

Nathan Derhake

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EDUCATION

Georgia Institute of Technology

August 2026 - Present

Mathematics PhD

Advisor: Prof. John Etnyre

Current Courses: Haken 3-manifolds, Algebra, Analysis

Awards: President's Fellowship of Georgia Tech (2026-2029)

University of Southern California

August 2023 - May 2026

B.S. in Mathematics; Minor in Computer Science

Summa Cum Laude, GPA: 3.98/4

Advisors: Prof. Julian Chaidez and Prof. Vatsal Sharan

Grad Courses: Riemannian Geometry; Differential Topology; Machine Learning; Algorithms; Automata Theory, Logic, and Formal Verification

Awards: NSF Graduate Research Fellowship Program (GRFP) (2026-2031)

The American University of Paris

August 2022 - May 2023

Transfer Student

GPA: 3.93/4

RESEARCH EXPERIENCE

Multicalibration

October 2024 - September 2025

Supervised by Siddhartha Devic and Vatsal Sharan

Los Angeles, CA

- Developed distance-based notions for multicalibration and multiaccuracy of predictors.
- Proved barriers to information-theoretic auditing of distance to multicalibration and developed two equivalent, information-theoretically auditable multicalibration metrics.
- Proved sample complexity results for multicalibration and multiaccuracy notions.
- Analyzed geometry and loss landscape of multicalibration metrics and the set of perfectly multicalibrated predictors.
- Results published in Innovations in Theoretical Computer Science 2026 ([arXiv](#)).

Legendrian Knot Theory

June 2025 - January 2026

Supervised by Julian Chaidez

Los Angeles, CA

- Proved complexity bound for a conversion from a front presentation of Legendrian knot to a grid diagram where grid index is at most a quadratic function of the total number of cusps and crossings.
- Examined when Cromwell moves on grid diagrams preserve Legendrian invariants on the corresponding front presentation.
- Presented work in a poster session at the 2026 Joint Mathematics Meetings.

Symplectic Capacities and the Viterbo Conjecture

September 2024 - June 2025

Supervised by Julian Chaidez

Los Angeles, CA

- Designed a Python program calculating Ekeland-Hofer-Zehnder (EHZ) capacity of a Lagrangian product of two convex polytopes.
- Used results from convex geometry to improve the efficiency of searching pairs of polytopes to investigate Viterbo's conjecture.
- Developed evolution-based search algorithm, computing EHZ capacity of over 63,000 Lagrangian products of polytopes.
- GitHub Repository: [Symmetric-Mahler-Conjecture](#)

Auditability and the Landscape of Distance to Multicalibration $(\alpha\beta)$ Nathan Derhake, Siddhartha Devic, Dutch Hansen, Kuan Liu, Vatsal Sharan.*ITCS 2026.* ([arXiv](#))

AWARDS AND HONORS

NSF Graduate Research Fellowship Program (GRFP) Awardee *2026*

- Proposal investigating knot theory for quantum-resistant cryptography.

President's Fellowship of Georgia Tech *2026*

- \$5,500 annual fellowship awarded by Georgia Institute of Technology.

William Lowell Putnam Exam top 500 scorer *2025*

TALKS AND PRESENTATIONS

Knot Theory Cryptography *Geometry and Topology Student Seminar 2026*

- Upcoming talk addressing the possibility of using knot theory for cryptography.

Auditability and the Landscape of Distance to Multicalibration *ITCS 2026*

- Presented my paper at Innovations in Theoretical Computer Science (ITCS) in Milan.

On Converting a Legendrian Front Presentation to a Grid Diagram *JMM 2026*

- Presented at the Joint Mathematics Meetings (JMM) Pi Mu Epsilon poster session.

Auditability and the Landscape of Distance to Multicalibration *USC Theory Group 2025*

- Talk overviewing multicalibration and results of our paper.

DRP Talk on Knot Theory and Algebraic Topology *USC Math DRP Symposium 2024*

- Directed Reading Program on Algebraic Topology (Alan Hatcher), Knots and Links (Dale Rolfsen).

INDUSTRY EXPERIENCE

Ryan Specialty *May 2024-August 2024**CAT Modeling Intern* *Chicago, IL*

- Designed Long Short-Term Memory Classifier with PyTorch to categorize occupancy data.

Post Pitch *July 2023-January 2024**Co-founder* *Virtual*

- Built software using AI to send personalized blogger outreach and link-building emails at scale.

Partner Engineering and Science *July 2021-August 2023**Software Engineering Intern* *Torrance, CA*

- Built chatbot that answers questions about reports. Led meetings discussing usage/implementation.

Prodigy Development *January 2023-July 2023**Co-Founder* *Paris, France*

- Developed [rhythmic.ai](#), a site for music recommendations using the OpenAI API.

TEACHING

Math Tutor *September 2022-April 2023**AUP Academic Resource Center* *Paris, France*

- Tutored 20+ students in Calculus, Statistics, Pre-Calculus, and Algebra.