Zach Walsh

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Employment

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

Education

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

Preprints

13. J. van der Pol, Z. Walsh, M. C. Wigal. Turán densities for matroid basis hypergraphs. arXiv:2502.03673, 2025.

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.

Publications

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

10. J. Paat, Z. Walsh, L. Xu. Extended formulations for the integer hull of strictly Δ-modular cographic polyhedral cones. *Oper. Res. Lett.* **60**(107235), 2025.

9. R. Shi, Z. Walsh, X. Yu. Dense circuit graphs and the planar Turán number of a cycle. *J. Graph Theory* **108**:27–38, 2025.

8. J. Geelen, P. Nelson, Z. Walsh. Excluding a line from complex-representable matroids. *Mem. Amer. Math. Soc.* **303**(1523), 2024.

7. D. I. Bernstein, Z. Walsh. Matroid lifts and representability. *Electron. J. Combin.* **31**(1):Paper 1.15, 2024.

6. J. Paat, I. Stallknecht, Z. Walsh, L. Xu. On the column number and forbidden submatrices for Δ-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**(1):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

Jul. 2025	*The foundation of a generalized parallel connection*, SIAM Conference on Applied Algebraic Geometry, Madison, WI.
Mar. 2025	*Turán densities for matroid basis hypergraphs*, AMS Spring Southeastern Sectional Meeting, Clemson, SC.
Dec. 2024	*The foundation of a generalized parallel connection*, Joint Meeting of the NZMS, AustMS, and AMS, Auckland, New Zealand.
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 (cancelled).
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

	Auburn University
Spring 2025	Math 7970 - Matroid Theory
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

2024	INFORMS Optimization Society 2024 Young Researchers Prize of $3,000 for the paper "On the column number and forbidden submatrices for Δ-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

2025	Co-organizer of the 34th Cumberland Conference on Graph Theory, Combinatorics, and Computing.
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.