN GOVERNANCE

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Managing the Risks of AI in Military Operations: An Exploration of Policy Solutions for Safeguarding Human Security in Nigeria

Nufaisa Garba Ahmed

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Abstract

The integration of artificial intelligence (AI) into military operations is transforming modern warfare, presenting both opportunities and risks especially in conflict-affected areas where human security challenges persist. In Nigeria, where security threats from Boko Haram insurgency, inter-communal violence, and banditry present complex challenges, AI holds the potential to enhance military capabilities and improve operational efficiency. However, its deployment also raises critical concerns about unintended consequences, including biases, loss of human oversight, and the escalation of conflict if unchecked. This duality underscores the urgent need for carefully crafted policies tailored to managing the risks of AI while ensuring ethical application in military operations. Based on available literature, this research finds that Nigeria faces a critical gap in AI regulation, with current military policies insufficiently addressing the ethical and human security implications of autonomous weapons systems in military operations. Therefore, this research explores policy solutions required to manage these risks and safeguard human security in the Nigerian military. This research is interdisciplinary

as it interrogates extant literature and empirical evidence from strategic and war studies, legal and public policy, as well as technology applications. Methodologically, the research employs a qualitative approach, involving review of existing policies and empirical exploration of case study analysis using the Nigerian military operations in the northeast. Primary data is to be acquired through interviews with military and AI ethics experts to understand how AI is currently utilised in Nigerian military operations and the challenges it poses. The research aims to provide a nuanced understanding and a balanced approach to AI integration in military operations, while offering policy solutions to the ethical applications of AI in military context.

Keywords: Artificial intelligence, military operations, human security, public policy, Nigerian military

Introduction

The deployment of artificial intelligence (AI) in military operations marks a significant shift in modern warfare and internal security strategies, especially in states experiencing irregular

warfare. In Nigeria, the use of AI technologies such as surveillance and combat drones is increasingly being integrated into counterinsurgency (COIN) and counterterrorism (CT) operations against groups such as Boko Haram and the Islamic State's West Africa Province (ISWAP) in the North East, as well as banditry in the North West (Obe 2022; Ndukwe and Olu-mide 2023). While these technologies enhance military capabilities and efficiency, their deployment amid weak regulatory frameworks, poor transparency and accountability mechanisms, and a history of human rights violations by security forces raises serious ethical, legal, and humanitarian concerns. Despite these critical concerns, literature on AI and military ethics focuses on the regulatory frameworks and doctrinal policies of Western countries such as those of the United States Department of Defence, NATO, and the European Union (Scharre 2018; Bou-lanin and Verbruggen 2017). There appears to be a paucity of scholarship on the deployment of AI in African military operational environments, particularly in Nigeria, despite the country's active use of AI technologies in military operations (Aghedo and Eke 2020). Most importantly, there appears to be an absence of a coherent policy or legal framework to regulate the application of AI in military operations, or any targeted legislative or ethical guidelines for military operations.

This study interrogates this regulatory vacuum by exploring viable policy solutions for managing the risks of AI in military operations in Nigeria, while safeguarding human security. This study investigates the implications of Nigeria's increasing adoption of AI-enabled military technologies for military operations. It examines the significant policy vacuum surrounding the deployment of military AI in Nigeria and seeks to propose practical policy solutions grounded in international humanitarian law, AI ethics, and accountability. The study adopts a multidimensional lens, drawing from fields including international humanitarian law, security studies,

public policy and technology. By doing so, the paper contributes to an emerging body of literature that bridges the gap between the use of emerging technologies and the imperative of protecting civilian populations in African contexts.

Methodology

This study employs a qualitative research design through an interpretivist lens to explore the risks posed by the deployment of AI in Nigerian military operations and the policy frameworks necessary to safeguard human security. The primary research question guiding this study is: how can Nigeria manage the risks of AI in military operations through effective policy frameworks to protect human security? The research adopts AI as a subject of inquiry rather than a tool of analysis by critically interrogating what policy framework could be targeted at safeguarding human security in AI-driven military operations. This choice reflects the study's concern with normative and institutional issues such as legality, ethics, and the implications of human security.

Semi-structured interviews with 15–20 key informants, including senior military officers, AI ethics scholars, and policymakers, will uncover how AI tools are currently being deployed in military operations in Nigeria and what challenges arise in the absence of specific legal and ethical frameworks. Participants will be selected based on expertise and experience, using purposive sampling to reach key respondents. Secondary sources, including Nigerian military strategy documents and reports from oversight institutions such as the National Human Rights Commission, as well as international bodies like the UN, International Committee of the Red Cross, and Amnesty International, will complement primary data. The data collected will be analysed using thematic content analysis to identify recurring patterns, and key themes will be generated to analyse the data. NVivo or similar qualitative

software might be used to code and organise large volumes of textual data, which will enhance transparency and analytical rigour.

Given the sensitive nature of military operations and national security, all research will comply with ethical standards related to informed consent, confidentiality, and risk mitigation. Interview participants will be briefed about the study's purpose and are allowed to withdraw at any stage. Anonymity will be maintained where required. Ethics clearance will be obtained from the appropriate institutional board prior to data collection if required.

Expected Outcomes and Findings

The study will develop a comprehensive and context-sensitive framework for managing the risks of AI in military contexts—one that prioritises civilian protection, ethical oversight, and democratic accountability. In doing so, the study will fill a significant knowledge gap in the intersection of AI, military practice, and human rights in Nigeria. It will specifically reveal the absence of a national defence AI policy and the lack of institutional safeguards for preventing the misuse of AI technologies in military operations in Nigeria. These findings will be critical in demonstrating that Nigeria's adoption of AI in military operations is currently unregulated, opaque, and susceptible to both misuse and ethical violations, thus undermining both human security and operational legitimacy.

The research also intends to map out policy entry points, such as legislative oversight, ethical review mechanisms for the armed forces, that can serve as foundational steps towards a national AI defence governance framework. The study will prescribe how Nigeria can align with global best practices as proposed by NATO, the EU, or the United States Department of Defence, while tailoring these approaches to its domestic

security and governance context.

Interdisciplinary Implications

This study bridges critical disciplinary boundaries by intersecting the fields of artificial intelligence, security studies, human rights law, ethics, and public policy. It contributes to the expanding field of science and technology by exploring how emerging technologies interact with social and political systems, especially in fragile contexts like Nigeria, where governance structures and security institutions are in a delicate balance.

Conclusion

This study illuminates the complex and underexplored terrain of AI in Nigerian military operations, particularly through the lens of human security, ethical accountability, and government policy. From the findings, a central generalisation can be drawn: Nigeria's adoption of AI in defence remains ahead of its institutional, legal, and ethical readiness. While the Nigerian military has begun integrating AI tools in CT and COIN activities, there exists a significant gap in regulatory oversight and human rights safeguards.

The study therefore concludes that AI's militarisation, in the absence of robust policy frameworks, poses serious risks to civilian safety, democratic governance, and operational legitimacy. It also shows that human-centred and context-specific policies are urgently needed to mitigate these risks and ensure that technological advancement does not outpace normative safeguards. Broadly, the study offers a framework for integrating AI into military operations in ways that are accountable, culturally responsive, and aligned with Nigeria's constitutional and international obligations.

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References

Aghedo, I., & Eke, S. J. (2020). The use and misuse of intelligence technology in Nigeria's counterinsurgency war. *African Security Review*, 29 (3), 225–240.

Boulanin, V., & Verbruggen, M. (2017). *Mapping the development of autonomy in weapon systems*. SIPRI.

Obe, A. (2022). Nigeria's digital surveillance and the shrinking civic space. *Open Society Foundations Report*.

Ndukwe, I., & Olumide, A. (2023). Surveillance technology in Nigeria: Security priorities and human rights risks. *Centre for Digital Policy Stud-*

Scharre, P. (2018). *Army of None: Autonomous Weapons and the Future of War*. W. W. Norton & Company.

Artificial Intelligence and Political Conflict and Cooperation in the Lake Chad Basin

Samuel Abimbola Kolawole Osanubi

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Abstract

This study investigates the potential of artificial intelligence to improve political conflict and cooperation in the Lake Chad Basin (LCB). The study is qualitative in nature and draws data from secondary sources. The findings revealed that Africa has been excluded from discussions on artificial intelligence at the global stage for a while, since Africa and African-based contexts were not considered when the earliest AI models were being developed. Despite this, artificial intelligence is becoming prevalent in Africa and, if used ethically, it has the potential to help combat conflict and foster cooperation in the Lake Chad Basin and other parts of Africa. However, the study concludes that there are often challenges related to data quality, ethical considerations, and governance framework on the deployment of artificial intelligence, not only in the Lake Chad Basin but across Africa. The study then recommends that stakeholders such as the African Union, the LCBC, member states, and international partners establish a regional AI-powered early warning system and should also foster collaboration and partnership to harness the potential of AI in pro-

moting peace, stability, and development in the LCB.

Keywords: Africa, AI, AU, conflict, cooperation, Lake Chad Basin, LCB, LCBC

Background to the Study

The Lake Chad Basin (LCB) is a region of immense strategic importance, situated at the heart of Africa. Spanning across Chad, Nigeria, Cameroon, and Niger, the LCB is a vital economic and environmental hub, supporting the livelihoods of millions of people (Osanubi 2024). The region's rich cultural heritage, diverse ecosystems, and significant natural resources have made it a focal point for regional development. The unique geography of the LCB has shaped the lives of its inhabitants, influencing their economic activities, social structures, and cultural practices. However, despite its potential, the region faces significant challenges that threaten its stability, as well as its development. In recent years, the region has been confronted with numerous challenges, including the Boko Haram insurgency, climate change, resource scarcity, and

displacement of populations. These challenges have had devastating impacts on the LCB's security, economy, and humanitarian situation, leading to widespread displacement, poverty, and human suffering. The Boko Haram insurgency has been a major driver of instability in the region, causing significant loss of life, displacement, and destruction of infrastructure, and the complex dynamics of the LCB require innovative solutions to address its unique needs. It is in this context that the study explores the potential of artificial intelligence (AI) in conflict prevention and cooperation.

The advent of AI has opened up new possibilities for addressing these complex challenges. AI models can analyse vast amounts of data, including satellite imagery and social media, to identify patterns and provide predictive insights that can enhance conflict prevention, mitigation, and resolution in the LCB. By understanding the historical context of conflicts, regional politics, and diplomacy, AI-driven solutions can be tailored to address the unique needs of the region.

The study aims to advance the body of knowledge on the potential for the application of AI to conflict prevention and cooperation in the LCB, while also highlighting the challenges and limitations of its deployment in the region. By examining the role of AI in promoting peace and stability in the LCB, the study seeks to provide a comprehensive understanding of how AI-driven solutions can be leveraged to support conflict prevention, mitigation, and resolution efforts in the region, taking into account the complex interplay between technological, political, environmental, and social factors.

Study Area

The LCB is located on the Sahelian part of West and Central Africa, by the southern edge of the Saharan Desert (Adewoye, Ukoha, and Okonkwo 2023, 40), and it cuts across northern Came-

roon, western Chad, south-eastern Niger and north-eastern Nigeria (Sanusi 2024). The size of the area within the region covers 2,381,635 km², and its Conventional Basin, which is 427,500 km² valued at 20% of the LCB area, spans 42% in Chad, 28% in Niger, 21% in Nigeria, and 9% in Cameroon. These countries also formed the Lake Chad Basin Commission (LCBC), under whose mandate the water and other natural resources of the Lake Chad Basin are managed.

Roughly 30 million people live in the LCB (Humanitarian Practice Network 2017; Osanubi 2024), and the region has long been a socio-economic and cultural melting pot that has witnessed a series of state-building from pre-colonial, colonial, and post-colonial periods (Umara 2018). It is home to several different ethnic groups, who are mostly farmers, each with their own unique culture and history. These ethnic groups, while they practise Islam, also have unique cultural adaptations to their specific societies. Groups like the Shuwa Arab, Kanuri, Hausa, Fulani, Buduma, Kotoko, Maba, and many others claim ownership and ancestral linkage to the region (Osanubi 2024).

Figure 1. The Map of the Lake Chad Basin



Source: Vivekananda et al., *Shoring Up Stability*, 23, figure 1.

Potential Application of Artificial Intelligence in Combatting Conflict and Fostering Cooperation in the Lake Chad Basin

The LCB is situated within a complex and dynamic landscape characterised by increasing tensions, climate change, and the natural resource and economic paradox (Adebola and Aniekwe 2022). These factors have contributed to significant humanitarian crises, displacement, and loss of life in the region (Osanubi 2024). The Boko Haram insurgency has been a major driver of conflict in the LCB, exacerbating existing tensions and competition over scarce resources. Climate change has further complicated the conflict dynamics, leading to intensified competition for resources such as water and land.

The application of AI offers a promising avenue for addressing the complex challenges facing the LCB. AI can significantly enhance conflict prevention and management in the region by analysing satellite imagery, social media, and historical trends to detect emerging threats in the region. The use of AI-powered platforms such as the Global Conflict Risk Index, which utilise machine learning algorithms to predict possible outbreaks of conflict, can also provide insights that inform conflict prevention and management strategies (Ndzana 2025). If done in a timely manner, AI can help assess security threats in the LCB and also enable proactive measures that could help prevent the outbreak of conflict involving its member states and violent non-state actors (VNSAs). To key into this, the LCBC and member states will have to integrate the AU Continental AI Strategy into their conflict mitigation, prevention, resolution, and plans of action.

A key benefit of AI in conflict prevention and management is its ability to identify potential flashpoints and areas of high risk, allowing for targeted interventions and resource allocation. AI can analyse large datasets to identify patterns

and trends of conflict that may not be apparent to human analysts, providing a more detailed understanding of the complex dynamics of conflict in the LCB. The use of AI in early warning systems can also reduce the impact of conflict on local communities by enabling early response and mitigation efforts (Amani Africa 2025). AI can help inform the development of targeted interventions, such as food aid programmes of the Food and Agriculture Organisation (FAO) or the peacebuilding initiatives of the United Nations Development Programme (UNDP), by analysing data on food security, climate-related disasters, and population movements across national boundaries of the LCB states.

The LCBC and member states can leverage AI to analyse data on cross-border security threats like arms proliferation and identify potential areas of cooperation. The natural language processing (NLP) tools of AI can contribute to conflict resolution via diplomatic mediation by analysing negotiation patterns and advising leaders within the region. By analysing large datasets, AI can help identify potential areas of conflict and inform the development of targeted peacekeeping and military strategies of the Multinational Joint Task Force (MNJTF), the regional security outfit saddled with the task of combating Boko Haram and other VNSAs. This can enhance regional cooperation and peace-led efforts in the LCB by optimising surveillance systems, logistics, and decision-making processes (Ndzana 2025).

Effective application of AI in the LCB requires collaboration and partnership among stakeholders, including the African Union (AU), the LCBC, member states, and international partners. By pooling their resources and expertise, stakeholders can harness the potential of AI to promote peace, stability, and development in the LCB. The AU can provide strategic guidance and support, while the LCBC can facilitate regional coordination and cooperation. International partners can provide technical assistance, funding, and

expertise to support the development and deployment of AI-powered solutions in regional centres and also in conflict-ravaged communities in the riparian states of the LBC.

Interdisciplinary Implications

Bridging Disciplinary Boundaries: The study bridges disciplinary boundaries by combining insights from multiple fields, including computer science, which provides the understanding of advanced analytical tools for conflict analysis and enables the identification of patterns and trends in conflict data; history, which provides valuable insights into the drivers of conflict in the region and highlights the importance of understanding the historical context of conflict; environmental science, which highlights the impact of environmental factors on conflict dynamics and underscores the need for sustainable and environmentally informed policies; international relations, which helps inform better understanding of conflict dynamics and regional security and highlights the importance of cooperation and diplomacy in preventing conflicts; and, lastly, public policy, which enables the development of effective policies for conflict prevention and regional cooperation and supports informed decision-making.

Potential Applications in Nigerian Contexts: This study could enhance conflict prevention and early warning systems, which can help prevent violent conflict and promote peace and stability in the country. Secondly, it could help inform policy decisions on cooperation and security in the LCB, which can further help promote regional stability and cooperation, which will in turn help support sustainable development in Nigeria.

Contributions to Understanding the Relationship between Technology and Society: The study could enhance conflict analysis and prevention by providing advanced analytical tools and enabling the identification of patterns

and trends in conflict data. It may also inform policy decisions and support evidence-based policies by providing policymakers with valuable insights and data-driven recommendations.

Additionally, the study could support community-based initiatives for peacebuilding and development by empowering local communities to take ownership of peacebuilding efforts, promoting sustainable development.

Resource Considerations for Implementing Similar Work in Low-Resource Settings

The resources required to adapt the study in low-resource settings include:

- **Digital Access:** Access to reliable internet, data storage, and computational resources, which can support the effective use of AI-driven solutions.
Capacity building: Provide training and capacity-building programmes for local stakeholders, which can enhance their capacity to use AI-driven solutions effectively.
- **Ethical guidelines:** Establish clear guidelines for data collection, analysis, and use, which can ensure the responsible use of AI-driven solutions.
- **Collaboration:** Foster collaboration with regional organisations, governments, and local communities, which can promote effective implementation and sustainability of AI-driven solutions.

Methodology

The study employs a qualitative case study approach, utilising a desk review of secondary data from existing sources to examine the potential of AI applications on conflict and cooperation in the LCB. Data were collected from online and offline sources, including academic articles, reports, and policy documents related to AI applications in conflict resolution and cooperation.

The collected data was thematically analysed, a qualitative research method that involves closely analysing data to identify common themes, ideas, subjects, and patterns of meanings that come up repeatedly. This approach allowed for a detailed examination of the potential benefits and limitations of AI models in conflict resolution and cooperation. The study uses a case study approach to examine the LCB as a specific context where AI models can be applied to enhance conflict resolution and foster cooperation. The analysis focuses on identifying the potential applications and limitations of AI models in addressing conflict and promoting cooperation in the region.

Ethical Considerations

The study recognises that the technical knowledge of AI is limited among stakeholders in Africa, which may lead to biases in the interpretation and application of AI models. It also acknowledges that resource limitations and accessibility challenges may affect the adoption and implementation of AI models in the LCB for its various activities, especially ones linked to conflict resolution and peaceful coexistence.

Recommendations and Conclusion

There are often challenges in the effectiveness of AI models because of the dependence on data quality, ethical considerations, and governance framework regulating AI's deployment in Africa, and because Africa's voice has previously been excluded from discussions on AI at various international fora. The effect of this exclusion is premised on the fact that Africa's interests and African contexts were not seriously considered while AI models were being developed (Musoni 2024). Despite these challenges, there has been significant progress recorded in the evolution of AI, from traditional models to generative systems capable of creating, extensively exploring, and interpreting complex data (Azaroual 2024). AI has been able to present a new framework for

understanding the causes and consequences of conflict and how cooperation can be fostered by leveraging big data, machine learning, and predictive analysis, which help in providing early warning systems, strengthening cooperation, and improving policy actions.

In Africa, AI is gradually making its way into technologies such as advanced surveillance systems and combat drones, which are deployed to fight organised crimes (Allen and Okpali 2022). The application of AI in issues of conflict and cooperation, as it affects the LCB, offers a promising solution to the complex challenges of conflict prevention and management in the region. By leveraging AI models, the AU, LCBC, and other stakeholders can enhance their ability to detect emerging threats, identify potential flashpoints, and develop targeted interventions. AI can also inform the development of peace support efforts and military strategies, optimise surveillance systems, and facilitate diplomatic mediation. The effective application of AI in the LCB requires collaboration and partnership among stakeholders, including the AU, the LCBC, member states, and international partners. By pooling their resources and expertise, stakeholders can harness the potential of AI to promote peace, stability, and development in the LCB. With AI-powered solutions, the region can better address the complex challenges of climate change, environmental degradation, and ongoing conflict, and work towards a more stable and prosperous future.

The study recommends that the AU, LCBC and their member states establish a regional, AI-powered early warning system to detect emerging threats and potential flashpoints and should also foster collaboration and partnership to harness the potential of AI in promoting peace, stability, and development in the LCB.

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References

- Adebola, T. & Aniekwe, C. C. (2022, August 26). *The Lake Chad Basin Region: Conflicts, crises and contemporary developments*. School of Law, University of Aberdeen, UK. <https://www.abdn.ac.uk/law/blog/the-lake-chad-basin-region-conflicts-crises-and-contemporary-developments/>
- Adewoye, A. R., Ukoha, P. A. & Okonkwo, S. J. (2023). *Big Data and Artificial Intelligence development for climate-smart agriculture modeling of the Lake Chad Basin*. Forum for Agriculture Research in Africa Research Report, 7 (6), 39-47. <https://doi.org/10.59101/frro72306>
- Allen, N. & Okpali, I. (2022, April). Artificial Intelligence creeps on to the African battlefield. Nairobi Law Report Monthly. wathi.org/artificial-intelligence-creeps-on-to-the-african-battlefield-nairobi-law-monthly-april-2022/
- Amani Africa. 2025. Artificial Intelligence and its impacts on peace, security and governance. <https://amaniafrica-et.org/artificial-intelligence-and-its-impact-on-peace-security-and-governance>
- AU (2024, July). Continental Artificial Intelligence Strategy: Harnessing AI for Africa's development and prosperity. <https://au.int/site/default/files/documents/44004-doc-EN-Continental-AI-Strategy-July-2024.pdf>
- Azaraoul, F. (2024, May 16). Artificial Intelligence in Africa: Challenges and opportunities. Policy Brief. PB-23/24. Policy Centre for the New South. <https://www.policycenterma/publications/artificial-intelligence-africa-challenges-and-opportunities>
- HPN (2017). *The Lake Chad Basin: An overlooked crisis?* <https://odihpn.org/magazine/lake-chad-basin-overlooked-crisis/>
- Musoni, M. (2024, January). Envisioning Africa's AI governance landscape. European Centre for Development Policy Management. Brief Note No. 177. <https://ecdpm.org/application/files/7017/0651/8711/Envisioning-Africas-AI-Governance-Landscape-in-2024-ECDPM-Briefing-Note>
- Ndzana, J. Y. N. (2025, March 26). *The role of Artificial Intelligence on conflict prevention and management in Africa*. ACCORD: Conflict and Resilience Monitor. <https://www.accord.org.za/analysis/the-role-of-artificial-intelligence-in-conflict-prevention-and-management-in-africa/>
- Osanubi, S. A. K. (2024). Boko Haram insurgency and regional stability in the Lake Chad Basin. An unpublished MSc Dissertation submitted to the School of Postgraduate Studies, Federal University of Lafia, Nigeria.
- Sanusi, S. A. (2024, August). *Information vacu-*

um and information disorder in conflicts zones:
An exploration of the Lake Chad Basin. [https://
daidac.thecjid.org/information-vacuum-and-
information-disorder-in-conflict-zonesan-
exploration-of-thelake-chad-basin/](https://daidac.thecjid.org/information-vacuum-and-information-disorder-in-conflict-zonesan-exploration-of-thelake-chad-basin/)

Umara, I. (2018). *National interest and foreign policy option for Nigerians in the Central Africa Sub-Region.* Kaduna: Joyce Graphic Printers and Publishers.

Vivekananda, Janani, Martin Wall, Chitra Nagarajan, Florence Sylvestre, and Oli Brown. 2019. *Shoring Up Stability: Addressing Climate and Fragility Risks in the Lake Chad Region.* adelphi research gemeinnützige GmbH. <https://shoring-up-stability.org/wp-content/uploads/2019/06/Shoring-up-Stability.pdf>

Reimagining AI Governance in Nigeria - A Feminist Decolonial Critique of Digital Transformation and Gendered Inequalities

Omokhose J. Ojebuovboh

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Abstract

Nigeria's digital transformation and AI governance initiatives, such as significant investments in digital public infrastructure and the rollout of a national digital identity system (NIMC), promise enhanced efficiency and greater financial inclusion. Yet they risk perpetuating entrenched patriarchal and colonial inequities. This paper employs a feminist decolonial framework—drawing on diverse critical perspectives, including insights from the Pygmalion displacement approach—to interrogate how efforts to “humanise” AI concurrently contribute to dehumanising, deskilling, and marginalising women. By centring Nigerian contexts and local epistemologies, the analysis reveals how historical erasures, such as the sidelining of early female contributions in technology, are reproduced in contemporary algorithmic systems that cloak bias under the guise of neutrality.

Through detailed case studies spanning Nigeria's public sector—from digital identity initiatives and resource allocation strategies to fintech innovations—this literature review ex-

poses a troubling paradox. Ambitious state-led projects are undermined by stark socio-economic disparities, as exemplified by lower formal banking access among women (31% versus 61% for men) and significantly reduced internet usage. Qualitative insights, drawn from prior interviews, policy documents, and digital activist campaigns (e.g., #NameAndShameNigeria), further highlight the disconnect between technocratic governance and the lived realities of marginalised communities.

In response, this synthesis advocates for an AI governance model that reorients digital transformation as a tool for social justice. Central to this vision is the integration of participatory design, rigorous ethical oversight, and indigenous feminist epistemologies. Such an approach promises to address algorithmic biases, dismantle inherited hierarchies, and enable Nigeria to leverage technological advances in fostering inclusive growth, equitable resource distribution, and the celebration of cultural diversity.

Keywords: Feminism, governance, decoloni-

alisation, digital transformation, AI, gendered inequality.

Introduction

Nigeria is undergoing a rapid digital transformation that is sure to reshape public policy and social governance. Ambitious state-led initiatives, such as significant investments in digital public infrastructure and the rollout of a national digital identity system (NIMC), promise to herald an era of connectivity, expanding economic opportunities for millions of citizens (Techeconomy 2024). And yet, beneath these promises lay numerous challenges. Varon et al. (2022) examine AI governance frameworks in this context through a feminist decolonial lens, and what becomes apparent is that algorithmic systems, often presented as objective and modern, can inadvertently perpetuate existing gendered, racial, and colonial power imbalances.

The prevailing literature on AI governance has largely emerged from technocratic discourses emphasising algorithmic fairness, transparency, and efficiency. However, critical feminist and postcolonial scholars like Morr (2024) and Ricaurte (2022) argue that these narratives obscure the fundamental reality that digital transformation is not a neutral technical process. Projects like “Not My A.I.” and broader critiques of digital colonialism highlight how AI systems often fail to acknowledge structural inequalities and injustices, thereby perpetuating existing systematic power imbalances, rather than dismantling them (Varon et al. 2022). Algorithms reduce complex human conditions—such as poverty, gender identity, and cultural diversity—to reductive, machine-readable formats (Zajko 2022). This reduction is reflective of historical marginalisation patterns conceptually linked to ideas like Pygmalion displacement, where the contributions and identities of marginalised groups, including women (e.g., the early “computer girls”), are systematically erased or undervalued (Erscoi et al. 2023).

This study seeks to interrogate AI in governance and public policymaking, using a feminist decolonial lens to highlight the reproduction of harmful bias and the perpetuity of systemic oppression, despite algorithms being touted as objective and modern. Methodologically, this study adopts an interdisciplinary, qualitative framework, combining critical policy analysis and historical discourse, examination of contemporary scholars in the area of research, as well as comprehensive case studies drawn from Nigeria and analogous contexts in Latin America and parts of Africa. The data sources include academic literature, official policy documents, media reports, stakeholder interviews, and analyses of digital activism, as highlighted by hashtag campaigns such as #NameAndShameNigeria and #SayHerNameNigeria (Chiluwa 2024). By triangulating these diverse materials, this research attempts to unpack the multiplicity of ways in which AI governance in Nigeria is shaped by global technocratic imperatives alongside local socio-cultural dynamics.

Preliminary findings reveal a significant disjuncture between Nigeria’s ambitious digital transformation goals and on-the-ground realities. Challenges such as uneven digital literacy, infrastructural and socio-cultural deficits that especially persist in rural areas (Tyers-Chowdhury and Binder 2021), and regulatory bottlenecks further complicate inclusive digital adoption in the country (Imaginarium HQ 2025). While investments in AI and digital public infrastructure promise improved operational efficiency and enhanced public service delivery (Asalu 2025), they also risk perpetuating historical biases rather than alleviating them. Marginalised voices remain largely absent from policymaking processes, exacerbating the disconnect between policy ambitions and lived experiences (Varon et al. 2022). Burrell and Fourcade (2021) highlight this disconnect as an emphasis of the identified risk of unchecked algorithmic governance reinforcing, rather than redressing, existing inequalities embedded in societal structures.

Situated at the crossroads of computer science, public policy, and feminist social theory, this review challenges the notion of AI as a purely technical artefact. It emphasises that the design, implementation, and regulation of digital systems are deeply embedded in cultural and historical contexts. In Nigeria, a nation still grappling with colonial legacies and persistent socio-economic disparities, such critical re-examination is not only timely but imperative (Onduko et al. 2024). This paper therefore advocates for a reimagined AI governance framework that centres local epistemologies, participatory design, and robust ethical oversight, ensuring that digital transformation becomes a tool for equitable and culturally resonant progress (Lugonzo 2025).

Methodology

Research Question and Relevance

This study reviews empirical and discursive academic literature to address the question: **How do Nigeria's digital transformation initiatives, particularly those involving AI technologies, reify historical gendered and colonial inequities, and how can a feminist decolonial perspective reconstitute these processes towards more equitable outcomes?**

This inquiry is significant both theoretical, challenging the dominant narrative of technological neutrality, and practical, by identifying policy gaps that marginalise local communities (especially women) and offering actionable insights for reform.

Research Framework

The study is anchored in an interdisciplinary framework, drawn from the reviewed literature, incorporating three critical perspectives:

- **Feminist Decolonial Theory:** This critiques how colonial legacies and patriarchal structures shape technological practices while foregrounding indigenous epistemologies and overlooked contributions (e.g., the

“computer girls”).

- **Critical Discourse Analysis (CDA):** This deconstructs language in policy documents, media reports, and digital activism, revealing how constructs like “objectivity” and “data-driven decision-making” can mask underlying biases.
- **New Social Movement Theory (NSMT):** This explores how Nigerian women's rights groups mobilise through online campaigns (e.g., #NameAndShameNigeria, #SayHerNameNigeria) to challenge state-led narratives and advocate for inclusive futures.

Research Design and Methods

Given the complex interplay among gender, technology, and policy, this study adopts a qualitative approach that synthesises existing research, rather than generating new primary data. The methods employed across the reviewed literature include:

- **Document and Discourse Analysis:**
 - **Data Collection:** Review policy documents, official publications, academic literature, and news media.
 - **Analytical Process:** Manual close reading and coding to identify recurring themes (e.g., “humanisation,” “efficiency,” “objectivity”), supported by comparative case studies from Europe, the U.S., Latin America, and West Africa.
- **Digital Activism Data Analysis:**
 - **Data Collection:** Gather digital content from social media platforms using tools like Netlytic.
 - **Analytical Process:** Thematic coding of online activism to reveal how digital campaigns contest official narratives.
- **Semi-Structured Interview Analysis:**

- **Participants:** Review interviews with policymakers, technical developers, analysts, and representatives from feminist organisations.
- **Objective:** Triangulate narrative insights on AI implementation and digital governance.
- **Participant Observation:**
 - **Settings:** Observations during AI system deployments and policy forums.
 - **Objective:** Capture real-time interactions and uncover discrepancies between official rhetoric and practice.
- **Supplementary Empirical Data:**
 - Incorporate quantitative indicators such as internet usage and formal banking access disparities to ground qualitative findings.

Data Preparation and Analytical Techniques

Data from interviews, documents, and digital content is coded thematically and analysed using narrative analysis. Triangulation across diverse sources ensures that conclusions are robust and contextually grounded.

Suitability of Methods and Their Relevance

The qualitative, interdisciplinary approach is well-suited for capturing subtle socio-political nuances and context-specific insights that purely quantitative methods might overlook. By bridging computational critiques with social science methodologies, this study remains tightly linked to Nigeria's unique socio-cultural landscape while providing actionable recommendations for more inclusive digital policies.

Ethical Considerations

This paper is firmly anchored in feminist decolo-

nial principles and is committed to ethical rigour, especially given the sensitive intersections of technology, gender, and institutional power in Nigeria. Data privacy is a central concern, and this study primarily draws on publicly available documents—including policy texts, academic literature, and social media posts—to examine digital activism and state-led digital transformation. Where primary data such as interviews or survey responses are used, it is confirmed that informed consent was robustly secured, and all identifiable information was carefully anonymised. Extra measures were implemented to protect the privacy of individuals, particularly given that participation in digital activism can sometimes render someone indirectly identifiable. These measures adhere to established ethical guidelines and ensure that sensitive information is handled with the utmost care.

Recognising that biases can be woven into both AI systems and research methodologies, this study adopts a critically reflexive stance. The analysis recognises that algorithmic processes often perpetuate historical inequities—particularly in colonial contexts—and it continually reflects on the potential biases that might emerge in qualitative methods. Through the rigorous triangulation of diverse data sources and consistent reflexive methodologies, the study actively works to minimise interpretive bias and challenge the notion of technological neutrality.

Given the historical marginalisation of women and other vulnerable groups in Nigeria—and the world at large—the review takes deliberate steps to ensure that the redress of existing power imbalances is prioritised in the research. Engagements with community stakeholders, policy actors, and digital activists, which were conducted through collaborative dialogue and mutual respect during research, were prioritised.

A culturally sensitive approach is integral to this study. All research instruments and analytical frameworks have been adapted to reflect local

norms, values, and epistemologies. This adaptation ensures that interpretations are contextually valid and that the study respectfully engages with indigenous perspectives, even as it critiques externally imposed paradigms. Furthermore, the study acknowledges the persistent challenges posed by resource constraints and the digital divide in Nigeria—factors that affect both data availability and the broader participation of communities in digital transformation. By openly discussing these limitations, the research underscores the vital need for more inclusive and accessible data ecosystems, providing a realistic framework for understanding and addressing the broader impacts of digital innovation.

Findings

This study’s investigation into Nigeria’s digital transformation—and particularly the governance of AI through a feminist decolonial lens—reveals a multifaceted landscape. By synthesising existing research and secondary data gathered from interviews, policy documents, participant observations, and quantitative analyses drawn from 169 licensed fintech providers (in addition to data from 17 emerging ones), this review uncovered a number of interrelated themes. Overall, while AI-driven applications and digital initiatives promise enhanced efficiency, the evidence indicates that these same advances risk perpetuating long-standing gendered and colonial inequities.

One of the most striking findings on gendered digital inequalities in Nigeria is the pronounced digital divide between men and women. Quantitative data from policy documents and statistical reports show that only 20.05% of Nigerian women are regular internet users compared to 37.20% of men, revealing a gender gap of approximately 17% (Banyan Global 2023). Trends emerging since 2019 indicate a decline in women’s digital engagement and mobile phone ownership, a pattern largely shaped by restrictive local norms. In northern Nigeria, surveys indicate

that over half of male respondents oppose their wives’ use of the internet, with similar attitudes found among fathers who restrict their daughters’ digital participation. These socio-cultural restrictions, in tandem with structural limitations of infrastructure, present a greater challenge, especially for rural women (Banyan Global 2023). These disparities create an empirical foundation for critiquing digital transformation policies, which, despite ambitious state-led investments, fail to incorporate gender-sensitive designs.

Table 1. Overview of Digital Access Statistics

| Metric | Men | Women |
|--|---------|----------|
| Regular Internet User Rate | 37.20% | 20.05% |
| Mobile Phone Ownership | 92% | 88% |
| Mobile Internet Usage | 54% | 34% |
| Autonomy Over Handset (selection) | 93% | 62% |
| Controlling Internet Access of Female Relatives (northern Nigeria) | Fathers | Husbands |
| | 61% | 55% |

Turning to AI adoption in the fintech sector, Omotubora’s (2024) quantitative insights reveal considerable discrepancies between claims and practices. Among the 169 fintech providers analysed, 45 claim to utilise AI; however, only 13 of these offer detailed explanations regarding how AI is integrated into their services. This gap suggests that many of these claims are superficial, reflecting an absence of substantive and transparent use of AI. Furthermore, approximately 75% of these providers are urban-based, con-

trasting sharply with the roughly 2% who serve rural areas. This urban concentration underscores a troubling pattern: the current AI solutions in Nigeria appear tailored to already advantaged populations to maximise profitability, leaving behind many underbanked and digitally excluded women.

Table 2. Overview of AI Adoption Metrics

| Metric | Value |
|--|-------|
| Total Fintech Providers Analysed | 169 |
| Providers Claiming AI Usage | 45 |
| Providers with Detailed AI Information | 13 |
| Urban-based Providers | ~75% |
| Rural-based Providers | ~2% |

Beyond the numbers, a critical discourse analysis of digital feminist activism reveals how Nigerian women’s rights groups contest both offline oppression and the neglect embedded within current AI governance through digital feminist activism. Chiluwa (2024) highlights how hashtag campaigns such as #NameAndShameNigeria and #SayHerNameNigeria consolidate individual narratives into collective calls for accountability, amplifying marginalised voices which are often excluded from formal policy dialogues. Visual content and linguistic analyses further demonstrate a dialectical tension between state-promoted, technocratic narratives and the emotive, inclusive voices emerging from grassroots activism (Aina and Temitope 2024). While these digital campaigns have considerable potential to empower marginalised communities, they also expose the limitations of online mobilisation in achieving lasting policy change. The aforementioned socio-cultural, economic, political and structural barriers for women and other marginalised groups constrain the translation of online

advocacy into concrete reforms (Ayana et al. 2024).

Another dimension of the findings concerns the operational dynamics of technology in governance. Many respondents in Saxena’s (2024) work note impressive efficiency gains from AI-driven tools, such as improved turnaround times in chatbots and data-driven resource allocation. AI-powered chatbots like HerSafeSpace, developed by a Nigerian NGO, provide real-time support to women facing online gender-based violence, combining technology with advocacy and education to create safer digital environments (Ileyemi 2025). However, these benefits come with hidden costs. Ayana et al. (2024) reiterate that algorithms, predominantly developed from Western-centric datasets, tend to cloak historical gender and colonial biases. Such biases manifest in the reinforcement of rigid gender binaries and in the marginalisation of non-normative identities (Botti-Lodovico 2024).

The study analysis finds that while automated tools are invaluable for processing large datasets quickly, the interpretive nuance required to appreciate local idioms and cultural contexts is only achievable through manual coding and qualitative assessment. Automated approaches offer fast processing and rapid trend identification; however, they are limited in cultural sensitivity and tend to operate as “black boxes,” obscuring justifications of local nuances—or a lack thereof (Zajko 2022). In a hybrid arrangement, human oversight proves essential in addressing the complexities that AI alone may overlook. AI systems in Nigeria and comparable contexts (in Latin America and other parts of Africa) tend to reduce complex human conditions of poverty, gender identity, and cultural diversity into oversimplified, machine-readable data. This abstraction inevitably ignores the lived experiences of marginalised groups and often reinforces a one-size-fits-all approach to policy (Reid et al. 2023).

Empirical evidence shows that algorithms not

only replicate but may also amplify pre-existing social biases by privileging global models over localised, indigenous epistemologies (Varon, Peña, and Center 2022). It underscores the critical need to embed AI systems within regulatory frameworks that rigorously interrogate and counter these embedded biases. Policy documents and stakeholder interviews further expose crucial gaps in public participation, with national AI initiatives often adopting Western models that overlook the perspectives of marginalised communities, especially women. Evidence of displacement is clear: the erasure of women's historical contributions to computing reflects a broader pattern of exclusion from digital narratives (Erscoi et al. 2023).

The Nigerian government, through the National Information Technology Development Agency (NITDA) and the Federal Ministry of Women Affairs, launched the National Gender Digital Inclusion Strategy (NGDIS) for 2024–2027 (Adaramola 2025). The NGDIS aims to remove barriers to digital inclusion by expanding digital skills training, infrastructure, mentorship, and creating safe online spaces for women and girls. Yet, despite progress in regulatory guidelines, significant implementation gaps remain, partly due to insufficient demographic and local contextualisation in AI system design and deployment (Nwosu et al. 2024).

AI governance is fragmented across existing laws on data protection, cybersecurity, and competition, and in many cases, anticipated benefits in public service delivery or financial inclusion have not materialised, partly due to insufficient demographic contextualisation and robust oversight (Omotubora 2024). Salihu (2025) points out that limited institutional capacity and funding restrict regulatory authorities' ability to conduct continuous oversight, such as mandatory bias audits or impact assessments.

Taken together, these findings point to the necessity of a hybrid governance model that mar-

ries AI's efficiency with human-driven, context-sensitive methods. Strengthening public participation through inclusive policy frameworks and ensuring continuous regulatory oversight over privately owned enterprises—via regular audits and community feedback—are imperative steps to mitigating AI's inherent biases and to fostering a genuinely transformative digital future.

In summary, while Nigeria's digital transformation and AI governance initiatives may enhance operational efficiency, they remain fundamentally entangled with historical gender and colonial inequities. The evidence highlights the importance of blending computational efficiency with nuanced, human-centred approaches, a hybrid methodology that is essential for the development of equitable and responsive policies. These findings call for urgent, context-driven reforms that prioritise local participation and rigorous regulatory oversight, ultimately paving the way for a more inclusive and transformative digital future.

Interdisciplinary Implications

This study embodies an inherently interdisciplinary approach by integrating insights from fields as diverse as computer science, public policy, and feminist/decolonial theory. In doing so, it challenges dominant narratives in AI governance and digital transformation, arguing that technology is not a neutral tool but is deeply embedded in broader socio-political, cultural, and historical contexts. It spans the gap between technical assessments and critical socio-political inquiry. Combining rigorous AI system evaluations with feminist and decolonial theoretical frameworks—such as the Pygmalion displacement approach—it reveals how algorithmic models, despite their claims of efficiency, reproduce gendered and colonial biases. Rather than treating AI solely as a technical artefact, this work reimagines it as a socio-political construct that demands a multidisciplinary critique. And by

fostering dialogue between computational techniques and qualitative social research, the review promotes reflexive practices that harmonise insights from STEM fields, the humanities, and public policy, thereby capturing the full cultural and ethical dimensions of digital transformation.

The implications of this interdisciplinary work also extend to educational settings, policy development, and community empowerment. Embedding feminist decolonial theory and indigenous knowledge systems into AI and public policy curricula can prepare future technologists and policymakers to address both technical and socio-cultural dimensions of digital innovation (Hooper and Oyege 2024). By bridging disciplinary divides, adapting global policies to local realities, reforming educational frameworks, and adopting resource-sensitive strategies, the study offers robust theoretical and practical models for reimagining AI governance.

Recommendations

Rooted in Nigerian socio-political realities and bearing broader resonance for similar African contexts, the study encourages practical directions for reimagining AI governance. It advocates for policymakers to adopt gender-inclusive, decolonial frameworks that transcend purely technocratic approaches by embracing human-centred models designed to actively mitigate algorithmic bias. In parallel, digital rights advocates and women's rights groups are empowered to leverage data on the pronounced gender digital divide to press for policies that protect marginalised communities. The research demonstrates that imported, globalised models often reinforce colonial legacies and overlook local socio-cultural realities. In line with Lugonzo (2025), the study suggests that incorporating indigenous epistemologies and participatory methodologies rooted in community knowledge can produce governance frameworks that are ethical, culturally resonant, and responsive to local

needs. This approach offers a replicable model for digital democracy especially suited to resource-constrained settings like Nigeria and similar African countries.

The findings advocate for regulatory frameworks that mandate transparency, participatory oversight, and continuous auditing of AI systems. Such policies would help ensure that digital transformation initiatives do not deepen existing inequalities but rather work to alleviate them. Mwelu (2025) emphasises that collective responsibility, as reflected in Ubuntu philosophy, can shift governance from individualistic, technocratic models to more inclusive, community-centred approaches. At the grassroots level, these insights support the creation of local digital literacy programmes and community-based decision-making processes, transforming citizens from passive recipients into active stakeholders in digital governance.

The study refutes the myth of AI neutrality by showing that AI systems are imbued with socio-cultural and gendered assumptions that perpetuate historical biases. Sustainable digital transformation, therefore, must involve a balance between quantitative efficiency and qualitative human complexities; this balance challenges the prevailing notion of “techno-solutionism” and calls for the integration of ethical, cultural, and historical contexts throughout technological innovation. By recognising infrastructural and economic limitations in Nigeria and similar contexts, the research recommends practical strategies, such as adopting low-tech solutions like community radio or SMS-based education and leveraging open-source AI models that are tailored to local capacities. The Thomas Reuters Foundation (2024) recommends collaborative funding partnerships among universities, government agencies, and international feminist tech movements to support context-specific digital initiatives that remain both accessible and scalable.

Policymakers are urged to incorporate inclusive, participatory practices and enforce rigorous disclosure standards in AI governance. Fintech providers must transition from models focused solely on efficiency and profitability to those that prioritise user-centred, gender-inclusive financial solutions that bridge both urban and rural divides. Furthermore, educational institutions should adopt interdisciplinary curricula that merge technical training with critical theories of ethics and cultural sensitivity, while future research is recommended to employ longitudinal, mixed-methods designs to capture the evolving digital experiences of marginalised communities. In sum, the interdisciplinary findings of this research underscore a call for collaborative, multi-sector approaches that merge technical expertise with critical social inquiry. Its ultimate aim is to transmute digital transformation into a process that is not only efficient but also equitable, culturally resonant, and socially just.

Nonetheless, several exceptions and limitations temper the general trends found in this study. The reliance on qualitative analyses and secondary data means that some on-the-ground nuances, particularly in rural areas, remain underexplored. For instance, many fintech providers offer only vague disclosures about their AI practices, limiting our comprehensive understanding of technological integration. Moreover, while digital activism—exemplified by campaigns like #NameAndShameNigeria and #SayHerNameNigeria—has amplified women's voices online, this does not automatically translate into tangible policy reform. This “null effect” highlights the enduring gap between online mobilisations and offline change. Additionally, while the Pygmalion displacement framework yields valuable insight into gendered dynamics, it may oversimplify the intersecting influences of economic constraints, regional diversity, and infrastructural challenges on the broader landscape of digital governance.

Conclusion

The study confirms that Nigeria's digital transformation, and specifically the integration of AI into governance and fintech, is entwined with gendered and colonial inequality. Despite the promise of enhanced efficiency and data-driven decision-making from state-led digital initiatives, synthesis of existing research reveals that these advances are consistently undermined by pervasive biases that marginalise women and reinforce entrenched power hierarchies. The study's analysis demonstrates that digital and AI systems in Nigeria are far from neutral artefacts. Instead of being detached technical tools, these systems embed gendered biases inherited from global, patriarchal frameworks.

The process of humanising AI through feminised design elements gives rise to a dynamic—exemplified by the concept of Pygmalion displacement—where the historical contributions and lived labour of women are simultaneously mimicked and marginalised. In parallel, digital transformation efforts create conditions of financial exclusion; empirical evidence from prior studies shows significant disparities and gaps observable in digital use and access. As currently implemented, these digital initiatives—often modelled on Western technocratic paradigms that neglect local socio-cultural complexities—risk reinforcing exclusionary practices rather than redressing them. Further assessments reveal that while automation offers speed and scale, it lacks the nuance to capture local realities. Hybrid models that combine computational efficiency with context-sensitive human judgment are therefore essential for developing policies that genuinely meet the needs of marginalised communities.

While Nigeria's digital transformation and AI governance hold significant potential for enhancement and innovation, realising these benefits demands a reimagining of digital policies through an interdisciplinary, feminist decolonial

lens. This study advocates for a collaborative, multi-stakeholder approach that intersects technology, policy, and feminist critique. Such an approach is essential for forging a digital future where transformative policy reforms and robust regulatory oversight ensure that digital innovation serves as a true vehicle for social equity.

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References

- Salihu, Abdulameed, O. 2024. "Regulating the Future: The Current State and Prospects of Artificial Intelligence Policy in Nigeria." *SSRN*. July 18. <https://doi.org/10.2139/ssrn.5117653>.
- Adaramola, Zakariyya. 2025. "Nigeria Moves to Bridge Gender Digital Divide." *Daily Trust*. April 9. <https://dailytrust.com/nigeria-moves-to-bridge-gender-digital-divide-2/>
- Agunwa, Nkem. 2024. "Feminism and the Digital Era: Challenges and Opportunities in Africa." *Feminist Africa* 5 (2): 113–26. <https://www.jstor.org/stable/48799338>
- Aina, Adeola, T. 2024. "From Hashtags to Entrepreneurship: A Qualitative Study of the Influence of Digital Activism on Female-Led Businesses in Nigeria." *Nigerian Journal of Management Sciences* 25. <https://nigerianjournalofmanagementsciences.com/wp-content/uploads/2024/11/From-Hashtag-to-Entrepreneurship.pdf>.
- Banyan Global. 2023. "Understanding the Gender Digital Divide in Nigeria." *Banyan Global*.

USAID. https://banyanglobal.com/wp-content/uploads/2023/08/Nigeria-GDD-Brief_Final-508-May-2023.pdf.

Benoit, Kenneth. 2024. "AI and Data Science for Public Policy." *LSE Public Policy Review* 3 (3). <https://doi.org/10.31389/lseppr.115>.

Botti-Lodovico, Yolanda. 2024. "Against All Odds: Increasing African Women's Influence on AI Innovation and Policy." Tech Policy Press. October 31, 2024. <https://www.techpolicy.press/against-all-odds-increasing-african-womens-influence-on-ai-innovation-and-policy/>.

Burrell, Jenna, and Marion Fourcade. 2021. "The Society of Algorithms." *Annual Review of Sociology* 47 (1): 213–37. <https://doi.org/10.1146/annurev-soc-090820-020800>.

Erscoi, Lelia, annelies kleinherenbrink, and Olivia Guest. 2023. "Pygmalion Displacement: When Humanising AI Dehumanises Women," February. <https://doi.org/10.31235/osf.io/jqxb6>.

Gelan Ayana, Kokeb Dese, Hundessa Daba Nemomssa, Bontu Habtamu, Bruce Mellado, Kingsley Badu, Edmund Yamba, et al. 2024. "Decolonizing Global AI Governance: Assessment of the State of Decolonized AI Governance in Sub-Saharan Africa." *Royal Society Open Science* 11 (8). <https://doi.org/10.1098/rsos.231994>.

Hooper, Danielle, and Ivan Oyege. 2024. "Application of African Indigenous Knowledge Systems to AI Ethics Research and Education: A Conceptual Overview." In *2024 ASEE Annual Conference & Exposition*. <https://peer.asee.org/46585>.

Ileyemi, Mariam. 2025. "Nigerian Group Unveils AI Chatbot to Combat Online Gender-Based Violence." *Premium Times Nigeria*, February 17, 2025. [https://www.premiumtimesng.com/news/top-news/774916-nigerian-group-unveils-ai-chatbot-to-combat-online-gender-based-](https://www.premiumtimesng.com/news/top-news/774916-nigerian-group-unveils-ai-chatbot-to-combat-online-gender-based-violence.html)

[violence.html](https://www.premiumtimesng.com/news/top-news/774916-nigerian-group-unveils-ai-chatbot-to-combat-online-gender-based-violence.html).

Imaginarium HQ. 2025. "Navigating the Challenges of Digital Transformation in Nigeria | LinkedIn." LinkedIn.com. March 17, 2025. <https://www.linkedin.com/pulse/navigating-challenges-digital-transformation-nigeria-y7ykf/>.

Innocent Chilwa. 2024. "Discourse, Digitisation and Women's Rights Groups in Nigeria and Ghana: Online Campaigns for Political Inclusion and against Violence on Women and Girls." *New Media & Society*, January. <https://doi.org/10.1177/14614448231220919>.

Lugonzo, Tamara. 2025. "From Colonial Bias to Relational Intelligence: Decolonizing AI with Indigenous and African Epistemologies." *Liberated Arts: A Journal for Undergraduate Research* 12 (1). <https://ojs.lib.uwo.ca/index.php/lajur/article/view/22436/17676>.

Macdonald, Ayang. 2025. "Nigeria Re-Commits to Improving Digital Services with \$2B Planned Investment." Biometric Update | Biometrics News, Companies and Explainers. BiometricUpdate.com. March 4, 2025. <https://www.biometricupdate.com/202503/nigeria-re-commits-to-improving-digital-services-with-2b-planned-investment>.

Morr, Christo El. 2024. "The Need for a Feminist Approach to Artificial Intelligence." *Proceedings of the AAAI Symposium Series* 4 (1): 332–33. <https://doi.org/10.1609/aaais.v4i1.31812>.

Mwelu, Naomi. 2025. "African Epistemologies as the Pillar of AI Ethics in Peacebuilding: A Definitive Framework." LinkedIn.com. March 3, 2025. <https://www.linkedin.com/pulse/african-epistemologies-pillar-ai-ethics-peacebuilding-naomi-pojuf/>.

Nwosu, Chibuzo Charles, Dike Chijioke Obalum, and Mathias Ozoemena Ananti. 2024. "Artificial Intelligence in Public Service and Governance in Nigeria." *Journal of Governance and Accounta-*

bility Studies 4 (2): 109–20. <https://doi.org/10.35912/jgas.v4i2.2425>.

Ololade Faniyi. 2024. “An African Feminist Manifesto.” *The Republic*. The Republic. February 27, 2024. <https://rpubl.com/february-march-2024/an-african-feminist-manifesto/>.

OLUWOLE ASALU. 2025. “Shaping Nigeria’s Digital Future: Vision for 2025 and Beyond.” *Independent.ng*, February 2, 2025. <https://independent.ng/shaping-nigerias-digital-future-vision-for-2025-and-beyond/>.

Omotubora, Adekemi. 2024. “AI for Women’s Financial Inclusion—Analysis of Product Design and Policy Approaches in Nigeria.” *Data & Policy* 6. <https://doi.org/10.1017/dap.2024.62>.

Onduko, Joseph Otochi, Michael Acharya Kalombo, Makuach Dut Kuol, Bentley Gift Makale, and Mahsen Abdulkarim Saleh. 2024. “AI-Driven Governance: Transforming Public and Addressing Legacy Issues in Post-Colonial Africa.” *Proceedings of London International Conferences*, no. 11 (September): 52–63. <https://doi.org/10.31039/plic.2024.11.243>.

Reid, Octavia Field, Anna Colom, and Roshni Modhvadia. 2023. “What Do the Public Think about AI?” *Adalovelaceinstitute.org*. October 26, 2023. https://www.adalovelaceinstitute.org/evidence-review/what-do-the-public-think-about-ai/#_ftnref81.

Ricaurte, Paola. 2022. “Artificial Intelligence and the Feminist Decolonial Imagination.” *Bot Populi*. March 4, 2022. <https://botpopuli.net/artificial-intelligence-and-the-feminist-decolonial-imagination/>.

Saxena, Ashish K. 2024. “AI in Governance and Policy Making.” *International Journal of Science and Research (IJSR)* 13 (5): 1218–23. <https://doi.org/10.21275/sr24519015426>.

Techeconomy. 2024. “Empowering Governance through Digitalisation: Nigeria’s Roadmap for

Transparent Transformation | Tech | Business | Economy.” *Tech | Business | Economy*. December 3, 2024. <https://techeconomy.ng/empowering-governance-through-digitalisation-nigerias-roadmap-for-transparent-transformation/>.

Thomas Reuters Foundation. 2024. “A.I. GOVERNANCE for AFRICA PART 3: BUILDING ADVOCACY STRATEGIES.” *Trust.org*. <https://www.trust.org/wp-content/uploads/2024/12/TRF-Toolkit-3-Advocacy-Strategies-2024.pdf>.

Tyers-Chowdhury, Alexandra, and Gerda Binder. 2021. “What We Know about the Gender Digital Divide for Girls: A Literature Review.” *UNICEF*. UNICEF. <https://www.unicef.org/eap/media/8311/file/What%20we%20know%20about%20the%20gender%20digital%20divide%20for%20girls:%20A%20literature%20review.pdf>.

Varon, Joana, Paz Peña, and Carr Center. 2022. “Not My A.I. Towards Critical Feminist Frameworks to Resist Oppressive A.I. Systems.” https://www.hks.harvard.edu/sites/default/files/2023-11/22_10JoanaVaron.pdf.

Zajko, Mike. 2022. “Artificial Intelligence, Algorithms, and Social Inequality: Sociological Contributions to Contemporary Debates.” *Sociology Compass* 16 (3). <https://doi.org/10.1111/soc4.12962>.

GROUP 6

SOCIAL WELFARE & POLICY

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AI Governance in Africa: Harmonizing Policies to Safeguard Democratic Processes from AI Manipulation

Habeeb Adewale Tajudeen

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Introduction

The intersection of artificial intelligence (AI) and democratic governance presents a critical and timely research agenda for African nations, particularly as AI technologies increasingly shape political processes. From digital voter registration systems to AI-enhanced surveillance and content moderation tools, the anticipated deployment of AI in electoral contexts raises both opportunities and challenges for democratic consolidation (Jobin, Ienca, and Vayena 2019). While these technologies hold the potential to improve electoral efficiency and transparency, they also risk introducing new forms of manipulation, bias, and disinformation that could erode public trust and electoral legitimacy (Floridi 2020; Biniok and Maedche 2019).

In African democracies, where elections are often contested amid weak institutions and volatile political landscapes, the governance of AI assumes heightened importance. Countries such as Nigeria and Kenya have already experimented with biometric verification and real-time results transmission, but the broader regulatory frameworks to safeguard against misuse remain underdeveloped (Umar and

Nwobilor 2020). Recognising this gap, the proposed study aims to investigate how African nations can harmonise AI governance to safeguard democratic processes from AI-driven manipulation.

This research will build on existing scholarship in political science, digital governance, and ethics, engaging with international frameworks such as the OECD AI Principles (2019), the European Union's guidelines (European Commission 2019), and notably, the African Union's (AU) Continental AI Strategy (2024), which provides a regional vision for ethical, inclusive, and sustainable AI adoption. The project adopts a policy-focused analytical framework, drawing insights from governance literature, African AI policy initiatives (Effoduh 2023; World Bank 2021), and comparative international examples. The aim is to explore the governance gaps, assess the political and institutional readiness of African states, and propose a harmonised, context-sensitive governance approach.

Positioned within the social sciences, this research takes a critical policy lens to examine AI as a subject of inquiry in relation to democratic

processes. Its relevance to Nigeria and the broader African context lies in its potential to inform the development of robust, regionally coordinated governance models that anticipate and mitigate the risks of AI-driven political manipulation.

Methodology

This research will adopt a qualitative, interpretive approach grounded in comparative policy analysis and critical governance studies. Its primary objective is to explore the governance of artificial intelligence (AI) within African electoral contexts, focusing on Nigeria, Kenya, and South Africa as representative case studies. These countries have been selected due to their relative leadership in digital adoption within Africa and their diverse experiences with electoral technology implementation (Effoduh 2023; Umar and Nwobilor 2020). The research design will centre on three core questions:

1. What governance frameworks currently exist for regulating AI use in African electoral contexts?
2. How do these frameworks compare with international benchmarks and models, particularly the African Union's Continental AI Strategy (2024) and the Estonian regulatory approach?

What practical policy pathways can African nations pursue to harmonise AI governance and safeguard elections from AI-driven manipulation?

The research will draw on multiple data sources, including:

Primary materials, such as national AI strategies, legal frameworks, electoral commission documents, and regional charters from bodies like the African Union and ECOWAS.

Key regional references, including the AU

Continental AI Strategy (2024), which articulates ethical, inclusive, and sustainable AI governance priorities for Africa.

Secondary sources, comprising scholarly literature on AI ethics, digital governance, algorithmic accountability, and democratic theory (Floridi 2020; Jobin, Ienca, and Vayena 2019; Biniok and Maedche 2019).

The study will use a purposive sampling strategy to select country cases that represent diverse governance and technological profiles—focusing on Nigeria, Kenya, and South Africa as African cases, and Estonia as a comparative benchmark from a digitally advanced democracy (The Estonian Government 2020; Ministry of Economic Affairs and Communications of Estonia 2021). This comparative lens will allow the study to identify governance gaps, institutional challenges, and areas of promising policy transfer.

The theoretical framework draws from critical policy studies and democratic theory, particularly scholarship on digital governance, surveillance capitalism, and algorithmic harms (Zuboff 2019; Tufekci 2015). By framing AI as a political and institutional actor, the research will analyse how governance arrangements shape the use and consequences of AI technologies in electoral processes.

Ethical Considerations

Ethical rigour is central to this proposed research, particularly given its focus on AI governance within politically sensitive electoral contexts. The study will critically engage with core ethical principles such as data privacy, algorithmic fairness, transparency, and accountability—principles that are especially salient in environments characterised by fragile democratic institutions and contested political legitimacy (Jobin, Ienca, and Vayena 2019; Umar and Nwobilor 2020).

A key ethical concern involves the risk of digital surveillance and voter profiling, which can lead to the erosion of individual autonomy and the suppression of dissent. AI technologies deployed in elections—such as facial recognition systems, predictive analytics, and misinformation detection tools—can easily be weaponised to serve partisan interests, thereby exacerbating existing power asymmetries (Floridi 2020; Effoduh 2023). The proposed study will maintain a critical focus on these risks, situating them within broader debates about digital rights and the ethics of algorithmic governance (Biniok and Maedche 2019; Zuboff 2019).

The research also acknowledges the structural imbalances between domestic actors (such as national electoral commissions), international technology firms, and regional governance institutions. This dynamic often results in policy dependency and limited local control over AI-driven electoral technologies. The study will examine these power relations, drawing insights from the African Union’s Continental AI Strategy (2024), which emphasises data sovereignty, ethical AI development, and the promotion of African values in technological governance.

Cultural appropriateness and inclusivity are integral to the research design. The study will prioritise African-authored policy documents and amplify voices from local civil society organisations and electoral observers, ensuring that the ethical analysis is both grounded and context-sensitive (Effoduh 2023; Umar and Nwobilor 2020). Where possible, it will seek to integrate perspectives from marginalised communities that are disproportionately affected by AI-induced governance shifts.

In terms of research ethics, the study will adhere to established guidelines on responsible scholarship and data handling, following best practices laid out by institutions such as the OECD (2019)

and the European Commission (2019). Although the study does not involve human participants, it will still engage with sensitive political materials and policy documents, necessitating careful attention to confidentiality, integrity, and transparency in its analysis and reporting.

By foregrounding these ethical considerations, the research aims to contribute not only to scholarly debates but also to practical frameworks that can guide policymakers, technologists, and civil society actors in developing AI governance systems that are both ethically robust and democratically legitimate.

Findings

This research project anticipates generating findings that will deepen understanding of governance challenges and opportunities surrounding AI deployment in African electoral processes. Preliminary analysis of policy documents and governance literature suggests that while many African states have shown enthusiasm for digital innovation in elections, the regulatory frameworks governing AI remain fragmented and underdeveloped (Effoduh 2023; Umar and Nwobilor 2020). The research will examine how this governance gap increases vulnerability to AI-driven political manipulation, including voter microtargeting, algorithmic bias, disinformation amplification, and the misuse of biometric and surveillance technologies.

A key line of inquiry will explore the extent to which the AU Continental AI Strategy (2024) provides a coherent continental framework for addressing these risks. Early reviews indicate that the AU strategy emphasises ethical, inclusive, and sustainable AI development, with calls for member states to adopt shared principles on transparency, accountability, and human rights protections (African Union 2024). The study will investigate how national-level policies in Nige-

ria, Kenya, and South Africa align with or diverge from these regional commitments, and where gaps in implementation and enforcement may exist.

The research will also investigate comparative lessons from Estonia, a country renowned for its centralised, ethical AI governance structures and integrated digital services (The Estonian Government 2020; Ministry of Economic Affairs and Communications of Estonia 2021). By applying a comparative lens, the study aims to identify which aspects of Estonia's model—such as algorithmic audits, multi-stakeholder governance, or public trust-building measures—might be adapted to African governance contexts.

Although the research is still in progress, anticipated outcomes include a detailed mapping of governance gaps, an assessment of political and institutional readiness across African cases, and policy recommendations for harmonising national and regional efforts. The study will also reflect critically on the structural constraints—such as resource limitations, external technological dependencies, and contested political environments—that complicate AI governance in Africa (Jobin, Ienca, and Vayena 2019; Floridi 2020).

Ultimately, this project seeks to contribute both empirical insights and theoretical reflections on how African democracies can manage the dual challenge of technological innovation and democratic safeguarding.

Interdisciplinary Implications

This research proposal underscores the inherently interdisciplinary nature of AI governance, situated at the confluence of political science, law, ethics, information technology, and governance studies. By investigating the deployment of AI in electoral systems, the study bridges de-

bates around algorithmic accountability, democratic theory, and socio-technical governance, offering a framework that is both analytically rigorous and contextually grounded.

A key interdisciplinary implication anticipated by the study is the necessity of integrating legal frameworks with technological safeguards to ensure that AI tools uphold democratic principles. As Floridi et al. (2018) and Biniok and Maedche (2019) have noted, effective AI governance requires a synthesis of normative ethical standards and enforceable legal mechanisms—an approach that remains underdeveloped in many African contexts. The research will explore how cross-sectoral collaboration between legal scholars, technologists, policymakers, and civil society actors can foster more robust and responsive governance structures.

Furthermore, the study will contribute to broader discussions around data sovereignty and digital colonialism, particularly in light of Africa's reliance on foreign-developed AI systems (Zuboff 2019; Effoduh 2023). By engaging with the African Union's Continental AI Strategy (2024), which emphasises local ownership, data protection, and capacity building, the research will highlight the critical role of regional institutions in shaping equitable and culturally relevant AI frameworks.

The study is also expected to have pedagogical implications. Insights from this research could inform curriculum development in higher education programmes across public policy, computer science, legal studies, and ethics. Embedding topics such as AI ethics, algorithmic governance, and electoral technology into academic curricula will help equip future practitioners and scholars with the competencies needed to navigate the complexities of AI in governance (European Commission 2019; OECD 2019).

Lastly, the research underscores the practical necessity of multi-stakeholder approaches in policy design and implementation. It will advocate for the inclusion of marginalised voices—particularly grassroots organisations, election monitors, and affected communities—in shaping AI governance policies. Given the resource constraints typical of many African states, the study anticipates emphasising scalable, context-sensitive governance models that are affordable and adaptable, ensuring that ethical AI deployment is not confined to well-resourced settings alone (Ibrahim and Nwobilor 2020; The Estonian Government 2020). In summary, the research aspires to contribute both to scholarly debates and actionable governance strategies that align technological advancement with democratic values and local realities. Theoretically, this research will contribute to debates about digital governance, democratic resilience, and the ethics of algorithmic power. Practically, it aims to offer policymakers, civil society actors, and international partners a roadmap for designing governance models that are democratic, adaptive, and responsive to the needs of African societies.

The study acknowledges certain limitations. As a qualitative and policy-oriented investigation, it may not capture the full empirical diversity of electoral experiences across Africa, nor does it include primary fieldwork at this stage. Future research will need to integrate quantitative data, stakeholder interviews, and comparative fieldwork to deepen understanding of AI's impact on democratic practices.

Conclusion

This research aims to advance scholarly and policy debates on how African states can develop harmonised and context-sensitive frameworks for AI in electoral processes. By exploring the governance gaps and institutional challenges associated with AI deployment in elections, the project seeks to highlight both the promise and

perils of AI for democratic consolidation across the continent. The study anticipates finding that, while AI tools hold potential for improving electoral transparency and administrative efficiency, their unregulated or poorly overseen use risks amplifying political inequalities, eroding public trust, and undermining democratic norms (Jobin, Ienca, and Vayena 2019; Floridi 2018).

A central argument of this research will be that effective AI governance in Africa must be shaped through both national innovation and regional coordination. The AU Continental AI Strategy (2024) offers a crucial regional framework for promoting ethical, inclusive, and sustainable AI governance, but its success will depend on how well national governments, including Nigeria, Kenya, and South Africa, translate continental principles into enforceable domestic policies (African Union 2024). Drawing on comparative lessons from Estonia, the project will propose context-appropriate mechanisms, such as algorithmic audits, public consultations, and cross-sectoral regulatory bodies, to strengthen national governance regimes. In sum, this project aspires to inform the development of governance systems that enable African countries to harness AI's benefits while safeguarding the integrity of their democratic institutions.

References

- AU (African Union). 2024. *Continental Artificial Intelligence Strategy*. African Union. https://au.int/sites/default/files/documents/44004-doc-EN-_Continental_AI_Strategy_July_2024.pdf.
- Biniok, Peter, and Alexander Maedche. 2019. "Ethical Guidelines for Trustworthy AI." *Communications of the ACM* 62 (8): 70–79.
- Effoduh, Joshua. 2023. *AI Governance and Regulatory Gaps in Nigeria*. National Centre for Ar-

tificial Intelligence and Robotics.

European Commission. 2019. *Ethics Guidelines for Trustworthy AI*. European Commission. <https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai>.

Floridi, Luciano, Josh Cowls, Monica Beltrametti, et al. 2018. "AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations." *Minds & Machines* 28 (4): 689–707. <https://pubmed.ncbi.nlm.nih.gov/30930541/>.

Jobin, Anna, Marcello Ienca, and Effy Vayena. 2019. "The Global Landscape of AI Ethics Guidelines." *Nature Machine Intelligence* 1: 389–399. <https://doi.org/10.1038/s42256-019-0088-2>.

Ministry of Economic Affairs and Communications of Estonia. 2021. Estonian AI Strategy 2030. Accessed February 10, 2024. https://www.mkm.ee/sites/default/files/03.02.2020_artificial_intelilgenc_strateegi_a_eng.pdf.

OECD. 2019. OECD AI Principles. Paris: OECD Publishing.

The Estonian Government. 2020. Estonian AI Taskforce Report: Towards Ethical AI Governance in Estonia. Tallinn: Estonian Government Printing Office.

Tufekci, Zeynep. 2015. "Algorithmic Harms Beyond Facebook and Google: Emergent Challenges of Computational Agency." *Colorado Technology Law Journal* 13: 203–218. <https://ctlj.colorado.edu/wp-content/uploads/2015/08/Tufekci-final.pdf>.

Ibrahim, Umar, A., and Chinyere J. Nwobilor. 2020. "Artificial Intelligence as a Tool for Decision Making: A Perspective from the Central

Bank of Nigeria." *International Journal of Managerial Studies and Research* 8 (1): 76–85. <https://doi.org/10.20431/2349-0349.0801008>.

World Bank. 2021. Nigeria: Building a Digital Economy through Artificial Intelligence. Washington, DC: World Bank Group.

Zuboff, Shoshana. 2019. *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. PublicAffairs.

Artificial Intelligence (AI) and Social Welfare Targeting in Nigeria: What Participatory Frameworks Could Align Algorithmic Design with Grassroots Equity Demands?

Adewumi Adediran

SCAN TO READ ONLINE



Abstract

The advancement in technology, through the use of AI, has exacerbated inequalities in social welfare targeting in developing countries. Thus, this research examines how AI can be leveraged for an effective targeting mechanism in Nigeria, specifically the participatory frameworks that could align algorithmic design with grassroots equity demands, given its unique contextual issues in the form of fraud, persistent exclusion errors, and inefficiencies in beneficiary selection, using case studies from Kenya and South Africa. While addressing issues related to ethical considerations, infrastructural gap, and data availability, Kenya's Huduma Namba (digital ID system) and South Africa's South African Social Security Agency's (SASSA) Social Relief of Distress (SRD) grant (algorithm means-testing) identify significant opportunities, such as biometric verification for reduced leakage and predictive analytics for poverty mapping, by examining current AI-driven welfare systems and their applicability to the Nigerian context. Methodologically, this paper relies on comparative case studies, secondary data

analysis, and expert opinions to propose a framework for how AI can be leveraged for an effective targeting mechanism in Nigeria. Key findings indicate that although the use of AI can address inefficiencies in Nigeria's social welfare, its adoption requires ethical safeguards, robust digital infrastructure and inclusive design to mitigate marginalisation. This study provides policy recommendations for Nigeria's National Social Register (NSR) and contributes to the discussion on AI governance in low-resource settings. Specifically, this research examines AI as a subject of study, emphasising a more multi- and interdisciplinary perspective from public policy, computer science, development economics, information technology management, and data science.

Keywords: Social welfare, artificial intelligence, Nigeria, exclusion, digital identity

Introduction

Social welfare programmes in Nigeria, including the National Cash Transfer Programme (NCTP) implemented by the National Social Safety Nets Coordinating Office (NASSCO),

deal with challenges like the exclusion of vulnerable groups, ghost or fraudulent beneficiaries, and manual verification delays (World Bank 2023). AI provides the possibility of addressing these issues through the use of biometric IDs, predictive poverty mapping, and automated eligibility checks. But its use in low-resource settings is inadequate due to the lack of robust digital infrastructure. This paper assesses lessons for Nigeria by examining how Kenya and South Africa integrated AI into their social welfare system. While Kenya's Huduma Namba employs biometric ID to ensure effective and efficient public service delivery, South Africa's SASSA SRD grant leverages AI-driven cross-checks to target relief. However, exclusion errors, data privacy, and algorithm bias were the main issues with both systems.

Artificial intelligence (AI) has two sides to its integration into social welfare systems. It raises important operational and ethical concerns, while also potentially increasing efficiency. Though sometimes at the cost of overall accuracy. Studies highlight how the integration of AI into social

welfare systems can improve the accuracy of welfare targeting, as evidenced by conditional cash transfer (CCT) programmes where adjustments in algorithms reduce exclusion errors (Noriega et. al. 2018). However, there are also concerns about AI-driven bias and surveillance, with evidence suggesting that automated systems could perpetuate historical marginalisation trends, especially in fraud detection (Zajko 2023). Although regulatory frameworks like the European Union's AI Act attempt to address these concerns, they are criticised for possible flaws that permit tech companies to self-regulate, putting vulnerable populations at the risk of inadequate protections (Akhmedjonov, 2023).

Methodology

The research question is within the intersection

of the effectiveness and adaptability of AI, asking what lessons Nigeria can derive from the implementation of Kenya's Huduma Namba (digital ID system) and South Africa's South African Social Security Agency's (SASSA) Social Relief of Distress (SRD) grant (algorithm means -testing). This paper relies on comparative case studies, secondary data analysis and expert opinions to propose a participatory framework for how AI can be leveraged for an effective targeting mechanism in Nigeria. The focus of this study is on policy lessons. Key findings indicate that although the use of AI can address inefficiencies in Nigeria's social welfare, its adoption requires ethical safeguards, robust digital infrastructure, and inclusive design to mitigate marginalisation.

Ethical Considerations

1. Data privacy and consent: There exists a need in Kenya's Huduma Namba, though well-intentioned, for robust data protection measures and transparency (Allen and Zyl 2020). In the Nigerian context, privacy concerns have been raised by the Nigeria Data Protection Regulation (NDPR) about the national identification number (NIN) enrolment with mandatory linkage with SIM cards (National Information Technology Development Agency 2019).
2. Potential biases in AI systems or traditional methods: South Africa's SASSA SRD grant excluded informal workers as a result of reliance on formal tax database for eligibility verification. There was also the issue of faulty eligibility verification, where 80% of rejections were as a result of misclassified financial status (Howson et. al. 2025).
3. Considerations for local context and cultural appropriateness: A 2021 study by the World Bank Identification for Devel-

opment Initiative on gender barriers in Nigeria revealed that women had to seek permissions from fathers or husbands to leave the house, which hindered their ability to obtain a form of identification. Also, other social norms issues that were identified include unveiling for photographs, mixed gender spaces, and physical contact required to capture fingerprints (Hammer, Esquivel-Korsaik, and Pande 2021).

Findings

Kenya: Huduma Namba

Success

In addition to improving social welfare targeting, the system's ability to provide exclusive monitoring capabilities, particularly at key locations like airports and border posts, was emphasised by the government. Huduma Namba was able to anticipate potential threats, respond quickly in those crucial moments, and dynamically adjust to changing security issues through the utilisation of AI (Nyakundi 2020; Huduma Namba Admin 2019).

Challenges

Bor and Koech (2023) noted that Amnesty International and Human Rights Watch, among other well-known international human rights organisations, pointed out the programme's hidden dangers and emphasised the need for strict data protection protocols and transparency, no matter how well-intentioned the Huduma Namba is (Allen and Zyl 2020). The Numbian community in Kenya also raised serious concerns about exclusion and discrimination during the Huduma Namba registration, highlighting the possibility for inherent bias and misuse in such a broad programme (Kenya Human Rights Commission 2021).

South Africa: SASSA SDR Grant

Success

South Africa's SASSA SRD grant has been an effective tool in alleviating poverty through the increase in income expenditure and purchasing power (Ubisi 2024). Through the grant, the government reached over 30 million South Africans with cash-based relief measures (Gronbach et. al. 2022).

Challenges

South Africa's SASSA SRD grant excluded informal workers as a result of reliance on formal tax database for eligibility verification. There was also the issue of faulty eligibility verification, where 80% of rejections were as a result of misclassified financial status (Howson et. al. 2025). Another main issue was that of exclusion error, which occurred as a result of barriers to accurate verification of eligibility via proxy means testing, application, and receiving payments having been approved. Howson et al. (2025) further revealed that people who experienced existing forms of marginalisation, including financial exclusion, spatial inequality, digital exclusion, lack of access to identification documents, gender inequality, and immigration status, were most vulnerable to erroneous exclusion from the grant.

Interdisciplinary Implications

This research bridges disciplinary boundaries by bringing together economics (social welfare) with computer science (AI). Some of the potential implications in the Nigerian context are the design of a hybrid AI-humane system, where AI is used for initial screening and committees in the community are responsible for the final verification, which addresses Kenya's exclusion error. Also, dynamic eligibility models can be developed to adjust welfare access based on real-time shocks like floods; this was useful in South Africa's COVID-19 response and is still relevant.

Evidence from Kenya and South Africa has re-

vealed that AI welfare systems fail when imposed without participation. Nigeria can learn from this by starting with grassroots equity demands and building algorithms around them. Nigeria can also ensure an inclusive and sustainable integration of AI in social welfare targeting by institutionalising transparent rules, community panels and a hybrid form of verification.

This study is relevant in the educational setting as this discussion could lead to the design of a robust curriculum on AI ethics for public administrators. Policy makers are also well-informed about the need for comprehensive AI governance frameworks. Furthermore, communities are better equipped to take proactive steps through the demand for transparency in algorithm decisions, for example, explanations for rejections through SMS.

Conclusion

This research finds that while AI can enhance efficiency in social welfare targeting, its implementation requires careful design to avoid exclusion. The other side is the potential risks where both systems exclude vulnerable groups as a result of data accessibility and quality, digital divide, or algorithmic biases.

The limitation of this study stems from the reliance on secondary data. Primary field testing can be useful to provide further insights into future research. The practical recommendation for the government is to ensure an inclusive data protection act that comprises welfare algorithm audits. In the case of the research findings by the World Bank Identification for Development Initiative on gender barriers in Nigeria, highlighted earlier, the National Identity Management Commission can accelerate gender-sensitive ID enrolment in collaboration with the local governments. Finally, it is important that AI systems are monitored for fairness.

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References

- Allen, Karen, and Izak van Zyl. *Who's Watching Who? Biometric Surveillance in Kenya and South Africa*. Pretoria: ENACT, 2020. <https://enact-africa.s3.amazonaws.com/site/uploads/2020-11-11-biometrics-research-paper.pdf>
- Akhmedjonov, Akmaljon. *The Implication of AI in Social Welfare Systems: Potential Risks and Prevention Measures*. 2023. https://www.etd.ceu.edu/2023/akhmedjonov_akmaljon.pdf
- Bor, Sherry, and Nicole Cheptoo Koech. "Balancing Human Rights and the Use of Artificial Intelligence in Border Security in Africa." *Journal of Intellectual Property and Information Technology Law (JIPIT)* 3, no. 1 (2023): 77–122. <https://doi.org/10.52907/jipit.v3i1.260>.
- Gronbach, Lena, Jeremy Seekings, and Vayda Megannon. *Social Protection in the COVID-19 Pandemic: Lessons from South Africa*. CGD Policy Paper 252. Washington, DC: Center for Global Development, 2022. <https://www.cgdev.org/sites/default/files/social-protection-covid-19-pandemic-lessons-south-africa.pdf>

Hanmer, Lucia C., Victoria Esquivel-Korsiak, and Rohini P. Pande. *Barriers to the Inclusion of Women and Marginalized Groups in Nigeria's ID System: Findings and Solutions from an In Depth Qualitative Study*. Identification for Development. Washington, D.C.: World Bank Group, 2021. <http://documents.worldbank.org/curated/en/881401618990982108>

Howson, Kelle, Siyanda Baduza, Thato Setambule, and Thobani Khumalo. *Systemic Exclusion from a South African Social Assistance Transfer: Drivers, Impacts and Who Is Most at Risk*. Institute of Economic Justice (IEJ) Research Paper No. 340, 2025. [https://iej.org.za/wp-content/uploads/2025/03/South-Africa-SRD-exclusions WEB.pdf](https://iej.org.za/wp-content/uploads/2025/03/South-Africa-SRD-exclusions_WEB.pdf)

Huduma Namba Admin. *Huduma Namba and Our National Security Strategy*. 2019.

Kenya Human Rights Commission. "Consortium Applauds Court Judgement Declaring Huduma Cards Illegal; Calls for Further Reforms." *Citizenship Rights in Africa Initiative*, October 18, 2021. <https://citizenshiprightsafrika.org/kenya-consortium-applauds-court-judgement-declaring-huduma-cards-illegal-calls-for-further-reforms/>

National Information Technology Development Agency. 2019. *Nigeria Data Protection Regulation (NDPR) Report*. <https://nitda.gov.ng/wp-content/uploads/2020/11/NigeriaDataProtectionRegulation11.pdf>

Noriega, Alejandro, Bernardo Garcia-Bulle, Luis Tejerina, and Alex Pentland. *Algorithmic Fairness and Efficiency in Targeting Social Welfare Programs at Scale*. 2018. [https://data.bloomberglp.com/company/sites/2/2018/09/algorithm-fairness-efficiency .pdf](https://data.bloomberglp.com/company/sites/2/2018/09/algorithm-fairness-efficiency.pdf)

Nyakundi, F. *Huduma Namba: Kenya's Trans-*

formation into an Informational State. Master's thesis, University of Washington, 2020. <https://digital.lib.washington.edu/server/api/core/bitstreams/1de6a6a9-dd35-42ce-b3fa8ec68b6c4935/content>

Ubisi, Tricxy Maureen. The Impact of SASSA Social Relief of Distress Grant (SRD 350) As a Measure for Poverty Alleviation. *African Journal of Development Studies*, Vol. 14(2) 2024. <https://journals.co.za/doi/epdf/10.31920/2634-3649/2024/v14n2a8>

World Bank. *Consolidated Recommendations – Nigeria Social Protection Fiscal Space Study*. 2023.

Zajko, Mike. 2023. Automated Government Benefits and Welfare Surveillance. *Surveillance & Society* 21 (1): 52–65. <https://ojs.library.queensu.ca/index.php/surveillance-and-society/article/view/16107>

Decision-Making Bias in AI: Do Large Language Models Discriminate?

Shukurat Bello

SCAN TO READ ONLINE



Abstract

This research investigates bias and fairness in large language models (LLMs) across hiring, political decision-making, and information retrieval contexts. The analysis reveals consistent patterns of demographic, dialectal, and political biases in LLM outputs, while evaluating the strengths and limitations of current auditing methodologies. The review highlights critical ethical dilemmas in deploying biased AI systems and proposes an interdisciplinary framework for developing more equitable LLM applications. Key challenges include detecting covert biases and implementing effective mitigation strategies that reduce some biases and might then create others. While successes demonstrate the potential of hybrid human-AI systems and innovative auditing techniques. It concludes with recommendations for researchers and practitioners working at the intersection of AI ethics and applied linguistics.

Keywords: Artificial intelligence, bias, fairness, AI ethics, AI decision-making, large language models

Introduction

A growing body of research provides compelling evidence that large language models (LLMs) consistently exhibit various forms of bias that mirror and often amplify existing societal prejudices. Multiple studies confirm the presence of troubling demographic biases in LLMs, particularly in high-stakes contexts like hiring decisions. An et al. (2024), Gaebler et al. (2024), and Armstrong et al. (2024) all demonstrate how these models discriminate based on race, ethnicity, and gender. For instance, An et al. found that in simulated hiring scenarios, resumes with Hispanic male names received systematically lower acceptance rates compared to other demographic groups. Similarly, Armstrong et al. revealed that women and minority candidates face significant penalties when applying for positions in male-dominated or White-dominated professional fields.

Beyond these overt demographic biases, researchers have uncovered subtler but equally concerning forms of discrimination. Hofmann et al. (2024) demonstrated how LLMs covertly associate African American English (AAE) with negative stereotypes, even when explicitly

trained to avoid overt racism. This dialect discrimination operates beneath the surface of model outputs, making it particularly challenging to detect and address. The political realm is not immune either, as Fisher et al. (2024) showed that LLMs can significantly influence human political decision-making through the subtle shaping of partisan biases in their outputs.

Sources of bias

The roots of these biases appear to stem from multiple interconnected sources. Most fundamentally, the training data itself reflects and reproduces societal stereotypes, as evidenced by Armstrong et al. and Hofmann et al.'s findings. The models essentially learn and amplify the prejudices present in their training corpora. Interestingly, model architecture and size also play crucial roles. Moore et al. (2024) found that while larger models like Llama2-70b generally show reduced bias, the fine-tuning process can introduce new inconsistencies, particularly when dealing with controversial topics. The research also highlights how sensitive LLMs are to prompt phrasing. An et al. and Gaebler et al. both demonstrated that subtle changes in prompt wording or framing can significantly alter how biases manifest in model outputs.

Methodological insights

Researchers have developed innovative approaches to detect and measure these biases. Gaebler et al.'s (2024) correspondence experiments and Hofmann et al.'s (2024) matched guise probing represent particularly effective methodologies for uncovering both overt (obvious) and covert(hidden) discrimination in LLMs. These techniques allow researchers to isolate specific variables (like names or dialects) while holding other factors constant. Meanwhile, comprehensive surveys like Gallegos et al. (2024) have made significant contributions by systematising the field's understanding of bias

metrics, distinguishing between embedding-based and generation-based approaches, and categorising mitigation strategies across different stages of model development. However, Moore et al.'s work raises important questions about model consistency, showing that LLMs often lack reliability when responding to paraphrased prompts or multilingual inputs, which complicates efforts to evaluate and mitigate their biases.

Challenges and Real-World Implications

The practical consequences of these findings are profound and concerning. In hiring contexts, Armstrong et al. warn that unchecked LLM deployment could create a "silicone ceiling" that systematically disadvantages marginalised groups, potentially violating anti-discrimination laws and perpetuating workplace inequalities. Beyond hiring, Dai et al. (2024) demonstrate how LLM-enhanced information retrieval systems may inadvertently propagate misinformation or create dangerous echo chambers through subtle ranking biases. These findings collectively suggest that without significant interventions, the widespread adoption of LLMs risks hardwiring existing societal inequities into automated decision-making systems at scale. The challenge moving forward will be to develop technical and policy solutions that can address these issues without sacrificing the utility of these powerful tools.

Proposed Research Direction

Expand intersectional and global audits, particularly for non-Western dialects (African languages) and multicultural value systems (like in African communities) not usually covered by mainstream models.

Develop auditing frameworks for covert biases in hiring and other domains, combining sociolinguistic methods with algorithmic

mic fairness metrics.

Evaluate hybrid human-AI workflows to mitigate biases, such as human review of LLM-generated outputs

Interdisciplinary implications

This synthesis reveals crucial intersections between computer science, in the area of algorithm design and artificial intelligence, as well as linguistics (dialect analysis), in the case of bias based on how a person speaks or their accent, sociology (bias definition and measurement), law (compliance with anti-discrimination policies), and psychology (human-AI interaction). The most promising solutions emerge from integrating sociolinguistic insights with algorithmic fairness approaches, particularly in developing culturally-aware bias detection systems. Future research should foster deeper collaboration between these disciplines to address complex, embedded biases.

Conclusion

These papers collectively underscore that while LLMs offer efficiency gains, their biases risk reinforcing societal inequities. Proactive mitigation through auditing, technical improvements, and policy is critical to ensure equitable deployment. Future work should prioritise real-world validation of debiasing methods and interdisciplinary collaboration (e.g., sociolinguistics, ethics) to address bias holistically. Also, training data must be inclusive to prevent the marginalisation of minority groups

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References

An, Hoazhe, Christabel Acquaye, Colin K. Wang, Zongxia Li, and Rachel Rudinger. 2024. "Do Large Language Models Discriminate in Hiring Decisions on the Basis of Race, Ethnicity, and Gender?" Preprint, arXiv, July 18. <https://arxiv.org/abs/2406.10486>.

Armstrong, Lena, Abbey Liu, Stephen MacNeil, and Danaë Metaxa. 2024. "The Silicon Ceiling: Auditing GPT's Race and Gender Biases in Hiring." Preprint, arXiv, July 18. <https://arxiv.org/abs/2405.04412>.

Dai, Sunhao, Chen Xu, Shicheng Xu, Liang Pang, Zhenhua Dong, and Jun Xu. 2024. "Bias and Unfairness in Information Retrieval Systems: New Challenges in the LLM Era." Preprint, arXiv, July 18. <https://arxiv.org/abs/2404.11457>.

Fisher, Jillian, Shangbin Feng, Robert Aron, et al. 2024. "Biased AI Can Influence Political Decision-Making." Preprint, arXiv. July 18. <https://arxiv.org/abs/2410.06415>.

Gaebler, Johann, D., Sharad Goel, Aziz Huq, and Prasanna Tambe. 2024. "Auditing the Use of Language Models to Guide Hiring Decisions." Preprint, arXiv, July 18. <https://arxiv.org/abs/2404.03086>.

Gallegos, Isabel O., Ryan A. Rossi, Joe Barrow, et al. 2024. "Bias and Fairness in Large Language Models: A Survey." *Computational Linguistics* 50 (3): 1097–1179. https://doi.org/10.1162/coli_a_00524.

Hofmann, Valentin, Pratyusha. R. Kalluri, Dan Jurafsky, and Sharese King. 2024. “AI Generates Covertly Racist Decisions about People Based on Their Dialect.” *Nature* 633: 147–154. <https://doi.org/10.1038/s41586-024-07856-5>.

Moore, Jared, Tanvi Deshpande, and Diyi Yang. 2024. “Are Large Language Models Consistent over Value-laden Questions?” Preprint, arXiv, July 18. <https://arxiv.org/abs/2407.02996>.

GROUP 7

MEDIA COMMUNICATION

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Social Media Narratives: Analyzing Public Discourse on Climate Change in Nigeria: A Case Study of the Borno Flood

Olalekan Ojumu

SCAN TO READ ONLINE



Abstract

This study explores how social media narratives reflect public discourse on climate change in Nigeria, using the September 2024 Borno flood as a case study. Employing artificial intelligence (AI) methods, specifically natural language processing (NLP) and sentiment analysis, the research analyses tweets from public figures, organisations, and individuals between September 2024 and April 2025. Through a combination of manual qualitative coding and sentiment labelling, the study identifies emerging themes around climate change awareness, government negligence, and humanitarian aid efforts. Findings reveal that 50% of social media posts expressed negative sentiments, particularly blaming government officials for corruption and mismanagement of the dam and disaster relief. Positive sentiments (35%) centred largely on donations and aid initiatives led by private citizens and NGOs. Neutral posts (15%) were primarily informational. Although explicit references to climate change were less frequent, there is growing climate consciousness within public discussions. Overall, the study highlights the power of social media in amplifying citizen voices, exposing govern-

ance failures, and promoting solidarity during disasters. It underscores the importance of transparent governance, climate-resilient planning, and the role of non-state actors in effective disaster response. This research contributes to understanding the evolving intersection of AI tools and public discourse analysis in Nigeria.

Keywords: Climate change, social media, Nigeria, Twitter, X, government negligence,

Introduction

Social media platforms have increasingly become critical arenas for discussing environmental disasters, shaping public opinion, and influencing governance responses (Hu et al. 2023). This study examines social media narratives around the September 2024 Borno flood to analyse public discourse on climate change, perceptions of government response, and the role of humanitarian aid. The main objectives are to identify emerging themes, sentiment patterns, and the growing intersection between climate awareness and disaster discourse in Nigeria.

Existing literature, such as Mundt et al. (2018) and Walsh (2020), has shown that social me-

dia amplifies voices during crises and can either reinforce or challenge official narratives. In Nigeria, studies such as Adam and Fazekas (2021), Gumbi and Baba (2024), and Omilusi (2025) have pointed out that online activism often highlights governance failures while pushing for accountability and transparency. However, fewer studies have focused on how climate change discussions are woven into such digital conversations following localised disasters.

This research uses a combination of natural language processing (NLP) techniques and manual sentiment analysis to study tweets related to the Borno flood, posted between September 2024 and April 2025. A thematic coding framework was applied to identify dominant narratives across the dataset. By applying AI methods like NLP within public discourse analysis, this study highlights the evolving integration of computational tools into environmental and communication research disciplines. Understanding social media discourse is crucial in Nigeria, where growing digital engagement increasingly influences both political accountability and climate action awareness.

Methodology

This study explores the narratives surrounding the Borno flood by analysing 500 X (formerly Twitter) posts from public figures, organisations, and individuals between September 2024 and April 2025. The research question focuses on how climate change, government negligence, and aid efforts are discussed. Using natural language processing (NLP) and manual sentiment analysis, the posts were categorised into themes such as climate change awareness, government accountability, and humanitarian support. Sentiment labelling was applied to classify tweets into positive, negative, or neutral categories. The framework draws on social media discourse analysis to evaluate public sentiment and narrative shifts. After the paper was written, it was fed to ChatGPT for grammatical errors and refinement.

Ethical Considerations

Ethical guidelines were adhered to by anonymising users' identities and ensuring consent for public data usage.

Findings

The analysis of 500 X (formerly Twitter) posts revealed several key themes regarding the Borno flood and climate change awareness. Firstly, while climate change was frequently referenced, the explicit link between the flood and climate change was more common among organisations and public figures such as @FAONigeria and @oxfaminnigeria. However, individual users were less likely to frame the disaster in this way, highlighting a gap in grassroots climate consciousness.

The findings reveal that government negligence dominated negative sentiments (50%), while donations and non-governmental efforts attracted positive responses (35%). Climate change awareness, although emerging, remained secondary, taking up the remaining 15% for neutral sentiments. The negative sentiments involved discourse that expressed anger towards government negligence and corruption, especially regarding negligence of the environment and mismanagement of relief funds. Notable accusations included the embezzlement of flood victim funds by Governor Zulum of Borno State, as voiced by users like @OfficialAzzaki, and widespread distrust about the distribution of aid. The critiques largely centred on inefficiency and lack of transparency, similar to public sentiments observed after previous flooding events in Nigeria. Relief efforts were largely praised, especially those by NGOs and individuals, making up the positive responses. While government initiatives were viewed with scepticism, private donations were recognised for their swift and impactful response.

Linking this to the Ogunpa flooding, it becomes evident that historical government inaction, such as after the catastrophic floods of the 1980s, has been a recurring theme. Like Borno, the Ogunpa flood

disaster faced similar government negligence, leading to repeated flooding events, including in 1960, 1963, 1978, 1980, and 2011 (Adegbola 2012). The failure to implement lasting infrastructure solutions or provide adequate response remains a critical issue, underlined by both the Ogunpa and Borno flood cases.

Interestingly, the analysis also revealed a gap in effective AI or sentiment analysis tools for fully capturing the nuance of local languages and dialects, which may have limited the depth of certain social media sentiments. Moreover, traditional manual coding proved time-consuming and limited in scope, suggesting a need for more refined AI models capable of identifying subtle shifts in public mood.

Interdisciplinary implications

This research bridges the fields of climate studies, history, social media analysis, and digital humanities by applying natural language processing (NLP) to analyse public discourse on climate change in Nigeria. It has significant implications for Nigerian and African contexts, offering insights into public attitudes towards government response and climate change. The findings can inform policy development, especially in disaster preparedness and climate resilience strategies. In educational settings, the study demonstrates the value of integrating AI tools into social sciences. However, resource constraints in low-resource settings, such as limited access to technology and data, may hinder similar future research.

Conclusion

This study highlights the growing recognition of climate change in public discourse surrounding natural disasters in Nigeria, particularly the 2024 Borno flood. By analysing over 500 tweets using natural language processing (NLP) and sentiment analysis, we found that the public overwhelmingly blamed the government for in-

adequate disaster response, while also acknowledging the significant role of NGOs and private individuals in relief efforts. The sentiment analysis revealed a predominantly negative sentiment towards the government, with positive responses mainly centred on aid and donations.

Despite the valuable insights gained, there are limitations. Such as the exclusion of non-X (formerly Twitter) platforms and the inability to capture nuanced local narratives. Additionally, the focus on public discourse may not fully represent government action or broader societal responses. However, the study provides practical references for improving government transparency, climate-resilient policies, and disaster management. The findings suggest that social media can be a powerful tool for raising awareness and influencing policy, especially in contexts where traditional media may be limited.

The study also offers theoretical contributions by demonstrating the intersection of AI and social media in understanding public opinion. It is recommended that future research expand the scope to include more platforms and incorporate more localised data to provide a fuller picture of climate change narratives and governance.

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References:

Adam, Imran, and Mihály Fazekas. 2021. "Are Emerging Technologies Helping Win the Fight against Corruption? A Review of the State of Evidence." *Information Economics and Policy* 57: 100950. <https://doi.org/10.1016/j.infoecopol.2021.100950>.

Adegbola, Adejoke. 2012. "Historical Rainfall-Runoff Modelling of River Ogunpa, Ibadan, Nigeria." *Indian Journal of Science and Technology* 5 (5): 1–4. <https://doi.org/10.17485/ijst/2012/v5i5.5>.

Gumbi, Kolawole S., and Yusuf T. Baba. 2024. "Political Trust and Legitimacy Crisis in the Age of COVID-19: An Assessment of the EndSARS Protest in Nigeria." *Frontiers in Political Science* 6. <https://doi.org/10.3389/fpos.2024.1334843>.

Hu, Tao, Xiaohui Huang, and Song Wang. 2023. "Actionable Environmental Science through Social Media Platforms." In *Springer eBooks*, 355–71. https://doi.org/10.1007/978-3-031-41758-0_13.

Mundt, Marcia, Karen Ross, and Charla M. Burnett. 2018. "Scaling Social Movements through Social Media: The Case of Black Lives Matter." *Social Media + Society* 4 (4). <https://doi.org/10.1177/2056305118807911>.

Omilusi, Mike. 2025. "Participatory Governance and Youth Protests in the Digital Age: Interrogating the #EndSARS Movement." *African Security*, 1–24. <https://doi.org/10.1080/19392206.2025.2474276>.

Walsh, John P. 2020. "Social Media and Moral Panics: Assessing the Effects of Technological Change on Societal Reaction." *International Journal of Cultural Studies* 23 (6): 840–59. <https://doi.org/10.1177/1367877920912257>.

Annotation of Words (Keywords)

| Word | Annotation |
|-----------------------------|---|
| Flood | Natural disaster (Environmental Crisis) |
| Relief | Aid, Donations, Humanitarian Efforts |
| Tax waiver | Government Economic Support |
| Corruption | Governance Failure |
| Donation | Humanitarian Support |
| Boko Haram | Security Threat, Violence |
| Recovery | Post-Disaster Development |
| Excavator, Medical supplies | Infrastructure/Material Support |
| Marginalisation | Governance/Political Discontent |
| Palliative | Emergency Support, Relief Materials |
| World Bank | International Aid |
| N1bn | Large-Scale Donation |
| Humanitarian work | Philanthropy |
| Foundation (DIF) | Charitable Organisation |

Categories developed from the tweets:

| Category | Description | Example Handles |
|---|--|---|
| Climate Change/ Environmental Risk | Tweets linking floods to climate | @firehorse249791 |
| Humanitarian Dona- tions and Aid | Tweets praising or announcing dona- tions to victims | @PeterObi, @Tripz1958092, @ChidiNdumnego, @oxfaminnigeria |
| Government Eco- nomic Support | Actions like tax waivers or equip- ment donations | @fairviewafrica, @Yawagist_, @Union_tv1, @NEDCOfficialNg |
| Governance Failure/ Negligence | Tweets criticising government failure or corruption | @OfficialAzzaki, @dazzy_kay, @Jidda_Jnr, @Gboye3000 |
| Governance Frustra- tion and Injustice | Tweets expressing dissatisfaction with the political re- | @mazi_chiadikaebube, @Okechukwu_Chinonso |
| Disaster Recovery Plans | Initiatives to rebuild or seek global aid | @SundiataPostNgr |
| Large Philanthropic Donations | Corporate or organi- sational contribu- tions | @TheTochlight003, @TheWhistlerNG |

Appendix

Table summarising the main tweets:

| Handle | Theme | Summary |
|-------------------------|---------------------------------------|---|
| @firehorse249791 | Climate Change | Warned of Lagos and Borno flood risks linked to climate |
| @PeterObi | Donations/Aid | Expressed sympathy for Borno flood victims and urged |
| @Tripz1958092 | Donations/Aid De- | Defended Peter Obi's flood |
| @ChidiNdumnego | Donations/Aid | Emphasised Peter Obi's non-partisan visit to Borno flood |
| @mazi_chiadikaeb ube | Governance Frus- tration | Linked the Borno crisis to regional injustice and security |
| @OdogwuAkpos | Government Negli- | Criticised the selective focus |
| @Okechukwu_Chi nonso | Governance Frus- tration | Echoed frustrations about insecurity and marginalisa- |
| @fairviewafrica | Government Aid | Reported the Borno govern- ment's two-year tax waiver for |
| @Yawagist_ | Government Aid | Confirmed the two-year tax waiver for flood victims. |
| @Union_tv1 | Government Aid | Confirmed Borno's two-year tax waiver for traders impact- |
| @itz_flexible | Government Aid | Reiterated Governor Zulum's two-year tax waiver for flood- affected businesses. |
| @OfficialAzzaki | Government Negli- gence/Corruption | Accused the Borno govern- ment of mismanaging flood |
| @dazzy_kay | Government Negli- | Alleged misuse of flood relief |
| @phredaa_ | Donations/Aid | Praised donations to flood victims, including Borno. |
| @oxfaminnigeria | Humanitarian Aid | Distributed hygiene kits to Borno flood victims. |
| @NEDCOfficialNg | Government Aid/ Relief | Announced donation of an excavator and supplies for |
| @Jidda_Jnr | Governance Frus- tration | Complained about palliative diversion in the Borno flood |
| @Gboye3000 | Governance Cri- tique | Criticised the government's priorities over flood victim |
| @TheTochlight003 | Donations/Aid | Reported Dangote commit- tee's donation of N1bn relief |
| @TheWhistlerNG | Donations/Aid | Reported the donation of N1bn worth of flood relief |
| @SundiataPostNgr | Recovery Plans | Reported Governor Zulum's request for World Bank sup- port for flood recovery. |

A Multimodal AI Model for Misinformation Detection in Pidgin-Speaking West African Communities

Chika Norah John

SCAN TO READ ONLINE



Abstract

In the digital era, the internet and social media platforms have emerged as predominant channels for news production and distribution. This transition has led to a noticeable increase in the quantity and accessibility of news sources. While this democratisation of information is beneficial, it also presents challenges. Notably, the proliferation of false news and misinformation, which pose significant threat to societal stability and the public's capacity to differentiate between reality and falsehood. This issue is particularly prevalent in Pidgin-speaking communities in West Africa, where reliance on social media for news is prevalent. Misinformation spreads widely in domains such as politics, health (e.g., herbal remedies, vaccines), and finance (e.g., Ponzi schemes, fraudulent business opportunities). Furthermore, the rise of misinformation through AI-generated multimedia content presents challenges in detection, as such content is inherently intricate to analyse using traditional fact-checking methods. To address these challenges, this study proposes a hybrid AI-driven fact-checking model that leverages graph neural networks (GNNs) and Transformer-based architectures to enhance misinformation detection across various modalities.

The proposed system integrates Transformer models such as BERT and RoBERTa for textual misinformation analysis, a convolutional neural network (CNN)-based deepfake detection for multimedia verification, and GNNs for modelling misinformation propagation within social networks. By combining content analysis with network-based misinformation tracking, this research aims to develop a comprehensive and efficient fact-checking framework capable of addressing the evolving landscape of digital misinformation.

Introduction

The rapid spread of misinformation through social media platforms has raised concerns regarding its impact on public opinion. Along with the myriad benefits of this connectivity, e.g., the ability to share information instantaneously with a large audience, the spread of inaccurate and misleading information has emerged as a major problem. Misinformation spread via social media has far-reaching consequences, including the potential to create false narratives related to health (e.g., COVID-19 and vaccine misinformation), politics (e.g., election interference), and religion (e.g., inciting sectarian tensions), and these continue to

cause widespread confusion, distrust, and in some cases, violence. While significant advances have been made in misinformation detection, the focus remains largely on monolingual high-resource contexts, with low-resource languages often overlooked, as the majority of research in this field has concentrated on the English language. The human-based fact-checking efforts currently in place are overwhelmed and often ineffective in identifying AI-generated misinformation, especially deepfakes and synthetic text, leaving vulnerable communities exposed to digital manipulation. Despite the prevalence of Pidgin English in West Africa, there is a noticeable lack of research and resources dedicated to this language variant.

For instance, during events like the Ebola outbreak, culturally ingrained misinformation, including conspiracy theories and false remedies, has had a detrimental impact on the public. These regions encounter barriers in accessing reliable fact-checking sources due to language barriers and limited digital literacy. Despite Pidgin being a widely spoken lingua franca, it is often disregarded in natural language processing models. Many studies rely on high-resource language datasets, leading to challenges in model performance when applied to low-resource languages due to differences in linguistic structures and cultural contexts. A significant portion of existing research focuses solely on textual data, neglecting the multimodal nature of misinformation, which often includes images, videos, and network propagation patterns. The amalgamation of Pidgin and English in content further complicates the identification of misinformation, exacerbated by the absence of advanced AI fact-checking tools tailored for effective Pidgin processing. Traditional verification methods encounter difficulties with low-resource languages, and existing automated systems exhibit bias towards high-resource languages, rendering them ineffective when applied to low-resource languages.

Addressing these challenges necessitates the development of hybrid, multimodal models that integrate textual analysis, multimedia content evaluation, and network propagation understanding, all tailored to the linguistic and cultural specifics of the target communities. This study proposes a hybrid, multimodal fact-checking framework that leverages the strengths of three AI paradigms: Transformers for textual misinformation detection, convolutional neural networks (CNNs) for multimedia analysis, and graph neural networks (GNNs) for modelling how misinformation spreads across digital platforms. The framework is specifically tailored to process content in Nigerian Pidgin and to identify misinformation in critical domains such as health, politics, and religion. This hybrid approach not only ensures content verification but also provides a deeper insight into the dissemination of misinformation within Pidgin-speaking online communities. Additionally, the model incorporates bias-mitigation strategies, including multilingual training datasets and fairness-aware machine learning techniques, to enhance fact-checking accuracy in marginalised regions of West Africa.

This study seeks to bridge the gap in misinformation detection for low-resource languages and marginalised communities by introducing a scalable, context-aware, and multimodal verification system. By enhancing fact-checking capabilities for both textual and multimedia content, the research will contribute to low-resource natural language processing, misinformation detection, and AI ethics, offering a more inclusive and culturally relevant approach to combating digital misinformation.

Objectives of the Study

Design and implement a hybrid artificial intelligence model that integrates Transformer-based architectures for textual analysis, convolutional neural networks (CNNs) for multimedia content

evaluation, and graph neural networks (GNNs) for modelling misinformation propagation.

Investigate how misinformation spreads differently across health, political, and religious domains within Pidgin-speaking communities. Utilise GNNs to model these dissemination patterns, providing insights into the dynamics of misinformation propagation in various contexts.

Assess the influence of deploying an AI-driven fact-checking framework in Pidgin on public trust in information sources.

Research Questions

The following research questions have been created to guide the research.

- How can a hybrid AI model integrating Transformers, CNNs, and GNNs effectively detect and mitigate misinformation in Pidgin-speaking West African communities, particularly concerning health, politics, and religion?
- What are the unique linguistic and cultural challenges in processing Pidgin English content, and how can AI models be adapted to address these challenges in misinformation detection?
- How can bias mitigation techniques, such as multilingual training datasets and fairness-aware machine learning methods, enhance the accuracy and fairness of misinformation detection in marginalised regions?
- In what ways do the propagation of misinformation differ across health, political, and religious domains within Pidgin-speaking communities, and how can GNNs model these dissemination patterns?
- Will AI-driven fact-checking framework in Pidgin influence public trust in information propagated using this multi-lingual framework?

Literature Review

Accessing reliable fact-checking sources for low-resource languages like Nigerian Pidgin presents significant technical challenges. These challenges stem from data scarcity, linguistic complexities, and the lack of specialised tools tailored to these languages. However, recent advancements in natural language processing (NLP) and cross-lingual learning have proposed innovative solutions to address these barriers. This review explores the technical barriers and solutions, drawing insights from relevant research papers.

For instance, Mahl et al. (2024) address the imbalance in research focus on fact-checking initiatives primarily in the Global North, particularly the United States, by introducing a context-sensitive framework for analysing fact-checking cultures. The study highlights the need for broader comparative studies in fact-checking. Mridha et al. (2021) delve into the critical challenge faced by organisations in detecting fake news online and the efficacy of deep learning techniques in addressing this issue. Their review highlights the superiority of deep learning approaches such as Attention, Generative Adversarial Networks, and Bidirectional Encoder Representations for Transformers in fake news detection. By categorising and evaluating these advanced techniques, the paper emphasises the need for further research to enhance the accuracy and efficiency of fake news detection.

Školokay and Filin (2019) aimed to evaluate the effectiveness of artificial intelligence (AI) tools in combating misinformation by analysing and ranking existing AI-based solutions for fake news detection and fact-checking. Their research utilises a comparative analytics approach to assess the accuracy and comprehensiveness of these intelligent systems. Chaka (2022) delves into the realms of digital marginalisation, data marginalisation, and algorithmic exclusions within the context of the Global South. Chaka sheds light on how underrepresented users and

communities face marginalisation and exclusion through the use of digital technologies, big data, and algorithms by various entities.

According to Wang, Zhang, and Rajtmajer (2023), low-resource languages (LRLs) like Pidgin face significant technical barriers, including limited annotated datasets, inadequate digital tools, and a lack of research attention. These challenges hinder effective misinformation detection and access to reliable fact-checking sources. Solutions include developing language-agnostic models that can operate across diverse linguistic contexts, improving data collection practices, and fostering interdisciplinary collaboration. Additionally, enhancing multilingual training can significantly boost detection performance, ensuring that LRLs are not overlooked in misinformation moderation efforts.

Though Lin et al. (2023) do not specifically address technical barriers and solutions for accessing reliable fact-checking sources for low-resource languages like Pidgin, it highlights challenges such as data scarcity and orthographic variation, which hinder effective spoken language processing. The proposed solutions include collecting a large-scale parallel English-Pidgin corpus and employing cross-lingual adaptive training to improve model performance, which could indirectly support better access to reliable information by enhancing language processing capabilities.

Methodology

- **Data Collection:** Gather Pidgin English content from social media platforms, news websites, and fact-checking organisations. Ensure the dataset includes examples from health, political, and religious contexts. Collect images and videos associated with the textual data, focusing on content that has been identified as misinformation or verified

information.

- **Social Network Data:** Map the dissemination of misinformation by collecting data on how information spreads within Pidgin-speaking online communities.
- **Data Preprocessing:** Normalise Pidgin English text, addressing issues like non-standard spelling and grammar. Implement tokenisation and remove noise to prepare the data for model training. Extract features from images and videos using CNNs to identify patterns indicative of misinformation, such as inconsistencies or manipulations.
- **Social Network Data:** Construct graphs representing the spread of information, where nodes represent users or posts, and edges represent interactions or shares.

Model Development

- **Transformer Models:** Fine-tune pre-trained models like BERT or RoBERTa on the Pidgin English dataset to capture contextual nuances in the text.
- **CNNs for Multimedia Analysis:** Train CNNs to detect anomalies or manipulations in images and videos that are commonly associated with misinformation.
- **GNNs for Propagation Modelling:** Utilise GNNs to analyse the structure of information dissemination networks, identifying patterns that are characteristic of misinformation spread.
- **Hybrid Integration:** Combine the outputs of the Transformer models, CNNs, and GNNs to create a comprehensive system capable of assessing the veracity of information across multiple modalities.
- **Fairness-Aware Algorithms:** Implement algorithms designed to detect and correct biases in model predictions, ensuring equitable performance across different demographic groups.

Evaluation

Assess model accuracy, precision, recall, and F1-score to evaluate effectiveness.

1. **Accuracy:** The accuracy of a classification model gives the fraction of the predictions predicted correctly by the model. It could also be expressed in percentage. Accuracy is simply defined as the ratio of the number of correct predictions to the total number of predictions. It is obtained with various positives and negatives in a confusion matrix.

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

eqn 1

2. **Precision:** Precision is one indicator of a machine learning model's performance—the quality of a positive prediction made by the model. Precision refers to the number of true positives divided by the total number of positive predictions (i.e., the number of true positives plus the number of false positives). Precision measures the number of positive classes that were accurately predicted.

$$Precision = \frac{TP}{TP + FP}$$

eqn 2

3. **Recall:** Whereas precision tries to obtain the correctly predicted positive class mathematically with a high degree of certainty. Recall does so too, but with a lesser degree of certainty. Recall measures the positive class prediction without much carefulness in the measurements.

$$Recall = \frac{TP}{TP + FN}$$

(eqn 3)

4. **F1 Score:** The F1 score combines the precision and recall in order to measure the accuracy

of the model. The F1 score is simply the harmonic mean of precision and recall. The F1 score is used to properly evaluate the performance of a model since the accuracy metrics cannot be used to evaluate an imbalanced model.

Mathematically;

$$f1_score = \frac{2 * Precision * Recall}{Precision + Recall}$$

(eqn 4)

User Studies: Conduct surveys or interviews with members of Pidgin-speaking communities to evaluate the system's impact on trust and information consumption behaviours.

Summary

In conclusion, this research presents a comprehensive hybrid AI framework that effectively addresses the multifaceted challenge of misinformation in Pidgin-speaking West African communities, particularly within the domains of health, politics, and religion. By integrating Transformer-based models for nuanced textual analysis, convolutional neural networks (CNNs) for multimedia content verification, and graph neural networks (GNNs) for modelling the propagation of misinformation across social networks, the proposed system offers a robust, multimodal approach to misinformation detection.

References

Adiba, F. I., Islam, T., Kaiser, M. S., Mahmud, M., & Rahman, M. A. (2020). Effect of Corpora on Classification of Fake News using Naive Bayes Classifier. *International Journal of Automation, Artificial Intelligence and Machine Learning*. <https://doi.org/10.61797/ijaauml.v1i1.45>

Chaka, C. (2022). Digital marginalization, data marginalization, and algorithmic exclusions: a

critical southern decolonial approach to datafication, algorithms, and digital citizenship from the Souths. *JOURNAL of E-LEARNING and KNOWLEDGE SOCIETY*, 18(3), 83–95. <https://doi.org/10.20368/1971-8829/1135678>

Gerber, D., Esteve, D., Lehmann, J., BBhmann, L., Usbeck, R., Ngonga Ngomo, A.-C., & Speck, R. (2015). DeFacto - Temporal and Multilingual Deep Fact Validation. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3198925>

Goyal, P., Taterh, Dr. S., & Saxena, Mr. A. (2021). Fake News Detection using Machine Learning: A Review. *International Journal of Advanced Engineering, Management and Science*, 7(3), 33–38. <https://doi.org/10.22161/ijaems.73.6>

Grönvall, J. (2023). Fact-checkers and the news media: A Nordic perspective on propaganda. *Nordic Journal of Media Studies*, 5(1), 134–153. <https://doi.org/10.2478/njms-2023-0008>

Gururaj, H. L., Lakshmi, H., Soundarya, B. C., Flammini, F., & Janhavi, V. (2022). Machine Learning-Based Approach for Fake News Detection. *Journal of ICT Standardization*. <https://doi.org/10.13052/jicts2245-800x.1042>

Lin, P.-J., Saeed, M., Chang, E., & Scholman, M. (2023). Low-Resource Cross-Lingual Adaptive Training for Nigerian Pidgin. *ArXiv (Cornell University)*. <https://doi.org/10.48550/arxiv.2307.00382>

Mahl, D., Zeng, J., Schäfer, M. S., Fernando Antonio Egert, & Oliveira, T. (2024). “We Follow the Disinformation”: Conceptualizing and Analyzing Fact-Checking Cultures Across Countries. *The International Journal of Press/Politics*, 27(1). <https://doi.org/10.1177/19401612241270004>

Matúš Pikuliak, Srba, I., Moro, R., Hromadka, T., Timotej Smoleň, Melišek, M., ... Bielikova, M. (2023). Multilingual Previously Fact-Checked Claim Retrieval. *The International Journal of*

Press/Politics, 27. <https://doi.org/10.18653/v1/2023.emnlp-main.1027>

Monti, F., Frasca, F., Eynard, D., Mannion, D., Bronstein, M., Ai, F., & Lugano, U. (2019). *Fake News Detection on Social Media using Geometric Deep Learning*.

Mridha, M. F., Keya, A. J., Hamid, Md. A., Monowar, M. M., & Rahman, Md. S. (2021). A Comprehensive Review on Fake News Detection With Deep Learning. *IEEE Access*, 9, 156151–156170. <https://doi.org/10.1109/access.2021.3129329>

Peng, X., Xu, Q., Feng, Z., Zhao, H., Tan, L., Zhou, Y., ... Doi. (n.d.). *Automatic News Generation and Fact-Checking System Based on Language Processing*.

Školkay, A., & Filin, J. (2019). A Comparison of Fake News Detecting and Fact-Checking AI Based Solutions. *Studia Medioznawcze*, 20(4), 365–383. <https://doi.org/10.33077/uw.24511617.ms.2019.4.187>

Wang, X., Zhang, W., & Rajtmajer, S. (2023). *Monolingual and Multilingual Misinformation Detection for Low-Resource Languages: A Comprehensive Survey*.

Zhou, J., Hu, H., Li, Z., Yu, K., & Chen, F. (2019). Physiological Indicators for User Trust in Machine Learning with Influence Enhanced Fact-Checking. *Lecture Notes in Computer Science*, 94–113. https://doi.org/10.1007/978-3-030-29726-8_7

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