Pablo Castilla

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Research Interests

Discrete optimization, mixed-integer programming, cutting plane theory, Gomory's master group relaxation, computational game theory, participatory democracy.

Education

University of Kentucky

- Ph.D., Mathematics (expected graduation: May 2028).
  Advisor: Yuan Zhou

University of Massachusetts Amherst

- B.S., Computer Science and Mathematics (May 2023).

Research Experience

University of Massachusetts Amherst, REU (2022)

- Advisor: Alejandro Morales, Ph.D.

- Studied flow polytopes and their discrete volumes. Derived closed forms for the perturbed Ehrhart polynomials of many families of graphs. Proved the conjectured non-negativity of the related h^* polynomial.

University of Massachusetts Amherst, Independent Study (2022)

- Advisor: Yair Zick, Ph.D.

- Explored the current state of participatory budgeting, a subfield of game theory. Generalized fairness results about the fairness notion of the core in the discrete setting from additive to submodular binary utility functions under different matroid constraints.

Presentations

Seminars

- "*Procedural stained-glass patterns from generalized Sierpiński-like recurrences.*" UMass Recreational Math Club, University of Massachusetts Amherst, Amherst, MA, May 2023.

- "*Perturbed Ehrhart and h* polynomials of flow polytopes.*" Discrete Math Seminar, University of Massachusetts Amherst, Amherst, MA, September 2022.

- "*Perturbed Ehrhart and h* polynomials of flow polytopes.*" University of Massachusetts Math REU Program, University of Massachusetts Amherst, Amherst, MA, August 2022.

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[1]Updated February 8, 2025.

Posters

- *"Flow Polytopes: Volumes and Perturbed Polynomials."* Discrete Math Workshop, Northeast Combinatorics Network, Smith College, Northampton, MA, November 2022.

TEACHING EXPERIENCE

University of Kentucky

- Teaching Assistant, MA 113: Calculus I (Spring 2025).

- Teaching Assistant, MA 123: Elementary Calculus (Fall 2024).

- Primary Instructor, MA 113: Calculus I (Summer 2024).

- Teaching Assistant, MA 162: Finite Math (Spring 2024).

- Teaching Assistant, MA 110: Precalculus (Fall 2023).

Private Tutoring

- Advanced Calculus II (Spring 2025).

- Advanced Calculus I (Fall 2024).

- Matrix Algebra (Spring 2024).

- Algebra and Precalculus (Spring 2021–Present).

Kumon Learning Center of Westborough

- K-12 Mathematics, up through Calculus I and II (Summer–Fall 2018).

OUTREACH

- University of Kentucky Math Lab (Fall 2023–Present).

- UMass Recreational Math Club (Spring 2023).