Sven Harder

Ph.D. candidate in theoretical physics, UCLA

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Research Interests

Quantum field theory and strongly coupled dynamics; generalized symmetries and defects; gauge theories of quantum critical points in $2+1$ dimensions; thermal order; supersymmetry and its breaking; machine learning for theoretical physics, including Feynman integrals for gravitational-wave physics.

Education

University of California, Los Angeles 2021 – 2027 (expected)

Ph.D. in Theoretical Physics, advisor Prof. Thomas Dumitrescu. GPA 4.0/4.0. M.Sc. in Physics, 2022.

Universität Hamburg, Germany 2018 – 2021

B.Sc. in Physics, GPA 4.0/4.0, top of class.

Research

Graduate Student Researcher, UCLA 2023 – present

- Thermal order: conformal field theories that stay superfluid at every temperature.
- Generalized symmetries and line defects: 2-group symmetries and tilt operators; magnetic line defects in $2+1$-dimensional gauge theories.
- Supersymmetry breaking and background supergravity in three- and four-dimensional gauge theories.

Visiting Researcher, SLAC National Accelerator Laboratory 2026 – present

Machine learning for master integrals and canonical bases of post-Minkowskian Feynman integrals.

B.Sc. thesis, Universität Hamburg, CMS group 2021

Machine-learned refinement of fast LHC simulation with a Wasserstein GAN in PyTorch. Code.

Publications

- S. Harder, T. Jacobson and Z. Sun, *Tilts from 2-Groups*, arXiv:2608.04248 (2026).
- S. Harder and A. Sharon, *A Superfluid at All Temperatures*, arXiv:2610.10169 (2026).
- S. Harder, Z. Komargodski, F. K. Popov, A. Sharon and Claude, *Resisting Misalignment*, blog post, Bhaumik Institute, UCLA (2026). Link.

Talks and Lectures

***Understanding Extended Magnetic Defects*, SCGP, Stony Brook** Nov. 2026

Invited seminar. Video.

Lecturer, California AI Amplitudes School and Workshop, UCLA Nov. 2026

Awards and Fellowships

Ernst Adolf Marum Fellowship, UCLA 2024, 2025

UCLA Prize for Outstanding Teaching 2023

Heinrich Hertz Prize for the best B.Sc. in Physics, Universität Hamburg 2022

Hamburg Prize for Excellent Teaching 2021

Studienstiftung des deutschen Volkes (German Academic Scholarship Foundation) 2020

Teaching and Service

Teaching Assistant, UCLA 2021 – present

Graduate QFT I–III, electromagnetism, classical mechanics and lab courses; about 600 students in total.

Organizing committee, California AI Amplitudes School and Workshop, UCLA (2026); journal club organizer, Bhaumik Institute, UCLA. Participant, IHES school *Symmetries and Anomalies: a Modern Take* (2024).

Computational Skills

Python (NumPy, SciPy, SymPy, PyTorch, JAX), Mathematica, C/C++; integration-by-parts reduction (FIRE); cluster and GPU computing; research workflows with AI coding agents.