Trevor J. Alston

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SUMMARY

Computational neuroscientist and neural engineer building real-time models of neural dynamics. Experienced in Jupyter-to-production workflows, JAX-based modeling, large-scale dataset integration, and infrastructure-aware experimentation. Developing deployable modeling systems for next-generation neurotechnology and brain–computer interfaces.

EDUCATION

Duke University – Doctor of Philosophy in Neurobiology   May 2026

Dissertation title: OSPLAT: A Method for Uncovering Latent Oscillatory Neural Signals Across Time

Selected Honors and Programs:
- *MIT SUD VENTURE PROGRAM (2025),*
- *IMPACT Neuroscience Program (2024),*
- *NWB-DANDI Hackathon Travel Award (2024)*
- *Neural Conference Travel Award (2023, 2024)*
- *NSF Supplement (2023)*
- *NEURAL Shark Tank – 3rd Place (2023)*

Northwestern University - M.S. Biomedical Engineering

GPA: 3.5   Graduated Jun 2019

Rutgers University: B.S. Biomedical Engineering | Minor: Chemistry

GPA: 3.7 Summa Cum Laude   Graduated May 2017

RESEARCH EXPERIENCE

Pearson Lab – Duke University, Durham, NC
PhD Student   **Jun 2020 – Present**
- Led a multi-year PhD research project focused on real-time inference of population neural dynamics.
- Developed end-to-end computational workflows, prototyping models and figures in Jupyter notebooks, modularizing code into Python scripts, and deploying automated experiments in Linux terminal environments.
- Built and maintained complex modeling pipelines, significantly strengthening software engineering, debugging, and code organization skills.
- Developed a deep perspective on modeling frameworks, including how statistical assumptions, data structure, and computational constraints interact.
- Sourced and integrated large-scale public neural datasets to test algorithmic performance across experimental conditions.
- Employed Git/GitHub for version control, collaboration, and reproducible experimentation.

Hartmann Lab – Northwestern University, Chicago, IL

Master's Student   May 2018 – May 2019
- Led electrophysiology research investigating whisker-based encoding in rat SpVi region.
- Constructed acquisition systems, performed surgeries, and analyzed neural firing-rate data.
- Designed and built experimental hardware for neurophysiology workflows.

Selected Doctoral Rotations – Duke University, Durham NC   Sept 2019 – May 2020
- Brunel Lab – Developed prototype cerebellar circuit model using BRIAN simulation framework.
- Gong Lab – Built whisker stimulation device for optogenetic experiments; exposure to viral targeting and neural circuit manipulation.

Research Intern - CAMP, Ann Robert Lurie Children's Hospital, Chicago IL   August 2017- May 2018
- Developed synchronized audio cue detection methods aligned with EEG recordings for early neurodevelopmental risk analysis.

SELECTED PUBLICATIONS AND PRESENTATIONS

- Schnaude Dorizan, K., Kleczka, K. J., Resulaj, A., **Alston, T**., Bresee, C. S., & Hartmann, M. J.
  - A novel stimulator to investigate the tuning of multi-whisker responsive neurons for speed and the direction of global motion. Journal of Neuroscience Methods. 2021.
- A Generative Approach to Derive Neural Ensembles across Multiple DANDI Datasets – NWB-DANDI Hackathon (2024)
- O-SPLAT: Uncovering Latent Sources from Oscillatory Data – SFN (2024), NEURAL Conference (2024)
- Decomposing Neural Data with SPLAT – BMES (2022), Triangle SFN (2022)

PROFESSIONAL EXPERIENCE

Genentech

Automation Engineer (Intern)   Jun 2019 – Aug 2019

- Collaborated with scientists to understand end-to-end lab workflows and identify opportunities for automation using liquid handling robotics.
- Developed robot control logic and a user-facing GUI to make automated pipetting workflows more flexible and responsive to user needs.
- Designed and 3D-printed parametric custom fixtures to robustly accommodate variability across test tubes and containers, improving reliability of robotic insertion.
- Reduced manual intervention in repetitive lab tasks, enabling scientists to redirect time toward higher-value experimental work.

ENTREPRENEURIAL & TRANSLATIONAL EXPERIENCE

SUD Venture Program- Massachusetts Institute of Technology, Boston MA

Product Engineer   Jan 2025

- Participated in team-based health technology venture development focused on substance use disorder innovation.
- Developed and pitched an early-stage health-tech concept within structured startup immersion program.
- Engaged with founders and digital health companies in the SUD ecosystem.

Nuventure Program (Medical Robotics Startup) – Northwestern University, Chicago IL

Product Engineer   September 2017 – June 2018

- Contributed to development of robotic system for radiology-guided insertion trajectory isolation.
- Participated in year-long incubator-style engineering and product development program.
- Collaborated on technical prototyping, systems integration, and device design considerations.

TECHNICAL SKILLS

Programming & Modeling
- Python, JAX, Linux, Git, Statistical Modeling, Machine Learning (gradient descent, Q-learning, clustering)

Infrastructure & Deployment
- Docker, NAS administration, RAID configuration, local AI deployment

Experimental & Neurophysiology
- Electrophysiology acquisition, rodent surgery, optogenetic workflows

Systems & Prototyping
- Fusion 360 (parametric CAD), rapid prototyping & additive manufacturing, Arduino/Teensy, Raspberry Pi, lab automation systems

SELECTED ENGINEERING PROJECTS

Self-Hosted Infrastructure & Local AI Services
- Designed and maintained a self-hosted homelab including a local NAS and containerized media services, emphasizing data privacy, fault tolerance, and automation.
- Built and deployed locally hosted AI services (LLMs and embedding pipelines) integrated with personal media and file indexing, enabling low-latency, offline inference.
- Configured networking, storage, and backup workflows (RAID, snapshots, remote sync) to ensure data durability and recovery.
- Automated service orchestration and monitoring using Docker and system-level tooling to minimize downtime and manual intervention.
- Evaluated tradeoffs across hardware, storage, and deployment strategies under real-world resource constraints.

NWB-DANDI Hackathon – Janelia Research Campus   July 2024
- Improved upon existing lab tool (SPLAT) to extract neural ensembles across multiple standardized NWB datasets.
- Integrated heterogeneous recordings via DANDI API workflows.
- Collaborated with open-science developers to improve cross-lab reproducibility and dataset interoperability.
- Presented results to the hackathon cohort and contributed to shared repositories.

LEADERSHIP INITIATIVES

Duke University Neuroscience Experiences (DUNE) – Duke University, Durham, NC

Founder /Co-Chair   Aug 2020 – Aug 2023

- Founded and launched pilot neuroscience outreach program for underrepresented high school students.
- Coordinated school partnerships, admissions rubric, and mentor matching.
- Placed 25+ high school students into paid research roles within Duke Neuroscience labs.