Franklin Wang

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EDUCATION

Massachusetts Institute of Technology | Cambridge, MA

Double Major in Computer Science and Mathematics, Bachelor of Science

GPA: 5.00/5.00

Coursework: Hardware Arch. for Deep Learning, Inference and Information, Modern Mathematical Statistics, Machine Learning, Natural Language Processing, Computational Sensorimotor Learning (RL), Symmetry (Group Theory) for Machine Learning, Computational Structures, Design & Analysis of Algorithms

EXPERIENCE

Intern at Anyscale

- Implement DPO into Anyscale training library and accelerate training with asynchronous preprocessing of reference model probabilities with Ray
- Conduct case study on preference tuning for summarization: generated synthetic preference data with Q&A-based summarization metric to finetune Mistral-7B with multi-iteration online DPO, beating GPT-40 performance
- Published blog post on scaling synthetic data & DPO training with Anyscale: Blog Link

Student Researcher at MIT CSAIL Torralba Lab

- Nearest Neighbor Normalization Improves Multimodal Retrieval (in collaboration with Stanford NLP) Discovered general debiasing method for multimodal retrieval tasks, consistently improving performance of all tested 0
 - contrastive models (eg. CLIP, BLIP, BEiT-3, SigLIP) on text/image retrieval benchmarks without any training Improved gender debiasing on image retrieval while improving retrieval accuracy (all previous debiasing methods Ο decrease accuracy)
- A Multimodal Automated Interpretability Agent
 - Develop GPT-4-Vision agent for interpreting & experimenting on neurons in vision models, matching human expert 0 experimenter performance
 - Applied approach to spurious feature removal on vision models, improving robustness to irrelevant background 0 features and attaining near-SOTA performance on a spurious correlation benchmark w/o requiring any annotations (which current SOTA methods require)
 - Fine-tuned open-source LLMs on large multi-GPU clusters to act as judges and scorers for benchmark evaluation 0
- Intuitive Physics with Graph Neural Nets and Transformers
 - Designed transformer and GNN architectures to simulate solids & fluids using particle cloud representations 0
 - Ran experiments using data from ThreeDWorld to prepare for experiments on real-world data Ο

Student Researcher at MIT CSAIL Jaakkola Lab

- Equivariant GNNs for Coarse-Grained Molecular Dynamics
 - Expanded upon previous equivariant GNNs to incorporate historical states and predict uncertainty distributions
 - Applied model to simulate polymer chains, improving accuracy over non-equivariant models 0

ML Research Intern at Genesis Therapeutics

- Researched graph neural net approaches to modeling the dynamics of small molecule drugs with quantum mechanical data, leading to >300 times speedup compared to quantum methods and improving accuracy over traditional molecular dynamics approximations
- Created large-scale dataset of compute-intensive QM simulations of ligand-protein residue systems
- Developed molecular data loading caching system to significantly reduce redundant graph neural net calculations

Student Researcher at Lienhard Research Group

- Neural Ordinary Differential Equations for Nanofiltration Behavior Prediction
 - Leveraged ODE-based neural networks to predict the behavior of ions through a nanofilter 0
 - 0 Developed custom layers in the neural network to constrain the model based on physical laws like charge conservation
 - Significantly improved model expressivity through NeRF-like positional encoding 0

Independent Astronomy Research

- Discovering Faint and High Apparent Motion Rate Near-Earth Asteroids Using A Deep Learning Program
 - 0 Developed novel asteroid dataset simulation strategy, discovering 6 new asteroids missed by previous methods
 - Created & optimized the entire pipeline: preprocessing data, training the CNN, deployment, filtering for review 0
 - Presented research at the AAS 240 Conference 0

NLP Research Intern at Uniphore

Trained contrastive Bi-LSTM model, improving sentence embeddings for empathy detection in call center transcripts

Aug 2019 – Aug 2022

May - Aug 2024

Sep – Dec 2023

Feb 2023 - Present

May 2026

Jun – Aug 2023

Sep – Dec 2022

Jul – Aug 2022

PUBLICATIONS

A Multimodal Automated Interpretability Agent

Sarah Schwettmann*, Tamar Rott Shaham*, **Franklin Wang**, Achyuta Rajaram, Evan Hernandez, Jacob Andreas, Antonio Torralba

ICML 2024 [Link]

Nearest Neighbor Normalization Improves Multimodal Retrieval

Franklin Wang*, Neil Chowdhury*, Sumedh Shenoy*, Douwe Kiela, Sarah Schwettmann, Tristan Thrush Under Review at EMNLP 2024 [Link]

Discovering Faint and High Apparent Motion Rate Near-Earth Asteroids Using A Deep Learning Program <u>Franklin Wang</u>, Jian Ge, Kevin Willis

Monthly Notices of the Royal Astronomical Society, Volume 516, Issue 4 [Link]

OTHER PROJECTS

Learning Equivariant Features for Camera Control of Video Diffusion Models (Symmetry for ML class project)

- Adapted <u>CameraCtrl</u> model to leverage only SO(3) equivariant operations for processing camera poses to control the motion of a video diffusion model, improving accuracy of camera trajectories with extreme rotations
- Fine-tuned AnimateDiff and Stable Video Diffusion on a multi-GPU setup, improved memory efficiency by designing architecture to maintain equivariance under mixed precision

Controlling Video Diffusion Models with Diffusion Features (Machine Learning class project) Link to Writeup

- Trained unconditional video diffusion model from scratch on synthetic data of 2D physics simulations using multi-GPU setup
- Showed that regression models trained on internal U-Net features allow for effective classifier guidance of properties like acceleration and position with only a small labeled dataset, as opposed to training a classifier on pixels only

Evaluating Diffusion Policy (Sensorimotor Learning class project)

• Replicated the <u>Diffusion Policy</u> paper for an offline RL task with visuomotor control, performing hyperparameter searches to investigate hyperparameter sensitivity

AWARDS

International Science & Engineering Fair: 1st in Physics & Astro, Peggy Scripps Award for Science Communication Davidson Fellow Laureate: \$50K scholarship for ML asteroid detection research project, awarded to top 4 projects USA Computing Olympiad Platinum Division: Ranked in the top 100 for the 2020 US Open contest