Kehan Long

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Education

- **Ph.D., Mathematics** 2025
  University of California, San Diego *La Jolla, CA*
- **M.S., Mathematics** 2022
  University of California, San Diego *La Jolla, CA*
- **B.S., Applied Mathematics** 2019
  University of Illinois, Urbana-Champaign *Champaign, IL*

Experience

- **Member of Technical Staff, Robotics** SceniX AI
  Mentors: Yunzhu Li and Sonny Hu Aug 2025 - Present
  Led the development of an end-to-end sim-to-real pipeline for robotic manipulation, integrating large-scale simulation-based trajectory generation and optimization, domain randomization, unreal rendering, VLA policy training, and real-world deployment.

- **Graduate Student Researcher** University of California, San Diego
  Advisors: Nikolay Atanasov, Jorge Cortes, and Melvin Leok March 2020 - Sep 2025
  Conducted research in robotics spanning safe motion planning and control, learning-based control, and decision-making under uncertainty, with a focus on certifiable (safe) robot autonomy.

- **Research Resident** Toyota Research Institute of North America
  Advisors: Georgios Fainekos and Bardh Hoxha May - Sep 2024
  Developed geometric modeling and safety-critical control strategies for continuum robots, and designed motion planning algorithms for tractor-trailer systems.

- **Student Researcher** University of Illinois, Urbana-Champaign
  Advisor: Naira Hovakimyan 2018 - 2019
  Worked on implementations of deep reinforcement learning algorithms.

Honors & Awards

- **Chancellor's Dissertation Medal**, University of California San Diego 2026
  Awarded by the School of Physical Sciences [webpage]
- **Robotics: Science and Systems (RSS) Pioneers** 2025
  Selected as one of the top early-career researchers in robotics worldwide [webpage]
- **Best Workshop Paper (Poster) Awards**
  IEEE ICRA Workshop "Multi-Modal Spatial AI for Robust Navigation and Open-World Understanding" 2026
  IEEE RoboSoft Workshop "The Role for Control in Soft Robot Autonomy" 2026
  IEEE RoboSoft Workshop "Minds and Bodies: Co-Design for the Future of Soft Manipulation" 2026
  IEEE ICRA Workshop on Future of Construction 2025

Research Interests

Relevant Fields: Robotics, Robot Learning, Optimization and Control, Task and Motion Planning, Uncertainty Quantification, Reinforcement Learning

- General-purpose robotic learning, with an emphasis on high-fidelity simulation and large-scale data generation for training and evaluation of vision–language–action (VLA) policies
- Uncertainty-aware motion planning and safe control for robots in unknown dynamic environments
- Model-based reinforcement learning with stability and safety guarantees for robot control systems

Publications

* indicates equal contribution

Preprints

P3. A. Mangan, **K. Long**, K. M. B. Lee, M. Potdar, N. Atanasov, T. K. Morimoto, "Contact-Aware Planning and Control of Continuum Robots in Highly Constrained Environments," under review, 2026. [arxiv]

P2. **K. Long**, Y. Zhao, P. Mestres, J. Cortés, L. Lindermann, N. Atanasov, "Comparisons and Connections of Distributionally Robust Optimization and Conformal Prediction," under preparation, 2026.

P1. H. Parwana, T. Kim, **K. Long**, B. Hoxha, H. Okamoto, G. Fainekos, and D. Panagou, "BR-MPPI: Barrier Rate guided MPPI for Enforcing Multiple Inequality Constraints with Learned Signed Distance Field," under review, 2025. [arxiv]

Journals

J6. **K. Long**, K. M. B. Lee, N. Raicevic, N. Attasseri, M. Leok, N. Atanasov, "Neural Configuration-Space Barriers for Manipulation Planning and Control," IEEE Transactions on Automation Science and Engineering, 2026. [arxiv] [code] [website]

J5. **K. Long**, Y. Yi, Z. Dai, S. Herbert, J. Cortés and N. Atanasov, "Sensor-Based Distributionally Robust Control for Safe Robot Navigation in Dynamic Environments," The International Journal of Robotics Research (IJRR), 2026. [arxiv] [code] [website]

J4. **K. Long**, J. Cortés and N. Atanasov, "Distributionally Robust Policy and Lyapunov-Certificate Learning," IEEE Open Journal of Control Systems (OJ-CSYS), vol. 3, pp. 375-388, 2024. [arxiv] [code]

J3. P. Mestres, **K. Long**, N. Atanasov and J. Cortés, "Feasibility and Regularity Analysis of Distributionally Robust Safe Stabilizing Controllers," IEEE Control Systems Letters (L-CSS), vol. 8, pp. 91-96, 2024.[arxiv]

J2. **K. Long**, V. Dhiman, M. Leok, J. Cortés and N. Atanasov, "Safe Control Synthesis With Uncertain Dynamics and Constraints," IEEE Robotics and Automation Letters (RA-L), 7(3), pp. 7295-7302, 2022.[arxiv]

J1. **K. Long***, C. Qian*, J. Cortés and N. Atanasov, "Learning Barrier Functions With Memory for Robust Safe Navigation," IEEE Robotics and Automation Letters (RA-L), 6(3), pp. 4931-4938, 2021. [arxiv]

Conferences

C7. **K. Long**, J. Cortés, N. Atanasov, "Certifying Stability of Reinforcement Learning Policies using Generalized Lyapunov Functions," Advances in neural information processing systems (NeurIPS), 2025. [arxiv][code]

C6. **K. Long**, H. Parwana, G. Fainekos, B. Hoxha, H. Okamoto, N. Atanasov, "Neural Configuration Distance Function for Continuum Robot Control," IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025. [arxiv] [code]

C5. P. Mestres, **K. Long**, M. Leok, N. Atanasov and J. Cortés, "Stabilization of Nonlinear Systems through Control Barrier Functions," IEEE Conference on Decision and Control (CDC), 2024. [arxiv] [code]

C4. **K. Long**, K. Tran, M. Leok and N. Atanasov, "Safe Stabilizing Control for Polygonal Robots in Dynamic Elliptical Environments," American Control Conference (ACC), 2024. [arxiv]

C3. **K. Long**, Y. Yi, J. Cortés and N. Atanasov, "Distributionally Robust Lyapunov Function Search Under Uncertainty," Learning for Dynamics and Control Conference (L4DC), 2023. [arxiv] [code]

C2. **K. Long***, Y. Yi*, J. Cortés and N. Atanasov, "Safe and Stable Control Synthesis for Uncertain System Models via Distributionally Robust Optimization," American Control Conference (ACC), 2023. [arxiv]

C1. HJ. Yoon, H. Chen, **K. Long**, H. Zhang, A. Gahlawat, D. Lee and N. Hovakimyan, "Learning to Communicate: A Machine Learning Framework for Heterogeneous Multi-Agent Robotic Systems," AIAA Scitech Forums, 2019. [arxiv]

Workshops

W5. S. Kim*, B. Pak*, **K. Long**, Y. Tian, N. Atanasov, "4D Latent Mapping for Mobile Manipulation Policy Learning", Workshop on "Multi-Modal Spatial AI for Robust Navigation and Open-World Understanding" at IEEE ICRA 2026. [pdf]

W4. A. Mangan, **K. Long**, K. M. B. Lee, M. Potdar, N. Atanasov, T. K. Morimoto, "Contact-Aware Planning and Control of Continuum Robots in Highly Constrained Environments," Workshop on "The Role for Control in Soft Robot Autonomy" at IEEE RoboSoft 2026.

W3. A. Mangan, **K. Long**, K. M. B. Lee, M. Potdar, N. Atanasov, T. K. Morimoto, "Contact-Aware Planning and Control of Continuum Robots in Highly Constrained Environments," Workshop on "Minds and Bodies: Co-Design for the Future of Soft Manipulation" at IEEE RoboSoft 2026.

W2. **K. Long**, "Certifiable Robot Autonomy Under Uncertainty," Robotics: Science and Systems Pioneers Workshop 2025. [pdf]

W1. D. M. Kim, K. M. B. Lee, Y. H. Seo, N. Raicevic, R. B. Li, **K. Long**, C. S. Yoon, D. M. Kang, B. J. Lim, Y. P. Kim, N. Atanasov, T. Nguyen, S. W. Jun, Y. W. Kim, "A Shared-Autonomy Construction Robotic System for Overhead Works," Workshop on Future of Construction at IEEE ICRA 2025. [video]

Seminars & Talks

T4. "Certifiable Robot Autonomy under Uncertainty," Summer 2025 GRASP Seminar, University of Pennsylvania, Philadelphia, PA, July 2025.

T3. "Sensor-Based Distributionally Robust Control Barrier Function for Safe Robot Navigation," 44th Southern California Control Workshop, USC, Los Angeles, CA, Nov 2024.

T2. "Introduction to Control Lyapunov Functions and Control Barrier Functions and its Applications," MAE 207 Guest Lectures, UC San Diego, La Jolla, CA, Nov 2021.

T1. "Safe and Stable Controller Synthesis for Robotic Systems with Errors in Measurements and System Dynamics," 38th Southern California Control Workshop, UC Irvine, Irvine, CA, Oct 2021.

Professional Activities

- **Journal Reviewer**: IEEE Transactions on Robotics, International Journal of Robotics Research, IEEE Robotics and Automation Letter, IEEE Transactions on Automatic Control, IEEE/ASME Transactions on Mechatronics, IEEE Open Journal of Control Systems, IEEE Control System Letters, Advanced Robotics, Elsevier Mathematics and Computers in Simulation.
- **Conference Reviewer**: Robotics: Science and Systems (RSS) (2023, 2025), The Annual Conference on Neural Information Processing Systems (NeurIPS) (2025), IEEE International Conference on Robotics and Automation (ICRA) (2021 - present), Confernce on Robot Learning (CoRL) (2025), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2021 - present), Learning for Dynamics and Control Conference (L4DC) (2026), IEEE International Conference on Decision and Control (CDC) (2022 - present), American Control Conference (ACC) (2022 - present), IEEE Conference on Control Technology and Application (CCTA) (2025), ACM International Conference on Hybrid Systems: Computation and Control (HSCC) (2023).
- **Program Committee**: Robotics: Science and Systems (RSS) Pioneers 2026.
- **Session Chair**: IEEE International Conference on Robotics and Automation (ICRA) 2021.

Teaching Experience

- **Teaching Assistant,** MATH 171B: Intro Numerical Optimization: Nonlinear Programming — Spring 2022
- **Teaching Assistant,** MATH 171A: Intro Numerical Optimization: Linear Programming — Winter 2022
- **Teaching Assistant,** MATH 20E: Vector Calculus — Fall 2021
- **Teaching Assistant,** MATH 193A: Actuarial Mathematics — Summer 2021
- **Teaching Assistant,** MATH 170A: Intro Numerical Analysis: Linear Algebra — Fall 2020
- **Teaching Assistant,** MATH 20D: Introduction to Differential Equations — Summer 2020
- **Teaching Assistant,** MATH 18: Linear Algebra — Spring 2020
- **Teaching Assistant,** MATH 20B: Calculus for Science and Engineering — Winter 2020
- **Teaching Assistant,** MATH 20A: Calculus for Science and Engineering — Fall 2019

Mentoring

- **Ph.D. Student:**
  - Nikola Raicevic (UCSD) — 2024

  M.S. Student:
  - Sam Dang (UCSD) — 2025
  - Viswesh Nagaswamy Rajesh (UCSD) — 2025
  - Niyas Attasseri (UCSD) — 2024–2025
  - Kevin Shih (UCSD) — 2024
  - Fengrui Zhang (UCSD) — 2023
  - Yinzhuang Yi (UCSD) — 2022–2023

  Undergraduate Student:
  - Kushagra Mishra (UCSD) — 2025
  - Darren Ng (UCSD) — 2025
  - Xuezhou Xu (National University of Singapore) — Summer 2023