

SAMANTHA ALLEN

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Research Interests

Low-dimensional topology, knot theory in dimensions three and four. In particular, the interplay between classical knot invariants and those arising from Heegaard Floer, and what it can tell us about classical knot-theoretic problems, the knot concordance group, and 3-manifolds.

Academic Appointments

Assistant Professor August 2022 – present

Department of Mathematics and Computer Science
Duquesne University

Limited Term Assistant Professor August 2021 – July 2021

Department of Mathematics
University of Georgia

John Wesley Young Research Instructor July 2018 – July 2021

Department of Mathematics
Dartmouth College

Education

PhD in Mathematics – Indiana University, Bloomington, IN June 2018

Thesis: Relationships between the nonorientable genus and the normal Euler number of nonorientable surfaces whose boundary is a knot

Advisor: Charles Livingston

BS in Mathematics – High Point University, High Point, NC May 2012

BS in Computer Science – High Point University, High Point, NC May 2012

Publications

5. *Nonorientable surfaces bounded by knots: a geography problem.*
New York J. Math. 29 (2023), 1038–1059. arXiv version: arxiv.org/abs/2007.14332
4. *Do Link Polynomials Detect Causality In Globally Hyperbolic Spacetimes?* Joint with Jacob H. Swenberg.
J. Math. Phys. 62 (2021), no. 3, 032503. arXiv version: arxiv.org/abs/2011.09415
3. *Unknotting with a single twist.* Joint with Charles Livingston.
Enseign. Math. 66 (2020), no. 3-4, 541–589. arXiv version: arxiv.org/abs/2005.10717
2. *Concordances from differences of torus knots to L -space knots.*
Proc. Amer. Math. Soc. 148 (2020), no.4, 1815–1827. arXiv version: arxiv.org/abs/1710.10664
1. *Using secondary Upsilon invariants to rule out stable equivalence of knot complexes.*
Algebr. Geom. Topol. 20 (2020), no. 1, 29–48. arXiv version: arxiv.org/abs/1706.07108

Preprints

3. *Using knot Floer invariants to detect prime knots.* Joint with Charles Livingston, Misha Temkin, and C.-M. Micheal Wong. Submitted for publication. Preprint: arxiv.org/abs/2311.11089
2. *Unknotting via null-homologous twists and multi-twists.* Joint with Kenan İnce, Seungwon Kim, Benjamin Matthias Ruppik, and Hannah Turner. Submitted for publication. Preprint: arxiv.org/abs/2211.04621
1. *An Upsilon torsion function for knot Floer homology.* Joint with Charles Livingston. Submitted for publication. Preprint: arxiv.org/abs/2208.04768

Invited Talks

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| Barbara T. Faires Allegheny Mountain Colloquium | October 2023 |
| AWM Research Symposium | October 2023 |
| Virginia Commonwealth University Geometry Seminar | October 2022 |
| PATCH Seminar at Temple University | September 2022 |
| Georgia Topology Conference | May 2022 |
| Georgia Tech Topology Seminar | April 2022 |
| AMS Special Session on Knots, Links, 3-manifolds, and 4-manifolds (JMM) | April 2022 |
| UGA Graduate Student Topology Seminar | November 2021 |
| University of Georgia Topology Seminar | September 2021 |
| UC Davis Geometry & Topology Seminar | May 2021 |
| Rutgers Topology Seminar | April 2021 |
| Michigan State University Geometry & Topology Seminar | March 2021 |
| AMS Special Session on Low Dimensional Topology (JMM) | January 2021 |
| Boston College Geometry/Topology/Dynamics Virtual Seminar | November 2020 |
| University of Nevada, Reno Algebraic and Geometric Topology Seminar | November 2020 |
| CKVK* Virtual Seminar | October 2020 |
| Topic group on Knots, surfaces, and 4-manifolds (NCNGT conference) | June 2020 |
| Dartmouth Mathematics Society (undergraduate club) | March 2020 |
| AMS-AWM Special Session on Women in Topology (JMM) | January 2020 |
| Special Session on Invariants of Knots, Links, and Low-dimensional Manifolds (AMS Sectional) | October 2019 |
| Knot concordance and low-dimensional manifolds, Le Croisic, France | June 2019 |
| Special Session on Invariants of Knots, Links, and Low-dimensional Manifolds (AMS Sectional) | April 2019 |
| Special Session on Algebraic, Combinatoric, and Quantum Invariants of Knots and Manifolds (AMS Sectional) | March 2018 |
| University of Virginia Geometry Seminar | February 2018 |
| University of Oregon Topology Seminar | January 2018 |

Professional Development

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| Attended CTE Micro-Workshop on Transparent Assignment Design | October 2023 |
| Attended Allegheny Mountain Section NExT Workshop | September 2023 |
| Participant in the CTE book study on Inclusive Teaching | Spring 2023 |
| Attended CTE Micro-Workshop on Cultivating Student Feedback | February 2023 |
| Certificate in Diversity and Inclusion at UGA (completed) | Spring 2022 |
| Attended the Georgia Topology Conference | June 2021 |
| Participant in the AIM 4-dimensional Topology virtual research community | Spring 2021 |
| Attended the Simons Center workshop on Floer homology in low-dimensional topology | January 2021 |
| Attended the Joint Mathematics Meetings of the AMS and MAA | January 2021 |
| Attended the Tech Topology Conference (Georgia Tech) | December 2020 |
| Attended the ICERM workshop Perspectives on Dehn Surgery | July 2019 |
| Attended the Workshop in Geometric Topology (Calvin College) | June 2018 |
| Attended the Joint Mathematics Meetings of the AMS and MAA | January 2018 |
| Attended the UCLA Topology Conference 2018 | January 2018 |
| Attended the Banff workshop on Thirty Years of Floer Theory for 3-Manifolds in Oaxaca, Mexico | July 2017 |

Awards and Grants

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| AIM SQuaRE | Summer 2023 |
| Wimmer Award | Fall 2022 |
| MSRI 2022 Summer Research in Mathematics | Summer 2022 |
| NSF-AWM Travel Grant | Fall 2019 |
| Joseph & Francis Morgan Swain Fellowship, Indiana University | Spring 2018 |
| IUB Provost's Travel Award for Women in Science, Indiana University | Fall 2017 |
| Rothrock Teaching Award (for excellence in teaching), Indiana University | Spring 2015 |
| Muriel Adams Stahl Fellowship, Indiana University | Fall 2012 |
| Best in Undergraduate Research, Mid-Southeast ACM Conference | November 2011 |

Teaching Experience

For each of the following, I was the **instructor of record**.

Instructor, Duquesne University

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| Math 116 Calculus II | Spring 2024 (ongoing) |
| Math 215 Calculus III | Falls 2022, 2023; Spring 2023 |
| Math 311 Number Theory | Falls 2022, 2023 (ongoing) |
| Math 350 History of Mathematics | Springs 2023, 2024 (ongoing) |

Instructor, University of Georgia

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| Math 2250 Calculus I for Science and Engineering | Fall 2021 |
| Math 2260 Calculus II for Science and Engineering | Spring 2022 |

Instructor, Dartmouth College

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| Math 8 Calculus of Functions of One and Several Variables | Fall 2018; Spring 2019, 2021 |
| Math 17 Intro to Math Beyond Calculus (<i>taught remotely</i>) | Spring 2020 |
| Math 22 Linear Algebra with Applications | Fall 2018 |
| Math 25 Number Theory | Fall 2019 |
| Math 31 Topics in Algebra (<i>taught remotely in Fall 2020</i>) | Fall 2019, 2020 |

Instructor, Indiana University

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| Math D116 Introduction to Finite Mathematics I | Fall 2017 |
| Math D117 Introduction to Finite Mathematics II | Fall 2015, 2016; Spring 2015 |
| Math J010 Introduction to Algebra* | Summer 2013, 2014, 2016 |
| Math J110 Introductory Problem Solving* | Summer 2015 |
| Math J111 Introduction to College Math I* | Fall 2013, 2014 |
| Math M014 Basic Algebra | Spring 2014 |
| Math T101 Mathematics for Elementary Teachers | Spring 2017 |

*Part of the Groups Scholars program.

(Established to address low college attendance rates among underrepresented students at IU. Eligible students are the first in their family to attend college with limited financial resources from all racial backgrounds.)

Mentorship

- Co-advisor** of undergraduate research project for student Jacob Swenberg Spring & Summer 2020
Along with Vladimir Chernov and Ina Petkova, advised undergraduate student in research on link polynomials and causality in spacetimes. Culminating in a co-authored paper, listed above.
- Mentor** in the Directed Reading Program at IU Fall 2017
Advised an advanced undergraduate student in a Graph Theory independent reading project, culminating in a short, seminar-style presentation to his peers.

Programming and Other Skills

Proficient in L^AT_EX, Mathematica, C++
Familiar with MATLAB, Python
Teaching experience in the use of:
Canvas and Brightspace (LMS),
Zoom (for teaching & collaboration),
TechSmith Relay and Kaltura (for video capture and editing),
WeBWorK and WebAssign (online homework systems), and
Gradescope (for grading in the remote setting).

Outreach, Service, and Other Activities

- Committee member** for the School of Science and Engineering Diversity, Equity, and Inclusion Committee Ongoing
- Committee member** for the Department Awards Committee Ongoing
- Referee** for journals *Topology and its Applications* and *Pacific Journal of Mathematics* Ongoing
- Co-organizer** of an MSRI Special Session at the Joint Mathematics Meeting Winter 2023
- Co-organizer** of the Dartmouth College Topology Seminar Winter 2021
- Co-host** of the Math 8 Sessions of the Undergraduate Open House September 2020
Served the department by co-hosting two question-and-answer sessions about Math 8 (a part of the calculus sequence) for incoming freshmen.
- Presenter** at The Governor's Institute of Vermont in Mathematical Sciences June 2019, 2020
Taught an interactive class to high school students.
2019 topic: introduction to knot theory.
2020 topic: platonic solids, Euler, and induction.
- Member of selection committee** for the "Biographies of Contemporary Women in Mathematics" essay contest Winters 2019, 2020
This essay contest (sponsored by the Dartmouth Mathematics Department) asks middle school, high school, and undergraduate students to interview and write a biography about a contemporary woman working in a field related to mathematics.
- Judge** for the Dartmouth Math Department's Undergraduate Poster Session Spring 2019
- Co-organizer** of Sonia Kovalesky Math Day at Dartmouth College Spring 2019
Co-organized and ran a cryptography workshop for middle and high school girls and their teachers. Participated in the panel discussion as the postdoc representative.
- Volunteer** at IU Science Fest Falls 2015, 2017
- Volunteer** at Math and Science Night at McCormick's Creek Elementary School Spring 2017
- Tutor** in the Women in STEM Living-Learning Center Spring 2014 – Spring 2015
Tutored students living in the Women in STEM dormitory (all women majoring in STEM fields) in various math, physics, and computer science courses.

Memberships

Member of the American Mathematical Society
Member of the Association for Women in Mathematics
Member of the Mathematical Association of America