Last Update: Aug 12, 2025

Seungjae Baek

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https://bsj970.github.io

Education

Carnegie Mellon University — Pittsburgh, PA
Visiting Researcher at Robotics Institute — Aug. 2024 – Present
Collaborator: Sebastian Scherer — *(Remote: Mar. 2025 – Jul. 2025)*

Ulsan National Institute of Science and Technology — Ulsan, Korea
M.S. in Artificial Intelligence — Aug. 2023 – Aug. 2026 (exp.)
Advisor: Jeong hwan Jeon

B.S. in Electrical Engineering — Feb. 2017 – Aug. 2023*
Graduated Cum Laude

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

Research Interests

My research focuses on developing intelligent autonomous systems that make information-efficient decisions in complex, partially observed environments. My work spans informative path planning and coverage, safe trajectory planning, and cooperative multi-agent reinforcement learning (MARL) for aerial and/or ground robots. Methodologically, I focus on information-theoretic objectives, deep reinforcement learning (DRL), and model-based planning, with broad applicability across field robotics and large-scale autonomous decision-making.

Publications

**** indicates equal contribution.***

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

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

Preprints

1. **STOMP-Guided Diffusion for Motion Planning**
   Sunhwi Kim, **Seungjae Baek**, Jungeun Lee, Jaechan Shin, Junsu Kim, Seongjae Lee, Sungjun Yang, Kyungdon Joo, Jeong hwan Jeon
   Under Review

2. **Multi-Objective Deep Reinforcement Learning for Eco-Friendly Fleet Rebalancing in Autonomous Mobility-on-Demand Systems**
   Jungeun Lee*, **Seungjae Baek***, Sunhwi Kim, Chanju Kim, Seongjae Lee, Jeong hwan Jeon
   Under Revision

Research Experiences

Carnegie Mellon University Pittsburgh, PA
Robotics Institute, AirLab
Visiting Researcher Aug. 2024 – Present
(remote Mar. 2025 – Jul. 2025)

- Developed an indoor map exploration algorithm that leverages path-wise information gain from predicted global maps.
- Contributing to an end-to-end multi-drone 3D exploration simulation project.

Ulsan National Institute of Science and Technology Ulsan, Korea
Robotics & Mobility Lab
Graduate Research Assistant Aug. 2023 – Present

- Developed MARL learning algorithms for cooperative control of UAVs in enemy surveillance scenarios.
- Conducting experiments and simulations for multi-objective ride-sharing RL algorithms.

Undergraduate Research Assistant Jul. 2022 – Aug. 2023

- Adapted a CTDE MARL method in video-game simulations, culminating in a B.S. research thesis.
- Developed and ran Python experiments using the CARLA AV simulator.

Teaching & Working Experiences

Ulsan National Institute of Science and Technology Ulsan, Korea
ITP117: Introduction to AI Programming II, Head Teaching Assistant Feb. 2024 – Jul. 2024

- Assisted in teaching a course with 120 students alongside four other teaching assistants.
- Lectured on MLPs, CNNs, and RNNs using TensorFlow and PyTorch in English.

EEE351: Automatic Control, Student Lecturer of AFEE Aug. 2022 – Dec. 2022

- AFEE is an official student organization within Electrical Engineering at UNIST.
- Organized and facilitated group study sessions for both domestic and international students.

Clinomics Inc. Ulsan, Korea
Project-Based Learning (PBL) Teaching Assistant Feb. 2023 – Jul. 2023

- Supported a project collaborating with office workers to integrate AI solutions into their workflows.
- Used AnoGAN and VAE to generate hypothetical disease-associated DNA methylation data.

Achievements

Honors, Scholarships & Fellowships

- **Korean Government Scholarship Program for Study Overseas** (total $150,000) Aug. 2026 – Aug. 2029 (exp.)
  Government of the Republic of Korea. US$50,000/year for 3 years.
- **Industrial Innovation Talent Growth Support (Overseas Linkage)** ($21,500) Aug. 2025 – Feb. 2026
  Korea University. Funding for visiting research at Carnegie Mellon University.
- **AI Excellence Global Innovative Leader Education Fellowship** ($40,000, including tuition) Aug. 2024 – Feb. 2025
  Sogang University. Funding for visiting research at Carnegie Mellon University.
- **Government-funded Graduate Scholarship (Fully funded)** Aug. 2023 – Aug. 2025
  Ministry of Science and ICT

- **UNIST Academic Performance Scholarship (4-year, fully funded)** Feb. 2017 – Aug. 2023
  Ulsan National Institute of Science and Technology

Awards & Grants

- **IEEE IES SYPA Travel Award (IROS 2025)** ($1,500) Oct. 2025
  IEEE Industrial Electronics Society. Selected for participation in IROS 2025.
- **Undergraduate Research Excellent Poster Session Award** Jul. 2023
  Department of Electrical Engineering, Ulsan National Institute of Science and Technology

Skills & Services

Languages:

- **Korean**: Native
- **English**: Advanced (TOEFL iBT: 106 of 120)

Programming Languages: C++, Python, MATLAB

Software and Tools: ROS, Git, Docker, CARLA, SUMO, NVIDIA Isaac-sim, PyTorch, TensorFlow

Reviewer: *IROS* (2025)