

# Samantha Allen

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## Research Interests

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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

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Limited Term Assistant Professor University of Georgia	August 2021 – present
John Wesley Young Research Instructor Dartmouth College	July 2018 – July 2021

## Education

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<b>Indiana University</b> , Bloomington, IN Ph.D in Mathematics Thesis: Relationships between the nonorientable genus and the normal Euler number of nonorientable surfaces whose boundary is a knot Advisor: Charles Livingston	June 2018
<b>High Point University</b> , High Point, NC B.S. in Mathematics	May 2012
B.S. in Computer Science	May 2012

## Publications and Preprints

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*Do Link Polynomials Detect Causality In Globally Hyperbolic Spacetimes?* Joint with Jacob Swenberg.  
To appear in the Journal of Mathematical Physics. Preprint: <https://arxiv.org/abs/2011.09415>.

*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](https://arxiv.org/abs/2005.10717).

*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](https://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](https://arxiv.org/abs/1706.07108).

## Awards and Grants

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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

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Michigan State University Geometry & Topology Seminar	March 2021
Rutgers Topology Seminar	April 2021
UC Davis Geometry & Topology Seminar	May 2021
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 <a href="http://u.osu.edu/ckvkastrks">u.osu.edu/ckvkastrks</a> .	October 2020
Topic group on Knots, surfaces, and 4-manifolds, NCNGT Conference, held virtually at <a href="http://ncngt.org">ncngt.org</a> .	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

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Attended the Georgia Topology Conference University of Georgia (virtual)	June 2021
Participant in the 4-dimensional Topology virtual research community hosted by AIM	Spring 2021
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

## Teaching Experience

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

**Instructor**, University of Georgia

Math 2250 Calculus I for Science and Engineering Fall 2021

**Instructor**, Dartmouth College

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

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.)

## Programming and other skills

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Proficient in L<sup>A</sup>T<sub>E</sub>X, Mathematica, C++

Familiar with MATLAB, Python

Teaching experience in the use of:

- Canvas and Brightspace (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).

## Memberships

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Member of the American Mathematical Society

Member of the Association for Women in Mathematics

## Mentorship

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<b>Co-advisor</b> 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
<b>Mentor</b> in the Directed Reading Program at IU Advised an advanced undergraduate student in a Graph Theory independent reading project, culminating in a short, seminar-style presentation to his peers.	Fall 2017

## Outreach, Service, and Other Activities

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<b>Co-organizer</b> of the Dartmouth College Topology Seminar	Winter 2021
<b>Co-host</b> 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
<b>Presenter</b> 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
<b>Member of selection committee</b> for the "Biographies of Contemporary Women in Mathematics" essay contest This essay contest (sponsored by the Dartmouth Mathematics Department) asks middle and 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
<b>Judge</b> for the Dartmouth Math Department's Undergraduate Poster Session	Spring 2019
<b>Co-organizer</b> 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
<b>Volunteer</b> at IU Science Fest Worked with a team of professors and other graduate students to expose students in grades K through 12 to various math games, puzzles, and crafts.	Fall 2017
<b>Volunteer</b> 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
<b>Volunteer</b> at IU Science Fest Worked with another graduate student to teach students in grades K through 12 some facts about knots and links using fun crafts and puzzles.	Fall 2015
<b>Tutor</b> in the Women in STEM Living-Learning Center Tutored students living the Women in STEM dormitory (all women majoring STEM fields) in various math, physics, and computer science courses.	Spring 2014 – Spring 2015