

Xiuquan Wang, Ph.D.

Associate Professor of Mathematics and Chair, Department of Mathematics & Computer Science
Tougaloo College, Tougaloo, MS
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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

Hazael McFarland (H. M.) Thompson Endowed Chair in Mathematics Aug. 2026 – Present
Tougaloo College Tougaloo, MS

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
- ◇ **NSF IUSE: EDU (#2631840)**
The Tougaloo College Sociolinguistics Lab: Improving STEM Education Through Sociolinguistic Investigation
Period: Jan. 1, 2027 – Dec. 31, 2029; Total funding: \$594,422; Role: Co-PI; Status: Pending

Current and Active Funded Grants

- ◇ **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: Sep. 1, 2026 – Aug. 31, 2028; Total funding: \$200,000; Role: PI

◇ **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, 2027; Total funding: \$299,882; Role: Principal Investigator

◇ **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

◇ **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

◇ **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). BioFilter-EVTS: Biology-Guided Evaluation and Refinement of RNA Velocity Visualizations in Single-Cell Transcriptomics. *Submitted to the Mississippi Emerging Research Institution Council (MERIC 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>

Conferece Paper

- ◇ **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)*.

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
- ◇ MATH 107: Intermediate Algebra
- ◇ MATH 109: Trigonometry and Analytic Geometry
- ◇ MATH 140: Short Course in Calculus

Fall 2013

Spring 2012

Summer 2013

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, 2025–2027
- ◇ Member, Undergraduate Research Committee, Tougaloo College.
- ◇ Organizer, Annual Kincheloe Research Symposium, 2019–202.
- ◇ 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)