

# Sean Kafer

Georgia Institute of Technology, School of Mathematics  
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<b>CURRENT POSITION</b>	<b>Visiting Assistant Professor</b> <i>Georgia Institute of Technology, School of Mathematics</i>	2023-2025
<b>EDUCATION</b>	<b>PhD in Combinatorics and Optimization</b> Supervisor: Laura Sanità Thesis title: Polyhedral Diameters and Applications to Optimization University of Waterloo, Waterloo, Ontario	2022
	<b>Master of Mathematics: Combinatorics and Optimization</b> Supervisor: Laura Sanità Thesis title: On The Circuit Diameters of Some Combinatorial Polytopes University of Waterloo, Waterloo, Ontario	2017
	<b>Bachelor of Science (Major: Mathematics)</b> University at Buffalo, Buffalo, NY	2015
<b>EMPLOYMENT HISTORY</b>	<b>Postdoctoral Fellow</b> <i>Brown University, Institute for Computational and Experimental Research in Mathematics (ICERM)</i> <ul style="list-style-type: none"><li>Discrete Optimization: Mathematics, Algorithms, and Computation semester program</li></ul>	Winter 2023
	<b>Lecturer</b> <i>Georgia Institute of Technology, School of Mathematics</i>	Fall 2022
	<b>Graduate Research Assistant</b> <i>University of Waterloo, Faculty of Mathematics</i> <ul style="list-style-type: none"><li>Research in polyhedral diameters and linear optimization.</li></ul>	2015-2022
	<b>Undergraduate Researcher</b> URGE to Compute: NSF CSUMS at Buffalo <ul style="list-style-type: none"><li>Research on clique problems in intersection graphs of convex polygons.</li></ul>	2013
<b>TEACHING</b>	<b>Instructor</b> <i>Georgia Institute of Technology, School of Mathematics</i> <ul style="list-style-type: none"><li>MATH 3012: Applied Combinatorics</li><li>MATH 1113: Precalculus</li><li>MATH 1551: Differential Calculus</li><li>MATH 1553: Introduction to Linear Algebra</li><li>MATH 1554: Linear Algebra</li></ul>	two sections, Spring 2025 Fall 2024 Spring 2024 two sections, Fall 2023 Fall 2022
	<i>University of Waterloo, Faculty of Mathematics</i> <ul style="list-style-type: none"><li>CO 227: Introduction to Optimization (Non-Specialist Level)</li></ul>	Fall 2021
	<b>Teaching Assistant</b> <i>University of Waterloo, Faculty of Mathematics</i> <ul style="list-style-type: none"><li>CO 250: Introduction to Optimization</li><li>CO 370: Deterministic Operations Research Models</li></ul>	eleven terms, 2015-2022 seven terms, 2016-2022

- CO 450/650: *Combinatorial Optimization* one term, 2018
- CO 327: *Deterministic OR Models (Non-Specialist Level)* one term, 2020

## PUBLICATIONS & PREPRINTS

- S. Borgwardt, W. Grewe, **S. Kafer**, J. Lee, L. Sanità. *On the Hardness of Short and Sign-Compatible Circuit Walks*. Submitted to Discrete Applied Mathematics. 2024<sup>+</sup>. (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. 2024. (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 IWCMIA 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.

**OUTREACH  
ACTIVITY**

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

**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

**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)