

YUAN LUO

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EDUCATION

University of California, Davis Ph.D. in Applied Mathematics	<i>2022 - 2026 (expected)</i> <i>GPA 3.9/4.0</i>
University of Chicago M.S. in Computational and Applied Mathematics	<i>2020 - 2022</i> <i>GPA 3.8/4.0</i>
University of Liverpool B.S. (First Class Honors) in Applied Mathematics	<i>2016 - 2020</i> <i>GPA 3.8/4.0</i>

TECHNICAL SKILLS

Languages: C++, Python (NumPy, PyTorch, Weights & Biases), Lean 4

Parallelism: Taskflow, CUDA

Math: computational topology, geometry processing, shape analysis

Tools: CMake, Pybind11, Git, Docker, Tmux, SLURM, Lawrencium (LBNL HPC), Cursor, Codex

WORK EXPERIENCE

Machine Learning Software Engineer Intern

Jun 2025 - Sep 2025

Meta (Ads Ranking Team)

- Built a production feature-importance aggregation API for ads ranking models, generating scores from historical records and reducing computation time from days to minutes.

Research Intern

Jul 2024 - Sep 2024, Jun 2026 - Present

International Computer Science Institute

- Developed and implemented a C++ algorithm for multi-parameter persistent homology, reducing time complexity from $O(n^3)$ to $O(n \log n)$.
- Developed a reinforcement learning framework for verifiable mathematical search over discrete Morse vectors, improving optimal-vector success rate by 20% over a baseline policy.

Graduate Research Assistant

Sep 2022 - Present

University of California, Davis

- Built **geomp**, a C++/Python library for parallel geodesic computation and torus shape comparison, supporting a conditionally accepted SIGGRAPH Asia 2026 Journal paper.
- Built PyTorch pipelines to minimize geometric loss on meshes, with checkpoint-resume and experiment tracking.

NSF-Mathematical Sciences Graduate Internship

Jun 2023 - Aug 2023

Lawrence Berkeley National Laboratory

- Developed topological optimization heuristics as a custom PyTorch layer, improving loss convergence in generative-model and time-series data-cleaning experiments.

CODING PROJECTS

- *2024.10 - 2026.01* [geompp](#) (hidden for paper review)
C++/Python geometry library for parallel geodesic computation, mesh-based energy optimization, and torus shape-space comparison.
- *2026.05* [hyperbolic-shape-morphing](#)
Generated hyperbolic kaleidoscope patterns by shape morphing and geometric energy minimization on the hyperbolic disk.
- *2024.07 - 2024.09* [graph-mpH0](#)
C++/Python implementation of efficient 0-dimensional multi-parameter persistent homology on graphs.
- *2022.01 - 2022.06* [Torch-TDA](#)
PyTorch package exposing differentiable topological features for neural-network training loops.
- *2021.06 - 2021.09* [NLP+RSA](#)
Transformer-based sequence model for decrypting messages generated from the RSA encryption algorithm.
- *2021.04 - 2021.07* [BATS](#)
C++ library for computing and visualizing persistent homology, used as a backend for applied topology workflows.

PUBLICATIONS

- Yuan Luo, Yanwen Luo, Patrice Koehl and Joel Hass. Computing a Metric on the Shape Space of Tori, Conditionally accepted to the SIGGRAPH Asia 2026 Journal Track.
- Yuan Luo, Dmitriy Morozov and Luis Scoccola. [Computing Betti tables and minimal presentations of zero-dimensional persistent homology](#), *arXiv preprint arXiv:2410.22242*, 2026.
- Yuan Luo and Bradley J Nelson. [Accelerating Persistent Homology Computations with Warm Starts](#), *Computational Geometry*, page 102089, 2024.
- Bradley J Nelson and Yuan Luo. [Topology-Preserving Dimensionality Reduction via Interleaving Optimization](#), *arXiv preprint arXiv:2201.13012*, 2022.

ACADEMIC SERVICES

- Reviewer: Journal of Applied and Computational Topology
- Reviewer: Symposium on Computational Geometry (SoCG)
- Teaching Assistant: Calculus, Optimization, Linear Algebra at UC Davis