YUAN LUO

Email: luoyuan9809@gmail.com ⋄ Personal website: https://yluo.org

EDUCATION

University of California, Davis *2022 - 2026(expected)*
Ph.D. in Applied Mathematics *GPA 3.9/4.0*

University of Chicago *2020 - 2022*
M.S. in Computational and Applied Mathematics *GPA 3.8/4.0*

University of Liverpool *2016 - 2020*
B.S. (First Class Honors) in Applied Mathematics *GPA 3.8/4.0*

TECHNICAL SKILLS

Languages: C++, Python (PyTorch, NumPy, pandas, scikit-learn), Lean 4
Tools: CMake, Git, Docker and Tmux
Cloud: Lawrencium (LBNL) and EC2 (AWS)

WORK EXPERIENCE

Research Intern
June 2026 - Present *International Computer Science Institute*

· Developed a PyTorch GRPO/RL framework for verifiable optimal Morse vector search, improving optimal-vector success rate by 20% over a baseline policy on a simplicial-complex benchmark.
· Built custom AI-agent workflows for checkpoint/eval parsing, baseline comparison, run reporting, and iterative performance-planning.

Graduate Research Assistant
Sep 2022 - Present *University of California, Davis*

· Formalized selected lemmas from a discrete-to-smooth geometric convergence proof in Lean, including finite-sum estimates and max error bounds.
· Built an ML infrastructure for geometric energy minimization on meshes, with CPU parallelization via Taskflow and Python bindings via Pybind11, plus Wandb experiment tracking, checkpoint-resume, plateau stopping, and learning-rate scheduling.

Machine Learning Software Engineer Intern
June 2025 - September 2025 *Meta(Ads Ranking Team)*

· Built a feature-importance aggregation API to generate importance scores from historical records, reducing computation time from days to minutes in production models.

Research Intern
July 2024 - September 2024 *International Computer Science Institute*

· Developed and implemented a C++ algorithm to compute absolute multi-parameter persistent homology, reducing time complexity from $O(n^3)$ to $O(n \log n)$.

NSF-Mathematical Sciences Graduate Internship
Jun 2023 - August 2023 *Lawrence Berkeley National Laboratory*

· Developed advanced topological optimization heuristics, integrated as a custom neural network layer in PyTorch, and demonstrated improved loss convergence rates in diverse experiments, including generative AI models and time series data cleaning.

CODING PROJECTS

- *2024.10 - 2026.01* **geomp** (hidden for paper review)
  C++/Python library for parallel geodesic computation and torus shape comparison.
- *2026.05 - 2026.05* **hyperbolic-shape-morphing** (hidden for paper review)
  Generated hyperbolic kaleidoscope patterns by shape morphing and geometric energy minimization.
- *2024.07 - 2024.09* **graph-mph0**
  C++/Python implementation for efficient 0-dimensional multi-parameter persistent homology on graphs.
- *2022.01 - 2022.06* **Torch-TDA**
  PyTorch package that exposes differentiable topological features for use in neural-network training loops.
- *2021.06 - 2021.9* **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, Submitted to review.
- 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)