

# Shadi Haddad

PHD CANDIDATE · APPLIED MATHEMATICS

Santa Cruz, CA

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## Education

### University of California, Santa Cruz

Santa Cruz, CA

#### PHD IN APPLIED MATHEMATICS

*Expected graduation in Aug 2023*

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

### 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, Data Structure, 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

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

## Talks and Presentations

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

## Professional Activities

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- 2023 **Reviewer for Journal of Systems and Control Letters**
- 2023 **Reviewer for Journal of Optimization Theory and Applications**
- 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,** *UC Santa Cruz*
- Finite Element Method** *University of Tehran*