

MARIUM YOUSUF

Curriculum Vitae

Email | LinkedIn

RESEARCH VISION

Develop efficient methods to infer large-scale complex and dynamical systems using probabilistic graphical approaches for a better understanding of the role of hippocampus in memory consolidation and anticipation.

EDUCATION

Ph.D. in Applied Mathematics expected Fall 2025
University of Arizona, Tucson AZ

Research Keywords: Hippocampal Replay, Functional Connectivity, Causal Structure Learning, Graphical Models

M.S. in Applied Mathematics Summer 2023
University of Arizona, Tucson AZ

M.S. in Computer Science Spring 2022
University of Arizona, Tucson AZ

B.S. in Mathematical Sciences, *summa cum laude* Fall 2017
Northern Illinois University, DeKalb IL

ACADEMIC APPOINTMENTS

PhD Student, University of Arizona

Research Assistant

Department of Mathematics Fall 2022 - present

Explore causal discovery methods to extract functional connectivity between neurons from spike train data containing hippocampal replay instances, using data generated from NEURON.

Advisors: Jean-Marc Fellous, Michael Chertkov

Department of Computer Science Fall 2019 - Spring 2022

Implemented an approximation of the marginal likelihood for a G-Wishart distribution. The project focused on a Bayesian approach to statistical learning of sparse graphical structures using G-Wishart distribution to model different levels of functional brain connectivity.

Advisor: Jason Pacheco

Instructor

Elements of Calculus, Dept. of Mathematics Summer 2024

College Algebra, Dept. of Mathematics Spring 2024

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

Project Title: Robust Automation for Connectomics

Developed methods for automated image processing of high-throughput TEM and X-ray mouse brain images in Python, as well as efficient integration with external visualization systems (such as WebKnossos and NeuroGlancer) with the goal of improvement over existing tool chains such as TrakEM2 that require human intervention.

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*

April - August 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

UNIX and Networking, Dept. of Computer Science

Fall 2017

CONFERENCE ACCEPTANCES**Poster Presentation, Society for Neuroscience**

October 2024

Marium Yousuf, Jean-Marc Fellous, Misha Chertkov (2024, October 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, USA URL

Contributed Talk, Arizona Women's Symposium in Mathematics

September 2024

Marium Yousuf, Jean-Marc Fellous, Misha Chertkov (2024, September 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, USA URL

Poster Presentation, Society for Neuroscience

November 2023

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

Poster Presentation, Arizona Women's Symposium in Mathematics

November 2023

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

AWARDS, HONORS, AND SCHOLARSHIPS

Herbert E. Carter Travel Award (600 USD, 100 USD), Graduate College UArizona

October 2023, 2024

TA of the Month, Dept. of Computer Science, University of Arizona

October 2021

Grace Hopper Student Scholar

October 2019

Norma K. Stelford Mathematics Endowment, NIU

December 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

Fall 2015 - Fall 2017

PROFESSIONAL DEVELOPMENT*Treasurer*, SIAM UArizona Chapter

2024-2025

Secured 300+ USD funds from the SIAM board

Mentor, STAR Lab, UArizona

Fall 2024

Mentoring a high school senior on conducting a research project involving neural data simulation

Panelist, Graduate Teaching Assistants' Orientation and Training, UArizona

August 2024

GTA training for incoming graduate students in the Dept. of Mathematics

Mentor, Undergraduate Mathematical Modeling, UArizona

Spring 2024

Mentoring undergraduate team for a capstone project on learning language models using Markov Chains

Volunteer, Outreach Program BASIS Oro Valley High School, Oro Valley AZ

March 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

SKILLS AND CERTIFICATES

Technical Skills

Python, LaTeX, MATLAB, R, Julia, C++, Java, HTML, CSS, JavaScript, Git, Jupyter Notebook, RStudio, NEURON, WebKnossos

Certificates

Advancing Learning Through Evidence-Based STEM Teaching	Spring 2022
CIRTL Associate, <i>Center for the Integration of Research, Teaching, and Learning</i>	Fall 2021
Level I designation in the CIRTL Network's three-tiered teaching certificate program.	
An Introduction to Evidence-Based Undergraduate STEM Teaching	Fall 2020