

Max Varverakis

🐙 GitHub: [MaxVarverakis](#) | [in](#) LinkedIn: [MaxVarverakis](#) | ✉ maxvarverakis@ucla.edu | 📞 +1 (248) 943 3648

EDUCATION

2025 – Present	Ph.D., Physics	UCLA, Los Angeles
2022 – 2024	M.S., Applied Mathematics	Cal Poly, San Luis Obispo
2019 – 2024	B.S., Mathematics	Cal Poly, San Luis Obispo
2019 – 2024	B.S., Physics	Cal Poly, San Luis Obispo

RESEARCH EXPERIENCE

Accelerator Physics Intern – Computational Accelerator Physics January 2025 – March 2025
SLAC National Accelerator Laboratory | FACET-II, SLAC Group

- Performed jitter simulations of FACET-II lattice parameters using Impact-T and Bmad.
- Large parallelized simulations were carried out on the high performance computer clusters NERSC and S3DF.
- Performed convergence scan of Impact-T to determine optimal simulation resolution.
- Consulted with experts in the FACET-II cohort to understand the implications of jitter on beam quality.
- Learned essential accelerator physics concepts and technologies, such as beam optics and lattice design.
- Presented simulations results bi-weekly to the FACET-II start-to-end simulation group.

Accelerator Physics Intern – Theoretical and Computational Particle Physics Sept 2024 – December 2024
SLAC National Accelerator Laboratory | Michael Peskin, Ph.D., SLAC Professor

- Derived Feynman rules for QED in the light-front gauge using the Lagrangian density.
- Calculated helicity differential cross sections for $2\gamma \rightarrow e^+e^-$ and Compton scattering using Mathematica.
- Obtained Compton scattering amplitude and differential cross section using standard QFT techniques.
- Ran HiPACE++ simulations of positron plasma wakefield acceleration on LUMI to probe beam stability.
- Performed G4Beamline simulations of a liquid xenon positron target to better understand the energy deposition density profile throughout the volume. Target windows were also examined.

Applied Mathematics Graduate Researcher – Representation theory Sep 2023 – Jun 2024
Cal Poly, San Luis Obispo | Sean Gasiorek, Ph.D., Assistant Professor

- Investigated representation theory in the context of mathematical/theoretical physics by studying literature in diverse areas, ranging from group and knot theory to quantum mechanics.
- Utilized irreducible representations and Lie group generators to observe the emergence of discretization and conservation laws in quantum systems.
- Explored the braid group and its representations in the context of anyons, culminating in a [master's thesis](#) that covers a wide breadth of applications of representation theory in physics.

Computational Accelerator Physics Intern – Plasma wakefield acceleration Jun 2023 – Nov 2023
SLAC National Accelerator Laboratory | Spencer Gessner, Ph.D., Staff Scientist

- Simulated plasma wakefield acceleration (PWFA) of positron beams using HiPACE++ simulation code.
- Re-derived theoretical model of linear-regime PWFA and compared them to simulations analyzed in Python.
- Collaborated with physicists internationally (SLAC, LBNL, DESY) to tune simulation parameters.
- Read 15+ papers on plasma wakefield acceleration to understand the physics and current research.
- Wrote and submitted a manuscript to be [published](#) in *Journal of Physics: Conference Series*.
- [Presented](#) research to 30+ leading experts in plasma wakefield acceleration at FACET-II User Meeting.

Computational Accelerator Physics Intern – Liquid xenon positron source Jun 2022 – Mar 2023
SLAC National Accelerator Laboratory | Spencer Gessner, Ph.D., Staff Scientist

- Wrote code in C++ using GEANT4 library to simulate novel positron source. Analyzed results in Python.
- Developed engineering requirements for a liquid xenon positron source with physicists at SLAC and Jefferson Lab. Consulted with physicist at RIKEN (Nishina) to conduct simulations.
- Wrote and [published](#) peer-reviewed article in *Nuclear Inst. and Methods in Physics Research Sec. A*.
- [Presented](#) research to 20+ accelerator physicists at Intl. Workshop on Future Linear Colliders. Presented [poster](#) at APS April Meeting.

- Designed and built linear actuator prototype with force sensor to measure hysteresis in knitted materials.
- Wrote custom Arduino (C++) code with documentation to control stepper motor and collect force data.

Computational Soft Matter Physics Research Assistant – *Memory physics*

Mar 2021 – Aug 2021

Cal Poly, San Luis Obispo | Hilary Jacks, Ph.D., Assistant Professor

- Studied information theory in 2D disordered systems using the Python library SwellPy.
- Implemented anisotropy functionalities in SwellPy to improve the memory capacity of disordered systems.
- [Presented](#) at Frost Summer Physics Symposium; presented [poster](#) at APS Far West Section Meeting.

PROGRAMMING SKILLS

Languages	Python, C++, Bash/Zsh, JSON
Programs	MATLAB, Mathematica, Microsoft Excel, SolidWorks
Markup	L ^A T _E X, HTML, CSS, Markdown
Misc.	Machine learning (Pytorch, scikit-learn), High performance computation (LUMI, S3DF, NERSC), Git, PGF/TikZ

PUBLICATIONS AND PREPRINTS

Varverakis, Max, Robert Holtzapple, Severin Diederichs, Carl Schroeder, and Spencer Gessner (2023a). “Energy recovery in filament-regime plasma wakefield acceleration of positron beams”. In: *(Accepted) J. Phys.: Conf. Ser.* DOI: [10.48550/ARXIV.2311.07087](https://doi.org/10.48550/ARXIV.2311.07087). URL: <https://arxiv.org/abs/2311.07087>.

Varverakis, Max, Robert Holtzapple, Hiroki Fujii, and Spencer Gessner (Aug. 2023b). “A liquid xenon positron target concept”. In: *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 1053, p. 168329. ISSN: 0168-9002. DOI: [10.1016/j.nima.2023.168329](https://doi.org/10.1016/j.nima.2023.168329). URL: <http://dx.doi.org/10.1016/j.nima.2023.168329>.

TALKS/POSTERS

2025	Updated simulations of a LXe e^+ target	US-Japan Advanced e^+ Source Concepts Meeting
2024	Representation Theory and its Applications in Physics	Cal Poly Master’s Thesis Defense Colloquium
2023	Energy Recovery for Plasma-based Positron Acceleration	FACET-II User Meeting
2023	Liquid Xenon Positron Target	Intl. Workshop on Future Linear Colliders
2023	Liquid Xenon Positron Target (Poster)	APS April Meeting
2021	Multiple Memories in an Anisotropic Swelling System (Poster)	APS Far West Section
2021	Multiple Memories in an Anisotropic Swelling System	Frost Summer Physics Symposium

TEACHING EXPERIENCE

Teaching Associate – *Calculus for Business and Economics*
Cal Poly, San Luis Obispo

Apr 2023 – Jun 2024

- Taught 4-unit course MATH 221 for 3 quarters, totaling ~370 hours and 160 students.
- Lectured 4 hours/class weekly. Wrote lesson plans, quizzes, and exams. Held 1 office hour/class weekly.

AWARDS/HONORS

2024	Received Master’s Degree With Distinction	Cal Poly, Mathematics Dept.
2021	Advancement of Science and Technology Scholarship	Cal Poly, Mathematics Dept.
2021	Top Applicant Stipend	CMAF Summer School Program