

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. *Coursework:* Design & Analysis of Algorithms, Machine Learning, Algorithmic Machine Learning & Data Science, Deep Learning, Applied Genomics & Network Modeling, Protein Design, Neuroinformatics, Big Data, Mathematical Tools for Neuroscience

Tufts University

Medford, MA

Bachelor of Science in Cognitive & Brain Sciences

December 2021

Awards & Fellowships

National Defense Science and Engineering Graduate ([NDSEG](#)) Fellowship

May 2024

Proposal: 'Integrating AI & Neuroscience: Advancing Brain-Inspired Computational Models for Language Prediction'

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

New England Small College Athletic Conference All-Academic Team

Fall 2018, 2019, 2021

Research & Professional Experience

Neuroinformatics Lab, NYU Tandon CSE

Brooklyn, NY

Doctoral Researcher

September 2023-Present

Advisor: Erdem Varol

- Developing novel and scalable methods to uncover fundamental principles of biological neural networks.
- Applying statistical modeling and deep learning techniques to understand the relationship between the genome, gene expression, and brain connectivity patterns. (available on request: github.com/neuroinfolab/GeneEx2Conn/)
- Performing representation learning of sequence and graph data using GNNs/attention to identify biomarkers.
- Bridging neuroscience findings with molecular biology by modeling protein-protein interactions in neural circuits using state-of-the-art methods like AlphaFold, AlphaProteo, and BindCraft.
- Lead developer of codebase integrated with high-performance computing environment for in-silico experiments.
- Visiting researcher at Penn Artificial Intelligence in Biomedical Imaging Lab, Reviewer for eLife Journal

Columbia University Dept. of Neurology and Mental Health Data Science Division

New York, NY

Neuroimaging Research Technician/Data Analyst

February 2022 – July 2023

- Curated custom preprocessing, quality assurance, and data analysis pipelines for neuroimaging data.
- Identified biomarkers of language impairment in Multiple Sclerosis (MS) patients by calculating novel graph-theoretical metrics from functional neuroimaging data.
- Performed advanced feature engineering of longitudinal clinical data from over 10,000 patients.
- Identified 3 cognitive phenotypes of MS patients via the implementation of Subtype and Stage Inference algorithm using mixture modeling, Expectation-Maximization, and Markov Chain Monte Carlo.

Merck - SALAR Digital Operations and Innovation

West Point, PA

Data Science Intern

May 2021 – August 2021

- Designed a rapid web-scraping 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. Interfaced with multiple types of 'omics' data (genomic, transcriptomic, proteomic).
- Created a custom PubMed search ranking algorithm utilizing natural language processing methods such as Okapi BM25 ranking to improve search results for investigators evaluating novel drug targets.

Tufts Integrative Cognitive Neuroscience Lab

Medford, MA

Research Assistant

September 2020 – September 2023

- Applied a general linear model to explain the relationship between resting state brain activity and memory performance in noisy environments.
- Supported research for thesis, ‘Characterizing pre-stimulus alpha dynamics that predict stimulus-evoked cortical responses and sensory processing’.

Mira Therapeutics

Remote/Hoboken, NJ

Software Development Intern

June 2020 – November 2020

- Developed android app for 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.

Tufts Human-Computer Interaction Lab

Medford, MA

Research Assistant

February 2019 – August 2019

- 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.

Publications

Ratzan, A., Dong, J., Faizal, S., Raj, R., Varol, E. (2025). Predicting brain connectivity from regional gene expression in human population datasets. *In preparation for Medical Image Computing and Computer Assisted Intervention (MICCAI)*

Ratzan, A., Patel, M., Galioto, R., Hancock L., Leavitt V.M. (2025). Deriving clinical subtypes with unsupervised learning and event-based modeling in a large multiple-sclerosis cohort. *Manuscript in preparation*

Simani, L., Tozlu, C., Lee, S., Dworkin, J., **Ratzan, A.**, Buyukturkoglu, K., Onomichi, K., Mata, J., Riley, C.S., Leavitt, V.M. (2025). Longitudinal investigation of neuroimaging changes related to memory decline in multiple sclerosis: Testing a mechanistic model. *Multiple Sclerosis Journal*

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. *Americas Committee for Treatment and Research in Multiple Sclerosis*

Skills & Software

Side Project Repository: alexander-ratzan.github.io/projects/

Programming Languages: Python, Java, Bash, R, Matlab, C++, Javascript

Packages: NumPy, SciPy, scikit-learn, PySpark, PyTorch, Pandas, Keras, TensorFlow, matplotlib, Jupyter, AWS, Git

Systems: high-performance computing cluster, linux, cloud-based

Languages: French, Dutch