Riley Shahar

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Department of Mathematics, University of Pennsylvania

Research interests

Homotopy theory and category theory, especially equivariant and higher algebraic structures and interactions with logic.

Education

- **University of Pennsylvania** 2024–2030 (expected)
  Ph.D. in Mathematics Philadelphia, PA
  - *National Science Foundation Graduate Research Fellow*
  - Advisor: Mona Merling
- **Reed College** 2020–2024
  B.A. in Mathematics and Computer Science Portland, OR
  - *Phi Beta Kappa*
  - Thesis: *Categories for Cryptographic Composability*, advised by Angélica Osorno and Adam Groce

Papers and preprints

- *Enumerating submonoids of finite commutative monoids.* Joint with C. Kirkpatrick, A. el Mahmoud, K. Ormsby, A. M. Osorno, D. Schandelmeier-Lynch, L. Yi, A. Young, and S. Zhu. 2025. Available at arXiv:2508.20786. *Submitted.*

Fellowships and awards

- **Graduate Research Fellowship** 2024–
  National Science Foundation
- **Benjamin Franklin Fellowship** 2024–
  University of Pennsylvania
- **Class of '21 Award** 2024
  Reed College
  - For "creative work of notable character, involving an unusual degree of initiative and spontaneity."
- **Phi Beta Kappa** 2024
  Reed College
- **Commendation for Academic Excellence** 2020–21, 2021–22, 2022–23, 2023–24
  Reed College

Research experience

- **Collaborative Mathematics Research Group (CMRG) Participant** Summer 2024
  Reed College Portland, OR
  - Advisors: Angélica Osorno and Kyle Ormsby
- **Research Experiences for Undergraduates in Programming Languages (REPL) Participant** Summer 2023
  University of Pennsylvania Philadelphia, PA
  - Advisor: Steve Zdancewic
- **Student Research Fellow** Summer 2022
  Reed College Portland, OR
  - Advisor: Charlie McGuffey

Teaching Experience

- **University of Pennsylvania**
  Teaching Assistant
  - MATH 1070: *Mathematics of Change, Part I* Fall 2025
- **State Correctional Institution Chester**
  Instructor
  - *Math in the Courtroom*, with Athina Avrantini, Maxine Calle, Mona Merling, and Marc Muhleisen Spring 2026
- **Canada/USA Mathcamp**
  Instructor
  - *The Curry-Howard Isomorphism* 2026, Week 1
  - *Some Cool Spaces*, with Maya Saran 2026, Week 2

- *The Many Faces of the Euler Characteristic: An Introduction to Algebraic K-theory* 2026, Week 3
- *Indifference* 2026, Week 4
- *Truth in Fiction* 2026, Week 5
- *A "Topological" Proof of the Infinitude of Primes* 2026, Week 5
- *Extra Stretchy Rubber-Sheet Geometry* 2025, Week 1
- *Category Theory from Scratch*, with Della Hendrickson 2025, Week 2
- *Oops All Algebra: An Introduction to Infinity-Categories* 2025, Week 3
- *A Tour of Paradox* 2025, Week 4
- *A Cute Combinatorics Problem* 2025, Week 5

- **Reed College**
  Teaching Assistant
  - CSCI 121: *Computer Science Fundamentals I* Fall 2021–Spring 2024
  - Math 111: *Calculus* Spring 2024
  - CSCI 387: *Computability and Complexity* Spring 2024, Fall 2022
  - Math 201: *Linear Algebra* Fall 2023
  - CSCI 384: *Programming Language Design and Implementation* Fall 2023
  - Math 332: *Abstract Algebra* Spring 2023
  - CSCI 393: *Operating Systems* Spring 2023
  - CSCI 122: *Intermediate Computer Science Fundamentals I* Fall 2022
  - CSCI 221: *Computer Science Fundamentals II* Spring 2022

Talks

- *Parameterized higher category theory*, Penn Oral Qualifying Exam April 2026
- *Categorical Fraïssé theory*, Penn Model Theory Seminar April 2026
- *A survey of directed topology*, Penn Graduate Geometry-Topology Seminar September 2025
- *The sequence 1, 11, 21, 1211, ... (its name is a spoiler!)*, Penn Pizza Seminar September 2025
- *What if algebra but equality is just vibes?*, Mathcamp Colloquium July 2025
- *The K-theory of Lawvere theories*, Penn Kan Seminar on Algebraic K-Theory April 2025
- *Deloopings of categories*, Penn Kan Seminar on Algebraic K-Theory April 2025
- *A connectivity toolbox*, AMTRaK IV April 2025
- *Classifying spaces of categories*, Penn Kan Seminar on Algebraic K-Theory March 2025
- *Artin gluing in logic*, Penn Graduate Logic Seminar February 2025
- *The logical interpretation of topology*, Penn Graduate Geometry-Topology Seminar February 2025
- *Categorical semantics, via vibes*, Penn Pizza Seminar January 2025
- *Girard's paradox for set theorists, via Hurkens*, Penn Graduate Logic Seminar November 2024
- *Saturated transfer systems on cylinders*, Penn Graduate Geometry-Topology Seminar October 2024
- *Towards linear topoi*, Penn Graduate Logic Seminar September 2024

Service and organization

- **University of Pennsylvania Department of Mathematics**
  Head TA Fall 2026-
- **Atlantic Meeting on Topology, Representation theory, and K-theory (AMTRaK)**
  Co-organizer with Nooria Ahmed 2025–
  - AMTRaK V: Scissors Congruence K-Theory, at the University of Pennsylvania April 2026
- **Directed Reading Program**, University of Pennsylvania
  Mentor 2026–
  - Michael Carfley, *Linear Algebra* Spring 2026
- **Graduate Pizza Seminar**, University of Pennsylvania
  Co-organizer with Chris Dunstan 2025–26
- **Mathematics Student Colloquium**, Reed College
  Co-organizer with Asa Ferguson 2023–24
- **SL(m): Student Liaisons in Mathematics**, Reed College
  Liaison 2023–24
- **Computer Science Peer Mentorship Program**, Reed College
  Co-founder and co-organizer with Daniela Arroyo-Perez and Aria Killebrew Bruehl 2022–24