

Trevor Loe

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Education

- **California Polytechnic State University, San Luis Obispo** **San Luis Obispo**
Bachelor of Science in Physics and Mathematics, Summa Cum Laude *September 2019 – June 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
- **Solid state physics research** **Cal Poly SLO**
Physics Department *April 2020 – December 2020*
 - Worked with Cal Poly physics department faculty member Dr. Matt Beekman in analyzing previously gathered results of x-ray diffraction of type 2 clathrates under different temperatures for the purpose of seeing negative thermal expansion.
 - Applied simplified crystal lattice dynamics model (debye model) to hypothetical 1-D crystal lattice; obtained numerical (with python) and analytical results for comparison of model in different scenarios

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

Awards

- **MCM Finalist and MAA Award for Question A**
- **2022 COMAP MCM submission, "Applying Optimal Control with SQP to Cycling Performance 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*

Skills

- **Coding Languages:** python, matlab, (proficient), mathematica, C++, html, C#, fortran (somewhat proficient)
- **Coding Workflow:** gitlab, github, scrum
- **LaTeX Typesetting:** beamer (for presentations), beamer (for posters), BAPoster

Other Experience

- **Engineering Technical Intern** **Raytheon Technologies, El Segundo, CA**
Airborne Radar Section *June 2020-August 2020*
 - 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**
Mathematics department *September 2022 – June 2023*
 - 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**
Physics department *January 2021 – March 2021*
 - 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>.