Juyeop Han

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Research Interest

Uncertainty Quantification, Generative Modeling for Robotics, Task & Motion Planning

Education

Massachusetts Institute of Technology (MIT) Cambridge, MA
Ph.D. Candidate, Mechanical Engineering / LIDS *2023 - Present*

- Advisor: Prof. Sertac Karaman

Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
M.S. in Aerospace Engineering *2021 - 2023*

- Advisor: Prof. Han-Lim Choi
- Thesis: "Computation of Tight Forward Reachable Set for a Multirotor based on the Nonlinear Adaptive Controller"

Seoul National University (SNU) Seoul, South Korea
B.S. in Mechanical Engineering *2015 - 2021*

- **Summa Cum Laude**
- Leave of Absence for Mandatory Military Service (2017 - 2019)

Research Experience

Autonomy and Embedded Robotics Accelerated Lab, MIT 2023 - Present
Graduate Research Assistant | PI: Prof. Sertac Karaman *Cambridge, MA*

- Researched uncertainty quantification of generative models and its application to vision-language-action (VLA) models and world models.
- Proposed a robust visual-inertial navigation system and active perception with uncertainty quantification under learning-based visual representations.
- Proposed large city-scale scene reconstruction methods through neural scene representations.

Autonomous Decision and Control Lab, CU Boulder 2022 - 2023
Visiting Scholar | PI: Prof. Zachary Sunberg *Boulder, CO*

- Researched decision-making algorithms given task specifications under uncertainty.

Lab for information and Control Systems, KAIST 2021 - 2023
Graduate Research Assistant | PI: Prof. Han-Lim Choi *Daejeon, South Korea*

- Proposed 3-dimensional dynamic occupancy grid mapping algorithm using LiDAR.
- Proposed optimal trajectory planning algorithm and safety-guaranteed control method of a multirotor.

Innovative Design and Integrated Manufacturing Lab, SNU 2020
Undergraduate Research Intern | PI: Prof. Sung-Hoon Ahn *Seoul, South Korea*

- Implemented surface cleaning using a 6-DOF robot manipulator.

Publications

[1] **CaLiSa-NeRF: Neural Radiance Field with Pinhole Camera Images LiDAR point clouds and Satellite Imagery for Urban Scene Representation**
Juyeop Han, Guilherme V. Cavalheiro, Josef Biberstein, Elham Alkabawi, Shahad Alqhatni, Fadwa Alaskar, Eman Bin Khunayn, and Sertac Karaman
WACV Workshop on Computer Vision for Geospatial Image Analysis (GeoCV), 2025. [paper]

[2] **NVINS: Robust Visual Inertial Navigation Fused with NeRF-augmented Camera Pose Regressor and Uncertainty Quantification (Oral)**
Juyeop Han, Lukas Lao Beyer, Guilherme V. Cavalheiro, and Sertac Karaman
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2024. [paper] [video]

[3] **DS-K3DOM: 3-D Dynamic Occupancy Grid Mapping with Kernel Inference and Dempster-Shafer Evidential Theory**
Juyeop Han, Youngjae Min*, Byeongmin Jeong, Hyeok-Joo Chae and Han-Lim Choi*
International Conference on Robotics and Automation (**ICRA**), 2023. [paper] [code] [video]

[4] **Computation of Tight Forward Reachable Set for a Multirotor based on the Nonlinear Adaptive Controller**
Juyeop Hanand Han-Lim Choi
American Control Conference (**ACC**), 2023. [paper]

[5] **Pseudospectral method-based safe motion planning for quadrotors in a cluttered environment**
Juyeop Han, Min-jea Tahk, and Han-Lim Choi
AIAA Science and Technology Forum (**Scitech**), 2022. [paper]

Preprints

[1] **Flow Matching with Uncertainty Quantification and Guidance**
Juyeop Han, Lukas Lao Beyer, and Sertac Karaman
Under Review, 2026. [paper]

[2] **Construction of Digital Terrain Maps from Multi-view Satellite Imagery using Neural Volume Rendering**
Josef Biberstein, Juyeop Han, Guilherme V. Cavalheiro, and Sertac Karaman
Under Review, 2025. [paper]

[3] **SCREP: Scene Coordinate Regression and Evidential Learning-based Perception-Aware Trajectory Generation**
Juyeop Han, Lukas Lao Beyer, Guilherme V. Cavalheiro, and Sertac Karaman
Under Review, 2025. [paper]

Honors & Awards

Fellowships & Scholarships

MathWorks Mechanical Engineering Fellowship, MathWorks 2024 - 2025
Korean Government Scholarship, South Korean Government 2023 - 2025
Government-Funded Scholarship, KAIST 2021 - 2023
SNU Alumni-Funded Scholarship, SNU Alumni Foundation 2020
Merit-Based Scholarship, SNU 2015 - 2017

Awards

Outstanding Award, SNU ME Materials and Manufacturing Process Course 2019
Excellence Award at I·Seoul·U Hackathon, Administration of Seoul 2016
Creative Award, SNU ME Creative Engineering Design Course 2015

Teaching Experience

Teaching Assistant, 16.S690/6.S080 Introduction to Autonomy 2026

Professional Activities

Organizer RSS IDMAV Workshop (2022)
Reviewer ICML (2026), RA-L (2025), L-CSS (2022)

Technical Skills

Programming	Python, C/C++, CUDA, MATLAB
Libraries & Tools	Pytorch, OpenCV, Git, Nix, LaTeX, ROS, SolidWorks
Languages	Korean (Native), English (Fluent)

Leadership Experience

Committee Member, K-RAINES (Korean robotics community in New England) 2025 - Present
Unit Supply Specialist (ROK Army Sergeant), 2nd Infantry Division, US Army 2017 - 2019
Committee Member, DALISHA (SNU Running Crew) 2018 - 2021