

SooJean Han

Assistant Professor, Director of Autonomous Control for Stochastic Systems (ACSS)
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EDUCATION

California Institute of Technology (Caltech)

Ph.D. Control and Dynamical Systems

Thesis Defense Video: [Link]

Pasadena, CA, USA

Sep. 2017 - Jan. 2023

University of California, Berkeley (UC Berkeley)

B.S. Electrical Engineering and Computer Science

B.S. Applied Mathematics

Berkeley, CA, USA

Jun. 2014 - Dec. 2016

Jun. 2014 - Dec. 2016

WORK & EMPLOYMENT HISTORY

Korea Advanced Institute of Science & Technology (KAIST).

Aug 2023 - present

Assistant Professor (School of Electrical Engineering).

Director and founder of the Autonomous Control for Stochastic Systems (ACSS) research laboratory, where we use mathematical theory and real-world applications to develop autonomous control, estimation, and decision-making algorithms, especially for stochastic systems.

Associate Editor, IEEE Robotics and Automation Letters (RA-L).

Jan 2025 - present

Joined the Editorial Board for IEEE RA-L in the area of Mechanisms, Design, and Control.

Associate Editor, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

Apr 2025 - present

Joined the Editorial Board for IROS2025 in the area of Design, Mechanisms, and Control.

California Institute of Technology (Caltech).

Feb 2023 - Aug 2023

• *Postdoctoral Scholar.*

Autonomous Robotics and Control Lab (ARCL). Performed experiments for autonomous aerial visual navigation in low-light environments (e.g., night, heavy fog), and diffusion-based motion planning. Models were trained on thermal near-shore data curated by the lab. Supported by DARPA Learning in Control (LINC) and ONR.

• *Graduate Research Assistant.*

Doyle Lab and ARCL. Performed research broadly at the intersection of control theory and artificial intelligence. Concrete applications include stochastic systems, networks and distributed sensing, and autonomous decision-making. Supported by NSF GRFP.

NASA Jet Propulsion Laboratory (JPL).

Jun 2018 - Aug 2018

Research Affiliate.

Involved with the DARPA Subterranean (SubT) Challenge as a part of Team CoSTAR. Implemented vision-based SLAM using C++ and deployed it on terrestrial rolling-walking hybrid robots custom-built by our team. Objective was to perform distributed collaborative mapping and merging using keypoint feature detection.

CAST, Caltech.

Jun 2017 - Aug 2017

Research Assistant.

Center for Autonomous Systems & Technologies (CAST). Implemented distributed control over multiple Crazyflie quadrotor platforms for synchronization and formation-flight. The combined PID and nonlinear controllers were designed in Python and C++, and deployed through ROS and VICON motion capture.

University of California, Berkeley (UC Berkeley).

Jan 2017 - May 2017

Undergraduate Research Assistant.

Hybrid Systems Lab. Developed and implemented obstacle detection for FaSTrack, a modular framework for autonomous path-planning. Relevant publications [\[here\]](#) and [\[here\]](#).

GRANTS & CONTRACTS

Air Force Office of Scientific Research (AFOSR)

Apr 2025 - Mar 2026

Project Title: Fast, Accurate, and Efficient Environment Situational Awareness for Wireless Visual Sensor Networks

Position: Principal Investigator (PI)

Amount: \$76K

Korean Agency for Defense Development (ADD)

Jun 2024 - May 2026

Project Title: Manned Operation Internal Decontamination System (in Korean)

Position: Co-Principal Investigator (Co-PI)

Amount: \$70K

PUBLICATIONS

Textbooks

- **SooJean Han.** *Linear Systems: Theory and Application.* Springer, To be published, 2025

Academic Journals

- Published
 - * **SooJean Han**, Soon-Jo Chung, and John C. Doyle. Predictive Control of Linear Discrete-Time Markovian Jump Systems by Learning Recurrent Patterns. *Automatica*, 156, May 2023. [\[Link\]](#)
 - * **SooJean Han** and Soon-Jo Chung. Incremental Nonlinear Stability Analysis for Stochastic Systems Perturbed by Lévy Noise. *International Journal of Robust and Nonlinear Control*, 32(12):7174–7201, Aug 2022. [\[Link\]](#)
 - * Shih-Hao Tseng, **SooJean Han**, and Adam Wierman. Trading Throughput for Freshness: Freshness-Aware Traffic Engineering and In-Network Freshness Control. *ACM Transactions on Modeling and Performance Evaluation of Computing Systems (ToMPECS)*, 8(4):1–26, Mar 2023. [\[Link\]](#)
 - * Mo Chen, Sylvia L. Herbert, Haimin Hu, Ye Pu, Jaime Fernández Fisac, Somil Bansal, **SooJean Han**, and Claire J. Tomlin. FaSTrack: A Modular Framework for Real-Time Motion Planning and Guaranteed Safe Tracking. *IEEE Transactions on Automatic Control*, 66(12):5861–5876, Dec 2021. [\[Link\]](#)
- Preprints
 - * **SooJean Han** and Soon-Jo Chung. A Two-Part Controller Synthesis Approach for Nonlinear Stochastic Systems Perturbed by Lévy Noise Using Renewal Theory and HJB-Based Impulse Control. ArXiv. Aug 2021. [\[Link\]](#)

Conferences

- Published
 - * Jeongyong Yang, Hojin Ju, and **SooJean Han**. Curvature and Energy-based Trajectory Optimization in Unstructured Environments. In *Korean Robotics Conference (KRoC)*, Feb 2025. in Korean
 - * Seunghwan Jang and **SooJean Han**. Comparison of Compression Codec Algorithms to Image Datasets in 3D Gaussian Splatting Models. In *Workshop on Image Processing and Image Understanding (IPIU)*, Feb 2025. in Korean
 - * **SooJean Han**, Minwoo Kim, and Ieun Choo. A Stochastic Robust Adaptive Systems Level Approach to Stabilizing Large-Scale Uncertain Markovian Jump Linear Systems. In *IEEE 63rd Annual Conference on Decision and Control (CDC)*, Sep 2024

- * Mukul Chodhary, Kevin Octavian, and **SooJean Han**. Efficient Replay Memory Architectures in Multi-Agent Reinforcement Learning for Network Congestion Control. In *27th IEEE International Conference on Intelligent Transportation Systems (ITSC)*, Jul 2024
- * **SooJean Han**, Soon-Jo Chung, and Johanna Gustafson. Congestion Control of Vehicle Traffic Networks by Learning Structural and Temporal Patterns. In *Proceedings of The 5th Annual Learning for Dynamics and Control Conference*, volume 211 of *Proceedings of Machine Learning Research*, pages 903–914. PMLR, Jun 2023. [Link]
- * **SooJean Han**. Localized Learning of Robust Controllers for Networked Systems with Dynamic Topology. In *Proceedings of the 2nd Conference on Learning for Dynamics and Control (L4DC)*, volume 120 of *Proceedings of Machine Learning Research*, pages 687–696. PMLR, Jun 2020. [Link]
- * Shih-Hao Tseng, Carmen Amo Alonso, and **SooJean Han**. System Level Synthesis via Dynamic Programming. In *IEEE 59th Annual Conference on Decision and Control*, pages 1718–1725, Dec 2020. [Link]
- * Sylvia L. Herbert, Mo Chen, **SooJean Han**, Somil Bansal, Jaime F. Fisac, and Claire J. Tomlin. FaSTrack: A Modular Framework for Fast and Guaranteed Safe Motion Planning. In *IEEE 56th Annual Conference on Decision and Control (CDC)*, pages 1517–1522, Dec 2017. [Link]
- Preprints
 - * Jeongyong Yang, KwangBin Lee, and **SooJean Han**. Hybrid Conformal Prediction-based Risk-Aware Model Predictive Planning in Dense, Uncertain Environments. In *IEEE 64th Annual Conference on Decision and Control (CDC)*, Mar 2025. Under review
 - * Hyeongmin Choe and **SooJean Han**. Advantages of Feedback in Distributed Data-Gathering for Accurate and Power-Efficient State-Estimation. In *IEEE 64th Annual Conference on Decision and Control (CDC)*, Mar 2025. Under review
 - * Eunwoo Sung and **SooJean Han**. Distributed Kalman-IMM Cooperative Estimator Synthesis for Large-Scale Networked Switching Systems. In *IEEE 64th Annual Conference on Decision and Control (CDC)*, Mar 2025. Under review
 - * **SooJean Han**, Michelle Effros, and Richard M. Murray. OUTformation: Distributed Data Gathering with Feedback under Unknown Environment and Communication Delay Constraints. *ArXiv*, Aug 2022. [Link]
 - * **SooJean Han**, Michelle Effros, and Richard M. Murray. Optimizing Accuracy and Efficiency using Feedback in Distributed Data Gathering of Uncertain Environments. Sep 2022. [Link]

INVITED SEMINARS AND SYMPOSIUMS

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| <p>KAIST Cho Chun Shik Graduate School of Mobility Invited Seminar
Presented recent developments on ACSS lab’s current and future research.</p> <p>Institute of Control Robotics and Systems (ICROS) Invited Talk
Presented recent developments on ACSS lab’s current and future research.</p> <p>Korea Robotics Conference (KRoC) New Faculty Seminar
Invited presentation for new faculty research seminar. Presented several works on autonomous control based on learning patterns, and current and future directions.</p> <p>Invited Seminar at KAIST
Presented research on stability analysis and learning-based control for two types of jump stochastic systems: nonlinear systems with Lévy noise and discrete-time Markovian jump systems. The controller framework learns patterns in the jump process to reduce redundant computation, and can be used in applications including the fault-tolerant control of networks with time-varying topology. Slides can be found [here].</p> <p>39th SoCal Control Workshop
Presented a controller framework for a class of discrete-event systems based on a novel principle which learns patterns in the underlying event process. The framework reduces computation redundancy and time by using martingale theory to predict future occurrence times and probabilities of repeating patterns. Slides can be found [here]</p> <p>Caltech CAST Poster Session
Presented a distributed data-gathering framework which uses processor-to-sensor feedback communication to reduce redundant data transmissions and sensor power consumption. Poster can be found [here].</p> | <p>Feb 2025</p> <p>Dec 2024</p> <p>Feb 2024</p> <p>Oct 2022</p> <p>Apr 2022</p> <p>Feb 2020</p> |
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TEACHING & MENTORING EXPERIENCE

Courses Taught at KAIST

Aug 2023 - present

Semester	Course Number	Title	Class Size
Spring 2025	EE210	Probability and Random Processes	120
Fall 2024	EE202	Signals and Systems	120
Spring 2024	EE581	Linear Systems	60
Fall 2023	EE488F	Learning Patterns for Autonomous Control	12 (self-created topics course)

Summer Undergraduate Research Fellow (SURF) Mentor

Jun 2022 - Sep 2022

Mentored one SURF student in the Autonomous Robotics and Control Lab (ARCL) at Caltech. Project was about congestion control of vehicle traffic intersection networks via adaptive signals. Relevant paper [here], presented at L4DC'23).

Teaching Assistant for Optimal Control and State-Estimation

Jan 2020 - Mar 2020

TA for CDS 112/Ae103a taught at Caltech during the Winter 2020 quarter. Provided lecture recitations and guest lectures on discrete and continuous-time Kalman filtering, particle filtering, the HJB equation, Euler-Lagrange equations, and the Pontryagin Maximum Principle. Created lecture notes for the course which can be found [here] and [here] (this one was made with students).

Summer Undergraduate Research Fellow (SURF) Mentor

Jun 2017 - Aug 2017

Mentored two SURF students in the Autonomous Robotics and Control Lab (ARCL) at Caltech. Project was about synchronization and formation-flying for multi-agent networks of Crazyflie quadrotors.

FELLOWSHIPS

NSF GRFP

Jun. 2019 - Jun. 2022

Caltech Special EAS Fellowship

Jun. 2017 - Jun. 2019

PEER REVIEW EXPERIENCE

Journal Articles

- 6 papers in IEEE Transactions on Automatic Control (TAC)
- 12 papers in IEEE Control Systems Letters (L-CSS)
- 4 paper in IEEE Transactions on Control Systems Technology (TCST)
- 1 paper in Automatica
- 1 paper in International Journal of Robust and Nonlinear Control (RNC)
- 1 paper in SIAM Journal on Control and Optimization (SICON)
- 1 paper in Results in Control and Optimization (RICO)

Conference Papers

- 14 papers in IEEE Conference on Decision and Control (CDC)
- 10 papers in American Controls Conference (ACC)
- 1 paper in IEEE Conference on Control Technology and Applications (CCTA)

TECHNICAL SKILLS

Software: Python, MATLAB, C/C++, Java, LaTeX, Metapost, TikZ, R, HTML, ROS

Version Control Tools: Github, Bitbucket

Libraries and Toolboxes: CVX, Simulink, SLS Toolbox