Eric Tal Myzelev

Education

Carnegie Mellon University August 2025 - Present
- Degree: PhD in Algorithms, Combinatorics, and Optimization
- GPA: 4.00/4.00
- Funding: National Science Foundation Graduate Research Fellowship Program

University of Pennsylvania August 2021 - May 2025
- Degrees: Masters of Arts, Bachelor of Arts
- Major: *Mathematics*, Minor: *Computer and Information Science*
- Masters GPA: 4.00/4.00, Bachelor GPA: 3.96/4.00

Publications

1. Roots of Real-Valued Zero Mean Maps
with Francesca Cantor, Julia D'Amico and Florian Frick
European Journal of Mathematics (2025)
https://link.springer.com/article/10.1007/s40879-025-00870-5

2. New Dominating Set Game on Graphs
with Sean Fiscus, Glenn Hurlbert and Travis Pence
In progress.

3. Characterization of Colorings Obtained by a Method of Szlam
Geombinatorics Quarterly, 34(4), 147-152 (2024)
https://arxiv.org/abs/2411.04346

4. A New Class of Geometric Hypergraphs Arising from the Hadwiger-Nelson Problem
with Sean Fiscus and Hongyi Zhang
Geombinatorics Quarterly, 34(3), 97-106 (2024)
https://arxiv.org/abs/2411.05931

5. Transfer Learning on Physics-Informed Neural Networks for Tracking the Hemodynamics in the Evolving False Lumen of Dissected Aorta
with Mitchell Daneker, Shengze Cai, Ying Qian, Arsh Kumbhat, He Li and Lu Lu
Nexus, 1(2) (2024)
https://www.sciencedirect.com/science/article/pii/S2950160124000147

Talks and Posters

- *A New Equivalence in Euclidean Ramsey Theory.* Joint Mathematics Meetings, Pi Mu Epsilon, January 5, 2024.
- *A New Class of Geometric Hypergraphs arising from the Hadwiger Nelson Problem.* 2023 Southern Africa Mathematical Sciences Association Annual Conference, University of Pretoria, November 21-24, 2023.
- *Geometric Combinatorics: Coloring the Plane.* Math Department Talk, University of Pennsylvania, October 29, 2023.
- *Physics-Informed Neural Networks for Tracking the Hemodynamics of Dissected Aorta.* Undergraduate Research Expo, University of Pennsylvania, September 18, 2023.
- *Solving Stiff ODEs with Physics Informed Neural Networks.* Undergraduate Research Expo, University of Pennsylvania, September 19, 2022.

Research Experience

REU at Carnegie Mellon University: Geometry and Topology in a Discrete Setting May 2024 – July 2024
Mentor: Professor Florian Frick, Carnegie Mellon University

- Developed methods to bound distances between successive roots in symmetric maps using methods from equivariant topology
- The methods specialize to a novel topological proof of a theorem of Babenko about roots of trigonometric polynomials

Auburn University REU in Discrete Math and Algebra May 2023 – July 2023
Mentor: Professor Peter Johnson, Auburn University

- Proved an equivalence between the Hadwiger-Nelson problem and a hypergraph generalization
- Characterized colorings of $\mathbb{R}^d$ produced by Szlam's Lemma
- Presented at the 2023 Southern Africa Mathematical Sciences Association Annual Conference
- Presented a Pi Mu Epsilon contributed talk at the National Joint Mathematics Meetings Conference

Masamu Advanced Study Institute (MASI) November 2023, November 2024

- MASI is a ten-day program which fosters international collaboration between American and African mathematicians
- Traveled to Pretoria, South Africa and Windhoek, Namibia to participate
- Verified Graham's Conjecture on products of Petersen Graphs
- Related novel combinatorial game on graphs to game played in groups and found winning strategies by exploring connections between the two settings

Research Assistant in Physics Informed Neural Network lab May 2022 – May 2023
Mentor: Professor Lu Lu, University of Pennsylvania

- Physics Informed Neural Networks (PINNs) are a new technique leveraging deep learning to approximate solutions to difficult PDEs
- Developed an adaptive domain decomposition technique to increase PINN accuracy for stiff PDEs
- Modeled blood clots by solving Navier Stokes equations with PINNs and interpolating crossectional MRI data
- Presented at the University of Pennsylvania Research Expo in 2022 and 2023

Awards and Achievements

- NSF Graduate Research Fellowship Program April 2025
- Phi Beta Kappa Junior Inductee May 2024
- Barry Goldwater Scholarship March 2024
- NSF Research Experience for Undergraduates Grant May 2023, May 2024
- Penn Undergraduate Research Mentoring Program Award May 2022
- Bronze Medal at the International Olympiad of Astronomy and Astrophysics October 2020
  - Traveled to Beijing, China and Budapest, Hungary to represent Canada
- First Place on Pascal Math Competition (over 30,000 participants) March 2018

Outreach

- Contest Writer for Canadian Astronomy and Astrophysics Olympiad (CAAO), used to select national Canadian astrophysics team (first-ever student writer in contest's history) March 2020 - Present
- Science Olympiad Event Director (contest with over 1000 participants) October 2020 - May 2024

Teaching Experience

- Linear Algebra Teaching Assistant — August 2024 - May 2025
- Teacher at Q2 Academy — June 2021 - February 2022
- Summer Astrophysics Instructor at Beyond the Five — May 2021 - August 2021

Skills

- **Programming:**
  - Proficient: Python, Java, R, OCaml
  - Exposure to: MATLAB, Mathematica, C++, Octave
- **Software:** Tensorflow, Microsoft Office, G Suite, Latex
- **Languages:** English (native), Russian (fluent), Ukrainian (spoken comprehension)