

## 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 (GPA: 4.25/4.3)  
Advisor: Jeong hwan Jeon

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

B.S. in Electrical Engineering (CGPA: 3.54/4.3, Major GPA: 3.66/4.3, Advanced GPA: 3.76/4.3)  
Graduated Cum Laude

Feb. 2017 – Aug. 2023\*

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

## Publications

\* indicates equal contributions.

### Conferences

1. **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. **Prior-Constrained Explorative Guidance for Generalization in Diffusion Motion Planning**  
Co-author, Under Review at ICRA 2026
2. **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"> <li>Developed a <b>CTDE-based cooperative MARL framework</b> for urban fleet management; achieved scalability from <b>5 to 100 agents</b> while substantially reducing <b>carbon emissions</b> and maintaining service rates.</li> <li>Designed cooperative reinforcement learning algorithms for aerial surveillance, optimizing formation control to <b>minimize covariance of target estimation up to 50%</b>.</li> </ul> |                     |

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

## Teaching & Working Experiences

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

## Achievements

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

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

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

## Skills & Services

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