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 Spring 2026
University of Arizona, Tucson AZ
Research Keywords: Hippocampal Replay, Functional Connectivity, Causal Discovery, Probabilistic 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

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

Volunteer, 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, *Center for the Integration of Research, Teaching, and Learning* 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