SAMANTHA ALLEN

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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

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 Coumputer Science – High Point University, High Point, NC May 2012

Publications

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. *Unknotting via null-homologous twists and multi-twists.* Joint with Kenan İnce, Seungwon Kim, Benjamin
   Matthias Ruppik, and Hannah Turner. Preprint: arxiv.org/abs/2211.04621

2. *An Upsilon torsion function for knot Floer homology.* Joint with Charles Livingston.
   Submitted for publication. Preprint: arxiv.org/abs/2208.04768

1. *Nonorientable surfaces bounded by knots: a geography problem.*
   Submitted for publication. Preprint: arxiv.org/abs/2007.14332

Awards and Grants

MSRI 2022 Summer Research in Mathematics	Summer 2022
AIM SQuaRE (Proposal accepted; scheduled for Summer 2023.)	Spring 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, Idndiana University	Fall 2012
Best in Undergraduate Research, Mid-Southeast AcM Conference	November 2011

Invited Talks

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

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

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, Duquesne University

Math 215 Calculus III	Fall 2022
Math 311 Number Theory	Fall 2022

Instructor, University of Georgia

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

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 (*taught remotely*)	Spring 2020
Math 22 Linear Algebra with Applications	Fall 2018
Math 25 Number Theory	Fall 2019
Math 31 Topics in Algebra (*taught remotely in Fall 2020*)	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.)

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
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 LaTeX, 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

Referee for journals *Topology and its Applications* and *Pacific Journal of Mathematics*

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 — Winters 2019, 2020
in Mathematics" essay contest
    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.