



Rose Nakasi, of Makerere University, in Kampala, Uganda is developing an AI-based app for detecting malaria.

ROSE NAKASI/MAKERERE AI HEALTH LAB

Africa's newest resource could be a game-changer for the global south

Researchers across the continent are using artificial intelligence to design bespoke solutions for health, development and more. **By Rachel Nuwer**

To an outside observer, Olubayo Adekanmbi's career in telecommunications epitomized success. At Airtel and MTN Group, two of the largest such firms in Africa, he applied artificial intelligence (AI) tools to help understand the consumer behaviour of 200 million mobile users in 20 countries, and designed ways of driving their consumption of products. He won awards for his work, but as his career progressed, he felt unfulfilled. "I began to think more about how these data could serve a greater purpose beyond commercial use," says Adekanmbi, who lives in Lagos, Nigeria. "I felt it was time

to make a difference."

In 2016, Adekanmbi founded Data Science Nigeria, a non-profit group dedicated to bringing AI to sub-Saharan Africa. Since the group's inception, Adekanmbi and his team have set up more than 100 AI learning clubs hosted by dedicated Data Science Nigeria tutors and volunteers at universities and community centres in 14 African countries, where people can come for weekly or bimonthly lessons in topics ranging from basic data-science literacy to expert-level machine-learning techniques. The group has launched programmes at universities and schools and, in 2020, published

the first AI textbook for children in Africa.

In addition to education, Data Science Nigeria collaborates closely with academia, government, non-profit organizations and companies to create practical AI solutions to local challenges. "We try to demonstrate that, even with infrastructural gaps in Africa, we can still deliver the possibility of AI to everyone, everywhere," Adekanmbi says. "We have the talents and the raw data sets to use AI to improve the quality of lives of people who need it most."

Recent projects include a multilingual, voice-based chatbot that provides financial guidance to female business owners in Nigeria

– for which Adekanmbi won a US\$145,000 Global Grand Challenges grant from the Bill & Melinda Gates Foundation in 2023. During the COVID-19 lockdown, he spearheaded a project, funded by the Mastercard Foundation, to deliver a smartphone-based learning platform, underpinned by AI, for children without access to laptops or Internet connection. The technology reached millions of students and was listed by the United Nations cultural organization UNESCO as a top-100 AI project for meeting the UN's Sustainable Development Goals.

Many other developers and researchers across Africa are using AI to design interventions and solutions that are tailored to local contexts and projects. But whether Africa can fully realize AI's potential will depend on overcoming a number of hurdles, including a limited infrastructure for energy- and computing-intensive technologies and a relative dearth of computer-science expertise. Data scientists such as Adekanmbi are optimistic, though. They hope to see the continent become a global leader in AI tools that are not only technologically groundbreaking, but game-changers for communities and countries in the global south. "We're trying to come up with solutions that are impactful and go straight to the societal needs we face," says Rose Nakasi, a computer scientist at Makerere University in Kampala, Uganda.

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Although relatively few people in Africa have training in computer science compared with countries in the global north, the continent is quickly catching up. This is thanks in part to groups such as Data Science Nigeria and Data Science Africa, a non-profit group based in Kenya, which has organized annual conferences and training events since 2015. The most recent conference – in Nyeri, Kenya – set a record with more than 300 attendees, says Ciira Maina, one of the organizers and director of the Centre for Data Science and Artificial Intelligence at Dedan Kimathi University of Technology, in Nyeri. Data Science Africa also provides research grants for AI projects that are geared towards social aims, and fellowships for computer scientists to visit partner institutions around the continent. Another group, Deep Learning Indaba, headquartered in South Africa, brings together the African AI community for an annual conference, and organizes mentorships, grants and awards.

The aim of all of these efforts is to nurture

talent to design creative AI solutions "within the African context", rather than borrowing solutions from outside the continent and "trying to apply them to Africa", says Elaine Nsoesie, a data scientist and global-health researcher at Boston University in Massachusetts.

The focus on building local expertise is important for empowering African scientists and also for ensuring that solutions meet regional specific needs. Drug development is a clear example of why this is important, says Kelly Chibale, the Neville Isdell chair in African-centric drug discovery and development at the University of Cape Town, South Africa. Although Africa has the most genetically diverse population in the world, the vast majority of pharmaceuticals and vaccines are developed elsewhere and are rarely optimized for African people, Chibale says. Differences in metabolic rates can cause a drug that is designed to work for one population to be less effective, or even detrimental, in another. In short, "you're overdosing or underdosing people", Chibale says – a problem that can also contribute to the emergence of drug resistance.

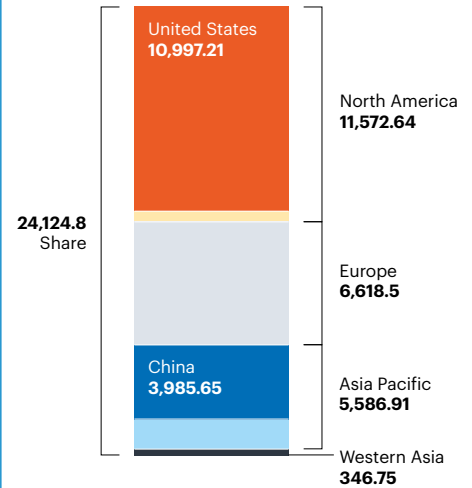
Chibale and his team use AI to speed up the discovery process and tailor drugs for African populations. One of their projects uses AI to identify genetic variants that are prevalent in the region, and which might affect the efficacy of malaria and tuberculosis (TB) drugs, owing to variations in metabolism. Their results can help to predict what the ideal dose of such pharmaceuticals should be relative to their patient population. In another project, supported by Schmidt Sciences – a philanthropic fund established by former Google chief executive Eric Schmidt and his wife, Wendy – Chibale and his colleagues use AI to predict potential interactions between drugs for treating conditions such as cancer and diabetes, and *Mycobacterium tuberculosis*, the bacterium that causes TB. *Mycobacterium tuberculosis* can change how the body takes up certain drugs, so Chibale and his team are also using AI to predict the best dosage for patients in such instances.

African computer scientists tailor their interventions by working closely with communities, Nsoesie says. A high dropout rate in schools, especially among girls, is a significant challenge in parts of Tanzania. Researchers from the Nelson Mandela African Institution of Science and Technology in Arusha, worked with teachers and parents to develop a machine-learning model that analyses information about students and predicts their likelihood of dropping out based on factors such as days missed and parental involvement in homework. Schools in the city are now using the tool as "an early warning system, so they can intervene", Nsoesie says.

Africa's ability to use AI can be hindered,

NORTHERN DOMINANCE

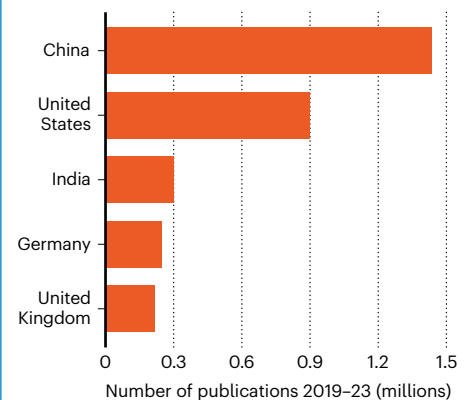
The leading 200 institutions for artificial intelligence output in Nature Index journals are almost all in the Northern Hemisphere, shown by this regional distribution of their 2019–23 output. A small amount of Share came from institutions in Western Asia, but there is no African representation.



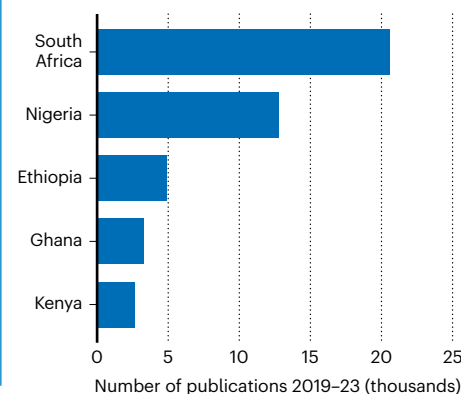
GROWTH POTENTIAL

Total research output in artificial intelligence (AI) from Africa was still well below global leaders such as the United States and China, according to Dimensions data for 2019–23. But the leading five countries in sub-Saharan Africa collectively produced more than 40,000 AI publications.

Leading countries globally



Leading countries in sub-Saharan Africa



however, by poor infrastructure. Reliable and affordable access to electricity and the Internet is not always guaranteed, says Miquel Duran-Frigola, co-founder and chief scientist at Ersilia, a non-profit organization based in Barcelona, Spain, that promotes open-source science as a way to tackle diseases in the global south. Rather than data being the limiting factor for pursuing AI solutions in Africa, Duran-Frigola says, it's often a lack of computing power.

In the absence of such infrastructure, collaboration with the global north can provide a solution, Chibale says. Often, this has been Africa providing data and local expertise, while the global north offers funding and high-powered computing resources. More of these collaborations should be encouraged, Nsoesie says, but stresses that they need to be equitable so that knowledge is exchanged and built on.

Duran-Frigola and his team have a collaboration with Chibale and several other computer-science groups in Africa. A few universities are forming more formal partnerships, too. In 2023, for example, the Guild of European Research-Intensive Universities, a consortium of 22 European academic institutions, and the African Research Universities Alliance, a group of 16 leading African universities, established a programme called the Africa-Europe Clusters of Research Excellence to exchange PhD students between the two continents, including in the fields of AI and data science.

"These partnerships are strong because they're equal," says Joyce Nabende, who heads the Artificial Intelligence Lab at Makerere University, which is a member of the new exchange programme. "We're co-supervising students and working together to develop models."

Despite the challenges around infrastructure, AI provides the potential to be revolutionary for African research, says Gemma Turon, co-founder and chief operating officer of Ersilia. "The biggest opportunity is to use AI as a way to produce research that's cheaper, faster and can cover gaps in data," she says.

Nabende, Nakasi and their colleagues, for example, created an app called Ocular that uses a 3D-printed adapter that attaches a smartphone's camera to the eyepiece of a microscope and uses a predictive AI model to determine whether cervical lesions are likely to be cancerous or not. This helps health-care workers, particularly in underserved regions, to quickly identify women who need a lengthier screening process. "We think this will be a very good first line of testing for nurses," Nabende says. They are also using the same technology to detect malaria and tuberculosis in patient samples. The technology could be a "game changer" for both remote facilities where there are no pathologists, and for urban



ELEN MARLEN/SHUTTERSTOCK

Potential school drop-out cases can be identified by an AI model tracking behavioural data.

hospitals where patients far outnumber doctors, Nakasi says. The program will automatically file the findings electronically, saving doctors' time and providing live data for officials in the event of an outbreak.

Pipeline of potential

In Nigeria, Adekanmbi and colleagues are pursuing practical applications, including a chatbot that will allow women to talk confidentially about contraception in their own language. This is important, Adekanmbi says, because women can be prohibited from seeking out information for cultural reasons.

"The aim is to create a bespoke strategy, because we have our own unique challenges."

According to Maina, programmers in Africa are leading efforts to create tools for working with 'low-resourced languages', or those that lack a robust digitized database. It's important to pursue this, he says, because although many African people do speak English, it usually isn't their mother tongue. Africa also has higher rates of illiteracy than other parts of the world, Adekanmbi adds, driving "a critical need for voice-first AI solutions". For this reason, in 2023, Adekanmbi and his Data Science Nigeria colleagues launched a start-up to develop hyperlocal language data sets to train Africa-centric AI models, a project for which

they won backing from the Gates Foundation.

African computer scientists are also getting involved in designing appropriate policies and guidance on AI usage – ones that they hope will put guardrails in place for safety and inclusivity while not stifling technology. This year, Adekanmbi began meeting with figures from government, industry and academia in Nigeria to develop a national strategy for AI. The aim, he says, is to create a bespoke strategy, "because we have our own unique challenges".

AI might even be able to assist with policy making itself, says Uzma Alam, who leads science-policy engagement for the Science for Africa Foundation, a non-profit group that promotes science and manages grant programmes in Africa. It could help, for example, with evidence gathering, analysing current trends and writing first drafts of new policies – including those related to AI. Although human input would still be crucial, Alam says, there are "steps we could improve and make more efficient using basic AI".

"Africa has a unique opportunity amid so many pressing health challenges to shape the future of AI and its capabilities in health care," Nakasi says. But establishing inclusive policies that provide regulatory and ethical standards – while also supporting innovation – will be necessary for "ensuring a beneficial outcome", she adds. "The AI revolution in Africa is no longer just a possibility – it is already under way."

Rachel Nuwer is freelance journalist, based in New York.