

Samantha Allen

Department of Mathematics
6188 Kemeny Hall
Hanover, NH 03755

samantha.g.allen@dartmouth.edu
math.dartmouth.edu/~samanthaallen

Research Interests

Geometric 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

John Wesley Young Research Instructor
Dartmouth College

July 2018 – present

Education

Indiana University, Bloomington, IN

Ph.D in Mathematics

June 2018

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

Advisor: Charles Livingston

High Point University, High Point, NC

B.S. in Mathematics

May 2012

B.S. in Computer Science

May 2012

Publications and Preprints

Nonorientable surfaces bounded by knots: a geography problem.

Submitted for publication. Preprint: <https://arxiv.org/abs/2007.14332>.

Unknotting with a single twist. Joint with Charles Livingston.

To appear in L'Enseignement Mathématique. Preprint: arxiv.org/abs/2005.10717.

Do Link Polynomials Detect Causality In Globally Hyperbolic Spacetimes? Joint with Jacob Swenberg.

J. Math. Phys. 62 (2021), no. 3, 032503. arXiv version: <https://arxiv.org/abs/2011.09415>.

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.

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.

Awards and Grants

NSF-AWM Travel Grant

Fall 2019

Joseph & Frances 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

University Fellowship, High Point University

2008 – 2012

Wachovia Scholarship, High Point University

2008 – 2012

Talks

AMS Special Session on Low Dimensional Topology, Joint Mathematics Meetings (virtual).	January 2021
Boston College Geometry/Topology/Dynamics Virtual Seminar	November 2020
Algebraic and Geometric Topology Seminar, University of Nevada, Reno	November 2020
CKVK* Virtual Seminar, held at u.osu.edu/ckvkastrks .	October 2020
Topic group on Knots, surfaces, and 4-manifolds, NCNGT Conference, held virtually at ncngt.org .	June 2020
Dartmouth Mathematics Society (undergraduate club), Topic: Unknotting: questions which are easy to state, but difficult to answer.	March 2020
AMS-AWM Special Session on Women in Topology, Joint Mathematics Meetings, Denver, CO.	January 2020
AMS Special Session on Invariants of Knots, Links, and Low-dimensional Manifolds, Binghamton, NY	October 2019
Knot concordance and low-dimensional manifolds, Le Croisic, France	June 2019
AMS Special Session on Invariants of Knots, Links, and Low-dimensional Manifolds, Hartford, CT	April 2019
AMS Special Session on Algebraic, Combinatoric, and Quantum Invariants of Knots and Manifolds, Columbus, OH	March 2018
University of Virginia Geometry Seminar, Charlottesville, VA	February 2018
University of Oregon Topology Seminar, Eugene, OR	January 2018
Graduate Student Topology and Geometry Conference, East Lansing, MI	April 2017

Professional Development

Attended workshop on Floer homology in low-dimensional topology Simons Center (virtual)	January 2021
Attended the Joint Mathematics Meetings of the AMS and MAA Washington, DC (virtual)	January 2021
Attended the Tech Topology Conference Georgia Institute of Technology (virtual)	December 2020
Participated in the Mentoring Series (on being an effective mentor) Dartmouth College (virtual)	Spring 2020
Attended the Joint Mathematics Meetings of the AMS and MAA Denver, CO	January 2020
Attended the ICERM workshop Perspectives on Dehn Surgery Providence, RI	July 2019
Attended the Workshop in Geometric Topology at Calvin College Grand Rapids, MI	June 2018
Attended the Joint Mathematics Meetings of the AMS and MAA San Diego, CA	January 2018
Attended the UCLA Topology Conference 2018 Los Angeles, CA	January 2018
Attended the Banff workshop on Thirty Years of Floer Theory for 3-Manifolds Oaxaca, Mexico	July/August 2017

Memberships

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

Teaching Experience

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

Instructor, Dartmouth College

Math 8 Calculus of Functions of One and Several Variables	Fall 2018
45 students, material coordinated between section instructors	Spring 2019
Math 17 Intro to Math Beyond Calculus (Topic: Knot Theory)	Spring 2020
20 students, topic chosen and syllabus designed by instructor	
Taught remotely: via Canvas, with module structure, and asynchronous lectures with synchronous office hours.	
Math 22 Linear Algebra with Applications	Fall 2018
50 students, material coordinated between section instructors	
Math 25 Number Theory	Fall 2019
15 students, elective course for various years and majors	
Math 31 Topics in Algebra	Fall 2019, 2020
25-30 students, fulfills a major requirement	
Taught remotely in Fall 2020: via Canvas, with module structure, and asynchronous lectures with weekly synchronous problem sessions.	

Instructor, Indiana University

D-116 Introduction to Finite Mathematics I	Fall 2017
70 students, 1st of 2-term course fulfilling gen. ed. requirement	
D-117 Introduction to Finite Mathematics II	Fall 2015, 2016
70 students, 2nd of 2-term course fulfilling gen. ed. requirement	Spring 2015
J-010 Introduction to Algebra	Summer 2013, 2014
15-20 students, part of the Groups Scholars Program*	Summer 2016
Remedial course to prep students for college mathematics	
J-110 Introductory Problem Solving	Summer 2015
15-20 students, part of the Groups Scholars Program*	
Topics include proof-writing and modular arithmetic.	
J-111 Introduction to College Math I	Fall 2013, 2014
15-20 students, part of the Groups Scholars Program*	
M-014 Basic Algebra	Spring 2014
40 students, remedial course to prep students for finite mathematics	
T-101 Mathematics for Elementary Teachers	Spring 2017
25 students, emphasis on proof-writing and various visual methods for communicating concepts to young students	

*The Groups Scholars program was 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. "J" courses are taught in the summer to incoming freshmen.

Mentorship

Co-advisor of undergraduate research project for student Jacob Swenberg 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.	Spring & Summer 2020
Mentor in the Directed Reading Program at IU Advised an advanced undergraduate student in a Graph Theory independent reading project, culminating in a presentation to his peers.	Fall 2017

Outreach, Service, and Other Activities

Co-organizer of the Dartmouth College Topology Seminar	Winter 2021
Co-host of the Math 8 sessions of the Undergraduate Open House Served the department by co-hosting two question-and-answer sessions about Math 8 (a part of the calculus sequence) for incoming freshmen.	September 2020
Presenter at The Governor's Institute of Vermont in Mathematical Sciences Taught an interactive class to high school students. 2019 topic: introduction to knot theory. 2020 topic: platonic solids, Euler, and induction.	June 2019, 2020
Member of selection committee for the "Biographies of Contemporary Women in Mathematics" essay contest This essay contest (sponsored by the Dartmouth Mathematics Department) asks middle, high school, and undergraduate students to interview and write a biography about a contemporary woman working in a field related to mathematics.	Winters 2019, 2020
Judge for the Dartmouth Math Department's Undergraduate Poster Session	Spring 2019
Co-organizer of Sonia Kovalevsky Math Day at Dartmouth College 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.	Spring 2019
Volunteer at IU Science Fest Worked with a team of professors and graduate students to expose students in grades K-12 to various math games and crafts.	Fall 2017
Volunteer at Math and Science Night at McCormick's Creek Elementary School Worked with a team of faculty and graduate students to help students build, solve, and teach their friends to solve a version of the "two washers" puzzle.	Spring 2017
Volunteer at IU Science Fest Taught students in grades K through 12 about knots and links using crafts and puzzles.	Fall 2015
Tutor in the Women in STEM Living-Learning Center Tutored students living the Women in STEM dormitory (all women majoring STEM fields) in math, physics, and computer science courses.	Spring 2014 – Spring 2015.

Programming and other skills

Proficient in \LaTeX , Mathematica, C++
Familiar with MATLAB, Python
Teaching experience in the use of:
<ul style="list-style-type: none"> • Canvas (LMS), • Zoom (for teaching and collaboration), • TechSmith Relay and Kaltura (for video capture and editing), • WeBWorK and WebAssign (online homework systems), and • Gradescope (for grading in the remote setting).