Astrid Arena Olave Herrera

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EDUCATION

Ph.D. in Mathematics   2021 - Present
Michigan State University
Advisor: Elizabeth Munch

M.Sc. in Applied Mathematics   2021
Universidad Nacional de Colombia
Meritorious thesis : Revealing brain network dynamics during
the emotional state of suspense using topological data analysis
Advisor: José Perea (MSU). Coadvisor: Francisco Gómez

B.Sc. with Honors in Mathematics   2018
Universidad Nacional de Colombia
Thesis: Persistent homology analysis of RNA secondary structures
Advisor: Gustavo N. Rubiano

RESEARCH INTERESTS

- Topological data analysis: Foundations and applications
- Algebraic topology
- Mathematical biology

PAPERS

2. Olave, A. A., Perea, J. A., and Gómez, F., *Revealing brain network dynamics during the emotional state of suspense using topological data analysis*, bioRxiv (2024)

1. Georgiou, K., Jiang, A. J., Lee, E., Olave, A. A., Seong, I., and Upadhyaya, T., *Lift & project systems performing on the partial-vertex-cover polytope*, Theoretical Computer Science **820** (2020), 1–16

PRESENTATIONS

7. *Bounding the interleaving distance on concrete categories using a loss function.* Talk in the Applied Algebraic Topology Research Network (AATRN). Online Seminar. Aug 2025

6. *Bounding the interleaving distance on concrete categories using a loss function.* Poster present at the workshop: The geometric realization of AATRN. Chicago, IL, US. Aug 2025

5. *Generalizing the interleaving distance using categorical flows.* Short video on the AATRN tuthorial-a-thon Spring 2025. YouTube video. Feb 2025

4. *Revealing brain network dyamics during the emotional state of suspense using topological data analysis.* Oral contribution presented at GEOTOP-A International Conference: Applications of Geometry and Topology. Mérida, México. Jan 2024

3. *Finding interleaving distances on a poset using categories with flows.* Poster present at 2023 AWM Research Symposium. Atlanta, GA, US. Oct 2023

2. *Revealing brain network dyamics during the emotional state of suspense using topological data analysis.* Short talk presented at II SIPAIM virtual Workshop. Online Seminar. May 2021

1. *Persistent homology analysis of RNA secondary structures.* Poster session presented at XXII Colombian Congress of Mathematics. Popayán, Colombia. Jun 2019

HONORS AND AWARDS

Mathematics Recruiting Fellowship   2021
Michigan State University

Scholarship for complete tuition for M.Sc programs   2019
Universidad Nacional de Colombia

Exemption from payment for best average   2013-2018
Universidad Nacional de Colombia

TEACHING EXPERIENCE

Courses

College Algebra II (MTH 103B)   Spring 2025
Michigan State University
Instructor for section 010

College Algebra II (MTH 103B)   Fall 2024
Michigan State University
Instructor for section 001

Calculus III (MTH 234)   Spring 2024
Michigan State University

Teaching assistant for sections 001,015 and 018

**Matrix Algebra with
Computational Applications (MTH 314)**   Fall 2024
Michigan State University
Teaching assistant for section 004

**Matrix Algebra with
Computational Applications (MTH 314)**   Summer 2023
Michigan State University
Instructor for section 101

Calculus II (MTH 133)   Spring 2023
Michigan State University
Teaching assistant for sections 013,018 and 024

Calculus I (MTH 132)   Fall 2022
Michigan State University
Teaching assistant for sections 019,021 and 024

Mathematics Learning Center   Spring 2022
Michigan State University
Tutor

Survey of Calculus I (MTH 124)   Fall 2021
Michigan State University
Teaching assistant for Lecture 1

Tutor of Círculos Matemáticos   2019 - II
Universidad Nacional de Colombia
Guided enthusiastic high school students about mathematics
into the experience of being a mathematician

Integral calculus   2018 - I
Universidad Nacional de Colombia

Leading Teaching Assistant

Leader for teaching assistants in MTH 234   Spring 2024
Michigan State University
Organized biweekly meetings to support teacging assistants
and discuss lesson preparation

Conduct classroom observations   Fall 2023
Michigan State University
Provided teaching feedback for 8 teaching assistants

PROFESSIONAL CERTIFICATES

Teaching certificates

Certification in College Teaching 2024 - 2025
Michigan State University
Project: The implementation Khanmigo as a mathematics tutor:
A study from students' perspectives

Other certificates

Data Science Boot Camp May - June 2024
The Erdős Institute
Project: Temporal Graphs for Music recommendation systems

SERVICE

Departmental service

AMS Graduate Student Chapter at MSU 2024-2025
Treasurer

Council of Graduate Students 2023-2024
Representative of the mathematics department

Professional service

Graduate Student Topology and Geometry Conference April 2024
Organizer

Community outreach

Marble Elementary School Math Night November 2024
Volunteer

Reviewer/Referee

Symposium on Computational Geometry (SoCG) 2023
Reviewer

EXTRACURRICULAR ACTIVITIES

Intramural soccer   2021-Present
    Player and captain of the mathematics team

Sin Medida inter-university catholic community   2018-2021
    Leadership team member

Universidad Nacional women's soccer team   2014-2021
    Goalkeeper