Jason J. Choi

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Research Interests

Safe & Multi-Agent Robot Autonomy, Controls, Robotics

Academic Experience

University of California, Los Angeles — Nov 1st, 2025
Assistant Professor, Department of Electrical and Computer Engineering — Los Angeles, CA

Stanford University — Jun—Oct 2025
Visiting Researcher, Department of Aeronautics and Astronautics — Stanford, CA
Faculty Host: Somil Bansal (Safe and Intelligent Autonomy Lab)

University of California, Berkeley — Aug 2019—Aug 2025
Graduate Student Researcher / Instructor — Berkeley, CA

Advisors: Koushil Sreenath, Claire J. Tomlin

Ph.D. Thesis: Safety guarantees for uncertain dynamical systems—combining model-based analysis with data-driven approaches (Degree confer date: Aug 15, 2025)

Cranfield University — June—July 2023
Visiting Research Student — Cranfield, UK

Supervisors: Namhoon Cho, Hyo-Sang Shin

Selected Honors & Awards

IEEE Control Systems Ph.D.s in Controls, Dec 2025

Robotics: Science and Systems (RSS) Pioneers 2024

- Top 30 early career researchers globally in robotics (Acceptance rate: 15 %) [Webpage]

Berkeley Fellowship for Graduate Study, Graduate Division, Fall 2019—Summer 2021

- University-wide with full tuition/stipend coverage, granted only to top admitted PhD students.

Kwanjeong Educational Foundation Scholarship, Fall 2019—May 2025

- Top Korean scholarship program for graduate studies.

1st Place Winner, ACM/IEEE Human Robot Interaction Student Design Competition, 2018

- Shelly, a Robotic Tortoise for Children-Robot Interaction (Undergraduate Internship project)
- Interviewed by and featured in IEEE Spectrum, TechCrunch, and NBCNews-Mach. The robot was exhibited in Korea National Science Museum (Gwacheon).

National Excellence Scholarship, Korea Student Aid Foundation, 2012—2018

- Government-funded supporting undergraduate studies for top Korean STEM students.

Publications (* indicates co-first authors)

Preprints & In Preparation

P4. J. Li, G. Qu, **J. J. Choi**, S. Sojoudi, & C. J. Tomlin, "Guided Policy Search for Multi-Agent General-Sum Dynamic Games", *Arxiv:2509:24226*, 2025.

P3. D. Baek, A. Purushottam, **J. J. Choi**, & J. Ramos, "Whole-Body Bilateral Teleoperation with Multi-Stage Object Parameter Estimation for Wheeled Humanoid Locomanipulation", *Arxiv:2508.09846*, 2025.

P2. **J. J. Choi**, S. Sastry, C. J. Tomlin, & K. Sreenath, "When are safety filters safe ? On minimum phase conditions of Control Barrier Functions", *Arxiv:2508.07684*, 2025.

P1. **J. J. Choi***, D. Lee*, B. Li, J. P. How, K. Sreenath, S. L. Herbert, & C. J. Tomlin, "Forward Reachability Perspective of Control Barrier Functions and Discount Factor in Reachability", *Arxiv:2310.17180*, 2023.

Journal Publications

J5. F. Castaneda*, **J. J. Choi***, W. Jung, B. Zhang, C. J. Tomlin, & K. Sreenath, "Recursively Feasible Probabilistic Safe Online Learning with Control Barrier Functions", *Accepted to IEEE Open Journal of Control Systems (OJ-CSYS)*, 2025.

J4. **J. J. Choi***, F. Castaneda*, W. Jung*, B. Zhang, C. J. Tomlin, & K. Sreenath, "Constraint-Guided Online Data Selection for Scalable Data-Driven Safety Filters in Uncertain Robotic Systems", *IEEE Transactions on Robotics*, 2025.

J3. T. Hsu, **J. J. Choi**, D. Amin, C. J. Tomlin, S. C. McWherter, & M. Piedmonte, "Towards Flight Envelope Protection for the NASA Tiltwing eVTOL Flight Mode Transition using Hamilton-Jacobi Reachability", *Journal of the American Helicopter Society* ***(JAHS)***, 2023.

J2. K. P. Wabersich*, A. J. Taylor*, **J. J. Choi***, K. Sreenath, C. J. Tomlin, A. D. Ames, & M. N. Zeilinger, "Data-Driven Safety Filters: Hamilton-Jacobi Reachability, Control Barrier Functions, and Predictive Methods For Uncertain Systems", *IEEE Control Systems Magazine* ***(CSM)***, 2023.

J1. **J. J. Choi**, A. Agrawal, K. Sreenath, C. J. Tomlin, & S. Bansal, "Computation of Regions of Attraction for Hybrid Limit Cycles Using Reachability: An Application to Walking Robots", *IEEE Robotics & Automation Letters* ***(RA-L)*** *(presented at ICRA 2022)*, 2022.

Peer-Reviewed Conference Publications

C11. **J. J. Choi***, C. A. Strong*, K. Sreenath, N. Cho & C. J. Tomlin, "Data-Driven Hamiltonian for Direct Construction of Safe Set from Trajectory Data", *accepted to IEEE Conference on Decision and Control*, 2025.

C10. **J. J. Choi***, J. J. Aloor*, J. Li*, M. G. Mendoza, H. Balakrishnan, & C. J. Tomlin, "Resolving Conflicting Constraints in Multi-Agent Reinforcement Learning with Layered Safety", *Robotics: Science and Systems (RSS)*, 2025.

C9. X. Xia*, **J. J. Choi***, A. Agrawal, K. Sreenath, C. J. Tomlin, & S. Bansal, "Gait Switching and Enhanced Stabilization of Walking Robots with Deep Learning-based Reachability: A Case Study on Two-link Walker", *IEEE* ***CDC***, 2024.

C8. W. Lavanakul*, **J. J. Choi***, K. Sreenath, & C. J. Tomlin, "Safety Filters for Black-Box Dynamical Systems by Learning Discriminating Hyperplanes", *Annual Learning for Dynamics & Control Conference **(L4DC)***, 2024.

C7. K. Kang, P. Gradu, **J. J. Choi**, M. Janner, C. Tomlin, & S. Levine, "Lyapunov Density Models: Constraining Distribution Shift in Learning-Based Control", *International Conf. on Machine Learning **(ICML)***, 2022. (Acceptance rate: 22%)

C6. **J. J. Choi**, D. Lee, K. Sreenath, C. J. Tomlin, & S. Herbert, "Robust Control Barrier-Value Functions for Safety-Critical Control", *IEEE **CDC***, 2021.

C5. F. Castaneda*, **J. J. Choi***, B. Zhang, C. J. Tomlin, & K. Sreenath, "Pointwise Feasibility of Gaussian Process-based Safety-Critical Control under Model Uncertainty", *IEEE Conference on Decision and Control **(CDC)***, 2021.

C4. S. Herbert*, **J. J. Choi***, S. Sanjeev, M. Gibson, K. Sreenath, & C. J. Tomlin, "Scalable Learning of Safety Guarantees for Autonomous Systems using Hamilton-Jacobi Reachability" in *IEEE International Conference on Robotics and Automation **(ICRA)***, 2021.

C3. F. Castaneda*, **J. J. Choi***, B. Zhang, C. J. Tomlin, & K. Sreenath, "Gaussian Process-based Min-norm Stabilizing Controller for Control-Affine Systems with Uncertain Input Effects" in *American Control Conference **(ACC)***, 2021.

C2. **J. J. Choi***, F. Castaneda*, C. J. Tomlin, & K. Sreenath, "Reinforcement Learning for Safety-Critical Control under Model Uncertainty, using Control Lyapunov Functions and Control Barrier Functions" in *Robotics: Science and Systems **(RSS)***, 2020. (Acceptance rate: 32%)

C1. H. Ku* , **J. J. Choi***, S. Jang*, W. Do*, S. Lee, & S. Seok, "Online Social Touch Pattern Recognition with Multi-modal-sensing Modular Tactile Interface" in *International Conference on Ubiquitous Robots **(UR)***, 2019.

Workshop & Short Papers

H. Ku*, **J. J. Choi***, S. Lee*, S. Jang*, & W. Do*, "Designing Shelly, a Robot Capable of Assessing and Restraining Children's Robot Abusing Behaviors", in *Companion of the ACM/IEEE HRI*, 2018.

W. Do*, S. Jang*, & **J. J. Choi***, "Constrained Explicit Model Predictive Control of Two-wheeled Inverted Pendulum Robot under Strong Perturbation", in *Korea Robotics Society Annual Conference (KRoC)*, 2018.

H. Ku*, W. Do*, S. Lee*, S. Jang*, & **J. J. Choi***, "Shelly: An Educational Robot for Restraining Children's Abusive Behaviors towards Robots", in *KRoC*, 2018. (Best Student Paper)

K. Park, E. Lee, G. Ryou, **J. Choi**, Y. Ko, S. Lee, & J. Kwon, "Smart Phone Application on Safety Education for Children with Disabilities", in *HCI Korea*, 2014.

PATENT

KR10-2018-0026268, Korea, Patent Pending—*Methods and devices for processing sensory data related to user's tactile interaction.*

Education

University of California, Berkeley — Aug 2019—Aug 2025
Ph.D. Candidate in Mechanical Engineering — Berkeley, CA

Advisors: Koushil Sreenath, Claire J. Tomlin

Thesis: Safety guarantees for uncertain dynamical systems—combining model-based analysis with data-driven approaches

Seoul National University (SNU) — Mar 2012—Aug 2019
B.S. in Mechanical Engineering (*Summa Cum Laude*) — Seoul, Korea

Teaching

ECE133A Applied Numerical Computing, UCLA — Winter 2026

ME C237/EE222 Nonlinear Systems, UC Berkeley — Spring 2022
Graduate Student Instructor (Teaching Assistant)

- Instructors: Shankar Sastry, Koushil Sreenath
- Student evaluation score: 4.75/5 (department average: 4.19/5)

Tutor, Basic Calculus 1, Basic Physics 2, Mechanics, Fluid Dynamics, SNU — 2014—2018

Guest Lectures

- **Safety Filters for Uncertain Dynamical Systems: Control Theory & Data-driven Approaches**
  - UC Berkeley EECS 206B (Robotic Manipulation & Interaction), 2024.
  - UC San Diego MAE 248 (Safety for Autonomous Systems), 2024. [Available online]
  - CMU 16-886 (Models & Algorithms for Interactive Robotics), 2024. [Available online]
- **Control Barrier Functions for Nonlinear System Safety Control**
  - UC Berkeley EECS 206B (Robotic Manipulation & Interaction), 2023.
  - USC EE 599 (Learning & Control for Safety-Critical Robotic Systems), 2023.
- **Optimal Control and Reinforcement Learning for Legged Robots**
  - UC Berkeley EECS 206B (Robotic Manipulation & Interaction), 2023.
- **Introduction to Control Lyapunov Functions and Control Barrier Functions**
  - UC San Diego MAE 207 (Safety for Autonomous Systems), 2021. [Available online]

Work Experience

Joby Aero, Inc May—Aug 2023
Flight Research Intern San Carlos, CA, US

- Contributed to the development of the GNC (Guidance, Navigation, and Control) and flight autonomy stack, focusing on automated air traffic management (ATM) algorithms for high-density advanced air mobility (AAM) operations.
- Built symbolic libraries for autonomy with support for automatic differentiation, enhanced trajectory optimization runtime by three times, and conducted large-scale simulations for validation.

Mars Auto Apr 2018—May 2019
Control Team Lead, Early Member Seoul, Korea

- Led the control team in developing vision-only self-driving technologies for autonomous trucking, approved by the Korean government for public road tests.
- Designed and implemented Model Predictive Control (MPC)-based planning and control, and estimation algorithms for 3D road map construction using vision-based SLAM.

Naver Labs Jul 2017—Feb 2018
Research Intern, Robotics Group Seongnam, Korea

- Developed Shelly, a Robotic Tortoise for Children-Robot Interaction, featured by IEEE Spectrum, and won the IEEE/ACM HRI 2018 Student Design Competition [Video demo].
- Developed optimal balancing control systems of last-mile mobility platform based on MPC.

Mentorship

Past Students - UC Berkeley
Wonsuhk Jung, Kai Yun, Alahe Akhavan, Elias Morley, Pranit Mohnot, Will Lavanakul, Xingpeng Xia, Ritvik Mahajan, Gechen Qu, Andrew Lee

Outreach

Transfer-to-Excellence (TTE) Research Program, Berkeley Engineering, May—Aug 2022
Research Mentor [Program webpage] Berkeley, CA

- Mentored two underrepresented California community college students, supporting them on their first research project as they prepared to transfer to a four-year university to pursue STEM careers.
- Visual navigation of quadruped robots for collaborative package transportation [Poster]

Overseas STEM Institution Exploration Tour, Seoul Science High School, 2019, 2022-2024
Organizer & Mentor Berkeley, CA

- Mentored Korean high school students in their STEM career development.
- Organized and hosted their annual UC Berkeley campus visit event.

Committee Roles

Local Chair, Organizing Committee, RSS Pioneers Workshop 2025.

Program Committee Member, Special track on Safe and Robust AI, AAAI 2023.

Review Activities

IFAC Automatica.

IEEE Transactions on Automatic Control (TAC).

IEEE Transactions on Robotics (T-RO).

IEEE Transactions on Control of Network Systems (TCNS).

ASME Journal of Dynamic Systems, Measurement and Control.

IEEE Robotics and Automation Letters (RA-L).

IEEE Control Systems Letters (L-CSS).

IEEE Open Journal of Control Systems (OJ-CSYS).

IEEE International Conference on Decision and Control (CDC).

IEEE International Conference on Robotics and Automation (ICRA).

IEEE International Conference on Intelligent Robots and Systems (IROS).

Conference on Robot Learning (CoRL).

Learning for Dynamics and Control (L4DC).

Modeling, Estimation and Control Conference (MECC).

Journal of Machine Learning Research (JMLR).

Research Talks

22. Invited Speaker, Global Technology Research (GTR) Division, Samsung Electronics, *Safety & Collective Intelligence for Next-Generation Robot Autonomy*, 2025.

21. Invited Speaker, Cho Chun Shik Graduate School of Mobility, KAIST, *Data-Driven Frameworks for Safety Verification and Applications in Advanced Air Mobility*, 2025.

20. Invited Speaker, GoGE Workshop on Optimization, Decision and AI, Department of Electrical and Computer Engineering, Seoul National University, *Data-driven Safety Frameworks—Indirect vs Direct Approaches*, 2025.

19. SNU Data Science Seminar, Graduate School of Data Science, Seoul National University, *AI and Control Theory for Safety in Aviation Autonomy*, 2025.

18. Safe and Intelligent Autonomy Lab, Stanford, *Towards Generalizable Safety for Advanced Air Mobility*, 2025.

17. Institute for Dynamic Systems and Control, ETH Zurich, *Towards Generalizable Safety Frameworks for Robot and Aviation Autonomy*, 2024.

16. Mechanical Engineering Control Seminar, UC Berkeley, *Effective Abstractions for Data-driven Safety Analysis in Robot and Aviation Autonomy*, 2024

15. Student Spotlight Talk, Bay Area Robotics Symposium, *Effective abstractions for direct data-driven safety analysis*, 2024.

14. Tutorial Lecture, 6th Annual Learning for Dynamics & Control Conference, *Safety Filters for Control: Concepts, Theory and Practice (Co-lectured with Melanie Zeilinger, Kim Wabersich, Max Cohen)*, 2024.

13. Invited Talk, Centre for Autonomous and Cyberphysical Systems, Cranfield University, *Data-driven safety filters for uncertain systems: with or without certificate functions ?*, 2024.

12. Monthly Seminar, NASA University Leadership Initiative–Safe Aviation Autonomy, *Flight Envelope Protection for eVTOL Flight Mode Transition and towards Safe Architecture for Advanced Air Mobility*, 2023.

11. Young Researcher Presentation, Workshop on Clean Slate Approaches to Crewed and Uncrewed Air Traffic Operations, UC Berkeley, *Towards Flight Envelope Protection for the NASA Tiltwing eVTOL Flight Mode Transition using Hamilton-Jacobi Reachability*, 2023.

10. Intelligent Control Lab, CMU, *Data-driven Methods for Safety Control under Model Uncertainty*, 2022.

9. Semiautonomous Seminar, UC Berkeley, *Overview of Various Safety Filters for Uncertain Systems and Open Research Questions for Safety Problems*, 2022.

8. CORE Group, Seoul Nat'l Univ., *Overview of Various Safety Filters for Uncertain Systems and Open Research Questions for Safety Problems*, 2022.

7. BAIR Robotics & Systems Workshop, UC Berkeley, *Computation of Regions of Attraction for Hybrid Systems: An Application to Walking Robots*, 2022.

6. Robotics Seminar, UIUC, *Value function-based methods for safety-critical control*, 2021.

5. Monthly Seminar, NASA University Leadership Initiative–Safe Aviation Autonomy, *Data-driven methods for safety control under model uncertainty*, 2021.

4. Invited Spotlight Talk, IROS 2021 Workshop on Safe Real-World Robot Autonomy, *Data-Driven Methods for Safety Control Under Model Uncertainty*, 2021.

3. Semiautonomous Seminar, UC Berkeley, *Value function-based methods for safety-critical control*, 2021.

2. Institute for Data Science in Mechanical Engineering (DSME) Seminar, RWTH Aachen University, *Learning-based Safety-Critical Controller Design for Systems with Model Uncertainty*, 2021.

1. Learning for Control, High Confidence Learning-Enabled Systems, DARPA Assured Autonomy Program Virtual Site Visit, *Optimizing Model-Based Controllers With Model-Free Reinforcement Learning*, 2020.