Sean Kafer

Georgia Institute of Technology, School of Mathematics
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EDUCATION

PhD in Combinatorics and Optimization August 2022
Supervisor: Laura Sanità
Thesis title: Polyhedral Diameters and Applications to Optimization
University of Waterloo, Waterloo, Ontario

Master of Mathematics: *Combinatorics and Optimization* August 2017
Supervisor: Laura Sanità
Thesis title: On The Circuit Diameters of Some Combinatorial Polytopes
University of Waterloo, Waterloo, Ontario

Bachelor of Science *(Major: Mathematics)* May 2015
University at Buffalo, Buffalo, NY

EMPLOYMENT HISTORY

Visiting Assistant Professor
Georgia Institute of Technology, School of Mathematics *2023-2025*

Postdoctoral Fellow
Brown University, Institute for Computational and Experimental Research in Mathematics (ICERM)

- *Discrete Optimization: Mathematics, Algorithms, and Computation semester program* *Winter 2023*

Graduate Research Assistant
University of Waterloo, Faculty of Mathematics

- *Research in polyhedral diameters and linear optimization.* *2015-2022*

Teaching
University of Waterloo, Faculty of Mathematics

- *CO 227: Introduction to Optimization (Non-Specialist Level)* *Fall 2021*

Georgia Institute of Technology, School of Mathematics

- *MATH 1113: Precalculus* *Fall 2024*
- *MATH 1551: Differential Calculus* *Spring 2024*
- *MATH 1554: Linear Algebra* *Fall 2022*
- *MATH 1553: Introduction to Linear Algebra* *two sections, Fall 2023*

Teaching Assistant
University of Waterloo, Faculty of Mathematics

- CO 250: Introduction to Optimization eleven terms, 2015-2022
- CO 370: Deterministic OR Models seven terms, 2016-2022
- CO 450/650: Combinatorial Optimization one term, 2018
- CO 327: Deterministic OR Models (Non-Specialist Level) one term, 2020

Undergraduate Researcher *2013*
URGE to Compute: NSF CSUMS at Buffalo

- I worked on a research team with two other undergraduates for one year, during which time we produced two publications on clique problems in intersection graphs of convex polygons.

PUBLICATIONS & PREPRINTS

- S. Borgwardt, W. Grewe, **S. Kafer**, J. Lee, L. Sanitá. *On the Hardness of Short and Sign-Compatible Circuit Walks*. Submitted to Discrete Applied Mathematics. (arXiv:2402.01066)
- A. Black, J. A. De Loera, **S. Kafer**, L. Sanità. *On the Simplex method for 0/1 polytopes.* Mathematics of Operations Research. (arXiv:2111.14050).
- J. A. De Loera, **S. Kafer**, L. Sanità. *Pivot rules for circuit-augmentation algorithms in linear optimization.* SIOPT. 2022. (arXiv:1909.12863)
- **S. Kafer**, K. Pashkovich, L. Sanità. *On the circuit diameter of some combinatorial polytopes.* SIDMA. 2019. (arXiv:1709.09642)
- V. E. Brimkov, K. Junosza-Szaniawski, **S. Kafer**, J. Kratochvíl, M. Pergel, P. Rzażewski, M. Szczepankiewicz, J. Terhaar. *Homothetic polygons and beyond: Maximal cliques in intersection graphs.* Discrete Applied Mathematics. 2017. (arXiv:1411.2928)
- V. E. Brimkov, **S. Kafer**, M. Szczepankiewicz, J. Terhaar. *On intersection graphs of convex polygons.* Lecture Notes in Computer Science. 2014.
- V. E. Brimkov, **S. Kafer**, M. Szczepankiewicz, J. Terhaar. *Maximal cliques in intersection graphs of quasi-homothetic trapezoids.* Proc. MCURCSM. 2013.

PRESENTATIONS

Invited Talks

- *An Introduction to the Circuits of Polyhedra: Basics, Diameters, and Optimization.* Plenary talk at Circuit Diameters and Augmentation: Recent Advances in Linear and Integer Optimization. May 2023

Conferences and Workshops

- *Solving 0/1 LPs in Polynomial Time with Simplex.* Presented at Discrete Optimization: Mathematics, Algorithms, and Computation. August 2024
- *It's not hard to solve LPs quickly with circuits.* Presented at Circuit Diameters and Augmentation: Recent Advances in Linear and Integer Optimization. May 2023
- *Performance of Steepest Descent in 0/1 LPs.* Presented at Hausdorff workshop on tropical geometry and the geometry of linear programming. September 2021.
- *On intersection graphs of convex polygons.* Presented at IWCIA 2014. July 2014.
- *Maximal cliques in intersection graphs of quasi-homothetic trapezoids.* Presented at MCURCSM 2013. November 2013.

Seminars

- *Simplex Implementations of Classical Combinatorial Algorithms.* Combinatorics Seminar, Georgia Tech. February 2024.
- *Generating Short Monotone Paths in 0/1 LPs.* Discrete Optimization: Mathematics, Algorithms, and Computation Seminar, ICERM. April 2023.
- *Generating Short Monotone Paths in 0/1 LPs: From Circuits to Simplex.* CombOpt Reading Group Seminar, University of Waterloo. April 2022.
- *An Introduction to the Circuits of Polyhedra, The Circuit Diameter, and Their Applications.* CombOpt Reading Group Seminar, University of Waterloo. February 2020.
- *The circuits of combinatorial polytopes: Diameter bounds and hardness of computation.* Mathematics of Data and Decisions at Davis Seminar, UC Davis. February 2019.

AWARDS

University of Waterloo

- Sinclair Graduate Scholarship ($ 1 500) — 2022
- William Tutte Postgraduate Scholarship ($ 2 500) — 2019 - 2020
- Sinclair Graduate Scholarship ($ 2 100) — 2019

- Math Faculty Award ($ 1 000) 2018
- Math Faculty Award ($ 5 000) 2017
- Math Graduate Experience Award ($ 1 000) 2016

University at Buffalo
- Presidential Scholarship ($ 20 000) 2011-2014

OUTREACH ACTIVITY
- Mentor for Georgia Tech's Directed Reading Program Spring & Fall 2024
- Speaker for Georgia Tech's Undergraduate Seminar Fall 2024

REFEREE ACTIVITY
- Symposium on Discrete Algorithms (SODA)
- Integer Programming and Combinatorial Optimization (IPCO)
- SIAM Journal on Discrete Mathematics (SIDMA)
- Mathematical Programming (MAPR)
- Journal of Combinatorial Optimization (JOCO)
- Operations Research Letters (ORL)
- Foundations of Software Technology and Theoretical Computer Science (FSTTCS)