English
It is a wonderful day

Acholi
Obedo nino maber tutwal.

Ateso
Erai apaaran naejok noi.

Luganda
Olunaku lulungi nnyo.

Lugbara
O'du 'di ndrizaru saaru

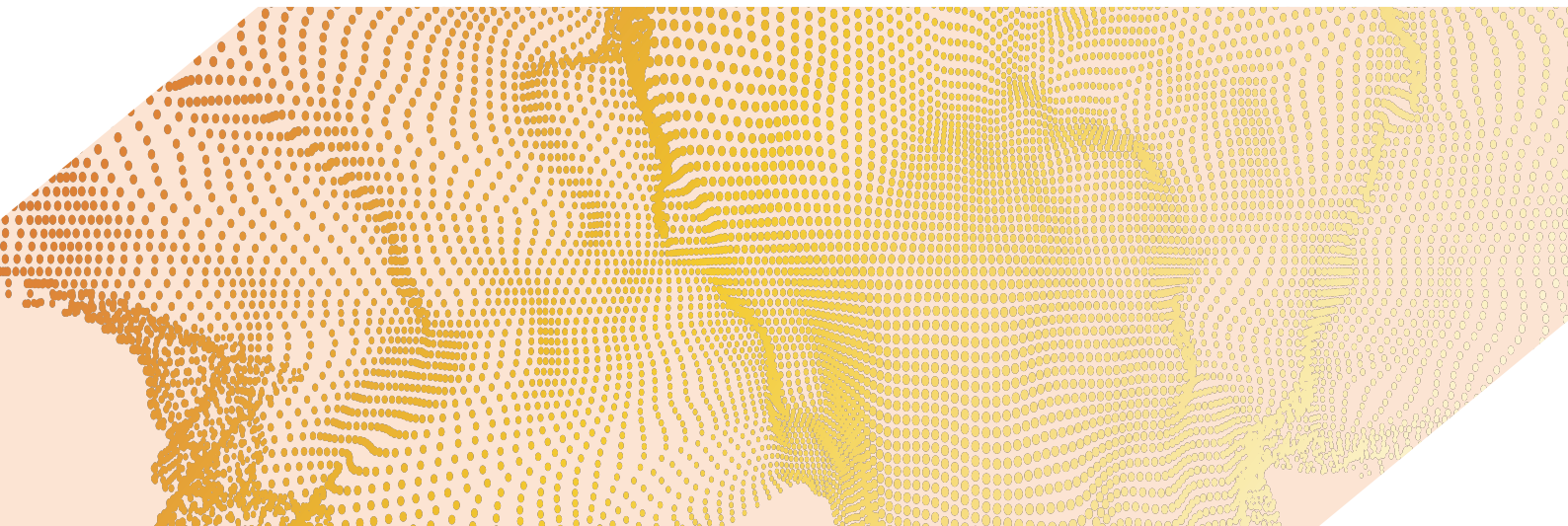**Runyankole**
N'eizooba rirungi munonga.
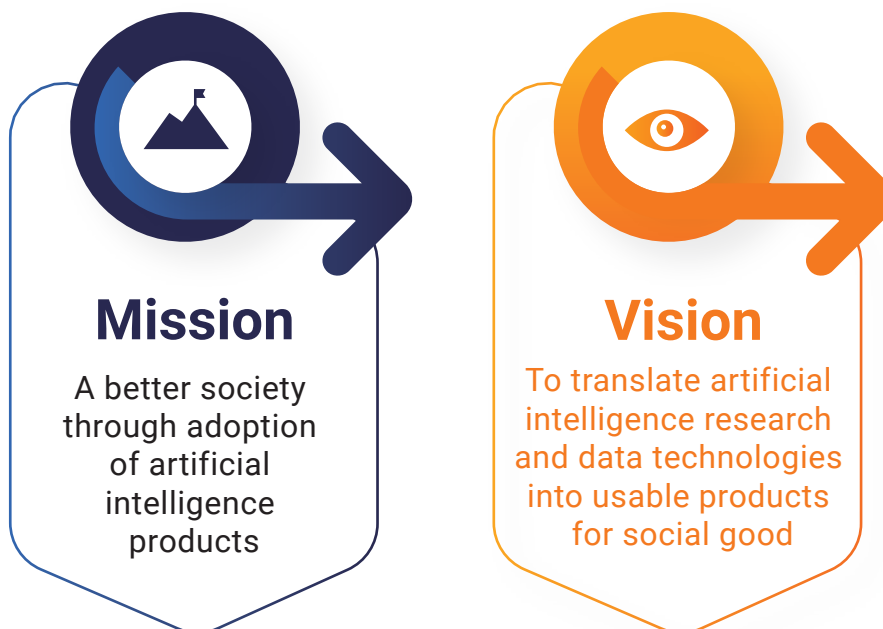
SUNBIRD AI

ANNUAL REPORT 2022

TABLE OF CONTENTS

Sunbird AI

Who We Are

Sunbird AI is a non-profit organization that develops artificial intelligence systems for social impact in Africa. We aim to help social initiatives, public institutions and policymakers develop new AI technology for their own needs.We believe that better data technology has the potential to improve planning, policy, real-time decision-making, and strengthen the feedback loop between citizens and policy makers.Artificial intelligence in particular has the potential to help Africa leapfrog the traditional constraints of infrastructure to improve human wellbeing.

Mission

A better society through adoption of artificial intelligence products

Vision

To translate artificial intelligence research and data technologies into usable products for social good

Practical AI Solutions/Systems

Projects at Sunbird AI result in practical systems being deployed.

Open Source

Projects are open source so that anyone can reuse or extend them. We develop open systems that can be replicated or expanded by others. For this to happen, we are committed to open source and open research, so that others can build on what we are doing.
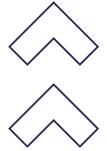
Decision Making

We have a particular focus on creating AI systems that can help with decision-making in public policy.

African Technology

We aim to build African technical capacity with a team that understands both the technology and the local context. We also aim to be a neutral source of advice for African institutions on the practical possibilities, benefits and risks of AI technology. We are also committed to building African technical capacity, in order to have a team who understand both the social context and also the technological opportunities.

MEET THE TEAM

Engineer Bainomugisha
Director and Board Member

Engineer Bainomugisha, one of the founding Directors at Sunbird AI and an Associate Professor and Chair of the Department of Computer Science at Makerere University combines his vast experience in Computer Science Education and Social Impact Research in Africa spanning over 15 years. He has pioneered and led several social impact research projects including, AirQo, a Google-supported initiative that leverages IoT and AI technologies for environmental air pollution monitoring and analysis in African cities.

Ernest Mwebaze
Executive Director

Ernest Mwebaze possesses over 10 years of teaching experience in computer science and machine learning. He is passionate about using artificial intelligence to improve society particularly in developing parts of the world. He is currently the executive director of Sunbird AI. Previous to this he worked with Google AI and the UN Global Pulse.

John Quinn
Director

John Quinn has been working in AI, artificial intelligence, for nearly twenty years. As well as being one of the Directors of Sunbird AI, he is also a Senior Software Engineer at Google Ghana, where he currently leads a team that processes satellite imagery across the continent to add buildings and roads to Google Maps.

Peace Tumuheki
Operations Manager

Peace Buhwamatsiko Tumuheki is an Operations Manager at Sunbird AI She possesses extensive experience and expertise in strategic planning, financial management, project administration and monitoring and evaluation of learning processes and outcomes.

Isaac Owomugisha
Software Lead

At Sunbird AI, Isaac recently took on the role of Software lead. His primary work includes building data pipelines, deploying applications and data analysis.

Lydia Naggayi
Software Engineer

Lydia Sanyu Naggayi joined Sunbird AI to venture into creating useful applications in AI. At Sunbird, she does Data Engineering and Data Analysis tasks as part of the pipeline for various AI projects. In 2022, Lydia won a scholarship to pursue a Masters in Law, Data and Artificial Intelligence from Dublin City university.

Benjamin Akeera
Software Engineer

Benjamin Akera is a Software Engineer at Sunbird AI .He focuses on machine learning and applying methods from research into production in order to build scalable adaptable solutions. He is currently pursuing a masters in Computer Science at McGill University.
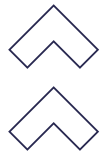
Nasser Kaweesa
Hardware team lead

Nasser is an electronics products developer passionate about using electronics to build solutions that have potential to scale and impact communities. At Sunbird AI, his key role is to develop electronics schematics that are translated into devices that provide special purpose solutions like the Sunbird Noise Monitor.

Joel Muhanguzi
Embedded Systems Engineer.

Joel's domain encompasses hardware and firmware design, development, testing, field deployment and maintenance of Sunbird IoT systems. He is currently pursuing a Masters in Computer Science specializing in AI data science.
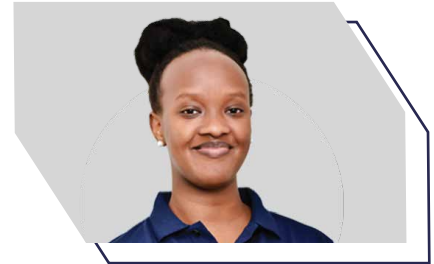
Lilian Nabukeera
Administration Manager

Lilian Teddy Nabukeera is an Administrative Assistant at Sunbird AI. She is well versed in administrative works, financial management and public relations. She also has a background of mass media communication and entrepreneurship. Lilian works with both the Makerere University AI Research team and the Sunbird AI team.

Daphine Nkunda
Communications and Engagement Officer

Daphine's background is in development communications. She is passionate about the aspect of communications that aims to improve the lives of structurally marginalized people/ communities. Her experience includes integrating communications and research to develop citizen-centered policies.

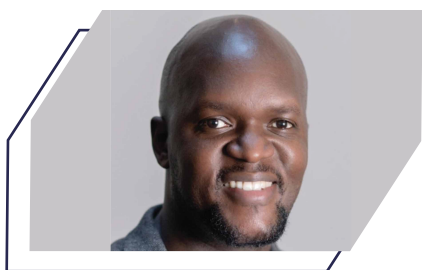## Jimmy Mpananobi
Finance Lead.

Jimmy Mpabanobi is an accountant and auditor, with over 10 years of working experience. He currently heads the finance department at Sunbird AI. He is a Certified Internal Auditor (CIA), Certified Public Accountant (CPA), Certified Tax Advisor (CTA) and is currently finalizing his Masters of Business Administration from Makerere University Business School (MUBS)

Board of Directors

Davis Adieno
Board Chair

Mr. Davis Adieno is the Director of Programs for the Global Partnership for Sustainable Development Data (GPSDD). He fosters multi stakeholder partnerships at the regional level and across sectors through national data roadmap processes that support regional and country priorities for investments and innovations in data ecosystems in Africa, Latin America and elsewhere.
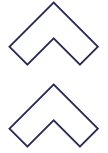
Dr. Rhona Mijumbi
Board member

Rhona Mijumbi-Deve is the founding director of the Centre for Rapid Evidence Synthesis (ACRES) at Makerere University's College of Health Sciences. She is also a senior lecturer of public policy at the Liverpool School of Tropical Medicine (LSTM), where part of her portfolio is to head the Malalwi-Liverpool-Wellcome (MLW) Clinical Research Programme's Policy Unit. Rhona trained as a medical doctor and following several years of working as a clinician and researcher, she has concentrated her efforts in understanding, supporting and improving the science-policy nexus.

Sarah.T.Lucas
Board Member

Sarah Lucal is the Global Lead at Data on Demand, an initiative that enables public sector decision -makers to use timely, high-quality, data-driven insights to improve decisions.

Prior to IDinsight, Sarah served as a program officer for Evidence-Informed Policymaking at the William and Flora Hewlett Foundation. She holds a degree in Latin American studies with concentration on Political Science and Spanish and a Masters degree in Public Policy from the John F Kennedy School of Government at Harvard University.
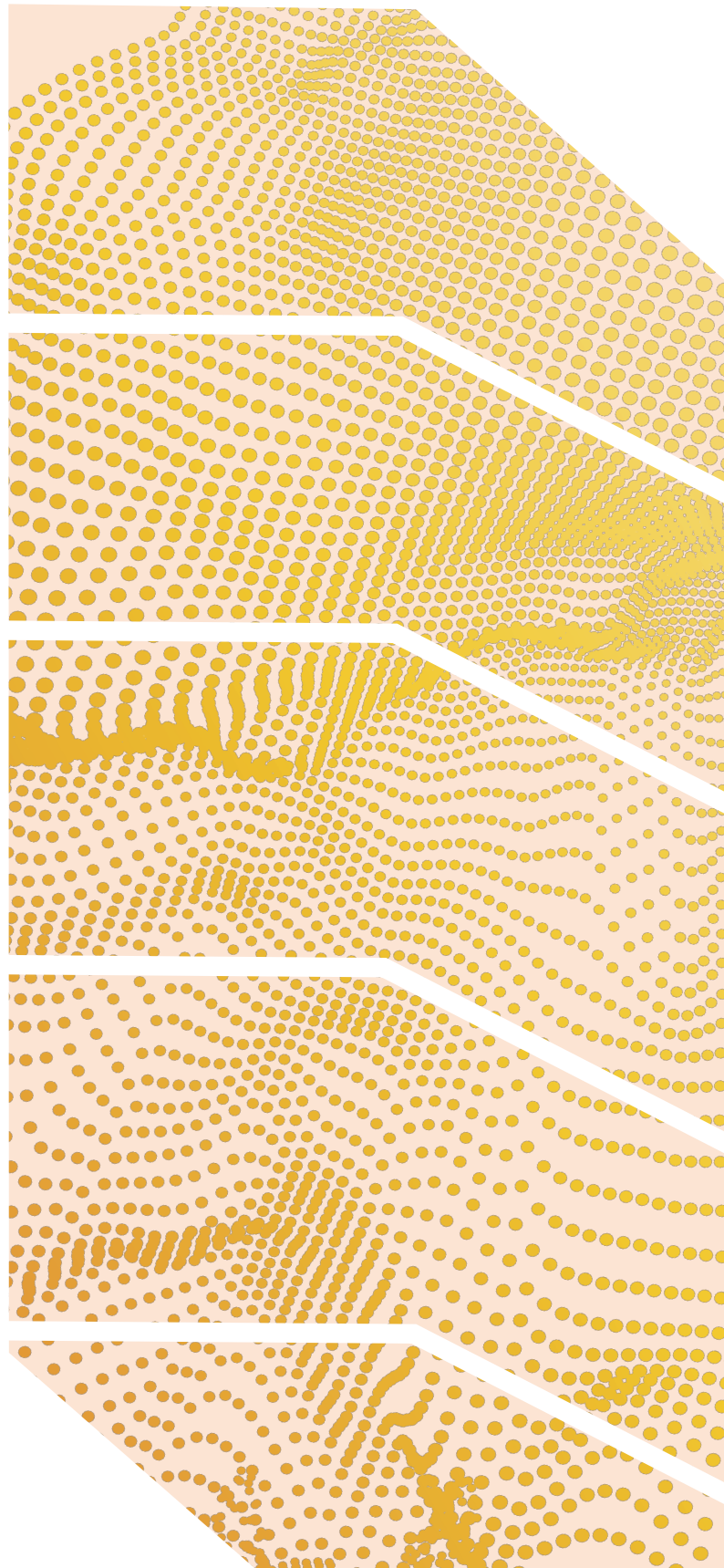
Kenneth Legesi
Board Member

Kenneth is the CEO/Chief Investment Officer (CIO) at Ortus Africa Capital. He is responsible for providing leadership and strategic oversight towards achieving the firm's vision and mission to harness investment into and finding capital for entrepreneurs and businesses to drive Africa's growth. As the CIO he oversees venture and debt investment vehicles managed by Ortus Africa Capital.

Prior to Ortus Africa Capital, he was a financial advisor and management consultant at Deloitte with a focus on infrastructure, real estate, energy and utilities and financial services.

Kenneth Legesi holds a Masters degree in Environmental Engineering with Business Management from Imperial College London. He has completed the Chartered Financial Analyst (CFA) Program and is a CFA Charterholder.

Official Launch of Sunbird AI

Sunbird AI formally came into existence in November 2019 as a not for profit organization focusing on AI for social good. On 20th May 2022, Sunbird AI was officially launched at an event that saw several projects being presented and collaborations cemented.

The flagship products included our African Language Technology System dubbed "Sunbird Translate" that can automatically take text and speech from any of the five local languages; Acholi, Ateso, Luganda, Lugbara and Runyankole and translate it to and from English with state of the art accuracy.

A second product was from our Environmental Sensing Project. Sunbird is developing custom embedded hardware noise boxes and installing them around the city to collect data on the sources of noise and sound pressure levels. This will make available, for the first time, comprehensive, real -time data on noise, which can be used for planning and mitigation.

The third Sunbird AI product launched was the open machine learning-powered site identification system for green electrification which increases the accuracy of planning decisions of selections for renewable energy sites and energy source options in rural areas of Uganda that are not electrified.

For the launch we presented the utility of the product in identifying green energy sites for Lamwo district.

The chief guest at the launch was the permanent secretary of the Ministry of ICT and National Guidance Dr. Aminah Zawedde, the key parent ministry overseeing the integration of AI and data science in government activities. The launch was attended amongst others by UNICEF, Cente -Tech, a key partner of Sunbird AI, UN Global Pulse. Kampala, and several government, private and civil society organizations in Uganda.

Building key alliances and networks with these crucial players in Uganda is important in building the brand of Sunbird AI but mostly it served as a vehicle to present the work Sunbird AI is doing and the potential for the use of AI for generating evidence for decision making. From the launch we've started several nascent collaborations where MoUs have been signed to create a portfolio of collaborative projects.
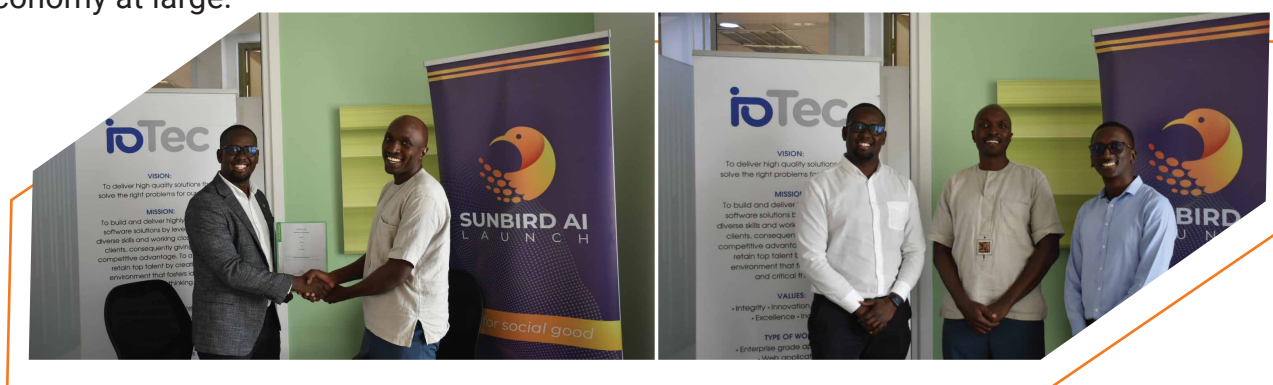
Inroads into Fintech with ioTec

On 17th June, 2022, we kicked off our collaborations in the fin-tech space by partnering with ioTec Limited, a financial company and software consultancy firm building secure enterprise software solutions to unlock economic potential by bringing services closer to individuals and businesses through intuitive, simple, secure, and instant digital channels.
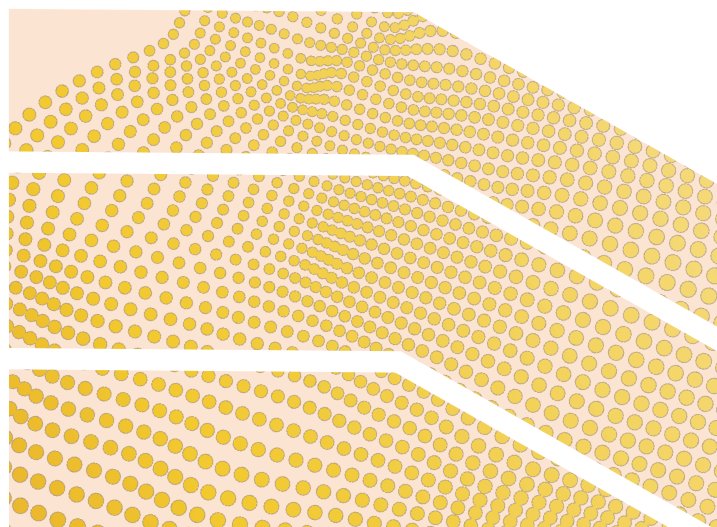
ioTec limited aims at building a customer-centric and interoperable platform to democratize access to services, strengthen service-linkages between financial service providers, manufactures and SMEs while subsidizing the high platform maintenance costs. Consequently, accelerating business growth, improving quality of life and the economy at large.

Dr. Ernest Mwebaze,
Sunbird AI's Executive Director reflects on this partnership,
"We're definitely looking forward to synergising with ioTec limited. The commendable efforts they are making in extending financial services aligns with the work we do in building practical systems to ensure there is a clear benefit to society. At Sunbird AI, we are intent on co-creating ethically sound and inclusive solutions with our partners and this collaboration with ioTec comes right on time."

Mr. Kenneth Kwesiga, ioTec's CEO stated;
"We are particularly excited about this partnership because it is strategically aligned with our objective of advancing the financial services sector through increasing access and reach of services equitably. We strongly believe that by collaborating with Sunbird AI to apply evidence-based artificial intelligence models to existing financial services data, we are able to unveil uncharted addressable markets parti-cularly those regarded as un-credit worthy by conventional methods that require collateral."

Partnering with Centenary group

As Artificial Intelligence continues to take center-stage, we appreciate partners in the private sector that see the need to embed intelligence systems in order to effectively scale innovative businesses. On 6th July, 2022, we partnered with are looking forward to the strategic with Centenary Technology Services, a technology company of Centenary Group that provides holistic technology solutions and delivers innovation that matters to enable and inspire growth through ICT advisory and Research; ICT Managed Services and Infrastructure; and ICT Innovation and Digital Services.
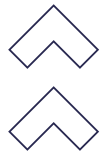
This collaboration addresses challenges to equality and inclusion, through the adoption of Artificial Intelligence technology. Speaking at the signing of the MoU, Dr Grace Ssekakubo, Chief Executive Officer at Cente-Tech said, *"The MoOU being signed seeks to create a framework for a successful partnership between Cente-Tech & Sunbird AI to create sustainable, scalable projects and initiatives which will leverage the deep expertise of Sunbird AI to support Cente-Tech's strategic ambitions to utilize modern ICT innovations for socio-economic development among the rural poor*

With a reach of over 20 million Ugandans within the Centenary brand, the partnership created will help improve social services country wide through the various Artificial Intelligence applications that Sunbird AI has developed and will develop through this collaboration."

The promise of AI-based technologies is enormous, and the benefits range from efficiency gains to unprecedented improvements in quality of life, especially in driving inclusion.

Data for DataFest

Sunbird AI co-organised an Africa-wide hackathon with Zindi Africa as part of the Africa 2022 DataFest conference organised by Pollicy., Pollicy is a feminist collective of technologists, data scientists, creatives and academics working at the intersection of data, design and technology to craft better life experiences by harnessing improved data. The hackathon challenge was based on the noise dataset collected by Sunbird AI and publicly released as part of our environmental sensing project. The challenge attracted over 100 participants across Africa with the winners coming from Egypt, Kenya and Ethiopia. Mostly it served as a platform to expose the community of machine learning experts and enthusiasts on the African continent to the challenge of noise as a key health challenge but also provide the data and tools to start tackling the problem and generating actionable information for their different governments.
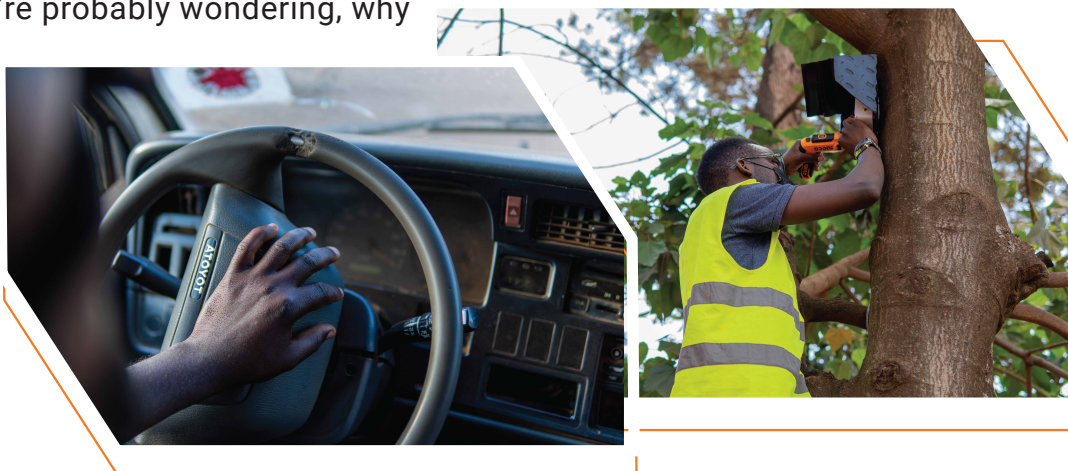
Under 2022's theme "Big Data, Little Data and everything in between " Sunbird was glad to provide noise data sets for participants to train a classification model that classifies noise audios into various categories and even more excited about partnering with Pollicy and Zindi Africa on making this challenge come to life. But before we go further you're probably wondering, why noise?

About the Hackathon.

The hackathon that ran from July 7th to 26th, was exclusively open to African countries attracted over 100 participants finding solutions on how to classify noise categories using machine learning. The first, second and third place solutions won $500, $300 and $200 respectively. Sunbird AI's goal is to integrate parts of the winning solution into our autonomous sensors to enable classification of noise on the edge.

It was interesting for the participants to realize that noise, especially in rapidly urbanizing cities, not just in Uganda but across Africa has the potential of causing serious harm. It was good to see that participants interacted with a fairly new type of data with the winning solution managing to achieve 88% accuracy on this machine learning task.

We're hoping that the solutions shared will spur the conversation on how as Africans, we can continue leveraging better data technology to mitigate some of our most pressing challenges, more specifically, challenges that are detrimental to our wellbeing over the long term.
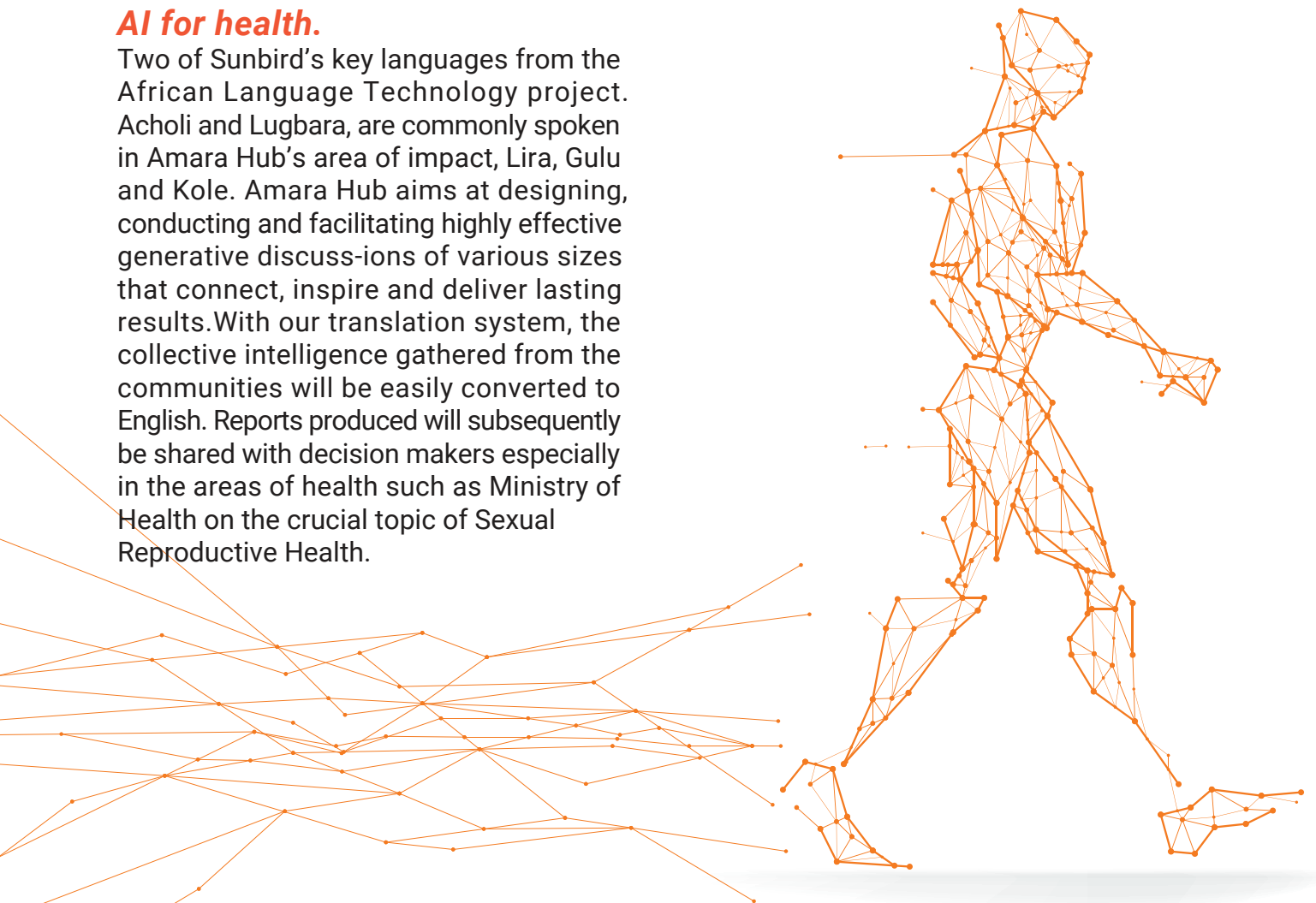
Exploring AI's benefits in citizen feedback

One of Sunbird's mandates is to support decision makers to make evidence-informed decisions. In September, we partnered with SEMA, an organisation that aims to increase transparency and accountability of public services by gathering real-time citizen feedback to discuss the numerous way AI could support their work. Our hardware team expanded the functionality of the current SEMA device to allow for speech feedback. The first pilot was placed at Kiswa Health Centre in Bugolobi. With combined efforts we hope to scale the improved devices to other public-facing facilities such as police stations.

AI for health.

Two of Sunbird's key languages from the African Language Technology project. Acholi and Lugbara, are commonly spoken in Amara Hub's area of impact, Lira, Gulu and Kole. Amara Hub aims at designing, conducting and facilitating highly effective generative discuss-ions of various sizes that connect, inspire and deliver lasting results.With our translation system, the collective intelligence gathered from the communities will be easily converted to English. Reports produced will subsequently be shared with decision makers especially in the areas of health such as Ministry of Health on the crucial topic of Sexual Reproductive Health.

AI for education difficulties

Back-Up Uganda is doing amazing work promoting and providing individual attention for pupils and students in Uganda, particularly those who experience learning difficulties through capacity building and advocacy. Sunbird is exploring how best to support their work though AI aided transcribing and translation systems in order to ease these processes and scale their efforts.
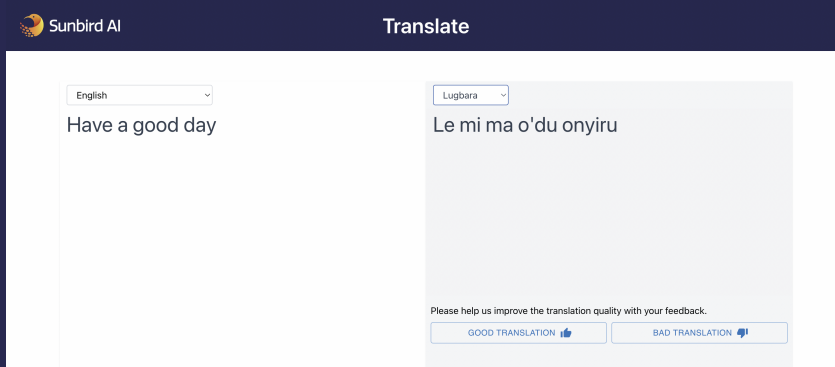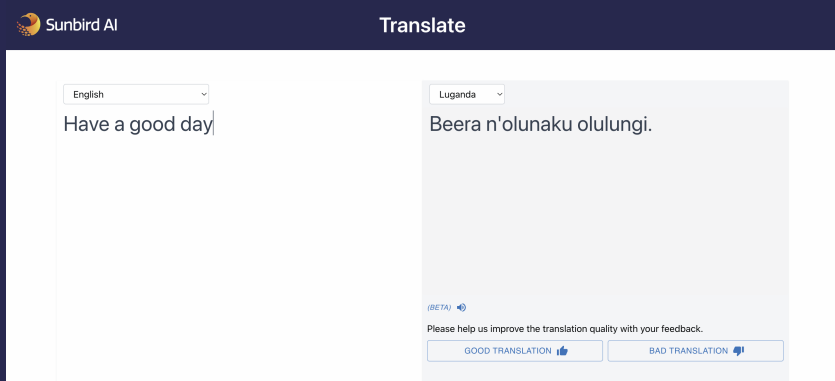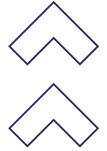
Exploring Text-To-Speech Translations

This year, Our African language technology system has pivoted from it's original text to text to text to speech. Funded by the Hewlett Foundation, *The project commenced in 2020* aimed at bridging the communication gap within Uganda's multi-cultural society. Because of the language barrier, people in Uganda who don't speak English can miss out on important information or opportunities. They might have a hard time accessing services, particularly if they have moved from a different part of the country: imagine being in a hospital or government office and not being able to understand the signs and forms, and not knowing how to ask anyone for help. That was where sunbird translation came in.

Text translation can help with many kinds of practical situations. For individuals, translation can help while traveling, or for coordinating business, finding out the news, learning a language, or interacting with authorities. We are especially interested in how it can help organisations, though. For example, government departments can use translation to make their information more accessible to more people; businesses can analyse feedback from their users in their preferred languages; doctors can find out

Sunbird AI has trained models which are the state of the art for translating between five Ugandan languages and English using a live system. Speech technology is important because local languages are more often spoken rather than written. It's common for somebody to be able to speak a language but not to be able to read or write in it.

The current text-to-speech (TTS) models are normally trained by having a voice actor in a studio make recordings of sentences. Sunbird AI has been able to train Luganda TTS in a new way, using crowdsourced data from Common Voice. The model was trained using the voices of hundreds of individuals. This is to our knowledge the only existing TTS model for any Ugandan language, and is freely and openly available.

Using Machine Learning for Green Electrification

Uganda is close to 27% electrified with the coverage falling sharply as you move to rural areas outside town centers. Sunbird AI during this phase partnered with the Ministry of Energy and Mineral Development and GIZ to build an AI/machine learning based system to provide decision support to the ministry to determine the best green electrification strategy for villages in rural areas of Uganda.

The map zooms into the village center and provides a visual depiction of the building outlines as automatically detected from the Open Buildings dataset. We further analysed this to categorise types of buildings, for example permanent or non-permanent buildings. We found that the layout of a settlement and the shapes and sizes of settlements gives rich information about the requirements for electricity. It also indicated whether solar mini-grids were feasible for each settlement, as there were constraints in how far apart buildings can be. We also analysed the demand and supply side of electrification in the selected village providing possible options of electrification and how likely they are to be suitable for the particular village. For example, we use satellite based wind speed estimates to evaluate whether wind power is feasible, and look at vegetation (outside of protected areas) to assess biomass potential.

This project was also highlighted by Google as a key example of how to use some of the satellite data projects they have previously released for social good. This particular project is the open building dataset which maps all buildings in Africa.

We held a dissemination meeting on 21st October, 2022 to discuss our findings and suggest solutions together with GIZ and

The Ministry of Energy and Mineral Development (MEMD). Our guest of honor, Dr. Brian Isabirye, Commissioner, Renewable Energy Deve-lopment (MEMD) appreciated the use of AI to effectively enhance government's strategy to increase electrification across the country.

AI Clinics

One of our mandates here at Sunbird AI is to contribute to Africa's AI ecosystem. We strive for leadership in AI for social good in the African context and do so by extending our knowledge, experience and expertise to individuals and organisations on the same mission. On 25th October, we launched the Sunbird AI clinics, a neutral source of advice targeted to public oriented, start-ups, developers, data scientists and AI enthusiasts on the practical possibilities, benefits and risks of AI technology. Some of this advice includes calculating statistics from satellite data, advice on AI deployments, translating and analyzing feedback.

SUNBIRD AI CLINICS
WHAT IS AN AI CLINIC?
Sunbird AI clinics are a neutral source of advice for African institutions on the practical possibilities, benefits and risks of AI technology.

Participating in Africa-wide AI hubs

AI for Maternal, Sexual and Reproductive Health

Sunbird AI is a consortium partner for two Africa-wide hubs on AI in two different sectors. The first hub, HASH is an AI consortium for Maternal, Sexual and Reproductive Health (MSRH) hub where Sunbird AI is working with Infectious Diseases Institute (IDI) and Makerere University College of Computing to build a contextual body of research, data, and products on AI for MSRH. In December, Sunbird was invited to the HASH subgrantee inception meeting where 9 individuals developing AI solutions to Maternal, Sexual and Reproductive Health challenges in Sub-Saharan Africa under the themes of HIV, Sexually Transmitted Diseases, Adolescent Sexual Reproductive Health and Maternal Health were taken through strategies to ensure responsible AI.

Gender and Responsible Artificial Intelligence Network (GRAIN)

The second hub, the GRAIN network is focused on responsible AI for Gender and Inclusion. Sunbird AI is partnering with Initiative Prospective Agricole et Rurale (IPAR) in Senegal and Center for the Study of the Economies of Africa (CSEA) in Nigeria to implement this Africa-wide network. This phase of reporting Sunbird AI was involved in formulating the strategy of the hub and formulating a call of action for interested hub members. Defining AI in terms of Gender and Inclusion is a key aspect of building the ecosystem particularly for these areas where there is limited work being done in Africa. In November, the hub released a call for research proposals aimed at

researchers and organizations working on improving gender inclusion and equality through AI in Sub-Saharan Africa.

Contributing to the Ugandan Chapter of Data Science Africa

Sunbird AI was also involved in local community activities of the Ugandan chapter of Data Science Africa (DSA). Proud to be founding members of a local initiative of DSA, the network of data science professionals and enthusiasts is meant to showcase what is happening in the Artificial Intelligence, data, data science and innovation space in Uganda but also, bring together partners working in data science space within the country.

The launch aimed at increasing interest, awareness and ownership in data science among stakeholders and also communicated the agenda of the local chapter so that people can be aware of what is available on offer and stimulate discussion on partnership.

The major goal is to grow the next generation of data scientists in Africa to solve African problems. Using data science, we can solve problems in finance, agriculture, health and commerce

Towards this end we also participated and co-organised 2 workshops on the development of different AI curricula targeting different groups of professionals in Uganda including early career professionals, students and business leaders. For this Sunbird AI partnered with Pulse lab Kampala, GIZ, Refactory and Makerere University. In the next phase we intend to participate in the running of AI courses as an implementation of these activities.

Sunbird Internships

In 2022, we recruited 3 interns under the hardware and software teams. 2 of them Wendy and Jude are pursuing their undergraduate degrees in Computer Science and Electronics and Networks from Ashesi University in Ghana. Kwezi Louis studying computer engineering at Makerere University.

Kwezi and Jude worked under the hardware team working on the noise monitoring devices Noise Monitoring Sensor, and a Voice recorder for SEMA company.

"During the internship, I learned much about reading data sheets, quickly prototyping, and getting non-compatible modules/libraries/devices to work together. Based on this work, I was able to ease into my final year classes this semester with knowledge based on Industry. I am excited about linking academic concepts to real world problems. Also, I learned about building relationships and working towards a common goal with various people of different methods, styles and personalities."

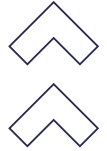shares Jude, he went on to write about his experience here.

Kwezi's learning experience included understanding how to read and use the components' data sheet effectively which enabled him to design proper circuits.

Wendy, who joined the software team, worked on the back-end of the noise monitoring devices, doing data analysis and visualizing the sensor metrics. Wendy had minimal experience in software engineering and consequently gained knowledge on AI and machine learning.

"I can now visualize the steps I need to take in order to become a software engineer," she shares.

End of year party

We held our end of year party on 21st December 2022 to close off the year reflecting on achievements and brainstorming on how to improve challenges. The fun-filled day consisted of critical thinking games and sports activities. We split up into two teams, Team Avengers and Team Wakanda.

To close off the day was an insightful discussion on engaging policy makers facilitated by one of our board members, *Dr. Rhona Mijumbi*.