

Artificial Intelligence Bias against Women: Societal Implications in Nigeria

Jamila Husaini Yakubu

Mass Communication Department,
Federal University of Kashere,
Gombe State, Nigeria
jamilah632@gmail.com

Abstract

This paper examines the issue of artificial intelligence (AI) bias against women in Nigeria and its wider societal implications. AI systems, often trained on incomplete or historically skewed data, risk reinforcing existing inequalities rather than promoting fairness. Drawing on a desk review of global and Nigerian literature, policy documents, and case studies, the study highlights how bias emerges in recruitment, financial services, education, healthcare, and voice recognition technologies. Evidence shows that women are disadvantaged by AI-driven hiring platforms, excluded from credit systems, steered away from STEM fields, and underserved by diagnostic tools. These patterns mirror global experiences but are intensified in Nigeria by structural inequalities in access to education, finance, and digital resources. The societal consequences are profound: economic exclusion, restricted career advancement, poorer health outcomes, reduced civic participation, and the reinforcement of patriarchal norms. The paper underscores the urgent need for gender-sensitive AI design, transparent governance, and regulatory oversight to ensure that Nigeria's digital transformation advances equity rather than deepens discrimination.

Keywords : Artificial Intelligence (AI), Gender Bias, Algorithmic Discrimination, Nigeria, Women

Introduction

Artificial intelligence (AI) is fundamentally transforming communication, healthcare, banking, education, and employment worldwide. While this technology offers unprecedented opportunities for efficiency and innovation, it also introduces significant challenges, particularly the pervasive risk of algorithmic bias. Global research indicates that AI systems often reproduce and even amplify the societal patterns embedded in their training data, leading to systemic discrimination (Stanford AI Index, 2024; UNESCO, 2023). This is evident in phenomena such as the default use of female-voiced assistants for

subservient roles and biased outputs from language models, which collectively reinforce harmful stereotypes and shape societal perceptions of women in technology and beyond.

In Nigeria, this global challenge intersects with deep-seated national inequalities. Persistent gender gaps already restrict women's access to education, digital technology, and financial services (World Bank, 2022; EFINA, 2023). Data shows that women are significantly less likely to use mobile internet than men (GSMA, 2024), and they face substantially lower access to formal financial services and credit (EFINA, 2024). As Nigerian banks and fintech firms increasingly deploy AI for critical functions like credit scoring, loan approvals, and fraud detection, there is a clear danger that these algorithmic systems will not merely reflect these disparities but actively entrench them, automating and scaling discrimination.

Recognizing both the potential and the peril of AI, Nigeria is actively formalizing its approach. The Federal Government's National AI Strategy (2024) explicitly emphasizes inclusion, gender equity, and skills development as key pillars for responsible adoption. However, this progressive intent faces a complex reality. Globally, standardized frameworks for auditing AI systems and mitigating bias remain inconsistent and underdeveloped (Stanford AI Index, 2025). This gap raises critical questions about the practical implementation of Nigeria's strategy and its capacity to effectively shield women from algorithmic harm in the absence of robust, universally accepted evaluation tools. Therefore, AI has become central to Nigeria's economic and social transformation, yet compelling evidence indicates that these very systems often perpetuate gender bias to the detriment of women (UNESCO, 2020; Stanford AI Index, 2024). Nigerian women, already constrained by limited access to mobile internet, digital skills, and financial services compared to men (GSMA, 2024; EFINA, 2023), stand at a critical juncture.

If these intersecting inequalities are not deliberately addressed, the integration of AI into decision-making for jobs, credit, and public services threatens to deepen existing gender gaps rather than bridge them. This study is thus necessitated by the urgent need to ensure that Nigeria's rapid digital advancement promotes inclusion, fairness, and equal opportunity, rather than reinforcing historical discrimination.

Objectives

Consequently, this study aims to achieve the following objectives:

1. To identify and analyze AI bias against women in Nigerian
2. To examine the societal implications of against women in Nigeria

Literature Review

Conceptual Clarification

Artificial Intelligence (AI) refers to computational systems designed to perform tasks that ordinarily require human intelligence, including learning, reasoning, decision-making, and natural language processing. In Nigeria and across Africa, AI technologies are increasingly deployed in sectors such as finance, telecommunications, healthcare, security, and public administration, often as part of broader digital transformation and development agendas (UNESCO, 2021; African Union, 2020). Algorithmic bias occurs when these AI systems generate systematically prejudiced or unfair outcomes due to flawed assumptions, incomplete datasets, or biased design processes. Such biases are not inherent to technology itself but are embedded through human decisions made during data collection, system design, and deployment (Snyder, 2019).

Bias enters AI systems through multiple pathways that are particularly pronounced in African contexts. Data imbalance is a major source, as many AI systems used in Nigeria rely on datasets developed in Western contexts that underrepresent African populations and women in particular. Historical gender inequalities in education, employment, and digital access further skew available data, leading to AI models that fail to accurately represent women's realities (UNESCO, 2020). Labeling practices may also reflect cultural stereotypes, while training algorithms on historically biased records—such as employment or credit data, can reproduce existing gender disparities. Additionally, deployment contexts can amplify bias in societies like Nigeria where digital divides, low data literacy, and uneven access to technology disproportionately affect women (UNDP, 2022). Global and regional studies provide strong evidence of gender bias in AI systems. UNESCO reports consistently highlight gender gaps in AI design, leadership, and usage worldwide, with Africa recording one of the widest disparities in women's participation in AI-related fields (UNESCO, 2021). The Stanford AI Index documents uneven AI performance across gender and regional lines, noting that systems trained predominantly on Global North data perform poorly in African contexts. Snyder (2019) further demonstrates that algorithmic decision-making often reflects entrenched social hierarchies, which in African societies intersect with gender, class, and cultural norms to disproportionately disadvantage women.

AI systems learn from data. If the data has gender patterns, models can repeat them (Stanford AI Index, 2024; Stanford AI Index, 2025). Studies report bias in language models, recommendations, and voice assistants. These systems can stereotype women or rank male terms higher (UNESCO, 2023; Stanford AI Index, 2025). Bias can appear at many stages: data collection, labeling, model

training, and deployment. Poor or unbalanced data increases the risk (Snyder, 2019; Stanford AI Index, 2024). The effects include unfair content, skewed search or recommendations, and unequal outcomes in hiring, lending, and services (Stanford AI Index, 2025). Experts say testing and reporting of responsible-AI results are not yet consistent across providers (Stanford AI Index, 2024; 2025).

Artificial intelligence (AI) has emerged as one of the most transformative forces of the twenty-first century, reshaping industries, economies, and societies at an unprecedented pace (Uctu, Tuluca, & Aykac, 2024). However, alongside the remarkable advancements in AI technologies, there are increasing concerns regarding the pervasive gender biases embedded in these systems and the broader implications for women's participation and representation in the digital realm.

Gender bias in AI is well-documented, manifesting in various ways, including biased algorithms, the under-representation of women in AI development teams, and the reinforcement of gender stereotypes within AI applications (Shrestha & Das, 2022; Yarger, Cobb Payton, & Neupane, 2020). These biases not only reflect existing societal inequalities but also risk strengthening them, embedding such disparities more deeply within our increasingly AI-driven world.

Globally, women remain underrepresented in AI. Only 22% of AI workers are women, a number that is concerning because AI will shape the future of work and technology (Thakkar, Kumar, & Sambasivan, 2020). When development teams lack diversity, AI systems risk reinforcing gender stereotypes and discrimination in applications such as hiring, lending, and decision-making. Furthermore, bias in AI extends beyond representation; it includes the datasets and algorithms that drive these technologies (O'Connor & Liu, 2024).

AI systems trained on historically biased data can perpetuate and even worsen gender differences. For example, AI-based hiring tools have been found to disadvantage women, while voice recognition systems often perform less accurately with female voices (Franzoni, 2023).

One possible solution is strengthening **digital literacy** among women. Digital literacy does not only mean the ability to use technology but also to think critically about and question digital tools, including AI (Buckingham, 2015; Haider & Sundin, 2022). With such skills, women can better identify bias, challenge it, and benefit more from AI systems.

The purpose of this study is to identify the causes and manifestations of gender bias in AI systems, examine how this bias hinders women's advancement, and explore how digital literacy can reduce the gap. This is especially important in Nigeria, where women face challenges in digital access, financial inclusion,

and representation in STEM. As AI systems become central to education, work, healthcare, and social life, ensuring gender fairness is critical (Habbal, Ali, & Abuzaraida, 2024; Schlicht & Råker, 2024). For Nigeria, addressing AI bias against women is necessary to close the gender digital divide and ensure that women can fully participate in the country's digital transformation (World Economic Forum, 2019; Global Gender Gap Report, 2024).

AI in Nigeria

Nigeria is expanding AI use in government, finance, education, health, and startups (National AI Strategy, 2024; NCAIR/NITDA, 2024). Open banking rules now support data sharing through APIs. This enables data-driven services like credit scoring and fraud detection (CBN, 2023). Nigeria has a data protection law that applies to AI systems processing personal data (NDPA, 2023). Policy actors highlight inclusion and women's participation in the digital economy and AI skills (NITDA, 2024–2025). These moves can bring growth. They also make fairness, privacy, and accountability important (National AI Strategy, 2024; NDPA, 2023).

Artificial Intelligence (AI) is steadily gaining ground in Nigeria as the country embraces digital transformation. The rapid expansion of mobile technology, internet connectivity, and fintech innovation has created a fertile ground for AI-driven solutions. In sectors such as health, education, agriculture, and finance, AI is already being applied to solve pressing local challenges. For example, AI-powered health platforms are used for disease diagnostics and medical imaging, fintech firms employ AI for fraud detection and financial inclusion, while smart farming applications use AI to optimize crop yields and monitor soil conditions (Adetunmbi & Olajide, 2022). These innovations reflect how AI is becoming an integral tool in Nigeria's socio-economic development.

The Nigerian government has also shown commitment to advancing AI adoption. In 2022, the Federal Ministry of Communications and Digital Economy unveiled the National Artificial Intelligence Strategy aimed at positioning Nigeria as a leader in AI development in Africa. This strategy highlights the potential of AI to boost economic growth, create employment opportunities, and improve public service delivery (Federal Ministry of Communications and Digital Economy, 2022). Alongside this, universities and private technology hubs are investing in AI research, training, and startups to build indigenous capacity and reduce reliance on foreign technologies (Oluwatobi et al., 2023).

However, the adoption of AI in Nigeria is not without challenges. Infrastructural gaps such as unreliable electricity, limited broadband access, and inadequate digital literacy remain significant barriers to AI penetration,

especially in rural areas (World Bank, 2023). Moreover, there are ethical concerns about bias, privacy, and accountability in AI systems. Without proper regulation, AI may reinforce existing inequalities, including gender disparities, particularly if women are excluded from access to digital resources (GSMA, 2022).

AI Biases Against Women

A substantial body of international literature documents how AI bias manifests across critical sectors. In recruitment and employment, algorithmic hiring tools have been shown to disadvantage women by favouring male-dominated historical employment patterns (Franzoni, 2023). Similarly, AI-driven financial services, including credit scoring and loan approval systems, have been found to discriminate against women due to limited financial histories and biased risk models (O'Connor & Liu, 2024). In education, UNESCO (2020) reports that AI-based learning platforms can reinforce gender stereotypes by steering female students away from science and technology-related fields. Healthcare applications also demonstrate bias, as AI diagnostic systems trained on male-dominated datasets often perform less accurately for women (WHO, 2021). Additionally, voice recognition technologies have been criticized for lower accuracy in recognizing female voices, particularly those with diverse accents, as shown in the landmark study by Buolamwini and Gebru (2019).

International studies demonstrate widespread patterns of bias in recruitment, finance, education, healthcare, and voice recognition. Nigerian research has noted comparable risks, and this study adds to the debate by systematically examining how these global patterns resonate within Nigeria's rapidly digitizing economy.

The European Union has emphasized that users of AI systems must protect fundamental rights and assess risks in high-impact areas. Based on this, Bertaina et al. (2025) developed a framework for assessing AI impact using questionnaires and quantitative methods. This framework highlights how AI can threaten rights if risks are not properly addressed, especially in areas affecting vulnerable groups such as widows. The model also shows that structured assessment can improve accountability and transparency in AI deployment. Clarke (2019) and later studies such as Dwivedi et al. (2021) reported that AI adoption often leads to discriminatory bias. Brazil, for example, introduced efforts to monitor AI discrimination by measuring people's perceptions of AI systems. Findings from these studies suggest that AI is not neutral, and its biases often reflect poor-quality data, limited algorithmic design, and human bias from both developers and users.

Scholars such as Hadzovic, Becirspahic, and Mrdovic (2024) argue that AI governance frameworks are necessary to protect rights, particularly when AI is applied in sensitive areas like gender equality. In Europe, several regulatory initiatives exist to ensure AI respects ethical values and human rights (Stahl et al., 2022; Shaelou & Razmetaeva, 2023). However, studies point out that many frameworks lack cohesion, clarity, and operational depth (Hernández-Orallo et al., 2020).

Other scholars argue that AI regulation requires new oversight bodies and ethical guidelines. Helbing (2019) and Hilb (2020) emphasize that AI governance must involve multi-stakeholder discussions, monitoring, and evaluation to ensure responsible adoption. Misra et al. (2023) also highlight the importance of frameworks tailored to national contexts, which can help governments address challenges and mitigate risks.

AI has the power to improve welfare but can also increase inequality if poorly managed (Coeckelbergh, 2021).

Societal Implications of AI Biases Against Women

Beyond technical performance, AI biases have far-reaching societal consequences. Economically, biased AI systems can widen existing gender income gaps and limit women's access to financial opportunities, as highlighted in the Global Gender Gap Report (2024). Employment implications include restricted career mobility and exclusion from emerging digital jobs (Thakkar et al., 2020).

In education, biased recommendation systems can shape learning pathways that disadvantage female students, reinforcing gendered occupational segregation (Schlicht & Råker, 2024). Healthcare implications are equally significant, as misdiagnosis or underdiagnosis resulting from biased AI tools can adversely affect women's health outcomes (WHO, 2022). Politically, algorithmic bias in digital platforms may reduce women's visibility and participation in civic and political spaces (Ajayi, 2022). Culturally, AI systems can reinforce harmful gender norms by reproducing stereotypes embedded in training data (UNDP, 2022).

Global literature highlights the consequences of AI bias for women's empowerment, education, healthcare, and political participation. Nigerian studies point to similar challenges, and this research contributes to the debate by analyzing these societal implications in the Nigerian context as part of the wider global discourse.

Conclusion of the Literature Review

The literature shows that AI bias against women is well documented globally and increasingly discussed in Nigeria. This research does not claim to fill a void but rather makes an additional contribution to the ongoing debate by systematically examining AI bias and its societal implications in Nigeria, thereby situating local realities within the broader global conversation on gender and technology.

Theoretical Framework

This study is underpinned by Feminist Communication Theory and the Critical Theory of Technology, which together provide a robust analytical framework for examining the intersection of artificial intelligence (AI), communication systems, and gender inequality in Nigeria. These theories are adopted to explain both the communicative processes through which AI bias against women is produced and the broader socio-technical structures that sustain such biases within digitally transforming societies (Tong, 2019; Crawford, 2021).

Feminist Communication Theory (Primary Underpinning Theory)

Feminist Communication Theory serves as the primary theoretical lens for this study. The theory posits that gender is socially constructed and continually reproduced through communication practices, media representations, and technological systems rather than being biologically fixed (Tong, 2019; Collins & Bilge, 2020). From this perspective, AI technologies, such as voice assistants, recruitment algorithms, and credit-scoring systems, operate as communicative agents that encode, circulate, and normalize gendered meanings.

In the Nigerian context, this theoretical lens is particularly useful for explaining how AI outputs may reinforce traditional gender roles and patriarchal norms, such as the feminization of submissive digital assistants or the marginalization of women in algorithmic decision-making processes. Structural inequalities, including women's limited access to digital infrastructure, data ownership, and digital literacy, further heighten their vulnerability to biased AI-mediated communication (Okunola & Olaoye, 2021; GSMA, 2024). By foregrounding power relations embedded in communication systems, Feminist Communication Theory directly supports the first objective of this study, which seeks to identify and analyze AI biases against women in Nigeria (Coeckelbergh, 2021).

Critical Theory of Technology (Andrew Feenberg) (Supporting Theory)

The Critical Theory of Technology, as articulated by Andrew Feenberg, complements Feminist Communication Theory by emphasizing that technology is socially shaped rather than neutral or value-free. According to this perspective, technological systems are embedded with the social values, institutional priorities, and power relations of the contexts in which they are designed and

deployed (Crawford, 2021; Helbing, 2019). Consequently, AI systems developed within societies marked by gender, economic, and digital inequalities are likely to reproduce and amplify existing forms of social exclusion.

Applied to this study, Feenberg's theory provides insight into how AI systems operating in Nigeria and across Africa may reinforce discrimination in key domains such as employment, financial inclusion, education, healthcare, and political participation (Ene & Alalade, 2023; World Bank, 2022). The theory enables an understanding of AI bias as a structural and institutional problem rather than a purely technical malfunction, thereby supporting the second objective of the study, which focuses on examining the societal implications of AI biases against women (Bertaina et al., 2025; Hadzovic et al., 2024).

Together, Feminist Communication Theory and the Critical Theory of Technology constitute the underpinning theoretical framework for this study, offering complementary insights into the communicative and structural dimensions of AI bias. While Feminist Communication Theory explains how gendered meanings and stereotypes are produced and reinforced through AI-mediated communication, the Critical Theory of Technology situates these biases within broader systems of power, governance, and socio-economic inequality shaping technological development and deployment (Dwivedi et al., 2021; Stanford HAI, 2024).

Together, Feminist Communication Theory and the Critical Theory of Technology provide a complementary lens for this study, enabling an analysis of how AI systems reproduce gendered communication patterns and how these biases carry wider societal implications for women in Nigeria's digital transformation.

Method

This study adopted a desk review methodology, relying on secondary sources rather than primary data collection. The approach involved systematically identifying, selecting, and analysing existing literature, reports, and policy documents from international organizations such as UNESCO, the World Bank, and GSMA, as well as Nigerian sources including EFinA surveys, government strategies, and academic studies. Sources were chosen based on their relevance to the two objectives of the study: identifying and analysing AI biases against women, and examining the societal implications of such biases. Key themes were extracted and organized thematically to align with these objectives, ensuring that global perspectives were distinguished from Nigerian realities. The desk review was considered appropriate given the evolving nature of AI adoption in Nigeria and the need to situate local experiences within broader global debates on gender and technology.

AI Biases against Women in Nigeria

This theme addresses Objective One, which is to identify and analyse AI biases against women in Nigeria. The desk review highlights several areas where such biases are evident:

- **Recruitment and Employment Bias:** AI-driven hiring platforms and algorithms reproduce gender stereotypes, disadvantaging women in ICT and STEM jobs.
- **Financial Services Bias:** Credit scoring and fintech systems often exclude women due to limited banking histories and reliance on informal economic participation.
- **Education Bias:** Adaptive learning technologies reinforce stereotypes, discouraging female participation in STEM fields.
- **Healthcare Bias:** Diagnostic tools fail to adequately address maternal and reproductive health needs, leading to poorer outcomes.
- **Voice Recognition Bias:** AI systems struggle to recognize African female voices, reducing accessibility and usability.

Taken together, these biases illustrate that Nigeria reflects global patterns of AI discrimination, but they are intensified by structural inequalities in education, finance, and technology access.

Women in Nigeria face gaps in digital access and use. In low- and middle-income countries, women are less likely to use mobile internet; Nigeria shows similar patterns (GSMA, 2024). Global data also show fewer women online than men,

which limits skills and opportunities (ITU, 2023). Financial inclusion surveys in Nigeria find gender differences in access to accounts, savings, and credit (EFInA, 2023; EFInA, 2024). Lower digital access and lower formal financial access can combine to reduce women's benefits from AI-enabled services (GSMA, 2024; EFInA, 2023). For women, especially in contexts like Nigeria, AI bias can worsen gender inequality in financial inclusion, employment, and digital access. Therefore, structured governance and regulatory frameworks are needed to ensure AI protects rather than threatens women's rights.

Societal Implications of AI Biases in Nigeria

This theme addresses Objective Two, which is to examine the societal implications of AI biases against women in Nigeria. The desk review highlights several areas where these implications are most evident:

- **Economic Implications:** Women's exclusion from fintech and credit systems deepens poverty and widens the wealth gap.
- **Employment Implications:** AI-driven hiring perpetuates occupational segregation and limits women's career advancement.
- **Educational Implications:** Reinforced stereotypes hinder women's participation in the digital economy and STEM education.
- **Healthcare Implications:** Biased diagnostic tools contribute to poor maternal health outcomes and limited access to quality care.
- **Political and Civic Implications:** Algorithmic bias reduces visibility of women leaders and restricts civic participation.
- **Cultural Implications:** AI systems reinforce patriarchal norms, slowing progress toward gender equality and the Sustainable Development Goals

The societal implications of AI bias in Nigeria extend beyond individual disadvantage, threatening to entrench systemic gender inequalities across economic, educational, healthcare, and political domains. Together, these outcomes highlight that AI bias not only mirrors existing inequalities but also risks amplifying them, thereby slowing progress toward gender equity and sustainable development.

Global literature highlights the consequences of AI bias for women's empowerment, education, healthcare, and political participation. Nigerian studies point to similar challenges, and this research contributes to the debate by analyzing these societal implications in the Nigerian context as part of the wider global discourse.

Together, these outcomes highlight that AI bias not only mirrors existing inequalities but also risks amplifying them, thereby slowing progress toward gender equity and sustainable development.

The societal implications of AI bias are wide-ranging, as they directly impact women's participation in education, employment, healthcare, politics, and finance. These implications reinforce gender inequality and slow down national development. AI bias in financial services hinders women's access to loans, insurance, and credit facilities. Since women dominate informal trade and small-scale enterprises in Nigeria, being denied fair access to financial resources prevents them from scaling their businesses or transitioning into the formal

economy. This contributes to a persistent wealth gap between men and women, undermining Nigeria's financial inclusion goals (Central Bank of Nigeria, 2021). Employment opportunities are also shaped by AI biases. When recruitment systems systematically filter out women, it reduces their access to higher-paying jobs, particularly in the ICT and STEM sectors. This reinforces occupational segregation and keeps women concentrated in low-income and informal jobs. Over time, this reduces household income security and slows poverty reduction efforts in Nigeria, where women often serve as primary caregivers.

AI bias in educational technology affects the quality of learning for female students. If recommendation systems channel male students toward advanced science courses while pushing female students into arts or non-technical fields, the gender gap in STEM continues to widen. This has long-term consequences for women's ability to compete in the digital economy. As the Nigerian economy becomes more knowledge-based and dependent on digital skills, the exclusion of women from STEM education threatens the inclusivity of economic growth (Okoye & Chinedu, 2022).

Healthcare bias has direct consequences on women's well-being. If AI diagnostic tools fail to adequately represent women's health conditions, women may receive less accurate or delayed treatment. In Nigeria, where maternal mortality rates remain among the highest in the world, the absence of gender-sensitive AI in healthcare exacerbates risks to women's lives (WHO, 2022). Furthermore, limited access to AI-based telemedicine tools due to language and voice recognition bias reduces the ability of women in rural areas to access health services.

AI-driven social media algorithms also contribute to women's underrepresentation in political and civic spaces. In Nigeria, women politicians already face barriers in visibility and campaign financing. Algorithms that amplify content based on engagement may favor male-dominated discourse, reducing women's voices in online political debates (Ajayi, 2022). Additionally, AI systems sometimes fail to effectively detect online harassment, leaving women exposed to gender-based violence and silencing them in digital spaces.

On a broader scale, AI bias reinforces societal stereotypes that portray women as less capable in leadership, finance, and technology. This slows progress toward gender equality, undermines government commitments to the Sustainable Development Goals (SDGs), and restricts Nigeria's ability to harness the full potential of its population.

The long-term consequences of unchecked AI bias are significant. If these biases persist, women in Nigeria risk being left behind in the digital transformation that is reshaping economies and societies worldwide. Biases in AI

will continue to widen gender gaps in education, employment, and financial access. This creates a cycle where women remain underrepresented in critical sectors, leading to fewer role models and mentors for future generations. The structural exclusion of women from the benefits of AI reinforces patriarchal norms and reduces societal progress toward equality. Denying women fair access to digital financial products and job opportunities, AI bias entrenches economic disparities. This may worsen poverty levels among women and their households, particularly in rural communities where women already face multiple barriers. Without deliberate intervention, Nigeria's vision for inclusive growth will be undermined. Nigeria has committed to gender equality through policies aligned with the SDGs, especially Goal 5 on achieving gender equality and Goal 9 on innovation and infrastructure. Persistent AI bias undermines these commitments and risks slowing progress on national development goals (UNDP, 2022). Countries that fail to ensure inclusivity in digital transformation may face long-term economic disadvantages, as large sections of the population are excluded from contributing to innovation and productivity.

If women consistently experience discrimination from AI systems, public trust in technology may erode. This could slow the adoption of digital innovations in Nigeria, particularly among women. A lack of trust in AI also creates barriers to building inclusive digital ecosystems that are critical for Nigeria's participation in the global digital economy.

Finally, unchecked AI bias could reinforce gender-based violence, both online and offline. Failure of AI-driven social platforms to detect harmful content can make digital spaces unsafe for women, discouraging their participation in politics, business, and public discourse. This has a ripple effect on women's empowerment and overall democratic participation.

Conclusion

Overall, the thematic outcomes of the paper show that AI bias against women is a global phenomenon, but its impact in Nigeria is intensified by structural inequalities in education, finance, healthcare, and technology access. The first theme addressed Objective One by identifying and analysing the specific ways AI systems disadvantage women in Nigeria, while the second theme addressed Objective Two by examining the wide-ranging societal implications of these biases. Viewed through the study's theoretical lens of feminist communication theory and critical theory of technology, these findings reinforce the argument that technology is not neutral but reflects and amplifies existing social hierarchies. By situating Nigeria's experience within this framework, the study contributes additional insights that highlight both the universality of AI bias and

the unique challenges faced in the Nigerian context. This synthesis provides a foundation for the subsequent discussion on strategies to mitigate bias and promote gender-inclusive AI development.

Based on the societal implications identified in this study, the following recommendations are proposed to mitigate AI bias against women in Nigeria:

Gender-Responsive AI Design and Auditing

AI developers and organizations should integrate fairness metrics, transparency standards, and bias-detection tools into recruitment, financial, healthcare, and educational AI systems throughout the design, training, and deployment stages to ensure equal treatment of women and men. Regular gender-focused audits should be conducted to identify and correct discriminatory outcomes.

Inclusive Data Practices

AI systems deployed in Nigeria should be trained on datasets that adequately represent Nigerian women across regions, diverse socio-economic, cultural and linguistic contexts working in partnership with universities and women's organizations to guarantee inclusivity and prevent underrepresentation.. This will reduce underrepresentation, misclassification, and algorithmic exclusion.

Strengthening Policy and Regulatory Frameworks

Government agencies should strengthen national AI policies by explicitly incorporating gender considerations, including mandatory impact assessments and accountability mechanisms for AI systems used in sensitive sectors such as finance, employment, healthcare, and governance. Policymakers and regulators, including NITDA and legislative bodies, should strengthen Nigeria's AI policy frameworks with explicit gender provisions by mandating independent audits of AI systems before they are deployed in critical sectors such as banking, healthcare, and security.

Digital Skills and Capacity Building for Women

Targeted digital literacy, AI education, and skills-development programmes should be expanded for women and girls through schools, community centers, and online platforms, while also offering scholarships and incentives to increase female participation in STEM fields to close the digital divide and enhance their participation in the digital economy and AI-related decision-making spaces.

Multi-Stakeholder Oversight and Advocacy

Civil society organizations, women's advocacy groups, academia, and the private sector should be empowered to monitor AI practices, report harmful outcomes,

advocate for ethical and inclusive AI governance through sustained multi-stakeholder collaboration, lobby for accountability, and raise public awareness through campaigns and media engagement, ensuring that women's voices are central in shaping Nigeria's AI future.

References

- Bertaina, E., Allhutter, D., Criado, N., De Fine Licht, K., & Rizza, C. (2025). Evaluating the societal impacts of AI systems: A framework for risk assessment and human rights protection. *Journal of Responsible Technology*, 24, Article 100123. <https://doi.org/10.1016/j.jrt.2024.100123>
- Buckingham, D. (2015). Defining digital literacy: What do young people need to know about digital media? *Nordic Journal of Digital Literacy*, 10(Jubileumsnummer), 21–35.
- Clarke, R. (2019). Principles and business processes for responsible AI. *Computer Law & Security Review*, 35(4), 410–422. <https://doi.org/10.1016/j.clsr.2019.04.007>
- Coeckelbergh, M. (2021). AI, responsibility, and gender justice. *AI & Society*, 36(2), 531–540. <https://doi.org/10.1007/s00146-020-01049-0>
- Collins, P. H., & Bilge, S. (2020). *Intersectionality*. Polity Press.
- Crawford, K. (2021). *Atlas of AI: Power, politics, and the planetary costs of artificial intelligence*. Yale University Press.
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. *International Journal of Information Management*, 57, Article 101994. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>
- Ene, C., & Alalade, O. (2023). Artificial intelligence and gendered implications for financial inclusion in Nigeria. *Journal of Gender and Technology in Africa*, 5(2), 45–61.

- Enhancing Financial Innovation & Access. (2023). *Access to financial services in Nigeria survey 2023*. EFINA. <https://www.efina.org.ng>
- Franzoni, V. (2023). Gender differences and bias in artificial intelligence. In *Gender in AI and robotics: The gender challenges from an interdisciplinary perspective* (pp. 27–43). Springer.
- GSMA. (2024). *The mobile gender gap report 2024*. <https://www.gsma.com/r/wp-content/uploads/2024/05/The-Mobile-Gender-Gap-Report-2024.pdf>
- Habbal, A., Ali, M. K., & Abuzaraida, M. A. (2024). Artificial intelligence trust, risk and security management (AI TRiSM): Frameworks, applications, challenges and future research directions. *Expert Systems with Applications*, 240, Article 122442.
- Haider, J., & Sundin, O. (2022). Information literacy challenges in digital culture: Conflicting engagements of trust and doubt. *Information, Communication & Society*, 25(8), 1176–1191.
- Hadzovic, F., Becirspahic, M., & Mrdovic, S. (2024). AI governance frameworks: Human rights, accountability, and the protection of vulnerable groups. *AI & Ethics*, 4(1), 45–60. <https://doi.org/10.1007/s43681-023-00234-9>
- Helbing, D. (2019). *Societal, economic, ethical, and legal challenges of the digital revolution*. Springer Nature.
- Hernández-Orallo, J., Martínez-Plumed, F., Avin, S., Whittlestone, J., & Ó hÉigeartaigh, S. (2020). AI paradigms and AI governance. *Minds and Machines*, 30(3), 439–461. <https://doi.org/10.1007/s11023-020-09523-6>
- Hilb, M. (2020). *New governance strategies for artificial intelligence*. Emerald Group Publishing.

- Misra, S., Panigrahi, R., & Behera, R. K. (2023). Artificial intelligence governance: Emerging trends, frameworks, and challenges. *AI & Ethics*, 3(2), 211–225. <https://doi.org/10.1007/s43681-023-00198-w>
- National Center for Artificial Intelligence and Robotics, & National Information Technology Development Agency. (2024). *Nigeria's national artificial intelligence strategy (NAIS)*. Federal Government of Nigeria.
- O'Connor, S., & Liu, H. (2024). Gender bias perpetuation and mitigation in AI technologies: Challenges and opportunities. *AI & Society*, 39(4), 2045–2057.
- Okunola, S., & Olaoye, B. (2021). Gender, digital technologies, and inequality in Nigeria. *African Journal of Information Systems*, 13(2), 115–132.
- Shaelou, S. L., & Razmetaeva, Y. (2023). *AI, human rights and democracy in Europe*. Routledge.
- Shrestha, S., & Das, S. (2022). Exploring gender biases in ML and AI academic research through systematic literature review. *Frontiers in Artificial Intelligence*, 5, Article 976838.
- Stahl, B. C., Antoniou, J., Ryan, M., & Jirotko, M. (2022). AI governance in practice: Risk, regulation, and the case for a European approach. *AI & Society*, 37(3), 1061–1073. <https://doi.org/10.1007/s00146-021-01208-7>
- Stanford Institute for Human-Centered Artificial Intelligence. (2024). *AI index report 2024*. Stanford University.
- Stanford Institute for Human-Centered Artificial Intelligence. (2025). *AI index report 2025*. Stanford University. <https://hai.stanford.edu/ai-index>
- Thakkar, D., Kumar, N., & Sambasivan, N. (2020). Towards an AI-powered future that works for vocational workers. In *Proceedings of the CHI Conference on Human Factors in Computing Systems* (pp. 1–13). ACM.

- Tong, R. (2019). *Feminist thought: A more comprehensive introduction* (5th ed.). Routledge.
- Uctu, R., Tuluca, N. S., & Aykac, M. (2024). Creative destruction and artificial intelligence: The transformation of industries during the sixth wave. *Journal of Economics and Technology*, 2(3), 296–309.
- UNESCO. (2023). *AI and gender equality: Ensuring an inclusive future*. United Nations Educational, Scientific and Cultural Organization.
- World Bank. (2022). *Nigeria gender assessment*. World Bank Publications.
- Yarger, L., Cobb Payton, F., & Neupane, B. (2020). Algorithmic equity in the hiring of underrepresented IT job candidates. *Online Information Review*, 44(2), 383–395.

Author

Jamila Husaini Yakubu is a lecturer at the Department of Mass Communication Department, Federal University of Kashere, Gombe State, Nigeria