Xiuquan Wang, Ph.D.

Associate Professor of Mathematics and Chair, Department of Mathematics & Computer Science
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PROFESSIONAL PROFILE

Applied mathematician and data scientist with expertise in machine learning, bioinformatics, RNA velocity, single-cell and long-read sequencing analysis, network analysis, and topological data analysis. Experienced department chair and externally funded researcher with a strong record of undergraduate teaching, curriculum development, and mentoring award-winning student researchers.

EDUCATION

Southern Illinois University, Carbondale, IL — *Aug. 2014*
Ph.D. in Mathematics; M.S. in Mathematics

Hebei Normal University, China — *Aug. 2002*
B.S. in Electrical Engineering

PROFESSIONAL POSITIONS

Chair, Department of Mathematics & Computer Science — *Jul. 2024 – Present*
Tougaloo College — Tougaloo, MS

Associate Professor of Mathematics — *Apr. 2021 – Present*
Tougaloo College — Tougaloo, MS

Assistant Professor of Mathematics — *Aug. 2015 – Apr. 2021*
Tougaloo College — Tougaloo, MS

Assistant Professor of Mathematics — *Aug. 2014 – Jul. 2015*
Penn State Altoona — Altoona, PA

Graduate Research/Teaching Assistant — *Aug. 2007 – May 2014*
Southern Illinois University, Department of Mathematics — Carbondale, IL

RESEARCH INTERESTS

- Applied mathematics, data science, machine learning, and deep learning.
- Bioinformatics, single-cell RNA-seq, RNA velocity, long-read sequencing, and computational biology.
- Network analysis, topological data analysis, mathematical biology, and high-performance computing.

GRANTS AND AWARDS

Pending Grants

- **NSF EPSCoR E-RISE RII Project (#269732)**
  E-RISE: Increasing Mississippi's Research Capacity in Artificial Intelligence for Agricultural Autonomy (AI4A2) for Food Security and Upskilled Farm Work
  Period: Jan. 1, 2027 – Dec. 31, 2031; Total funding: $8,000,000; Role: Co-PI; Status: Pending
- **MS-INBRE Project Development Grant (PDG)**
  Integrating RNA Velocity and Isoform-Level Analysis to Define Macrophage State Transitions in Non–Small Cell Lung Cancer
  Period: 2026 – 2028; Total funding: $200,000; Role: PI; Status: Pending

Current and Active Funded Grants

- **NSF HBCU-UP Implementation Project (#2510537)**
  Strengthening the Diverse STEM Pipeline through a Holistic Multi-layer Approach
  Period: Aug. 1, 2025 – July 31, 2030; Total funding: $2,245,846; Role: Co-PI, lead author and technical lead

- **NSF HBCU-UP Research Initiation Award (#2300445)**
  Uncovering and Extracting Biological Information from Nanopore Long-read Sequencing Data with Machine Learning and Mathematical Approaches
  Period: Aug. 1, 2023 – July 31, 2026; Total funding: $299,882; Role: Principal Investigator
- **MS-INBRE Summer Undergraduate Research Fellowship (SURF) Program (#8007695-09.01)**
  Mega-Scale Cell–Cell Similarity Network Analysis of Embryonic Mouse Brain Transcriptomes
  Period: June 1, 2026 – July 31, 2026; Total funding: $25,550; Role: Subaward PI
- **Nissan Foundation Award**
  Increasing the STEM Pipeline
  Period: April 1, 2026 – March 31, 2027; Total funding: $45,000; Role: PI

Selected Completed Grants and Awards

- **RITA UARC Contract Award**
  Representational Assessment Tools for Neuroscience Computational Modeling and AI Engineering
  Period: July 15, 2023 – July 14, 2025; Total funding: $149,998; Role: Subaward PI
- **NIH/NIGMS, MCCTR, Investigator Development Project**
  Uncovering and Understanding Population Differences with Topological Methods
  Period: July 30, 2017 – July 30, 2021; Total funding: $100,225; Role: Subaward PI
- **HBCU-UP Seed Grant, Curriculum Development Award**
  Designing Machine Learning: A New Multidisciplinary Course at Tougaloo
  Period: June 15, 2021 – April 30, 2022; Total funding: $10,000; Role: Subaward PI

PUBLICATIONS

Submitted Manuscript

- **Wang, X.**, Nan, N., & Wang, K. (2026). EVTS: A topology-aware metric for evaluating RNA velocity embedding faithfulness. *Submitted to the International Conference on Intelligent Biology and Medicine (ICIBM 2026).*

Peer-Reviewed Journal Articles

- Chism, C. M., Sepehri, B., Guerin, N., Heintz, R., Hamadani, C. M., Hoang, A., Shami, A. A., Vanlandingham, M. B., Dasanayake, G., Jarrett, E., Misra, S. K., Doerksen, R. J., Sharp, J. S., **Wang, X.**, & Tanner, E. E. L. (2025). Comprehensive evaluation of human and murine protein coronae formed on choline carboxylic acid ionic liquid-modified PLGA nanoparticles. *Bioconjugate Chemistry*, 36(12), 2569–2588.
- **Wang, X.**, Ahsan, M. U., Zhou, Y., & Wang, K. (2023). Transformer-based DNA methylation detection on ionic signals from Oxford Nanopore sequencing data. *Quantitative Biology*, 11(3), 287–296. https://doi.org/10.15302/J-QB-022-0323
- Wang, J., **Wang, X.**, Bhat, A., Chen, Y., Xu, K., Mo, Y.-y., Yi, S. S., & Zhou, Y. (2020). Comprehensive network analysis reveals alternative splicing-related lncRNAs in hepatocellular carcinoma. *Frontiers in Genetics*, 11, 659. https://doi.org/10.3389/fgene.2020.00659
- **Wang, X.**, Xu, K., Wang, J., & Zhou, Y. (2020). LCLE: A web portal for lncRNA network analysis in liver cancer. *International Journal of Computational Biology and Drug Design*, 13(5/6), 482–495. https://doi.org/10.1504/IJCBDD.2020.113855
- Xu, D., Reeve, J. D., **Wang, X.**, & Xiao, M. (2010). Developmental variability and stability in continuous-time host–parasitoid models. *Theoretical Population Biology*, 78(1), 1–11. https://doi.org/10.1016/j.tpb.2010.03.007

SELECTED UNDERGRADUATE RESEARCH MENTORING OUTCOMES

- Zein, D. *Embedding Robustness and Topology Preservation in RNA Velocity Analysis.* Oral presentation, Emerging Researchers National Conference in STEM, 2026. First Place, Data Science Division.
- Zein, D. *Uncovering Transcriptional Dynamics in COVID-19: Integrating PBMC scRNA-Seq and RNA Velocity.* Poster presentation, Emerging Researchers National Conference in STEM, 2025. First Place, Computer Sciences and Information Management category.
- Lee, R. *Transformer-Based Classification of Parkinson's Disease from EEG Using BIDS-Formatted OpenNeuro Datasets.* Accepted paper, Association for the Advancement of Artificial Intelligence (AAAI), 2026.
- Lee, R. *Transformer-Based Machine Learning for EEG Data Analysis.* Oral presentation, Mississippi IDeA Conference, 2025. First Place Oral Presentation.

TEACHING EXPERIENCE

Teaching Profile Dedicated undergraduate teacher with broad experience across lower-division service courses, upper-division mathematics, applied mathematics, statistics, machine learning, data science, and interdisciplinary computational courses. Experienced in curriculum development, project-based learning, undergraduate research mentoring, and preparing students for graduate study and STEM careers.

Tougaloo College *2015–Present*

- MAT 103: College Algebra II — *Fall 2015*
- MAT 104: Trigonometry — *Fall 2015; Spring 2016*
- MAT 208: Biostatistics — *Spring 2018–2026*
- MAT 218: Discrete Mathematics — *Spring 2021–2026*
- MAT 221: Calculus I — *Every semester, Fall 2015–Spring 2025*
- MAT 222: Calculus II — *Fall 2016; Spring 2017*
- MAT 321: Calculus III — *Fall 2015; Fall 2016*
- MAT 322: Calculus IV — *Spring 2016–2024*
- MAT 316: Differential Equations — *Fall 2016–Fall 2024*
- MAT 326: Introduction to Probability Theory — *Fall 2020–2024*
- MAT 338: Numerical Analysis — *Spring 2022–2026*
- MAT 341: Linear Algebra — *Spring 2017; Fall 2019–2025*
- MAT 345: Topology — *Spring 2021; Fall 2022*
- MAT 371: Introduction to Machine Learning — *Fall 2021–2023; Spring 2026*
- MAT 414: Modern Algebra — *Fall 2016; Fall 2017*
- MAT 426: Advanced Calculus — *Spring 2017; Fall 2018*
- MAT 429: Complex Variables — *Spring 2018*
- MAT 434: Theory of Mathematical Statistics — *Spring 2019–2022*
- MAT 452: Data Analysis and Visualization — *Fall 2024–2025*
- MAT 491: Senior Seminar I — *Fall 2025*
- MAT 492: Senior Seminar II — *Spring 2019–2022*
- CSC 460: Introduction to Geographic Information Systems — *Spring 2026*
- CHE 104: Mathematics for Chemistry — *Fall 2023*

Brown University Pre-College Programs *Summer 2022–2024*

- CSCI 0535: Linear Algebra for Machine Learning — *Summer 2022*
- CECS 0926: Introduction to Machine Learning and AI with Python — *Summer 2022–2024*
- CECS 0931: Data Skills for Bioinformatics — *Summer 2023–2024*
- CEMA 0925: Real-World Networks: Using Mathematics to Understand Complex Systems — *Summer 2023–2024*

Penn State Altoona *2014–2015*

- MATH 021: College Algebra I — *Fall 2014*
- MATH 022: College Algebra II — *Fall 2014; Spring 2015*
- MATH 211: Intermediate Calculus and Differential Equations — *Summer 2015*

Southern Illinois University Carbondale *2012–2014*

- MATH 101: Introduction to Contemporary Mathematics — *Fall 2013*
- MATH 107: Intermediate Algebra — *Spring 2012*
- MATH 109: Trigonometry and Analytic Geometry — *Summer 2013*
- MATH 140: Short Course in Calculus — *Fall 2012; Spring 2014*

RESEARCH EXPERIENCE

Visiting Data Scientist, CHOP Research Institute *Jan. 2022 – Present*
University of Pennsylvania Philadelphia, PA

- Conduct computational research using high-throughput genomic and transcriptomic datasets, with a focus on Nanopore long-read sequencing, single-cell RNA-seq, RNA velocity, and DNA methylation analysis.
- Develop and benchmark computational methods for long-read single-cell RNA-seq data generated from 10x Genomics and Parse Biosciences platforms.
- Develop transformer-based machine learning models for direct detection of DNA methylation from Nanopore sequencing signals.

Investigator, MCCTR *July 2017 – July 2021*
University of Mississippi Medical Center Jackson, MS

- Applied topological data analysis methods to simplify, visualize, and interpret complex biomedical and population-level datasets.
- Developed computational approaches to identify patterns and structures in high-dimensional research and medical datasets.

SELECTED PRESENTATIONS

Conference Presentations

- *EVTS: A Topology-Aware Metric for Evaluating RNA Velocity Embedding Faithfulness.* 14th International Conference on Intelligent Biology and Medicine (ICIBM 2026), Buffalo, NY, Aug. 2-5 2026.
- *Isoform-Level Characterization of Single-Cell RNA-seq Data.* 2025 NSF HBCU-UP PI Meeting, Lansdowne Resort and Conference Center, Leesburg, VA, Apr. 9–11, 2025.
- *TransModDNA: Transformer-Based DNA Methylation Detection on Ionic Signals from Oxford Nanopore Sequencing Data.* 10th International Conference on Intelligent Biology and Medicine (ICIBM 2022), Philadelphia, PA, Aug. 7–9, 2022.
- *Uncovering and Understanding Population Differences with Topological Methods.* Joint Mathematics Meetings, AMS Contributed Paper Session, Denver, CO, Jan. 15, 2020.
- *Estimation of Diffusion Rate and Biased Movement Parameters with Mean Occupancy Time.* MAA Louisiana/Mississippi Section Annual Conference, Shreveport, LA, Feb. 24–27, 2016.
- *Insect Drift Movement Modeling and Parameter Estimation via Boundary Characteristics.* Joint Mathematics Meetings, AMS Session on Mathematical Biology, Seattle, WA, Jan. 6, 2016.

Invited Research Seminars and Guest Lectures

- *Uncovering and Understanding Population Differences with Topological Methods.* University of Mississippi Medical Center, Mississippi Center for Clinical and Translational Research, Jackson, MS, May 7, 2018.
- *Insect Drift Movement Modeling and Parameter Estimation via Boundary Characteristics.* Belhaven University, Department of Mathematics, Jackson, MS, Apr. 14, 2016.
- *Dimensional Reduction.* Invited guest lecture, Ph.D. course, Department of Data Science, University of Mississippi Medical Center, Jackson, MS, Apr. 4 and Apr. 9, 2019.
- *Introduction to Biological Research.* Invited guest lectures, undergraduate biology course, Department of Biology, Tougaloo College, Tougaloo, MS, Sept. 12–23, 2016.

TECHNICAL STRENGTHS

Programming	Python, R, C/C++, MATLAB, Mathematica, Stata
ML/DL	PyTorch, TensorFlow, Scikit-learn
Platforms	High-Performance Computing (HPC), AWS, GCP, Linux, Bash shell scripting
Bioinformatics	Single-cell sequencing data analysis, Bioconductor, Nextflow, Git/GitHub
Other Skills	Parallel computing, database management, reproducible computational workflows

SELECTED PROFESSIONAL ACTIVITIES AND SERVICE

- NSF Reviewer, 2023–2025.
- Referee for journals and conferences in applied mathematics, computational biology, bioinformatics, control theory, and data science.
- Faculty mentor and student advisor, Department of Mathematics, Tougaloo College.
- Member, Faculty Promotion Committee, Tougaloo College.

- ◇ Member, Undergraduate Research Committee, Tougaloo College.
- ◇ Organizer, Annual Kincheloe Research Symposium, 2019–2023.
- ◇ Faculty Search Committee, Department of Mathematics, Tougaloo College.
- ◇ MAA Louisiana/Mississippi Section NExT Fellow, 2016–2017.

PROFESSIONAL MEMBERSHIPS

American Mathematical Society (AMS); Society for Industrial and Applied Mathematics (SIAM); Society for Mathematical Biology (SMB)