

Kayode Olumoyin

Moffitt Cancer Center – Integrated Mathematical Oncology – Tampa, FL 33612

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EDUCATION:

- **Ph.D.** Computational Science, Middle Tennessee State University, Murfreesboro, TN **May 2022**
Dissertation Topic: Data-driven deep neural networks for epidemiological and biochemical models
Advisor: Dr. Abdul Q. M. Khaliq
- **M.A.** Computational Mathematics, Bowling Green State University, Bowling Green, OH **May 2016**
Advisor: Dr. So-Hsiang Chou
- **M.A.** Mathematics, Marshall University, Huntington, WV **May 2013**
Dissertation Topic: Solutions of dynamic equations on time scales with jumps
Advisor: Dr. Bonita Lawrence
- **B.S.** Mathematics, Federal University of Agriculture, Abeokuta, Nigeria **January 2009**

RESEARCH INTEREST:

- Mathematical Oncology, Machine Learning, Deep Learning, Infectious Disease Modeling, Fractional Differential Equations Modeling, Dynamic Equations on Time Scales.

EXPERIENCE:

- **Applied Postdoctoral Fellow**, Moffitt Cancer Center, Tampa, FL **2022 – Present**
Project: Development of Adoptive T-cell Bladder Cancer Incorporating Patient-Specific Tumor Microenvironment
Advisor: Dr. Katarzyna Rejniak
- **Adjunct Faculty**, Mathematics Department, Middle Tennessee State University **2021 – 2022**
- **Adjunct Faculty**, University Studies Department, Middle Tennessee State University **Summer 2019**
- **Lecturer**, University Studies Department, Middle Tennessee State University **2016 – 2019**

SOFTWARE:

- **pyLinG3D** Developed and maintain pyLinG3D, a Python implementation of the LinG3D framework for generating 3D lineage trees—a visualization of spatio-temporal clonal evolution dynamics. Original LinG3D: <https://github.com/rejniaklab/LinG3D> pyLinG3D repository: <https://github.com/okayode/pyLinG3D>

PUBLICATIONS:

○ REFEREED

1. **Olumoyin, K.D.**, Aydin, A.M., Bazargan, S., Bunch, B.L., Chamseddine, I., Karolak, A., Beaty, M., Pilon-Thomas, S., Poch, M., Rejniak, K.A. *A data-derived machine learning protocol stratifies patients for the adoptive cell therapy with tumor-infiltrating lymphocytes in bladder tumors.* (in preparation).
2. Hu, A.^{*}, Ojwang, A.M.E.^{*}, **Olumoyin, K.D.**^{*}, Rejniak, K.A. *LinG3D: Visualizing the spatio-temporal dynamics of clonal evolution.* *BMC Bioinformatics* **25**, 201 (2024). <https://doi.org/10.1186/s12859-024-05813-7>.
3. **Olumoyin, K.D.**, Khaliq, A.Q.M., Furati, K.M. *Data-driven deep learning algorithm for asymptomatic*

^{*}Equal contribution.

COVID-19 model with varying mitigation measures and transmission rate. Epidemiologia **2** (2021), 471–489. <https://doi.org/10.3390/epidemiologia2040033>.

○ PREPRINTS

1. Permuth, J., Park, M., . . . , **Olumoyin, K.D.**, . . . , Rejniak, K.A., . . . , Judge, A. *Race-based differences in serum biomarkers for cancer-associated cachexia in a diverse cohort of patients with pancreatic ductal adenocarcinoma.* (2025). <https://doi.org/10.21203/rs.3.rs-5690506/v1>.
2. Hu, A. *, Ojwang, A.M.E. *, **Olumoyin, K.D.** *, Rejniak, K.A. *Visualizing the spatio-temporal dynamics of clonal evolution with LinG3D software.* *bioRxiv* (2024). <https://doi.org/10.1101/2024.03.05.583631>

*Equal contribution.

3. **Olumoyin, K.D.**, Khaliq, A.Q.M., Furati, K.M. *Multi-variant COVID-19 model with heterogeneous transmission rates using deep neural networks.* *arXiv:2205.06834v1* (2022). <https://doi.org/10.48550/arXiv.2205.06834>
4. **Olumoyin, K.D.** *Learning differential equations from data.* *arXiv:2205.11483v1* (2022). <https://doi.org/10.48550/arXiv.2205.11483>
5. **Olumoyin, K.D.**, Khaliq, A.Q.M., Furati, K.M. *Data-driven deep learning algorithms for time-varying infection rates of COVID-19 and mitigation measures.* *arXiv:2104.02603v3* (2021). <https://doi.org/10.48550/arXiv.2104.02603>

○ CONFERENCE ABSTRACTS

1. Miller, J.W., Bazargan, S., Beatty, M., Braun, M., Ojwang', A.M.E., **Olumoyin, K.D.**, Rejniak, K.A., Rodriguez-Valentin, M., Guske, C., Pilon-Thomas, S., Spiess, P., Gilbert, S., Li, R., Poch, M. *MP15-10: Immune profiling and clinical outcomes of TIL therapy for high-risk BCG-exposed NMIBC.* *The Journal of Urology* **213**(5S), e500 (2025). <https://doi.org/10.1097/01.JU.0001109876.32161.cb.10>
2. Miller, J.W., Bazargan, S., Beatty, M., Braun, M., Ojwang', A.M.E., **Olumoyin, K.D.**, Rejniak, K.A., Rodriguez-Valentin, M., Guske, C., Pilon-Thomas, S., Spiess, P., Gilbert, S., Li, R., Poch, M. *Intravesical autologous TIL therapy in BCG-exposed NMIBC: A report of early safety and efficacy findings.* *Urologic Oncology: Seminars and Original Investigations* **43**(3, Suppl) (2025). <https://doi.org/10.1016/j.urolonc.2024.12.232>
3. **Olumoyin, K.D.** *From COVID-19 to melanoma: Modeling time-varying treatment response using an epidemiology-informed neural network.* *SMB MathEpiOnco 2024*, **February 18–20, 2024**. <https://seminar.math.vt.edu/SMB-MEPI-ONCO/SMB-MEO-Abstracts.pdf>
4. **Olumoyin, K.D.**, Aydin, A.M., Bunch, B.L., Pilon-Thomas, S., Poch, M., Rejniak, K.A. *An early determination of patients' eligibility for a bladder cancer immunotherapy using a data science approach.* In *Proceedings of AACR Special Conference in Cancer Research: Translating Cancer Evolution and Data Science: The Next Frontier*, Boston, Massachusetts, **December 3–6, 2023**. *Cancer Research* **84**(3 Suppl 2), A020 (2024). <https://doi.org/10.1158/1538-7445.CANEVOL23-A020>
5. Lawrence, B.A., **Olumoyin, K.D.**, Peterson, M.K. *Solutions of dynamic equations on a sequence of converging time scales.* *AMS Fall Central Sectional Meeting*, Washington University, St. Louis, Missouri, **October 18–20, 2013**. http://www.ams.org/meetings/sectional/2204_program_saturday.html

AWARDS:

○ PRESENTATION AWARDS

1. **Oral Presentation Award (Top 10 Awardees)**, 14th Annual Moffitt Scientific Symposium, Moffitt Cancer

Center, Tampa, Florida, **May 8, 2024**.

2. **Best Presentation Award**, College of Basic and Applied Sciences (CBAS) Graduate Research Showcase, Middle Tennessee State University, Murfreesboro, Tennessee, **February 5, 2021**.

○ TRAVEL AWARDS

1. **Travel Award to attend the Inaugural Mathematical Oncology Meeting (MATHONC23)**, Phoenix, Arizona, **April 30 – May 3, 2023**. Award Amount: **\$750**.
2. **Student Travel Award to attend the SIAM Conference on Mathematics of Data Science (MDS20)**, Cincinnati, Ohio, **May 5 – 7, 2020** (*conference held virtually due to the COVID-19 pandemic*).

○ GRADUATE FELLOWSHIP AND TEACHING ASSISTANTSHIP

1. **Graduate Teaching Assistantship**, Department of Mathematics, Bowling Green State University, Ohio, **August 2013 – May 2016**. Award Amount: **\$23,286**.
2. **Winifred O. Stone Presidential Graduate Fellowship Award for Diversity Enhancement**, Bowling Green State University, Ohio, **August 2013 – May 2015**. Award Amount: **\$33,000**.
3. **Graduate Teaching Assistantship**, Department of Mathematics, Marshall University, West Virginia, **August 2011 – May 2013**. Award Amount: **\$18,000**.

○ National Mathematics Competition for University Students (NAMCUS): National Mathematical Center (NMC), Abuja, Nigeria, **November 2008**.

Team Ranking — First Prize Winner (Federal University of Agriculture, Abeokuta).

Individual Ranking — Second Prize Winner (Kayode Olumoyin, Federal University of Agriculture, Abeokuta).

CONFERENCE SESSION ORGANIZED:

○ MINISYMPOSIUM

- **MS65: Advances in Computational Modeling of Novel Tumor Treatments** SIAM Conference on the Life Sciences (LS24), Portland, Oregon, **June 13, 2024**. https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=79243

CONFERENCE PRESENTATIONS:

1. *Modeling Adoptive Cell Therapy in Bladder Cancer Using Physics-Informed Neural Network with Biology Constraints*. SIAM Conference on Applications of Dynamical Systems (DS25), Denver, Colorado, **May 13, 2025**.
2. *A Predictive Tool for the Expansion of Tumor Infiltrating Lymphocytes in Patients' Bladder Tumor*. SIAM Conference on the Life Sciences (LS24), Portland, Oregon, **June 13, 2024**.
3. *An Early Determination of Patients' Eligibility for a Bladder Cancer Immunotherapy Using a Data Science Approach*. **Oral Presentation, Quantitative Science Category**, 14th Annual Moffitt Scientific Symposium, Moffitt Cancer Center, Tampa, Florida, **May 8, 2024**.
4. *From COVID-19 to Melanoma: Modeling Time-Varying Treatment Response Using an Epidemiology-Informed Neural Network*. Joint Meeting: Mathematical Epidemiology and Mathematical Oncology Subgroups, Society of Mathematical Biology (SMB MathEpiOnco 2024), Virtual, **February 18–20, 2024**.
5. *A Machine Learning Protocol for Predicting Expansion of Tumor Infiltrating Lymphocytes in Patients' Bladder Tumors*. 17th U.S. National Congress on Computational Mechanics (USNCCM17), Albuquerque, New Mexico, **July 23–27, 2023**.
6. *ML-PETIL: A Machine Learning Predictor of the Expansion of Tumor Infiltrating Lymphocytes in Patients' Bladder Tumors*. Inaugural Mathematical Oncology Meeting (MATHONC23), Phoenix, Arizona, **April 30–May 4, 2023**.

7. *Mathematical Modeling of Adoptive Immunotherapy in B16 Melanoma: A Physics-Informed Machine Learning Approach*. Mathematics and Statistics Department Colloquium, Bowling Green State University, Virtual, **November 4, 2022**.
8. *Physics-Informed Attention Neural Network: Learning the Dynamics of Partial Differential Systems with an Attention-Based Model*. **Lightning Talk**, Holistic Design of Time-Dependent PDE Discretizations Workshop, ICERM, Providence, Rhode Island, **January 10–15, 2022**.
9. *Data-Driven Deep Learning Algorithms for COVID-19 Time-Varying Infection Rates and Mitigation Measures*. SIAM Conference on Computational Science and Engineering (CSE2021), Virtual, **March 1–5, 2021**.
10. *Learning Time-Varying COVID-19 Infection Rate from Data*. CBAS Graduate Research Showcase, Middle Tennessee State University, Murfreesboro, Tennessee, **February 5, 2021**.
11. *PDE-Based Neural Network Approach Using Noisy Data in Facial Recognition*. SIAM Conference on Mathematics of Data Science (MDS20), Cincinnati, Ohio, **May 5–7, 2020**.
12. *The Marshall–Simpson Differential Analyzer Project: Mechanical Interpretations of Mathematical Equations*. (Co-presented with Dr. Bonita Lawrence and Molly Peterson) Simpson College, Iowa, **March 18, 2013**. <https://simpsoncollegemath.blogspot.com/>
13. *Generalization of First-Order Linear Differential and Difference Equations*. 40th Annual Mathematics and Statistics Conference, Miami University, Oxford, Ohio, **September 2012**.

POSTER PRESENTATIONS:

1. *An Early Determination of Patients' Eligibility Using a Data Science Approach*. Moffitt Quantitative Science Octoberfest, Moffitt Cancer Center, Tampa, Florida, **October 7, 2024**.
2. *An Early Determination of Patients' Eligibility Using a Data Science Approach*. 2023 AACR Special Conference: Translating Cancer Evolution and Data Science—The Next Frontier, Boston, Massachusetts, **December 3–6, 2023**.
3. *A Machine Learning Protocol for Predicting Expansion of Tumor Infiltrating Lymphocytes in Patients' Bladder Tumors*. Moffitt Quantitative Science Octoberfest, Moffitt Cancer Center, Tampa, Florida, **October 23, 2023**.
4. *ML-PETIL: A Machine Learning Predictor of the Expansion of Tumor Infiltrating Lymphocytes in Patients' Bladder Tumors*. 13th Annual Moffitt Scientific Symposium, Moffitt Cancer Center, Tampa, Florida, **May 16–17, 2023**.
5. *Physics-Informed Attention Neural Network: Learning the Dynamics of Partial Differential Systems with an Attention-Based Model*. CBAS Scholars Week 2022, Middle Tennessee State University, Murfreesboro, Tennessee, **March 22, 2022**.
6. *Data-Driven Deep Learning Algorithm for Asymptomatic COVID-19 Model with Time-Varying Transmission Rate*. Modeling in a Heterogeneous World, XVIII Red Raider Mini-Symposium, Texas Tech University, Lubbock, Texas, **August 20–21, 2021**.

WORKSHOPS:

○ INTEGRATED MATHEMATICAL ONCOLOGY (IMO) WORKSHOPS

1. **IMO 12: Toxicity**, Moffitt Cancer Center, **November 3–8, 2024**.
Member of the Orange Team. *Contributed code to the mathematical modeling of the cytostatic and cytotoxic effects of Gemcitabine on low- and high-ploidy cells. Served as one of the podium presenters.*
2. **IMO 11: Steering Evolution/Extinction**, Moffitt Cancer Center, **October 29–November 3, 2023**.
Member of the Purple Team (First Place, awarded a \$50,000 grant). *Developed a deep learning-based*

toxicity index prediction model using temporal tumor burden, lab tests, and patient-reported outcome data.

3. **IMO X: Cancer Communities**, Moffitt Cancer Center, **October 31–November 4, 2022.**

Member of the Blue Team. *Collaborated with Camara Casson to build a predictive model of cachexia in patients with non-small cell lung cancer (NSCLC). Presented as one of three podium speakers for the Blue Team.*

CONFERENCE PARTICIPATION:

1. *Mechanistic Learning as a Combination of Machine Learning and Modeling in Mathematical Oncology* 25w5448, Banff International Research Station for Mathematical Innovation and Discovery, **January 5–10, 2025** (virtual attendance).
2. *Mathematical Modelling of Cancer Treatments, Resistance, Optimization*, The Fields Institute for Research in Mathematical Sciences, **September 16–20, 2024** (virtual attendance).
3. *The Mathematics of the Hallmarks of Cancer*, The Fields Institute for Research in Mathematical Sciences, **August 19–23, 2024** (virtual attendance).
4. *Systemic Effects of Cancer Think Tank*, National Cancer Institute, Shady Grove campus, **April 16–17, 2024** (virtual attendance).
5. *Systems Biology: Foundations for Interdisciplinary Careers*, Center for Complex Biological Systems, University of California, Irvine, **February 20–March 1, 2024.**
6. *Cancer AI Research: Computational Approaches Addressing Imperfect Data*, National Cancer Institute, **April 3–4, 2023** (virtual attendance).
7. *Digital Twins in Biomedical Sciences Workshop*, National Academies, **January 30, 2023** (virtual attendance).
8. *SIAM Conference on Mathematics of Data Science (MDS22)*, San Diego, California, **September 26–30, 2022** (virtual attendance).
9. *MANNA (Modeling, Analysis and Numerics for Nonlocal Applications)*, Santa Fe, New Mexico, **December 11–15, 2017.**
10. *99th Annual Meeting of the Mathematical Association of America, Ohio Section*, Marshall University, Huntington, West Virginia, **March 27–28, 2015.**
11. *Informal Analysis Seminar*, Kent State University, Ohio, **April 11–13, 2014.**
12. *96th Annual Meeting of the Mathematical Association of America, Ohio Section*, Xavier University, Cincinnati, Ohio, **April 2012.**
13. *31st Southeastern-Atlantic Regional Conference on Differential Equations*, Georgia Southern University, Georgia, **September 2011.**

REFEREE:

○ **JOURNAL**

- *Radiation Oncology* – BioMed Central

SERVICE:

- Judge, Moffitt Postdoctoral Association (MPDA) Travel Award Competition for Best Poster, 14th Annual Moffitt Scientific Symposium, Moffitt Cancer Center, Tampa, Florida, **May 8, 2024.**

PROFESSIONAL MEMBERSHIP:

- **American Association for Cancer Research (AACR)**, Associate Member, 2024 – present
- **Society for Industrial and Applied Mathematics (SIAM)**, Early Career Member, 2014 – present
- **Society for Mathematical Biology (SMB)**, Standard Member, 2022 – present

- **U.S. Association for Computational Mechanics (USACM)**, Member, 2023 – present
- **Pi Mu Epsilon (West Virginia Beta)**, Member, 2012 – present
- **Nigerian Mathematical Society**, Member (NMS/2/5942), 2022 – present

PROGRAMMING SKILLS:

- **Machine Learning:** Python (PyTorch, TensorFlow, Keras, Scikit-learn, NumPy, SciPy, Pandas, Matplotlib)
- **Computational Science:** JavaScript, Julia, MATLAB, Mathematica
- **Statistics:** R
- **Programming Languages:** C, C++

STUDENT MENTORING AND OUTREACH:

- **High School Internship Program – Integrated Mathematical Oncology (HIP-IMO)**, Moffitt Cancer Center, Tampa, FL
 1. **Haarika Makam**, Student Intern **June 3 – July 26, 2024**
Project Topic: Machine Learning Techniques for Handling Missing Data of Bladder Cancer Patients.
 2. **Risheet Jajoo**, Student Intern **June 5 – July 28, 2023**
Project Topic: A Genetic Algorithm-based Manifold Learning Feature Selection Approach using Bladder Cancer Patients Data.
- **Great American Teach-In (GATI)**, Pasco County Schools, FL
 - **Sand Pine Elementary School** **November 15, 2023**
Task: Gave a talk to kindergarteners titled “Mathematics Can Improve Cancer Outcomes.”
- **Middle Tennessee State University**, Murfreesboro, TN
 - **Student Athletics Enhancement Center (SAEC)** **Fall 2019 – Spring 2020**
Task: Tutored and mentored student athletes.
- **National Youth Service Corps (NYSC)**, Nigeria **2009 – 2010**
A national volunteer program for university graduates in Nigeria.
 - **Mathematics Teacher**, Junior High School, Briyel, Bayo LGA, Borno State, Nigeria **August 2009 – December 2009**
Taught Mathematics to junior secondary school students.
 - **Headmaster**, Bayo Foundation Elementary School, Bayo LGA, Borno State, Nigeria **December 2009 – July 2010**
Managed school operations and academic oversight.