

Alex Mirugwe

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Professional Summary

Alex Mirugwe is a Data Scientist and PhD researcher in Medical AI at Queensland University of Technology (QUT), Brisbane, Australia, with over 4 years of experience spanning machine learning, deep learning, and applied research. His current doctoral research focuses on geometry-constrained latent diffusion models for structure-preserving, unsupervised anomaly detection in medical imaging, advancing robust and interpretable AI tools for clinical diagnostics. Beyond his doctoral work, he has a strong track record of designing data-driven solutions to complex, real-world problems in resource-limited settings, applying predictive modeling, computer vision, natural language processing, and time-series analysis. Driven by a commitment to building intelligent systems that are both technically rigorous and practically deployable, he is focused on bridging cutting-edge AI research with tangible clinical impact.

Education

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|----------------|---|
| 2026 – Present | Queensland University of Technology (QUT) , Brisbane, Australia
PhD. Medical AI
Research Topic: <i>Geometry-Constrained Latent Diffusion for Structure-Preserving Unsupervised Anomaly Detection in Medical Imaging</i> |
| 2020 – 2021 | University of Cape Town , South Africa
MSc. Data Science
Thesis title: <i>Investigating automated bird detection from webcams using machine learning</i>
Advisors: Dr Juwa Nyirenda and Dr Emmanuel Dufourq
GPA: 74.52% |
| 2014 – 2019 | Makerere University , Uganda
BSc. Computer Engineering
Dissertation: <i>A low-cost wireless TV audio transceiver</i>
CGPA: 4.18/5.0 |

Employment History

March-2022 - April-2026

Data Scientist. Makerere University School of Public Health, Monitoring & Evaluation Technical Support CDC program

- Architected and deployed a RAG-powered chatbot (fine-tuned LLaMA) enabling natural language querying of HIV databases via automated SQL generation, democratizing real-time data access for non-technical public health staff.
- Built a machine learning model to identify HIV patients at risk of dropping out of care or failing viral suppression, enabling proactive clinical interventions and improving patient retention and outcomes, achieving a 43% reduction in attrition in pilot facilities.
- Designed, implemented, and deployed a deep learning algorithm for cervical cancer and TB screening, increasing diagnostic accuracy and efficiency and contributing to earlier detection and treatment, piloted across 11 facilities across Uganda.
- Developed a probabilistic patient-matching algorithm to de-duplicate HIV patient records across PEPFAR-supported facilities in Uganda, reducing duplicate entries by 4.8%.
- Performed sentiment analysis on over 20,000 social media posts during the 2022 Uganda Ebola outbreak, generating actionable insights that informed public health risk communication strategies.

Jan-2022 - Feb-2024

Assistant Lecturer. Faculty of Science, Victoria University, Kampala.

- Delivered undergraduate and postgraduate courses in Introduction to Python, Machine Learning, Deep Learning, and Artificial Intelligence.
- Designed course materials and assessments, and provided timely, constructive feedback to foster student engagement and academic growth.
- Contributed to the design and review of the BSc Software Engineering and MSc Blockchain Technology curricula, ensuring academic rigour and industry relevance.

Jan-2021 - Sept-2021

Tutor. Department of Computer Science, University of Cape Town.

- Led and supervised laboratory sessions for undergraduate students covering core machine learning topics, including linear and logistic regression, decision trees, and support vector machines.
- Prepared instructional materials and live demonstrations to deepen students' conceptual understanding and practical application of machine learning techniques.
- Mentored students through coursework projects and assignments, offering targeted guidance to support academic progress.
- Collaborated with faculty to develop course content, problem sets, and assessments aligned with learning objectives.

Research Interests

Statistics, Mathematics, Machine Learning, Deep Learning, Computer Vision, Natural Language Processing, Time-Series Analysis, Data Security, and Privacy.

Research Publications

Journal Articles

- 1 A. **Mirugwe**, A. Fitzmaurice, A. Namale, *et al.*, "Patient deduplication in uganda's electronic medical records system: A comparison of three classification algorithms," *BMC Digital Health*, vol. 4, no. 37, 2026.  DOI: 10.1186/s44247-026-00257-w.

- 2 A. **Mirugwe** and J. Nyirenda, "Secure and efficient federated learning for predictive modeling in resource-constrained healthcare systems," *Medinformatics*, vol. 3, no. 2, pp. 178–184, 2026.  DOI: 10.47852/bonviewMEDIN52027621.
- 3 A. **Mirugwe**, S. Solomon, A. Fitzmaurice, *et al.*, "Visit-level prediction of missed hiv appointments using machine learning and transformer-based models in uganda," *BMC Medical Informatics and Decision Making*, vol. 26, no. 131, 2026.  DOI: 10.1186/s12911-026-03434-z.
- 4 L. Tamale, S. Denis, M. Drake, A. **Mirugwe**, and L. Jude T., "Artificial intelligence-powered multiclass deep learning model for detection of aflatoxin-related defects in ugandan groundnuts," *Discover Artificial Intelligence*, vol. 6, no. 291, 2026.  DOI: 10.1007/s44163-026-01027-3.
- 5 A. **Mirugwe**, L. Tamale, and J. Nyirenda, "Improving tuberculosis detection in chest x-ray images through transfer learning and deep learning: Comparative study of convolutional neural network architectures," *JMIRx Med*, vol. 6, e66029, 2025.  DOI: 10.2196/66029.
- 6 A. **Mirugwe** and C. Ashaba, "Cervical cancer screening: Artificial intelligence algorithm for automatic diagnostic support," *Translational Medicine*, vol. 13, no. 6, pp. 1–8, 2024.
- 7 A. **Mirugwe**, C. Ashaba, A. Namale, *et al.*, "Sentiment analysis of social media data on ebola outbreak using deep learning classifiers," *Life*, vol. 14, p. 708, 6 2024.  DOI: 10.3390/life14060708.
- 8 A. **Mirugwe**, "Adoption of artificial intelligence in the ugandan health sector: A review of literature," *Diversity and Equality in Health and Care*, vol. 20, 3 2023.  DOI: 10.21767/2049-5471.21.3.022.
- 9 A. **Mirugwe** and J. Kibanga, "Digital outbreak response system: A case study on the use of the go.data tool for ebola outbreak data management in uganda," *American Journal of Preventive Medicine and Public Health*, vol. 9, no. 5, pp. 1–6, 2023.
- 10 A. **Mirugwe**, "Restaurant tip prediction using linear regression," *International Journal of Data Science and Big Data Analytics*, 2021.  DOI: 10.51483/IJDSBDA.1.2.2021.31–38.

Conference Proceedings

- 1 A. **Mirugwe**, J. Nyirenda, and E. Dufourq, "Automating bird detection based on webcam captured images using deep learning," in *Proceedings of 43rd Conference of the South African Insti*, vol. 85, 2022, pp. 62–76.  DOI: 10.29007/9fr5.

Opinion Articles

- 1 A. **Mirugwe**, *When the Algorithm Passes the Test but Fails the Patient: A Global Reckoning with the Evidence Standards for Artificial Intelligence in Clinical Diagnosis*. 2026.  URL: <https://ssrn.com/abstract=6538200>.
- 2 A. **Mirugwe**, *What AI can do for improving health in Africa*. 2025.  DOI: 10.1038/d44148-025-00371-3.
- 3 A. **Mirugwe**, *Where is Africa in the AI conversation?* 2025, vol. 22, pp. 36–38.  DOI: 10.1093/jrssig/qmaf059.

Skills

Coding & Tools	Excel, Python, R, FastAPI, Flask
Databases	MySQL, PostgreSQL, MongoDB
Cloud Platforms	AWS, Azure
Data Manipulation	Polars, Pandas, NumPy, dplyr, tidyr
ML Frameworks	Scikit-learn, TensorFlow, Keras, OpenCV, NLTK
MLOps Platform	MLFlow, BentoML
Big Data	Hadoop, PySpark
Workflow Orchestration	Apache Airflow
GenAI tools	Langchain, GPT, Llama
Visualization	PowerBI, Tableau, ggplot2, Matplotlib, Plotly, Seaborn
Web Application Development	Flask, Streamlit
Others	GIT, $\LaTeX$