

# Trevor Loe

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## Education

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- **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

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- **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

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**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

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**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

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

## Skills

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- **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

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- **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

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T. Mastoridis, T. Loe, and M. Blaskiewicz. Electron-ion collider transverse instabilities due to the crab cavity fundamental impedance. *Phys. Rev. Accel. Beams*, 28:011001, Jan 2025. URL: <https://link.aps.org/doi/10.1103/PhysRevAccelBeams.28.011001>, doi:10.1103/PhysRevAccelBeams.28.011001.

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.

Themis Mastoridis, Kevin Smith, Trevor Hidalgo, and Matti Toivola Trevor Loe. 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>.

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

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.