

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, Yr. of 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
Leadership Computing Facility Apr - Aug 2018

Research Aide

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

Leadership Computing Facility

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, *Society for Neuroscience*

Nov 2025

Marium Yousuf, Laurent Pagnier, Misha Chertkov, Jean-Marc Fellous (2025, Nov 15-19). Causality in Replay: Detecting Effective Connectivity from Spike Trains. Neuroscience 2025, Society for Neuroscience, San Diego Convention Center.

Poster Presentation, *National Institute for Theory and Mathematics in Biology*

Aug 2025

Marium Yousuf, Laurent Pagnier, Misha Chertkov, Jean-Marc Fellous (2025, Aug 11-18). Causality in Replay: Comparing Methods to Detect Effective Connectivity from Spike Trains. NITMB MathBio Convergence Conference 2025, The Drake Hotel, Chicago.

Poster Presentation, *Society for Neuroscience*

Oct 2024

Marium Yousuf, Misha Chertkov, Jean-Marc Fellous (2024, Oct 5-9). Hippocampal Replay and Sleep's Hidden Language: Methods for Detecting Functional Connectivity from Spike Trains. Neuroscience 2024, Society for Neuroscience, McCormick Place in Chicago.

Contributed Talk, *Arizona Women's Symposium in Mathematics*

Sep 2024

Marium Yousuf, Misha Chertkov, Jean-Marc Fellous (2024, Sep 20-21). Hippocampal Replay and Sleep's Hidden Language: Methods for Detecting Functional Connectivity from Spike Trains. AWSiM 2024, Arizona Women's Symposium in Mathematics, Flagstaff, AZ.

Poster Presentation, *Arizona Women's Symposium in Mathematics*

Nov 2023

Marium Yousuf, Misha Chertkov, Jean-Marc Fellous (2023, Nov 17-19). Detecting replay in multi-unit spiking data: Bayesian networks. AWSiM 2023, Arizona Women's Symposium in Mathematics, Flagstaff, AZ.

Poster Presentation, *Society for Neuroscience*

Nov 2023

Marium Yousuf, Misha Chertkov, Jean-Marc Fellous (2023, Nov 11-15). Detecting replay in multi-unit spiking data: Bayesian networks. Neuroscience 2023, Society for Neuroscience, Washington D.C.

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 - Present

Completed Level I (*Associate*) and Level II (*Practitioner*) designations in the CIRTL's three-tiered teaching certificate program, with training in evidence-based undergraduate STEM teaching.

PROFESSIONAL DEVELOPMENT

<i>Mentor</i> , STAR Lab, UArizona	2024-Present
Mentoring high school seniors on conducting data-driven research	
<i>Vice President</i> , SIAM UArizona Chapter	2025-2026
<i>Presenter (invited)</i> Human Augmented Analytics Group, Georgia Institute of Technology	Apr 2025
<i>Presenter (invited)</i> , Graduate Interdisciplinary Programs Student Research Showcase, UArizona	2024
<i>Treasurer</i> , 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	
<i>Panelist (invited)</i> , Graduate Teaching Assistants' Orientation and Training, UArizona	Aug 2024
Participated in GTA training for incoming graduate students in the Dept. of Mathematics	
<i>Mentor</i> , Undergraduate Mathematical Modeling, UArizona	Spring 2024
Mentoring undergraduate team for a capstone project on learning language models using Markov Chains	
<i>Volunteer</i> , Outreach Program BASIS Oro Valley High School, Oro Valley AZ	Mar 2023, 2024
Brain- and memory-inspired educational activities for 6th-graders	
<i>Presenter</i> , Annual Graduate Research Symposium, Intelligent Systems Center, Rolla MO	2019
<i>Volunteer</i> , Hopper for Grace Hopper Conference	2018