Alexander Ratzan
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Education

New York University (NYU) Tandon School of Engineering, Brooklyn, NY
PhD in Computer Science September 2023-Present
Focus: Neuroinformatics

Tufts University Medford, MA
Bachelor of Science in Cognitive & Brain Sciences December 2021
Grade: Magna Cum Laude

Awards & Fellowships

National Defense Science and Engineering Graduate (NDSEG) Fellowship May 2024
First NYU Engineering student to receive award

NYU School of Engineering Fellowship from Department of Computer Science & Engineering May 2023

National Science Foundation Graduate Research Fellowship Program - Honorable Mention March 2023

Research

Neuroinformatics Lab (https://www.neuroinformaticslab.com/) Brooklyn, NY
Doctoral Researcher September 2023-Present
Advisor: Erdem Varol

- Developing novel, efficient, and scalable methods for population-level analysis of neural data.
- Applying advanced statistical modeling to understand the relationship between the genome, gene expression, and brain connectivity patterns.
- *Additional roles:* Visiting researcher at Penn Artificial Intelligence in Biomedical Imaging Lab, Reviewer for eLife, Molecular-Connectomics team lead

Columbia University Medical Center, Department of Neurology and Biostatistics New York, NY
Neuroimaging Research Technician/Data Analyst February 2022 – July 2023
Advisor: Victoria Leavitt, Seonjoo Lee

- Researched neural correlates of cognitive impairment in Multiple Sclerosis (MS).
- Curated custom preprocessing, quality assurance, and data analysis pipelines for MRI, fMRI, and DTI.
- Calculated novel functional connectivity network measures to investigate the neural basis of language impairment in MS.
- Identified three distinct cognitive phenotypes using unsupervised learning and disease progression modeling in a large dataset of MS patients.

Tufts Integrative Cognitive Neuroscience Lab (https://tuftsiconlab.weebly.com/) Medford, MA
Research Assistant September 2020 – September 2023
Advisor: Elizabeth Race

- Researched autobiographical memory and protection from misinformation using behavioral data and resting state functional connectivity.
- Supported research for PhD student's (David Distefano) Master's thesis, 'Characterizing pre-stimulus alpha dynamics that predict stimulus-evoked cortical responses and sensory processing'.

Tufts Human-Computer Interaction Lab (https://tufts-hci-lab.github.io/) Medford, MA
Research Assistant February 2019 – August 2019
Advisor: Robert Jacob

- Collaborated with graduate students on research in 'Brain-Computer Interaction using Functional Near Infrared Spectroscopy' using support vector machines to quantify mental workload on various tasks.
- Neuroscience consultant aiming to improve experimental design.

Publications & Presentations

Ratzan, A., Dong, J., Faizal, S., Raj, R., Varol, E. (2024). Predicting the Resting-State Functional Connectome from Regional Gene Expression in Human Population Datasets. *Submitted to Society for Neuroscience.*

Leavitt, V.M., Dworkin, J., Kalina, T., **Ratzan, A.** (2024). Sex differences in brain resilience of individuals with multiple sclerosis. *Multiple Sclerosis and Related Disorders.*

Leavitt, V.M., Dworkin, J., Galioto, R., **Ratzan, A.** (2024) Disparities in DMT treatment: Demographic and neurocognitive differences between MS patients currently treated versus not treated with disease-modifying therapies. *Multiple Sclerosis and Related Disorders.*

Ratzan, A., Siegel, M.D., Karanian, J.M., Thomas, A.K, Race, E. (2023). Intrinsic functional connectivity in medial temporal lobe networks is associated with susceptibility to misinformation. *Memory*

Ratzan, A., Simani, L., Dworkin, J., Buyukturkoglu, K., Riley, C.S., Leavitt, V.M. (2023). Characterizing the extended language network in individuals with multiple sclerosis. *Accepted poster at Americas Committee for Treatment and Research in Multiple Sclerosis.*

Buyukturkoglu, K., Lu, L., Yang, H., **Ratzan, A.**, Sideras, P., Leavitt, V.M., Lignelli-Dipple, A., Binsheng, Z., Riley, C.S., De Jager, P. (2022). Thalamus-derived Radiomic Features to Predict Symbol-Digit Modalities Test Results in MS. *Accepted ePoster at The European Committee for Treatment and Research in Multiple Sclerosis.*

Professional Experience

Merck - SALAR Digital Operations and Innovation West Point, PA
Data Science Intern May 2021 – August 2021

- Designed an automated capability to generate a drug target safety review document containing intuitive visualizations and analytics. Modernized an 8+ hour research process to take less than 1 minute. Integrated and harmonized multiple types of 'omics' data (genomic, transcriptomic, proteomic).
- Created a custom PubMed search ranking algorithm utilizing natural language processing and multi parameter optimization to improve search results for investigators evaluating novel drug targets.

Mira Therapeutics Remote/Hoboken, NJ
Software Development Intern June 2020 – November 2020

- Android app developer for startup focused on helping patients recover from trauma symptoms and PTSD.
- Collaborated with two senior developers to engineer interactive features throughout the app including our analytics page, user interface, and grounding exercise tools.
- Designed and implemented full stack notification system sending scheduled reminders and notifications based on user activity to increase user engagement and retention rate.
- Debugged frontend and backend issues.

Outreach & Organizations

Columbia University Neuroscience Outreach New York City, NY
Volunteer Member, Saturday Science Leadership Committee May 2022 – June 2022

- Planned and volunteered for monthly program hosting neuroscience events and lessons for K-12 students in West Harlem and the greater New York City area.
- Served as external evaluator for Bronx Lab School's Neuroscience Fair. Evaluated and discussed experimental design with two high school juniors who conducted original neuroscience experiments.

Tufts University Men's Soccer Medford, MA
Athlete 2017-2021

- Four year player. 2018, 2019 NCAA National Champions. 2017, 2019, 2021 NESCAC Champions.
- NESCAC All-Academic Team Honors 2018, 2019, 2021
- Academy and semi-professional experience prior to and during university off-seasons.
- *Community Engagement:* Soccer lessons at elementary schools, Team Impact (team partners with middle school aged athlete with cystic fibrosis), Grassroot Soccer partners (annual fundraiser to improve health outcomes in developing countries), Tufts Play for Pink (annual breast cancer fundraiser), Tufts LGBTQ+ Pride Games, GreenDot member (on campus sexual health and safety).
- Postgraduate mentor for underclassman Tufts student majoring in computational or life science related fields. Participate in individual bimonthly check-ins with mentee and career development workshops.

NeuroAnalysis Project Medford, MA/Remote
Mentor/Project Lead May 2020 – September 2020

- Mentored first-year Computer Science student throughout data science project by introducing them to fundamental machine learning concepts, Python, version control, and various software packages.

Tufts Neuronetwork Medford, MA
Student Member April 2018 – December 2021

- Three-year member of student led organization for neuroscience news and activities on Tufts main campus and medical campus. Attended research symposia and poster sessions.

Projects

MS Clinical Subtyping with SuStaIn (https://github.com/LeavittLabCUMC/SuStaIn_Clustering)

- Identified 3 distinct MS subtypes from cross-sectional clinical data using Subtypting and Stage Inference algorithm combining clustering and disease progression modeling.
- Conducted feature engineering on dataset of >11,000 patients to isolate 9 informative clinical features.
- Selected optimal model parameters based on log-likelihoods and underlying biomarker distributions.
- Demonstrated discriminability between subtypes based on MRI volumetric data.

NeuroAnalysis Project (https://github.com/aratzan/2020-NeuroAnalysis-Project)

- Identified and analyzed intriguing high dimensional fMRI neuroimaging datasets from BrainIak.
- Applied various machine learning techniques (Support Vector Machines, Clustering, Multi-Dimensional Scaling, Principal Component Analysis) and statistical analysis tools (Representational Similarity Analysis, correlational maps and matrices) to classify, predict, and examine neural data.

NBA Machine Learning (https://github.com/aratzan/NBA-Machine-Learning)

- Predicted the 2020 All-NBA team with 87% accuracy using a multi-layer perceptron neural net optimized and trained on 20 seasons of NBA statistics.

- Conducted multiple linear regression to evaluate appropriate player salaries.

Skills & Software

Programming Languages: Python, Java, Bash, R, Matlab, C++, , Javascript
Packages: NumPy, SciPy, scikit-learn, Pandas, Keras, TensorFlow, PyTorch, matplotlib, Jupyter, AWS, Git
Systems: local, high-performance computing, linux, cloud-based
Neuroimaging Software: SPM, CONN, FSL, Freesurfer, Lesion Segmentation Toolbox, ANTS, Tracula, Nipy, Brain Connectivity Toolbox
Languages: French, Dutch
