

Research Interests

Motion and Path Planning, Robotic Decision Making, Multi-agent Systems, Reinforcement Learning

Affiliations

Carnegie Mellon University

Visiting Researcher at Robotics Institute
Supervisor: Sebastian Scherer

Pittsburgh, PA
Aug. 2024 – Present
(Remote: Mar. 2025 – Jul. 2025)

Ulsan National Institute of Science and Technology

M.S. in Artificial Intelligence
Advisor: Jeong hwan Jeon

Ulsan, Korea
Aug. 2023 – Aug. 2026 (exp.)

B.S. in Electrical Engineering
Graduated Cum Laude

Feb. 2017 – Aug. 2023*

* Including military service, Republic of Korea Army, Feb. 2020 – Sep. 2021

Publications

* indicates equal contributions.

Conferences

1. **Prior-Constrained Explorative Guidance for Generalization in Diffusion Motion Planning**
Sunhwi Kim, Junsu Kim, **Seungjae Baek**, Jungeun Lee, Jaechan Shin, Seongjae Lee, Kyungdon Joo, Jeong hwan Jeon
IEEE International Conference on Robotics and Automation (ICRA) 2026
2. **PIPE Planner: Pathwise Information Gain with Map Predictions for Indoor Robot Exploration**
Seungjae Baek*, Brady Moon*, Seungchan Kim*, Muqing Cao, Cherie Ho, Sebastian Scherer, Jeong hwan Jeon
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2025 [\[Link\]](#)

Journals

1. **Cooperative Multi-Agent Reinforcement Learning for Multiple Anti-Aircraft Target Surveillance**
Kangbeen Lee*, **Seungjae Baek***, Philjoon Jung, Tae-Hyun Kim, Jeong hwan Jeon
Journal of the Institute of Control, Robotics and Systems June 2024 [\[Link\]](#)

Preprints & In Preparation

1. **Manuscript of Spatio-temporal based attention Rebalancing for eco-friendly fleet control system**
Co-first author, Under Review at IJCAI 2026

Research Experiences

Carnegie Mellon University Robotics Institute, AirLab

Visiting Researcher (Supervisor: Prof. Sebastian Scherer)

Pittsburgh, PA
Aug. 2024 – Present
(Remote: Mar. 2025 – Jul. 2025)

- Led the development of **PIPE Planner**, a predictive exploration framework; achieved **10% higher reconstruction quality** and a **zero-failure rate** in benchmarks by integrating deep learning-based map prediction.
- Leading the system integration of a full-stack aerial platform; **containerized SuperOdometry SLAM** framework to ensure real-time performance on resource-constrained onboard computers.
- Successfully demonstrated autonomous aerial inspection capabilities during a high-profile showcase for the **Pittsburgh Steelers organization**, validating system robustness in real-world settings.
- Developing a simulation environment for multi-drone inspection of unstructured construction sites, formulating implementing metrics for coverage and efficiency.

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| Ulsan National Institute of Science and Technology | Ulsan, Korea |
| Robotics & Mobility Lab | |
| Graduate Research Assistant (Advisor: Prof. Jeong hwan Jeon) | Aug. 2023 – Present |
| <ul style="list-style-type: none"> Developed a CTDE-based cooperative MARL framework for urban fleet management; achieved scalability from 5 to 100 agents while substantially reducing carbon emissions and maintaining service rates. Designed cooperative reinforcement learning algorithms for aerial surveillance, optimizing formation control to minimize covariance of target estimation up to 50%. | |

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| Undergraduate Research Assistant | Jul. 2022 – Aug. 2023 |
| <ul style="list-style-type: none"> Adapted a centralized training with decentralized execution (CTDE) MARL method to video-game simulations and authored a B.S. thesis. Engineered an autonomous race car platform as a team leader; addressed real-world sensor noise and drift, winning 1st place in a course racing competition. | |

Teaching & Working Experiences

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| Ulsan National Institute of Science and Technology | Ulsan, Korea |
| <ul style="list-style-type: none"> ITP117: Introduction to AI Programming II, Head Teaching Assistant EEE351: Automatic Control, Student Lecturer | Spring 2024 Fall 2022 |
| Clinomics Inc. | Ulsan, Korea |
| <ul style="list-style-type: none"> Project Based Learning (PBL) Teaching Assistant | Feb. 2023 – Jul. 2023 |

Achievements

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| Fellowships | |
| <ul style="list-style-type: none"> Korean Government Scholarship Program for Study Overseas (USD 150,000) Government of the Republic of Korea. Competitive national scholarship intended to support three years of PhD study at selected overseas institutions. Industrial Innovation Talent Growth Support (Overseas Linkage) (USD 21,500) Korea University. Funding for visiting research at Carnegie Mellon University. AI Excellence Global Innovative Leader Education Program (USD 40,000 incl. tuition) Sogang University. Funding for visiting research at Carnegie Mellon University. | Aug. 2026 – Aug. 2029 (exp.) Aug. 2025 – Jan. 2026 Aug. 2024 – Feb. 2025 |

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| Scholarships | |
| <ul style="list-style-type: none"> Government-funded Graduate Scholarship (Fully funded) Ministry of Science and ICT. 2-year, fully funded for Master’s degree. UNIST Academic Performance Scholarship Ulsan National Institute of Science and Technology. 4-year, fully funded for undergraduate. | Aug. 2023 – Aug. 2025 Feb. 2017 – Aug. 2023 |

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| Awards & Grants | |
| <ul style="list-style-type: none"> IEEE IES SYPA Travel Award (IROS 2025) (USD 1,500) IEEE Industrial Electronics Society. Selected for participation in IROS 2025. Undergraduate Research Excellent Poster Session Award Department of Electrical Engineering, Ulsan National Institute of Science and Technology | Oct. 2025 Jul. 2023 |

Skills & Services

Languages: Korean – Native, **English** – Advanced (TOEFL iBT: 106/120)
Programming Languages: C++, Python, MATLAB
Software and Tools: Git, Docker, CARLA, SUMO, ROS, Gazebo, NVIDIA Isaac Sim
Reviewer: *IROS* (2025), *ICRA* (2026), *RA-L*
Misc. & Interests: Marathon, Baseball, General Knowledge (TV Quiz Show Champion)