

Kevin Shu

kevinshu.me

Education	<p>PhD Student, Algorithms Combinatorics and Optimization, Georgia Institute of Technology, Atlanta, GA August 2019-Present</p> <ul style="list-style-type: none">• Advised by Grigoriy Blekherman.• Expected graduation date: May 2024• 4.0 GPA <p>B.S. in Mathematics, Computer Science, California Institute of Technology, Pasadena, CA, June 2018 GPA 3.9</p>
Publications	<p>Linear Principal Minor Polynomials: Hyperbolic Determinantal Inequalities and Spectral Containment 2022</p> <ul style="list-style-type: none">• Published in International Mathematics Research Notices in 2022. <p>Hyperbolic Relaxation of k-Locally Positive Semidefinite Matrices, with Grigoriy Blekherman, Santanu Dey, Shengding Sun 2021</p> <ul style="list-style-type: none">• Published in the SIAM Journal on Optimization in 2022. <p>Sums of Squares and Sparse Semidefinite Programming, with Grigoriy Blekherman 2021</p> <ul style="list-style-type: none">• Published in SIAM Journal for Applied Algebra and Geometry in 2021. <p>Syntactic Structures and Code Parameters, with Matilde Marcolli 2017</p> <ul style="list-style-type: none">• Published in Mathematics in Computer Science.• Describes the connection between the syntactic parameters framework in linguistics with coding theory and theoretical physics.
Preprints	<p>Accelerated Objective Gap and Gradient Norm Convergence for Gradient Descent via Long Steps with Ben Grimmer, and Alex Wang 2024</p> <ul style="list-style-type: none">• Submitted to Mathematical Programming• Hosted on the arxiv. <p>Accelerated Gradient Descent via Long Steps with Ben Grimmer, and Alex Wang 2023</p> <ul style="list-style-type: none">• Hosted on the arxiv. <p>Symmetric Hyperbolic Polynomials with Greg Blekherman, and Julia Lindberg 2023</p> <ul style="list-style-type: none">• Submitted to the Journal of Pure and Applied Algebra.• Hosted on the arxiv. <p>Hidden convexity, optimization, and algorithms on rotation matrices with</p>

Akshay Ramachandran, and Alex L. Wang
2023

- In revision at **Mathematics of Operations Research**.
- Hosted on the arxiv.

Quadratic Programming with Sparsity Constraints via Polynomial Roots
2022

- Hosted on the arxiv.

**Talks and
Presentations
Given**

Hidden convexity, optimization, and algorithms on rotation matrices , presented at the Informs Optimization Society conference
2024

Symmetric Hyperbolic Polynomials, presented at the SIAM Conference on Applied Algebraic Geometry
2023

Sparse Regression and PCA via Polynomial Roots, presented at the SIAM Conference on Optimization
2023

Hyperbolicity Cones and Sparse Optimization, presented at the MIT LIDS seminar
2023

Symmetrically Hyperbolic Polynomials, presented at the Oberwolfach Meeting on New Directions in Algebraic Geometry
2023

Sparse Quadratic Programs via Polynomial Roots, presented at the Carnegie Mellon University ACO seminar
2023

Sparse Quadratic Programs via Polynomial Roots, presented at the Centrum Wiskunde and Informatica Networks and Optimization seminar
2022

Approximating Sparse Semidefinite Programs, presented at the INFORMS conference
2021

Poster on Sparse Semidefinite Programs, presented at the MIP and IPCO conferences
2021

Causal Inference and Optimization, presented at the ACO Student Seminar
2021

Lightning Talk on Hyperbolic Relaxations of Locally-PSD Matrices , presented at the ICERM - Symmetry, Randomness, and Computations in Real Algebraic Geometry.
2020

Academic Honors	2022 ACO-ARC Fellowship
	2022 ARCS Foundation award
Conference Organization	2021 Honorable Mention at the MIP Conference Poster Competition
	2021 Honorable Mention at the IPCO Conference Poster Competition
	2021 David L. Brown Fellowship from the Georgia Tech Math Department
	2018 National Science Foundation Graduate Research Fellowship Recipient
	2018 Georgia Institute of Technology President's Fellowship Recipient
	Coorganizer for the Georgia Tech Student Algebra Seminar , Georgia Tech, GA August 2022-December 2023
	Coorganizer for the Special Session on Convexity , SIAM Conference on Applied Algebraic Geometry, Georgia Tech, GA July 2023
Research Experience	Organizer for the AMS Special Session on Algebraic Methods in Algorithms , Spring 2023 Southeastern Section Meeting of the AMS, Georgia Tech, GA March 2023
	Visiting Scholar , Max-Planck Institute for Mathematics in the Sciences, Leipzig, Germany Summer 2022 <ul style="list-style-type: none"> • Working under the supervision of Rainer Sinn and Bernd Sturmfels.
	Research Assistantship , Georgia Tech, Atlanta, GA Summer 2020 <ul style="list-style-type: none"> • Funded in part by NSF grant DMS-1901950 and the ACO department. • Advised by Grigoriy Blekherman.
Outreach and Community Service	Representative for the Diversity, Equity, and Inclusion committee , Georgia Tech, GA 2022-2023
	First Year Mentor , Georgia Tech, Atlanta, Georgia 2020-2021
	Directed Reading Program Mentor , Georgia Tech, Atlanta, Georgia 2020-2021
	Senior Class President , Caltech, Pasadena, CA 2018-2019
	Board of Control Secretary , Caltech 2017
Teaching Experience	Differential Equations Teaching Assistant , Georgia Tech, Atlanta, GA Aug 2022-Dec 2022
	Differential Equations Teaching Assistant , Georgia Tech, Atlanta, GA Aug 2021-Dec 2021
	Number Theory Lecture Assistant , Georgia Tech, Atlanta, GA

Jan 2021-May 2021

Differential Equations Teaching Assistant, Georgia Tech, Atlanta, GA
Jan 2020-May 2020

Linear Algebra Teaching Assistant, Georgia Tech, Atlanta, GA
Aug 2019-Dec 2019

Advanced Algorithms Teaching Assistant, Caltech, Pasadena, CA
Jan 2018-Mar 2018

Linear Algebra Teaching Assistant, Caltech, Pasadena, CA
Sep 2017-Dec 2017

Introduction to Algorithms Teaching Assistant, Caltech, Pasadena, CA
Jan 2017-Mar 2017

Work Experience

Full-time Software Engineer, Google, Mountain View, CA
August 2018-July 2019

- Full stack web development for a data labelling service (Crowd-Compute)
- Lead an initiative to update authentication/authorization to more modern technologies.
- Added a major feature for tracking work in the system.
- Managed production releases and infrastructure issues.
- Worked with C++, Java.

Software Engineering Intern, Google, Mountain View, CA
Aug 2018-Jul 2019

- Gathered data from online sources by parsing Reddit pages.
- Built a machine learning model to provide movie recommendations.
- Worked with C++, Python.