

Trevor Loe

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Education

- **University of California, Los Angeles** **Los Angeles, CA**
Doctor of Philosophy in Mathematics (Applied) *September 2024 – June 2029*
 - Applied concentration
- **California Polytechnic State University, San Luis Obispo** **San Luis Obispo, CA**
Bachelor of Science in Physics and Mathematics, Summa Cum Laude *September 2019 – December 2023*
 - Double major in physics and mathematics
 - Cumulative GPA of **3.95**
 - Coursework in differential equations, real/complex analysis, classical/quantum mechanics, statistical mechanics, differential geometry, abstract algebra, electromagnetism, and data science

Research Experience

- **SULI (Science Undergraduate Laboratory Internship)** **Fermi National Accelerator Laboratory**
External beam delivery department *June 2022 – August 2022*
 - Worked under Dr. Diktys Stratakis in the accelerator division on simulation and data analysis to support the Muon g-2 and Mu2e experiments
 - Ran simulations in G4beamline (a Geant4 based simulation toolkit) of beamline and beam optics
 - Extracted Courant-Snyder parameters from beam data taken within the Fermilab muon campus via python
- **Crab Cavity Accelerator Research** **Cal Poly SLO**
Physics department *January 2021 – Present*
 - Worked under Dr. Themis Mastoridis in the investigation of control system design for crab cavities in the EIC and HL-LHC
 - Created simulation framework in MATLAB/Simulink to test transverse beam stability and power draw with different controller configurations
 - Integrated fortran code from Brookhaven National Lab to determine adequate system impedance reduction with different controller configurations
 - Contributed to presentation given to Brookhaven National Laboratory and presented work at APS FWS meeting, CSU Research Competition
- **COMAP Mathematical Contest in Modeling** **Cal Poly SLO**
Mathematics Department *February 2020/2021/2022*
 - Competed each year for 3 years representing Cal Poly in international math competition
 - Contest consists of a 4 day long period of research real-world problem, creating and simulating a mathematical model for the problem, and writing a 25-page research report on the model developed
 - Topics: 2020 - migrating fish populations in northern Scotland; 2021 - fungal growth and decomposition of ground litter; 2022 - optimal power output for long-distance road cyclists
 - Successful participant in 2020 and 2021 competition and finalist/MAA award in 2022 competition
- **Technical Intern in Modeling and Simulation** **Johns Hopkins University Applied Physics Lab**
Special concepts and engineering section *June 2021 – August 2021*
 - Worked on several projects in modeling and simulation as part of a 10-week technical internship
 - Developed a matlab/simulink model for the hydraulic system of a submarine as part of a larger-scale

submarine pilot training simulation

- Worked on and debugged numerical simulation of undersea cable dynamics
- Work involved coding in matlab, C#, C++ and large-scale collaborative coding through git

Aerospace Engineering Team Member/ADCS Team Lead

Cal Poly CubeSat Laboratory

Cal Poly aerospace engineering department

November 2019 – June 2022

- Worked on the design, simulation, and testing of the CubeSat attitude determination and control system (ADCS)
- Developed matlab/python simulations in system power, spacecraft/orbital dynamics, and control loops as well as supported software implementation of controllers and sensors as a member of the aerospace engineering team
- Organized meetings, mentored younger students, and provided trainings in control theory, rigid body dynamics, and matlab as the ADCS team lead

Work Experience

Embedded Systems and Algorithms Software Engineer

Goleta, CA

Toyon Research Corporation

January 2024 - September 2024

- Designed, implemented, and tested control algorithms for both electric motor and RF systems on several embedded platforms including TI C2000 and EFM32
- Simulated and implemented digital signal processing techniques in MATLAB and ROS2 environments
- Designed and implemented MATLAB/Simulink Coder workflow for deployment of real-time algorithms on embedded systems
- Assisted with proposal writing

Presentations

MAA MathFest 2022

Philadelphia, PA

Undergraduate poster session

August 5th 2022

- Presented work "Applying Optimal Control with SQP to Cycling Performance Represented by Constituent Course Elements" as part of the "Research in Motion" undergraduate poster session
- Presented work done for award winning paper submission in the COMAP mathematical contest in modeling
- Poster presentation designated by MAA as one of the "outstanding posters" for undergraduate session

SULI poster session

Fermi National Accelerator Laboratory

Summer poster presentation

August 10th 2022

- Presented "Beam Optics Analysis from the Mu2e External Line Commissioning" to Fermilab scientists and engineers
- Presentation based on research work done over the 10-week summer period on initial beam data analysis and comparison to simulation

APS Far West Section Meeting

University of Hawai'i at Mānoa, Honolulu, HI

Poster session

October 7th 2022

- Presented "Crab Cavity Low-Level RF Design Simulation Tools for the Electron-Ion Collider" as part of student poster session

CSU Research Competition

Cal Poly, SLO/ San Diego State University, San Diego, CA

Research Presentation

February 25th/ April 29th 2023

- Presented "EIC Crab Cavity Low-Level RF Design" to a panel of judges and students at Cal Poly (Feb) and at SDSU (Apr) for the CSU Research Competition in the Mathematical Science undergraduate section
- One of 10 students selected to present again at the state-wide competition at San Diego State University

- **CSM Student Research Conference** **Cal Poly, SLO**
May 18th, 2023
 - *Research Presentation*
 - Presented "EIC Crab Cavity Low-Level RF Design" to students and faculty in the college of science and mathematics
- **APS Far West Section Meeting** **UCSD, San Diego, CA**
October 7th 2023
 - *Research Presentation*
 - Presented "EIC Crab Cavity Low-Level RF Design" in session on accelerator and high energy physics

Awards

- **Academic Excellence Award in Physics** May 18th 2024
 - *Presented by the Bailey College of Science and Mathematics for academic excellence*
- **MCM Finalist and MAA Award for Question A** May 2022
 - *2022 COMAP MCM submission, "Applying Optimal Control with SQP to Cycling Performance"*
Represented by Constituent Course Elements
- **2022 MAA MathFest Outstanding Poster** August 6th 2022
 - *Presentation of MCM 2022 Submission*
- **President's Honor List** 2019-2023
 - *For a consistent GPA above 3.5 for 3 quarters out of the year*
- **SPS Poster Award** November 1st 2022
 - *For presentation of "Crab Cavity Low-Level RF Design Simulation Tools for the Electron-Ion Collider" at APS FWS*
- **Physics Dept. Outstanding Student Award** June 10th 2024
 - *Presented by the physics department for academic excellence, research, and project excellence*

Skills

- **Coding Languages:** python, matlab, mathematica, embedded C, C++, html, C#, fortran
- **Coding Workflow:** gitlab, github, scrum
- **Other Software Environments:** ROS2, Simulink, Unreal Engine
- **LaTeX Typesetting:** beamer (for presentations), beamer (for posters), BAPoster

Other Experience

- **Engineering Technical Intern** **Raytheon Technologies, El Segundo, CA**
June 2020-August 2020
 - *Airborne Radar Section*
 - Worked on a team of 4 interns on the systems engineering team in developing a simulation of the F-15 airborne radar returns from digital terrain elevation data (DTED)
 - Modified simulation to different operating bandwidths, different antenna patterns (from a separate antenna model) and different signal processing techniques
- **Upper Division Math Grader** **Cal Poly SLO**
September 2022 – June 2023
 - *Mathematics department*
 - Worked as a grader for the upper division, intro to analysis series (Math 412,413,414), introduction to proofs (Math 248), and calculus 4 (241) for Dr. Erin Pearse
- **Modern Physics Grader** **Cal Poly SLO**
January 2021 – March 2021
 - *Physics department*

- Worked as a grader for the modern physics course for Dr. Oleg Kogan

Publications

Josh Grace, Luca Merlo Paula Soares, Trevor Loe, and John Bellardo. *A Low Cost Star Tracker for CubeSat Missions*. 2021. URL: <https://arc.aiaa.org/doi/abs/10.2514/6.2022-0520>, arXiv: <https://arc.aiaa.org/doi/pdf/10.2514/6.2022-0520>, doi:10.2514/6.2022-0520.

Trevor Loe. Beam optics analysis from the mu2e external line commissioning. 1 2022. URL: <https://www.osti.gov/biblio/1880573>, doi:10.2172/1880573.

Trevor Loe and Diktys Stratakis. Commissioning the muon campus external beamline: first beam optics measurement. *Journal of Instrumentation*, 18(04):P04005, apr 2023. URL: <https://dx.doi.org/10.1088/1748-0221/18/04/P04005>, doi:10.1088/1748-0221/18/04/P04005.

Trevor Hidalgo Trevor Loe Matti Toivola Themis Mastoridis, Kevin Smith. Time-domain simulation of the crab cavity/beam interaction. *BNL Technical Notes*, (EIC-ADD-TN-039), Feb 2023. URL: <https://technotes.bnl.gov/Home/ViewTechNote/224087?selectedPageNumber=0>.