

ELENA XINYI WANG

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EDUCATION

Michigan State University

Ph.D. in Computational Mathematics, Science, and Engineering
Thesis: *Topological Data Analysis on Graphs*

East Lansing, MI

Expected May 2025

Advisor: Dr. Elizabeth Munch

College of the Holy Cross

B.A. in Mathematics and Music with High Honors, Cum Laude
Thesis: *Invariant Theory in Characteristic p*

Worcester, MA

May 2020

Advisor: Dr. John Little

RESEARCH EXPERIENCE

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

Michigan State University

Graduate Research Assistant

East Lansing, MI

September 2020 – May 2025

ICERM at Brown University, Program on Math + Neuroscience

Long Term Visitor

Providence, RI

Fall 2023

Lawrence Berkeley National Laboratory

Ph.D. Intern; Mentor: Dr. Dmitriy Morozov

Berekeley, CA

Summer 2023

College of the Holy Cross

Undergraduate Researcher - Mathematics Honors Senior Thesis

Weiss Summer Research Student in the Science and Mathematics

Weiss Summer Research Student in the Humanities, Social Sciences, and Arts

Worcester, MA

September 2019 – May 2020

Summer 2017, 2018

Summer 2019

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.

PREPRINTS/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. Nigmatov. “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*, 2025.
- E. W. Chambers, R. Hasan[†], E. Munch, S. Percival, D. Selyuzhitsky[†], **Elena X. Wang**, C. Wenk. “Comparing Graph Distances: a Survey,” *in preparation*, 2025.
- A. Plaza-Rodriguez, W. Zhao, **Elena X. Wang**, L. Gyllingberg, A. Luanpaisanon, E. Fertig, G. Stein-O’Brien. “Dynamics of Oscillatory Networks Responsible for Cell-Fate Determination and Disease Development.” *in preparation*, 2025.

FELLOWSHIPS, AWARDS, AND HONORS

Ginther Research Fellowship Research fellowship awarded for outstanding research	Michigan State University <i>Spring 2025</i>
ELBE Postdoctoral Fellowship (<i>declined</i>) 2-year postdoctoral fellowship	Center for Systems Biology Dresden <i>Fall 2024</i>
Raymond P. Ginther Outstanding Research Award Awarded for outstanding research post-comprehensive exam	Michigan State University <i>Fall 2024</i>
Dissertation Completion Fellowship Awarded to students completing their dissertations	Michigan State University <i>Fall 2024</i>
National Museum of Mathematics MOST Fellow Outreach fellowship awarded to 10 early-career female mathematicians	MoMath <i>August 2023</i>
Engineering Leadership Fellow Outreach fellowship awarded to student leaders	Michigan State University <i>Fall 2023 – Fall 2024</i>
Distinguished Engineering Scholar Awarded to outstanding students to graduate study in engineering	Michigan State University <i>Fall 2020 – Spring 2021</i>
Raymond P. and Marie M. Ginther Graduate Fellowship Research fellowship awarded to selected first-year graduate students	Michigan State University <i>Fall 2020</i>
Pi Mu Epsilon Mathematical Honors Society	College of the Holy Cross <i>Inducted 2020</i>
MAA Poster Session Outstanding Poster Award Awarded to recognize best posters in MAA Undergraduate Poster Session	Joint Mathematics Meeting <i>January 2019</i>
The Beethoven Prize Awarded to an outstanding music major	College of the Holy Cross <i>May 2020</i>

CONFERENCES AND PRESENTATIONS

National Museum of Mathematics (<i>invited</i>) What is Topology?	New York, NY <i>June 2025</i>
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Graz School of Discrete Mathematics Advanced Topics Seminar <i>(invited)</i>	Graz, Austria
Comparing Geometric Graphs using Topology	<i>May 2025</i>
58th Spring Topology and Dynamics Conference <i>(invited)</i>	Newport News, VA
Persistence-Augmented Neural Networks	<i>March 2025</i>
Joint Mathematics Meeting <i>(invited)</i>	Seattle, WA
Persistence-Augmented Neural Networks	<i>January 2025</i>
Joint Mathematics Meeting	Seattle, WA
Computing the Bottleneck Distance for Time-Varying Systems	<i>January 2025</i>
Université de Fribourg <i>(invited)</i>	Fribourg, Switzerland
Computing the Bottleneck Distance from All Directions	<i>November 2024</i>
CMSE Data Science Student Conference <i>(poster)</i>	East Lansing, MI
Persistence-Augmented Neural Networks	<i>November 2024</i>
CMSE Data Science Student Conference	East Lansing, MI
A Kinetic Data Structure for Computing the Bottleneck Distance	<i>November 2024</i>
NSF Research Traineeship Workshop Series <i>(invited)</i>	East Lansing, MI
A Kinetic Data Structure for Computing the Bottleneck Distance	<i>November 2024</i>
ELBE Symposium <i>(invited)</i>	Dresden, Germany
Topological Shape Analysis for Static and Dynamic Data	<i>November 2024</i>
Applied Algebraic Topology Research Network <i>(invited)</i>	Virtual
Computing the Bottleneck Distance from All Directions	<i>October 2024</i>
AMS 2024 Fall Eastern Sectional Meeting <i>(invited)</i>	Albany, NY
The Kinetic Hourglass Data Structure for Computing the Bottleneck Distance	<i>October 2024</i>
Computational Persistence 2024	Graz, Austria
Computing the Bottleneck Distance from All Directions	<i>September 2024</i>
MSU TDA Seminar <i>(invited)</i>	East Lansing, MI
Computing the Bottleneck Distance from All Directions	<i>September 2024</i>
Spires Topology Conference <i>(poster)</i>	Oxford, UK
Persistence-Augmented Neural Networks	<i>August 2024</i>
Claremont Topology Seminar <i>(invited)</i>	Claremont, CA
Topological Data Analysis on Embedded Graphs	<i>April 2024</i>
Albion College Mathematics and Computer Science Colloquium <i>(invited)</i>	Albion, MI
Unraveling Hidden Patterns with Topological Data Analysis (TDA)	<i>March 2024</i>
National Museum of Mathematics <i>(invited)</i>	Virtual
Breaking limits and influencing the future: a panel discussion	<i>February 2024</i>
Joint Mathematics Meetings <i>(invited)</i>	San Francisco, CA
The Labeled Merge Tree Interleaving Distance and its Application	<i>January 2024</i>
CMSE Data Science Student Conference	East Lansing, MI
Directed Labeled Merge Tree Distance for Geometric Graphs	<i>November 2023</i>

Northeastern University Graduate Student Seminar (<i>invited</i>) The Labeled Merge Tree Interleaving Distance and its Application	Boston, MA <i>October 2023</i>
ICERM Topology and Geometry in Neuroscience Workshop Directed Labeled Merge Tree Distance for Geometric Graphs	Providence, RI <i>October 2023</i>
ICERM at Brown University Graduate Student Seminar Directed Labeled Merge Tree Distance for Geometric Graphs	Providence, RI <i>September 2023</i>
Computational Persistence The Labeled Merge Tree Interleaving Distance and its Application	West Lafayette, IN <i>September 2023</i>
TDA Week (<i>poster</i>) Directed Labeled Merge Tree Distance for Geometric Graphs	Kyoto, Japan <i>August 2023</i>
International Symposium on Computational Geometry Directed Labeled Merge Tree Distance on Classification of <i>Passiflora</i> Leaves	Dallas, TX <i>June 2023</i>
Randomness in Topology and its Applications (<i>poster</i>) A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance	Chicago, IL <i>March 2023</i>
8th Mexican Workshop on Applied Geometry and Topology (<i>poster</i>) A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance	Virtual <i>November 2022</i>
SIAM Conference on Mathematics of Data Science (<i>invited</i>) A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance	San Diego, CA <i>September 2022</i>
Algebraic Topology and TDA Hosted by the Institute for Mathematics and its Applications	Minneapolis, MN <i>August 2022</i>
Algebraic Topology: Methods, Computation, and Science Hosted by the Mathematical Institute, University of Oxford	Oxford, UK <i>June 2022</i>
Joint Mathematics Meetings (<i>poster</i>) Invariant Theory in Characteristic p	Denver, CO <i>January 2020</i>
Joint Mathematics Meetings (<i>poster</i>) Clairaut Surfaces in Euclidean Three-Space	Baltimore, MD <i>January 2019</i>

MENTORING AND TEACHING EXPERIENCE

Undergraduate Research Mentor <i>Michigan State University</i> - Ray Hasan - Denis Selyuzhitsky - Nathan Willey (now PhD student at the Ohio State University)	East Lansing, MI <i>September 2022 – Present</i> <i>September 2023 - Present</i> <i>September 2023 - May 2024</i> <i>September 2022 - May 2023</i>
REU Graduate Research Mentor <i>Michigan State University</i> - SURIUM REU program · Jasmine George · Oscar Lledo Osborn · Messiah Ridgley	East Lansing, MI <i>Summer 2024</i>

- ACRES REU program (10 students) *Summer 2022*
- 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
- 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**
40th International Symposium of Computational Geometry (SoCG) *June 2024*

TRAVEL GRANTS

- 58th Spring Topology and Dynamics Conference** **Newport News, VA**
Awarded \$500 in travel funds to attend STDC2 2025 *March 2025*
- 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
Travel support for undergraduates attending JMM 2019

Joint Mathematics Meeting
January 2019

SERVICE AND OUTREACH

Fellow, Mathematics Outreach Seminar and Training Program <i>National Museum of Mathematics</i>	New York, NY <i>July 2023 - December 2024</i>
Engineering K-12 Outreach Fellow, College of the Engineering <i>Michigan State University</i>	East Lansing, MI <i>August 2023 - December 2024</i>
Vice President of Graduate Student Organization <i>Michigan State University</i>	East Lansing, MI <i>September 2022 - August 2023</i>
Graduate Student Liaison, Department of CMSE <i>Michigan State University</i>	East Lansing, MI <i>September 2021 - August 2022</i>
Student Representative, CMSE Hiring Committee <i>Michigan State University</i>	East Lansing, MI <i>October 2021 - March 2022</i>
Co-Chair, Department of Music Student Advisory Committee <i>College of the Holy Cross</i>	Worcester, MA <i>April 2018 - April 2020</i>
Co-Chair, Department of Math and CS Student Advisory Committee <i>College of the Holy Cross</i>	Worcester, MA <i>April 2018 - April 2020</i>
Program Coordinator, International Student Orientation <i>College of the Holy Cross</i>	Worcester, MA <i>Fall 2017, 2018, 2019</i>
Workshop Leader, The Arts in Practice (News Appearance) <i>Burncoat High School</i>	Worcester, MA <i>October 2019</i>

WORKSHOP PARTICIPATION

ICERM at Brown University Women in Mathematical Computational Biology	Providence, RI <i>January 2025</i>
ICERM at Brown University Topology and Geometry in Neuroscience Workshop	Providence, RI <i>October 2023</i>
Mathematics Research Communities Single-Cut and Join in Genome Rearrangement	Java Center, NY <i>June 2022</i>

REVIEW AND REFEREE

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

PROFESSIONAL DEVELOPMENT

Certification in College Teaching Certification by the Graduate School	Michigan State University <i>May 2024</i>
Undergraduate Mentorship Training Two-day training program offered by the College of Engineering	Michigan State University <i>June 2024</i>

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, L^AT_EX, SQL, MATLAB, OpenMP/MPI

Interests: Piano and flute performance, cooking and gastronomy

Languages: Fluent Mandarin and English, conversational French and Korean