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Large language models through the lens of *ubuntu* for health research in sub-Saharan Africa

Significance:

The introduction of large language models has transformed text generation and accessibility across the globe. *Ubuntu* provides a distinct philosophy that could be useful in addressing the cultural and geographical nuances within the context of sub-Saharan Africa. Existing guidelines help offer a framework to foster and nurture consistency across diverse regions and cultures. These guidelines alone may not be sufficient to address past inequalities and disparities. An inclusive approach that adopts the guidelines in tandem with *ubuntu* philosophy could help promote equitable development and sustainability of these models across the sub-Saharan region.

Ubuntu provides a distinct philosophy that could be useful in addressing the cultural and geographical nuances within sub-Saharan Africa. This philosophy offers a unique framework that could prove valuable in navigating these nuances in the sub-Saharan region. At its core, *ubuntu* emphasises interconnectedness, community-driven engagement, and sustainability. This perspective underscores the need for culturally sensitive technology solutions that honour and safeguard local traditions while promoting individual liberties and communal welfare. *Ubuntu*'s approach offers an intriguing balance between the individual and the collective. Marginalised groups must be included in a comprehensive approach. Bias in sub-Saharan Africa has deep roots in historical injustice and is further reinforced by cultural norms, religious beliefs, and practices. In this article, I elaborate on ethical concerns in the context of sub-Saharan Africa.

Introduction

The utilisation of large language models (LLMs) in deep learning has recently experienced a substantial rise. These models are extensively trained using vast amounts of textual data to create responses that mimic human speech.[1] Medical professionals and academics have also begun exploring potential applications of LLMs in their respective fields, given that a considerable portion of medical practice and research involves tasks heavily reliant on text-based materials, such as presentations, publications, and reporting.[2]

Several LLMs are presently being developed by major corporations such as ChatGPT by OpenAI, Med-PaLM-2 by Google DeepMind, BioGPT by MIT, LaMDA by Google, Sparrow by DeepMind AI, Pangu Alpha by Huawei, OPT-IML by Meta, and Megataron Turing MLG by Nvidia.[3,4] BioGPT is designed explicitly for biomedical text generation and mining and can potentially revolutionise medicine and medical research.[5] AI-powered LLM chatbots and virtual assistants can enhance patient engagement and support. Besides conducting research, these tools can offer customised health information, respond to patient enquiries, and aid in the self-management of long-term medical conditions.

Biomedical ethics is a systematic approach that considers fundamental beliefs, principles, and values to make informed decisions that benefit all parties involved. The decision-making process is guided by established theories and principles that aim to maximise the overall well-being of individuals, such as the utilitarian approach, which seeks to promote net benefits; the rights approach, which is focused on respecting people's rights and freedoms; the justice approach, which is aimed at enhancing equity; the common good approach which emphasises service to the majority; and the virtue approach which involves treating others as we would want to be treated.[6] Although Western philosophy and ethical approaches have long been dominant, there is growing interest in exploring other frameworks, such as *ubuntu* and indigenous wisdom systems, because they offer the potential for an advanced cultural understanding of ethics.[7]

Ubuntu, as a philosophy, emphasises the importance of recognising our shared humanity with others. It aligns with the universal principle of treating others as we would like to be treated ourselves, which is present in many cultures worldwide. *Ubuntu*, a southern African philosophy often translated as 'I am because we are', emphasises the importance of recognising our shared humanity with others.[8] Additionally, adopting values from sub-Saharan Africa, a region facing significant economic challenges, could have practical and symbolic advantages towards greater inclusivity and progress. Furthermore, *ubuntu*'s relational approach, which emphasises communitarianism, has practical and symbolic advantages for fostering greater inclusion of sub-Saharan Africa in artificial intelligence (AI) ethics discussions and for reaping both economic and social benefits from AI. This approach is not exclusive to Africa, but its widespread influence on numerous African subcultures and its significant role in sub-Saharan African philosophy and ethics make it particularly relevant.[9,10]

This approach offers collective decision-making (a cultural context and local engagement), humanity over machines (bias and fairness) and community trust (data privacy, security, and sovereignty). The four core bioethics principles – autonomy, beneficence, non-maleficence, and justice[6] – can inform and guide the nuanced areas of cultural context, technology–human dynamics, and trust in the digital and data-driven era.

Assessing the ethical implications of novel sub-Saharan technologies while prioritising their moral and beneficial uses, which contribute to societal well-being, requires the utmost attention.[11] LLMs have promising uses in sub-Saharan Africa; however, ethical concerns around cultural context, local engagement, bias, data security, and

sovereignty through the lens of *ubuntu* must be addressed. In this article, I elaborate on these ethical concerns in the context of sub-Saharan Africa.

Cultural context and local engagement

Sub-Saharan Africa is a diverse region with various cultural and social factors that can significantly impact the adoption and success of AI applications in health care.[12] While it is challenging to consider all these factors, it is crucial not to ignore the existing diversity. When considering this perspective, there are two sides to the debate on ethical guidelines. Universal guidelines prioritise autonomy, individual rights, and structured engagement, promoting equal treatment and opposing impartiality. From a Western viewpoint, the individual tends to be at the centre of attention; for example, upholding the principle of autonomy involves respecting an individual's decision-making abilities without undue influence or coercion.[13]

Although these guidelines are well grounded, AI ethics face challenges in resolving disparities stemming from historical disadvantage, value misalignment, and global exclusion felt by developing countries, where AI reflects Western values, agendas, and motives.[14] Most of these guidelines and recommendations are developed by stakeholders from economically developed, primarily Western regions such as the USA and the European Union.[14,15] It is essential to consider cultural context when considering generic principles, especially in post-colonial Africa, given its history of imposed external values.[16]

The power of universal principles in guiding human behaviour towards a sustainable and just future cannot be overstated. However, excluding certain groups can result in a lack of representation and failure to acknowledge diverse perspectives and experiences. By ensuring that everyone has a seat at the table, we can establish a more inclusive and equitable system that reflects the needs and aspirations of all. This approach fosters trust, understanding, and collaboration between communities and lays the foundation for a better future for everyone.[17] A one-size-fits-all approach may not adequately address these challenges; hence the importance of community participation in context-specific guidelines considering cultural values and religious practices.[18]

In the context of AI development, integrating *ubuntu* philosophy would prioritise cultural context and local community engagement. This means involving community members in the decision-making processes to ensure that AI technologies align with the values and needs of the community. Integrating *ubuntu* philosophy and Western principles in ethical frameworks, particularly in AI, can lead to a more balanced, inclusive, and culturally sensitive approach. This combination can strengthen ethical guidelines by respecting individual autonomy and community impact, promoting inclusivity by representing diverse values, and facilitating mutual learning across cultures. The Western principles provide a foundation in rights, justice, and equality, while *ubuntu* contributes a community-oriented perspective emphasising interconnectedness and communal well-being. By considering these principles, we can create an ethical framework that strengthens the implementation of AI ethics, fostering trust and support from a broader range of stakeholders while upholding individual and communal values.[12]

For instance, mental health resources in Africa are overburdened and overwhelmed.[19] With an *ubuntu*-centred approach, integrating these models could assist a wide range of tasks and alleviate the mental healthcare burden, as it offers the unique potential to complement human qualities of empathy and interpret and predict behavioural patterns.[20] This strategy could narrow the care gap without compromising the essential human touch – however, the digital gap remains a threat in Africa and this could widen inequalities in areas with limited connectivity. The recent Internet outage experienced in Africa is a stark reminder of the digital gap.[21] Public–private partnerships, including non-governmental, are crucial to ensuring that mental health resources and technologies are accessible and affordable for everyone. With sufficient regulatory, ethical, and privacy safeguards, these models serve as supplementary roles to support clinically oriented tasks. These initiatives should prioritise inclusive design practices and align with *ubuntu*'s community, dignity, and holistic well-being values. By emphasising these concepts, these models can bridge care gaps while honouring the principles of empathy, mutual support, and *ubuntu*'s community values of interconnectedness and mutual care. This approach could ensure that mental health care remains compassionate, inclusive, and practical, and reflects the core of *ubuntu* philosophy[22] in mental health and technological advancement.

Bias and fairness

Bias and fairness are critical global considerations for harms associated with LLMs in medicine and health research.[23] These models often reflect the training data which can amplify existing social inequalities. In the sub-Saharan region, colonialism has left indelible marks on its societies – this historical backdrop has implications for modern-day biases. These biases are expressed when external entities approach the region with preconceived notions and attempt to apply global standards without local context. The sub-Saharan region is home to diverse cultures, traditions, and languages; amid globalisation, the region has maintained its cultural identities. Although this rich diversity can lead to intergroup biases within the region, it also serves as a testament to the resilience and adaptability of the region.[24] Vulnerable populations, including those in low- and middle-income countries (LMICs), are susceptible to various biases due to existing social bias against minority groups, lack of technical capacity, and digital divide.[25] When addressing bias, the goal is not to achieve perfect unbiasedness – an arguably unattainable ideal – but to strive for fairness and equity in algorithmic decisions, continuously improving and adapting systems as our understanding of bias evolves. This pursuit of fairness and equity necessitates constantly improving and adapting systems as our understanding of bias evolves. Simply adding more data to data sets is not enough to eliminate algorithmic bias. We must address fundamental issues such as historical inequalities in data, biased algorithm creation and implementation, biased interpretation of results, and feedback loops that reinforce bias. A comprehensive strategy is necessary to mitigate these biases, including a thorough evaluation of data sources, inclusive and transparent algorithm development, conscientious application of algorithmic recommendations, and ongoing oversight to adapt, correct biases, and blend technical, ethical, and equitable approaches.[26] To this end, the developers of these models need to consider a collaborative approach with stakeholders from diverse backgrounds, – including policymakers, technologists, social activists, community leaders and/or members – to harness the strength and minimise potential unintended harms.

These models need to be trained with representative data that captures the richness and diversity of this region's linguistic and cultural landscape. LLMs can produce unbiased and equitable outputs which accurately reflect contemporary cultures. One such example of this would be the ability of LLMs to translate valuable information into local dialects, ensuring that even those in linguistically marginalised communities can access and benefit from it. Specific local dialects, particularly those lacking standardised orthographies or limited online representation, can be complex for these models to process accurately. There is a need to work in tandem with regional linguistic and cultural specialists, and collaborative efforts can refine and adjust LLMs to better account for these subtleties. To enhance their visibility, promoting the digital representation and documentation of these languages is crucial.

Using LLMs in this region should go beyond mere task completion. Hence, emphasising the *ubuntu* philosophy of holistic well-being, LLMs can serve as platforms to celebrate and disseminate local traditions, tales, and languages. These models can also bridge generational gaps, helping the youth connect with age-old traditions and histories. In addition, it is crucial to note that fairness can vary depending on cultural, social, and historical contexts. Therefore, by adopting a more comprehensive approach, AI systems can better navigate the complexities of fairness and avoid unintended consequences that reinforce existing biases.[27] This approach would involve incorporating a broader range of factors and perspectives into the design and evaluation of AI systems, ensuring that they are sensitive to the diverse needs and values of the communities they serve.

Data privacy, security, sovereignty, and sustainability

The development and deployment of technology, specifically LLMs and other AI systems, require the consideration of four interconnected pillars: data privacy, security, sovereignty, and sustainability. These pillars are crucial in ensuring responsible and ethical practices are maintained in the technical domain. The sub-Saharan African region encounters distinct data privacy and security challenges stemming from limited resources and inadequate infrastructure.[28] A key component of data sovereignty and ownership is maintaining control over data generated within sub-Saharan African nations and their citizens' data. This level of security requires abiding by data protection laws that prioritise protecting individual privacy and outline the responsibilities of those in charge of data. Careful management of cross-border data transfers is also necessary to balance the benefits of data sharing with privacy concerns. It is imperative to balance data sharing and privacy to ensure responsible use and safeguard citizens' privacy.

The primary goals of data sovereignty and ownership are to maintain control over data, protect citizens' privacy, and responsibly harness the benefits of data and AI technologies for the region's development. Achieving these objectives requires striking a balance between protecting national interests, promoting local innovation, and fostering global cooperation in data governance.

Ensuring data privacy, security, and sovereignty of information is of the utmost importance in the digital age – because these models rely on large amounts of data, it is an imperative to maintain trust and protect individual rights by safeguarding this information. However, beyond these points, reducing the carbon footprints and investing in renewable energy sources would help mitigate the environmental impact of these tools, as sustainability of the environment is crucial.[24] Integrating *ubuntu* and universal principles provides a critical balance for developers and users to foster socially and environmentally responsible technologies. Developers should think beyond these models and develop technologies that are sustainable and efficient while at the same time enhance privacy and security. Furthermore, these interconnected pillars should be central to regulatory and government agencies when developing regulatory frameworks.

In conclusion, to ensure the ethical and responsible development and deployment of AI technologies in health care in sub-Saharan Africa, it is important to adopt a flexible approach that combines universal ethical principles[25] with the region's specific cultural and social context. While a universal guideline can prevent biases and discrimination[26], there is a need for empirical research to address ethical nuances in LLMs across all disciplines. Considering these unique challenges among countries and communities in the region would be critical. An inclusive approach that promotes *ubuntu* core values is crucial to promote equitable development and sustainability of AI systems and to ensure that the region unlocks AI's full potential while respecting and preserving its diverse cultural heritage.

Competing interests

I have no competing interests to declare.

References

1. Li H, Moon JT, Purkayastha S, Celi LA, Trivedi H, Gichoya JW. Ethics of large language models in medicine and medical research. Lancet Digit Health. 2023;5(6):e333–e335. https://doi.org/10.1016/S2589-7500(23)00083-3
2. Topol EJ. High-performance medicine: The convergence of human and artificial intelligence. Nat Med. 2019;25(1):44–56. https://doi.org/10.1038/s41591-018-0300-7
3. Topol EJ. As artificial intelligence goes multimodal, medical applications multiply. Science. 2023;381(6663), eadk6139. https://doi.org/10.1126/science.adk6139
4. Cacciamani GE, Eppler MB, Ganjavi C, Pekan A, Biedermann B, Collins GS, et al. Development of the ChatGPT, generative artificial intelligence and natural large language models for accountable reporting and use (CANGARU) guidelines [preprint]. arXiv. 2023;arXiv:2307.08974v1. https://doi.org/10.48550/arXiv.2307.08974
5. Luo R, Sun L, Xia Y, Qin T, Zhang S, Poon H, et al. BioGPT: Generative pre-trained transformer for biomedical text generation and mining. Brief Bioinform. 2022;23(6), bbac409. https://doi.org/10.1093/bib/bbac409
6. Beauchamp JF, Childress TL. Principles of biomedical ethics. 8th ed. New York: Oxford University Press; 2019.
7. Kholopa C. The Interplay of ubuntu and hospitality as defining tenets in African and South African ethics: A Christian ethics reflection. Glob J Hum Soc Sci. 2022;22(C2):23–33. Available from: https://socialscienceresearch.org/index.php/GJHSS/article/view/4021
8. Teffo LJ. The concept of Ubuntu as a coherent moral value. Pretoria: Ubuntu School of Philosophy; 1994.
9. Eze MO. What is African communitarianism? Against consensus as a regulative ideal. S Afr J Philos. 2008;27(4):386–399. https://doi.org/10.4314/sajpem.v27i4.31526
10. Gade CBN. What is ubuntu? Different interpretations among South Africans of African descent. S Afr J Philos. 2012;31(3):484–503. https://doi.org/10.1080/02580136.2012.10751789
11. Dave T, Athaluri SA, Singh S. ChatGPT in medicine: An overview of its applications, advantages, limitations, future prospects, and ethical considerations. Front Artif Intell. 2023;6. https://doi.org/10.3389/frai.2023.1169595
12. Owoyemi A, Owoyemi J, Osiyemi A, Boyd A. Artificial intelligence for healthcare in Africa. Front Digit Health. 2020;2. https://doi.org/10.3389/fdgth.2020.00006
13. Genuis QIT. A genealogy of autonomy: Freedom, paternalism, and the future of the doctor-patient relationship. J Med Philos. 2021;46(3):330–349. https://doi.org/10.1093/jmp/jhab004
14. Roche C, Wall PJ, Lewis D. Ethics and diversity in artificial intelligence policies, strategies and initiatives. AI Ethics. 2023;3(4):1095–1115. https://doi.org/10.1007/s43681-022-00218-9
15. Corrêa NK, Galvão C, Santos JW, Del Pino C, Pinto EP, Barbosa C, et al. Worldwide AI ethics: A review of 200 guidelines and recommendations for AI governance. Patterns. 2023;4(10), Art. #100857. https://doi.org/10.1016/j.patter.2023.100857
16. Carman M, Rosman B. Applying a principle of explicability to AI research in Africa: Should we do it? Ethics Inf Technol. 2021;23(2):107–117. https://doi.org/10.1007/s10676-020-09534-2
17. Dempsey N, Bramley G, Power S, Brown C. The social dimension of sustainable development: Defining urban social sustainability. Sustain Dev. 2011;19(5):289–300. https://doi.org/10.1002/sd.417
18. Upadhyay N, Upadhyay S, Dwivedi YK. Theorizing artificial intelligence acceptance and digital entrepreneurship model. Int J Entrep Behav Res. 2022;28(5):1138–1166. https://doi.org/10.1108/IJEBR-01-2021-0052
19. Baker N, Naidu K. The challenges faced by mental health care users in a primary care setting: A qualitative study. Community Ment Health J. 2021;57(2):285–293. https://doi.org/10.1007/s10597-020-00647-y
20. Bila N. UP expert opinion: Ubuntu as a solution to mental illness challenges [webpage on the Internet]. c2024 [cited 2024 Mar 04]. Available from: https://www.up.ac.za/news/post_3210600-op-ed-ubuntu-as-a-solution-to-mental-illness-challenges
21. Auerbach Jahajeeah J. Undersea cables for Africa's internet retrace history and leave digital gaps as they connect continents. The Conversation Africa. 2024 March 15. Available from: https://theconversation.com/undersea-cables-for-africas-internet-retrace-history-and-leave-digital-gaps-as-they-connect-continents-225912
22. Edwards S, Makunga N, Ngcobo S, Dhlomo M. Ubuntu: A cultural method of mental health promotion. Int J Ment Health Promot. 2004;6(4):17–22. https://doi.org/10.1080/14623730.2004.9721940
23. Obasa AE, Palk AC. Responsible application of artificial intelligence in health care. S Afr J Sci. 2023;119(5/6), Art. #14889. https://doi.org/10.17159/sajs.2023/14889
24. Matemba Y. Decolonising religious education in sub-Saharan Africa through the prism of anticolonialism: A conceptual proposition. Br J Relig Educ. 2021;43(1):33–45. https://doi.org/10.1080/01416200.2020.1816529

25. Tiffin N, George A, LeFevre AE. How to use relevant data for maximal benefit with minimal risk: Digital health data governance to protect vulnerable populations in low-income and middle-income countries. BMJ Glob Health. 2019;4(2), e001395. https://doi.org/10.1136/bmjgh-2019-001395

26. Chen P, Wu L, Wang L. AI fairness in data management and analytics: A review on challenges, methodologies and applications. Appl Sci. 2023;13(18), Art. #10258. https://doi.org/10.3390/app131810258

27. Mikalef P, Conboy K, Lundström JE, Popovič A. Thinking responsibly about responsible AI and 'the dark side' of AI. Eur J Inform Syst. 2022;31(3):257–268. https://doi.org/10.1080/0960085X.2022.2026621

28. Kuteyi D, Winkler H. Logistics challenges in sub-Saharan Africa and opportunities for digitalization. Sustainability. 2022;14(4), Art. #2399. https://doi.org/10.3390/su14042399