Alexander Ratzan

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Education

New York University (NYU)   New York, NY
PhD in Computer Science   September 2023-Present
Focus: Neuroinformatics. GPA: 3.93

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, NYU Tandon CSE (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 statistical modeling and deep learning techniques to understand the relationship between the genome, gene expression, and brain connectivity patterns.
- Mentoring two graduate students on Master's theses. Mentored lab's first local high school intern.
- *Additional roles:* Visiting researcher at Penn Artificial Intelligence in Biomedical Imaging Lab, Reviewer for eLife Journal

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.

Mentorship & Activities

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

Side project repository: https://alexander-ratzan.github.io/projects/
- Label Propagation and Graph-Convolutional Networks for Disease Gene Discovery in a Multi-Species Network
- Convolutional Neural Networks and Recurrent-Neural Network Architectures for Decoding Handwriting from Microelectrode Arrays
- Differential Gene Expression Analysis of Cortical Regions across Primate Species
- Clinical Subtyping of Multiple Sclerosis with SuStaIn and TEBM
- Lightweight Big Data Pipeline for AlphaFold Protein Predictions
- fMRI NeuroAnalysis Project
- All-NBA Team Multi-Layer Perceptron Predictor

Skills & Software

Programming Languages: Python, Java, Bash, R, Matlab, C++, Javascript
Packages: NumPy, SciPy, scikit-learn, PySpark, PyTorch, Pandas, Keras, TensorFlow, 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