ELENA XINYI WANG

wangx249@msu.edu

EDUCATION

Michigan State University   **East Lansing, MI**
Ph.D. in Computational Mathematics, Science, and Engineering   *Expected May 2025*
Thesis: *Topological Data Analysis on Graphs*   Advisor: Dr. Elizabeth Munch

College of the Holy Cross   **Worcester, MA**
B.A. in Mathematics and Music with High Honors, Cum Laude   *May 2020*
Thesis: *Invariant Theory in Characteristic p*   Advisor: Dr. John Little

RESEARCH EXPERIENCE

Research Interest: Topological Data Analysis, Computational Geometry, Machine Learning

Michigan State University   **East Lansing, MI**
Graduate Research Assistant   *September 2020 – Present*

ICERM at Brown University, Program on Math + Neuroscience   **Providence, RI**
Long Term Visitor   *Fall 2023*

Lawrence Berkeley National Laboratory   **Berekeley, CA**
Ph.D. Intern; Mentor: Dr. Dmitriy Morozov   *Summer 2023*

College of the Holy Cross   **Worcester, MA**
Undergraduate Researcher - Mathematics Honors Senior Thesis   *September 2019 – May 2020*
Weiss Summer Research Student in the Science and Mathematics   *Summer 2017, 2018*
Weiss Summer Research Student in the Humanities, Social Sciences, and Arts   *Summer 2019*

PREPRINTS AND WORK IN PREPERATION

† indicates undergraduate mentees, ∗ indicates corresponding author

- E. W. Chambers, E. Munch, S. Percival, **Elena X. Wang**∗. "A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance," submitted, available on arXiv: 2407.09442.

- E. Munch, **Elena X. Wang**∗, C. Wenk. "The Kinetic Hourglass Data Structure for Computing the Bottleneck Distance," *under review*, 2025.

- **Elena X. Wang**∗, D. Morozov, A. Nigmetov. "Persistence-Augmented Neural Networks," *in preparation*, 2025.

- N. Wiley†, **Elena X. Wang**, E. Munch. "An Optimization of Euler Characteristic Transform Computation on Embedded Graphs," *in preparation*, 2025.

- J. George†, E. Munch, O. L. Osborn†, M. Ridgley†, **Elena X. Wang**. "Stability Results for the Euler Characteristic Transform," *in preparation*, 2024.

PUBLICATIONS

- R. Liu, S. Canturk, F. Wenkel, S. McGuire, **Elena X. Wang**, A. Little, L. O'Bray, M. Perlmutter, B. Rieck, M. Hirn, G. Wolf, L. Rampašek. "Taxonomy of Benchmarks in Graph Representation Learning," In: *Proceedings of the First Learning on Graphs Conference*, volume 198 of *Proceedings of Machine Learning Research*, pages 6:1-6:25. PMLR, 09-12 Dec 2022.

- A. Hwang, **Elena X. Wang**. "Clairaut Surfaces in Euclidean Three-Space," In: *Tôhoku Math. J.*, **74** no. 2, 215–227, 2022.

- L. Baily, H. S. Blake, G. Cochran, N. Fox, M. Levet, R. Mahmoud, E. Matson, I. Singgih, G. Stadnyk, **Elena X. Wang**, A. Wiedemann. "Complexity and Enumeration in Models of Genome Rearrangement," In: *Computing and Combinatorics*, volume 14422, 3-14, 2024.

CONFERENCES AND PRESENTATIONS

National Museum of Mathematics *(invited)* — **New York, NY**
What is Topology anyways? — *June 2025*

58th Spring Topology and Dynamics Conference *(invited)* — **Newport News, Virginia**
Persistence-Augmented Neural Networks — *March 2025*

Joint Mathematics Meeting *(invited)* — **Seattle, WA**
Persistence-Augmented Neural Networks — *January 2025*

Joint Mathematics Meeting — **Seattle, WA**
Computing the Bottleneck Distance for Time-Varying Systems — *January 2025*

Université de Fribourg *(invited)* — **Fribourg, Switzerland**
Computing the Bottleneck Distance from All Directions — *November 2024*

CMSE Data Science Student Conference *(poster)* — **East Lansing, MI**
Persistence-Augmented Neural Networks — *November 2024*

CMSE Data Science Student Conference — **East Lansing, MI**
A Kinetic Data Structure for Computing the Bottleneck Distance — *November 2024*

NSF Research Traineeship Workshop Series *(invited)* — **East Lansing, MI**
A Kinetic Data Structure for Computing the Bottleneck Distance — *November 2024*

ELBE Symposium *(invited)* — **Dresden, Germany**
Topological Shape Analysis for Static and Dynamic Data — *November 2024*

Applied Algebraic Topology Research Network *(invited)* — **Virtual**
Computing the Bottleneck Distance from All Directions — *October 2024*

AMS 2024 Fall Eastern Sectional Meeting *(invited)* — **Albany, NY**
The Kinetic Hourglass Data Structure for Computing the Bottleneck Distance — *October 2024*

Computational Persistence 2024 — **Graz, Austria**
Computing the Bottleneck Distance from All Directions — *September 2024*

MSU TDA Seminar *(invited)* — **East Lansing, MI**
Computing the Bottleneck Distance from All Directions — *September 2024*

Spires Topology Conference *(poster)* — **Oxford, UK**
Persistence-Augmented Neural Networks — *August 2024*

Claremont Topology Seminar *(invited)* — **Claremont, CA**
Topological Data Analysis on Embedded Graphs — *April 2024*

Albion College Mathematics and Computer Science Colloquium *(invited)* — **Albion, MI**
Unraveling Hidden Patterns with Topological Data Analysis (TDA) — *March 2024*

National Museum of Mathematics *(invited)* **Virtual**
Breaking limits and influencing the future: a panel discussion *February 2024*

Joint Mathematics Meetings *(invited)* **San Francisco, CA**
The Labeled Merge Tree Interleaving Distance and its Application *January 2024*

CMSE Data Science Student Conference **East Lansing, MI**
Directed Labeled Merge Tree Distance for Geometric Graphs *November 2023*

Northeastern University Graduate Student Seminar *(invited)* **Boston, MA**
The Labeled Merge Tree Interleaving Distance and its Application *October 2023*

ICERM Topology and Geometry in Neuroscience Workshop **Providence, RI**
Directed Labeled Merge Tree Distance for Geometric Graphs *October 2023*

ICERM at Brown University Graduate Student Seminar **Providence, RI**
Directed Labeled Merge Tree Distance for Geometric Graphs *September 2023*

Computational Persistence **West Lafayette, IN**
The Labeled Merge Tree Interleaving Distance and its Application *September 2023*

TDA Week *(poster)* **Kyoto, Japan**
Directed Labeled Merge Tree Distance for Geometric Graphs *August 2023*

International Symposium on Computational Geometry **Dallas, TX**
Directed Labeled Merge Tree Distance on Classification of *Passiflora* Leaves *June 2023*

Randomness in Topology and its Applications *(poster)* **Chicago, IL**
A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance *March 2023*

8th Mexican Workshop on Applied Geometry and Topology *(poster)* **Virtual**
A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance *November 2022*

SIAM Conference on Mathematics of Data Science*(invited)* **San Diego, CA**
A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance *September 2022*

Algebraic Topology and TDA **Minneapolis, MN**
Hosted by the Institute for Mathematics and its Applications *August 2022*

Algebraic Topology: Methods, Computation, and Science **Oxford, UK**
Hosted by the Mathematical Institute, University of Oxford *June 2022*

Joint Mathematics Meetings *(poster)* **Denver, CO**
Invariant Theory in Characteristic p *January 2020*

Joint Mathematics Meetings *(poster)* **Baltimore, MD**
Clairaut Surfaces in Euclidean Three-Space *January 2019*

MENTORING AND TEACHING EXPERIENCE

Undergraduate Research Mentor **East Lansing, MI**
Michigan State University *September 2022 – Present*
- Ray Hasan *September 2023 - Present*
- Denis Selyuzhitsky *September 2023 - May 2024*
- Nathan Willey (now PhD student at the Ohio State University) *September 2022 - May 2023*

Guest Lecturer, Department of CMSE　　　　　　　　　　　**East Lansing, MI**
Michigan State University　　　　　　　　　　　　　　　*Spring 2024 - present*
- CMSE201: Computational Modeling and Data Analysis　　　　　*Spring 2024*
- CMSE381: Fundamentals of Data Science Methods　　　　　　　*Fall 2024*

Teaching Assistant, Department of CMSE　　　　　　　　**East Lansing, MI**
Michigan State University　　　　　　　　　　　　　　　　*Spring 2024*
- CMSE201: Computational Modeling and Data Analysis

REU Graduate Research Mentor　　　　　　　　　　　　**East Lansing, MI**
Michigan State University　　　　　　　　　　　　　*Summer 2022, 2024*
- SURIUM REU program (3 students)　　　　　　　　　　　*Summer 2024*
- ACRES REU program (10 students)　　　　　　　　　　　*Summer 2022*

Teaching Assistant, Department of Mathematics and CS　　**Worcester, MA**
College of the Holy Cross　　　　　　　　　　　　*Fall 2017 - March 2020*
- MATH241 Multivariable Calculus　　　　　　　　　　　*Fall 2017, 2018*
- MATH243 Mathematical Structures　　　　　　　　　　　　*Fall 2019*
- MATH244 Linear Algebra　　　　　　　　　　　　　*Spring 2018, 2019*
- MATH361 Real Analysis　　　　　　　　　　　　　　　*Spring 2020*

Teaching Assistant, Department of Music　　　　　　　　**Worcester, MA**
College of the Holy Cross　　　　　　　　　　　*Fall 2017 - Spring 2019*
- MUSC201 Music Theory 1　　　　　　　　　　　　*Fall 2017, 2018, 2019*
- MUSC202 Music Theory 2　　　　　　　　　　　　　*Spring 2018, 2019*
- MONT110G Jazz, Civil Rights, Hip Hop　　　　　　　　　　*Fall 2019*
- MONT110G Music, Politics and Culture　　　　　　　　　　*Spring 2020*

CONFERENCE AND WORKSHOP ORGANIZATION

MSU TDA Seminar　　　　　　　　　　　　　　　　**East Lansing, MI**
Organize weekly seminars at MSU　　　　　　　　　*August 2024 - present*

Topological Data Analysis Workshop　　　　　　　　　**East Lansing, MI**
NSF Research Traineeship Workshop Series　　　　　　　　*November 2024*

Workshop on Directional Transform　　　　　　　　　　**Athens, Greece**
40$^{\text{th}}$ International Symposium of Computational Geometry (SoCG)　　*June 2024*

FELLOWSHIPS, AWARDS, AND HONORS

Ginther Research Fellowship　　　　　　　　　**Michigan State University**
Research fellowship awarded for outstanding research　　　　　*Spring 2025*

ELBE Postdoctoral Fellowship *(declined)*　　**Center for Systems Biology Dresden**
2-year postdoctoral fellowship　　　　　　　　　　　　　*Fall 2024*

Raymond P. Ginther Outstanding Research Award　　**Michigan State University**
Awarded for outstanding research post-comprehensive exam　　　*Fall 2024*

Dissertation Completion Fellowship　　　　　　**Michigan State University**
Awarded to students completing their dissertations　　　　　　*Fall 2024*

Engineering Leadership Fellow   **Michigan State University**
Outreach fellowship awarded to student leaders   *Fall 2023 – Present*

Distinguished Engineering Scholar   **Michigan State University**
Awarded to outstanding students to graduate study in engineering   *Fall 2020 – Spring 2021*

Raymond P. and Marie M. Ginther Graduate Fellowship   **Michigan State University**
Research fellowship awarded to selected first-year graduate students   *Fall 2020*

Museum of Mathematics MOST Fellow   **MoMath**
Outreach fellowship awarded to 10 early-career female mathematicians   *August 2023*

Pi Mu Epsilon   **College of the Holy Cross**
Mathematical Honors Society   *Inducted 2020*

MAA Poster Session Outstanding Poster Award   **Joint Mathematics Meeting**
Awarded to recognize best posters in MAA Undergraduate Poster Session   *January 2019*

The Beethoven Prize   **College of the Holy Cross**
Awarded to an outstanding music major   *May 2020*

TRAVEL GRANTS

AMS Fall 2024 Sectional Travel Grant   **Albany, NY**
Travel support for attending the AMS Sectional Meeting   *October 2024*

TDA Week 2023   **Kyoto University**
Travel support for attending TDA Week   *August 2023*

CG Week 2023   **UT Dallas**
Travel support for attending CG Week   *July 2023*

AMS MRC   **Java Center, NY**
Travel support for attending Mathematics Research Community   *June 2022*

AMS Undergraduate Travel Grant   **Joint Mathematics Meeting**
Travel support for undergraduates attending JMM 2020   *January 2020*

AMS Undergraduate Travel Grant   **Joint Mathematics Meeting**
Travel support for undergraduates attending JMM 2019   *January 2019*

SERVICE AND OUTREACH

Fellow, Mathematics Outreach Seminar and Training Program   **New York, NY**
National Museum of Mathematics   *July 2023 - December 2024*

Engineering K-12 Outreach Fellow, College of the Engineering   **East Lansing, MI**
Michigan State University   *August 2023 - present*

Vice President of Graduate Student Organization   **East Lansing, MI**
Michigan State University   *September 2022 - August 2023*

Graduate Student Liaison, Department of CMSE   **East Lansing, MI**
Michigan State University   *September 2021 - August 2022*

Student Representative, CMSE Hiring Committee   **East Lansing, MI**
Michigan State University   *October 2021 - March 2022*

Co-Chair, Department of Music Student Advisory Committee   **Worcester, MA**
College of the Holy Cross   *April 2018 - April 2020*

Program Coordinator, International Student Orientation   **Worcester, MA**
College of the Holy Cross   *Fall 2017, 2018, 2019*

Workshop Leader, The Arts in Practice (News Appearance)   **Worcester, MA**
Burncoat High School   *October 2019*

WORKSHOP PARTICIPATION

ICERM at Brown University   **Providence, RI**
Women in Mathematical Computational Biology   *January 2025*

ICERM at Brown University   **Providence, RI**
Topology and Geometry in Neuroscience Workshop   *October 2023*

Mathematics Research Communities   **Java Center, NY**
Single-Cut and Join in Genome Rearrangement   *June 2022*

REVIEW AND REFEREE

- International Symposium of Computational Geometry (SoCG) (Subreviewer)   *2023, 2025*
- Conference and Workshop on Neural Information Processing Systems (NeurIPS)   *2022-2024*
- Journal of Applied and Computational Topology   *2023*

PROFESSIONAL DEVELOPMENT

Certification in College Teaching   **Michigan State University**
Certification by the Graduate School   *May 2024*

Undergraduate Mentorship Training   **Michigan State University**
Two-day training program offered by the College of Engineering   *June 2024*

PROFESSIONAL EXPERIENCE

Research Analyst Intern   **Shanghai, China**
Caitong Fund Management Company   *May - September 2020*
- Developed data-driven insights on the future direction of 15 companies across 4 industries
- Presented 3 investment ideas to Caitong's investment community and helped investors harness data science to enhance their process

SKILLS AND INTERESTS

Programming: Python, LaTeX, SQL, MATLAB, OpenMP/MPI
Interests: Piano and flute performance, cooking and gastronomy
Languages: Fluent Mandarin and English, conversational French and Korean