

XINYI (ELENA) WANG

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EDUCATION

Michigan State University

PhD in Computational Mathematics, Science, and Engineering

Research Topic: Topological Data Analysis

East Lansing, MI

Expected May 2025

Advisor: Dr. Elizabeth Munch

College of the Holy Cross

Bachelor of Arts in Music and Mathematics with High Honors, Cum Laude

Thesis: *Invariant Theory in Characteristic p*

Worcester, MA

May 2020

Advisor: Dr. John Little

RESEARCH EXPERIENCE

Graduate Research Assistant

Michigan State University

East Lansing, MI

September 2020 – Present

My research is focused on applied topology and topological data analysis. I'm interested in combining and integrating application and theory in order to develop new data analysis methods. My current project is on developing a computationally efficient metric to compare two embedded graphs via topological signatures. This is implemented in Python using multiprocessing and applied to classify *Passiflora* leaves.

Graduate Research Mentor

Michigan State University

East Lansing, MI

September 2022 – Present

Mentor a senior undergraduate student studying Euler Characteristic Transform on graph data, to apply ML techniques on graphical signals for classification. We prove theoretical properties of ECT to improve complexity by allowing a partition by key angles in the domain.

REU Graduate Research Mentor

Michigan State University

East Lansing, MI

June 2022 - August 2022

Mentored a group of 10 undergraduate students at the *Advanced Computational Research Experience for Students* (ACRES) REU program. Their projects cover a wide range of fields such as physics, plant biology, and network studies. I provided general computational and mathematical guidance, as well as hosted workshops on research-related topics.

Mathematics Honors Senior Thesis

College of the Holy Cross

Worcester, MA

September 2019 – May 2020

Investigated the properties of the invariant rings of the cyclic group of prime order p acting on polynomials over a field of characteristic p , where p is prime. Use the theory of S.A.G.B.I. (subalgebra analog to Gröbner basis for ideals) bases to construct full generating sets of invariants for four and higher dimensional indecomposable modular representations.

2018 Weiss Summer Research Program in the Science and Mathematics

College of the Holy Cross

Worcester, MA

May - August 2018

Investigated local isometric immersion of Clairaut metrics in Euclidean three-space. A Clairaut metric is determined up to isometry by a single function of one variable. We showed that an isometric immersion is formally determined by two functions of one variable, uniquely up to coordinate reflection and ambient Euclidean motions.

2017 Weiss Summer Research Program in the Science and Mathematics

College of the Holy Cross

Worcester, MA

May - August 2017

Analyzed J. S. Bach's Fugue in B Minor and Schoenberg's Op. 11, No. 1 using pitch class set theory and mathematical tools from group theory and combinatorics. Showed their musical approaches have similar underlying structures that can be connected through hybrid music-mathematics approach (see The Holy Cross Effect).

AWARDS AND HONORS

Distinguished Engineering Scholar

Awarded to outstanding students to graduate study in engineering at MSU

Pi Mu Epsilon

Mathematical Honors Society

MAA Poster Session Outstanding Poster Award

Awarded to recognize best posters in MAA Undergraduate Poster Session

The Beethoven Prize

Awarded to an outstanding music major

Michigan State University

Fall 2020 – Spring 2021

College of the Holy Cross

Inducted 2020

Joint Mathematics Meeting

January 2019

College of the Holy Cross

May 2020

PUBLICATION

- A. Hwang, **X. Wang**. “Clairaut Surfaces in Euclidean Three-Space,” In: *Tōhoku Math. J.*, **74** no. 2, 215–227
- R. Liu, S. Canturk, F. Wenkel, S. McGuire, **X. Wang**, A. Little, L. O’Bray, M. Perlmutter, B. Rieck, M. Hirn, G. Wolf, L. Rampašek. “Taxonomy of Benchmarks in Graph Representation Learning,” Available on arXiv, submitted to LoG

CONFERENCES AND PRESENTATIONS

Randomness in Topology and its Applications

A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance

Chicago, IL

March 2023

8th Mexican Workshop on Applied Geometry and Topology

A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance

Virtual

November 2022

SIAM Conference on Mathematics of Data Science

A Distance for Geometric Graphs via the Labeled Merge Tree Interleaving Distance

San Diego, CA

September 2022

Algebraic Topology and TDA

Hosted by the Institute for Mathematics and its Applications

Minneapolis, MN

August 2022

Algebraic Topology: Methods, Computation, and Science

Hosted by the Mathematical Institute, University of Oxford

Oxford, UK

June 2022

Mathematics Research Communities

Single-Cut and Join in Genome Rearrangement

Java Center, NY

June 2022

Joint Mathematics Meetings

Invariant Theory in Characteristic p

Denver, CO

January 2020

Joint Mathematics Meetings

Clairaut Surfaces in Euclidean Three-Space

Baltimore, MD

January 2019

WORK AND TEACHING EXPERIENCE

Research Analyst Intern

Caitong Fund Management Company

Shanghai, China

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

Teaching Assistant, Department of Mathematics and CS

College of the Holy Cross

Worcester, MA

Fall 2017 - March 2020

- Graded homework and provided feedback for intermediate courses: Multivariable Calculus, Algebraic Structures, and Linear Algebra
- Held workshops for Algebraic Structures and office hours for Multivariable Calculus, worked with students through additional examples relevant to class materials

Teaching Assistant, Department of Music
College of the Holy Cross

Worcester, MA
Fall 2017 - Spring 2019

- Presented on selected topics such *Romeo and Juliet*, Schoenberg Op. 33, and music theory topics such as harmonic prolongation, cadences, and twelve-tone methods
- Provided in class help to students in Montserrat first year seminars in music

SERVICE AND ACTIVITIES

Graduate Student Liaison/Vice President, Department of CMSE
Michigan State University

East Lansing, MI
September 2021 - Present

- Responsible for serving on the Graduate Studies and Admissions Committee as the sole graduate student representative
- Provide feedback and input on curriculum decisions, qualifying exams, scholarship awards, and new student enrollment
- Actively contribute to department-wide Diversity, Equity, and Inclusion efforts

Student Representative, CMSE Hiring Committee
Michigan State University

East Lansing, MI
October 2021 - March 2022

- Appointed as the graduate student representative on the faculty hiring committee
- Evaluated candidates for a tenure-tracked position and provided feedback

Co-Chair, Department of Music Student Advisory Committee
College of the Holy Cross

Worcester, MA
April 2018 - April 2020

- Represented 70 students in department meetings to facilitate and contribute to discussions around policy, hiring, and events
- Led student initiatives and organized outreach activities for the Department of Music

Program Coordinator, International Student Orientation
College of the Holy Cross

Worcester, MA
Fall 2017, 2018, 2019

- Led a team of 7 in organizing the largest international student orientation program on campus
- Designed and implemented a two-week orientation program for 100+ international students

Workshop Leader, The Arts in Practice
College of the Holy Cross - Burncoat High School

Worcester, MA
October 2019

- Designed a two-hour workshop with Grammy-winning Silkroad Ensemble co-artistic director and percussionist, Shane Shanahan, specifically for visual arts students
- Led a workshop for 30 high school students on the appreciation of different genres of music through the lens of fine arts
- Appearance in news: Holy Cross Newsroom for art outreach in local communities

SKILLS AND INTERESTS

Programming: Python, L^AT_EX, SQL, MATLAB, OpenMP/MPI, Magma, Maple, Fortran

Interests: Piano and Flute Performance, Cooking and Gastronomy

Languages: Fluent Mandarin and English, Conversational French