

Research Interests	I design multimodal foundation models (FM) for scientific discovery, with recent applications in astronomy [P4] and metagenomics [P3]. My work also explores inference-time methods for decision-making with FMs [C6] as well as their underlying mechanisms [C1,C2,C3,C5,P6].	
Education	University of Southern California	08/2022 - <i>Present</i>
	Ph.D. in Computer Science Advisors: Dani Yogatama, Willie Neiswanger	
	Northwestern University	09/2019 - 06/2021
	M.S. in Industrial Engineering and Management Sciences	
	Carnegie Mellon University	08/2013 - 08/2019
	B.S. (Hons) and M.S. in Machine Learning	
Positions	The Simons Foundation & Polymathic AI , Research Scientist	09/2024 - 12/2024
	Host: François Lanusse, Shirley Ho Developed AION [P4], the first series of multimodal FMs for observational astronomy, leading post-training efforts and contributing to pre-training and model architecture ablations.	
	Microsoft Research , Research Intern	05/2024 - 08/2024
	Host: Corby Rosset Worked with the AI Frontiers Team and designed a self-improving workflow for post-training large language models from textual feedback, with applications in mathematical reasoning.	
	Reka AI , Research Intern	05/2023 - 07/2023
	Host: Qi Liu, Dani Yogatama Implemented training algorithms for reward models, with applications in multimodal data.	
	Redwood Research , Research Resident	01/2023 - 05/2023
	Host: The REMIX Research Program Applied path patching to identify reusable subgraph of language models that implement elementary mathematical operations, with results accepted to NeurIPS 2023 [C1].	
Refereed Publications	*: equal contribution; orange : featured publication [C7] Ghazal Khalighinejad, Sharon Scott, Ollie Liu , Kelly L. Anderson, Rickard Stureborg, Aman Tyagi, Bhuwan Dhingra “MATVIX: Multimodal Information Extraction from Visually Rich Articles” In: <i>Proceedings of NAACL 2025</i> . [pdf] [website] [C6] Ollie Liu [*] , Deqing Fu [*] , Dani Yogatama, Willie Neiswanger “DeLLMa: Decision Making Under Uncertainty with Large Language Models” In: <i>Proceedings of ICLR 2025</i> , Spotlight Presentation (top 5.1% of all submissions) . [pdf] [website] [C5] Deqing Fu [*] , Ruohao Guo [*] , Ghazal Khalighinejad [*] , Ollie Liu [*] , Bhuwan Dhingra, Dani Yogatama, Robin Jia, Willie Neiswanger “IsoBench: Benchmarking Multimodal Foundation Models on Isomorphic Representations” In: <i>Proceedings of COLM 2024</i> . [pdf] [website]	

[C4] Ting-Rui Chiang, Xinyan Velocity Yu, Joshua Robinson, **Ollie Liu**, Isabelle Lee, Dani Yogatama “On Retrieval Augmentation and the Limitations of Language Model Training” In: *Proceedings of NAACL 2024 (short)*. [[pdf](#)] [[code](#)]

[C3] Xianghao Kong*, **Ollie Liu***, Han Li, Dani Yogatama, Greg Ver Steeg “Interpretable Diffusion via Information Decomposition” In: *Proceedings of ICLR 2024*. [[pdf](#)] [[code](#)]

[C2] Ghazal Khalighinejad , **Ollie Liu**, Sam Wiseman “Approximating CKY with Transformers” In: *Proceedings of Findings of EMNLP 2023*. [[pdf](#)] [[code](#)]

[C1] Michael Hanna, **Ollie Liu**, Alexandre Variengien “How Does GPT-2 Compute Greater-Than?: Interpreting Mathematical Abilities in a Pre-Trained Language Model” In: *Proceedings of NeurIPS 2023*. [[pdf](#)]

Preprints

[P6] Haosheng Gan*, Deqing Fu*, Julian Asilis*, **Ollie Liu***, Dani Yogatama, Vastal Sharan, Robin Jia, Willie Neiswanger “Textual Representations Alone Can Steer Multimodal Models” In: *arXiv Preprint*. [[pdf](#)] [[website](#)]

[P5] Xiaoyuan Zhu, Muru Zhang, **Ollie Liu**, Robin Jia, Willie Neiswanger “LLM Unlearning Without Expert Curated Dataset” In: *arXiv Preprint*. [[pdf](#)] [[website](#)]

[P4] The Polymathic AI Collaboration, François Lanusse, Liam Holden Parker, Jeff Shen, **Ollie Liu**, Tom Hehir, Leopoldo Sarra, Lucas Thibaut Meyer, Micah Bowles, Sebastian Wagner-Carena, Helen Qu, Siavash Golkar, Alberto Bietti, Hatim Bourfoune, Pierre Cornette, Keiya Hirashima, Geraud Krawezik, Ruben Ohana, Nicholas Lourie, Michael McCabe, Rudy Morel, Payel Mukhopadhyay, Mariel Pettee, Bruno Régaldo-Saint Blancard, Kyunghyun Cho, Miles Cranmer, Shirley Ho “AION: Omnimodal Foundation Model for Astronomy” In: *arXiv Preprint*. [[pdf](#)] [[website](#)]

[P3] **Ollie Liu**, Sami Jaghouar, Johannes Hagemann, Shangshang Wang, Jason Wiemels, Jeff Kaufman, Willie Neiswanger “METAGENE-1: Metagenomic Foundation Model for Pandemic Monitoring” In: *arXiv Preprint*. [[pdf](#)] [[website](#)] [[models & datasets](#)]

[P2] Jiarui Zhang, **Ollie Liu**, Tianyu Yu, Jinyi Hu, Willie Neiswanger “[Euclid](#): Supercharging Multimodal LLMs with Synthetic High-Fidelity Visual Descriptions” In: *arXiv Preprint*. [[pdf](#)] [[website](#)] [[models & datasets](#)]

[P1] Wenye Hua, **Ollie Liu**, Lingyao Li, Alfonso Amayuelas, Julie Chen, Lucas Jiang, Mingyu Jin, Lizhou Fan, Fei Sun, William Yang Wang, Xintong Wang, Yongfeng Zhang “Game-Theoretic LLM: Agent Workflow for Negotiation Games” In: *arXiv Preprint*. [[pdf](#)]

Honors and Awards

Spotlight Presentation, DeLLMa: Decision Making Under Uncertainty with Large Language Models, The Thirteenth International Conference on Learning Representations (ICLR), 2025
Technical Innovation Fellowship, University of Southern California, 2025
Nebius Research Credits Program, est. \$200,000, Nebius Group, 2025
University Organizer Fellowship, est. \$30,000, Open Philanthropy, 2024
Provost’s Fellowship, est. \$2,000 per year, University of Southern California, 2022
Data Science Fellowship, est. \$10,000, Northwestern University, 2019

Royal E. Cabell Fellowship, est. \$10,000, Northwestern University, 2019
Senior Leadership Recognition, Carnegie Mellon University, 2018

Invited Talks

CSCI 699: Probabilistic and Generative Models, Guest Lecture on Flow Matching.
Intel EAI Tech Talk, DeLLMa: Decision Making Under Uncertainty with Large Language Models.
USC Information Science Institute NLG Seminar, DeLLMa: Decision Making Under Uncertainty with Large Language Models. [\[video\]](#)
USC NLP Lunch, IsoBench: Benchmarking Multimodal Foundation Models on Isomorphic Representations.
USC NLP Lunch, How Does GPT-2 Compute Greater-Than?: Interpreting Mathematical Abilities in a Pre-Trained Language Model.

Teaching
Experiences

TA, Generative Models (Ph.D. Elective), University of Southern California, Spring 2025
TA, Machine Learning (Master), University of Southern California, Fall 2023
Co-Instructor, Machine Learning (Ph.D. Elective), Northwestern University, Fall 2021
Co-Instructor, Mathematical Statistics (Ph.D. Core), Northwestern University, Fall 2020
TA, Introduction to Machine Learning (Master), Carnegie Mellon University, 2 Semesters.
TA, Principles of Computing (Undergraduate), Carnegie Mellon University, 4 Semesters.

Doctoral
Courseworks

Machine Learning, Natural Language Processing, Computer Vision, Learning Theory, Scalable Learning Systems, Theoretical Optimization

Services and
Activities

Reviewer, ICML (2024, 2025); NeurIPS (2024); ICLR (2025); ACL Rolling Review (2024)
President, [AI Safety Group](#), University of Southern California
Student organizer, [Center for Optimization and Statistical Learning](#), Northwestern University

Skills

Software: Python (JAX, PyTorch, 🤗 Hugging Face), Linux, R, \LaTeX
Language: Chinese (*native*), English (*proficient*, GRE V169+Q168)