Abigail Hickok

PhD Candidate, Department of Mathematics, UCLA
ahickok@math.ucla.edu
https://www.math.ucla.edu/ ahickok/

Research Interests

Topological data analysis, geometric data analysis, network science, computational geometry, spatial data, applications to biology

Education

PhD in Mathematics, UCLA 2018–Present
Advisor: Mason Porter
Expected completion: June 2023

BA in Mathematics, with Honors, Princeton University 2014–2018
Senior Thesis: *Khovanov Homology and Genus-2 Mutation*
Advisors: Zoltán Szabó and Peter Ozsváth

Research Visits

Columbia University Spring 2022
Visiting Scientist
Host: Andrew Blumberg

Honors & Awards

UCLA Dissertation Year Fellowship	2022–23
NSF Graduate Research Fellowship Honorable Mention	2020
UCLA Graduate Dean's Scholar Fellowship	2018–19
Eugene V. Cota-Robles Fellowship	2018–19, 2021–22

Publications & Preprints

8. Computing Persistence Diagram Bundles.
   A. Hickok. arXiv:2210.06424, 2022.

7. Persistence Diagram Bundles: A Multidimensional Generalization of Vineyards.
   A. Hickok. arXiv:2210.05124, 2022.

6. Persistent Homology for Resource Coverage: A Case Study of Access to Polling Sites.
   *A. Hickok, *B. Jarman, *M. Johnson, *J. Luo, M. A. Porter. arXiv:2206.04834, 2022.

5. A Family of Density-Scaled Filtered Complexes.
   A. Hickok. arXiv:2112.03334, 2022.

4. Analysis of Spatial and Spatiotemporal Anomalies Using Persistent Homology: Case Studies with COVID-19 Data.
   A. Hickok, D. Needell, M. A. Porter. *SIAM Journal on Mathematics of Data Science*, 4(3):1116-1144, 2022.

3. Topological Data Analysis of Spatial Systems.
   M. Feng, A. Hickok, M. A. Porter. In F. Battiston and G. Petri (eds.) *Higher-Order Systems*, ch. 17, pp. 389–399. Springer, Cham, Switzerland, 2022.

2. A Bounded-Confidence Model of Opinion Dynamics on Hypergraphs.
   A. Hickok, Y. H. Kureh, H. Z. Brooks, M. Feng, M. A. Porter. *SIAM Journal on Applied Dynamical Systems.* 21(1):1–32, 2022.

1. Adaptive Spectral Solution Method for the Landau and Lenard-Balescu Equations.
   C.R. Scullard, *A. Hickok, *J. O. Sotiris, *B. M. Tzolova, *R. L. Van Heyningen, F. R. Graziani. *Journal of Computational Physics* 402, 109110, 2020.

*Equal contribution.

Teaching

UCLA (Teaching Assistant)

Math 168: Introduction to Networks	Winter 2020, Spring 2020, Fall 2020
Math 31B: Integration and Infinite Series	Winter 2020, Spring 2020
Math 131AH: Honors Analysis	Fall 2019
Math 1: Precalculus	Fall 2019

Princeton (Undergraduate Course Assistant)

Math 215: Honors Analysis	Spring 2018
Math 335: Complex Analysis	Fall 2017

Academic Mentorship

REU, Irving Institute for Cancer Dynamics, Columbia University Summer 2022
Co-mentor with Andrew Blumberg.

Topic: *Scalar curvature estimation for biological data sets.*

Research in Industrial Projects for Students (RIPS) at IPAM Summer 2021
Mentor for a team of four undergraduates that was sponsored by Air Force Research Laboratory.
Topic: *Deconvolution of Temporally Under-Resolved Image Sequences for Coupled Dynamical Systems.*

UCLA Directed Reading Program Fall 2018
Mentor for an undergraduate in a reading course on Milnor's books *Topology from the Differentiable Viewpoint* and *Morse Theory.*

Service & Outreach

2023 JMM Special Session on Applied Category Theory Present
Co-organizer

Exploring Your Universe, UCLA Fall 2019, 2022
Volunteer

Women in Math, UCLA 2020-2022
Organizer

Frontiers for Young Minds 2021
Coauthor of the outreach article "Connecting the Dots: Discovering the 'Shape' of Data," with M. Feng, Y. H. Kureh, M. A. Porter, and C.M. Topaz.

Conferences, Seminars, and Workshops

November 2022	Applied Algebraic Topology Research Network (AATRN) Vietoris–Rips seminar (virtual speaker)
September 2022	SIAM Conference on Mathematics of Data Science (speaker)
July 2022	Young Topologist Meeting (speaker)
June 2022	Algebraic Topology: Methods, Computation and Science (ATMCS) conference (poster presenter)
June 2022	Math Research Community (MRC): Applied Category Theory
March 2022	SUNY Albany Applied Topology Seminar (virtual speaker)
February 2022	EPFL Applied Topology Seminar (virtual speaker)
January 2022	Applied Algebraic Topology Research Network (AATRN) poster session (poster presenter)
December 2021	Michigan State University, Topological Data Analysis Seminar (virtual speaker)

October 2021	Applied Algebraic Topology Research Network (AATRN) poster session (poster presenter)
May 2021	SIAM Conference on Applications of Dynamical Systems (virtual speaker)
March 2021	DSOFT/GSNP Short Course: Introduction to Topological Data Analysis, APS March Meeting (virtual speaker)
November 2020	Algorithms for Threat Detection (ATD) Workshop poster session (poster presenter)
January 2017	Joint Mathematics Meeting (speaker)