# Kyle Miller

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## Education

2014–present **Ph.D. Candidate**, *University of California*, Berkeley, CA.
Advisor: Ian Agol. Research in knot theory, spatial graphs invariants, and computations.

2008–2012 **S.B.**, *Massachusetts Institute of Technology*, Cambridge, MA.
Major: Mathematics with Computer Science. Minor: Music.

## Research Interests

Low-dimensional topology, representation theory, diagrammatics, and computer-assisted proofs.

## Publications and Preprints

### Published

2018 (with Calvin McPhail-Snyder), *Planar diagrams for local invariants of graphs in surfaces*, Journal of Knot Theory and Its Ramifications **29** (2020), no. 1, 1950093, 49, arXiv:1805.00575.

### Preprints

2019 Anderson, Baker, Gao, Kegel, Le, Miller, Onaran, Sangston, Tripp, Wood, and Wright, *Asymmetric L-space knots by experiment.* arXiv:1909.00790.

### In preparation

2020 *A category in graph theory.*

2020 *The homological arrow polynomial for virtual links* (draft on website).

2020 *The two-variable virtual Yamada polynomial.*

## Talks

### Research

Jan 2021 Special Session on Developments in Spatial Graphs, JMM (invited). *A 2D TQFT approach to topological graph polynomials and graphs in thickened surfaces.*

Dec 2019 University of Virginia geometry seminar (invited). *A TQFT approach to topological graph polynomials.*

Nov 2019 Rice topology seminar (invited). *Invariants of graphs in thickened surfaces from topological graph polynomials.*

Nov 2019 Special Session on Invariants of Knots and Spatial Graphs, Fall Western Sectional Meeting of the AMS (invited). *Invariants of virtual spatial graphs based on topological graph polynomials.*

Apr 2018 3-manifold seminar, UCB. *Diagrams on surfaces and an invariant of virtual spatial graphs.*

### Expository

Su2020 UC Berkeley Lean seminar. 3 talks about math in the Lean proof assistant.

Fa2019 Student 3-manifold seminar, UCB. 6 talks on topics in 3-manifold topology.

Sp2019 Student 3-manifold seminar, UCB. 8+ talks on combinatorial 3-manifold topology.

Feb 2019 3-manifold seminar, UCB. *The arithmeticity of figure eight knot orbifolds.*

Nov 2018 3-manifold seminar, UCB. *What is an alternating knot?*

Sep 2018 GRASP, UCB. *The Jones polynomial and the Temperley–Lieb category.*

Nov 2017 Knot theory topics course, UCB. *Quandles.*

Sep 2017 3-manifold seminar, UCB. *Spatial graph invariants.*

Apr 2017 Knot Another Seminar, UCB. *The Alexander ideal.*

## Service

Reviewed for Annales de l'Institut Henri Poincaré D: Combinatorics, Physics and their Interactions.

2020 Contributor to `mathlib`, the Lean mathematics library. Part of a group that is formalizing combinatorial objects.

Fa2019 **Student 3-Manifold Seminar (organizer)**, *University of California*, Berkeley, CA.

Su2019 **KnotFolio**, an online program for recognizing and identifying drawings of knots and links. https://kmill.github.io/knotfolio

Sp2019 **Student 3-Manifold Seminar (organizer)**, *University of California*, Berkeley, CA.

2015–2019 **Directed Reading Program (mentor)**, *University of California*, Berkeley, CA.
Fall 2015, Spring 2017, Fall 2017, Fall 2018, Fall 2019.

## Teaching Experience

### University of California, Berkeley

Fa2020 Discussion sections, Math 54 Linear Algebra

Sp2020 Discussion sections, Math 1B Calculus

Sp2017 Discussion sections, Math 55 Discrete Mathematics

Fa2016 Discussion sections, Math 54 Linear Algebra

Su2016 Lecture and discussion sections, Math 54 Linear Algebra

Sp2016 Discussion sections, Math 54 Linear Algebra

Fa2015 Discussion sections, Math 1B Calculus

Sp2015 Discussion sections, Math 1A Calculus

Fa2014 Discussion sections, Math 1A Calculus

## Awards

2018–2019 Awarded support by the UCB NSF Research Training Group in Geometry and Topology for Spring 2018, Spring 2019, Summer 2019, and Fall 2019.

## Work Experience

Su2015 **Software Engineer**, *Swift Navigation, Inc.*, San Francisco, CA.
With Scott Kovach, designed and implemented *Plover*, an experimental programming language for linear algebra in embedded applications.

2013–2014 **Research assistant**, *Microsoft Research New England*, Cambridge, MA.
Empirical microeconomics research with Markus Mobius and Susan Athey regarding news bias in social media.

2012–2013 **Software Engineer**, *Vecna Technologies, Inc.*, Cambridge, MA.
Enterprise Java software for online healthcare systems.