

Abuzar Mahmood

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Summary

Doctoral candidate in Neuroscience with a strong background in programming and mathematics. Interested in using big data and machine learning approaches to tackle challenging problems across multiple context domains. Currently studying coordination between multiple brain regions by modeling and analyzing noisy, high-dimensional time series data.

Education

Ph.D in Computational Neuroscience, Brandeis University Waltham, MA | GPA: 3.98 | Graduation Feb 2023
Thesis Advisor: Donald B. Katz

Thesis Title: Multi-region Coordination for Taste Processing in the Rodent Brain

M.S in Neuroscience, Brandeis University Waltham, MA | GPA: 3.96 | 2019

B.S in Physics, University of Missouri Columbia, MO | GPA: 3.95 (Summa Cum Laude) | 2017

Minors in Mathematics, Chemistry/Biology, and Computational Neuroscience

Relevant coursework: • Bayesian Inference and Computational Statistics • Advanced Data Analysis and Modeling • DeepLearning.AI TensorFlow Developer Specialization • Statistical Machine Learning • Mathematical Statistics • Advanced Visualizations in Python • DeepLearning.AI Machine Learning in Production Specialization

Skills

Software: Python, Bash, Git, R, MATLAB, [SQL](#)

Frameworks: numpy, scikit-learn, Tensorflow, PyMC3, pandas, PySpark, Kubernetes, AWS EC2 and ECS, and HPC

Machine Learning: Standard models for regression, classification, and clustering, dimensionality reduction, time-series models like ARIMA and Holt-Winters, HMMs, Probabilistic Modeling and Bayesian inference

Statistics: Frequentist techniques (parametric/non-parametric), Bayesian statistics (Hierarchical models, MCMC), computational neuroscience models (e.g. point-process models, drift-diffusion model of decision-making).

Languages: English, Urdu, Hindi, Japanese (elementary)

Work Experience and Projects

Data Science Intern

TrackstarHQ | New York City, NY

Apr-July 2023

Developed anomaly detection system for eCommerce timeseries data

- Tested, deployed, and iterated on models for time-series outlier detection
- Created a semi-automated data labelling pipeline to generate a “silver-standard” labelled dataset for establishing baseline (human-level performance) and model testing
- Developed hyperparameter optimization pipeline for supervised and unsupervised tuning
- Developed dashboard to visualize logs for monitoring model performance in deployment
- Managed model deployment, auto-scaling, and maintenance in AWS Fargate
- Developed and deployed timeseries comparison for Root-Cause Analysis, downstream of outlier detection, to allow users to investigate cause of outliers

Graduate Researcher, Computational Neuroscience

Katz Lab | Volen Center for Complex Systems, Brandeis University, MA

2017 – Present

Performed time-series analysis to investigate coordination in multiple brain regions for processing taste information

- Optimized open-source data processing pipeline for high channel-count neural recordings, parallelizing pre-processing and reducing temporary file sizes for >4x speed-up ([GitHub](#))
- Developed accurate changepoint detection for high-dimensional neural data using Bayesian Modeling ([Medium](#))
- Developed framework to perform streamlined, batched inference for changepoint models over parameter grids and multiple datasets ([GitHub](#) | [Documentation](#)).
- Performed distributed, parallel inference using changepoint models on 200+ datasets using Kubernetes cluster.
- Recruited, led, and mentored a team of 2 PhD, 1 post-bac, and 1 undergraduate students on projects involving recording and analysis of neural activity.

Personal Projects

- Improving data preprocessing and reducing experimenter time needed for neural signal detection using gradient boosted trees ([GitHub](#) | [Medium](#))
- Using Natural Language Processing to automatically discover topics in scientific articles ([GitHub](#))
- Classified clothing articles from online retailer using Neural Network-based Image Classifier

Research Assistant, Cardiovascular Disease and Diabetes

Pulakat Lab | Veterans Affairs Medical Center, MO, and Tufts Medical Center, MA

2013 –2017

Completed independent project testing efficacy of novel drug on cardiac function *in-vitro* and in animal models

- Collected multi-channel timeseries data of cell-growth
- Ported analysis of cell-growth data from Excel to R, improving speed and reproducibility of analysis pipeline
- Collected and analyzed 5TB+ of histological image data
- Overhauled image analysis pipeline to MATLAB and sped up feature extraction 100x using computer vision techniques.

Teaching Assistant, Brandeis University, MA

2018 - 2021

Assisted with courses on data analysis, statistics, time-series modeling, and computational neuroscience

- Advanced Data Analysis, 2021, ([code and slides](#)) lectures on clustering, Probabilistic Programming, HMMs, and Bayesian Modeling
- Applied Statistical Computing in R, 2019
- Data Analysis and Statistics Workshop, 2018

Awards and Funding

XSEDE Research Award, NSF, (2019-2022)

Computational Neuroscience Training Fellowship, NIH, (2017-2019)

Academic Hardware Grant, NVIDIA, (2018)

University of Missouri, Columbia, MO: • Dean's List (all 8 semesters) • 14 competitive merit scholarships • Life Sciences Research Opportunity, and Travel award • Award for Academic Distinction (10/22,000 students per year across 7 colleges)

Selected Publications and Presentations (Full list on [Google Scholar](#))

Mahmood A., Steindler J.R., Germaine H., et al. (*In submission to Journal of Neuroscience*) *Dynamics of coupling between basolateral amygdalar and gustatory cortical taste responses*

Mahmood A., Steindler J., Stone B.T., Katz D. B., *Multi-region coordination in Taste Processing*, NIH Blueprint Joint Symposium on Computational Neuroscience (Virtual Talk, June 2021)

Mahmood A., Steindler J., Stone B.T., Katz D. B., *Gustatory Cortex and Basolateral Amygdala Communication in Innate Taste Processing*, Volen Center for Complex Systems Retreat (Sept 2021) **First Place, Graduate Poster Competition**