

# Zach Walsh

zwalsh@auburn.edu

<https://zachwalsh.math.gatech.edu>

## Employment

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- 2024 -        Assistant Professor, Auburn University
- 2022 - 2024   Hale Visiting Assistant Professor, Georgia Institute of Technology
- 2020 - 2022   Postdoctoral Researcher, Louisiana State University

## Education

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- 2016 - 2020   Ph.D. in Combinatorics and Optimization, University of Waterloo  
Thesis: Quadratically Dense Matroids  
Supervisor: Peter Nelson
- 2015 - 2016   MMath in Combinatorics and Optimization, University of Waterloo  
Thesis: On the Density of Binary Matroids Without a Given Minor  
Supervisor: Peter Nelson
- 2011 - 2015   B.A. in Mathematics, *summa cum laude*, Carleton College

## Preprints and Publications

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### Preprints

12. M. Baker, O. Lorscheid, Z. Walsh, T. Zhang. The foundation of generalized parallel connections, 2-sums, and segment-cosegment exchanges of matroids. arXiv:2404.10656, 2024.
11. J. Paat, Z. Walsh, L. Xu. Extended formulations for the integer hull of strictly delta-modular cographic polyhedral cones. arXiv:2311.06017, 2024.

### Publications

10. R. Shi, Z. Walsh, X. Yu. Planar Turán number of the 7-cycle. arXiv:2306.13594, to appear in *European J. Combin.*

9. J. Geelen, P. Nelson, Z. Walsh. Excluding a line from complex-representable matroids. arXiv:2101.12000, to appear in *Mem. Amer. Math. Soc.*
8. R. Shi, Z. Walsh, X. Yu. Dense circuit graphs and the planar Turán number of a cycle. arXiv:2310.06631, to appear in *J. Graph Theory*.
7. D. I. Bernstein, Z. Walsh. Matroid lifts and representability. *Electron. J. Combin.* **31**, Paper 1.15, 2024.
6. J. Paat, I. Stallknecht, Z. Walsh, L. Xu. On the column number and forbidden submatrices for  $\Delta$ -modular matrices. *SIAM J. Disc. Math.*, **38**:1-18, 2024.
5. J. Oxley, Z. Walsh. Small cocircuits in minimally vertically 4-connected matroids. *SIAM J. Disc. Math.* **36**:2822-2829, 2022.
4. P. Nelson, Z. Walsh. The extremal function for geometry minors of matroids over prime fields. *SIAM J. Disc. Math.* **36**:2100–2120, 2022.
3. J. Oxley, Z. Walsh. 2-Modular matrices. *SIAM J. Disc. Math.* **36**:1231–1248, 2022.
2. Z. Walsh. A new matroid lift construction and an application to group-labeled graphs. *Electron. J. Combin.* **29**, Paper 1.6, 2022.
1. A. Khodkar, A.L. Peterson, C.J. Wahl, Z. Walsh. Uniquely bipancyclic graphs on more than 30 vertices. *J. Combin. Math. and Combin. Computing* **98**:327–342, 2016.

## Invited Conference Presentations

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- Oct. 2024 *The foundation of a generalized parallel connection*, Geometry of Matroids Workshop, Princeton, NJ.
- Oct. 2024 *Delta-Wye exchange for matroids over pastures*, AMS Fall Southeastern Section Meeting, Savannah, GA.
- Nov. 2023 *The Planar Turán number of the 7-cycle*, Atlanta Lecture Series XXVII, Atlanta, GA.
- Oct. 2023 *The Planar Turán number of the 7-cycle*, AMS Fall Southeastern Section Meeting, Mobile, AL.
- Mar. 2023 *Excluding a Line from Complex-representable Matroids*, Workshop on Algebraic Aspects of Matroid Theory, Banff, Alberta.
- Oct. 2022 *Graphs and Matroids with Bounded Circumference*, AMS Fall Southeastern Sectional Meeting, Chattanooga, TN.
- Mar. 2022 *A New Matroid Lift Construction*, 53rd Southeastern Combinatorics Conference (virtual).
- May 2019 *Quadratically Dense Matroids*, CanaDAM, Vancouver, British Columbia.
- Jul. 2017 *Density of  $PG(t+1,p)$ -Minor-Free Matroids*, SIGMA, Waterloo, Ontario.

- Jul. 2016 *Density of  $PG(t+2,2)$ -Minor-Free Matroids*, International Workshop on Structure in Graphs and Matroids, Eindhoven, Netherlands.
- Oct. 2014 *Uniquely Bipancyclic Graphs on More Than 30 Vertices*, 28th Midwest Conference on Combinatorics and Combinatorial Computing, Las Vegas, NV.

## Teaching

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### Auburn University

Fall 2024 Math 1610 - Calculus I

### Georgia Institute of Technology

Spring 2024 Math 2603 - Introduction to Discrete Mathematics

Fall 2023 Math 3012 - Introduction to Applied Combinatorics (two sections).

Spring 2023 Math 3012 - Introduction to Applied Combinatorics.

Fall 2022 Math 3012 - Introduction to Applied Combinatorics.

### Louisiana State University

Spring 2022 Math 1552 - Analytic Geometry and Calculus II.

Fall 2021 Math 2085 - Linear Algebra.

Spring 2021 Math 1550 - Differential and Integral Calculus.

### University of Waterloo

Winter 2020 CO 370 - Deterministic Operations Research Models.

## Awards

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- 2024 INFORMS Optimization Society 2024 Young Researchers Prize for the paper “On the column number and forbidden submatrices for  $\Delta$ -modular matrices”.
- 2024 Georgia Tech Student Recognition of Excellence in Teaching: Spring Semester 2024 Course/Instructor Opinion Survey Honor Roll.
- 2023 Georgia Tech Student Recognition of Excellence in Teaching: Fall Semester 2023 Course/Instructor Opinion Survey Honor Roll.
- 2023 Georgia Tech Student Recognition of Excellence in Teaching: Spring Semester 2023 Course/Instructor Opinion Survey Honor Roll.

- 2021 - 2023 AMS-Simons Travel Grant.  
2020 Nominated for the Canadian Mathematical Society Blair Spearman Doctoral Prize.

## Service

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- 2024 Co-organizer of the 28th Atlanta Lecture Series in Graph Theory and Combinatorics.  
2023 - present Co-editor of the Matroid Union blog.  
2023 - present Co-organizer of the online Graphs and Matroids seminar hosted by the Matroid Union blog.  
2023 Co-organizer of a Graphs and Matroids minimsymposium for the CanaDAM 2023 conference in Winnipeg, Manitoba.  
2023 Co-organizer of a graduate student and postdoc session for the ACORN 2023 conference in Atlanta, Georgia.  
2021 Mentor for the Student Research Mentorship program at Kenilworth Science and Technology Middle School in Baton Rouge, Louisiana.  
2018 - 2020 Co-organizer of the C&O and Pure Math Joint Colloquium series at University of Waterloo.