

Zhengchao Wan

✉ zcwan@ucsd.edu • 🌐 <https://zhengchaow.github.io>

Education

The Ohio State University

Ph.D. in Mathematics

Advisor: Facundo Mémoli

Columbus, OH, USA

2016-2021

Peking University

B.S. in Mathematics

Advisor: Bin Dong

Beijing, China

2012-2016

Employment

University of California San Diego

Postdoctoral Scholar

Mentors: Gal Mishne, Yusu Wang

La Jolla, CA, USA

2022-Present

Research Interests

Optimal Transport, Metric Geometry, Spectral Geometry, Topological Data Analysis

Publications

Papers in Journals and Peer-Refereed Conferences.....

Aziz Burak Gülen, Facundo Mémoli, Zhengchao Wan, and Yusu Wang. A generalization of the persistent Laplacian to simplicial maps. *To appear in 39th International Symposium on Computational Geometry (SoCG)*. *arXiv preprint arXiv:2302.03771*., 2023.

Samantha Chen, Sunhyuk Lim, Facundo Mémoli, Zhengchao Wan, and Yusu Wang. Weisfeiler-Lehman meets Gromov-Wasserstein. In *International Conference on Machine Learning (ICML)*, pages 3371–3416. PMLR, 2022.

Facundo Mémoli, Zhengchao Wan, and Yusu Wang. Persistent laplacians: Properties, algorithms and implications. *SIAM Journal on Mathematics of Data Science*, 4(2):858–884, 2022.

Facundo Mémoli, Zane Smith, and Zhengchao Wan. The Gromov-Hausdorff distance between ultrametric spaces: its structure and computation. *To appear in Journal of Computational Geometry*. *arXiv preprint arXiv:2110.03136*., 2021.

Facundo Mémoli and Zhengchao Wan. On p -metric spaces and the p -Gromov-Hausdorff distance. *p-Adic Numbers, Ultrametric Analysis and Applications*, 14(3):173–223, 2022.

Zhengchao Wan. A novel construction of Urysohn universal ultrametric space via the Gromov-Hausdorff ultrametric. *Topology and its Applications*, 300:107759, 2021.

Facundo Mémoli, Zane Smith, and Zhengchao Wan. The Wasserstein transform. In *International Conference on Machine Learning (ICML)*, pages 4496–4504. PMLR, 2019.

Preprints.....

Samantha Chen, Sunhyuk Lim, Facundo Mémoli, Zhengchao Wan, and Yusu Wang. The Weisfeiler-Lehman distance: Reinterpretation and connection with GNNs. *arXiv preprint arXiv:2302.00713*, 2023.

Gal Mishne, Zhengchao Wan, Yusu Wang, and Sheng Yang. The numerical stability of hyperbolic representation learning. *arXiv preprint arXiv:2211.00181*, 2022.

Sunhyuk Lim, Facundo Memoli, Zhengchao Wan, Qingsong Wang, and Ling Zhou. Some results about the Tight Span of spheres. *arXiv preprint arXiv:2112.12646*, 2021.

Facundo Mémoli, Axel Munk, Zhengchao Wan, and Christoph Weitkamp. The ultrametric Gromov-Wasserstein distance. *arXiv preprint arXiv:2101.05756*, 2021.

Facundo Mémoli and Zhengchao Wan. Characterization of Gromov-type geodesics. *arXiv preprint arXiv:2105.05369*, 2021.

Kun Jin, Facundo Mémoli, and Zhengchao Wan. The Gaussian transform. *arXiv preprint arXiv:2006.11698*, 2020.

Computational Software / Expository Webpages

Persistent Laplacian (with F. Mémoli and Y. Wang)

<https://github.com/ndag/Persistent-Laplacian>

Gromov-Hausdorff distances between ultrametric spaces (with F. Mémoli and Z. Smith)

<https://github.com/ndag/ultrametrics>

The ultrametric Gromov-Wasserstein distances (with F. Mémoli, A. Munk and C. Weitkamp)

<https://github.com/ndag/uGW>

Talks

Computational Persistence 2022 Oct. 2022

Persistent Laplacians: properties, algorithms and implications

International Conference on Machine Learning (ICML) 2022 July 2022

Weisfeiler-Lehman meets Gromov-Wasserstein

Topology, Geometry and Data Analysis seminar at Ohio State Oct. 2021

The Gromov-Hausdorff distance between ultrametric spaces

Geometry and Topology meet Data Analysis and Machine Learning (GTDAML 2021) July 2021

Persistent Laplacians: properties, algorithms and implications

Seminar at Centre for Topological Data Analysis, Oxford University May 2021

Persistent Laplacians: properties, algorithms and implications

Algebraic Topology: Methods, Computation, and Science (hosted by AATRN) Jan. 2021

Computing the Gromov-Hausdorff distance between ultrametric spaces

Topology, Geometry, and Applications - Graduate Students Seminar at Ohio State Oct. 2020

Urysohn universal ultrametric space

Geometry, Topology and Data Seminar, Florida State University Nov. 2019

The Wasserstein transform

Topology, Geometry, and Applications - Graduate Students Seminar at Ohio State Sep. 2019

Gromov-Hausdorff distance between ultrametric spaces

Air Force Research Lab in Dayton, Ohio July 2019

The Wasserstein transform

Poster Presentations

Conference on the Mathematical Theory of Deep Neural Networks Nov 2022

A numerical comparison between Lorentz and Poincaré models for representation learning

TILOS Annual Retreat / Industry Day <i>WL-based distance for directed graphs with attributes and Markov chain metric spaces</i>	<i>Oct 2022</i>
International Conference on Machine Learning (ICML) 2019 <i>The Wasserstein transform</i>	<i>June 2019</i>
GTDAML2019, the Ohio State University <i>The Wasserstein transform</i>	<i>May 2019</i>
Geometric Data Analysis, University of Chicago <i>The Wasserstein transform</i>	<i>May 2019</i>

Honors and Awards

Special Graduate Assignments, the Ohio State University	<i>Spring 2020</i>
Travel Award, ICML2019	<i>June 2019</i>
Alumina Yizheng Distinguished Scholar Award, Peking University	<i>Oct. 2014</i>
Jiang Zehan Scholarship, Peking University	<i>Sep. 2013</i>

Teaching Experiences

MATH 1172, the Ohio State University <i>Engineering Mathematics A</i>	<i>Spring 2021</i>
MATH 1172, the Ohio State University <i>Engineering Mathematics A</i>	<i>Autumn 2018</i>
Mini-Course, Peking University <i>Information Geometry</i>	<i>Summer 2016</i>

Professional Services

Organization of activities.....

Midwest Student Conference GTDAML2019, the Ohio State University <i>Co-organizer</i>	<i>June 2019</i>
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Referee.....

Journals

Analysis and Geometry in Metric Spaces
Computational Geometry: Theory and Applications
Discrete & Computational Geometry
Journal of Combinatorial Optimization
SIAM Journal on Applied Algebra and Geometry

Conferences

Symposium on Computational Geometry (2021, 2022, 2023)
ACM-SIAM Symposium on Discrete Algorithms (2019, 2023)
Conference on the Mathematical Theory of Deep Neural Networks (2022)