

# Shadi Haddad

PHD CANDIDATE · APPLIED MATHEMATICS

Santa Cruz, CA

✉ shhaddad@ucsc.edu | 🏠 shadihdd.github.io | 🔗 shadi-haddad-8b2577204

## Education

### University of California, Santa Cruz

Santa Cruz, CA

#### PHD IN APPLIED MATHEMATICS

*Expected graduation in Aug 2023*

- Chancellor's Fellowship (2019)
- Applied Mathematics Research Award (2022)

### University of Tehran, College of Mechanical Engineering

Tehran, Iran

#### M.SC. IN MECHANICAL ENGINEERING

*January 2018*

- Thesis: "Second Order Sliding Mode Tracking Control of a Piezoelectric Tapered Micro Actuator with Axial Deflection and System Nonlinearity"
- Full Tuition Merit Scholarship

### Chamran University of Ahvaz, College of Mechanical Engineering

Ahvaz, Iran

#### B.SC. IN MECHANICAL ENGINEERING

*July 2015*

- Full Tuition Merit Scholarship

## Work & Research

### Graduate Student Researcher with the University of California at Santa Cruz

Santa Cruz, CA

*2019-Present*

- Optimization for control and machine learning
- Set-based reachability analysis
- Stochastic control and model predictive control

### Teaching Assistant with the University of California at Santa Cruz

- Convex optimization
- Introduction to Dynamical Systems
- Mathematical Methods for Engineering II

*Fall 2022*

*Fall 2021*

*Winter 2021*

### Graduate Student Researcher with the University of Tehran

Tehran, Iran

*2015-2018*

- Micro-beam mechanical design and vibration control

## Expertise and Skills

- Optimization and semidefinite programming (SDP), Machine learning (ML)
- Optimal Control, Stochastic Control, Model Predictive Control (MPC)
- Reachability analysis

### Programming

- MATLAB and Simulink, CVX, Python, Matplotlib, TensorFlow, MAPLE, C++, Numerical Methods, Physical Simulations, Scientific Visualization

### Engineering, Modelling, and Simulation

- SOLIDWORKS, ABAQUS, LabVIEW

### Technical Writing and Documentation

- $\text{\LaTeX}$ , Jupyter Notebook, Keynote

## Publications

Convex and Nonconvex Sublinear Regression with Application to Data-driven Learning of Reach Sets <b>Shadi Haddad, Abhishek Halder</b>	AMERICAN CONTROL CONFERENCE 2023
Hausdorff Distance between Norm Balls and their Linear Maps <b>Shadi Haddad, Abhishek Halder</b>	ARXIV:2206.12012 2022
Certifying the Intersection of Reach Sets of Integrator Agents with Set-valued Input Uncertainties <b>Shadi Haddad, Abhishek Halder</b>	IEEE CONTROL SYSTEMS LETTERS 2022
Density-Based Stochastic Reachability Computation for Occupancy Prediction in Automated Driving <b>Shadi Haddad, Abhishek Halder, and Baljeet Singh</b>	IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY 2022
Boundary and Taxonomy of Integrator Reach Sets <b>Shadi Haddad, Abhishek Halder</b>	AMERICAN CONTROL CONFERENCE 2022
Anytime Ellipsoidal Over-approximation of Forward Reach Sets of Uncertain Linear Systems <b>Shadi Haddad, Abhishek Halder</b>	CPS IOT WEEK WORKSHOP 2021
The Curious Case of Integrator Reach Sets, Part I: Basic Theory <b>Shadi Haddad, Abhishek Halder</b>	ARXIV:2102.11423L 2021
Prediction and Optimal Feedback Steering of Probability Density Functions for Safe Automated Driving <b>Shadi Haddad, Kenneth F Caluya, Abhishek Halder, Baljeet Singh</b>	IEEE CONTROL SYSTEMS LETTERS 2020
The Convex Geometry of Integrator Reach Sets <b>Shadi Haddad, Abhishek Halder</b>	AMERICAN CONTROL CONFERENCE 2020 INTERNATIONAL JOURNAL OF CONTROL 2018
Observer Based Fault Reconstruction Schemes Using Terminal Sliding Modes <b>M. Mousavi, M. Rahnnavard, S. Haddad</b>	
Analytical Study on Nonlinear 3D Coupled Deformations of Tapered FG Micro-beams Accounting for Size Effects <b>S. Haddad, M. Baghani</b>	IRANIAN JOURNAL OF SCIENCE AND TECHNOLOGY 2018

## Talks and Presentations

<b>IEEE Conference on Decision and Control</b> JOURNAL PAPER AND CONFERENCE TALK “Certifying the Intersection of Reach Sets of Integrator Agents with Set-valued Input Uncertainties ”	Cancún, Mexico 2022
<b>American Control Conference</b> JOURNAL PAPER AND CONFERENCE TALK “Boundary and Taxonomy of Integrator Reach Sets”	Atlanta, GA 2022
<b>American Control Conference</b> JOURNAL PAPER AND CONFERENCE TALK “Prediction and Optimal Feedback Steering of Probability Density Functions for Safe Automated Driving”	Virtual 2021
<b>3rd NorCal Control Workshop</b> CONFERENCE TALK “The Convex Geometry of Integrator Reach Sets”	Virtual 2021
<b>American Control Conference</b> CONFERENCE PAPER AND TALK “The Convex Geometry of Integrator Reach Sets”	Virtual 2020
<b>Bay Area Robotics Symposium</b> SPOTLIGHT TALK AND POSTER PRESENTATION “Understanding the Geometry of Integrator Reach Sets for Robotics Applications”	University of California at Berkeley 2019

## Professional Activities

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- 2023 **Reviewer for 2023 American Control conference**
- 2022 **Reviewer for 2022 IEEE Conference on Decision and Control**
- 2022 **Reviewer for 2022 American Control conference**
- 2021 **Reviewer for 2021 IEEE Control Systems Letters**
- 2021 **Reviewer for 2021 IEEE Conference on Decision and Control**
- 2021 **Reviewer for 2021 CPS IoT Week Workshop on Computation-Aware Algorithmic Design for Cyber-Physical Systems**
- 2020 **Reviewer for 2020 IEEE Conference on Decision and Control**

## Honors & Awards

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- 2022 **Applied Mathematics Research Award**, University of California at Santa Cruz *Santa Cruz, CA*
- 2022 **Student Travel Award**, IEEE Control Systems Society, American Control Conference *Atlanta, GA*
- 2022 **Advancement to Ph.D Candidacy with Honors**, University of California at Santa Cruz *Santa Cruz, CA*
- 2021 **Student Travel Award**, IEEE Control Systems Society, American Control Conference *New Orleans, LA (Virtual)*
- 2020 **Student Travel Award**, IEEE Control Systems Society, American Control Conference *Denver, CO (Virtual)*
- 2019 **Chancellor's Fellowship**, University of California at Santa Cruz *Santa Cruz, CA*
- 2015 **Full Tuition Merit Scholarship**, University of Tehran *Tehran, Iran*
- 2011 **Full Tuition Merit Scholarship**, Chamran University of Ahvaz *Ahvaz, Iran*

## Selected Graduate Courses

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**Machine Learning, Convex Optimization, Nonlinear Control Theory, Applied Optimal Control,  
Finite Element Method**

*UC Santa Cruz  
University of Tehran*