

# Cagatay Ayhan

📍 Tallahassee, Florida 📩 hca21a@fsu.edu 📞 (850) 938-6132  
🔗 [github.com/ayhncgty](https://github.com/ayhncgty)

## ABOUT ME

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I am a Ph.D. Candidate in Biomathematics at Florida State University, advised by **Tom Needham**. My research focuses on both the theory and application of *Topological Data Analysis*.

Looking ahead, I want to continue doing research as a research or data scientist, focusing on how geometric and topological tools can be developed and applied to challenging problems in data science.

## EDUCATION

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**Ph.D. Candidate & M.S. in Biomathematics** August 2021 – August 2027

**Florida State University, Tallahassee, Florida**

- *M.S. Conferred:* Fall 2025
- *GPA:* 3.67/4.0

**B.S. in Pure Mathematics** July 2015 – June 2021

**Ege University, Izmir, Turkey**

- *GPA:* 3.70/4.0 (High Honors)
- *Exchange Student:* Studied mathematics for two semesters at the University of Aberdeen, Scotland (Fall 2017, Fall 2018)

## PUBLICATIONS

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### Preprints

- **Cagatay Ayhan**, Audrey N. Nash, Roberto Vincis, Martin Bauer, Richard Bertram, and Tom Needham (2025). *A Persistent Homology Pipeline for the Analysis of Neural Spike Train Data*. arXiv preprint [arXiv:2512.08637](https://arxiv.org/abs/2512.08637).
- **Cagatay Ayhan** and Tom Needham (2025). *Equivalence of Landscape and Erosion Distances for Persistence Diagrams*. arXiv preprint [arXiv:2506.21488](https://arxiv.org/abs/2506.21488).

## PROFESSIONAL EXPERIENCE

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**Florida State University, Department of Mathematics** Fall 2021 – Present  
**Tallahassee, FL**

- *Course Instructor:* MAC2313: Calculus with Analytic Geometry III (Fall 2025)
- *Research Assistant:* Supported by NSF Grant DMS-2324962 (Summer 2025, Fall 2024, Summer 2024)
- *Course Instructor:* MAC2312: Calculus with Analytic Geometry II (Spring 2025)
- *Course Instructor:* MAC2311: Calculus with Analytic Geometry I (Spring 2024)
- *Recitation Instructor:* MAD2104: Discrete Mathematics I (Fall 2023)
- *Lab/Lecture Assistant:* MAC2233: Business Calculus (Summer 2023)
- *Course Instructor:* MAC1140: Precalculus Algebra (Spring 2023)
- *Recitation Instructor:* MAC2311: Calculus with Analytic Geometry I (Fall 2022)
- *Teaching Assistant:* MGF1107, MAC1140, MAC1105 (Summer 2022, Spring 2022)
- *Grader:* MAC3301, MAC2302 (Spring 2022, Fall 2021)
- *Lab Assistant:* MAC2233: Business Calculus (Fall 2021)

## PRESENTATIONS

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- November 2025 *Equivalence of Landscape and Erosion Distances for Persistence Diagrams*, Talk and Poster Presentation at the Topological Data Analysis Conference 2025, University of Missouri, Columbia, MO
- October 2025 *Equivalence of Landscape and Erosion Distances for Persistence Diagrams*, (Online Talk) ComPer 2025: Workshop on Computational Topology, University at Albany, State University of New York
- September 2025 *Equivalence of Landscape and Erosion Distances for Persistence Diagrams*, FSU Data Science Seminar, Florida State University, Tallahassee, FL
- August 2025 *A Topological Framework for Network Activity*, Poster Presentation at the NITMB Math-Bio Convergence Conference, Chicago, IL
- April 2025 *A Topological Framework for Simultaneously Recorded Network Activity*, Graduate Research Week Flash Talk Competition, Florida State University, Tallahassee, FL
- March 2025 *Topological Optimization Techniques*, Machine Learning/Data Science Seminar, Florida State University, Tallahassee, FL
- March 2024 *TDA in Simultaneously Recorded Neural Spike Train Datasets*, AMS 2024 Spring Southeastern Sectional Meeting, Florida State University, Tallahassee, FL
- November 2023 *Methods in Topological Data Analysis with an Application in Simultaneously Recorded Neural Spike Train Datasets*, ATE (Candidacy) Exam, Florida State University, Tallahassee, FL
- October 2023 *Multiple Neuron Spike Train Data Analysis Using Persistent Homology*, Lightning Talks at ICERM, Brown University Topology and Geometry in Neuroscience Workshop, Providence, RI

## CERTIFICATIONS & AWARDS

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### Awards and Honors

- Dewitt Sumners Flash Talks Competition First Place (Tied), April 2025
- Bettye Anne Bushee Case Graduate Fellowship - Recipient, April 2024
- Outstanding Teaching Assistant Award (OTAA) - Nominated twice, 2023-2024

### Certifications

- **August 2025** Certificate of Completion – Data Science Boot Camp, *The Erdős Institute GitHub Project: Decoding Human Activity*
- **May 2024** Certificate of Completion – Data Science Boot Camp, *The Erdős Institute GitHub Project: Tallahassee Crime Map*
- **December 2023** Certificate of Completion – Data Science Boot Camp, *The Erdős Institute GitHub Project: Near Earth Objects*

## CONFERENCES AND WORKSHOPS ATTENDED

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- Conference on Topological Data Analysis Recent Developments and Applications, Columbia, MO (November 2025)
- NITMB Math Bio Convergence Conference, Chicago, IL (August 2025)
- AMS Mathematics Research Communities: Climate Science at the Interface Between Topological Data Analysis and Dynamical Systems Theory, Buffalo, NY (June 2024)
- AMS 2024 Spring Southeastern Sectional Meeting, Florida State University, Tallahassee, FL (March 2024)

- UF-FSU Topology Meeting, Florida State University, Tallahassee, FL (November 2023)
- Topology and Geometry in Neuroscience Semester Workshop, ICERM, Brown University, Providence, RI (October 2023)

## VOLUNTEER EXPERIENCE

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### • FSU Math Fun Day Volunteer

An annual outreach event by the FSU Department of Mathematics to engage the local community with accessible, hands-on math.

- Guided activities and explained concepts related to fractal geometry in the "Creating Geometric Patterns" room (Feb 1, 2025).
- Managed an interactive station and assisted students with puzzles in the "Geometric Constructions" room (March 25, 2023).

## SKILLS

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### Technical Skills

- Python (Pandas, Numpy, Scikit-learn)
- L<sup>A</sup>T<sub>E</sub>X
- Microsoft Office

### Languages

- **Turkish:** Native
- **English:** C2 (Professional Proficiency)

*Last updated: December 27, 2025*