

# MARIUM YOUSUF

## *Curriculum Vitae*

Email | LinkedIn | Webpage

### 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** (Ph.D. Candidate) expected Spring 2026

University of Arizona, Tucson AZ

Research Keywords: Replay, Effective Connectivity, Causal Discovery, Generative Artificial Intelligence

**M.S. in Applied Mathematics**

Fall 2022 - Summer 2023

University of Arizona, Tucson AZ

**M.S. in Computer Science**

Fall 2019 - Spring 2022

University of Arizona, Tucson AZ

**B.S. in Mathematical Sciences**, *summa cum laude*

Fall 2015 - 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**, Misha Chertkov, Jean-Marc Fellous (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**, Misha Chertkov, Jean-Marc Fellous (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**, Misha Chertkov, Jean-Marc Fellous (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**, Misha Chertkov, Jean-Marc Fellous (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**

Grogan Scholarship Award (6000 USD), Dept. of Mathematics, UArizona

Fall 2025

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

October 2024, 2023

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***Presenter*, 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

*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

<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	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, 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