

Re-imagining Artificial Intelligence on the African continent

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December 2023

Abstract

The impact of artificial intelligence on Africa must be carefully considered as it spreads throughout the world. Therefore, this essay takes the time to present some potential solutions for issues regarding Africa as a continent, women in Africa, and people living with disabilities in relation to AI. These include investing more in gender research, encouraging women to participate in all stages of the AI development process, increasing the number of research labs and institutes dedicated to AI research, and developing more diverse data sets that contain information on both women and people with disabilities.

Introduction

Decades from now, if all goes according to plan, autonomous electric vehicles will rule the streets of Africa, reducing carbon emissions on the continent; automatic sign language translators will ensure that the deaf African is no longer excluded from virtual meetings; and plant diseases on the African continent will be detected by the farmer with a single shutter of the camera on a smartphone, giving the rest of humanity more time to focus on what really matters.

When I look at the state of artificial intelligence in Africa, I see a desert characterized by a lack of innovation in AI rather than a jungle overflowing with life and opportunities in AI. From this point, it may be difficult to envisage the AI utopia outlined above, with concerns whirling around in the distance about whether it is conceivable for an Africa wrecked by so much political instability, poverty, and lack of access to technology. My answer to this question is “yes”. I do believe that AI can reach such a level in Africa; however, it would require a considerable amount of effort from Africa and African governments.

The second, and most pressing, concern is how and whether we can achieve this level without harming marginalized groups, particularly women and people with disabilities. In this essay, I explore this question while examining how AI has been used to perpetuate bias and discrimination towards the African continent, women in Africa, and individuals living with disabilities in Africa. I also discuss solutions to these difficulties, first steps which will help us take us toward the AI future that Africa deserves.

Problems of AI on the African continent

One of the most pressing concerns in Africa relates to the wide use of foreign AI. Even though more and more African developers are creating solutions that fit Africa, these solutions still feel like a drop in the ocean compared to the myriad of foreign AI tools widely available on the market. Examples of these AI tools include self-driving automobiles, personal assistants like Google Assistant, and, more recently, ChatGPT. The proliferation of these tools on the market, unsurprisingly, has had some consequences since these solutions do not work well for Africans. For an Africa definitely no stranger to foreign solutions not working in Africa, the

reason is clear: most of these solutions were not developed with the African or even persons of colour in mind. Therefore, unsurprisingly, they do not work. There have been countless examples of solutions unable to recognize cancer on dark skin or even facial recognition software that completely fails on darker skin. However, an example that springs to mind is from personal experience. On Twitter, I noticed that abusive comments and cyberbullying written in English are mostly hidden from the user or tagged as abusive content. However, an abusive statement written in a local Ghanaian language goes unchecked. This exposes Africans online to abuse and bullying that their western counterparts may be protected from - and illustrates the plight of an African using a tool from a world that does not think about them.

Another problem pertaining to AI in Africa is the lack of quality datasets for machine learning and AI purposes. On the African continent, there is some local data. However, most of these datasets were not collected for machine learning purposes and are most likely in incorrect formats. This is important because the data acquired to be used for a machine learning goal must be deliberate, containing all the necessary independent variables that influence the precise variable that the researcher or developer wishes to predict. The reasons for this shortage are diverse. According to Oyindamola Johnson in her article titled '*Challenges of Access to Data in Africa: A Two-Way Conversation*', the lack of data in developing countries is due to issues such as a lack of attention to research, poor infrastructure, a lack of funding, and a lack of centralized data banks. Even when data is collected, it is usually poorly sourced and classified, as well as filled with human bias and mistakes from using analog and outdated data collection methods. At other times, the data is collected by national agencies and global NGOs, which do not make the raw data public but only their own truncated analyses. The dearth of large enough datasets has caused some labs to embark on data collection processes to collect the data they need. Researchers in Africa are also often not inclined to share their collected data, as data collection is often tedious, time-consuming, or expensive. For developers that cannot afford to properly go searching and collecting data to develop solutions for Africa, they resort to using foreign datasets that may or may not capture the cultural environment in Africa.

Problems of AI on African women

AI has also been used to perpetuate harmful stereotypes about women. As society progresses, it aims to eliminate practices and ideas that are not beneficial. Nonetheless, some of these unconscious biases stay with us, seep into our creativity, and taint the solutions we create. An example of this is the fact that most customer service chatbots in Africa are coded as female, or at the very least feminine. In a case study conducted in Nigeria by Borokini et al. in 2023, it was found that out of 10 banks that had deployed chatbots, 7 of them were female-gendered on account of their names, avatars, and descriptors.

In a UNESCO report, *'I'd Blush if I Could'*, UNESCO detailed the potential negative impacts of chatbots on society's perceptions of gender. According to the paper, the spread of female-gendered conversational agents was driven mostly by customer choice and a non-critical assessment of product development decisions by product teams, all of which could entrench and perpetuate biases against women today. Long-standing social prejudices and assumptions about women may also have informed the creation and building of female-gendered chat bots, which in turn may continue and cement perceptions about social norms about women's capacity and nature. For instance, women have long been associated with servile or submissive roles; therefore, the use of female or feminine attributes on chatbots further and unconsciously promotes this bias. Such a gendered categorization of women may not only reinforce gender stereotypes but may also further sexualize women as female chat bots may be utilized to attract more consumers or increase an institution's profit through their soft, feminine voices and appearance. (Borokini et al., 2023) This raises questions concerning how ethical the practice is and how it may contribute to the disempowerment of women.

Another problem with AI that affects women on the African continent concerns the bias in the datasets that are available. Due to a violently misogynistic and sexist past, resulting in a lack of access to economic products and technology for African women, data collected may feature a gross overrepresentation or underrepresentation of women. Because AI is not neutral, if caution is not taken, it can reflect biases present in a given environment, including those related to race, gender, and sexual orientation. (Belenguer, 2022) This implies that any AI solution developed using a biased dataset will only have negative effects on women. Additionally, the designed solution may not precisely address their needs. A case study

conducted by Shamira Ahmed in her 2021 paper 'A Gender Perspective on the Use of Artificial Intelligence in the African FinTech Ecosystem: Case Studies from South Africa, Kenya, Nigeria, and Ghana', reveals that women are generally overrepresented in the underserved population in terms of bank account use and access, due to the lack of access in the past and therefore perpetuating a perfidious cycle of exclusion; women are also more likely to be without a smartphone and/or mobile internet access for the same reason. Therefore, solutions developed using these types of datasets will not work for women and illustrate the effects of heavily skewed and biased data on women in Africa.

Some other types of harm that AI may cause may come in more shocking and deliberate ways. One of these ways is through the popularization of image generation AI and DeepFakes. In late 2017, an anonymous individual using the alias "deepfakes" posted explicit videos to a social news website and forum on Reddit, claiming to be Taylor Swift, Scarlett Johansson, Aubrey Plaza, Gal Gadot, and Maisie Williams. (Gardiner, 2019) In a continent that is plagued by misogyny and has a high incidence of image-based sexual assault, this seems concerning, as it has become easier to generate fake but realistic-looking suggestive photos of real women. While there are many ways that videos and other content can be changed to falsely depict people and events, DeepFake technology is especially dangerous because it allows users to produce realistic images of the highest caliber and edit video and audio realistically. This is a new form of sexual harassment that takes power away from women to control their own sexual identity and is intended to humiliate and devalue a person. In the 2020 paper 'Deepfakes and Domestic Violence: Perpetrating Intimate Partner Abuse Using Video Technology', by Kweillin T. Lucas, it is also noted that deepfake technology can pose a significant risk for victims of domestic violence as perpetrators can use this form of image-based sexual assault to continue abusing their victims. This has caused many women to have some anxiety about posting pictures on the internet and has painted AI in a bad light for most of them.

Problems of AI on people living with disability

Another problem with AI in Africa that hinders its goal of being beneficial for all concerns the treatment of the disabled. Even though more scientists are creating solutions for the disabled in Africa, especially in the health domain, AI is still discriminating against the disabled in a more insidious way.(Whittaker et al., 2019) There is not much research into the

negative impacts of local AI on the disabled in Africa, yet despite this, a case can still be made that as foreign AI tools infiltrate Africa due to their ease of use and availability, firms in Africa start using some of these foreign tools that have some discriminatory bias against people living with disabilities. Furthermore, the same biases explored in the following paragraphs may be perpetrated by our very own AI in the future as the societal attitude toward disability in Africa is still extremely negative.

One example of how AI may negatively affect the disabled in Africa is through a job screening application that incorporates AI. Systematic bias can arise if the data used to train a model contains human decisions that are biased, and the bias is passed on to the learned model. For example, if recruiters continually reject applications from students with disabilities, a model trained on that data will repeat the same behavior. (Trewin, 2019) A scarier example may be in the case of HireVue, a virtual interview software application. According to experts, this AI software uses a candidate's tone of voice, gestures, and facial expressions to determine whether they are a good fit. These criteria are also areas of weakness and divergence related to neurodivergent disorders, including Tourette syndrome and autism spectrum disorder. (Moss,2021) Therefore, for job applicants who have these characteristics, the odds are already stacked against them.

One reason why discrimination against the disabled is so high in AI algorithms is due to a lack of diversity in datasets. Nakamura offers an example of AI not being able to understand the words of a speech-impaired person as being seen as normal, as other humans are also not able to do the same. However, misrecognition of disabled people can have serious consequences. This would include wheelchair users being run over by car drivers who do not recognize them as humans a problem embedded in the datasets used to train automobile vision systems. (Nakamura, 2019). This is the way continuous bias shows up in AI to discriminate against the disabled.

Protection of Africa as a continent

No matter how difficult these issues appear to be, humans always seem to manage to overcome the challenges.. I am confident that this will be the case with the challenges that we confront with AI on the African continent. At this point, one of the most important

problems to solve concerns the lack of access to good-quality datasets. The establishment of robust, modern national statistical systems capable of properly collecting and preserving critical data requires governments to increase funding for national statistical agencies. (Research ICT Africa, 2020) Also, as a means of fostering togetherness toward common goals, research labs and institutions should make their raw datasets publicly available by publishing them in open-access journals. This will speed up the development of AI and solutions that reflect and benefit Africa as a whole. Moreover, proper data collection methods should be used when collecting data on the African continent to ensure the integrity of the collected data using the help of subject matter experts when necessary. Finally, tech solutions should always add a data collection layer to their function in a way that protects the individual users' rights to privacy.

Furthermore, addressing the scarcity of high-quality datasets will almost certainly alleviate the challenges associated with the popularity of foreign AI technologies. This is because more developers will be motivated to create AI solutions as they will have access to more data to create tools that are appropriate for the continent. To fight the prevalence of foreign AI, countries are being urged to promote STEM education and increase financing for AI research centers. This will provide scientists with the resources they need to develop the best solutions.

African women

To not only protect but empower women and tackle gender bias existing in data, governments and policymakers are urged to invest more in gender research so we have more insight into how everything affects people of all genders and from all walks of life. Universities and labs should receive funding and grants to pursue gender-related research. This includes research on the potential for AI to enable the transcendence of gender identities and ways to mitigate gender discrimination. Gender studies and how gender influences life on the African continent are not widely studied. This contributes to our lack of precise knowledge of how sexist or ableist our data is, and our lack of answers to gender-related issues relevant to our region. I think Africa should be looking in this direction since relying entirely on international gender research to guide domestic policy could result in poor choices, wrong priorities, and ineffective initiatives. While some of the findings from studies conducted in the Global North may be applicable in Africa, the distributions of gender

and power there may differ. (Research ICT Africa, 2020) Governments are also encouraged to support the collection of gender-disaggregated data. Gender-disaggregated data is any data on individuals broken down by sex and collected and tabulated separately for men and women. These types of datasets usually allow for the measurement of differences between women and men on various social and economic grounds.

Last but not least, we should be concerned about and think critically about all our choices and ideas during every stage of the development of AI solutions and assess whether our decisions are a result of unconscious bias or not. A way to ensure this is to encourage the inclusion of women at all stages of an AI solution's development. History has shown that society views men as the default, and thus when solutions are built, other types of people are not necessarily considered. Therefore, a team that is completely male signals that the solutions built will mostly cater to men. An example is the predominance of female voice assistants, which may lie in the fact that they are designed by workforces that are overwhelmingly male, and weren't enough women to talk about how offensive creating female voice assistants might be. In the end, the unconscious bias the men held prevailed. Even during the deployment stages, women should be included, and developers must continuously assess the quality of their solutions for women and historically marginalized groups. This may take a long time, as women are usually discouraged from getting into STEM. However, as a starting point, it would be beneficial to developers of AI solutions at all levels to be educated and responsive to women's issues and the effects decisions in the lab or in product development have on them.

People living with disabilities

The best and most effective place to start the fight against discrimination against persons living with disabilities is through including nondiscrimination throughout the AI development process. It would be beneficial for creators of AI solutions at all levels to become informed about disabilities, acquire a sense of empathy for those who live with them, and take these individuals' needs into account. It would also be beneficial to encourage research into how the typical African is affected by disability and whether the solutions we develop cater to them. Additionally, much like with the problems with women, it is crucial that the researchers continually evaluate the caliber of their work with people with disabilities. Because a significant section of the population is impaired, even if this may be challenging

as disabled individuals are not a homogeneous group, it is worthwhile to pursue. Instead of creating barriers that prevent disabled people from gaining employment, we should find a way to get them into teams at all levels of the AI development phase. Additionally, developers should use existing techniques to test for bias and mitigate bias throughout the machine learning pipeline.(Trewin,2019) Data on people living with disabilities should be included in data collection processes to ensure that machine learning algorithms learn to recognize and cater to people living with disabilities. Through these measures, Africa can start to win the war against inequalities against people with disabilities.

The goal of this essay was to identify AI challenges affecting Africa and marginalized African people and examine potential solutions to these problems. Some of these solutions include investing more in gender research, encouraging women to participate in all stages of the AI development process, increasing the number of research labs and institutes dedicated to artificial intelligence research, and developing more diverse data sets that contain information on women and people with disabilities. Based on the analysis provided, Africa has reason to be optimistic. However, achieving the vision we imagine necessitates a concerted and purposeful effort.

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Biography

Rachel Yayra Adjoe is a Research Assistant at the Responsible Artificial Intelligence Laboratory (RAIL) in Ghana. She holds a Bachelor's Degree in Electrical and Electronics Engineering from KNUST. She is proficient in Python and Javascript and enjoys using her skills to contribute to the exciting technological advances that occur every day at RAIL, KNUST. Rachel is particularly interested in computer vision, electric vehicles, and recommender systems, and she enjoys building them.

