# Seungjae Baek

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## Education

**Carnegie Mellon University** — Pittsburgh, PA
Visitor at Robotics Institute — Aug. 2025 – Present
Collaborator: Sebastian Scherer — Aug. 2024 – Feb. 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 mandatory military service, Republic of Korea Army, Feb. 2020 – Sep. 2021*

## Research Interests

**Planning** — Informative Path Planning (IPP), Motion Planning

**Reinforcement Learning** — Model-Free Learning, Multi-Agent Reinforcement Learning (MARL)

**Autonomous System** — Unmanned Aerial Vehicles (UAVs), Autonomous Vehicles (AVs)

## 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 Institute of Control, Robotics and Systems June 2024*

### Preprints

1. **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*

2. **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*

## Research Experiences

**Carnegie Mellon University** — Pittsburgh, PA
**Robotics Institute, AirLab**
Visitor — 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 AirStack, 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**

- **Industrial Innovation Talent Growth Support (Overseas Linkage) (total $21,500)** Aug. 2025 - Feb. 2026
  Ministry of Trade, Industry, and Energy (MOTIE) & Korea Univerity
- **AI Excellence Global Innovative Leader Education Fellowship (total $40,000)** Aug. 2024 - Feb. 2025
  Ministry of Science and ICT (MSIT) & Sogang University
- **Government-funded Graduate Scholarship (Full-funded)** Aug. 2023 - Present
  Ministry of Science and ICT, The Government of the Republic of Korea
- **UNIST Academic Performance Scholarship (4-Year Full-funded)** Feb. 2017 - Aug. 2023
  Ulsan National Institute of Science and Technology

**Awards**

- **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, Reading: 28, Listening: 29, Speaking: 24, Writing: 25)

**Programming Languages**: C++, Python, MATLAB

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

**Reviewer**: *IROS* (2025)