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 – December 2023*

- Double major in physics and mathematics
- Cummulative GPA of **3.94**
- Coursework in differential equations, real/complex analysis, classical/quantum mechanics, statistical mechanics, differential geometry, abstract algebra, electromagnatism, 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.