Preparing Ghana for the Artificial Intelligence Ghanaians Want

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> … we're excited to combine our research interests in AI and machine learning and our experience in Africa to push the boundaries of AI while solving challenges in areas such as healthcare, agriculture, and education.
>
> ---Jeff Dean announcing Google's AI research center in Ghana, 2018.

> … investing in private- and public-sector workforces and building joined-up data systems will unlock the potential …and allow Ghana and our African neighbors to be in control of our own success.
>
> --Mahamudu Bawumia, vice-president of Ghana and head of the government's Economic Management Team. June 1, 2023.

The above two quotes, one from Google senior vice president Jeff Dean in 2018, when Google opened their offices in Ghana, and one from Ghana's vice president, Mahamadu Bawumia from June 2023, present similarly optimistic views of bringing AI technology to Ghana. Jeff Dean promises investment in healthcare, agriculture, and education, while Bawumia asserts that with enough investment from the tech industry Ghanaians and all Africans will increase their national well-being. Both appear confident that Ghana's development challenges can be addressed through artificial intelligence, but the question persists: *how much* and *which* AI does Ghana need when its challenges remain largely infrastructural? What kind of AI does Ghana need in healthcare, agriculture, and education when there are still not enough hospitals, roads, and schools? Many of the innovations from tech corporations in the Global North envision products of no immediate use to Africans. What would we do with generative models in classrooms when we still need more classrooms and teachers? Why would we need autonomous vehicles when many of our roads remain unpaved? Both questions show that too often the Global North wants to test their technologies on our populations and gather our data, while offering these in the guise of philanthropy. What we need is investment in infrastructure, which has historically been uneven, from the Chinese with their Belt and Road initiative to Americans who have claimed they want to provide the "last mile" of Internet connectivity when in fact the "first mile" remains still unreliable. This paper interviews Ghanaians who work in tech and considers the kinds of infrastructural investments that help Ghana and enable our participation in building algorithms we want that will serve Ghanaians.

AI Scramble for Africa

Over the past few decades, big tech and AI companies have sought to expand their services to the African continent. As they race for the continent envisioning themselves as charitably relieving "suffering" (Associated Press, 2023) or "bridging the digital divide" and "including Africa" (CNN, 2023) their rhetoric mirrors our own aspirations for development. Indeed, we hope to "bridge the digital divide" (Karar, 2019, Ofori-Atta & Owusu-Ekuful, 2022). Our NGOs like the Africa Digital Rights Hub state their purpose as to "ensure that Africans are not left behind," (Africa Digital Rights Hub, 2023) and African conferences strategize on how to bring Africa into the "4th Industrial AI revolution," (Kuzub, 2023). The

issue remains how well the goals of Big Tech can align with ours, especially with respect to our data and development. Africa possesses a vast amount of untapped data, including agricultural, healthcare, and financial data, which can be harnessed to develop AI-powered applications and services. This data fuels predictive algorithms and decision-making in various domains, driving economic growth and development for those who own the technology. As quoted above, Mahamudu Bawumia, vice-president of Ghana and head of the government's Economic Management, is eager to monetize that data in exchange for investment in infrastructure (Bawumia, 2023). We also hope to monetize data while building our own technologies.

Ghana's Attractions for the Global North

Most of all, Ghana, as our interviews show, has a young, fast-growing eager population for investment and to participate in the rapidly growing local tech industry. Our advantage of youthful demographics, combined with the increasing local talent base (Ghanaweb, 2023), has created a fertile ground for the development and adoption of AI technologies. The Republic of Ghana is located on the western coast of Africa, bounded to the north by Burkina Faso, to the east by Togo, the west by Cote d'Ivoire, and to the south by the Atlantic Ocean. Spanning an area of approximately 238,535 square kilometers, this country is home to over 30 million Ghanaians. Ghana was the first Sub-Saharan African country to gain independence in 1957. Ghana's official languages are English and French, though there are over 80 spoken languages. With a rich history, diverse culture, and breathtaking landscapes, Ghana has emerged as one of the continent's most promising nations for investment (BBC, 2023). Until its current downturn, Ghana's economy was the fastest growing economy in the world in 2019 with a focus on agriculture, mining, and services (Fröhlich, 2019). The country is Africa's leading producer of gold, 2nd leading producer of cocoa in the world, and a major exporter of oil, and timber, contributing significantly to its economic growth (Goosen, 2022).

According to UNESCO, Ghana has one of the highest literacy rates in West Africa, with an estimated 80.38% of the population being able to read and write (World Bank, 2022). According to the World Bank, Ghana's under-five mortality rate declined from 80 deaths per 1,000 live births in 2006 to 39 deaths per 1,000 live births in 2017. Ghana's technology industry has also seen significant growth in recent years, with the emergence of several tech

startups and the establishment of innovation hubs such as the Meltwater Entrepreneurial School of Technology (MEST) and the Ghana Tech Lab. In 2019, Ghana was ranked 4th in Africa in terms of tech startup funding, with over $56 million raised by Ghanaian startups. The government has also launched several initiatives to support the growth of the tech industry, such as the Ghana Innovation Hub and the National Digital Addressing System. In addition, Ghana has also made significant progress in improving its infrastructure, such as the expansion of its road network and the construction of new airports. Its new Pokuase Interchange is the largest 4 tier interchange in West Africa, and the 2nd largest on the whole continent, and the Kotoka International Airport the best airport by size and region on the continent (Awal, 2022).

Political Stability and Democracy in Ghana

The country's political environment and strategic location makes it an attractive destination for foreign investors. Indeed, Ghana enjoys a vibrant civil society that has long maintained a balance of power between the people and the state (Towah, 2023). Since independence Ghana has had four constitutional republics: 1960–1966, 1969–1972, 1979–1981 and 1992–present. The current Fourth Republic retains stability due to its constitution that political scientists view as “robust and revisable,” (Sefa-Nyarko, 2022). However attractive our stability, foreign interest has not always led to long term investment. For example, in 2019 Twitter, now X, moved to Ghana because the corporation saw the country as a champion of democracy and a supporter of free speech, online freedom, and the open internet. Yet, three years later, Twitter fired most of its employees in its Ghana office shortly after Elon Musk purchased the company (Ogbonna, 2022). Such examples show that “instability” is not merely an African political and economic characteristic, but rather also a prime factor in Big Tech corporations as well.

A better outcome thus far has been the case of Google AI, which opened its Africa office in Accra in 2018 with ambitions to build its African markets and monetize data from the continent. One major project has been broadening its natural language processing capabilities by adding African language data to their properties. As Google purchases Ghanaian language datasets, it promises Ghanaians better, more efficient, and accurate translation systems for their consumers, as well as expertise in building datasets for development. These opportunities

come at the price that Google now owns all the cultural property that its data workers have provided with their language skills and original source material. Such an exchange is also present in Google's other projects using machine learning to tackle food security, disaster management, remote sensing, and infrastructure planning (Matias, 2023). Mapping buildings in remote locations for the purpose of building infrastructure reveals a similar tradeoff. Google launched the Open Buildings dataset project, which combines AI with satellite imagery to pinpoint the location of buildings. This project offers governments and non-profit organizations insight into locations that require assistance, while also serving surveillance interests. Locust prediction presents another example of Google's technologies that help Ghanaians at a cost for loss of data and increase of surveillance. Collaborating with InstaDeep, an AI-product-focused company, and the United Nations Food and Agriculture Organization (FAO), the Google AI in Ghana is working to predict locust outbreaks and enable farmers to implement control measures. Similarly, Google's Flood Hub platform displays the forecasts up to seven days in advance, with detailed inundation maps to help locals prepare.

The Interviews

Through email surveys and our visit to this year's Deep Learning Indaba in Accra on September 3-9, 2023, we interviewed 191 young Ghanaians students and tech professionals, 37 who are currently studying or studied in Ghana, 112 in the United States and 62 outside of Ghana and the United States. 95% of interviewees expressed optimism, adding such statements as "we need more investment in our own products" and "Big Tech improves Ghana's profile as worthy of investment," and 87% hoped for employment in these corporations, but 80% remained cautious about Big Tech investment in Ghana. Most echoed Dr. Paul Azunre's perspective which he delineates in his interview in this volume as well, acknowledging the "double-edged sword" of tech investment which can help build the infrastructure and attract investment, while also eclipsing interest in local work, which is often much better because it is closer to the data (see also Azunre, 2021). In addition to overshadowing Ghanaian tech, Big Tech remains extractive both in the terms it sets for investment, which usually means it owns the data, and the choices it makes with it. At the Indaba, we spoke with several young Ghanaians who expressed the need for backup plans for African startups collecting large datasets should they run out of funding– which often happens. Such a plan for the data would ensure Ghanaians retain their sovereignty

over whatever data the startup collected. Very few Ghanaians claimed they wanted to stay in Ghana in its current financial situation. Rather, 85% said they could only be persuaded to stay if they worked for Big Tech in Ghana or a Big Tech funded start-up. Arafat Mohammed, who has a BS and MS in Computer Science from Stanford, currently works as a machine learning engineer for Meta on the Instagram Stories ranking team. For now, Mohammed chooses to stay in New York City for all the "culture, food, and fashion," but he could work in Ghana if there were the right role and opportunities for him there.

Opportunities are key, because machine learning and development that are appropriate for Ghana look very different from culture in metropolises of the Global North. An interview with Abib Duut, laboratory research scientist at The Francis Crick Institute in London affirms the dominant Ghanaian optimism of our interviewees sparked the curiosity of African youth about coding; "today, more Africans are enrolling in more STEM-related courses than in the last decade, and the numbers are also increasing for girls too." See also Duut's important work with Ghanaian youth in Torgbor et al. 2016). He also offers a measured look at what types of AI might be most helpful:

> Away from the fluff of what AI is, it is evident one does not need Alpha Fold-like models or ChatGPT-like models to make use of AI. This ties in with other issues like power constraints, given the challenges with power in Africa. However, as it has been evidenced, one does not need spectacular models to use AI. In fact, much of AI can be reduced to basic models that can be sustained in Africa.

Ghanaians' Wishes and Wants

As the Ghanaian people gain more technical skills and knowledge of the AI industry it is important for us to negotiate for better terms that allow us greater sovereignty over our data and our technologies. Most importantly, we must be included in the process of development so that Ghanaians gain the skills to sustain and further develop this technology. Ghana has a long history of foreign investment that has failed to equip Ghanaians with such abilities. For example, China's long standing investment in Ghana works on a system of exchange of resources for infrastructure. Such engagement in the energy sector has enabled China to build the Bui Dam, the Atuabo Gas project in exchange for oil, cocoa and other resources. Chinese

workers have also come to live in Ghana and better understand our needs on the ground and culture. However, for each of these projects, China's efforts to maintain financial expediency also cost our workers an opportunity to gain skills and positions of management, since the Chinese brought in their own skilled workforce (Odoom, 2017). Looking forward to the AI development experience in Ghana, we hope to gain better terms in exchange for our data resources so that Ghanaians can benefit from training and claim the organizational hierarchies into positions of decision-making power for our nation.

Such participation in AI projects allows us to communicate to corporations which of their technologies improve the lives of Ghanaians and which remain outside of our priorities no matter how attractive they are to the Global North. Infrastructure remains our greatest need and Ghanaians know which areas remain most critical for us. Despite all its economic gains over the past decade, there are still 15 percent of Ghanaians without access to electricity in the country (Sasu, 2023). For the rest of the population that does, electricity continues to be unstable with persistent load shedding across different cities and towns. Moreover, 20 percent of the Ghanaian population still has no access to basic healthcare, and those of us who do, struggle with inadequate healthcare facilities. We still have to walk or bike miles in order to receive medical treatment or even deliver a baby. Only about 27% of roads in the country are paved and the rest in dilapidated states (*Ministry of Roads & Highways,* 2023). These conditions make transportation of goods and services in the country difficult, affecting the jobs of the thousands of sellers in the country. The bad roads also cause delays in transportation of food from the farms to the cities or places of demand, resulting in a lot of post harvest losses which deeply affects the 24% of the citizens below the national poverty index (*Ghana: World Food Programme* 2023). Moreover, the Global South is facing significant effects of climate change which affects the cultivation and growth of crops. Most of the crops cultivated die due to low rainfall in times when there is supposed to be a lot of rain, and vice versa (Acheampong, 2022). Aside from all of these challenges, Ghana also lacks a lot of infrastructure geared towards manufacturing and processing of resources (Acheampong, 2022). As Ghana continues to recover from the extractive experience of colonialism, we need to modernize our infrastructures and look to the Global North for approaches to development that we can modify to serve our needs.

Negotiating What Ghanaians Want and How AI can help

In order for Ghana to benefit from AI, it also has to set up its data infrastructure (Ruwoko, 2022). Alongside initiatives like the Ghana card, and GPS address for every household program (JoyNews, 2021), Ghanaians still need a specific ministry to manage data and develop a robust regulatory framework to govern AI and the use of data to ensure that the people, their data, and unique cultures are both secured and preserved. There remain masses of raw, uncensored data in the country at risk of data exploitation.

AI in Ghanaian Agriculture

Ghana experiences a lot of post harvest losses due to lots of crop infestations and climate weather patterns. Modern AI tools help farmers monitor their crops and identify any crop or pest infestation and propose ways of curbing them. There are a plethora of AgriTech startups and organizations researching and experimenting different innovative ways to reduce post harvest losses in the country and it would be amazing if these companies could partner with them to brainstorm new ideas or implement what they already have. Just like Google AI lab has partnered with farmers in Tanzania to create a machine-learning application to diagnose early stages of cassava plant diseases to provide food for over 500 million Tanzanians (Arakpogun, Elsahn, Olan, & Elsahn, 2021).

AI in infrastructural development

Majority of the few crops obtained after all the post harvest losses are left to rot when they hit the feeder roads to be transported to the cities and towns where they would be sold and consumed. Poor road conditions disrupt transport farm produce. Journeys that are supposed to take a few days end up a week and sometimes months long. This leaves the helpless farmers poor while hindering the transportation of food to the cities, making groceries unaffordable for the majority population which is low-income. AI can be employed to help the government decide where to build the most ideal feeder roads, whether paved or not, and how to navigate which vehicles would be optimal for which routes. Such technology can also provide live feedback on what blockers may be on which roads and which ones to use instead to reach the cities in a timely manner; aside from the transportation of food, the country needs roads in in the best

places for its urban planning and AI could again be used here to decide which places would be suitable for what kinds of roads and which ones need overhead bridges, traffic lights, bumps, etc just like it was employed in Lusaka, Zambia (Ordnance Survey, 2022).

AI in water sanitation

Ghana harbors the world's largest man made lake and a plethora of water bodies, yet there are people in the country who lack access to potable drinking water. There has been ongoing research by some organizations and startups to explore what rivers or water bodies could be exploited to process potable drinking water for all the citizens from the Volta river, whose reservoir the Volta lake is the largest man made lake in the world (Siabi, 2022). AI companies could tap in and with their tools help sample out which bodies to experiment. They could also help communities decide which spots would be optimal for boreholes, tap installations and even the digging of wells as sources of water to be processed and made potable for everyone.

AI in Energy

Ghana has experienced prolonged power outages and load shedding over the last decade. It currently has an electricity penetration of 85 % leaving a tangible number of its citizens in complete darkness who have to study in the dark and run their businesses with no electricity (Sasu, 2023). The gradually increasing digital divide in Ghana is partially attributed to the lack of electricity or its instability in some towns and villages in the country. Using AI to inform consumers about their consumption and how to reduce them, we can save some energy to allow for extension and penetration of electricity into other areas (Kuehne, 2023). Moreover, the adoption of AI by the Electricity Company of Ghana will not only help in eradicating power theft, but also help in saving tons of energy for communities that need to be on the grid (The Presidency, Republic of Ghana, 2020).

AI could potentially be used in the country to map out cities and towns with the highest demands and evaluate how much energy should be conserved, and how much should be shared among communities. They could also be used to potentially help map out where to build resilient mini grids to connect communities that are off the grid and decide which communities should be part of what grids (Webb, 2023). AI could also be used in the field of renewables such as solar

and wind farms to automate some of the tasks under maximum efficiency to maximize the energy output which can be extended to communities that are off the grid (Microsoft, 2023).

AI in healthcare

In recent years, some Ghanaian organizations, startups, and international organizations like zipline have been experimenting with the idea of delivering first aid emergency tool kits, medicines, blood, and other materials for healthcare via drones to communities which lack access to hospitals and adequate health care facilities (Ampomah, 2019). With the expansion of this project, lives lost as a result of such barriers would be minimized. Furthermore, conditions like the rapid spread of infectious diseases in such communities and even bigger ones that usually escalate due to low capacity of the healthforce could be minimized by using AI to better predict and identify such diseases (Otaigbe, 2022).

AI could also be used for basic diagnostics and detection of sickness but in an efficient, fast, manner. In situations where there isn't "better" equipment for healthcare services, photos of scans and x-rays could be relayed with the help of AI technology to available doctors in fully equipped hospitals to analyze and send back the feedback to the local hospital or doctors in rural areas (University of Pretoria, 2018). More research is even being conducted into the poor radiology infrastructure in Ghana and how AI could be incorporated to make healthcare through that field a better one (Edzie. E et al., 2023).

Conclusion

All of these areas which AI can serve represent fields where basic infrastructure and education must come first. Every AI application remains merely a tool to aid in planning and decision-making, which helps us demonstrate readiness for more investment and infrastructure, and can render our projects more focused and feasible. Whatever decisions such AI tools help us make, we advocate for development shaped by Ghanaians for Ghanaians. At Deep Learning Indaba this year the theme was the Akan word "yebetumi" which means "We can." We believe Ghanaians can create a future where AI serves us, if and only if we attain our goals through our own policy writing, skills training, education, stakeholder engagement, and protections for Ghanaian data.

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