

KINGSLEY CHIMUANYA UKANDU

Ph.D. Candidate in Mathematical Sciences (Applied Mathematics) | Data Analytics M.S. Student

Las Vegas, Nevada, United States

| kingsley.ukandu@unlv.edu

LinkedIn: [linkedin.com/in/kingsley-ukandu](https://www.linkedin.com/in/kingsley-ukandu) | GitHub: github.com/kingsleyukandu

Google Scholar: scholar.google.com/citations?user=c56ylkoAAAAJ&hl=en | ORCID: 0009-0003-6641-2788

PROFESSIONAL PROFILE

Ph.D. Candidate in Mathematical Sciences (Applied Mathematics) and health data analytics researcher at the University of Nevada, Las Vegas; advanced to doctoral candidacy on June 25, 2026. Research integrates mathematical epidemiology, differential equations, endemic equilibrium analysis, data analytics, and scientific machine learning. Dissertation work examines how population movement and spatial heterogeneity influence disease persistence and endemic-equilibrium structure in susceptible-infected-susceptible epidemic network models. Research record includes three peer-reviewed journal articles, including a 2026 article in the SIAM Journal on Applied Mathematics, and two manuscripts under journal review. Additional experience includes a PyTorch-based SIRD disease-informed neural network for parameter recovery, explainable health-risk modeling, funded research assistantships, university teaching, conference presentations, and STEM community leadership.

RESEARCH INTERESTS AND AREAS OF EXPERTISE

- Mathematical biology; infectious disease modeling
- Data-informed modeling, machine learning, deep learning, and disease-informed neural networks
- Nonlinear functional analysis, monotone inclusion problems, variational inequalities, and optimization algorithms

EDUCATION

University of Nevada, Las Vegas, Las Vegas, Nevada, United States

Doctor of Philosophy (Ph.D.) in Mathematical Sciences (Applied Mathematics) | Fall 2022-Present | Expected Spring 2028

Advanced to Doctoral Candidacy: June 25, 2026

Dissertation: Effects of Population Movement in the Long-Term Dynamics of Infectious Diseases in SIS Epidemic Network Models: A Mathematical Perspective

Advisor and Dissertation Committee Chair: Dr. Rachidi B. Salako

Dissertation Committee: Dr. Xin Li, Dr. Monika Neda, and Dr. Ashok Singh

University of Nevada, Las Vegas, Las Vegas, Nevada, United States

Master of Science (M.S.) in Data Analytics | Summer 2025-Present | Expected Spring 2027

Admission Status: Full Admit | Faculty Advisor: Dr. Kazem Taghva

Graduate training in advanced data analysis, machine learning, and big-data technologies.

African University of Science and Technology, Abuja, Nigeria

Master of Science (M.S.) in Pure and Applied Mathematics | Awarded December 9, 2017

Thesis: *Inertial Forward Backward Forward Splitting Algorithm for Solving Monotone Inclusion Problems*

Selected Graduate Coursework: Ordinary Differential Equations, Partial Differential Equations, Numerical Methods for Partial Differential Equations, Real Analysis, Functional Analysis, Topology, and Complex Analysis

Advisors: Prof. C. E. Chidume and Dr. J. N. Ezeora

University of Nigeria, Nsukka, Nigeria

Bachelor of Science (B.S.) in Mathematics | 2012–2016

Thesis: *Optimization on Reflexive Spaces* | Advisor: Rev. Sr. Onyido Maria

ACADEMIC AND RESEARCH APPOINTMENTS

University of Nevada, Las Vegas, Department of Mathematical Sciences | Graduate Teaching Assistant and Graduate Research Assistant | 2022–Present

- Conduct doctoral research on SIS epidemic network models, emphasizing population movement, endemic equilibria, bifurcation structure, and long-term disease persistence.
- Develop data-informed and machine-learning models for health-risk prediction and explainable clinical analytics.
- Taught or led discussion sections for 33 official course-section assignments representing 814 term enrollments across Calculus I-III, Differential Equations I, and undergraduate/graduate Real Analysis I-II from Fall 2022 through Spring 2026.
- Present mathematical epidemiology research at academic seminars and conferences.

- Held extramurally funded Summer Graduate Research Assistant appointments in 2025 and 2026, each with a \$6,500 stipend and duties of up to 20 hours per week in research, teaching, or other academic support.

African University of Science and Technology, Institute of Pure and Applied Mathematics | Research Assistant | 2020–2022

- Conducted research in nonlinear functional analysis and iterative methods for mathematical optimization problems.
- Contributed to research on monotone inclusion, variational inequality, split null, and split feasibility problems.

Blooms Academy, Department of Mathematics, Abuja, Nigeria | Mathematics Teacher | 2018–2020

- Taught college-level mathematics courses and supported students in developing quantitative problem-solving skills.

SELECTED RESEARCH EXPERIENCE

Doctoral Dissertation Research: SIS Epidemic Network Models | University of Nevada, Las Vegas

- Formulate SIS epidemic network and patch models as systems of differential equations and analyze disease-free and endemic equilibria, including their existence, uniqueness, stability, multiplicity, and spatial distribution.
- Apply bifurcation analysis and numerical simulations to determine how susceptible-population movement, the basic reproduction number, spatial heterogeneity, and total population size shape long-term disease persistence.
- Coauthored a peer-reviewed article in the SIAM Journal on Applied Mathematics and presented related findings at American Mathematical Society meetings and a UNLV partial differential equations seminar.
- Investigate how long-term infectious disease dynamics change as susceptible-population movement rates and the basic reproduction number vary.

Extramurally Funded Summer Graduate Research Assistantships | University of Nevada, Las Vegas

- Held Graduate Research Assistant appointments for Summer 2025 (May 26-August 15, 2025) and Summer 2026 (May 25-August 14, 2026); each appointment provided a \$6,500 stipend.
- Performed up to 20 hours per week of research, teaching, or other academic support duties within Mathematical Sciences; worked under Dr. Rachidi B. Salako during the Summer 2026 appointment.
- Secured two consecutive summers of funded research support for continued graduate research and departmental academic work.

Nonlinear Functional Analysis and Optimization Algorithms | African University of Science and Technology and Research Collaborations

- Studied inertial splitting and forward-reflected algorithms for monotone inclusion, bilevel variational inequality, split null, and split feasibility problems.
- Contributed to published and submitted manuscripts addressing convergence-oriented computational methods in applied mathematics.

PEER-REVIEWED JOURNAL ARTICLES

1. Salako, R. B., & Ukandu, K. C. (2026). Complex structure in the endemic equilibrium set of an SIS epidemic patch model with the mass-action infection mechanism. *SIAM Journal on Applied Mathematics*, 86(2), 644-674. <https://doi.org/10.1137/25M1732532>
2. Okorie, K. O., Izuchukwu, C., Okeke, C. C., Ukandu, K. C., & Aphane, M. (2025). Inertial forward-reflected-backward method for solving bilevel variational inequality problem. *Results in Applied Mathematics*, 28, Article 100658. <https://doi.org/10.1016/j.rinam.2025.100658>
3. Okeke, C. C., Bello, A. U., Jolaoso, L. O., & Ukandu, K. C. (2022). Inertial method for split null point problems with pseudomonotone variational inequality problems. *Numerical Algebra, Control and Optimization*, 12(4), 815-836. <https://doi.org/10.3934/naco.2021037>

MANUSCRIPTS UNDER JOURNAL REVIEW

1. Okorie, K. O., Okeke, C. C., Ofem, A. E., & Ukandu, K. C. (2026). A two-step inertial forward-reflected-anchored-backward method for solving a bilevel variational inequality problem. Manuscript under journal review at *Mathematical Methods in the Applied Sciences* (Wiley).
2. Okeke, C. C., Okorie, K. O., Kanyane, M. S., Ofem, A., & Ukandu, K. C. (2026). Multiple output set with inertial and correction term for split feasibility problems. Manuscript under journal review at *Boletín de la Sociedad Matemática Mexicana* (Springer).

SELECTED RESEARCH AND MACHINE-LEARNING PROJECTS

Disease-Informed Neural Networks for Epidemic Mobility Models: From SIRD Parameter Discovery to SIS Patch Equilibria | June 2026–Present

- Developed a PyTorch-based susceptible-infected-recovered-deceased (SIRD) Disease-Informed Neural Network (DINN) that combines sparse synthetic epidemic observations with data loss, differential-equation residual loss, and initial-condition loss to learn disease trajectories and trainable parameters.
- Recovered the transmission, recovery, and mortality parameters as $\beta = 0.5000$, $\gamma = 0.2000$, and $\omega = 0.0715$ from true values of 0.5000, 0.2000, and 0.0714, respectively; each relative error was below 0.1% on synthetic data.
- Completed the basic SIRD parameter-discovery phase and initiated extensions to a two-region movement model and a multipatch susceptible-infected-susceptible (SIS) model with mass-action infection and endemic-equilibrium analysis.
- Repository: github.com/kingsleyukandu/dinn-epidemic-mobility

Toward Precision Medicine: Explaining Mortality Risk Predictions in Heart Failure Patients | May 2026–Present

- Analyzed a heart-failure clinical-records dataset containing 299 patients and 13 variables, including 203 patients with no observed death event and 96 patients with a death event; verified that the dataset contained no missing values or duplicate rows.
- Built and tuned logistic regression, random forest, gradient boosting, support vector machine, and k-nearest-neighbor classifiers using stratified splitting, preprocessing pipelines, and death-event precision, recall, and F1-score; excluded follow-up time from classification features to reduce leakage risk.
- Achieved death-event precision of 0.61, recall of 0.74, and F1-score of 0.67 with tuned logistic regression; tuned support vector machine achieved 0.95 recall with 0.46 precision, illustrating the tradeoff between detecting high-risk cases and limiting false positives.
- Applied SHAP to tuned logistic regression and gradient boosting models to explain global feature importance and patient-level true-positive, true-negative, and false-positive predictions; identified ejection fraction, serum creatinine, age, and serum sodium or platelets among the most influential model features.
- Completed the classification and explainability phase; identified survival analysis, including Kaplan-Meier analysis and Cox proportional hazards regression, as the principal next phase.
- Repository: github.com/kingsleyukandu/heart-failure-survival-risk-analysis

Predicting Heart Disease Severity: A Machine Learning Analysis of the UCI Heart Disease Dataset | DA 622 Course Project | January 2026-May 2026

- Developed an end-to-end machine-learning pipeline using the UCI Heart Disease dataset, whose repository contains 920 raw patient records with demographic, clinical, diagnostic-test, and heart-disease outcome variables.
- Performed clinical data cleaning, missing-value handling, feature engineering, and target transformation to classify no disease, mild disease, and severe disease while prioritizing detection of severe cases.
- Compared logistic regression, random forest, and weighted XGBoost using accuracy, precision, recall, F1-score, and area under the receiver operating characteristic curve, with model selection emphasizing severe-class recall and F1-score rather than accuracy alone.
- Selected weighted XGBoost as the strongest severe-case screening model; it detected 74.1% of severe heart-disease cases in the test set.
- Repository and final report: github.com/kingsleyukandu/heart_disease_project

CONFERENCE AND SEMINAR PRESENTATIONS

1. Ukandu, K. C. (June 2, 2026). *Population Movement and Endemic Persistence in SIS Epidemic Network Models*. Oral presentation, Industrial and Computational Mathematics: Interdisciplinary Approaches to Numerical Analysis and Scientific Computing (ICM@ICM), ICM 2026 Satellite Conference, Morgan State University, Baltimore, Maryland; 4:00-4:25 p.m., Communication Building, Room 104.
<https://www.morgan.edu/mathematics/icm-2026-satellite-conference/abstracts-of-oral-and-posters>
2. Ukandu, K. C. (December 5, 2025). *Effects of Population Movement on the Long-Term Dynamics of Infectious Diseases in SIS Epidemic Network Models: A Mathematical Perspective*. Seminar presentation, Seminar on Partial Differential Equations and Related Topics, Department of Mathematical Sciences, University of Nevada, Las Vegas, Las Vegas, Nevada; 11:30 a.m.-12:30 p.m., CHB C113.

3. Ukandu, K. C., & Salako, R. B. (March 29, 2025). *New Spatial Patterns of Endemic Equilibria Set in an SIS Epidemic Patch Model: Effects of Susceptible Population Movement*. Oral presentation, 2025 Spring Central Sectional Meeting, American Mathematical Society, University of Kansas, Lawrence, Kansas. <https://meetings.ams.org/math/spring2025c/meetingapp.cgi/Paper/47711>
4. Salako, R. B., & Ukandu, K. C. (September 14, 2024). *Structure of the Endemic Equilibria Set of an Epidemic Network Model as the Dispersal Rate of the Susceptible Population Varies*. Oral presentation by Kingsley Chimunya Ukandu, Special Session on Recent Trends in Differential Equations Applied to Biological Processes I, 2024 Fall Central Sectional Meeting, American Mathematical Society, University of Texas at San Antonio, San Antonio, Texas; 8:30 a.m., Business Building 3.01.06; abstract 1198-35-37035. <https://meetings.ams.org/math/fall2024c/meetingapp.cgi/Paper/37035>

TEACHING EXPERIENCE

University of Nevada, Las Vegas, Department of Mathematical Sciences | Graduate Teaching Assistant | Fall 2022-Spring 2026

- Instructor: MATH 182 - Calculus II (Lecture), Summer 2024; 1 section, 13 enrolled.
- Discussion Leader: MATH 181 - Calculus I, Fall 2022, Spring 2023, Fall 2023, Spring 2024, and Spring 2025; 10 sections.
- Discussion Leader: MATH 182 - Calculus II, Fall 2022, Spring 2023, Fall 2023, Spring 2024, and Spring 2025; 10 sections.
- Discussion Leader: MATH 427 - Differential Equations I, Fall 2024; 2 sections.
- Discussion Leader: MATH 283 - Calculus III, Fall 2025 and Spring 2026; 4 sections.
- Discussion Leader: MATH 457 / MAT 657 - Introduction to Real Analysis I, Fall 2025; 4 jointly scheduled undergraduate/graduate sections across 2 meeting groups.
- Discussion Leader: MATH 458 / MAT 658 - Introduction to Real Analysis II, Spring 2026; 2 jointly scheduled undergraduate/graduate sections in 1 meeting group.
- Completed 33 official course-section assignments representing 814 term enrollments across nine academic terms.

HONORS, SCHOLARSHIPS, GRANTS, AND RESEARCH SUPPORT

Summer 2026: Extramurally Funded Graduate Research Assistantship, Department of Mathematical Sciences, University of Nevada, Las Vegas - \$6,500 stipend

Academic Year 2025-2026: Wolzinger Family Research Scholarship, UNLV College of Sciences - \$10,000

Summer 2025: Extramurally Funded Graduate Research Assistantship, Mathematical Sciences, University of Nevada, Las Vegas - \$6,500 stipend

Academic Year 2024-2025: Graduate Registered Student Organization (GRSO) Award, University of Nevada, Las Vegas - \$3,000

Academic Year 2024-2025: Sciences General Scholarship, University of Nevada, Las Vegas - \$2,187.50

Academic Year 2024-2025: UNLV Access Grant - Graduate - \$2,000

Meeting of the American Mathematical Society, University of Texas at San Antonio, San Antonio, Texas - \$1,200

May 2024: College of Sciences Advancing Success of Underrepresented Groups Award (Academic Year 2024-2025), Society for Black Scientists, University of Nevada, Las Vegas - organizational support; \$2,100

Academic Year 2023-2024: Graduate Registered Student Organization (GRSO) Award, University of Nevada, Las Vegas - \$3,000

Academic Year 2023-2024: UNLV Access Grant - Graduate - \$2,000

June 2023: Joint Alabama-Florida Conference on Differential Equations and Dynamical Systems Travel Award - \$350

June 2023: UNLV Access Grant, University of Nevada, Las Vegas - \$4,182

April 2020: PGT Vice Chancellor's International Attainment Scholarship, University of Liverpool - offered and declined

July 2017: African Development Bank Scholarship Award - \$10,000

August 2016: African University of Science and Technology Scholarship Award - \$19,200

PROFESSIONAL LEADERSHIP AND SERVICE

President · Society for Black Scientists, UNLV College of Sciences | Academic Year 2024-2025

- Served as President of the Society for Black Scientists, an organization recognized under the UNLV College of Sciences Advancing Success of Underrepresented Groups Awards.

- As President of the Society for Black Scientists, supported professional development for College of Sciences students, particularly students from historically excluded communities in science, through a yearly seminar series, conference opportunities for selected presenters, and student-faculty networking.
- Served as the publicly listed contact for prospective members; documented organizational goals included increasing Black representation in STEM, providing specialized academic support, and fostering collaboration.

PROFESSIONAL MEMBERSHIPS

- Society for Industrial and Applied Mathematics, Member | 2023–Present
- American Mathematical Society, Member | 2023–Present

TECHNICAL SKILLS

Programming and Scientific Computing: Python, MATLAB, SQL, NumPy, pandas, SciPy, and Jupyter Notebook

Scientific Machine Learning: PyTorch, automatic differentiation, Physics-Informed Neural Networks (PINNs), Disease-Informed Neural Networks (DINNs), trainable parameter estimation, Adam optimization, and differential-equation residual losses

Machine Learning and Explainable AI: scikit-learn, XGBoost, logistic regression, random forest, gradient boosting, support vector machines, preprocessing pipelines, hyperparameter tuning, and SHAP

Statistical Analysis and Model Evaluation: Mann-Whitney U testing, correlation and crosstab analysis, confusion matrices, precision, recall, F1-score, ROC-AUC, and class-imbalance-aware evaluation

Mathematical and Computational Modeling: ordinary and partial differential equations, dynamical systems, epidemic network and patch models, disease-free and endemic-equilibrium analysis, stability and bifurcation analysis, and numerical simulation

Research and Visualization Tools: Git, GitHub, LaTeX, Overleaf, Matplotlib, and Seaborn

RELEVANT TRAINING AND CERTIFICATIONS

June 2024: Databases and SQL for Data Science with Python - IBM (Coursera). Credential ID: FXGQT5XWE95R.

Verification: <https://www.coursera.org/account/accomplishments/verify/FXGQT5XWE95R>

May 2024: Python for Data Science, AI & Development - IBM (Coursera). Credential ID: HWQG2EQP8CVA.

Verification: <https://www.coursera.org/account/accomplishments/verify/HWQG2EQP8CVA>

May 2024: Python NumPy for Data Science - Programiz. Credential ID: D372453818CB. Verification:

<https://programiz.pro/certificates/detail/D372453818CB>

May 3, 2024: Python Beyond Basics - Programiz. Credential ID: B3521B5DB8F3. Verification:

<https://programiz.pro/certificates/detail/B3521B5DB8F3>

March 20, 2024: Python Basics Challenges - Programiz. Credential ID: 1C3480EE1987. Verification:

<https://programiz.pro/certificates/detail/1C3480EE1987>

March 17, 2024: Learn Python Basics - Programiz. Credential ID: A2212B56B5D9. Verification:

<https://programiz.pro/certificates/detail/A2212B56B5D9>

July 3, 2022: Artificial Intelligence Foundations: Machine Learning - LinkedIn Learning

July 2, 2022: Learning MATLAB (2018) - LinkedIn Learning