YUJIN KIM

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RESEARCH INTERESTS

My research interests lie in the intersection of robotics and artificial intelligence, with a particular focus on the application of **Reinforcement Learning (RL)** to reward-free RL and multi-agent RL algorithms. I am interested in developing intelligent RL agents that can learn and adapt to their environment in a way that is similar to human learning mechanisms.

EDUCATION

Korea University   Seoul, Republic of Korea
MS, 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, Electrical and Computer Engineering; GPA: 4.0/4.5   *Mar. 2017 – Feb. 2021*

PUBLICATIONS

- **Yujin Kim**, Dong-Sung Pae, Sun-Ho Jang, Seong-Woo Kang, and Myo-Taeg Lim. "Reinforcement Learning for Autonomous Vehicle using MPC in Highway Situation." International Conference on Electronics, Information, and Communication (ICEIC), pp. 1-4. IEEE, 2022.

- **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.

- Jang, Sun-Ho, Woo-Jin Ahn, **Yujin Kim**, Hyung-Gil Hong, Dong-Sung Pae, and Myo-Taeg Lim. "Stable and Efficient Reinforcement Learning Method for Avoidance Driving of Unmanned Vehicles." Electronics 12, no. 18 (2023): 3773.

CONFERENCES

- **Yujin Kim**, Dong-Sung Pae, Sun-Ho Jang, Seong-Woo Kang, and Myo-Taeg Lim. "Reinforcement Learning for Autonomous Vehicle using MPC in Highway Situation." International Conference on Electronics, Information, and Communication (ICEIC), Jeju, Republic of Korea, Feb. 2022. (oral)

- **Yujin Kim**, Seok-Youl Yang, and Myo-Taeg Lim, "Prediction of estimated lane change distance on highway: based on traffic information". Autumn Annual Conference of Electrical machinery and Energy Conversion systems(EMECS), Busan, Republic of Korea, Nov. 2022. (poster)

EXPERIENCE/SELECTED PROJECTS

Korea Institution of Science and Technology   Seoul, Republic of Korea
Research Scientist   *Jan. 2023 – Present*
- **Manipulator Motion Planning and Control**: Built manipulator motion planning and control framework using RL for valve turning task. Developed simulation environment and implemented it on real robot (Franka Research 3).

Control and Mechatronics Lab, Korea University   Seoul, Republic of Korea
Research Assistant   *Mar. 2021 – Dec. 2022*
- **RL Methodology**: Proposed off-policy RL training method with modified experience replay to address imbalanced sub-goal distribution problem
- **Path Planning For Autonoumous Vehicle**: Developed path planning and control agent for autonomous vehicle based on mixed or RL and model predictive control method. Overcame infeasibility and real-time problem of optimization based methods.
- **Pallet Loading Algorithm with Robot Manipulator**: Developed pallet loading algorithm with Reinforcement Learning, resulting in increase of 11.8% in space efficiency. Implemented it on real robot (Doosan Robotics M1013).

Hyundai Motor Company   Seoul, Republic of Korea
Research Scholarship Student   *Sep. 2018 – Dec. 2022*
- **Fail Safe System**: Developed active fail-safe system for autonomous vehicles to address situations where lane or object information cannot be acquired due to sensor failures.

- **Prediction of estimated lane change distance**: Conducted data analysis and probability modeling to estimate lane change time in road junctions using the US Highway 101 Dataset, achieving more than 95% estimation accuracy.

Hyundai Motor Company   Seoul, Republic of Korea
R&D Software Engineer Intern   *Jul. 2019*
- **Traffic Lane Correction**: Developed traffic lane correction algorithm using Model Predictive Path Integral to address issues arising from inaccurate lane data obtained from videos.

Microrobot Research Society ZETIN, University Of Seoul   Seoul, Republic of Korea
Project Member   *Mar. 2017 – Feb. 2019*
- **Embeded Software Competition**: Developed perception and decision-making algorithms for urban areas, including rotaries, overpasses, and intersections, utilizing embedded RC car as a platform.
- **Intelligent Model Car Competition**: Designed and produced model car. Developed decision-making and control algorithms specifically designed for racing track environments.
- **Microrobot Competition**: Manufactured line-tracer robot hardware (from soldering main board to designing frame with Solidworks) and developed line tracing 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. 2018 – Dec. 2022*

10th F1TENTH Autonomous Racing Grand Prix, 3rd Place, ICRA 2022   *May 2022*

2018 Intelligent Model Car Competition, 3rd Place, Hanyang University   *Jul. 2018*

14th Microrobot Competition, Special Award for Women Engineer, Dankook University   *Jul. 2017*

LEADERSHIP

Reinforcement Learning Seminar   *Jan. 2023 – Feb. 2023*
- Conducted two seminars on basics and recent research trends of RL, reaching over 30 audiences at Korea Institution of Science and Technology

Mechatronics Lecture Teaching Assistant   *Mar. 2022 – Jun. 2022*
- Lectured principles of RL and supervised semester-long projects in regular class of 4th year undergraduate.

Team Leader of F1TENTH Autonomous Racing Grand Prix   *May 2023*
- Led team in competition, achieving 3rd place.

Head of Planning Department of Seoul Mate Program   *Feb. 2019 – Jun. 2019*
- Coordinated Seoul Mate Program, buddy program for international students at University Of Seoul. Developed plans and activities for over 50 international students.

Senior Tutor in ZETIN   *Mar. 2018 – Dec. 2018*
- Mentored freshmen on manufacturing line tracer and programming algorithms.

SELECTED SKILLS

Languages: Python, C++, MATLAB

Developer Tools: PyTorch, ROS, Git, OpenAI Gym, MuJoCo, Unity