

# **Motivations for AI Development and Its Applications in the Global South vs North America**

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## **Introduction**

The world is currently experiencing the Fourth Industrial Revolution whose main characteristic is that it is heavily technology driven. One of the technologies spurring this revolution is Artificial Intelligence (AI). AI is defined as “the science of making machines do things that would require intelligence if done by humans”.<sup>1</sup> AI works by using large amounts of data, known as “big data”, and intelligent algorithms to perform user defined functions.<sup>2</sup> AI functions commonly fall under the following categories: hyperpersonalization, autonomous systems, predictive analytics and decision support, conversational/human interactions, patterns and anomalies, recognition systems, and goal-driven systems.<sup>3</sup> AI as we know it can be traced back to 1956 when it was formally founded as an academic discipline. However, discussions and experiments on artificial intelligence techniques had begun many years before. Fast forward to the 21st century, the availability of vast amounts of data, cheap and fast computers and improved machine learning techniques are the catalysts to rapid and advanced research and development of AI applications.<sup>4</sup> The application of AI to real world problems is now universally accepted as a means to resolve the world’s most pressing problems.<sup>5</sup> However, this application is not homogenous; different regions of the world are using AI in varied ways.

To this end, this blog seeks to contrast the motivations and applications of AI development in two regions: the Global South particularly, Africa and the Global North particularly, North America region. In these two regions, the blog looks at how AI has been applied in four categories: health, education, security/surveillance and disability aid. In exploring the applications under these categories, the blog seeks to show the similarities and differences and the reasons for such similarities and differences in these regions.

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<sup>1</sup> [https://www.aiforhumanity.fr/pdfs/MissionVillani\\_WhatisAI\\_ENG\(1\)VF.pdf](https://www.aiforhumanity.fr/pdfs/MissionVillani_WhatisAI_ENG(1)VF.pdf)

<sup>2</sup> <https://www.wired.com/insights/2014/09/artificial-intelligence-algorithms-2/>

<sup>3</sup> <https://www.forbes.com/sites/cognitiveworld/2019/09/17/the-seven-patterns-of-ai/#16015e6812d0>

<sup>4</sup> <https://www.mantralabsglobal.com/blog/solve-real-world-complex-problems-using-ai/>

<sup>5</sup> <https://towardsdatascience.com/what-problems-can-we-solve-using-ai-ec7131f8159b>

## AI applications

### a. Health care

Application of AI in Africa can be traced back to the mid-1980s when AI was deployed for health worker-patient interactions in Kenya and Gambia.<sup>6</sup> In 1986, AI was used to detect eye disorders in Egypt.<sup>7</sup> Despite early applications, AI applications in health in Africa remain few especially in advanced healthcare provision. Health care services can be divided into three categories: primary, secondary and tertiary.<sup>8</sup> Primary health care is defined as essential health care that covers most of the health needs of a person not just for a specific disease.<sup>9</sup> Secondary healthcare is defined as specialist care given to a person which could not be dealt with at the primary level.<sup>10</sup> Tertiary health care refers to specialised care provided for those who have been referred from secondary healthcare.<sup>11</sup> In Africa, most of the AI powered health applications are used for providing primary and secondary healthcare services. There is a demand for primary healthcare services on the continent mainly due to shortages of healthcare practitioners, poorly equipped facilities, low budgetary allocations and poor leadership and management.<sup>12</sup> In Africa, fewer than 50% of the population have access to modern health facilities.<sup>13</sup> Many African countries spend less than 10% of their GDP on health care.<sup>14</sup> AI powered applications such as Ubenwa have been developed to fill in the gap. Ubenwa helps to detect and respond to birth asphyxia that could lead to infant mortality. Maternal healthcare falls under primary healthcare services.<sup>15</sup> Similarly, AI has been used for diabetic retinopathy screening as there are very few ophthalmologists in Africa to deal with the shortage. Ophthalmology falls under primary and secondary healthcare services.<sup>16</sup> An AI that helps in screening was developed and deployed in

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<sup>6</sup> <https://www.frontiersin.org/articles/10.3389/fdgth.2020.00006/full#B6>

<sup>7</sup> <https://www.frontiersin.org/articles/10.3389/fdgth.2020.00006/full#B6>

<sup>8</sup> <https://www.frontenders.in/blog/difference-between-primary-secondary-tertiary-medical-care.html>

<sup>9</sup> <https://www.who.int/news-room/fact-sheets/detail/primary-health-care>

<sup>10</sup> <https://www.internationalmedicalcorps.org.uk/what-we-do/all-emergencies/secondary-health-care#:~:text=Secondary%20Health%20Care%20is%20the,mmost%20often%20provided%20in%20hospital>

<sup>11</sup> <https://pallipedia.org/tertiary-health-care/>

<sup>12</sup> <https://www.dovepress.com/identifying-key-challenges-facing-healthcare-systems-in-africa-and-pot-peer-reviewed-fulltext-article-IJGM>

<sup>13</sup> <https://www.gsb.stanford.edu/insights/taking-challenges-health-care-africa#:~:text=Fewer%20than%2050%25%20of%20Africans,their%20GDP%20on%20health%20care.>

<sup>14</sup> <https://www.gsb.stanford.edu/insights/taking-challenges-health-care-africa#:~:text=Fewer%20than%2050%25%20of%20Africans,their%20GDP%20on%20health%20care.>

<sup>15</sup> <https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-019-2433-1>

<sup>16</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1860225/>

Kenya and Zambia.<sup>17</sup> This has helped to screen more patients and provide results in real time without the patient having to come back to the healthcare facility; a real challenge for people living far from the health facility.<sup>18</sup>

In the Global North, AI health applications are a common feature in the three levels of healthcare services. For example, Buoy is a symptoms checker that uses AI to find out the health issue and find the right care for it.<sup>19</sup> This can fall under the category of primary healthcare provision. Viz uses AI to detect a possible case of stroke and find the right assistance.<sup>20</sup> This application can fall under secondary healthcare services. Lastly, an application such as Pathai uses AI to perform accurate cancer diagnosis.<sup>21</sup> This can fall under tertiary healthcare services. Application of AI in healthcare has gone beyond applying it to health specific cases. Applications such as Suki, use AI to help in note taking and retrieval. While in Africa, low digitisation and a shortage of electronic health records negatively impact AI application in healthcare, the success of AI applications in the North has been as a result of the entire healthcare system being mandated to have electronic records.<sup>22</sup>

Unfortunately, while there is indeed a need to incorporate technology into the healthcare system in Africa, the level of funding and technical capacity currently available means the need is likely to remain unmet. Compared to companies in the north, that receive several rounds of funding and have access to a wide range of talent, African healthcare companies receive minimal funding and do not have access to such wide pools of talent. In addition, Africa lacks local data sets on which to train the models hence have to rely on foreign data sets. AI for medicine requires large labelled clinical datasets for training the AI models. However, low level of digitization and electronic medical record use across Africa, has resulted in a shortage of locally generated useful data. This has resulted in adverse effects in some cases.<sup>23</sup>

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<sup>17</sup> [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(19\)30004-4/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(19)30004-4/fulltext)

<sup>18</sup> [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(19\)30004-4/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(19)30004-4/fulltext)

<sup>19</sup> <https://www.buoyhealth.com/#solutions>

<sup>20</sup> <https://www.viz.ai/>

<sup>21</sup> <https://www.pathai.com/>

<sup>22</sup> <https://www.rtinsights.com/unlocking-the-potential-of-electronic-health-records-with-ai/>

<sup>23</sup> [https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(19\)30004-4/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(19)30004-4/fulltext)

## **b. Education**

Despite Africa's progress in the educational sphere, for example, increased primary school enrolment, it still lags behind other regions in fully developing its knowledge capital in what is being referred to as the "Learning Crisis".<sup>24</sup> While an increased number of students are attending school, they are not achieving the minimum proficiency level in reading and math hence the Learning Crisis.<sup>25</sup> Minimum proficiency level is defined as a "benchmark of basic knowledge in a domain (math or reading) measured through learning assessments".<sup>26</sup> The existence of the crisis is attributed to poorly managed schools and education systems that fail to cater for the needs of the students.<sup>27</sup> Similarly, Africa suffers the greatest shortage of teachers in the world, compounded with a rigid and inflexible education curriculum.<sup>28</sup> For example between 2010 and 2015 the student-teacher ratio in Kenya was 57:1.<sup>29</sup> Studies have shown that a high student-teacher ratio negatively affects performance while a reduced ratio improves classroom achievement.<sup>30</sup> To resolve these challenges in Africa's education system, there have been experiments with technology for education, commonly known as "ed-tech". Ed-tech utilises different technologies among them AI which continues to gain popularity on the continent. Several AI powered ed-tech applications have been developed to deal with the aforementioned challenges. These applications leverage on AI to provide personalised education.<sup>31</sup> Personalised education refers to "instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner".<sup>32</sup> For example, M-shule, the first ever adaptive learning platform in Africa, analyses a student's ability and then suggests content that matches the capabilities.<sup>33</sup> Gradely is another platform that uses AI to provide personalised learning based

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<sup>24</sup> <http://uis.unesco.org/en/news/6-out-10-children-and-adolescents-are-not-learning-minimum-reading-and-math>

<sup>25</sup> <http://uis.unesco.org/en/news/6-out-10-children-and-adolescents-are-not-learning-minimum-reading-and-math>

<sup>26</sup> <https://unstats.un.org/sdgs/metadata/files/Metadata-04-01-01.pdf>

<sup>27</sup> <https://www.worldbank.org/en/news/immersive-story/2019/01/22/pass-or-fail-how-can-the-world-do-its-homework>

<sup>28</sup> <https://nation.africa/kenya/news/education/education-quality-suffers-as-teacher-shortage-hits-schools-153454>

<sup>29</sup> <https://www.businessdailyafrica.com/news/Poor-state-of-public-schools-a-cause-for-worry--says-UN/539546-3911594-a5rop5/index.html>

<sup>30</sup> [https://www.researchgate.net/publication/333774652\\_Teacher-Student\\_Ratio\\_on\\_Classroom\\_Practices\\_in\\_Universal\\_Secondary\\_Schools\\_in\\_Wakiso\\_District-Uganda](https://www.researchgate.net/publication/333774652_Teacher-Student_Ratio_on_Classroom_Practices_in_Universal_Secondary_Schools_in_Wakiso_District-Uganda)

<sup>31</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6295749/>

<sup>32</sup> <https://medium.com/swlh/personalized-learning-through-artificial-intelligence-b01051d07494>

<sup>33</sup> <https://m-shule.com/>

on a child's strengths and weaknesses.<sup>34</sup> Additionally, AI for education on the continent does not only focus on school materials. There are applications that also provide personalised education resources for areas of knowledge such as agriculture, finance, entrepreneurship and nutrition.<sup>35</sup>

Heading to the global north, AI powered ed-tech applications are becoming a common occurrence. In fact, North America accounted for the highest number of AI powered ed-tech solutions in the world between 2014-2019. As an early market entrant, solutions provided by AI ed-tech applications in the North America region are broader than in Africa. They include using AI to offer personalized education<sup>36</sup>, virtual facilitators<sup>37</sup>, AI to grade assignments<sup>38</sup> and AI to perform school administrative functions among other uses. Similar to Africa, AI in North America is used for broad education purposes in addition to classroom education. For example, there are AI powered applications that provide foreign language solutions.<sup>39</sup>

In the North, there are numerous applications that cover higher education institutions. This is an aspect lacking in Africa. The proliferation of AI tools in higher learning is due to the ability of AI to streamline processes. Higher education in the North faces numerous challenges such as falling student enrollment, school drop out, inefficient enrolment processes among others.<sup>40</sup>

One unique feature in the North American ed-tech market is the high amount of funding available and the composition of the teams that develop the solutions. The startups are well funded and the team composition is varied. For example, Querium is a platform that helps students to master critical STEM skills by offering among other things, personalised lessons;<sup>41</sup> according to figures from Crunchbase, Querium has received funding of \$6.2 million through six

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<sup>34</sup> <https://gradely.ng/catchup>

<sup>35</sup> <https://www.arifu.com/>

<sup>36</sup> <https://www.century.tech/>

<sup>37</sup> <https://amp.insider.com/how-watson-ai-can-transform-education-2016-5>

<sup>38</sup> <https://www.bakpax.com/>

<sup>39</sup> <https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/technology-media-telecommunications/deloitte-cn-tmt-global-development-of-ai-based-education-en-191108.pdf>

<sup>40</sup>

[https://www.researchgate.net/publication/321258756\\_Exploring\\_the\\_impact\\_of\\_artificial\\_intelligence\\_on\\_teaching\\_and\\_learning\\_in\\_higher\\_education](https://www.researchgate.net/publication/321258756_Exploring_the_impact_of_artificial_intelligence_on_teaching_and_learning_in_higher_education)

<sup>41</sup> <http://querium.com/>

rounds of funding<sup>42</sup>. The maturity of the ed-tech market in the north can also explain the high amounts of funding and highly skilled people that are directed into AI powered education tools in the north compared to Africa. The situation in the north can be compared to applications such as M-shule, an application in Africa has only received one round of funding of an undisclosed amount.<sup>43</sup> The team composition of M-shule is its CEO/ Founder and one CTO. Funding and technical know-how for AI powered tools in Africa remains a challenge. According to one entrepreneur running an AI startup in Africa, getting funding in Africa is difficult to get by as most funders do not have the expertise to adequately evaluate AI solutions while foreign funders are discouraged by the economic and political situation in Africa.<sup>44</sup> As for technical expertise, Africa faces a short supply, however, there are numerous initiatives to train data scientists.<sup>45</sup>

Despite the entrance of AI powered ed-tech solutions on the continent, there are concerns with regards to their acceptance among the intended beneficiaries. Earlier this year, the Minister of Basic Education in South Africa launched Ms. Zora, an AI based educational platform. Ms. Zora was meant to be a teacher's assistant and a personal tutor to the learner. However, the solution was regarded as too futuristic as it ignored existing infrastructural deficits that exist in the country such as low skilled teachers.<sup>46</sup> Other challenges to development of AI powered education tools include lack of sustainable business models for these applications.<sup>47</sup> Additional impediments include ICT hardware availability, electrical reliability, internet reliability, data costs, students' basic ICT skills, language, and lack of culturally appropriate content.<sup>48</sup>

### **c. Security/surveillance**

The fact that Africa faces numerous security challenges is not new.<sup>49</sup> The key drivers for these challenges include high unemployment in a continent with a young population, poverty and

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<sup>42</sup> [https://www.crunchbase.com/organization/querium-corporation/company\\_financials](https://www.crunchbase.com/organization/querium-corporation/company_financials)

<sup>43</sup> [https://www.crunchbase.com/organization/m-shule/company\\_financials](https://www.crunchbase.com/organization/m-shule/company_financials)

<sup>44</sup> <https://www.weforum.org/agenda/2019/08/artificial-intelligence-africa-venture-capital-investment/>

<sup>45</sup> <https://www.weforum.org/agenda/2019/08/artificial-intelligence-africa-venture-capital-investment/>

<sup>46</sup> <https://www.dispatchlive.co.za/news/2020-01-18-classroom-ai-is-here-but-is-it-too-futuristic-in-current-education-climate/>

<sup>47</sup> <https://ventureburn.com/2019/02/african-edtech-startups-model/>

<sup>48</sup> <https://link.springer.com/article/10.1007/s40593-014-0028-6>

<sup>49</sup> <https://onlinelibrary.wiley.com/doi/abs/10.1111/hisn.13248>

corruption among other factors.<sup>50</sup> The increasing security threats on the continent coupled with improving technology has seen African governments adopt sophisticated technology tools to deal with security problems. The AI Global Surveillance (AIGS) Index indicates that China is providing AI technologies to African countries for surveillance purposes.<sup>51</sup> Initiatives such as the “Safe City Initiative” have been introduced in many African countries. The Safe City Initiative is a project by Huawei to provide public safety solutions by equipping African governments with modern security solutions to improve policing efforts. The initiative deploys technologies such as facial recognition technologies and license plate recognition. A city that has these technologies deployed is known as a “Safe City”. In this project, Huawei partnered with governments of various African countries to install cameras and traffic surveillance systems which are controlled by the police in the various countries.<sup>52</sup> The Safe City Initiative by Huawei, a Chinese company, runs in 12 African countries: Ghana, South Africa, Mauritius, Botswana, Kenya, Uganda, Nigeria, Ivory Coast, Madagascar, Ethiopia, Cameroon and Angola.<sup>53</sup>

While technology for security in Africa has been lauded as the solution that may help deal with security concerns, as these solutions continue to proliferate the continent, the line between using technology for security and national surveillance is becoming blurred.<sup>54</sup> For example, the efficacy of the Safe City Initiative has been questioned, as some cities that have implemented the initiative report increased crime rates.<sup>55</sup> The poor performance of this initiative coupled with the fact that the solutions have surveillance capabilities, raises the possibility that most of these countries are deploying the technologies for surveillance.<sup>56</sup>

Unlike Africa, the Global North and particularly the U.S. is a producer and consumer of its own AI technologies for security and surveillance. One such example is Clearview AI is an American

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<sup>50</sup> <https://www.weforum.org/agenda/2016/06/7-trends-shaping-the-african-security-landscape/>

<sup>51</sup> <https://carnegieendowment.org/2019/09/17/global-expansion-of-ai-surveillance-pub-79847>

<sup>52</sup> <https://www.huawei.com/ke/industry-insights/technology/digital-transformation/video/video-surveillance-as-the-foundation-of-safe-city-in-kenya>

<sup>53</sup> <https://chinaafricaproject.com/2019/11/13/huaweis-surveillance-technology-program-safe-cities-now-active-in-12-african-countries/>

<sup>54</sup> <https://qz.com/africa/1822312/huaweis-surveillance-tech-in-africa-worries-activists/#:~:text=Safe%20City%20initiatives%20are%20the,intended%20to%20improve%20policing%20efforts.>

<sup>55</sup> <https://www.csis.org/analysis/watching-huaweis-safe-cities>

<sup>56</sup> <https://www.csis.org/analysis/watching-huaweis-safe-cities>

company that provides facial recognition software to law enforcement agencies and private companies in the country.<sup>57</sup> The U.S. ability to produce and consume its own technologies is closely linked to the “American AI Initiative”.<sup>58</sup> The American AI Initiative is the US national strategy on how to stay ahead of the AI development curve by “promoting and protecting national AI technology and innovation”. Part of the initiative is to federally fund AI research and development in the country.<sup>59</sup> This is part of U.S. efforts to reduce foreign interference in AI technologies as seen in the ban on Huawei and ZTE (Chinese companies).<sup>60</sup> This can be contrasted with Africa where installation of these systems is debt funded.<sup>61</sup>

In the Global North, AI is also being used for enterprise security measures such as AI for cybersecurity.<sup>62</sup> North America makes up the largest share of the global AI in the cybersecurity market in the world. The use of AI for cybersecurity remains largely underdeveloped in Africa despite cyber risks heavily eroding the income of businesses.<sup>63</sup> One example of a company using AI to help businesses deal with cyber risks is Tabiri Analytics<sup>64</sup> Tabiri Analytics offers AI powered cybersecurity solutions to underserved communities. Africa already suffers a shortage of cybersecurity professionals<sup>65</sup> coupled with the shortage of AI experts as mentioned above, it is possible to see why there is little to no activity in the AI cybersecurity sphere in Africa.

#### **d. Disability aid**

Developing countries have the highest number of people living with disabilities. According to the World Health Organisation (WHO), of the 1 billion people living with disabilities, 80% are in developing countries. Despite this high number, people living with disabilities still lack the

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<sup>57</sup> <https://clearview.ai/>

<sup>58</sup> <https://www.whitehouse.gov/ai/>

<sup>59</sup> <https://www.whitehouse.gov/ai/>

<sup>60</sup> <https://telecoms.com/504320/huawei-and-zte-are-banned-from-doing-business-in-the-us-for-another-year/>

<sup>61</sup> [https://www.theepochtimes.com/huawei-safe-cities-are-ineffective-according-to-crime-figures\\_3187283.html](https://www.theepochtimes.com/huawei-safe-cities-are-ineffective-according-to-crime-figures_3187283.html)

<sup>62</sup> <https://www.globenewswire.com/news-release/2020/06/19/2050757/0/en/Artificial-Intelligence-AI-in-Cybersecurity-Market-Worth-46-3-billion-by-2027-Exclusive-Report-Covering-Pre-and-Post-COVID-19-Market-Estimates-by-Meticulous-Research.html>

<sup>63</sup> <https://digital4africa.com/wp-content/uploads/2018/04/Africa-Cyber-Security-Report-2017.pdf>

<sup>64</sup> <https://tabirianalytics.com/>

<sup>65</sup> <https://www.serianu.com/downloads/AfricaCyberSecurityReport2017.pdf>

necessary assistance and support they require.<sup>66</sup> Assistance for people living with disabilities can take various forms. It can be in the form of grants. Other forms of assistance include providing assistive devices and services. For example, in Kenya, there is the National Development Fund for Persons with Disabilities (NDFPWD) that provides devices such as wheelchairs, crutches, hearing aids, callipers, surgical boots and prosthetic arms or legs and services such as sign language translation.<sup>67</sup>

As technology evolves, there have been attempts at using technology to assist persons living with disabilities. In many African countries such as Kenya, the assistive technology space is still nascent so much so for assistive technologies that leverage on AI. This has been attributed to lack of funding as investors are unwilling to engage in businesses with undefined costs and undetermined demand.<sup>68</sup> This is true considering that most AI powered applications for differently abled people in the global north are offered for free. For example, Microsoft's Seeing AI that aids the visually impaired is free<sup>69</sup> Microsoft through its "AI for Accessibility" programme offers grants to organisations that develop AI applications for differently abled people. Similarly, Aira is a US based company that uses AI, remote assistance and augmented reality to assist the blind and people with low vision to navigate through their days.<sup>70</sup> Aira has a free version as well as a paid version.<sup>71</sup>

## **Conclusion**

The analysis of the AI applications and the motivations behind development of these AI powered applications under the four categories reveals important facts about the state of AI in the continent. First, it is clear that there are some similarities between the two regions. For instance, in the healthcare sector, there are applications that offer primary and secondary healthcare services in both regions. Similarly, in both regions, AI for educational purposes is being used to offer personalized experiences.

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<sup>66</sup> <https://www.scidev.net/sub-saharan-africa/health/feature/facts-figures-disabilities-in-developing-countries-1.html>

<sup>67</sup> <http://ncpwd.go.ke/index.php/ndfpwd/36-assistive-device>

<sup>68</sup> <https://www.capitalfm.co.ke/business/2019/12/first-cohort-of-assistive-technology-entrepreneurs-unveiled/>

<sup>69</sup> <https://visionaware.org/everyday-living/helpful-products/using-apps/seeing-ai-app/>

<sup>70</sup> <https://aira.io/aira-about-us>

<sup>71</sup> <https://www.prnewswire.com/news-releases/att-announces-largest-deployment-of-free-aira-service-300710958.html>

However, despite there being similarities, the magnitude of the AI development in the North exceeds that of Africa by a great margin. The analysis shows that great differences exist in areas such as funding, technical skill set and datasets used to train algorithms. This is illustrated, for example, by the state of AI applications in health in Africa where applications receive less funding than American counterparts and use foreign datasets. To fully benefit from this revolution Africa needs to create a conducive environment for development of technologies such as AI. From the analysis, a conducive environment for AI development includes availability of local datasets, bolstering efforts aimed at increasing technical capabilities and increasing funding options for African startups.