

YUJIN KIM

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RESEARCH INTEREST

My research interests are centered at the intersection of robotics and artificial intelligence, with a particular focus on the application of **Reinforcement Learning (RL)**. I am motivated by the potential of RL to enable intelligent agents to autonomously learn and solve complex, long-horizon tasks in unstructured environments, akin to human learning mechanisms.

EDUCATION

Korea University

Seoul, Republic of Korea

MS in Electrical Engineering; GPA: 4.39/4.5

Mar. 2021 – Aug. 2023

- Thesis: "Off-Policy Reinforcement Learning Training Method for Multi-Goal Environments and Driving Framework with Synchronized Model Predictive Control"

University of Seoul

Seoul, Republic of Korea

BS in Electrical and Computer Engineering; GPA: 4.0/4.5

Mar. 2017 – Feb. 2021

PUBLICATIONS

- [J1] **Yujin Kim**, Dong-Sung Pae, Sun-Ho Jang, Seong-Woo Kang, and Myo-Taeg Lim. "Reinforcement Learning for Autonomous Vehicles Using MPC in Highway Situations." International Conference on Electronics, Information, and Communication (ICEIC), pp. 1-4. IEEE, 2022. [paper]
- [C1] **Yujin Kim**, Dong-Sung Pae, Sun-Ho Jang, Woo-Jin Ahn, and Myo-Taeg Lim. "Classified Experience Replay: The Off-Policy Reinforcement Learning Method and Dynamic Trajectory Planning for Autonomous Driving." Under Review.
- [J2] Sun-Ho Jang, Woo-Jin Ahn, **Yujin Kim**, Hyung-Gil Hong, Dong-Sung Pae, and Myo-Taeg Lim. "Stable and Efficient Reinforcement Learning Methods for Avoidance Driving of Unmanned Vehicles." Electronics 12, no. 18 (2023): 3773. [paper]

CONFERENCES

- [C1] **Yujin Kim**, Dong-Sung Pae, Sun-Ho Jang, Seong-Woo Kang, and Myo-Taeg Lim. "Reinforcement Learning for Autonomous Vehicles Using MPC in Highway Situations." International Conference on Electronics, Information, and Communication (ICEIC), Jeju, Republic of Korea, Feb. 2022. (Oral Presentation)
- [P1] **Yujin Kim**, Seok-Youl Yang, and Myo-Taeg Lim. "Prediction of Estimated Lane Change Distance on Highways: Based on Traffic Information." Autumn Annual Conference of Electrical Machinery and Energy Conversion Systems (EMECS), Busan, Republic of Korea, Nov. 2022. (Poster Presentation)

RESEARCH EXPERIENCE/SELECTED PROJECTS

Korea Institution of Science and Technology

Seoul, Republic of Korea

Research Scientist

Jan. 2023 – Present

- **Manipulator Motion Planning and Control:** Developed autonomous robot manipulator operation using RL-based methods, implemented on real robot (Franka Research 3) post-simulation.

Control and Mechatronics Lab, Korea University

Seoul, Republic of Korea

Research Assistant

Mar. 2021 – Dec. 2022

- **RL Methodology:** Proposed off-policy RL training method addressing sub-goal distribution imbalance. [J1]
- **Path Planning for Autonomous Vehicle:** Developed hybrid RL-MPC path planning and control agent overcoming feasibility and real-time issues. [C1]
- **Pallet Loading Algorithm with Robot Manipulator:** Increased space efficiency by 11.8% using RL-based pallet loading algorithm on real robot (Doosan Robotics M1013).

Hyundai Motor Company Seoul, Republic of Korea
Research Scholarship Student *Sep. 2019 – Dec. 2022*

- **Fail-Safe System for Autonomous Vehicles:** Developed active fail-safe system for sensor failure scenarios.
- **Analysis and Statistical Modeling for Lane Change Decision-Making:** Conducted data analysis and probability modeling using the US Highway 101 Dataset to achieve more than 95% estimation accuracy for lane change time. [P1]

Hyundai Motor Company Seoul, Republic of Korea
R&D Software Engineer Intern *Jul. 2019*

- **Traffic Lane Correction:** Developed lane correction algorithm using Model Predictive Path Integral to address inaccuracies from video data.

Microrobot Research Society ZETIN, University Of Seoul Seoul, Republic of Korea
Project Member *Mar. 2017 – Feb. 2019*

- **Embedded Software Competition:** Developed perception and decision-making algorithms for urban areas using an embedded RC car platform.
- **Intelligent Model Car Competition:** Produced model car and developed driving algorithms for racing tracks.
- **Microrobot Competition:** Engineered line-following robot hardware and driving algorithm.

PATENTS

- Myo-Taeg Lim, Woo-Jin Ahn, Seongwoo Kang, **Yujin Kim**, and Sangryeol Baek. "Palletizing System and its Control Method." Korean Patent No. 10-2023-0079965. (Submitted)

HONORS AND AWARDS

Scholarship for Excellent Achievement, University of Seoul *Spring, 2018*
Full Scholarship for Selected Research Student, Hyundai Motor Company *Sep. 2019 – Dec. 2022*
Teaching Assistant Scholarship, Korea University *Spring, Fall 2021 – 2022*
3rd Place, 10th F1TENTH Autonomous Racing Grand Prix, ICRA 2022 *May 2022*
3rd Place, 2018 Intelligent Model Car Competition, Hanyang University *Jul. 2018*
Special Award for Women Engineer, 14th Microrobot Competition, Dankook University *Jul. 2017*

TEACHING AND TUTORING

Reinforcement Learning Seminar *Jan. 2023 – Feb. 2023*

- Conducted seminars on RL basics and recent research trends at the Korea Institution of Science and Technology, reaching over 30 attendees.

Senior Research Mentor, Control and Mechatronics Lab *Mar. 2022 – Dec. 2022*

- Tutored three first-year master's candidates in optimization theory and reinforcement learning. Provided assistance in their overall research through weekly meetings.

Teaching Assistant, Spring 2022 Mechatronics Course *Mar. 2022 – Jun. 2022*

- Lectured on RL principles and supervised semester-long projects for 4th-year undergraduates.

Seoul Donghaeng-Teaching Volunteering *Mar. 2018 – Jun. 2021*

- Engaged in volunteer teaching activities aimed at bridging educational gaps for elementary school students in math and science.

Kalman Filter Study Group *Jul. 2019 – Sep. 2019*

- Organized and hosted a Kalman Filter Study Group within the Hyundai Motor Group Research Fellowship.

Senior Tutor, ZETIN *Mar. 2018 – Dec. 2018*

- Mentored freshmen in manufacturing line-following robots and programming algorithms.

Lecturer, Baleun Academy *Mar. 2017 – Dec. 2017*

- Delivered lectures in math and science to secondary school students.

LEADERSHIP

Team Leader, F1TENTH Autonomous Racing Grand Prix

May 2023

- Led team to achieve 3rd place in the competition.

Head, Planning Department, Seoul Mate Program

Feb. 2019 – Jun. 2019

- Coordinated Seoul Mate Program, organizing activities for over 50 international students at University Of Seoul.

SELECTED SKILLS

Programming Languages: Python, C++, MATLAB

Developer Tools: PyTorch, Eigen, RBDL, ROS, Git, MuJoCo, Unity

Languages: Korean (Native), English (Fluent)