Kihyun Kim

617-949-1247 (U.S.) / 010-4266-3073 (Korea) | kihyun@mit.edu | Google Scholar

Research Interests

Reinforcement learning theory (Offline RL, Reward learning, RLHF), Control theory (Optimal control, Robust control)

Education

Massachusetts Institute of Technology *Cambridge, United States*

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

- 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 Reward Learning with Offline Human Behavior and Feedback Data
Kihyun Kim, Jiawei Zhang, Pablo Parrilo, Asuman Ozdaglar
Under Review

[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

Research Experience

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

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

- Research Focus: Offline reward learning (Inverse RL, RLHF), Offline reinforcement learning, Learning to optimize
- Proposed a novel linear programming (LP) framework for offline reward learning (Inverse RL and RLHF) that effectively addresses the data coverage issue in offline settings and provides a convex estimate of the feasible reward set with theoretical guarantees
- Applied offline RL theory to practical problems in operations research, aiming to bridge the theoretical-practical gap
- Explored the Learning to Optimize (L2O) framework for combinatorial optimization, integrating reinforcement learning and graph neural networks (GNNs).

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

Honors & Awards

2021 - 2026 **KFAS Doctoral Study Abroad Scholarship**, Supported by the *Korea Foundation for Advanced Studies*

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

2019 **Kwon Oh-hyun Scholarship**, Supported by the *SNU ECE Alumni Association*

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

Work & Teaching Experience

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

Skills

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

Languages Korean (native), English (professional)