

Ali Kashani

Interested in Control Systems, Optimization,
and Physics-Informed Machine Learning.

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EDUCATION

- Ph.D.* in Mechanical Engineering,
University of New Mexico (UNM), NM, United States, 2021 - 2025,
Dissertation: Data-Driven Constrained Control,
Committee: Claus Danielson (advisor), Meeko Oishi, Rafael Fierro, Wenbin Wan.
- M.S.* in Electrical Engineering, University of Tehran, 2014 - 2017,
Thesis: Data-informed adaptive control of a 3-DOF Delta robot.
- B.S.* in Electrical Engineering, Shiraz University, 2010 - 2014,
Project: Designing and Prototyping Levelometer Based on Resonance Tubes.

JOURNAL PUBLICATIONS (PEER- REVIEWED)

1. Ali Kashani, Claus Danielson, "*Data-Driven Invariant Set for Nonlinear Systems with application to Command Governors*", *Automatica*, 2024
2. Shirin Panahi, Ali Kashani, Claus Danielson, "*Primal-Dual Interior-Point Algorithm for Symmetric Model Predictive Control*", *Automatica*, 2023
3. Ali Kashani, Shirin Panahi, Ankush Chakrabarty, Claus Danielson, "*Robust Data-Driven Dynamic Optimization using a Set-Based Gradient Estimator*", *Optimal Control Methods and Applications (OCAM)*, 2024
4. Ali Kashani, Amy Strong, Leila Bridgeman, Claus Danielson, "*Probabilistic Data-driven Invariance for Constrained Control of Nonlinear Systems*", *IEEE Control Systems Letters (L-CSS)*, 2024
5. Mehran Tamizi, Ali Kashani, Faraz Azad, Ahmad Kalhor, Mehdi Masouleh, "*Experimental study on a novel simultaneous control and identification of a 3-DOF Delta robot using model reference adaptive control*", *European Journal of Control (EJC)*, 2022

CONFERENCE PUBLICATIONS (PEER- REVIEWED)

1. Ali Kashani, Ahmad Kalhor, Babak Nadjar Araabi, Claus Danielson, "*Dead-beat Identification for Model Reference Adaptive Control*", *Proc. IEEE Conf. Decis. Control*, 2022.
2. Ali Kashani, Amy Strong, Leila Bridgeman, Claus Danielson, "*Probabilistic Data-driven Invariance for Constrained Control of Nonlinear Systems*", *American Control Conference (ACC)*, 2025
3. Amy Strong, Ali Kashani, Claus Danielson, Leila Bridgeman, "*Data Driven Synthesis of Invariant Sets for Unmodeled Dynamical Systems using a Tree Data Structure*", *American Control Conference (ACC)*, 2025
4. Amy Strong, Ali Kashani, Claus Danielson, Leila Bridgeman, "*Invariant set and Lyapunov function synthesis for unmodeled discrete, dynamical systems using tree data structures*", *IFAC Symposium on Nonlinear Control Systems*, 2025
5. Amy Strong, Ali Kashani, Claus Danielson, Leila Bridgeman, "*Learning Continuous Piecewise Affine Barrier Functions for Nonlinear Lipschitz Systems*", *NeurIPS Conference on Neural Information Processing Systems*, under review, 2025

PATENT

- Ganiyu Azeez, Ali Kashani, Claus Danielson, *A System and Method for Enforcing Operational Hard Constraints for an Air Conditioner* Provisional Patent

EXPERIENCE

Postdoctoral Research Associate

University of Virginia, United States,

UVA School of Data Science

Aug 2025 - present,

Collaborating with the UVA Center for Diabetes Technology on developing glucose control algorithms for artificial pancreas devices.

- Planning to develop personalized data-driven control methods to enhance safety, reliability, and real-time performance in medical device applications.

Graduate Researcher

University of New Mexico, United States,

Planning, Autonomy and Control Lab

2021 - July 2025,

For autonomous systems, developed physics-informed machine learning algorithms.

Designed learning-based control methods for safety-critical systems, self-driving cars, autonomous drones, and HVAC systems.

- Designed model predictive controllers (MPCs) for Large-scale multi-agent systems. (Automatica 2023)
- Reduced the computation time of large-scale multi-agent MPC of HVAC systems by a factor of $10^{-1} \times$ by leveraging symmetry in a primal dual optimization. (Automatica 2023)
- Designed formal data-driven methods for neural network Lyapunov and barrier functions with formal guarantees. (L-CSS, ACC, Automatica, NeurIPS)
- Introduced the concept of probabilistic invariance through a scenario optimization for data-driven constraint satisfaction. (L-CSS 2024)
- Designed iterative algorithms to computing maximal controlled invariant set for constraint enforcement of safety-critical systems.
- Developed and solved data-driven dynamic optimization problems using numerical methods including radial basis functions, splines, gaussian processes, and neural networks.
- Designed safety enforcing MPCs for the following problems: Lane Keeping in Autonomous Driving, leakage inspecting drone, and a HVAC high fidelity model in Thermosys. (Provisional Patent)
- Improved the efficiency of extremum seeking control by 50 – 100% through a novel polyhedral dynamic optimization. (OCAM 2024)
- Designed data-driven safety verification and constraint enforcement methods by learning barrier functions. The effectiveness of the method is showcased by soft-landing and lane keeping problems as well as complex and chaotic systems: Julia, Var der Pol, and Lorenz (PhD dissertation)

Graduate Researcher

University of Tehran,

Center of Excellence for Control and IP

2017-2020

For a Delta robot, developed a data-driven model-reference adaptive controller.

- Developed a novel system identification technique with the theoretically fastest convergence rate, dead-beat (CDC 2022).
- Designed a tracking controller for a 3DOF Delta robot using the novel dead-beat system identifier. (EJC 2022)
- Performed modeling, optimization, and sensitivity analysis for financial investments using the theory of Irreversible Investments under Uncertainties.

COMPUTER SKILLS

Programming: Python, C, C++, Matlab, \LaTeX ,

Software: PyTorch, TensorFlow, Keras, Simulink, LabView, Qt, CodeVision.

AWARDS

- Doctoral Conference Presentation Award UNM, 2022
- Mechanical Engineering Dove Graduate Fellowship Award UNM, 2022

INTERESTS

Dynamical Systems, Physics-Informed Deep Neural Networks, Optimization, Learning-Based Control.