EMILY AUTUMN WINDES

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RESEARCH INTERESTS

I am interested in differential geometry. More specifically, I am interested in problems related to manifolds with special holonomy and gauge theory in higher dimensions. I am also interested in applications of differential geometry to artificial intelligence. In particular, I am intersted in geometric approaches to mechanistic interpetability.

EMPLOYMENT

- (Fall, 2025 – Spring 2026) **New Uzbekistan University**, Assistant Professor

EDUCATION

Ph.D., Mathematics, 2025, University of Oregon

Advisor 1: Boris Botvinnik (University of Oregon)

Advisor 2: Aleksander Doan (University College London)

Master's Degree, Mathematics, 2022, University of Rochester

B.A., Honors Mathematics, 2017, University of Rochester

Senior Thesis: *The Frobenius Theorem*

B.A., Honors Physics, 2017, University of Rochester

Senior Thesis: *From Harmonic Oscillators to Fields*

PUBLICATIONS AND PREPRINTS

- **(preprint: https://arxiv.org/abs/2508.17119)** *Gauge theory on $T^*\mathbb{C}P^2$: Explicit $Sp(2)$-instantons, HYM connections, and $Spin(7)$-instantons* (Joint with Jesse Madnick and Izar Alonso)
- **Communications in Mathematical Physics (2025) 406:216** *On Sp(n)-Instantons and the Fourier-Mukai Transform of Complex Lagrangians* (Joint with Jesse Madnick).
- **Annals of Global Analysis and Geometry, Volume 68, article number 6, 2025** *Transversality for Perturbed Special Lagrangian Submanifolds.*
- **Proceedings of the 12th ISAAC Congress, Aveiro, Portugal, 2019** *Two-frame fields on simply-connected Spin(7) manifolds* (Joint with Üstün Yildirim).

TEACHING EXPERIENCE

New Uzbekistan University

- Lead Instructor
  - MATH 201, Introduction to Linear Algebra (Fall 2025 – current)
  - **Teaching Duties:** Lectured to 300+ students, supervised seven workshop leaders, and developed course curriculum.

University of Oregon

- Instructor
  - MATH 112, Elementary Functions (2023-2025)
  - **Teaching Duties:** Served as sole lecturer for classes of 30-40 students.

- Workshop Leader
  - MATH 111, College Algebra (Fall 2022)

University of Rochester

- Main Instructor
  - MATH 164, Multivariable Calculus, (Summer 2020, Summer 2021, Summer 2022)
  - **Teaching Duties:** Designed and implemented remote- and hybrid-friendly teaching methods as the main instructor.
- Teaching Assistant
  - MATH 164, Multivariable Calculus, (Fall 2019, Fall 2020)
- Workshop Leader
  - MATH 161, Calculus I (Fall 2018)
- Grader and Teaching Assistant
  - MATH 200, Intro to Higher Math (Spring 2022)
  - MATH 265, Functions of a Real Variable (Spring 2021)
  - MATH 440, General Topology (Spring 2021)
  - MATH 174, Honors Calculus IV (Spring 2020)
  - MATH 453, Differential Geometry (Fall 2020, Fall 2017)

Private Tutoring: I have also acted as a private math tutor at the high school calculus level and at the advanced undergraduate level (specifically for introductory topology and geometry).

ORGANIZATION

- Co-organizer of *Gökova Geometry and Topology Online Seminars*, with Eylem Zeliha Yildiz, Üstün Yildirim.

OUTREACH

- Mentor: University of Oregon Directed Reading Program Mentor (2024)
- Mentor: University of Oregon Mentoring Program (2024)
- Mentor: STEM for all at University of Rochester (August, 2018 and 2020)
- Mentor: University of Rochester AMS graduate student chapter (2019-2020)
- Tutor: Refugee Student Alliance, (2017-2019)

AWARDS

- Jack and Peggy Borsting Award (2023)
- John V. Leahy Memorial Award (2023)
- Paul and Harriet Civin Memorial Award (2023)
- University of Rochester Graduate Teaching Award (2020)