MARIUM YOUSUF

Curriculum Vitae

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RESEARCH VISION

Develop robust data-driven frameworks for understanding the complex dynamics of the brain, with a particular emphasis on modeling functional and effective connectivity in neural systems.

EDUCATION

Ph.D. in Applied Mathematics (Ph.D. Candidate) — expected Spring 2026
M.S. in Applied Mathematics — Aug 2023
M.S. in Computer Science — May 2022
University of Arizona, Tucson AZ
B.S. in Mathematical Sciences, *summa cum laude* — Dec 2017
Northern Illinois University, DeKalb IL
Associates in Science — May 2015
McHenry County College, Crystal Lake IL

ACADEMIC APPOINTMENTS

Ph.D. Student, University of Arizona (UArizona)

Research

Department of Mathematics — Fall 2022 - Present
Developing a probabilistic graphical model to extract neural functional connectivity from spike trains.
Keywords: Replay, Brain Connectivity, Causal Discovery, Network Inference, Stochastic Modeling
Advisors: Jean-Marc Fellous, Michael Chertkov

Department of Computer Science — Fall 2019 - Spring 2022
Implemented an approximation of G-Wishart marginal likelihood to learn sparse graphical structures representing different levels of functional brain connectivity.

Instructor

Elements of Calculus, Dept. of Mathematics — Summer 2024, Summer 2025
College Algebra, Dept. of Mathematics — Spring 2024, Spring 2025
Calculus Preparation, Dept. of Mathematics — Fall 2023

Teaching Assistant

Understanding Data, Dept. of Mathematics — Spring 2023
College Algebra, Dept. of Mathematics — Fall 2022
Discrete Data Structures, Dept. of Computer Science — Fall 2019, 2021

Graduate Research Aide, Argonne National Laboratory — Summers 2021-2023
Automated high-throughput TEM and X-ray mouse brain image processing by integrating visualization systems (WebKnossos, NeuroGlancer) and reducing reliance on manual tools like TrakEM2.

Graduate Research Assistant, Missouri University of Science and Technology
Department of Computer Science — Fall 2018 - Summer 2019
Pre-processed and analyzed data collected from dementia patients at Phelps Health, MO to infer the role of sedentary body movements in early diagnosis of dementia.

Pre-Doctoral Intern, Argonne National Laboratory — Apr - Aug 2018

Research Aide, *Leadership Computing Facility*
Built Python tools for efficient visualization of real-time data from sensors located in Chicago for an Array of Things project.

Lecturer, *Big Data Visualization Camp*
Prepared materials on Big-Data visualization using Python and Jupyter Notebook and lectured in a three-day camp for rising high-school seniors.

Undergraduate Research Aide, Argonne National Laboratory — Summer 2017
Configured Apache Spark in Jupyter Notebook to analyze real-time simulated data for visualization tasks.

Undergraduate Teaching Assistant, Northern Illinois University (NIU)
UNIX and Networking, Dept. of Computer Science — Fall 2017

CONFERENCE CONTRIBUTIONS

Poster Presentation, *Dynamics Days* Jan 2026
Causality in Replay: Detecting Effective Connectivity from Large-Network Spike Trains

Poster Presentation, *Society for Neuroscience* Nov 2025
Causality in Replay: Detecting Effective Connectivity from Spike Trains

Poster Presentation, *National Institute for Theory and Mathematics in Biology* Aug 2025
Causality in Replay: Comparing Methods to Detect Effective Connectivity from Spike Trains

Poster Presentation, *Society for Neuroscience* Oct 2024
Hippocampal Replay and Sleep's Hidden Language: Functional Connectivity from Spike Trains

Contributed Talk, *Arizona Women's Symposium in Mathematics* Sep 2024
Hippocampal Replay and Sleep's Hidden Language: Functional Connectivity from Spike Trains

Poster Presentation, *Arizona Women's Symposium in Mathematics* Nov 2023
Detecting replay in multi-unit spiking data

Poster Presentation, *Society for Neuroscience* Nov 2023
Detecting replay in multi-unit spiking data

AWARDS, HONORS, AND SCHOLARSHIPS

Trainee Professional Development Award (1000 USD), Society for Neuroscience Nov 2025
Grogan Scholarship Award (6000 USD), Dept. of Mathematics, UArizona Fall 2025
Herbert E. Carter Travel Award (600 USD, 100 USD), Graduate College UArizona Oct 2024, 2023
TA of the Month, Dept. of Computer Science, University of Arizona Oct 2021
Grace Hopper Student Scholar Oct 2019
Norma K. Stelford Mathematics Endowment, NIU Dec 2017
(graduating senior in mathematics with the highest GPA)
The Clarence Ethel Hardgrove Mathematics Scholarship, NIU 2015-2016
(incoming transfer with excellent prior record in mathematics)
International Undergraduate Scholarship, NIU 2015-2017

ADDITIONAL ACADEMIC TRAINING

UArizona Research Training Group Fall 2024, Fall 2025
Funded through NSF-supported research group focused on modern computational methods for data-driven modeling and applications.

Simons Laufer Mathematical Sciences Institute Summer 2025
Selected to attend a summer graduate workshop on Local Limits of Random Graphs held at Université Paris-Saclay Mathematics Institute in France.

Center for the Integration of Research, Teaching, and Learning (CIRTL) Fall 2021 - Fall 2025
Completed all designations (*Associate, Practitioner, & Scholar*) in the CIRTL's three-tiered teaching certificate program, with training in evidence-based undergraduate STEM teaching.

PROFESSIONAL DEVELOPMENT

Mentor, STAR Lab, UArizona 2024-Present
Mentoring high school seniors on conducting data-driven research

Presenter (selected), Graduate Interdisciplinary Programs Student Research Showcase, UArizona 2025

Vice President, SIAM UArizona Chapter 2025-2026

Presenter (invited) Human Augmented Analytics Group, Georgia Institute of Technology Apr 2025

Presenter (invited), Graduate Interdisciplinary Programs Student Research Showcase, UArizona 2024

Treasurer, SIAM UArizona Chapter 2024-2025
Secured 490 USD funds from the SIAM board and assisted in planning chapter events
Co-organized SIAM mini-conference for graduate students from diverse disciplines

Panelist (invited), Graduate Teaching Assistants' Orientation and Training, UArizona Aug 2024
Participated in GTA training for incoming graduate students in the Dept. of Mathematics

Mentor, Undergraduate Mathematical Modeling, UArizona Spring 2024
Mentored an undergraduate team for a capstone project on learning languages using Markov Chains

Volunteer, Outreach Program BASIS Oro Valley High School, Oro Valley AZ Mar 2023, 2024
Brain- and memory-inspired educational activities for 6th-graders

Presenter, Annual Graduate Research Symposium, Intelligent Systems Center, Rolla MO 2019

Volunteer, Hopper for Grace Hopper Conference 2018