Alexander Ratzan
asr2195@columbia.edu • 609-651-9579 • Twitter: @AlexRatzan_neuro • GitHub: aratzan

Education

Tufts University Medford, MA
Bachelor of Science in Cognitive & Brain Sciences December 2021
GPA: 3.75, Magna Cum Laude
Key Coursework: Graduate Core Course in Neuroscience, Cognitive Brain Science Seminar, Physiological Psychology, Experimental Psychology, Psychopharmacology, Machine Learning, Artificial Intelligence, Reinforcement Learning, Computational Biology, Data Structures & Algorithms, Behavioral Statistics, Linear Algebra, General Chemistry, Organic Chemistry, Biology I & II, Physics II

Research

Columbia University Department of Neurology, Cognitive Neuroscience Division New York, NY
Neuroimaging Research Technician February 2022 - Present
Advisor: Victoria Leavitt

- Researching neural correlates of cognitive impairment in Multiple Sclerosis with multimodal data in the Translational Cognitive Neuroscience Lab at Columbia University Medical Center.
- Curating detailed preprocessing and data analysis pipelines for MRI, fMRI, and DTI data generating structural and functional metrics. Assisting in writing and editing of select publications.
- Spearheading project using novel functional connectivity network measures to explore language deficiencies in MS patients. Upcoming project: classifying cognitive phenotypes using unsupervised learning and disease progression modeling in a large dataset of MS patients (n>11,000).

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

- Researching 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 a support vector machine to quantify mental workload on various tasks.
- Acted as neuroscience consultant aiming to improve experimental design.

Papers & Presentations

Ratzan, A.S, Dworkin, J., Buyukturkoglu, K., Ricci, A., Onomichi, K., De Jager, P., Riley, C.S., Leavitt, V.M. (2022). Language network functional reorganization in individuals with multiple sclerosis. *Manuscript in preparation. Abstract submitted to Americas Committee for Treatment and Research in Multiple Sclerosis.*

Ratzan, A.S., Siegel, M.D., Karanian, J.M., Thomas, A.K, Race, E. (2022). The role of mnemonic style and medial temporal lobe connectivity in protecting memory from misinformation. *Accepted for poster presentation at Society for Neuroscience Conference (https://www.sfn.org).*

Leavitt, V., Dworkin, J., Makaretz, S., **Ratzan, A.** (2022). Women have higher brain reserve against multiple sclerosis disease burden than men. *Full-format manuscript under review. Accepted ePoster at The European Committee for Treatment and Research in Multiple Sclerosis (Selected for 1 of 5 poster prizes out of 1,400 posters).*

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). Thalamic radiomics to predict symbol digit modalities test performance in multiple sclerosis. *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 relevance of 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 – Present

- Planning and volunteering for monthly program hosting neuroscience events and lessons for youth 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 Men's Soccer Mentorship Program Medford, MA/Remote
Mentor Starting Spring 2023

- Postgraduate mentor for underclassman Tufts student majoring in Psychology and/or life science related fields. Participate in individual bimonthly check ins with mentee and career development workshops.

NeuroAnalysis Project (https://github.com/aratzan/2020-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 basic machine learning concepts, Python, version control, and various software packages.

Tufts Students in Biological Computation Medford, MA
Student Member March 2021 – December 2021

- Attended and participated in research symposia, seminars, and journal club related to computation in biological sciences.

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.

Personal Projects

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.

Athletics

Tufts University Men's Soccer 2017-2021

- 2018, 2019 NCAA National Champions. 2017, 2019, 2021 NESCAC Champions.
- NESCAC All-Academic Team Honors 2018, 2019, 2021
- *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).

Real Central New Jersey May 2021-August 2021

- Player for USL2 semi-professional soccer team in mid-atlantic division.

La Camillienne FC (Paris, France**)** January 2020-March 2020

- Registered player in top semi-professional division of Paris.

West Ham United FC (London, England) April 2014

- International academy player invited to compete with and trial for West Ham United FC's Premier League academy.

Skills & Software

Programming Languages: Python, Java, Matlab, C++, Bash, Javascript, HTML/CSS
Neuroimaging Software: SPM, CONN, FSL, Freesurfer, Lesion Segmentation Toolbox, ANTS, Tracula, Nipy, Brain Connectivity Toolbox
Packages: NumPy, SciPy, scikit-learn, Pandas, Keras, Tensorflow, matplotlib, Jupyter Notebook, AWS, Git
Laboratory: CITI certified for Biomedical Research, Human Research, and Clinical Practice
Languages: French, Dutch