

JUNG WHAN LEE

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Education

University of Southern California

MS in Computer Science

August 2022 – Present

GPA: 3.96/4.0

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

University of California, Los Angeles

BS in Applied Mathematics

August 2018 – May 2022

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-distribution 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

Google Summer of Code | Open Source Contributor

May 2024 – September 2024

Mentors: Dr. Iraklis Giannakis

- 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*

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

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*