Arthur Liang

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Education

Massachusetts Institute of Technology — Cambridge, MA

MEng in Computer Science and Neuroscience, BS in Mathematics; GPA: 5.0/5.0 — *Exp. May 2026*

- **Relevant Coursework:** Deep Generative Models (G), GenAI in Bio (G), Protein Design, CV (G), NLP, Symmetry in ML (G), Computational CogSci, Neural Computation, Neuroinformatics, ML, DSA, Probability & Random Variables, Algebraic Combinatorics, Topology, Geometry, Graph Theory, Causality, Computational Molecular Biology, Biochem, Organic Chem

Research

Research Intern @ MIT CSAIL — Cambridge, MA

Investigated protein representation and generation using LLMs, diffusion models, and flow matching — *Jan. 2024 - Present*

- Built *Magneton*, a comprehensive benchmark environment for substructure-aware protein modeling, including a dataset of 530K proteins with 1.7M curated substructure annotations across 13K types, a training framework, and 13 evaluation tasks spanning residue to protein-level representations
- Developed substructure-tuning to distill functional knowledge from evolutionarily conserved protein substructures into SoTA protein models, achieving 5-19% improvements in function prediction tasks. Demonstrated complementarity between substructural and global structural information across both sequence-only and structure-based models, showing that decades of curated biological knowledge about protein domains, motifs, and functional sites provides signals orthogonal to existing pretraining objectives
- Investigated latent diffusion models for unconditional protein generation, exploring different objectives, embeddings, and masking strategies as well as performing comprehensive ablation. Scaled extensive training runs and hyperparameter sweeps across multiple environments, leveraging distributed computing to optimize resource utilization
- Designed a decoder-only autoregressive model for joint protein sequence and structure modeling, enabling exact model likelihood estimation and controllable generation via MCMC and GPT-style tuning

Research Fellow @ Champalimaud Centre for the Unknown — Lisbon, PT

Uncovered geometric principles of neural computation through symmetry-constrained dynamical systems — *May 2025 - Aug. 2025*

- Developed symmetry-regularized variational state space models for neural dynamics using Lie brackets and group equivariance losses, achieving interpretable ring attractor recovery from high-dimensional noisy observations
- Established principled framework for embedding symmetry priors in neural system identification and demonstrated trade-offs between reconstruction accuracy and geometric structure preservation

Research Intern @ MIT Sinha Lab — Cambridge, MA

Linked neural structure and function with myelin, connectivity, and neural dynamics in cortical circuits — *Apr. 2025 - Present*

- Analyzed large-scale electron microscopy connectomics data (MICrOnS dataset) to quantify synaptic connectivity patterns, including analyses of adjacency matrices, reciprocal connection probabilities, network motifs, and statistical comparison against null models to identify non-random circuit organization principles
- Developed multimodal analysis pipeline integrating structural and functional brain data, combining automated myelin extraction from EM volumes, calcium imaging spike deconvolution, and correlation analyses to establish relationships between myelination patterns, synaptic connectivity strength, and neural activity dynamics

Research Intern @ MIT Synthetic Neurobiology Group — Cambridge, MA

Designed novel opsin variants so that our bodies don't recognize them as foreign — *Sep. 2022 - Aug. 2023*

- Employed ML protein engineering methods (Directed Evolution, GANs) and immunogenicity prediction models (NetMHCPan) to enable safer human integration of optogenetics by reducing opsin immunogenicity in the peripheral nervous system

Industry Experience

Research Intern @ Ritual AI — Remote

Found that frontier LLMs update their beliefs incoherently and even bet against their own predictions — *Jun. 2025 - Sep. 2025*

- Conducted empirical study evaluating belief coherence and action-belief alignment across SoTA language models, revealing up to 30% deviation from Bayesian-optimal belief updates and significant inconsistencies in decision-making behavior
- Designed and implemented experimental frameworks for measuring LLM consistency across multiple dimensions including Bayesian belief updating, betting behavior on prediction markets, and deference patterns under challenge, using diverse datasets and confidence elicitation methods like sampling and logit elicitation
- Improved model consistency by implementing contrastive activation addition using mean activation differences between stick and change behaviors, demonstrating that targeted interventions at middle layers can transform inconsistent models into deference-consistent ones, particularly on complex reasoning tasks

Research Intern @ Altera (now Fundamental Research Labs) — Menlo Park, CA

Built digital humans that care about us and each other — *Jul. 2024 - Sep. 2024*

- Led long-term social progression initiative towards evolving goal-driven agentic behavior and emotional continuity. Devised and optimized for social reasoning tasks, beating internal benchmarks and standardizing agent performance metrics
- Scoped and implemented methods for real-time virtual screen capture, visual reasoning, and low-level action execution within digital agents. Refactored agent brain architecture and developed infrastructure for interoperability beyond Minecraft

Machine Learning Engineer Intern @ Boeing AI Seoul, South Korea

Delivered 0→1 ubiquitously-used pipeline for utilizing industry-grade VLMs *May. 2024 - Jul. 2024*

- Developed transfer learning pipeline adapting pre-trained vision-language models (LLaVA) to aircraft defect detection, creating training infrastructure for continuous model updates as new defect patterns emerge
- Designed multi-agent RL environment for aircraft disruption management using historical flight data, implementing policies that balance passenger delays, crew schedules, and maintenance constraints

Publications

[7] Greater than the Sum of Its Parts: Building Substructure into Protein Encoding Models

Under Review @ ICLR *2026*

- R Calef, **A Liang**, M Kellis, M Zitnik

[6] Incoherent Beliefs & Inconsistent Actions In Language Models

Under Review @ ICLR *2026*

- **A Liang***, A Pal*, T Kitnavoski*, A Potti, M Goldblum

[5] Cortical Myelin Architecture Shapes Structural Connectivity and Neural Dynamics

Under Review @ COSYNE *2026*

- C Shvartsman, **A Liang**, P Sinha

[4] Symmetry-Regularized Learning of Continuous Attractor Dynamics

Accepted at NeurReps @ NeurIPS, Under Review @ COSYNE *2025*

- **A Liang**, A Ságodi, P Sokół, IM Park

[3] Do Large Language Models Defend Their Beliefs Consistently?

Accepted at MTI-LLM @ NeurIPS *2025*

- **A Liang***, A Pal*, T Kitnavoski*, A Potti, M Goldblum

[2] A Pharmacological Approach for Studying Alcohol Use Disorder: Using Calcium Imaging on hiPSC-derived Glutamatergic Neurons to Dissect the Glutamate Response in the Context of Chronic Ethanol Treatment

ISEF *2022*

- **A Liang**, I Gameiro-Ros, P Slesinger

[1] Development of an Aptamer-Gold Nanoparticle Assay for Field Use in Informing DIY-HRT

IYRC *2021*

- **A Liang**, S Ahuja, G Uttmark

Leadership & Service

EMT @ MIT Emergency Medical Services Cambridge, MA

Volunteered as first-responder in and around MIT, Cambridge, and Boston *Dec. 2023 - Present*

- Provided critical medical assistance to individuals in need, offering comfort and care during emergencies ranging from minor injuries to critical incidents, ensuring their well-being and safety within the MIT community
- Effectively communicated and coordinated with diverse teams of responders and medical staff to deliver prompt and compassionate care, ensuring seamless transition of care

Operations Lead @ MIT Hacking Medicine Cambridge, MA

Organized MIT Grand Hack, an annual three-day healthcare hackathon for 500+ industry professionals *Sep. 2022 - May 2024*

- Initiated a fast-moving research group toward infecting, energizing, and empowering a diverse, global community in healthcare entrepreneurship and innovation to scale medicine to attack and solve healthcare problems
- Represented HackMed at global healthcare and medicine conferences to recruit potential sponsors, mentors, and participants as well as keep HackMed up to date regarding up-and-coming technologies to iterate on our hackathon framework

Workshop Coordinator @ MIT Global Teaching Labs Seoul, South Korea

Spent two winters creating STEM curriculum for high schoolers in Korea *Jan. 2023 - Feb. 2024*

- Developed and delivered creative, hands-on machine learning, neuroscience, and biology workshops to high schoolers

Skills, Awards, & Interests

Programming: Python (PyTorch [Lightning], TensorFlow, NumPy, Matplotlib, pandas, scikit-learn, Openfold, hydra, NetworkX, BioPython, OpenCV, RDKit, Biotite, wandb), Linux & Unix, SLURM, Git, AWS EC2, R, SQL, MongoDB, vLLM
Skills: Calcium Imaging, Neural Induction, Transfection, Western Blotting, Staining, Plasmid Cloning, PCR, Gel Electrophoresis
Awards: ISEF Finalist & Special Award Winner, AIME, USABO Top 75, National Brain Bee Winner, NYC STEM Fair Grand Award Winner, COSYNE Undergraduate Travel Grant, Google CSRMP Fellow, Takeda Undergrad Research & Innovation Scholar
Interests: Taekwondo, Home Cooking, Venture Capital, Reading & Blogging, Hiking & Running, Foreign Languages, Eagle Scout
Service: Reviewer for MTI-LLM and NeurReps @ NeurIPS'25, NeurMAD @ AAAI'25
Teaching: Lab Assistant for Introduction to Machine Learning (Fall'24), Teaching Assistant for Emergent Computation Within Distributed Neural Circuits (Spring'24), Teaching Assistant for Multivariable Calculus (Fall'23)