Jung Whan Lee

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Education

University of Southern California *August 2022 – Present*
MS in Computer Science ***GPA: 3.96/4.0***

- **Coursework:** Theoretical Machine Learning, Machine Learning, Deep Learning and its Applications

University of California, Los Angeles *August 2018 – May 2022*
BS in Applied Mathematics *Magna Cum Laude,* ***GPA: 3.93/4.0***

- Specialization in Computing
- **Coursework:** Probability Theory, Linear Algebra, Real Analysis, Ordinary Differential Equations, Linear and Nonlinear Systems of Differential Equations

Research Interests

I am broadly interested in (1) understanding machine and deep learning systems using both theoretical analysis and empirical validation; (2) developing practical and efficient machine learning algorithms that are safe, fair, and robust; and (3) reinforcement learning.

Research Experience

USC Theory Group | Graduate Student Researcher *October 2023 - Present*
Mentors: Prof. Vatsal Sharan

- Researching differences between SGD and Adam in neural network training
- Exploring Adam's superior robustness against distribution shift, but weaker in-distrbution generalization compared to SGD
- Validated experimentally that Adam outperforms SGD in distribution shift settings by better learning core features and forgetting spurious ones
- Manuscript is in progress for submission at ICML 2025

USC Theory Group | Graduate Student Researcher *May 2024 - Present*
Mentors: Prof. Haipeng Luo

- Developing sample-efficient online reinforcement learning (RL) algorithms, specifically in the case with access to a high-quality simulator
- Expanding theoretical understanding of simulator access in RL problems with large state spaces that demand general value function approximation

UCLA StarAI Lab | Undergraduate Student Researcher *June 2021 - January 2022*
Mentors: Prof. Guy Van den Broeck

- Studied models for tractable probabilistic modeling, specifically probabilistic generating circuits (PGC)
- Designed an algorithm for generating randomly structured PGCs with structural properties that guarantee tractable inference over important classes of queries
- Verified empirically that the random PGCs outperform a simple PGC baseline on benchmark tasks

Publications and Preprints

Learning Dynamics of SGD and Adam Under Spurious Correlation
Manuscript in progress for submission at ICML 2025

Enhancing gprMax with LLM-Powered Chatbots: Streamlining Input File Generation and Support
Jung Whan Lee, Iraklis Giannakis, Antonis Giannopoulos, Craig Warren
Manuscript in progress for submission at Journal of Geophysical Research: Machine Learning and Computation

Experience

Google Summer of Code | Open Source Developer — *Los Angeles, CA*
Mentors: Dr. Iraklis Giannakis — *May 2024 – September 2024*

- Developed chatbots for *gprMax*, an open-source geophysical research program, by fine-tuning a large language model and integrating retrieval-augmented generation (RAG)
- Chatbots are equipped with domain-specific knowledge, and help researchers troubleshoot queries and generate complex input files using natural language prompts
- Manuscript based on this work is in progress for submission at the *Journal of Geophysical Research: Machine Learning and Computation*

Research Projects

TextGPT: Open-Source Chat Model Trainer using RAG [Code] — *May 2024 - September 2024*

- Developed an open-source program to streamline the creation and maintenance of chat models utilizing RAG over any local document stores
- Integrated a GUI for easy building, updating, and fine-tuning of chat models at the click of a button
- Containerized the project using Docker for multi-platform deployment

State-Conditioned Action Quantization (SAQ) in Offline RL [Report] — *January 2024 - May 2024*

- Studied the state-conditioned action quantization (SAQ) scheme, introducing a novel joint-training process "SAQ-Joint"
- Demonstrated superior performance of joint-training approach across various benchmarking tasks from D4RL dataset

Machine Unlearning ResNet18 [Report] — *September 2023*

- Designed a novel unlearning algorithm using PyTorch that obfuscates parameters with noise, then fine-tunes
- Proposed and implemented a novel evaluation metric that gauges performance on test and forgotten sets
- Achieved competitive results compared to the NeurIPS 2023 Machine Unlearning baselines

A Survey on Foundation Models [Report] — *August 2023*

- Surveyed ten papers regarding foundation models published at ICLR and ACL in the last two years
- Highlighted some of the most recent advances in the area, touching on aspects such as model training and finetuning, improvements to zero-shot performance, differential privacy for LLMs, and limitations

Coding Projects

Text Poker: Reinforcement Learning with Deep Q-Learning [Code] — *December 2023 - January 2024*

- Developed a text-based poker game from scratch, encompassing game logic, player interaction and betting mechanisms
- Utilized the PyTorch framework and deep Q-learning algorithms to train a RL agent to play the game effectively
- Engineered state representation and action space to enable the agent to make informed decisions on the game state

Reinforcement Learning for Snake AI *July 2023*

- Improved upon an open source RL agent for the popular "Snake" game
- By engineering better state representations, I increased the high score achieved by the AI by 11% and the average scores achieved by the AI by 12%

Kaggle ML Competition: Time Series Forecasting *October 2022 - December 2022*

- Trained an ML model to forecast time series sales data for Ecuadorian grocery retailer "Corporación Favorita"
- The final model achieved top 50 on leaderboards at the time, and was an ensemble of decision trees and regression models.

Awards

UCLA Latin Honors, magna cum laude *2022*
UCLA Dean's List *2019 - 2022*