

Madeleine (Maddie) Weinstein

CONTACT INFORMATION mweinstein@pugetsound.edu
<https://maddieweinstein.github.io/>

RESEARCH INTERESTS Applied algebraic geometry, distance optimization, geometry of data, topological data analysis, algebraic statistics, real algebraic geometry.

EMPLOYMENT **University of Puget Sound**
Assistant Professor, September 2023-Present

Stanford University
NSF Postdoctoral Fellow, September 2021-Present
• Mentor: Ravi Vakil

University of California San Diego
UC President's Postdoctoral Fellow, July 2021-August 2021
• Mentor: James McKernan

EDUCATION **University of California Berkeley**
Ph.D. in Mathematics, May 2021
• Thesis: *Metric Algebraic Geometry*. Advisor: Bernd Sturmfels

Harvey Mudd College
B.S. in Mathematics, May 2016
• High Distinction and Honors in Mathematics
• Thesis: *Adinkras and Arithmetical Graphs*. Advisor: Dagan Karp

Budapest Semesters in Mathematics
Fall 2014

FELLOWSHIPS *Mathematical Association of America Project NExT Fellow* 2024
National Museum of Mathematics MOST Fellow 2023
NSF Mathematical Sciences Postdoctoral Research Fellow 2021
AAAS IF/THEN Ambassador 2019
NSF Graduate Research Fellow 2016
UC Berkeley Chancellor's Fellow 2016

PAPERS *Distance Optimization in Polyhedral Norms with Applications to Algebraic Statistics* (with E. Duarte, N. Kaihnsa, J. Lindberg, and A. Torres). In preparation.

$O(k)$ -Equivariant Dimensionality Reduction on Stiefel Manifolds (with A. Lee, H. Lee, J. Perea, and N. Schonsheck). To appear in SIAM Journal on Mathematics of Data Science.

Critical Curvature of Algebraic Surfaces in Three-Space (with P. Breiding and K. Ranestad). To appear in Acta Univ. Sapientiae Math.

Voronoi Cells in Metric Algebraic Geometry of Plane Curves (with M. Brandt). *Mathematica Scandinavica* **130-1**(2024).

Real Symmetric Matrices with Partitioned Eigenvalues. *Linear Algebra and its Applications* **633** (2022), 281-289.

Voronoi Cells of Varieties (with D. Cifuentes, K. Ranestad, and B. Sturmfels). *Journal of Symbolic Computation* **109** (2022), 351-366.

96120: The Degree of the Linear Orbit of a Cubic Surface (with L. Brustenga i Moncusí and S. Timme). *Le Matematiche* **75** (2020), 425-437.

The Bottleneck Degree of Algebraic Varieties (with S. Di Rocco and D. Eklund). *SIAM J. Appl. Algebra Geometry* **4** (2020), 227-253.

Offset Hypersurfaces and Persistent Homology of Algebraic Varieties (with E. Horobet). *Comput. Aided Geom. Design* **74** (2019), 101767.

Learning Algebraic Varieties from Samples (with P. Breiding, S. Kalíšnik, and B. Sturmfels). *Revista Mathematica Complutense* **31** (2018), 545-593.

Geometric-Progression-Free Sets over Quadratic Number Fields (with A. Best, K. Huan, N. McNew, S.J. Miller, J. Powell, and K. Tor), *Proceedings of the Royal Society of Edinburgh, Section A: Mathematics* **147** (2017), 242-262.

Benford Behavior of Generalized Zeckendorf Decompositions (with A. Best, P. Dynes, X. Edelsbrunner, S.J. Miller, B. McDonald, and C. Turnage-Butterbaugh), *Combinatorial and Additive Number Theory II: CANT*, New York, NY, 2015 and 2016, Springer, New York, 2017.

Ramsey Theory Problems over the Integers: Avoiding Generalized Progressions (with A. Best, K. Huan, N. McNew, S.J. Miller, J. Powell, and K. Tor), *Combinatorial and Additive Number Theory II: CANT*, New York, NY, 2015 and 2016, Springer, New York, 2017.

Invariance of the Sprague-Grundy Function for Variants of Wythoff's Game. *Integers* **16** (2016).

Gaussian Distribution of the Number of Summands in Generalized Zeckendorf Decompositions in Small Intervals (with A. Best, P. Dynes, X. Edelsbrunner, S.J. Miller, B. McDonald, and C. Turnage-Butterbaugh). *Integers* **16** (2016).

Gaussian Behavior of the Number of Summands in Zeckendorf Decompositions in Small Intervals (with A. Best, P. Dynes, X. Edelsbrunner, S.J. Miller, B. McDonald, and C. Turnage-Butterbaugh), *Fibonacci Quarterly* **52** (2014), 35-46.

Benford Behavior of Zeckendorf Decompositions (with A. Best, P. Dynes, X. Edelsbrunner, S.J. Miller, B. McDonald, and C. Turnage-Butterbaugh), *Fibonacci Quarterly* **52** (2014), 47-53.

HONORS AND
AWARDS

<i>Friedman Memorial Prize</i>	2021
• Awarded by UC Berkeley for my doctoral dissertation	
<i>UC Berkeley Outstanding Student Leadership Award, Nominee</i>	2019
• Nominated for award recognizing leadership that impacts community	
<i>NSF We Are Mathematics Video Contest, Honorable Mention</i>	2019

<ul style="list-style-type: none"> Received Honorable Mention for MatheMaddies' Ice Cream Map in competition for videos to showcase math research in a way that is exciting and accessible to a broad audience 	
<i>NSF Graduate Research Fellowship</i>	2016
<ul style="list-style-type: none"> Awarded \$102,000 to support three years of graduate study 	
<i>UC Berkeley Chancellor's Fellowship</i>	2016
<ul style="list-style-type: none"> Awarded \$60,000 to support two years of graduate study 	
<i>Greever Mathematical Research Prize</i>	2015
<ul style="list-style-type: none"> Awarded by Harvey Mudd College for an original contribution to mathematics for paper <i>Invariance of the Sprague-Grundy Function for Variants of Wythoff's Game</i> 	
<i>Alice T. Schafer Prize, Honorable Mention</i>	2015
<ul style="list-style-type: none"> Awarded by the Association for Women in Mathematics to an outstanding undergraduate female mathematician 	
<i>Giovanni Borrelli Mathematics Prize</i>	2015
<ul style="list-style-type: none"> Awarded by Harvey Mudd College to two seniors 	
<i>Goldwater Scholarship, Honorable Mention</i>	2015
<i>Outstanding Presentation Award, Joint Mathematics Meeting</i>	2014
<i>Robert James Prize</i>	2013
<ul style="list-style-type: none"> Awarded by Harvey Mudd College to three sophomores 	
<i>National Merit Scholarship</i>	2012-2016
<i>Harvey S. Mudd Merit Award</i>	2012-2016

PRESENTATIONS	<i>Boise State Topics in Algebraic, Topology, Etc. Research Seminar, Virtual</i>	2025
	<ul style="list-style-type: none"> Invited Talk: Metric Algebraic Geometry 	
	<i>Joint Math Meetings, Seattle, WA</i>	2025
	<ul style="list-style-type: none"> Invited Talk: Critical Curvature of Algebraic Varieties 	
	<i>Lakeside Middle School, Seattle, WA</i>	2024
	<ul style="list-style-type: none"> Outreach Talk: What If Earth Were A Cube? 	
	<i>National Museum of Mathematics, Virtual</i>	2024
	<ul style="list-style-type: none"> Outreach Talk: What If Earth Were A Cube? 	
	<i>University of Washington AWM Speaker Series, Seattle, WA</i>	2024
	<ul style="list-style-type: none"> Invited Talk: Metric Algebraic Geometry 	
	<i>SIAM Conference on Applied Algebraic Geometry, Virtual</i>	2023
	<ul style="list-style-type: none"> Invited Talk: Voronoi Cells and Maximum Likelihood Estimation 	
	<i>Applied Algebraic Topology Research Network Seminar, Virtual</i>	2023
	<ul style="list-style-type: none"> Invited Talk: Metric Algebraic Geometry 	
	<i>UC Santa Cruz Applied Mathematics Seminar, Santa Cruz, CA</i>	2023
	<ul style="list-style-type: none"> Invited Talk: Metric Algebraic Geometry 	
	<i>UC Berkeley CAAG Seminar, Berkeley, CA</i>	2023
<ul style="list-style-type: none"> Invited Talk: Metric Algebraic Geometry 		
<i>UC Berkeley Metric Algebraic Geometry Course, Virtual</i>	2023	
<ul style="list-style-type: none"> Guest Lecture: Curvature, Bottlenecks, and Reach 		
<i>Joint Math Meetings, Boston, MA</i>	2023	
<ul style="list-style-type: none"> Invited Talk: Enumerative Geometry of Curvature Invited Talk: Dimensionality Reduction on Stiefel Manifolds 		

<i>Harvard University CMSA Interdisciplinary Science Seminar</i> , Virtual	2022
• Invited Talk: Metric Algebraic Geometry	
<i>SFSU Algebra, Geometry, and Combinatorics Seminar</i> , Virtual	2021
• Invited Talk: Metric Algebraic Geometry	
<i>Stanford Algebraic Geometry Seminar</i> , Stanford, CA	2021
• Invited Talk: Algebraic Geometry of Curvature and Matrices with Partitioned Eigenvalues	
<i>SIAM Conference on Applied Algebraic Geometry</i> , Virtual	2021
• Invited Talk: Algebraic Geometry of Curvature	
<i>UC San Diego Optimization Seminar</i> , Virtual	2021
• Invited Talk: Metric Algebraic Geometry	
<i>Stanford Algebraic Geometry Seminar</i> , Stanford, CA	2019
• Invited Talk: Metric Algebraic Geometry	
<i>Commutative Algebra and Algebraic Geometry Seminar</i> , Berkeley, CA	2019
• Talk: Metric Algebraic Geometry	
<i>Western Algebraic Geometry Symposium</i> , Salt Lake City, UT	2019
• Poster: Voronoi Cells in Metric Algebraic Geometry of Plane Curves	
<i>Varieties, Polyhedra, Computation</i> , Berlin, Germany	2019
• Poster: Voronoi Cells in Metric Algebraic Geometry of Plane Curves	
<i>AMS Sectional</i> , Madison, WI	2019
• Invited Talk: Voronoi Cells in Metric Algebraic Geometry of Plane Curves	
<i>Intersection Theory Seminar</i> , Leipzig, Germany	2019
• Talk: Fano Schemes	
<i>SIAM Conference on Applied Algebraic Geometry</i> , Bern, Switzerland	2019
• Invited Talk: Voronoi Cells of Varieties	
<i>Trieste Algebraic Geometry Summer School</i> , Trieste, Italy	2019
• Talk: Voronoi Cells of Varieties	
• Course Assistant: Algebraic Geometry of Data Clouds	
<i>Invitation to Nonlinear Algebra Course</i> , Leipzig, Germany	2019
• Talk: Representation Theory	
<i>MEGA: Effective Methods in Algebraic Geometry</i> , Madrid, Spain	2019
• Talk: Voronoi Cells of Varieties	
<i>ASGARD Math</i> , Oslo, Norway	2019
• Talk: Voronoi Cells of Varieties	
<i>Applied Invariant Theory Seminar</i> , Berkeley, CA	2019
• Talk: The Reach of an Algebraic Variety	
<i>Nonlinear Algebra Seminar</i> , Berkeley, CA	2019
• Talk: Voronoi Cells of Varieties	
<i>Connections for Women: Derived Algebraic Geometry, Birational Geometry and Moduli Spaces</i> , Berkeley, CA	2019
• Poster: Voronoi Cells of Varieties	
<i>Real Algebraic Geometry and Optimization at ICERM</i> , Providence, RI	2018
• Poster: Offset Hypersurfaces and Persistent Homology of Algebraic Varieties	

	<i>Applied Algebra and Topology Seminar</i> , Oxford, England	2018
	• Talk: Offset Hypersurfaces and Persistent Homology of Algebraic Varieties	
	<i>IAS Women and Mathematics</i> , Princeton, NJ	2018
	• Talk: Gender Equity in Mathematical Studies	
	<i>Linking Topology to Algebraic Geometry and Statistics</i> , Leipzig, Germany	2018
	• Poster: Algebraicity of Persistent Homology	
	<i>Nonlinear Algebra Seminar</i> , Leipzig, Germany	2018
	• Talk: Offset Hypersurfaces and Persistent Homology of Algebraic Varieties	
	<i>Commutative Algebra and Algebraic Geometry Seminar</i> , Berkeley, CA	2017
	• Talk: Symbolic Powers and the Zariski-Nagata Theorem	
TEACHING	<i>Instructor at University of Puget Sound</i>	2023-Present
	• Calculus, Linear Algebra, Abstract Algebra, Mathematics and Democracy	
	<i>Instructor at Stanford University</i>	2022
	• Calculus	
	<i>Graduate Student Instructor at UC Berkeley</i>	2020
	• Precalculus	
PROFESSIONAL DEVELOPMENT	<i>CIRTL at Stanford Teaching Certificate Program</i>	2022-2023
	• Earned Associate Level Teaching Certificate	
	<i>Advancing Learning Through Evidence-Based Teaching, CIRTL</i>	2023
	• Completed course with distinction	
	<i>IDEAL Pedagogy, Stanford University</i>	2022
	• Completed optional course on inclusive and equitable pedagogy	
	<i>Introduction to Evidence-Based STEM Undergraduate Teaching, CIRTL</i>	2022
	• Completed course with distinction	
	• Facilitated meeting of Local Learning Community at Stanford University	
OUTREACH	<i>AAAS IF/THEN Ambassador</i>	2019-present
	• Serving as a high-profile STEM role model for middle school girls	
	• Engaged public in conversations about mathematical careers alongside my statue at Smithsonian Institution	
	• Appeared in exhibit at Pacific Science Center	
	• Partnered with GoldieBlox to produce YouTube video about my work with over 50,000 views	
	• Reached approximately 1,000 K-12 students as a virtual guest speaker through Nepris platform	
	• Created and delivered fun math activities to kids at science fairs in Washington, D.C. and Seattle	
	<i>MAA MathFest</i>	2024
	• Served as a judge for the undergraduate poster session	
	<i>Harvey Mudd College Women in Mathematics Mentorship Program</i>	2021-2022
	• Mentored two undergraduates through biweekly virtual meetings	
	<i>CBS Mission Unstoppable</i>	2020
	• Created a TikTok video about my research for National STEM Day outreach campaign with over 200,000 views	
	<i>National Museum of Mathematics</i>	2020
	• Served as invited panelist for virtual program <i>The Limit Does Not Exist</i>	
	<i>Julia Robinson Math Festival</i>	2019
	• Ran activity at math conference for K-12 students	
	<i>Expanding Your Horizons</i>	2019
	• Volunteered to support STEM conference for girls	

- Co-Founder and Co-Leader of Gender Equity in Mathematical Studies* 2017-2019
- Organized multi-semester reading group discussing equity and diversity in STEM
 - Planned social events to bring together communities of graduate and undergraduate students in math
 - Facilitated events to help undergraduates prepare for GRE Math Subject Test and apply to graduate school
 - Organized group of students to volunteer weekly throughout the year in math classrooms at Willard Middle School
- Volunteer Teacher, Willard Middle School* 2016-2019
- Developed curriculum in alignment with Common Core standards to meet needs of students who struggled in previous math courses
 - Taught after-school credit recovery course to 8th grade students
 - Established program to bring other mathematics students from UC Berkeley to volunteer at Willard Middle School
- IAS Women and Mathematics Ambassador* 2017-2018
- Awarded \$1500 to found and run Gender Equity in Mathematical Studies organization for UC Berkeley graduate and undergraduate students with Madeline Brandt
- UC Berkeley Women in Math Graduate School Panel* 2016
- Served as volunteer panelist to discuss graduate application process with undergraduate women
- Littlebrook Science Expo* 2016
- Taught lesson on Möbius Valentine to encourage elementary school students' interest in math
- Teaching Assistant, Bridge to Enter Advanced Mathematics* 2016
- Assisted teacher in Mathematical Logic course at summer camp for talented middle school students from underserved communities
 - Led homework sessions and encouraged development of students' skills at solving difficult math problems

REFEREEING

Algebraic Statistics
Experimental Mathematics
Foundations of Data Science
International Mathematics Research Notices
SIAM Journal on Applied Algebra and Geometry
The College Mathematics Journal