Samuel Silver (he/him/his)

University College London • London, UK
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Research interests

• Algebraic/differential topology/geometry • Homotopy theory and higher category theory • Mathematical physics

Education

University College London London, UK
Incoming doctoral student at the London School of Geometry and Number Theory Fall 2026 - Spring 2031 (expected)
Will be studying birational geometry, derived categories, and mirror symmetry under the guidance of Prof. Ed Segal.

University of Massachusetts - Amherst Amherst, MA
BS in Mathematics (pure concentration). GPA: 4.0 Fall 2022 - Spring 2026
Relevant Coursework: Mathematics of Machine Learning (590STA), Quantum Mechanics (PHYSICS 424), Quantum Field Theory (PHYSICS 811), Abstract Algebra I and II (611-612), Real and Complex Analysis (623, 621), Topology and Algebraic Topology (671-672), Lie Algebras (718), Representation Theory (717), Differential Geometry (703), Elliptic Curves (714), Algebraic Geometry (707), Complex Geometry (708), Higher Category Theory (690STJ), all at the graduate level after the first two.

Waltham High School Waltham, MA
GPA: 5.1/5.3 weighted, SAT: 1580, ACT: 36 Fall 2018 - Spring 2022

Research Experience

UMass Amherst Mathematics REU Amherst, MA
Student Researcher Summer 2026

- With another student, investigated a conjecture of my mentor Weimin Chen, an upper bound on the self-intersection of a rational cuspidal curve with one Puiseux pair
- Proved novel number theory results yielding a simpler formula for the upper bound and a closed form for a natural continued fraction invariant, and showing that the bound is always sharp (preprint on arXiv)
- Collaborated with Jenia Tevelev on a proof of the conjecture using the logarithmic minimal model program

Independent studies with Martina Rovelli Amherst, MA
Student Researcher Fall 2024 - Spring 2026

- Began studying the Morita construction for strict monoidal categories in Fall 2024, produced notes with proofs for the strict theory
- Collaborated closely with Martina and her students Arghan Dutta and Stefano Luneia to write a paper providing an explicit construction and verification of a 2-complicial set modeling the Morita $(\infty, 2)$-category of a general monoidal category
- Wrote an honors thesis on the construction for strict monoidal categories

Mathematics REU at the Hebrew University of Jerusalem Jerusalem, IL
Student Researcher Summer 2025

- Participated in the 2025 HUJI mathematics REU, working with Jake Solomon alongside two other students to search for further cases of the correspondence between descendent integrals on the moduli space $\overline{M}_{g,n,k}$ of marked genus-g Riemann surfaces with boundary and the moduli space $\overline{M}_{h,n}$ of marked genus-h curves, inspired by Witten's observations on 2D quantum gravity

Mathematics REU with Jenia Tevelev Amherst, MA
Student Researcher Summer 2024

- Participated in a summer research program with Jenia Tevelev, in which I wrote a program using Julia, Macaulay2, and MATLAB to generate and check through several million potential counterexamples to the Fulton-Faber conjecture about generators for the cone of curves of $\overline{M}_{0,n}$, arising from matroids augmented with curves. Results are available in a database accessible via my website.

UMass Amherst Mathematics REU Amherst, MA
Student Researcher Summer 2023

- Participated in the 2023 Math/Stats department REU program, in which our team wrote a paper characterizing the nilpotence variety $\mathcal{N}$ of the 2D superconformal Lie algebra $\mathfrak{sconf}(N)$ and the orbits of the action of $\mathfrak{sconf}_0(N)$ on $\mathcal{N}$
- This has applications to the physics of quantum field theory, particularly to theories of supersymmetry

Research Output

- Weimin Chen, Yusupjan Ouyang, and Sam Silver, "A note on the self-intersection of rational unicuspidal curve with one Puiseux pair", *submitted for publication*, preprint available at https://arxiv.org/abs/2608.06534
- Arghan Dutta, Stefano Luneia, Martina Rovelli, and Sam Silver, "The Morita $(\infty, 2)$-category of a monoidal category as a 2-complicial set", *submitted for publication*, preprint available at https://arxiv.org/abs/2509.21472
- Sam Silver, "Notes on strict Morita categories", *Honors thesis at UMass Amherst CHC*, available at https://sam-silver.github.io/thesi
- A database of curve-enhanced matroids and their status relative to the Fulton-Faber conjecture, available at https://sam-silver.github.io/CEM_DB.html
- Nikos Orginos, Nathaniel Reid, Sam Silver, "Adjoint actions of nilpotent elements in the 2D superconformal algebra $\mathfrak{sconf}(N)$", available at https://sam-silver.github.io/REU23.pdf

Talks

- "Classifying principal bundles over spheres using the clutching construction", 12 March 2025, Gauge theory seminar
- "What is a Feynman Diagram? A crash-course in perturbative QFT", 29 April 2025, Gauge theory reading seminar
- "What is the Morita bicategory of a monoidal category?", 8 October 2025, UMass Math Graduate Student Seminar
- "What is a hole?" (background-free talk defining the fundamental group to solve a puzzle), 16 October 2025, UMass Undergraduate Math Club

Leadership, Activities, & Employment

UMass Recreational Math Club Amherst, MA
President since Fall 2025

- Planning and running weekly meetings, which typically consist of pizza and a new problem set for people to solve together
- Also assisting with budgeting and advertisement for the club, including the creation, purchase, and sale of merch
- 40+ regular members

UMass Mathematics and Statistics Department Amherst, MA
Grader and TA since Fall 2025

- Fall 2025: graded weekly homeworks and quizzes for MATH 545: Advanced Linear Algebra
- Spring 2026: Graded quizzes and exams for MATH 411, and ran weekly office hours; also graded homeworks and essays for MATH 481: History of Mathematics

Boy Scouts of America, Troop 250 Waltham Waltham, MA
Patrol Leader, Quartermaster, Eagle Scout October 2020 - June 2022

- Active Boy Scout since 1st grade
- Lead and managed activities and planning for my patrol
- Closely involved in planning and leadership for the troop as a whole, as well as organization of supplies
- Became an Eagle Scout in 2022
  - Culmination of efforts as a Boy Scout
  - Prepared, gathered materials and assistance, and led a team of volunteers to install 20 new signposts in Prospect Hill Park in Waltham, MA
  - Significantly developed leadership, organizational, and project management skills

Skills & Interests

Technical: Experience with Python, Sage, Julia, and Macaulay2 scripting, and an interest in cybersecurity as a hobby. Involved from time to time in the UMass Cybersecurity Club, particularly with cryptography. I also enjoy anything you can do in a makerspace (woodworking, electronics, textiles, etc.)
Language: English (native), French (conversational), Russian (conversational)