Alexander Wagner

Contact Information

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Research Interests

Theory of persistent homology, topological data analysis, statistics, machine learning, Morse theory

Education

University of Florida

Ph.D. Candidate, Mathematics (expected 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, September 2017

Honors and Awards

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
2009–2013	National Merit Scholar

Papers

- Arkadi Schelling and Alexander Wagner. Approximation of Persistence Modules with Discrete Morse Theory. (In Preparation)
- Alexander Wagner. Nonembeddability of Persistence Diagrams with $p > 2$ Wasserstein Metric. *arXiv e-prints*, art. arXiv:1910.13935, Oct 2019.
- Peter Bubenik and Alexander Wagner. Embeddings of Persistence Diagrams into Hilbert Spaces. *arXiv e-prints*, art. arXiv:1905.05604, May 2019. (Undergoing peer review; submitted May 25, 2019)
- Paul Bendich, Peter Bubenik, and Alexander Wagner. Stabilizing the unstable output of persistent homology computations. *Journal of Applied and Computational Topology*, Accepted 2019. Available at arXiv:1512.01700.
- Alexander Wagner and Stan Uryasev. Portfolio Optimization with Expectile and Omega Functions. To appear in *Proceedings of the 2019 Winter Simulation Conference*, National Harbor, Maryland, December 8-11, 2019. Available at arxiv:1910.14005.

Invited Talks

Embeddings of Persistence Diagrams into Hilbert Spaces, AMS Sectional Meeting, University of Florida, November 2019. (Upcoming)

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

Contributed Talks

Stabilizing the Persistent Homology Pairing of Critical Points of a Morse Function, FSU-UF Joint Topology and Dynamics Meeting, University of Florida, February 2017

Topology and Dynamics Seminar, University of Florida

- *Geometric Persistence Measures*, October 2017
- *Stabilizing Auxiliary Persistence Information*, Ph.D. Oral Exam, April 2017
- *Geometric Persistence Measures*, November 2016

UF Graduate Student Topology Seminar, University of Florida

- *A Crash Course in Morse Homology*, February 2018
- *Dowker's Theorem*, November 2017
- *Multidimensional Persistence Modules* (3 talks), October 2016
- *Introduction to Homological Algebra* (3 talks), March 2016
- *Topological Complexity of Spaces and Maps* (5 talks), October 2015

Persistence Algorithm, UF Student Applied Topology Seminar, University of Florida, January 2016

Equal Circle Packing on a Square Flat Klein Bottle, MAA Mathfest, Madison, WI, August 2012

Posters

- *Embeddings of Persistence Diagrams into Hilbert Spaces*, Conference on Geometric Data Analysis, University of Chicago, May 2019
- *Stabilizing the Persistent Homology Pairing of Critical Points of a Morse Function*, Conference on Applied and Computational Algebraic Topology, Hausdorff Institute for Mathematics, May 2017
- *Stabilizing the Persistent Homology Pairing of Critical Points of a Morse Function*, Applied Algebraic Topology 2017, Hokkaido University, August 2017

Mentoring

2019-Present	David Freeman
2019-Present	Gianfranco Cortes-Arroyo
2018-Present	Jose Bouza

Programming Languages

- R
- MATLAB
- C/C++

Selected Graduate Coursework

- ❑ Morse Theory
- ❑ Stochastic Optimization
- ❑ Advanced Engineering Economy
- ❑ Advanced Machine Learning
- ❑ Geometric Group Theory (2 semesters)
- ❑ Functional Analysis (2 semesters)
- ❑ Algebraic Topology (2 semesters)
- ❑ Homological Algebra
- ❑ Numerical Linear Algebra
- ❑ Differential Topology and Vector Bundles

Teaching Experience

Fall	2017	Instructor, Online Precalculus and Algebra
Summer C	2017	Instructor, Online Precalculus and Algebra
Fall	2016	Discussion Leader, Calculus 1
Spring	2016	Discussion Leader, Mathematics for Liberal Arts
Spring	2016	Grader, Survey of Calculus 2
Fall	2015	Discussion Leader, Mathematics for Liberal Arts
Spring	2015	Teaching Assistant, Differential Equations with Linear Algebra
Fall	2014	Teaching Assistant, Calculus 1
Spring	2014	Teaching Assistant, Number Theory
Fall	2013	Teaching Assistant, Abstract Algebra