JOSEPH MALINZI

Curriculum Vitæ

Applied Mathematician | *Mathematical Oncology* | *Disease Modelling* | *Data Science*

Department of Mathematics, University of Eswatini, M201 Kwaluseni, Eswatini

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✉ josephmalinzi1@gmail.com **ORCID:** 0000-0001-9184-8506
Google Scholar: Profile
LinkedIn: Profile · **Nationality:** Ugandan

Personal Statement. I am an Applied Mathematician and academic dedicated to bridging mathematical biology, computational mathematics, and data science. I develop predictive models for cancer combination therapies and epidemic dynamics, combining PDEs, optimal control theory, and machine learning. My work has identified optimal timing protocols for synergistic oncolytic virotherapy and directly informed national COVID-19 policy in Eswatini. I bring a strong track record of publications, competitive grant acquisition, postgraduate supervision, and international collaborations, driven by a commitment to applying mathematical rigour to critical challenges in biomedicine and public health.

EDUCATION

2013–2016
Doctor of Philosophy in Applied Mathematics
University of KwaZulu-Natal, South Africa
Thesis: Mathematical Modelling of Cancer Treatments and the Role of the Immune System Response to Tumour Invasion
Supervisor: Prof. Precious Sibanda

2012–2013
Master of Science in Applied Mathematics *(Cum Laude)*
University of KwaZulu-Natal, South Africa
Dissertation: Modelling the Response of Cytotoxic-T Lymphocytes in Controlling Solid Tumour Invasion

2011–2012
Postgraduate Diploma in Mathematical Sciences
African Institute for Mathematical Sciences (AIMS), South Africa
Essay: Efficacy Analysis of Two Basic Control Measures in Malaria Prevention

2007–2010
Bachelor of Science with Education (Honours), Second Class Upper Division
Makerere University, Uganda Majors: Mathematics and Economics

ACADEMIC APPOINTMENTS

November 2023 – present
Senior Lecturer in Mathematics
University of Eswatini, Eswatini

July 2018 – November 2023
Lecturer in Mathematics
University of Eswatini, Eswatini

July 2016 – June 2018
Postdoctoral Research Fellow and Assistant Lecturer
University of Pretoria, South Africa
Host: Prof. Jacek Banasiak (DST/NRF SARChI Chair in Mathematical Models and Methods in Biosciences and Bioengineering)

August 2014 – April 2016
Senior Tutor in Mathematics
University of KwaZulu-Natal, South Africa

July 2012 – July 2014
Mathematics Tutor
University of KwaZulu-Natal, South Africa

November 2015
Visiting Lecturer
African Institute for Mathematical Sciences, South Africa

Visiting Positions

January – February 2026
Visiting Researcher
Institut des Hautes Études Scientifiques (IHÉS), Bures-sur-Yvette, France

February 2025
Visiting Research Fellow
Sydney Mathematical Research Institute (SMRI), University of Sydney, Australia
Host: Prof. Peter Kim

January 2023 – July 2024
Visiting Research Fellow
Wolfson Centre for Mathematical Biology, Mathematical Institute, University of Oxford, United Kingdom
Host: Prof. Helen M. Byrne

March 2020 – present
Honorary Research Fellow
Durban University of Technology, South Africa

Research Impact

2020–2022
COVID-19 policy impact. Member, Technical Working Group on COVID-19, Ministry of Health,

Eswatini. Transmission dynamics models directly informed national testing, quarantine, and vaccination policies.

2023–2026
Oncolytic virotherapy optimisation. Developed a predictive model for synergistic effects of combining vesicular stomatitis and vaccinia viruses, identifying optimal timing protocols for clinical translation (arXiv:2601.10405).

Selected Peer-Reviewed Publications

[1] **J. Malinzi**, H.M. Byrne. Editorial: Quantitative insights into new cancer therapies: a mathematical modeling approach. *Frontiers in Applied Mathematics and Statistics*, 12 (2026): 1869506. doi:10.3389/fams.2026.1869506

[2] **J. Malinzi**, P. Dubey. Editorial: Integrative mathematical models for disease, volume II. *Frontiers in Applied Mathematics and Statistics*, 12 (2026): 1843851. doi:10.3389/fams.2026.1843851

[3] V.O. Juma, C.E. Madubueze, J. Mwaonanji, G. Nkem, **J. Malinzi**. Some new aspects on COVID-19 transmission dynamics applicable to other epidemics. *Innovation and Emerging Technologies*, 12 (2025): 2550087. doi:10.1142/S2424823X2550087X

[4] S.A. Tiomela, A. Mvogo, B. Bodo, S. Macias, **J. Malinzi**, J.E. Macias-Diaz. Analysis, simulation and applications of a delayed target-limited cell model under the cumulative effects of vaccine and treatment. *International Journal of Biomathematics*, (2025): 2550011. doi:10.1142/S179352452550011X

[5] P. Dubey, **J. Malinzi**. Editorial: Mathematical modeling of diseases at population-level and cellular-level. *Frontiers in Applied Mathematics and Statistics*, 10 (2024): 1534439. doi:10.3389/fams.2024.1534439

[6] **J. Malinzi**, V.O. Juma, E. Mwakilama, T. Mupedza, J. Mwaonanji, G. Nkem, C.E. Madubueze *et al.* COVID-19 transmission dynamics and the impact of vaccination: modelling, analysis and simulations. *Royal Society Open Science*, 10(7): 221656, 2023. doi:10.1098/rsos.221656

[7] S.S. Salim, **J. Malinzi**, E. Mureithi, N. Shaban. Mathematical modelling of chemovirotherapy cancer treatment. *International Journal of Modelling and Simulation*, 45(1): 364–385, 2023. doi:10.1080/02286203.2023.2204355

[8] S.S. Salim, **J. Malinzi**, E. Mureithi, N. Shaban. Mathematical modeling of chemovirotherapy cancer treatment. *International Journal of Modelling and Simulation*, (2023): 1–23. doi:10.1080/02286203.2023.2165751

[9] **J. Malinzi**, S. Gwebu, S. Motsa. Determining COVID-19 dynamics using physics-informed neural networks. *Axioms*, 11(3): 121, 2022. doi:10.3390/axioms11030121

[10] **J. Malinzi**. A mathematical model for oncolytic virus spread using the telegraph equation. *Communications in Nonlinear Science and Numerical Simulation*, 101 (2021): 105944. doi:10.1016/j.cnsns.2021.105944

[11] S. Sani, T.H. Gadaga, I.L. Moyo, **J. Malinzi**, P. Horton. The moon project: where management meets mathematics. *Scientific African*, (2021): e00803.

doi:10.1016/j.sciaf.2021.e00803

[12] **J. Malinzi**, K.B. Basita, S. Padidar, H.A. Adeola. Prospect for application of mathematical models in combination cancer therapy. *Informatics in Medicine Unlocked*, 24 (2021): 100534. doi:10.1016/j.imu.2021.100534

[13] H.A. Ejalonibu, **J. Malinzi**. Numerical simulations of mathematical models for chemo-immunotherapy: determination of immune system components most critical for tumour eradication. *Far East Journal of Mathematical Sciences*, 129 (2021): 81–112.

[14] S. Salim, E. Mureithi, N. Shaban, **J. Malinzi**. Mathematical modelling of the dynamics of prostate cancer with a curative vaccine. *Scientific African*, 11 (2021): e00715. doi:10.1016/j.sciaf.2021.e00715

[15] **J. Malinzi**, I. Amima. Mathematical analysis of a tumour-immune interaction model: a moving boundary problem. *Mathematical Biosciences*, 308 (2019): 8–19. doi:10.1016/j.mbs.2018.12.010

[16] **J. Malinzi**. Mathematical analysis of a model of chemovirotherapy: effect of drug infusion method. *Computational and Mathematical Methods in Medicine*, 2019: 7576565. doi:10.1155/2019/7576565

[17] **J. Malinzi**, R. Ouifki, A. Eladdadi, D.F. Torres, K.A.J. White. Enhancement of chemotherapy using oncolytic virotherapy: mathematical and optimal control analysis. *Mathematical Biosciences & Engineering*, 15(6): 1435–1463, 2018. doi:10.3934/mbe.2018065

[18] **J. Malinzi**, P.A. Quaye. Exact solutions of non-linear evolution models in physics and biosciences using the hyperbolic tangent method. *Mathematical and Computational Applications*, 23(3): 35, 2018. doi:10.3390/mca23030035

[19] M.C. Wakira, G.O. Lawi, **J. Malinzi**. A spatiotemporal model on the transmission dynamics of the Zika virus disease. *Asian Research Journal of Mathematics*, 10(4): 1–15, 2018. doi:10.9734/ARJOM/2018/41593

[20] **J. Malinzi**, A. Eladdadi, P. Sibanda. Modelling the spatiotemporal dynamics of chemovirotherapy cancer treatment. *Journal of Biological Dynamics*, 11(1): 244–274, 2017. doi:10.1080/17513758.2017.1328079

[21] **J. Malinzi**, P. Sibanda, H. Mambili-Mamboundou. Analysis of virotherapy in solid tumour invasion. *Mathematical Biosciences*, 263 (2015): 102–110. doi:10.1016/j.mbs.2015.01.015

[22] **J. Malinzi**, P. Sibanda, H. Mambili-Mamboundou. Response of immunotherapy to tumour-TICLs interactions: a travelling wave analysis. *Abstract and Applied Analysis*, 2014: 137020. doi:10.1155/2014/137020

[23] H. Mambili-Mamboundou, P. Sibanda, **J. Malinzi**. Effect of immunotherapy on the response of TICLs to solid tumour invasion. *Mathematical Biosciences*, 249 (2014): 52–59. doi:10.1016/j.mbs.2014.01.004

PREPRINTS

[1] **J. Malinzi**, A. Eladdadi, R. Ouifki, R. Eftimie, A. Madzvamuse, H.M. Byrne. A predictive model for synergistic oncolytic virotherapy: unveiling the ping-pong mechanism and

optimal timing of combined vesicular stomatitis and vaccinia viruses. *arXiv preprint*, 2026. arXiv:2601.10405

Research Supervision

Doctoral

- Salim Said Seif. *Mathematical modelling of the dynamics of prostate cancer in the presence of vaccination and immune checkpoint inhibitors.* PhD, University of Dar es Salaam, Tanzania. 2019–2022.

Master's *(17 completed or ongoing; affiliations span five countries)*

- Lennox M. Nkambule. *Mathematical analysis of prey-predator models with different trophic functions.* MSc, University of Eswatini. 2020–present.
- Patricia Sibandze. *Mathematical analysis of a model for oncolytic virotherapy: effect of the tumour microenvironment.* MSc, University of Eswatini. 2020–present.
- Benjamin Ogwang. *A mathematical model for oncolytic virus spread.* MSc, AIMS Rwanda. 2023.
- Adjei Nana Owusu. *A brief review of tumour growth models.* MSc, AIMS Rwanda. 2023.
- Hassani Saidi Namanolo. *Dynamical survival analysis for epidemics.* MSc, AIMS Rwanda. 2023.
- Simanga Gwebu. *Determining the dynamics of COVID-19 using physics-informed neural networks.* MSc, University of Eswatini. 2020–2022.
- Wezzie Grace Banda. *Dynamical survival analysis: from population to individual-based epidemic models.* MSc, AIMS South Africa. 2022.
- Alinafe Maenje. *A mathematical model of collagen accumulation in a healing wound: effects of local and systemic factors.* MSc, AIMS South Africa. 2022.
- Rhoda Terim Akparibo. *A hyperbolic prey-predator model.* MSc, AIMS Ghana. 2022.
- Kelvin Antwi Gyamfi. *The telegraph equation.* MSc, AIMS Ghana. 2022.
- Kevin Bosire Basita. *A systematic review of mathematical models for combination cancer therapy.* MSc, AIMS South Africa. 2019.
- Adrien Honoré Quete Njako. *Analysis of a free boundary problem for tumour growth.* MSc, AIMS Senegal. 2018–2019.
- Wachira Charles Muriuki. *A spatiotemporal model on the transmission dynamics of the Zika virus disease.* MSc, Masinde Muliro University, Kenya. 2017–2018.
- Paul Amarh Quaye. *Travelling wave solutions using the hyperbolic tangent method.* MSc, AIMS Rwanda. 2016–2017.
- Hammed Adewale Ejalonibu. *Mathematical model for chemo-immunotherapy: determination of immune system components most critical for tumour eradication.* MSc, AIMS Rwanda. 2016–2017.
- Innocenter Moraa Amima. *Cancer dormancy: modelling the dynamics of tumour-immune interactions.* MSc, AIMS Ghana. 2016.

- Nonduduzo Maureen Rasenyalo. *Mathematical modelling of tumour development during angiogenesis and anti-angiogenesis.* MSc, University of KwaZulu-Natal. 2015–2016.

Undergraduate (selected)

- Lethu Gama. *Mathematical modeling of an influenza outbreak in a boarding school.* BSc, University of Eswatini. 2024–2025.
- Samkelisiwe Shongwe. *Dynamics of victim-criminal interactions in a cybernetwork: a machine learning approach.* BSc, University of Eswatini. 2024–2025.
- Nomkhosi Dlamini. *Classical mathematical models for tumour growth.* BSc, University of Eswatini. 2018–2019.
- Qiniso Dube. *A simple mathematical model of virus-immune interactions.* BSc, University of Eswatini. 2019–2020.
- Sebenzile Nkambule. *Transmission dynamics of COVID-19 in Eswatini: effect of testing and quarantining.* BSc, University of Eswatini. 2020–2021.
- Fezile Ntombikayise Soko. *A mathematical model of tumor-immune interactions.* BSc, University of Eswatini. 2020–2021.

Selected Invited Talks

- Optimal Control of a Dual-Pivot Oncolytic Virotherapy: Synergy Between Vaccinia and Vesicular Stomatitis Viruses. *Masamu Colloquium* (Virtual). March 2026.
- Investigating the Synergistic Anti-Cancer Effects of Combining Two Oncolytic Viruses: Mathematical Modelling and Machine Learning Approaches. *Applied Mathematics Seminar*, University of Sydney, Australia. February 2025.
- Mathematical Modelling of the Synergistic Anti-Cancer Effects of Combining Vaccinia and Vesicular Stomatitis Viruses. *International Conference on Mathematical Analysis and Applications*, Karnatak University, India. June–July 2025.
- The Future of Cancer Treatments: Insights from Mathematical Modelling. *Department of Mathematics*, Makerere University, Uganda. January 2022.

Selected Conference Presentations

- Complexity Coffee: Nascent Research Ideas (ABM and Network Science Informed Modelling of Oncolytic Virotherapy and Combination Cancer Treatments), Santa Fe Institute, Virtual. 16 June 2026.
- Africa Oxford Initiative (AfOx) 10th Anniversary Celebrations & Research Symposium, University of Oxford, United Kingdom. 8–12 June 2026.
- The Analysis and Differential Equations with Applications (ADEANS VI), Hluhluwe, South Africa. September 2025.
- Conference on Mathematical Modelling for Biosciences and Engineering (M2BE 2025), Yaoundé, Cameroon. July 2025.
- Applied Mathematics Seminar, University of Sydney, Australia. February 2025.

- Postdocs in Complexity Conference, Santa Fe Institute, USA. September 2024.
- International Conference on Mathematical Modeling in Biology and Life Sciences, North-West University, South Africa. February–March 2024.
- Southern Africa Mathematical Sciences Association (SAMSA) Annual Conference, University of Pretoria, South Africa. November 2023.
- Weekly Mathematical Biology and Mathematical Oncology Seminars, Wolfson Centre for Mathematical Biology, University of Oxford, UK. May and June 2023.
- International Conference on Recent Developments in Mathematical Biology, North-West University, South Africa. March 2023.
- SAMSA-Masamu CRN Virtual Colloquia Series, Auburn University, USA. September 2022.
- International Conference on Mathematical Methods and Models in Biosciences, University of Pretoria, South Africa. June 2021.
- Department of Mathematics Webinar, University of Southampton, UK. May 2020.
- International Conference on Mathematical Methods and Models in Biosciences, Bedlewo, Poland. June 2019.
- 43rd Symposium on Numerical and Applied Mathematics (SANUM 2019), University of Pretoria, South Africa. March 2019.
- International Conference on Mathematical Methods and Models in Biosciences, Sofia, Bulgaria. June 2018.
- Southern Africa Mathematical Sciences Association (SAMSA) Annual Conference, Arusha, Tanzania. November 2017.
- International Conference on Mathematical Methods and Models in Biosciences, Kruger Park, South Africa. June 2017.

Schools and Workshops

- Transport Models in Biology and Initiation to Finite Volume Methods (3MC), North-West University, South Africa. March 2026.
- Training Workshop on Mathematical Modelling of HIV in Sub-Saharan Africa, HIV Modelling Consortium. September 2025.
- Global Complexity School, Santa Fe Institute, USA. September 2024.
- 3MC African Mathematical School on Quantitative Biology, North-West University, South Africa. February 2024.
- Global Complexity School, University of Witwatersrand & Santa Fe Institute, Limpopo, South Africa. December 2023.
- CIMPA Research School: Mathematical Modeling in Biology, North-West University, South Africa. March 2023.
- CIMPA Research School: Mathematical and Statistical Methods for Data Science, AIMS Cape Town, South Africa. July 2022.
- The Future of Science Conference, AIMS, Kigali, Rwanda. July 2019.

- Clinic on the Meaningful Modelling of Epidemiological Data, AIMS Cape Town, South Africa. May–June 2012.

Editorial and Review Service

Guest Editor, Frontiers in Applied Mathematics and Statistics:

- Quantitative Insights into New Cancer Therapies: A Mathematical Modeling Approach
- Integrative Mathematical Models for Disease: Volume II
- Mathematical Modeling of Diseases at Population-Level and Cellular-Level

Reviewer for: Bulletin of Mathematical Biology; Journal of Mathematical Biology; Mathematical Biosciences; Acta Biotheoretica; Discrete and Continuous Dynamical Systems B; Communications in Nonlinear Science and Numerical Simulation; Applied Mathematics and Computation.

Teaching

Postgraduate: Population Dynamics and Epidemiology; Advanced Differential Equations.

Undergraduate: Differential Equations; Computational Methods; Probability and Statistics; Calculus I & II; Introduction to Numerical Methods; Introduction to Calculus; Algebra, Trigonometry and Analytic Geometry.

Grants, Fellowships and Awards

2026
Simons Foundation Programme for Africa-based Visiting Researchers
Institut des Hautes Études Scientifiques (IHÉS), Bures-sur-Yvette, France (EUR €2,500.)

2025
Sydney Mathematical Research Institute (SMRI) Visiting Research Fellowship
University of Sydney, Australia (AUD $15,000)

2024
Africa Oxford (AfOx) Catalyst Research Grant
University of Oxford, United Kingdom (GBP £5,000)

2023–2024
Africa Oxford (AfOx) Visiting Research Fellowship
University of Oxford, United Kingdom (GBP £5,000)

2016–2018
DST/NRF SARChI Chair Postdoctoral Fellowship
University of Pretoria, South Africa (ZAR 480,000)

2013–2015
University of KwaZulu-Natal Postgraduate Scholarship — PhD (ZAR 180,000)

2013
University of KwaZulu-Natal Cum Laude Award

2011–2012
Full Scholarship, African Institute for Mathematical Sciences, South Africa

2007–2010
Government of Uganda Undergraduate Bursary, Makerere University

Administrative and Professional Service

2016–2022
Executive Committee Member, Southern Africa Mathematical Sciences Association (SAMSA)

2020–2022
Member, Technical Working Group on COVID-19, Ministry of Health, Eswatini *(mathematical modelling input to national policy)*

2020–2022
Teaching and Learning Executive Committee Member, Faculty of Science, University of Eswatini

2019–present
Executive Committee Member (Treasurer), UNESWA Catholic Community

2020–present
Committee Member, Faculty of Science COVID-19 Task Team, University of Eswatini

2008–2010
Student Course Coordinator, Makerere University

2015–2016
Adviser and Leader, Mathematics-Biology Journal Club, University of KwaZulu-Natal

2011–2012
Student Facility Organizer, African Institute for Mathematical Sciences, South Africa

Professional Affiliations

Southern Africa Mathematical Sciences Association (SAMSA).

Technical Skills

Computing: Python (NumPy, SciPy, PyTorch, scikit-learn), MATLAB (ODEs, PDEs, optimisation), Mathematica, Maple, Sage, Git, LaTeX.

Systems: Linux (Debian/Ubuntu/RedHat), macOS, Windows; basic HPC experience.

Languages: Luganda/Lusoga (native); English (C1/C2); Siswati (A2); French (A2).

Referees

Prof. Helen M. Byrne
Wolfson Centre for Mathematical Biology
University of Oxford, United Kingdom
Helen.Byrne@maths.ox.ac.uk
Tel: +44 1865 615149

Prof. Precious Sibanda
Department of Mathematics
University of KwaZulu-Natal, South Africa
SibandaP@ukzn.ac.za
Tel: +27 72 220 7293

Prof. Anotida Madzvamuse
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