Aarav Sinha's Resume

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Research & Projects

Drosophila Brain Connectome Modeling

- Simulated functional neural dynamics in Drosophila based on structural connectome data in Brian2, a Python library.
- Implemented neuromodulation, better simulation of inhibitory dynamics(changing the zero-basal-firing-rate), and SDTP to explore mechanisms of learning.
- Recreated model structures from published papers (for example, connectome-constrained vision models) and attempted to improve them
- Simulated real-world dynamic odor perception through the *Drosophila* model, improving on current static odor prediction models

Exploring how optimization principles from the human visual cortex can improve image detection algorithms in artificial systems at the University of Pennsylvania.

Studying impacts of noise on ring attractor RNNs inspired by the fly brain's head direction system at MIT

NeuroBridge - AI Learning Platform *(in development)*

- React, TypeScript, TailwindCSS, TensorFlow.js, Konva, Recoil
- Developing a gamified, neurodivergent-friendly drag-and-drop platform to teach AI/ML fundamentals to underserved students.
- Features include visual neural network simulations, interactive modules (classification games, image recognition tasks), and no-code model editing.
- Uses real-time inference with TensorFlow.js, interactive canvas rendering with Konva, and scalable state management with Recoil.

AI/ML Specialization Projects(over the last year)

- Built a neural network to predict delivery demand for real-world datasets
- Built a neural network to predict wildfire spread during the wildfire season in California
- Created an AI Chatbot that my school counselors use regularly to help students with course selection
- Built a program that uses LLMs to generate science olympiad practice questions.

Awards & Leadership

- TMSCA 1st place in State (Science)
- Science Olympiad - top 10 @ MIT Invitational(top national invy), 1st place at regionals, 3 top 5 finishes at the State tournament(in Dynamic Planet, Eco, and Geo Mapping)
- Member of the Tompkins Symphony Orchestra- #1 full orchestra in Texas, participated in the Midwest Conference, and at TMEA, which are prestigious national and state-level orchestra conferences
- Established an AI club at my school that offers free education on AI and teaches how to use and build AIs for free. Information about AI is now free and readily available in my school. Grew it to 40 members in just one year. We are going to host our own AI Competition along with hosting the regional round of US AI Olympiad next year.
- Green belt in Songham Taekwondo- projected to become Black Belt in 8 months
- Top 5 ranked in my class(by GPA)

Online Certifications

- Harvard MCB80x: Fundamentals of Neuroscience, Parts 1–3
- DeepLearning.AI: Machine Learning Specialization (Andrew Ng)
- MIT OpenCourseWare- Introduction to Neural Computation
- Working on getting a certification for mathematics for machine learning through Coursera

Skills

- Programming and Software: I am proficient in coding with PyTorch and Tensorflow. I also used libraries such as Pandas, Matplotlib, and Seaborn to do data analysis and visualization, which was essential, especially in my Drosophila computational network project. I also know Java very well.
- Neuroscience: I am proficient in using Brian2 for neural modeling. I am also well-versed in connectomics and statistical analysis of connectomes.
- Very reliable, hardworking, and persistent. I ask for help when I need it but am mostly self-sufficient.