

Towards Ethics in the Age of Artificial Intelligence: A Study of STEM Students' Perceptions of AI Ethics in Nigerian Universities

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Abstract

Artificial Intelligence (AI) is fast transforming societies across the world and poses serious ethical issues concerning biases, privacy, accountability and job losses in the future. Although international bodies like the UNESCO Ethics of Artificial Intelligence Recommendation, the European Union Trustworthy AI Guidelines, and the U.S. AI Bill of Rights have paid particular attention to the idea of fairness, transparency, and human control, little is understood about how students in developing countries view the topics. This paper examines the awareness and perceptions of AI ethics among STEM students in Nigerian higher education institutions, where there is an increasing use of AI, but little AI ethics education. The study was based on the use of a cross-sectional survey of 300 students in three universities with a combination of quantitative measures of awareness and attitudes and related to qualitative thematic insights. Results show that there is moderate knowledge of AI ethics concepts: data privacy (80%) and job displacement (70%) were well known, yet fewer students were familiar with algorithmic bias (60%), transparency (45%), or human oversight (50%). Seven common themes in the qualitative responses were identified: privacy and surveillance, bias, job loss, misinformation, accountability, autonomy, and academic integrity. The cautious optimism of students was, however, accompanied by a significant lack of confidence in the reliability of AI in the future (77%), as well as the paramount support of regulation (88%) and ethics-by-design approaches (85%). Interestingly, 80% of the respondents complained that their curricula had failed to equip them with knowledge about the ethical issues surrounding AI, with informal information sources coming to the rescue. The study recommends that the implementation of AI ethics in STEM education, the alignment of curricula to international standards, and the contextualization of AI ethics with African philosophies are the three necessary steps to ensure that Nigeria produces not only consumers of AI, but ethically-enlightened innovators.

Keywords: *Ethics, Artificial Intelligence, STEM Students, Nigerian Universities.*

INTRODUCTION

Artificial intelligence is swiftly moving out of the niche technology category into an ever-present factor in nearly every sphere of human activity (Stone et al., 2022). In healthcare and finance, social media and education, among other areas, AI systems are becoming more and more deployed to make decisions or assist human activities, which have already generated unprecedented improvements and at the same time brought up serious ethical issues (Du & Xie, 2021). Such problems like the bias in algorithms, the violation of data privacy, autonomous decision-making in life-and-death scenarios, or the replacement of human labor

by intelligent machines have become not just hypothetical, but also concrete topics of public discussion (Ozmen-Garibay et al., 2023). An ethical compass is more likely to be needed in the AI than in any other sphere, in part due to its general-purpose nature and the risk of going viral and ingraining inequalities or undermining human rights (Raman et al., 2025). As a result, ethics of artificial intelligence has become a highly urgent interdisciplinary subject, and the guidelines that should be created by global organizations and governments to ensure the development and use of AI are consistent with the key human values have been established (De-Almeida et al., 2021). The 2021 Recommendation on the Ethics of AI by UNESCO is the first international standard of AI ethics having been accepted by 193 member states, including Nigeria, and it highlights several ethics principles including human rights, fairness, transparency, and human control, which it translates into policy recommendations.

On the same note, the Ethics Guidelines of Trustworthy AI (2019) by the European Union also provide an overview of several requirements that AI systems must meet, such as human agency, privacy, non-discrimination, transparency, societal well-being, and accountability (Nikolinakos, 2023). In the United States, the White House Office of Science and Technology Policy published a Blueprint to an AI Bill of Rights (2022) that states five principles: safe and effective systems, protection against algorithmic discrimination, data privacy, notice and explanation, and human alternatives (i.e., human oversight). These international frameworks are indicative of a growing knowledge base on the moral obligations of AI, i.e. that AI must be developed and used in accordance with human dignity, causing less harm, and ensuring fairness and responsibility (The White House Office of Science and Technology Policy, 2022).

It is against this global backdrop that Nigeria and other African nations are developing their own reaction to the AI revolution. In 2024, the African Union signed a Continental AI strategy, which recommends an Africa-centered, development-oriented approach, specifically advocating ethical, responsible, and equitable AI practice in all its member states (African Union Commission, 2024). Nigeria, commonly known as the Giant of Africa, appreciates the transformational power of AI in line with its developmental goals. AI is perceived as a tool toward realizing Nigeria economic and social desires, including improving healthcare and agriculture as well as increasing access to education (Dada et al., 2024). However, benefits of AI come with the obligation of finding solutions to its ethical issues (Jedličková, 2025). Today, Nigeria is only at the initial phases of developing a policy on AI. In early 2025, a draft National AI Policy is being developed, which is expected to facilitate a comprehensive approach (Salihu, 2024). The draft policy aims at capturing ethical issues, i.e., AI bias, accountability, transparency, and privacy, and aligning Nigeria with global AI governance models (Shittu et al., 2024). The fact that Nigeria is a signatory to Bletchley declaration on AI safety of 2023 is evidence that Nigeria is a responsible AI developer internationally. On the domestic level, the adoption of the Nigeria Data Protection Act (2023) is a strong legal basis to protect privacy in the context of the widely consumable and processed data that lies at the core of AI systems.

However, despite these top-down initiatives, a significant deficiency persists in education and talent development. Most universities in Nigeria do not include AI in their curriculum, and the little that does exist is often limited to introductory, and sometimes even outdated, computer science courses (Omoroguiwa et al., 2023). There is a general lack of specialized courses that include machine learning, AI design, or AI ethics. This means that Nigeria may end up with graduates who are only consumers of AI technologies and do not have an in-depth insight into how the technology works and the ethical aspects of the technology (Bali et al., 2024). This has been highlighted by a commentary in the literature that we are breeding a generation of

consumers, not creators of AI, and that this means that Nigerian students will be left behind in an AI-driven economy unless there is a strong AI education ecosystem (Olatunji-Ishola & Okanlawon, 2025). This knowledge gap is especially worrying in the field of AI ethics. Next-generation engineers, computer scientists, and other STEM personnel will need not just to be technically competent in AI but also ethically literate as a way of predicting and countering the negative effects of AI on society (Zhang et al., 2023). Researchers highlight that it is necessary to educate AI practitioners and stakeholders on critical reflection of AI impact on human life, the need to hold themselves accountable to maximize benefits and minimize harms, and the need to integrate AI ethics into curricula (Sadek et al., 2025). Therefore, teaching ethical theories and principles and their use in the designing of AI is as important as teaching programming or mathematics to young technologists.

The interplay between global discourse on AI ethics, socio-technical realities in Nigeria, and the educational divide in training the innovators of tomorrow is what motivated the study. Future AI developers, engineers, and tech entrepreneurs in Nigeria, STEM students attending Nigerian universities, will be a decisive factor in the design and implementation of AI in their country. Their ethical consciousness is thus paramount: when informed, they will be capable of promoting equitable, open, and socially oriented AI systems; otherwise, Nigeria will remain susceptible to importing technologies that reinforce bias, undermine privacy, and increase inequalities without critical adjustment. The analysis of how these students feel about the current problems of algorithmic bias, data misuse, and global or national AI ethics regulations, the factors that impact their opinions, and the differences in perceptions by gender, field of study, and exposure, are a much-needed precursor to policy and educational interventions.

Research Questions

- 1) To what extent do core AI ethics concepts (data privacy, algorithmic bias, transparency, and human oversight) as a group have STEM student awareness in Nigerian universities?
- 2) What are perceptions among Nigerian STEM students on the effect of AI on society, in the context of inequality, trust, employment, and regulation?
- 3) What are the most common ethical issues raised by Nigerian STEM students on the topic of AI, and how they are linked to the ethical discussion in the rest of the world as well as the socio-economic background of Nigeria?
- 4) How do Nigerian university STEM students perceive their education as ready to handle the ethical issue that AI presents, and what do they suggest to change?

LITERATURE REVIEW

The world is moving towards a common ground in the ethics and policies that must guide artificial intelligence (AI). The Recommendation on the Ethics of Artificial Intelligence (2021) by UNESCO is a groundbreaking guide that puts human rights and dignity as the core of AI ethics. The document not only demands that AI systems should not violate the basic freedoms but also explicitly stipulates fairness, non-discrimination, transparency, and human control as the principles. Notably, it offers effective action areas of policy to governments, such as in the area of education, accountability, inclusivity, and data governance, which translates abstract concepts into practical strategies. Given that every UNESCO member state, including Nigeria, is supposed to adopt this recommendation, it substantially establishes an international standard of national AI ethics initiatives.

Europe has also been on the forefront in creating the governance structures of AI, especially through the European Union. In 2019, its High-Level Expert Group on AI published Ethics Guidelines for Trustworthy AI (2019), which summarized world ethics debates about AI into seven main requirements: human agency and oversight, technical robustness and safety, privacy and data governance, transparency, diversity and fairness, societal and environmental well-being, and accountability. These principles are a mix of utilitarianism regarding the welfare of the group, deontology that has an appreciation of rights, and virtues of responsibility in terms of accountability. The EU transitioned since then to policy, converting these guidelines into the legally binding AI Act, set to be enforced in 2025, regulating AI according to the risk level (Nikolinakos, 2023). This regulatory model is especially important as it shows how abstract ethical principles may be transformed into enforceable rules prohibiting harmful applications such as social scoring but placing stringent controls on applications with high potential harms, such as biometrics and hiring tools.

The US has chosen a more decentralized model, however, based on sector regulation and voluntary structures (De-Almeida et al, 2021). The White House Office of Science and Technology Policy (2022) has released the Blueprint of an AI Bill of Rights (2022), which is the most important federal effort to develop five main protections, such as needing safe and effective systems, preventing algorithmic discrimination, safeguarding data, notifying and explaining, and providing human alternatives to automated decision-making (Park, 2023). The National Institute of Standards and Technology has supplemented this principles approach with its AI Risk Management Framework (2023), which integrates fairness, transparency, and accountability into a risk-based approach to managing AI. Although the U.S. scheme does not show the same legal consistency as the EU one, it reveals a firm willingness to institute ethical protections in both federal and the private-sector use of AI, often through the mechanism of societal discrimination through existing civil rights law (Dixon, 2023).

In other places, China has embraced its own approach to AI ethics. In 2019, its Ministry of Science and Technology released the New Generation AI Governance Principles, where harmony, fairness, and accountability are emphasized (Wu et al., 2019). Although these principles are consistent with international standards, they are heavily influenced by the state-centric agendas of China, especially the issues of stability in the society and national security. In the same tone, the OECD Principles on AI 2019, which is supported by more than 40 nations, reflects the same themes of inclusiveness, transparency, robustness, and accountability on the global scale and promotes collaboration at the international level and interdisciplinary studies. Taken together, these moves point to an impressive overlap of geopolitical settings on the idea of what trustworthy AI entails.

How these ethical frameworks are portrayed into the education industry has also become a matter of scholarly and institutional interest. According to Weichert (2025), computer science majors need to incorporate ethics to overcome the emergent controversies like autonomous vehicles making decisions or algorithmic bias in policing. In a systematic review, Chavez et al. (2021) demonstrate that universities have tried various models, including stand-alone ethics classes, embedded curriculum, and experiential learning like hackathons. In North America and Europe, universities such as Stanford and the University of Montreal have integrated AI ethics into their education, and in India the government national AI strategy supports responsible AI to All. These discussions are also finding their way into African universities, and Kenya and South Africa have created ethics courses that are usually funded by NGOs and industry actors (Kiemde & Kora, 2022). According to a recent cross-country comparative study

in Kenya, Nigeria, and South Africa, although students mostly have a positive attitude toward AI as an inclusivity tool, they are also worried about risks such as misinformation and bias (Oyelere & Aruleba, 2025).

In Nigeria, on the other hand, AI ethics is not formally introduced into curricula. The guidelines provided by the National Universities Commission on computing programs are silent on AI ethics, and most universities continue to not provide AI as a subject, much less its ethical aspects. As commentators have pointed out, unless policy developments are coupled with reforms in the education sector, Nigeria may find itself left behind. According to surveys, awareness of AI among Nigerian students is not evenly distributed. A significant survey by David-Olawade et al. (2025) revealed that familiarity with AI tools was generally high among students, yet exposure was mostly superficial, in terms of practical use, as opposed to intensive exposure, in terms of thinking about its ethical implications. There was gender and disciplinary disparity with male and postgraduate students showing far higher awareness as compared to the female students and those in non-STEM areas. In a survey of the use of artificial intelligence (AI) writing tools in academic writing by Nigerian university students, Nwagbara (2025) also discovered extraordinarily low rates of AI ethics exposure, with 82 percent of the surveyed students having no access to AI resources. These results highlight a digital divide in Nigeria, in which STEM students have access to informal exposure and others are locked out. The awareness of AI ethics in particular is even less. Nwozor (2025) discovered that the Nigerian students understand that plagiarizing and academic dishonesty with AI tools is recognized as unethical, yet the systematic training of AI ethics is still largely lacking. Anecdotal experience of workshops indicates that students are starting to consider matters of biasness especially when relating to Western-trained AI systems which cannot reflect African identities. This can be seen as an indication of larger questions regarding the idea of digital colonialism, such that global AI systems have a tendency to marginalize the African data, contexts and perspectives.

Lastly, there is an increasing awareness that the Nigerian and African cultural traditions can contribute to global AI ethics. Researchers have proposed that African philosophies, like Ubuntu, that focus on community, harmony, and mutual care, would be a useful approach to contextualizing AI ethics in Africa. Such a practice would make evaluation less about individual good but more about communal good, which would be more in line with the social realities in Nigeria. Therefore, although Nigerian students are still eager AI users, their insufficient exposure to the ethics and learning materials may deny them a chance to influence the discourse. To close this divide, reforms in the curriculum, specific awareness campaigns, and the incorporation of African philosophies into AI ethics will be necessary so that Nigeria will be not only a consumer but a contributor of AI ethics on the international stage.

THEORETICAL BACKGROUND

The study of AI ethics usually has recourse to existing moral philosophies in order to examine and shape the actions of AI systems. Utilitarianism, deontology, and virtue ethics are three of the most often mentioned classical ethical theories that provide a lens of their own (Boddington, 2023). Utilitarianism, a version of consequentialism, is based on the contributions of Jeremy Bentham and John Stuart Mill; utilitarianism evaluates actions based on their consequences; an action is ethical when it brings the greatest happiness or least harm (Komu, 2020). Within the AI world, a utilitarian approach can, e.g., program an autonomous vehicle to act in a way that maximizes the number of lives saved in a life-threatening event. Nevertheless, the issue that has been mentioned is that pure utilitarian reasoning can contradict

the rights of individuals or fairness a maximally beneficial solution to the majority may seriously harm the minority (Kumar & Choudhury, 2023). Conversely, deontological ethics (which is sometimes identified with Immanuel Kant) is a philosophy that focuses on responsibilities, regulations, and the value of individual rights. A deontological AI ethics system would have AI systems adhering to some unbreakable rules (e.g., never lie to users, never infringe on privacy rights), no matter what the result is (D'Alessandro, 2024). This would follow legalistic or rights-based principles; an AI recruitment system based on deontology would be coded to never consider sensitive data such as race or gender during decision-making, as a matter of principle. The virtue ethics which is based on the philosophy of Aristotle changes the emphasis and centers on moral character and virtues of the agent. In AI, this would be the focus on characteristics that we believe to be virtuous, like fairness, honesty, empathy, in the design and goals of AI systems (Gamez et al, 2020). As an illustration, an AI tutor system could be made to be patient and empathetic towards students which are virtuous traits. There are varieties of contemporary methods which blend these philosophies into pluralistic models.

One of the most notable is *principlism* in such disciplines as bioethics, where various principles (beneficence, non-maleficence, autonomy, justice) are weighed instead of following a single theory (Revon & Reiss, 2025). Multi-pronged approaches are also advocated by AI ethicists: because no single theory (utilitarian or deontological in isolation) can address every situation, combining various ethical theories can produce more resilient AI decision-making. Practically, applying ethical theories to AI is difficult- it involves putting abstract concepts into tangible technical constraints or algorithms. This research in computational ethics is looking into ways to give AI an ethical reasoning using techniques such as rule-based systems, logic programming, and even machine learning within the bounds of ethical principles (Segun, 2021). As an example, continuous logic programming has been suggested as a method of enabling AI to cope with subtle moral problems by assessing logical rules and exceptions. These technical investigations highlight the fact that, though ethical theories are an essential underpinning, their translation into code requires methodical decisions: such as the transparency of the reasoning used by AI, the awareness of the context, and the ability to override AI decisions (Felzman et al., 2020).

Overall, the literature and background demonstrate: (a) there is a strong body of universal AI ethics that can be localized in Nigeria; (b) the policy and education systems of Nigeria are still in the process of dealing with AI ethics, with a gap in STEM courses; (c) Nigerian STEM students may have an uneven familiarity with AI and AI ethics, some well-informed and already using AI, some with scant knowledge, and the study will attempt to map this terrain. Our theoretical lens is a synthesis of the principled approach (in which we apply global ethical principles to what students should know or ought to take into consideration) and a contextual cognizance that the attitudes of students develop within the particular socio-technical realities of Nigeria. This dual lens shapes our approach and analysis because we not just measure factual awareness (e.g. can a student detect an AI ethical problem) but also the value judgments and concerns a student emphasizes.

METHODOLOGY

Research Design

The research was conceived as a descriptive survey with quantitative and qualitative components to enable the thorough evaluation of the perceptions of AI ethics of STEM students.

The cross-sectional survey method was selected to provide a picture of the existing awareness, as well as the attitudes of students of the selected universities in Nigeria. Since AI ethics knowledge is not necessarily taught in a formal setting, a survey can enable us to determine informal or intuitive knowledge among a wide sample.

Also, we had open-ended questions in order to get some qualitative information (e.g., we asked students to explain, in their own words, what ethical issues they can relate to AI). This mixed-method design suits the study of a relatively new topic in the Nigerian environment that offers breadth (through structured questions) and depth (through narrative answers) of the data.

Participants and Sampling:

The sample of the study was undergraduate and post graduate students in Nigerian universities pursuing STEM majors. In this sense, STEM (Science, Technology, Engineering, Mathematics) involved Computer Science, Electrical Engineering, Mechanical Engineering, Computer and Robotics Education, Mathematics, Biology and other related categories, although there were predominantly computing and engineering students. We incorporated federal (public) universities across three major geopolitical zones of Nigeria to capture the differences in resources and curricula.

The sampling strategy adopted was stratified: we chose 3 universities in three geopolitical regions of Nigeria (e.g., one in North-Central, one in South-West and, one in South-East to have a regional representation). In every university, we contacted STEM faculties and recruited volunteer participants of different year levels. The survey was completed online using a Google Forms link, shared in departmental mailing lists and WhatsApp groups of students (with the consent of faculty coordinators). Overall, N = 300 students took part in the survey.

Survey Instrument

The survey questionnaire was designed based on global guidelines of AI ethics and consisted of four parts. The first gathered demographic information such as age, gender, field and year of study, and prior exposure to AI or ethics courses. The second measure the awareness and knowledge of AI concepts (such as algorithmic bias, data privacy and transparency) on familiarity scales, quiz-based questions and short scenarios to define ethical issues and benign uses. The third part measured the attitudes towards AI on the Likert scale regarding trust, regulation, ethical application of such tools as ChatGPT and perceptions of risks such as job displacement.

The last part consisted of open-ended questions and asked students to name significant ethical concerns and consider whether their training equipped them to deal with the ethical implications of AI. The instrument was pilot-tested on ten students as well and the reviews of the instrument resulted in refinements including incorporation of brief definitions of the technical terms to make the instrument understandable and user-friendly.

Data Analysis

The SPSS was employed to analyze quantitative data and the items of awareness and attitude were summarized by descriptive statistics (frequencies, percentages, means, and standard deviations). Chi-square tests on categorical variables (e.g., gender or field of study) and independent-samples t-tests on the mean attitude scores were used to test group differences, and both tests can identify moderate to large differences regardless of sample size constraints.

Thematic analysis was used to analyze qualitative responses to open-ended questions, and two researchers coded and consolidated the prominent themes of privacy, bias and discrimination, job displacement, misinformation, accountability and governance, AI misuse, and ethical use in education. Themes were tabulated and good quotes were picked, the responses regarding preparedness to educate were given as ‘prepared’ or ‘not prepared’ with explanation. The findings are demonstrated in the form of summary tables and thematic insights, concentrating on the findings that are most applicable to curriculum and policy implications.

FINDINGS AND ANALYSIS

Result of Quantitative Data

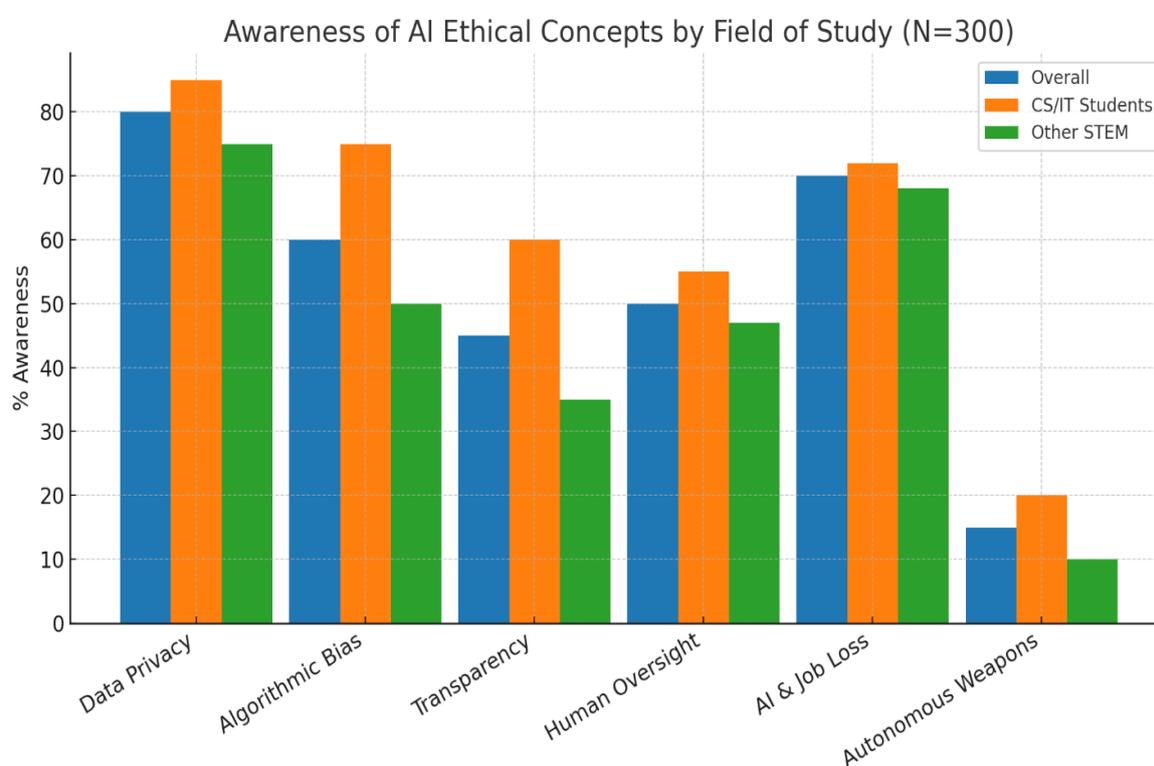


Fig 1: Field of study comparison chart (Overall, CS/IT students, and Other STEM)

Awareness of AI and Ethical Concepts

In Fig 1, it is indicated that STEM Nigerian students had moderate awareness of the AI ethics concepts, although the familiarity with different topics of AI ethics was different. Almost all respondents (98% said they had heard of Artificial Intelligence and 72% accurately named applications used in everyday life (e.g., virtual assistants, facial recognition). There was a lack of awareness regarding certain ethical issues.

The most familiar one was data privacy because 80% of the respondents were aware of the privacy issues of AI-based solutions, and they usually mentioned social media and targeted advertising; nonetheless, only a third of them were able to name the Data Protection Act of Nigeria. 60 percent of students identified as having been affected by algorithmic bias, many students giving examples of biased soap dispensers or hiring algorithms, although familiarity

with algorithmic bias was much higher among computer science students (75 percent) than among other STEM students (50 percent), $921 = 2(1, 300) = 9.21, p < .01$.

The transparency of AI was less known (45%), and a great number of students were surprised at the thought of AI showing its working. Likewise, 50% of respondents implicitly understood human oversight with only 20% familiar with technical terminology including human-in-the-loop.

The least known were autonomous weapons and long-term AI risks with only 15% awareness, and primarily among postgraduates or tech enthusiasts. In order to demonstrate these results, Table 1 cross tabulates AI ethics awareness of important issues by discipline and gender.

Table 1: Awareness of AI Ethical Concepts by Student Group (N=300)

AI Ethics Concept	%Aware (Overall)	% Aware – CS/IT Students	%Aware– Other STEM	%Aware– Male	%Aware– Female
Data Privacy concerns	80%	85%	75%	82%	77%
Algorithmic Bias/Fairness	60%	75%	50%	65%	53%
AI Transparency/Explainability	45%	60%	35%	50%	38%
Need for Human Oversight	50% (implicit)	55%	47%	52%	47%
AI and Job Loss (aware it's debated)	70%	72%	68%	70%	69%
Autonomous Weapons/Risks	15%	20%	10%	18%	10%

Table 1: “Aware” indicates those who answered that they are familiar with the concept or could correctly identify an issue related to it. “Implicit” indicates they demonstrated awareness through scenario reasoning even if not naming the concept.

Based on Table 1, it is possible to observe the following rather obvious patterns: Computer science/IT students are, predictably, more aware of technical ethical concerns (bias, transparency) than their colleagues. There are also gender differences - male students were more familiar with most of the topics. An example of this is that 65 percent of male respondents were cognizant of AI bias compared to 53 percent of women. This is consistent with other reports in Nigeria that female students have been reported to have a little (slightly) lower awareness or use of AI tools, perhaps because they have fewer access points or confidence differences. Nevertheless, it is not a massive gender gap in our sample; there are also a lot of female STEM students who are very knowledgeable. Awareness of job impact of AI is another interesting statistic. Approximately 70 percent admitted that they have overheard or seen that AI can work jobs and even make some people lose their jobs entirely. This was the same in subgroups. The influence of AI on jobs is, in fact, a popular theme reported in the media and the wider society- and it rings very well in Nigeria where unemployment among young people is high. Students were very anxious about this: 62% of them concurred with the statement, saying that ‘*they feared that AI will kill a lot of jobs that could have provided people like me with employment.*’ Others directly cited the Nigerian context: ‘*our economy is not that good; a banking or government automation with AI: where do graduates get jobs?*’ There is a sense of apprehension that Nigeria may not be ready to absorb workers displaced by AI, unlike perhaps more developed economies, which can find new technologies to employ.

This feeling is connected to the field of ethics as the idea of just allocation of AI advantages people as they intuitively engage in thinking about utilitarian (general welfare of the society) and justice-based reasoning, asking whether the use of AI could lead to the destruction of social well-being unless regulated.

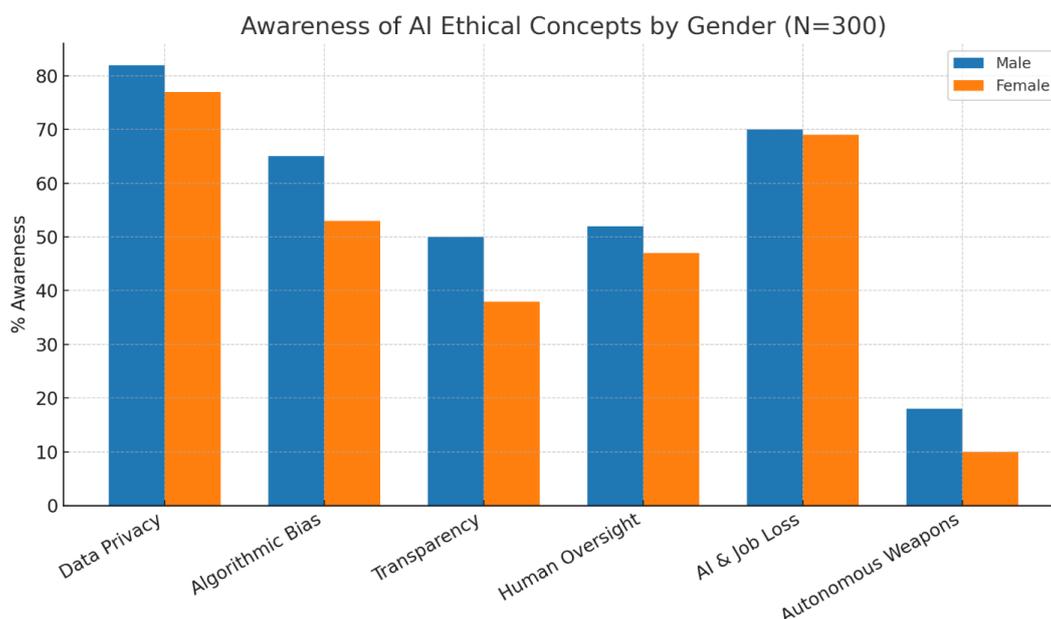


Fig 2: Gender comparison chart on AI ethics awareness

Furthermore, as can be seen in the gender comparison chart, male students indicated their perpetually higher awareness of the AI ethical concepts in all categories in comparison to their female counterparts. The biggest differences are observed in algorithmic bias/fairness (65% of males vs. 53% of females) and transparency/explainability (50% vs. 38%), implying that male students are better informed about technical and abstract ethical problems. The level of awareness about data privacy and the influence of AI on employment in both genders was relatively high and comparable, which adds to the fact that these are not technical issues but actively debated problems in society. It is also interesting to note that overall awareness of autonomous weapons and AI risks was low, although it was a little higher among male participants (18% vs. 10%). These findings indicate that female STEM learners are already actively engaged, but still, the gender disparity in exposure and confidence with AI ethics discourse, particularly in more technical aspects, is relatively small.

Fig 3 data demonstrate the stacked bar chart that clearly demonstrates the equilibrium of optimism, skepticism and demand to regulate among the Nigerian STEM students. The consensus was the greatest on the ones that require the external protection, where 88% respondents held that the government should regulate it and 85 percent insisted that ethical considerations must be considered during the development of AI. Likewise, 75% were in favor of self-regulation of industry.

Conversely, there was a high level of distrust towards AI in general, as only 15 percent said they could place trust in AI to make objective decisions and only ten percent felt at ease leaving high-stakes decisions to AI without human intervention. Opinions on the wider social impacts of AI were cautious: 30% thought that AI would positively impact Nigerians, however, much higher numbers were worried that AI could increase inequality (70%), or it would do individuals harm when unchecked (65%). Lastly, views on AI in schoolwork expressed ethical indifference, 40 percent of people said it was not wrong to use AI on some school work, and 60 percent considered it cheating. Generally, the chart supports the idea that the student population is not mindlessly passionate but rather, they integrate a sober optimism and acute request of ethical protection and responsibility.

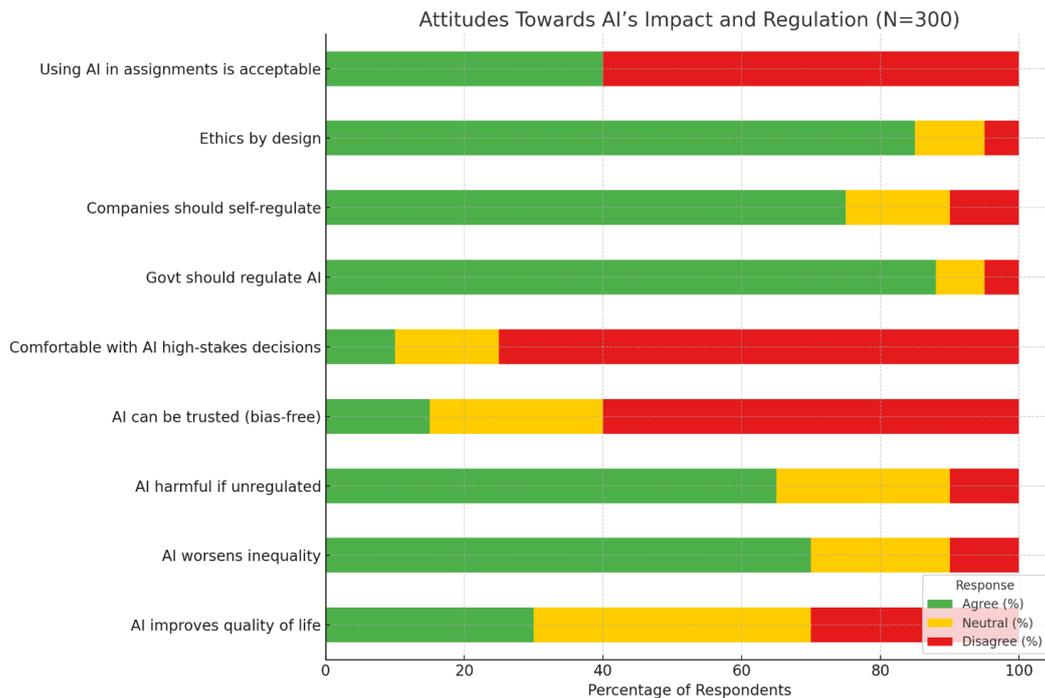


Fig 3: Attitudes Toward AI's Impact and Regulation

The students were cautiously optimistic about AI, but the answers that they provided made more sense of concern than eagerness. Only one out of three people saw AI to make life better to the majority of Nigerians and 70% of all felt that AI-unregulated might lead to the increase of inequality and 65% thought that it would do more harm than good. On the question of their own attitudes, 50 percent responded that they felt more worried than enthusiastic, matching surveys across the globe that reveal similar proportions of caution. Trust in AI was notably low.

The only thing that 15% of people agreed was that AI could make unbiased decisions without any human involvement and only 10% felt comfortable with AI making high stakes decisions like medical diagnoses without human intervention. Most people highly stressed the importance of human supervision, but female students were more skeptical than males. Regulation was now almost unanimously popular: 88% said that the government should pass AI laws, although only 30% thought that the authorities in Nigeria were sufficiently well-informed to do so. Industry responsibility was also supported by students with 75 percent of the students agreeing that tech companies ought to have their own code of ethics even when they are not under regulation yet many were skeptical that the companies would place ethics high without pressure.

The majority of the respondents (85) noted that they believed that the principles of ethics by design should be considered during the design of AI systems, which demonstrated the knowledge of the concept of ethics by design. Some of them even demanded interdisciplinary cooperation and said that ethics and cultural values should determine technical development. Lastly, respondents were queried regarding the use of AI in academia, 40% found it acceptable in small uses (like research support), but 60% found it unethical when used to produce complete assignments or examinations. There was a demand to make the policies more evident, which proves that the students already have to face the problem of AI ethics in the real-life process of education.

Result of Qualitative Data

Key Ethical Concerns (Themes)

The qualitative responses to the question of the largest ethical concerns or AI threats were insightful and enlightening. We identified approximately 7 major themes in the responses of the students, which were as follows with the percentage of respondents who mentioned it. (note: *many of the respondents mentioned multiple themes, so percentages sum to more than 100%*).

Data Privacy and Surveillance – 60%:

The most recurring issue. Students are afraid that AI will imply increased data gathering and possibly misuse of personal data. Some mentioned the widespread use of CCTV, smartphone eavesdropping, or AI-based surveillance by government. Sample quote: The government or companies could use AI to spy on us everywhere to the point where we lose our privacy. It also correlates with worldwide trends in which privacy is a priority issue (in most surveys, the problem of data misuse takes the first position among AI concerns). In Nigeria, the laws on digital privacy are novel, so students know that they are in unexplored areas.

Bias and Discrimination – 45%:

The fear that AI may be unfair is of concern to many respondents. They used examples such as facial recognition is not as accurate on Africans, or AI decision systems will favor the rich or a specific tribe unless it is specifically designed. One student said, AI systems imported into the country may not perform well in the country or even discriminate against people, such as loan algorithms dismissing individuals in a specific region due to biased data. This demonstrates a sensitivity that AI can be as just as the data and design of AI. The reference to the local context (imported abroad) is also quite insightful in the sense that it indicates a post-colonial consciousness that technologies are not neutral and that they can be biased in a way that is inapplicable or damaging towards local populations. It is important to note that this concern among the respondents who had some tech background was more so.

Job Loss and Economic Impact – 50%:

One-half of the students mentioned the automation powered by AI and resulting in joblessness or economic inequality. In particular, they cited such things as robots in factories, AI replacing banking jobs or customer service. This issue has an ethical dimension in a nation where young people are a major proportion of the population and there are limited employment opportunities: a question of distributive justice and the future of work. According to students, ‘reckless use of AI may increase poverty or inequality’. Others weighed this against hope: a small number of people said that AI would produce jobs as well, but the overall mood was fear of losing employment.

Misinformation and Deepfakes – 30%:

Many of them mentioned how AI has ‘the potential to create fake information, artificial news, or deepfakes that can be harmful to society’. Nigeria already experiences problems with misinformation on social media that sparks violence or political instability, so students are sensitive to how AI may make this issue worse. An IT student remarked, with AI such as deepfakes, we cannot trust anything we see or hear on the internet anymore - it can be used to defraud or even to manipulate elections in bad faith. In fact, no more than one-in-ten of the

U.S. public and experts believes it will be beneficial to the news or elections as reflecting a global mistrust with our participants.

Lack of Accountability – 25%:

The biggest concern of many participants is the question “*Who is the one to blame in case of a bad decision made by AI?*” They are afraid of a situation in which something bad happens (such as a mis-diagnosis or an unjust refusal of service) and nobody claims it was the algorithm. This is addressed to the accountability and transparency principles. One of the students remarked that AI companies may be hiding behind algorithms. Accountability should be made clear to the victims of AI errors are not given justice. This demonstrates a rather advanced awareness that ethical AI concerns not only technology but also legal and governance policies. It echoes with the demand of auditability and redress in guidelines.

Autonomy and Human Control – 20%:

There was a vague yet profound worry in some students that AI might get too independent or strong. They cited the AI in weapons or just plain AI that cannot be stopped. Although this was emphasized in only a small fraction of those concerned with sci-fi-esque AI takeover fears, those who were heavily impacted. It resembles the so-called AI existential risk argument, only in simpler forms. Although not everyone is concerned about robot overlords, the notion that AI must be kept in human hands was widespread (as noted, 75 percent do not want AI to make critical decisions without human involvement).

Ethical Use in Education – 10%:

A more minor theme, yet because we inquired within the context of their studies, some (particularly lecturers among postgrad respondents or the prolific students) committed or pointed to the problem of AI facilitating cheating and lessening the learning effort of humans. They view there as an ethical concern when students turn to AI to avoid learning (and undermine skills and academic integrity). Although this concern is not related to the harm of AI to the society in general, it is personal and immediate to them. It implies a micro-ethical terrain in classrooms that requires regulation (such as AI-related honor codes) and productive applications (such as teaching students how to use AI as a learning resource ethically, rather than a shortcut). Table 2 below that illustrates the themes and percentage of respondents who mention each of them:

Table 2: Top Ethical Concerns Mentioned by STEM Students

Ethical Concern/Theme	% of Students Mentioning	Illustrative Quote
Data Privacy & Surveillance	60%	“AI is collecting personal data everywhere – our privacy could disappear.”
Bias & Discrimination	45%	“AI might be biased against Africans or women if it learns from biased data.”
Job Loss & Economic Impact	50%	“Automation by AI could take jobs away, worsening unemployment in Nigeria.”
Misinformation & Deepfakes	30%	“AI can create fake news or deepfakes – people could be misled on a huge scale.”
Lack of Accountability	25%	“Who is to blame when AI makes a wrong decision? Right now, it feels like no one is accountable.”
Loss of Human Control (Autonomy)	20%	“I worry about AI becoming so autonomous that humans can’t control outcomes.”
Academic Integrity (AI in education)	10%	“If students use AI to do all their work, it’s cheating – they won’t actually learn.”

Table 2: Summary of the main themes identified in the open-ended responses which indicate their approximate prevalence, and the illustrative comment of the students

It is remarkable that the greatest issue raised by the respondents was the privacy of the data. This result could also be indicative of an increased degree of digital literacy because participants seem to be aware of the personal risks of data usages; this fact is consistent with the international polls suggesting that many people are concerned about artificial intelligence (AI) and possible data misuse. This is a reflection of the economy in Nigeria since job loss has emerged as a major issue of concern. Third, bias develops as an indicator of awareness, yet its high position can also lead to believe that respondents who are well knowledgeable about bias perceive bias as an issue particularly critical- some respondents indicated this with vigorous undertones of fairness. The transparency of misinformation highlights an acknowledgement that AI is tightly connected with information ecosystems and this can be concluded based on the experience of the observers regarding the dynamics of social media. When comparing gendered responses, female students were a bit more likely to talk about safety and misuse problems, including particular fears about AI use in weaponry that caused personal fear. Male respondents, conversely, more frequently referenced technical issues such as bias or concrete examples of technology. These differences can be explained by the different priorities or the different exposure to specific discourses; current literature indicates that women are likely to focus more on the societal and human aspects of technology, whereas men are more focused on technical features. However, gender differences were not significant as both groups were more concerned with privacy and employment.

In general, the research points to the fact that Nigerian STEM students have moderate awareness of AI and related ethical issues, but their knowledge is not balanced between major concepts. Although almost all of the respondents were able to recognize AI in general and the majority associated it with the privacy concern, fewer of them demonstrated a depth of knowledge on such technical aspects of AI as transparency, oversight, or even algorithmic biasing. Attitudes were characterized by some modest optimism through skepticism: students admitted to the possible good that AI could bring, but were more vocal about inequality, bias, and negative consequences in the absence of regulation, and appeared to be highly supportive of laws and ethics-by-design systems. There was a general distrust of AI systems, especially in high-stakes decision making, with the majority of the respondents claiming to need human supervision. Regarding education, some 80 percent said that their curriculum had not adequately trained them in dealing with AI ethics and instead relied on informal learning sources; only a smaller fraction said they were exposed through electives or extracurricular clubs. Although these gaps exist, students were conditionally optimistic, arguing that AI has the potential to help Nigeria as long as it is appropriately governed through shared progressive changes in the educational system and strong ethical protection.

DISCUSSION

This research provides useful information on the similarities and differences in the perception of AI ethics among STEM students in Nigeria in comparison with the world trend and existing ethical models. It is in this section that we take the results, contextualize them as part of theoretical antecedents, and outline the implications of their findings to the educational practice and policy formulation. It is noteworthy that the major ethical issues of Nigerian students related to data privacy, algorithm bias, future job displacement, misinformation, and accountability are highly relevant to the ones proposed by international discourses. This

agreement indicates that the Nigerian youth are not only involved in the worldwide debate on AI ethics, but they are already involved in it despite the contextual differences, which is facilitated by digital platforms and social media networking. As an illustration, the most critical issue, the one referenced by 60 percent of the respondents, is the data privacy, which is also in line with the global empirical data showing that the issue of privacy is one of the first ones in the AI age (Kelley et al., 2023). In the West, high-profiled scandals like Facebook/Cambridge Analytica and controversy over government surveillance, including facial-recognition use in the streets, have made people more aware. Nigerian students also demonstrate sensitivity to such concerns, which might be aggravated by domestic factors like the enforcement of SIM card registration and increased coverage of CCTV cameras in cities, therefore connecting technology to privacy discourses.

The fact that 45 per cent of respondents focus on algorithmic bias indicates a high degree of awareness. This increased awareness can be the result of the extensive distribution of case studies showing AI bias, such as the misclassification of African-American faces that have gained worldwide media attention and might be what the Nigerian respondents will relate to the wider idea of racial injustice (Pasipamire & Muroyiwa, 2024). Since the issue of bias is a key topic in AI ethics literature (Hanna et al., 2025), it is reassuring that a high percentage of the potential Nigerian technology workers recognize its importance, which is a precondition that will allow correcting it. The results are also relevant to the ethical theory, since the fear of fairness expressed by the students (that is, their rejection of the idea of an algorithm) can be viewed as the intuition towards justice (deontological orientation) and, along with it, utilitarian considerations, since a biased AI leads to a negative outcome and decreases the overall well-being by making some groups of people worse off. Moreover, the strong rejection of the idea that AI is neutral or trustworthy, with only 15 per cent declaring themselves confident in the neutrality of AI, also reflects a critical skepticism that was agreeable to the overall expert opinion on the matter globally (Reinhardt, 2023).

The apprehension about losing jobs emphasizes a utilitarian and social orientation: students do not evaluate AI in an abstract form but in connections with its real effects on welfare and societal stability. The fear of automation is relatively high in high-income countries, but it is mitigated by job-evolution expectations. In Nigeria where unemployment and underemployment are high, especially among young people, this concern has an acute ethical connotation: any technology that can eliminate employment opportunities should be handled carefully, otherwise it may increase poverty. This situation may strengthen the ethical position of students that the advent of AI needs to be balanced with methods of retraining employees or establishing new positions, thus aligning with the principle of ‘*Do No Harm*’ and joining the calls to inclusive AI that can benefit everyone (Palmirotta, 2025). It is worth noting that international standards like the recommendation of UNESCO focus on the principle of diversity and inclusiveness and avoidance of adverse social effects (UNESCO, 2021), which, practically, includes the prevention of mass unemployment. Nigerian students will naturally tend to adopt this perspective by categorizing job displacement as unethical in its uncontrolled form. The current research approach has shown that Nigerian STEM students are both optimistic and cautious about artificial intelligence. Even though a significant percentage recognize AI as having the potential to influence society in a positive way, their concerns, which include data privacy, biased algorithms, replacement of jobs, misinformation and accountability are aligned with the worldwide ethical concerns. This alignment demonstrates that the ethical awareness of the Nigerian youth is not limited to the local level but rather a part of an interconnected global awareness of the dangers and duties of AI. Still, an evident gap in

their formal training became clear: most of them said that they were not taught to critically analyze AI ethics, and most of the information came through personal research or media exposure. This trend underscores the resilience and curiosity of the students and at the same time, outlines the urgency to institutionalize teaching of ethics in STEM education (Ozturk, 2025). Without these types of interventions, Nigeria runs the risk of raising a generation of technically skilled graduates lacking the ethical base to develop responsible AI.

These findings have implications on universities, policy makers and industry stakeholders. In higher education, the gap between technical abilities and ethical literacy would be closed by teaching AI ethics through applied case studies, interdisciplinary projects and ethics-oriented student projects. Regulatory bodies, such as the National Universities Commission (NUC) and the National Information Technology Development Agency (NITDA) may play a central role in imposing the ethics of AI in the accreditation requirements and aligning the country-level regulations with the world-wide standards like the Recommendation on AI Ethics by UNESCO. The culture of responsible AI development can be developed in the private sector by partnering with academic institutions, creating internal ethical review boards, and community outreach programmes. These steps, taken together, would allow not only to help Nigeria safeguard its population against the negative effects of AI but also help place the country as an example of responsible AI use in the continent. As a result, the discourse highlights a dual truth: although Nigerian STEM students are mindful of the moral imperatives of AI, the structural changes in education and policy frameworks are essential to realize the awareness of the former into the sustainable and context-based actions.

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Declarations

Ethical Approval: Ethical approval to conduct the research was sought from University of Nigeria Research Ethics Board (UNNIRB/25213B) as well as the Ethics Board in all the Universities this study was conducted. In accordance with the Nigerian Data Protection Regulation (NDPR), participants were given the electronic informed consent form through a Google Form detailing the use, storage, and their rights of the data entered.

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