Abigail Hickok

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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

Honors & Awards

NSF Mathematical Sciences Postdoctoral Research Fellowship	2023
UCLA Dissertation Year Fellowship	2022
NSF Graduate Research Fellowship Honorable Mention	2020
UCLA Graduate Dean's Scholar Fellowship	2018
Eugene V. Cota-Robles Fellowship	2018

Research Visits

Columbia University Spring 2022
Visiting Scientist
Host: Andrew Blumberg

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

Talks and Poster Presentations

Montana State University, Mathematics Seminar (speaker)	Feb. 2023
University of Florida, Topological Data Analysis conference (speaker)	Feb. 2023
Persistence, Sheaves, and Homotopy Theory Seminar (virtual speaker)	Jan. 2023
Santa Fe Institute (speaker)	Jan. 2023
Joint Mathematics Meeting (JMM) (speaker)	Jan. 2023
Yale, Krishnaswamy Lab group meeting (virtual speaker)	Dec. 2022
AATRN Vietoris–Rips seminar (virtual speaker)	Nov. 2022
SIAM Conference on Mathematics of Data Science (speaker)	Sep. 2022
Young Topologist Meeting (speaker)	July 2022
Algebraic Topology: Methods, Computation and Science (ATMCS) (poster)	June 2022
SUNY Albany, Applied Topology Seminar (virtual speaker)	Mar. 2022
EPFL, Applied Topology Seminar (virtual speaker)	Feb. 2022
Applied Algebraic Topology Research Network (AATRN) (poster)	Jan. 2022
Michigan State University, Topological Data Analysis Seminar (virtual speaker)	Dec. 2021
Applied Algebraic Topology Research Network (AATRN) (poster)	Oct. 2021
SIAM Conference on Applications of Dynamical Systems (virtual speaker)	May 2021
APS March Meeting (short course speaker)	Mar. 2021
Algorithms for Threat Detection (ATD) Workshop (poster)	Nov. 2020
Joint Mathematics Meeting (speaker)	Jan. 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

JMM special session on applied category theory Jan. 2023
Co-organizer for a special session on applied category theory

Exploring Your Universe, UCLA Fall 2019, 2022
Volunteer

Women in Math, UCLA 2020-2022
Co-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.

Invited Workshop Participation

Math Research Community (MRC): Applied Category Theory June 2022