

## Education

**University of California, Berkeley** Fall 2021 - Expected Spring 2026  
Ph.D. Student in Electrical Engineering and Computer Sciences

**University of California, Berkeley** Fall 2017 - Spring 2021  
B.S. in Electrical Engineering and Computer Sciences  
Graduated with Highest Honors  
GPA: 4.0 / 4.0

*Relevant Coursework:*

- Reinforcement Learning, Machine Learning, Artificial Intelligence.
- Nonlinear System Theory, Linear System Theory, Robotics.

## Research Interests

*Safe learning in control; control theory; reinforcement learning.*

Application of machine learning to control, with an emphasis on safety guarantees, particularly under model uncertainty.

## Professional Experience

**Power System Control and Optimization Intern at Siemens** Spring 2023  
Development of an algorithm to safely handle power-line failures (contingencies) in a computationally tractable manner by grouping contingencies by similarity from a controls perspective, and designing one controller per group of contingencies. Paper published in IEEE Transactions on Power Systems.

**Embedded Software Simulation Intern at Waymo** Summer 2020  
Design and implementation of a C++ library for loading and simulating interconnected models of hybrid dynamical systems using the Functional Mock-up Interface standard.

**Autoflight Intern for 777X Program at Boeing** Summer 2019  
Creating monitors of autonomous takeoff. Modeling in Simulink, simulation of models, and analysis of data with MATLAB.

**Intelligent Robotics Group Intern at NASA Ames** Summer 2018  
Research and implementation of algorithms for relative localization of nodes in a wireless sensor network using ultra-wide band radios for pair-wise distance measurement. Additional hardware and firmware prototyping of nodes.

## Works Under Review

- **Neelay Junnarkar**, Murat Arcak, and Peter Seiler. *Synthesizing Neural Network Controllers with Closed-Loop Dissipativity Guarantees*. 2024. arXiv: 2404.07373 [eess.SY]  
Submitted to IFAC Automatica.

- **Neelay Junnarkar**, Can Kizilkale, Nevena Golubovic, Murat Arcak, and Aydin Buluc. *Sempervirens: A Fast Matrix Reconstruction Algorithm for Noisy and Incomplete Matrix Representations of Phylogenetic Trees*. 2023  
Submitted to INFORMS Journal on Computing.

## Publications

- **Neelay Junnarkar**, Murat Arcak, and Peter Seiler. *Stability Margins of Neural Network Controllers*. 2024. arXiv: 2409.09184 [eess.SY]  
Accepted to 2025 American Control Conference.
- Emily Jensen, **Junnarkar**, **Neelay**, Murat Arcak, Xiaofan Wu, and Suat Gumussoy. “Certifying Stability and Performance of Uncertain Differential-Algebraic Systems: A Dissipativity Framework”. In: *IEEE Transactions on Control of Network Systems* (2024). DOI: 10.1109/TCNS.2024.3510585
- Yasin Sonmez, **Neelay Junnarkar**, and Murat Arcak. “Exploiting Symmetry in Dynamics for Model-Based Reinforcement Learning With Asymmetric Rewards”. In: *IEEE Control Systems Letters* 8 (2024). DOI: 10.1109/LCSYS.2024.3409560
- **Neelay Junnarkar**, Emily Jensen, Xiaofan Wu, Suat Gumussoy, and Murat Arcak. “Grouping of N-1 Contingencies for Controller Synthesis: A Study for Power Line Failures”. In: *IEEE Transactions on Power Systems* (2024). DOI: 10.1109/TPWRS.2024.3393866
- **Neelay Junnarkar**, He Yin, Fangda Gu, Murat Arcak, and Peter Seiler. “Synthesis of Stabilizing Recurrent Equilibrium Network Controllers”. In: *2022 IEEE 61st Conference on Decision and Control (CDC)*. 2022. DOI: 10.1109/CDC51059.2022.9992684
- **Neelay Junnarkar**, Emmanuel Sin, Peter Seiler, Douglas Philbrick, and Murat Arcak. “Fast Assignment in Asset-Guarding Engagements using Function Approximation”. In: *2022 American Control Conference (ACC)*. 2022. DOI: 10.23919/ACC53348.2022.9867720

## Presentations

- “Synthesis of Stabilizing Recurrent Equilibrium Network Controllers”, December 2022  
2022 IEEE 61st Conference on Decision and Control (CDC), Cancún, Mexico.
- “Synthesis of Stabilizing Recurrent Equilibrium Network Controllers”, June 2022  
NorCal Controls Workshop, UC Santa Cruz, Santa Cruz, California.
- “Fast Assignment in Asset-Guarding Engagements”, June 2022  
2022 American Control Conference (ACC), Atlanta, Georgia.

## Other Experience

**Undergraduate researcher in UC Berkeley Arcak lab** (Advisor: Murat Arcak)  
Fall 2019 - Summer 2021

- Synthesizing safe exploratory controllers to optimally gather data to improve a learned Gaussian Process model of a dynamical system using control barrier functions and sum-of-squares programming.
- Toolbox for Interval Reachability Analysis (TIRA): Implementing, testing, and optimizing methods for interval over-approximation of reachable sets for dynamical systems.

- Training and testing classifiers to select optimal parameters for multiple interceptors to intercept threat missiles under uncertainty. Used this classifier as a fast (real-time) approximation of a detailed but computationally expensive dynamics model.

### **Avionics Lead for Space Technologies and Rocketry (STAR) Club**

Lead: Summer 2019 - Spring 2021, Member: Fall 2017 - Spring 2021

- Lead for design and implementation of club's avionics projects, and coordination of avionics with other rocket subsystem development.
- Designed an ARM microcontroller based ground station (schematic, PCB layout, and firmware) to relay telemetry and commands between a computer and the rocket via radio. Additional work on desktop-based software for live telemetry visualization.

### **Undergraduate researcher in UC Berkeley Swarm lab (Advisor: Kristofer Pister)**

Spring 2018 - Spring 2019

- Research of computationally-inexpensive pose-estimation algorithms fusing IMU data for implementation on ARM Cortex-M4 processors.

## **Teaching Experience**

### **Teaching Assistant for Linear System Theory**

Fall 2022

Taught recitation section, developed homeworks, graded homeworks and exams.

## **Honors and Awards**

- Dean's Honors List: GPA in the top 10% in the College of Engineering, UC Berkeley.

## **Skills and Interests**

**Languages:** Python, C++, MATLAB, Rust, C.

**Software:** PyTorch, TensorFlow, UNIX & Linux.