

Jakob Hansen

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Education

Ph.D. Applied Mathematics and Computational Science, University of Pennsylvania, in progress.

M.A. Applied Mathematics and Computational Science, University of Pennsylvania, 2017.

B.S. Mathematics, B.S. Economics *summa cum laude*, Arizona State University, 2015.

Experience

Teaching Assistant for Topological Data Analysis mini-course at IAS Park City Mathematics Institute Graduate Summer School, 2016.

ATR Center Intern, Air Force Research Laboratory, 2014.

Computational Science Training for Undergraduates in the Mathematical Sciences, Arizona State University, 2013.

Fields of Research Interest

Applied Algebraic Topology, Spectral Graph Theory, Category Theory

Research

Peer-Reviewed Journal Articles

1. J. Hansen and R. Ghrist. Toward a Spectral Theory of Cellular Sheaves. *Journal of Applied and Computational Topology*, to appear. (2019)
2. R.A. Renaut, M. Horst, Y. Wang, D. Cochran, and J. Hansen. Efficient Estimation of Regularization Parameters via Downsampling and the Singular Value Expansion. *BIT Numerical Mathematics* 57:2 (2017).
3. J. Hansen, J. Hogue, G. Sander, R.A. Renaut, S.C. Popat. Non-negatively Constrained Least Squares and Parameter Choice by the Residual Periodogram for the Inversion of Electrochemical Impedance Spectroscopy Data. *Journal of Computational and Applied Mathematics* 278 (2015).

Conference Publications

1. J. Hansen and R. Ghrist. Distributed Optimization with Sheaf Homological Constraints. Allerton Conference on Communication, Control, and Computing, 2019.
2. J. Hansen and R. Ghrist. Learning Sheaf Laplacians From Smooth Signals. IEEE International Conference on Acoustics, Sound, and Signal Processing, 2019.
3. J. Culbertson, D. Guralnik, J. Hansen, P. Stiller. Consistency Constraints for Overlapping Data Clustering. International Conference on Data Science, 2019. arXiv:1608.04331

Awards and Honors

National Science Foundation Graduate Research Fellowship Honorable Mention, 2015.

Charles Wexler Mathematics Prize, Arizona State University, 2015.
(awarded to the outstanding senior mathematics student at ASU)

Dean's Medal, Economics, Arizona State University, Spring 2015.
(awarded to the outstanding graduating economics student at ASU)

Goldwater Scholarship, 2014.

J.P. Morgan Chase Scholar, Arizona State University, 2013.

NSF Research Experience for Undergraduates, Arizona State University, 2013.

Presentations

Distributed Optimization with Sheaf Homological Constraints. Allerton Conference on Communication, Control, and Computing: Monticello, IL, September 26, 2019.

Laplacians of Cellular Sheaves and their Applications. Union College Mathematics Conference: Schenectady, NY, September 14, 2019.

Sheaves in Dimensionality Reduction. Graduate Student Conference: Geometry and Topology meet Data Analysis and Machine Learning: Columbus, OH. June 1, 2019.

From Connections to Relationships with Cellular Sheaves. SIAM Workshop on Network Science: Snowbird, UT. May 22, 2019.

Sheaf Laplacians as Sums of Semidefinite Matrices. Oxford Topological Data Analysis Seminar: Oxford, UK, May 10, 2019.

Expander Graphs. University of Pennsylvania Graduate Student Seminar: Philadelphia, PA. October 19, 2018.

Toward a Spectral Theory of Cellular Sheaves. Special Session in Applied Topology, AMS Eastern Sectional Meeting: Newark, DE. September 30, 2018.

The Cheeger Inequality and its Generalizations. University of Pennsylvania Graduate Student Seminar: Philadelphia, PA. March 1, 2018.

Clustering with Hierarchical Sieves. ATR Center Summit: Dayton, OH. August 6, 2014.

Improving conditioning for the electrochemical impedance spectroscopy inverse problem. Undergraduate Research in Applied Mathematics, Joint Mathematics Meetings: Baltimore, MD. January 17, 2014.

Conference Participation

Graduate Student Conference: Geometry and Topology meet Data Analysis and Machine Learning, Columbus, OH. June 1-2, 2019

SIAM Workshop on Network Science 2019, Snowbird, UT, May 22-23, 2019.

International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2019, Brighton, UK, May 12-17, 2019.

IMA Tutorial on Multiparameter Persistence, Minneapolis, MN, August 13-15, 2018.

IMA Workshop: Bridging Statistics and Sheaves, Minneapolis, MN, May 21-25, 2018.