Matt Larson

CONTACT INFORMATION

Email: mattlarson@princeton.edu
Citizenship: United States

EMPLOYMENT

Institute for Advanced Study

Bourgain Fellow, 2024 – present

Princeton University

Associate Research Scholar, 2024 – present

EDUCATION

Stanford University

PhD in Mathematics, 2019 – 2024
Advisors: June Huh and Ravi Vakil

Yale University

M.S. in Mathematics, B.S. in Mathematics, 2015 – 2019
Honors: Phi Beta Kappa, *magna cum laude*, distinction in the major

RESEARCH PAPERS

A decomposition theorem for Lefschetz modules (with O. Amini and J. Huh), preprint.

Vanishing theorems for combinatorial geometries (with C. Eur and A. Fink), preprint.

Complementary vectors of simplicial complexes (with A. Stapledon), preprint.

Differential operators, anisotropy, and simplicial spheres (with K. Karu and A. Stapledon), preprint.

Fine multidegrees, universal Gröbner bases, and matrix Schubert varieties (with D. Huang), preprint.

Determinants of Hodge-Riemann forms (with I. Novik and A. Stapledon), preprint.

Rigidity matroids and linear algebraic matroids with applications to matrix completion and tensor codes (with J. Brakensiek, M. Dhar, J. Gao, and S. Gopi), preprint.

The local motivic monodromy conjecture for simplicial nondegenerate singularities (with S. Payne and A. Stapledon), preprint.

Lefschetz properties of local face modules (with A. Stapledon). To appear in Algebr. Comb.

The Bergman fan of a polymatroid (with C. Crowley, J. Huh, C. Simpson, and B. Wang). To appear in Trans. Amer. Math. Soc.

K-theoretic positivity for matroids (with C. Eur). To appear in Alg. Geom.

Kapranov degrees (with J. Brakensiek, C. Eur, and S. Li), Int. Math. Res. Not. IMRN 20 (2025), 1-16.

Rank functions and invariants of delta-matroids. Electron. J. Combin. 32 (2025),

Paper No. 2.4, 17pp.

Straightening laws for Chow rings of matroids. J. Algebra. 672 (2025), 50-70.

K-classes of delta-matroids and equivariant localization (with C. Eur and H. Spink), Trans. Amer. Math. Soc. 378 (2025), 731-750.

Signed permutohedra, delta-matroids, and beyond (with C. Eur, A. Fink, and H. Spink), Proc. Lond. Math. Soc. 128 (2024). Paper No. e12592, 54pp.

Intersection theory of polymatroids (with C. Eur), Int. Math. Res. Not. IMRN. (2024), 4207-4241.

K-rings of wonderful varieties and matroids (with S. Li, S. Payne, and N. Proudfoot), Adv. Math. 441 (2024). Paper No. 109554, 43pp.

Kazhdan–Lusztig polynomials of braid matroids (with L. Ferroni), Comm. Amer. Math. Soc. 4 (2024), 64-79.

Stellahedral geometry of matroids (with C. Eur and J. Huh), Forum Math. Pi 11 (2023). Paper No. e24, 48pp.

Resolutions of local face modules, functoriality, and vanishing of local h-vectors (with S. Payne and A. Stapledon), Algebr. Comb. 6 (2023), 1057-1072.

The Arakelov-Zhang pairing and Julia sets (with A. Bridy), Proc. Amer. Math. Soc. 149 (2021), 3699-3713.

Inverse problems for minimal complements and maximal supplements (with N. Alon and N. Kravitz), J. Number Theory 223 (2021), 307-324.

Unions of Random Trees and Applications (with A. James, D. Montealegre, and A. Salmon), Disc. Math. 344 (2021). Paper No. 112265, 13pp.

Power maps in finite groups, Integers 19 (2019). Paper No. A58, 15pp.

Expository work

Combinatorial Hodge theory (with C. Eur), Notices Amer. Math. Soc. 72 (2025), 261-270.

Theorem of the base (with R. Cheng, L. Ji, and N. Olander). *Stacks Project Expository Collection*, 163-193, London Math. Soc. Lecture Note Ser., 480, Cambridge Univ. Press (2022).

Invited Talks

Linear algebra of the decomposition theorem, BATMOBILE conference, Amherst. (November 2025)

Fine Schubert polynomials, Schubert seminar, online. (October 2025)

Linear algebra of the decomposition theorem, University of Pennsylvania algebraic geometry seminar, Philadelphia. (September 2025)

K-theory of wonderful compactifications, Summer Research Institute in Algebraic Geometry, Fort Collins. (July 2025)

Complementary vectors of simplicial complexes, KOALA conference, Columbus. (June 2025)

Fine multidegrees and Gröbner degenerations, NC State symbolic computation seminar, Raleigh. (April 2025)

Matrix completion and tensor codes, Matroids, rigidity, and algebraic statistics workshop, Providence. (March 2025)

Triangulations of spheres and determinants of Hodge-Riemann forms, Combinatorics & Geometry BLT seminar, online. (December 2024)

Fine multidegrees and Gröbner degenerations, Algebra, geometry and combinatorics day, Ann Arbor. (November 2024)

Geometry of delta-matroids, Geometry of matroids workshop, IAS. (October 2024)

K-theory of Bergman fans, Tropical geometry: Moduli spaces and matroids, Frankfurt. (October 2024)

Signed permutohedra, Rutgers discrete math seminar, New Brunswick. (September 2024)

Matrix completion and tensor codes, Georgia Tech algebra seminar, Atlanta. (September 2024)

The monodromy conjecture for simplicial nondegenerate singularities, Princeton algebraic geometry seminar, Princeton. (September 2024)

Augmented geometry of matroids, Arrangements, matroids and logarithmic vector fields workshop, Oberwolfach. (June 2024)

Low rank matrix completion and tensor codes, University of Zagreb applied math seminar, Zagreb. (June 2024)

The monodromy conjecture for simplicial nondegenerate singularities, SNU algebraic geometry seminar, Seoul. (March 2024)

Cross-ratio degrees, University of Minnesota combinatorics seminar, online. (January 2024)

Kapranov degrees, Joint Math Meetings, San Francisco. (January 2024)

Cross-ratio degrees, Harvard–MIT combinatorics seminar, Cambridge. (November 2023)

Cross-ratio degrees, University of Oregon algebra seminar, Eugene. (October 2023)

Signed permutohedra, Combinatorial algebraic geometry ICERM event, Providence. (August 2023)

The Kähler package for projective bundle rings, Workshop on Lefschetz properties, Toronto. (May 2023)

Signed permutohedra, San Francisco State University algebraic geometry seminar, San Francisco. (May 2023)

Bergman fans of polymatroids, Fields matroid seminar, online. (April 2023)

The K-ring of $\overline{M}_{0,n}$, University of Michigan algebraic geometry seminar, Ann Arbor. (March 2023)

Invariants of delta-matroids, Algebraic aspects of matroid theory workshop, BIRS. (March 2023)

The K-ring of $\overline{M}_{0,n}$, Cambridge algebraic geometry seminar, Cambridge. (February 2023)

Stellahedral geometry of matroids, KTH combinatorics seminar, online. (November 2022)

The local motivic monodromy conjecture for simplicial nondegenerate singularities, Brown algebraic geometry seminar, Providence. (November 2022)

Algebraic geometry of delta-matroids, Matroids day, Madison. (November 2022)

The local motivic monodromy conjecture for simplicial nondegenerate singularities, Stanford algebraic geometry seminar, Stanford. (October 2022)

Stellahedral geometry of matroids, University of Western Ontario geometry and combinatorics seminar, online. (October 2022)

Algebraic geometry of delta-matroids, Fall Eastern Sectional Meeting, Amherst. (October 2022)

Nonvanishing criteria for local h-polynomials, Fall South Sectional Meeting, El Paso. (September 2022)

Teaching

Princeton University
Fall 2025 Course head for Advanced Vector Calculus
Stanford University
Spring 2020 Course assistant for Modules and Groups Representations
Fall 2019 Course assistant for Applied Linear Algebra
Yale University
Fall 2017 - Spring 2019 Peer tutor for Vector Calculus and Linear Algebra I and II

Honors and Awards

2023 ARCS Fellowship
2020 NDSEG Fellowship
2019 DeForest Prize
2018 Chess International Master
2018 Anthony Stanley Prize
2017 Benjamin F. Barge Prize

Service

Organizer of special session on "Combinatorial Hodge theory" at JMM (2026)
Organizer of Arbeitsgemeinschaft on "Combinatorial Hodge theory" (2025)
Lecturer at summer school on "Positivity in K-theory" (2025)

Organizer of the IAS special year seminar (2024-2025)
Stanford directed reading project mentor (2022-2024)
Organizer of Stanford student algebraic geometry seminar (2020-2023)
Contributor to the Stacks project
Member of Yale math department's undergraduate student advisory committee (2018-2019)
Reviewer for MathSciNet
Referee for Adv. Math., Adv. in Appl. Math., Algebr. Comb., Algebra Number Theory, Ann. Math., Collect. Math., Combinatorica, Comm. Amer. Math. Soc., Compos. Math., Discrete Comput. Geom., Discrete Math. Lett., Duke Math. J., Electron. J. Combin., Eur. J. Combin., Exp. Math., Forum. Math. Sigma, FPSAC, Int. Math. Res. Not. IMRN, J. Algebra, J. Lond. Math. Soc., J. Pure Appl. Algebra, J. Symbolic Comput., Math. Proc. Camb. Phil. Soc., Manuscripta Math., Math. Comp., MATRIX Ann., Selecta Math.