SEUNGCHAN KIM

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EDUCATION

Carnegie Mellon University Pittsburgh, PA
Ph.D. Candidate at Robotics Institute Sep 2020 - Present
Advisor: Sebastian Scherer

Brown University Providence, RI
Sc.M. in Computer Science Sep 2019 - May 2020
Sc.B. in Applied Mathematics – Computer Science Sep 2013 - May 2019
Advisor: George Konidaris

RESEARCH EXPERIENCE

CMU AirLab Pittsburgh, PA
Graduate Research Assistant Sep 2020 - Present

- Conducting Ph.D. research in robotics, focusing on multi-robot exploration, navigation and embodied AI.
- Developing multi-drone 3D outdoor navigation system with real-time semantic mapping and onboard deployment of vision-language models for search & rescue.
- Proposed indoor robot exploration algorithms using large-scale map predictions and novel information gain metrics.

Brown University Intelligent Robot Lab Providence, RI
Undergraduate Research Assistant Sep 2017 - May 2020

- Researched on deep reinforcement learning and model-based reinforcement learning.

JOURNAL PUBLICATIONS

[1] **Multi-Robot Multi-Room Exploration with Geometric Cue Extraction and Circular Decomposition**
Seungchan Kim, Micah Corah, John Keller, Graeme Best, Sebastian Scherer
IEEE Robotics and Automation Letters (RA-L) 2023
Presentation at IEEE International Conference on Robotics and Automation (ICRA) 2024

[2] **Unsupervised Online Learning for Robotic Interestingness with Visual Memory**
Chen Wang, Yuheng Qiu, Wenshan Wang, Yafei Hu, **Seungchan Kim**, Sebastian Scherer
IEEE Transactions on Robotics (T-RO) 2021

CONFERENCE PUBLICATIONS

[1] **MapEx: Indoor Structure Exploration with Probabilistic Information Gain from Global Map Predictions**
Cherie Ho*, **Seungchan Kim***, Brady Moon, Aditya Parandekar, Narek Harutyunyan, Chen Wang, Katia Sycara, Graeme Best, Sebastian Scherer
IEEE International Conference on Robotics and Automation (ICRA) 2025
(*: Equal Contributions)

[2] **AirDet: Few-Shot Detection without Fine-tuning for Autonomous Exploration**
Bowen Li, Chen Wang, Pranay Reddy, **Seungchan Kim**, Sebastian Scherer
European Conference on Computer Vision (ECCV) 2022

[3] **Robotic Interestingness via Human-Informed Few-Shot Object Detection**
Seungchan Kim, Chen Wang, Bowen Li, Sebastian Scherer
IEEE/RSJ International Conference on Robotics and Systems (IROS) 2022

[4] **DeepMellow: Removing the Need for a Target Network in Deep Q-Learning**
Seungchan Kim, Kavosh Asadi, Michael Littman, George Konidaris
International Joint Conference on Artificial Intelligence (IJCAI) 2019
Multidisciplinary Conference on Reinforcement Learning and Decision Making (RLDM) 2019

PREPRINTS, WORKSHOP PAPERS, EXTENDED ABSTRACTS

[1] **RayFronts: Open-Set Semantic Ray Frontiers for Online Scene Understanding and Exploration**
Omar Alama, Avigyan Bhattacharya, Haoyang He, **Seungchan Kim**, Yuheng Qiu, Wenshan Wang, Cherie Ho, Nikhil Keetha, Sebastian Scherer
arXiv preprint arXiv:2504.06994 (2025). Submitted to IROS 2025. Under Review

[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
arXiv preprint arXiv:2503.07504 (2025). Submitted to IROS 2025. Under Review
(*: Equal Contributions)

[3] **MapExRL: Human-Inspired Indoor Exploration with Predicted Environment Context and Reinforcement Learning**
Narek Harutyunyan*, Brady Moon*, **Seungchan Kim**, Cherie Ho, Adam Hung, Sebastian Scherer
arXiv preprint arXiv:2503.01548 (2025). Submitted to IROS 2025. Under Review

[4] **Toward General-Purpose Robots via Foundation Models: A Survey and Meta-Analysis**
Yafei Hu*, Quanting Xie*, Vidhi Jain*, Jonathan Francis, Jay Patrikar, Nikhil Keetha, **Seungchan Kim**, Yaqi Xie, Tianyi Zhang, Hao-Shu Fang, Shibo Zhao, Shayegan Omidshafiei, Dong-Ki Kim, Ali-akbar Agha-mohammadi, Katia Sycara, Matthew Johnson-Roberson, Dhruv Batra, Xiaolong Wang, Sebastian Scherer, Chen Wang, Zsolt Kira, Fei Xia, Yonatan Bisk
arXiv preprint arXiv:2312.08782 (2023)

[5] **Adaptive Temperature Tuning for Mellowmax in Deep Reinforcement Learning**
Seungchan Kim, George Konidaris
NeurIPS 2019 Deep Reinforcement Learning Workshop

[6] **Combating the Compounding-Error Problem with a Multi-step Model**
Kavosh Asadi, Dipendra Misra, **Seungchan Kim**, Michael Littman
arXiv preprint arXiv:1905.13320 (2019)

[7] **Removing the Target Network from Deep Q-Networks with the Mellowmax Operator**
Seungchan Kim, Kavosh Asadi, Michael Littman, George Konidaris
International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2019

[8] **Using Computational Analysis of Behavior to Discover Developmental Change in Memory-Guided Attention Mechanisms in Childhood**
Dima Amso, Lakshmi Govindarajan, Pankaj Gupta, Heidi Baumgartner, Andrew Lynn, Kelley Gunther, Diego Placido, Tarun Sharma, Vijay Veerabadran, Kalpit Thakkar, **Seungchan Kim**, Thomas Serre
PsyArXiv. doi:10.31234/osf.io/gq4rt

ADVISING & MENTORING

Master's Research

- Seungjae Baek (UNIST; CMU AI Intensive Education Program) — Aug 2024 - Feb 2025

Undergraduate Research

- Narek Harutyunyan (Brown University; CMU RISS) — Jun 2024 - Aug 2024
- Aditya Parandekar (BITS Pilani; CMU Visitor) — Jun 2023 - Dec 2023

TEACHING

- **16-711 Kinematics, Dynamics, Control**, Teaching Assistant (CMU) — Jan 2023 - May 2023
- **16-833 Robot Localization and Mapping**, Teaching Assistant (CMU) — Jan 2022 - May 2022
- **CSCI1430 Computer Vision**, Teaching Assistant (Brown) — Jan 2019 - May 2019
- **CSCI0040 Intro to Scientific Computing & Problem Solving**, Teaching Assistant (Brown) — Jan 2015 - May 2015

SERVICE & OUTREACH

Tartan Planning Series, Organizer — Mar 2023 - May 2023

- Organized a virtual research talk series featuring 12 world-renowned experts in robot planning (400+ attendees).

Reviewer

- **Robotics:** IJRR, IEEE RA-L, IROS 2024, 2025, ICRA 2023, 2025, CASE 2025, MRS 2023
- **Machine Learning:** ICLR 2021, 2023, NeurIPS 2021, 2022, AAAI 2021, ICML 2020

INVITED TALKS

Spatial Reasoning and Semantic Representations for Intelligent Multi-Robot Exploration and Navigation
Resilient Intelligent Systems Lab, CMU *(Host: Wennie Tabib)* Nov 8th 2024

An Alternative Softmax Operator for Deep Reinforcement Learning
Machine Intelligence Community (MIC) Conference, Boston University Sep 7th 2019

AWARDS & HONORS

CMU GSA/Provost Conference Funding Mar 2025
IEEE ICRA 2025 RAS Travel Grant Feb 2025
Karen T. Romer Undergraduate Teaching and Research Awards Mar 2018

MEDIA COVERAGE

Autonomous Aerial Robots Communicate, Prioritize Rooms in Multiroom Exploration Jul 2024
Marylee Williams, CMU School of Computer Science News