Kihyun Kim

+1-617-949-1247 | kihyun@mit.edu | kihyun.xyz | Google Scholar

Research Interests

Reinforcement learning (reward learning, imitation learning), Preference learning (RLHF, LLM post-training), Control theory

Education

Massachusetts Institute of Technology *Cambridge, United States*

Ph.D. Program in Electrical Engineering & Computer Science *Sep. 2021 - Current*

- Received M.S. in June 2024 (Link to thesis)
- Advisor: Prof. Asuman Ozdaglar, Prof. Pablo Parrilo

Seoul National University *Seoul, Republic of Korea*

B.S. in Electrical and Computer Engineering *Mar. 2014 - Aug. 2020*

- Graduated with *Summa Cum Laude* (GPA: 4.15/4.30 Overall, 4.22/4.30 in Major)
- Paused for two years to fulfill military duty in the Republic of Korea (Dec. 2016 - Sep. 2018)

Seoul Science High School *Seoul, Republic of Korea*

High school for gifted students in science and mathematics *Mar. 2011 - Feb. 2014*

Publications

[1] A Unified Linear Programming Framework for Offline Reward Learning from Human Demonstrations and Feedback
Kihyun Kim, Jiawei Zhang, Pablo Parrilo, Asuman Ozdaglar
International Conference on Machine Learning (ICML), 2024

[2] Distributional robustness in minimax linear quadratic control with Wasserstein distance
Kihyun Kim, Insoon Yang
SIAM Journal on Control and Optimization 61.2 (2023) pp. 458–483. SIAM, 2023

[3] Minimax control of ambiguous linear stochastic systems using the Wasserstein metric
Kihyun Kim, Insoon Yang
2020 59th IEEE Conference on Decision and Control (CDC), 2020

[4] Optimizing large-scale fleet management on a road network using multi-agent deep reinforcement learning with graph neural network
Juhyeon Kim, Kihyun Kim
2021 IEEE International Intelligent Transportation Systems Conference (ITSC), 2021

[5] Generative autoregressive networks for 3d dancing move synthesis from music
Hyemin Ahn, Jaehun Kim, Kihyun Kim, Songhwai Oh
IEEE Robotics and Automation Letters 5.2 (2020) pp. 3501–3508. IEEE, 2020

[In preparation] Offline Nash Learning from Human Feedback for Distributional Preference Models
Kihyun Kim, Jiawei Zhang, Pablo Parrilo, Asuman Ozdaglar
Work in Progress, 2024

Research Experience

Laboratory for Information & Decision Systems (LIDS) *MIT*

Advisor: Prof. Asuman Ozdaglar, Prof. Pablo Parrilo *Sep. 2021 - Current*

- Research Focus: RLHF, Inverse RL, Offline RL
- Proposed a novel linear programming (LP) framework for offline reward learning (Inverse RL & RLHF) that estimates the reward function without Bradley–Terry (BT) model assumption by effectively addressing the data coverage issue in offline settings
- Studied a game-theoretic approach to preference learning for general human preferences in offline settings

Control and Optimization Research Lab *Seoul National University*

Advisor: Prof. Insoon Yang *Sep. 2019 - Aug. 2021*

- Research Focus: Stochastic optimal control, Distributionally robust optimization
- Developed a novel minimax linear-quadratic control method using the Wasserstein metric, which is robust to the unknown distribution of system parameters
- Suggested a theoretical connection between the classical H-infinity controller and the modern distributionally robust optimization technique with the Wasserstein ambiguity set

Robot Learning Lab *Seoul National University*

Advisor: Prof. Songhwai Oh *Jun. 2019 - Aug. 2019*

- Research Focus: Robot learning, Humanoid robot, Generative model
- Developed an experimental program for a real humanoid robot using ROS to evaluate motion sequences generated from deep neural network models

Work & Teaching Experience

Teaching Assistant *MIT*

6.7920: Reinforcement Learning: Foundations and Methods *Sep. 2024 - Dec. 2024*

- Graduate-level course on reinforcement learning (Instructors: Prof. Cathy Wu, Prof. Munther Dahleh)

ML Research Internship *LG AI Research*

Summer Internship, Advanced ML Lab at LG AI Research *Jun. 2024 - Sep. 2024*

- Proposed and analyzed an RLHF model that incorporates confidence levels in human feedback data.

Digital Signal Processing Enginner *Republic of Korea*

SEC Signals Laboratory, Republic of Korea Army *Dec. 2016 - Sep. 2018*

- Specialized in digital signal detection and demodulation

Mathematical Olympiad Instructor *Republic of Korea*

Privatenote Co. *Aug. 2015 - Feb. 2016*

- Led online courses for students preparing for the national Mathematical Olympiad
- Courses covered: Number Theory, Algebra, Geometry

Honors & Awards

2021 - 2026 **KFAS Doctoral Study Abroad Fellowship**, *Korea Foundation for Advanced Studies*

2021 - 2022 **Alan V. Oppenheim Fellowship**, *MIT EECS*

2014 - 2020 **Seoam Undergraduate Scholarship**, *Seoam Yoon Se Young Foundation*

2019 **Kwon Oh-hyun Scholarship**, *Former CEO of Samsung Electronics & SNU ECE Alumni Association*

2015 **6th Place (Special Prize)**, ACM International Collegiate Programming Contest Korea Regional

Skills

Programming Languages Python (PyTorch, NumPy, Pandas, etc.), Julia, C/C++, Java, Matlab, ROS, LaTeX

English (professional), Korean (native)