Alexander Wagner

CONTACT

U.S. citizen, Website, LinkedIn

ABOUT

My work is on the mathematical theory of geometric and topological invariants of data and their practical implementation as new or improved optimization and data science techniques.

Research Interests: Topological Machine Learning, Computational Geometry, Statistical Learning Theory, Dimensionality Reduction, Risk Management.

Programming: Python, TensorFlow, PyTorch, NumPy, Pandas, SciPy, Scikit-learn, R, C/C++, MATLAB, Git, LaTeX

EMPLOYMENT

Duke University

Phillip Griffiths Assistant Research Professor, Department of Mathematics, August 2020 - July 2023

EDUCATION

University of Florida

Ph.D. in Mathematics, May 2020
Advisor: Dr. Peter Bubenik

Vanderbilt University

M.S. in Mathematics, May 2015
B.A. in Mathematics, Summa Cum Laude, May 2013

VISITING POSITIONS

Hausdorff Institute for Mathematics, Germany, September 2017

HONORS AND AWARDS

2023	Lewis Blake Award for Excellence in Teaching
2019	UF CAM Summer Graduate Research Fellowship
2018	UF Informatics Institute Graduate Student Fellowship
2012	MAA Outstanding Presentation Award
2010–2013	Vanderbilt University College of Arts and Science College Scholar

PAPERS

❑ Alexander Wagner*, Elchanan Solomon*, and Paul Bendich. Improving Metric Dimensionality Reduction with Distributed Topology. arxiv:2106.07613

❑ Elchanan Solomon, Alexander Wagner, and Paul Bendich. From Geometry to Topology: Inverse Theorems for Distributed Persistence. *Symposium on Computational Geometry*, 2022. arxiv:2101.12288

❑ Alexander Wagner. Nonembeddability of Persistence Diagrams with $p > 2$ Wasserstein Metric. *Proceedings of the American Mathematical Society*, March 2021. arXiv:1910.13935

❑ Elchanan Solomon*, Alexander Wagner*, and Paul Bendich. A Fast and Robust Method for Global Topological Functional Optimization. *24th International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2021. arxiv:abs/2009.08496

- ❏ Peter Bubenik and Alexander Wagner. Embeddings of Persistence Diagrams into Hilbert Spaces. *Journal of Applied and Computational Topology*, September 2020. arXiv:1905.05604

- ❏ Paul Bendich, Peter Bubenik, and Alexander Wagner. Stabilizing the unstable output of persistent homology computations. *Journal of Applied and Computational Topology*, November 2019. arXiv:1512.01700

- ❏ Alexander Wagner and Stan Uryasev. Portfolio Optimization with Expectile and Omega Functions. *Proceedings of the 2019 Winter Simulation Conference*, National Harbor, Maryland, December 8-11, 2019. arxiv:1910.14005

INVITED TALKS	*Distributed Persistent Homology: Inverse Theorems and Dimensionality Reduction*, Algebraic Topology: Methods, Computation and Science (ATMCS10), University of Oxford, June 2022

A Topological Heatmap for the Shape of Biological Images, AMS Fall Southeastern Virtual Sectional Meeting, November 2021

Learning with Approximate or Distributed Topology, Topological Data Analysis Workshop, Institute for Mathematical and Statistical Innovation, April 2021

Nonembeddability of Persistence Diagrams into Hilbert Spaces, Applied Algebraic Topology Research Network, August 2020

Portfolio Optimization with Expectile and Omega Functions, Winter Simulation Conference 2019, National Harbor, Maryland, December 8-11, 2019

Embeddings of Persistence Diagrams into Hilbert Spaces, AMS Sectional Meeting, University of Florida, November 2019

Embeddings of Persistence Diagrams into Hilbert Spaces, Midwest Graduate Student Conference: Geometry and Topology meet Data Analysis and Machine Learning, The Ohio State University, June 2019

The Generic Nature of Morse Functions, AMS Spring Southeastern Sectional Meeting, Auburn University, March 2019

The Generic Nature of Morse Functions, Topology, Geometry, and Data Analysis seminar, The Ohio State University, March 2019

A Persistent Homology Measure for Morse Functions, Joint Mathematics Meetings, Baltimore, MD, January 2019

Stabilizing the location of persistent homology, Algebraic Topology: Methods, Computation and Science (ATMCS8), Institute of Science and Technology Austria, June 2018

MENTORING	2021-2023	Jesse Zhang (Duke University)

OUTREACH / SERVICE	2021	Faculty Curriculum on Anti-Racism
	2019	Facilitator at Julia Robinson Mathematics Festival