

Woojin Kim

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Employment / Education

CV — short vers.

- Aug 2020 - July 2023** **Duke University**, NC
William W. Elliott Assistant Research Professor of Mathematics
- May 2020** **The Ohio State University**, OH
Ph.D. in Mathematics
Thesis: The Persistent Topology of Dynamic Data (Advisor: Facundo Mémoli)
- Aug 2014** **Seoul National University**, South Korea
B.S. in Mathematics Education (with Honors)
Korean National Secondary Teacher Certificate (Grade II) of Math

Research interests

Theoretical Foundations of Topological Data Analysis, Metric Geometry, Computational Geometry, and Their Applications to Dynamical Systems.

Papers (■: published, □: in preprint)

- **Analysis of dynamic graphs and dynamic metric spaces via zigzag persistence** (with F. Mémoli, Z. Smith), The Proceedings of Abel Symposium on Topological Data Analysis, Paper link (18 pages), 2020.
- **Elder-rule-staircodes for augmented metric spaces** (with C. Chen, F. Mémoli, Y. Wang), The Proceedings of the 36th International Symposium on Computational Geometry (SoCG), Paper link (17 pages), arXiv preprint (41 pages), 2020.
- **Spatiotemporal persistent homology for dynamic metric spaces** (with F. Mémoli), Discrete & Computational Geometry, Paper link, arXiv preprint (45 pages), 2020.
- **The metric structure of the formigram interleaving distance** (with F. Mémoli, A. Stefanou), arXiv/1912.04366 (26 pages).
- **Generalized persistence diagrams for persistence modules over posets**, with F. Mémoli, arXiv/1810.11517 (55 pages), submitted.
- **Formigrams: Clustering Summaries of Dynamic Data** (with F. Mémoli), The Proceedings of the 30th Canadian Conference on Computational Geometry Paper link (9 pages), 2018.
- **Stable signatures for dynamic metric spaces via persistent homology** (with F. Mémoli) in *Statistics for Data with Geometric Structure*. Oberwolfach Report, 3 (2018), p.169-172.
- **Stable signatures for dynamic graphs and dynamic metric spaces via zigzag persistence**, (with F. Mémoli), arXiv/1712.04064 (58 pages), Last update: Aug, 2018.

Computational software / Expository webpages

- Spatiotemporal persistent homology** (with N. Clause) <https://github.com/ndag/PHoDMSs>
- Elder-rule-staircodes** (with C. Cai, F. Memoli, Y. Wang) <https://github.com/Chen-Cai-OSU/ER-staircode/>
- Classification of collective behaviors via zigzag persistent homology** (with Z. Smith)
<https://research.math.osu.edu/networks/formigrams/>
- Formigramator** (with D. Verano, F. Mémoli) <https://research.math.osu.edu/networks/formigramator/>

Talks (■: invited talks, □: contributed talks, ♣: poster presentations)

- **The Grad-Faculty seminar at Duke Univ.** September 2020
TBD
- **The 36th International Symposium on Computational Geometry, virtual meeting** June 2020
Elder-rule-staircodes for augmented metric spaces
- **Algebraic Topology: Methods, Computation, and Science (hosted by AATRN), virtual meeting** June 2020
Spatiotemporal persistent homology for dynamic metric spaces
- **The University of Florida Topological Data Analysis workshop** January 2020
Generalized persistence diagrams for persistence modules over posets
- **The Joint Mathematics Meetings 2020 in Denver, Colorado (Special Session on Applied Topology)** January 2020
Spatiotemporal persistent homology for dynamic metric spaces
- **Topology seminar at Colorado State** October 2019
Generalized persistence diagrams for persistence modules over posets
- **Union College Math Conference (Applied Topology Session)** September 2019
Generalized persistence diagrams for persistence modules over posets
- **Applied Topology seminar, University at Albany, SUNY** September 2019
Spatiotemporal persistent homology for dynamic metric spaces
- **Topology, Geometry and Data Analysis seminar at Ohio State** September 2019
Generalized persistence diagrams for persistence modules over posets
- **Air Force Research Lab in Dayton, Ohio** July 2019
Topological data analysis of time-evolving metric data
- ♣ **Midwest Student Conference: Geometry and Topology meet Data Analysis and Machine Learning** June 2019
Persistent homology for dynamic metric spaces
- ♣ **TGDA@OSU: Structure in the micro-world** May 2019
Persistent homology for dynamic metric spaces
- ♣ **Conference on Geometric Data Analysis at University of Chicago** May 2019
Persistent homology for dynamic metric spaces
- **Great Lake SIAM at University of Michigan** April 2019
Multiparameter persistent homology for time-varying metric data
- **Mathematics Graduate Student Association Lecture at Ohio State** April 2019
Rank of a diagram and its application in topological data analysis
- **Brown-bag seminar at the Dept of CMSE, Michigan State** April 2019
Multiparameter persistent homology for time-varying metric data
- **Bubenik's research group meeting at University of Florida** March 2019
Rank invariant and generalized persistence diagrams for zigzag persistence
- **Topology seminar at Florida State** March 2019
Persistent homology for time-evolving metric/network data
- **Topology, Geometry, and Applications - Graduate Students Seminar at Ohio State** February 2019
Multiparameter persistent homology for time-varying metric data
- ♣ **Workshop on Applied Topology at Kyoto Univ** January 2019
Rank invariant for zigzag modules
- **Topology, Geometry, and Applications - Graduate Students Seminar at Ohio State** November 2018
Rank for arbitrary diagrams
- **The 30th Canadian Conference on Computational Geometry, University of Manitoba** August 2018
Formigrams: Clustering summaries of dynamic data
- **AMS Spring Central Sectional Meeting at Ohio State** March 2018
Stable signatures for dynamic metric spaces via zigzag persistent homology
- **Dept. of Mathematics Education, Seoul National University** July 2016
Topological and geometric ideas in data analysis
- **More than 30 Talks in Mémoli's group seminars or course work** 2015 - 2020
More than 30 research or expository talks about topological data analysis, networks, optimal transport, probability, and differential/metric geometry. Links: 1, 2, 3, 4, 5, 6

Referee

International Symposium on Computational Geometry (×2)

Awards

Special Graduate Assignments Math department fellowship (exemption from teaching duty) Spring 2018, Spring 2020

Travel Grants for 9 conference attendances: U of Florida (2020), AMS (2020), Brown (2019), U of Chicago (2019), U of Michigan (2019), Kyoto Univ (2019), U of Minnesota (2018), U of Bonn (2018), Carnegie Mellon (2017)

Teaching Experience

Multivariable Calculus Fall 2020

Calculus for Engineers A Fall 2016

Calculus 2 Spring 2016

Calculus 3 and Topics for Engineers, Tutor Fall 2014, Spring 2015, Fall 2015
Tutored 4 hours per week at Math and Stat Learning Center, OSU

Introduction to Applied Algebraic Topology, Lecturer for 2 weeks Spring 2019
A substitute for the original lecturer Tom Needham

Services and activities

TA training mentor (selected by TA coordinator) Summer 2019

Chair of the organizing committee for Midwest Student Conference: GTDAML2019 Spring 2019

Cöde Bootcamp held by Erdős Institute May 2018
Learned the basics of Python

Co-organizer (with Mémoli) of activities in Network Data Analysis group at OSU 2018-2019