

Curriculum Vitae

FU LIU

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Education/Employment:

2019 – Professor, University of California, Davis.
2013 – 2019 Associate Professor, University of California, Davis.
2007 – 2013 Assistant Professor, University of California, Davis.
2007 Spring Krener Assistant Professor, University of California, Davis.
2006 Fall Postdoc Fellow, Member of the program *Computational Applications of Algebraic Topology*.
2002 – 2006 Ph.D. in Mathematics, Massachusetts Institute of Technology.
1999 – 2002 B.S. in Mathematics, California Institute of Technology.
1999 – 2002 B.S. in Engineering and Applied Science, concentrated in Computer Science, California Institute of Technology.

Scientific/Academic Honors:

2022 – 2025 NSF grant #2153897-0, National Science Foundation.
2016 – 2022 Collaboration Grants for Mathematicians, Simons Foundation.
2013 – 2017 NSF grant DMS-1265702, National Science Foundation.
2012 – 2014 Collaboration Grants for Mathematicians, Simons Foundation.
2011 – 2012 Hellman Fellowship, UC Davis.
2009 – 2011 NSA 2 year grant H98230-09-1-0029, National Security Agency.
2006 Clay Mathematics Institute Liftoff Fellowship
2006 Charles W. and Jennifer C. Johnson Prize, MIT
2002 Yao T. Li Fellowship, MIT
2002 Scott Russell Johnson Undergraduate Prize, Caltech
2001 Superior Performance on the 62nd William Lowell Putnam Mathematical Competition
2001 Herbert J. Ryser Scholarship, Caltech
2001 Summer Undergraduate Research Fellowship, Caltech
1997 – 1999 Yuxi Scholarship, Peking University
1996 Bronze medal in the 37th International Mathematical Olympiad

Research Interests:

Enumerative Combinatorics and algebraic combinatorics.

Thesis Title:

Contributions to the Theory of Ehrhart polynomials

Published or Accepted papers (in reverse chronological order):

1. (with Brian Osserman, Montserrat Teixidor I Bigas, and Naizhen Zhang) *The strong maximal rank conjecture and moduli spaces of curves*, accepted by Algebra & Number Theory.

2. (with Yonggyu Lee) *Deformation cone of Tesler polytopes*, Advances in Geometry **24** (2024), no. 2, 209–227.
3. (with Federico Castillo) *The permuto-associahedron revisited*, European Journal of Combinatorics **110** (2023), Paper No. 103706, 30pp.
4. (with Yonggyu Lee) *Ehrhart positivity of Tesler polytopes and Berline-Vergne’s valuation*, Discrete and Computational Geometry **69** (2023), no. 3, 896–918.
5. (with Federico Castillo) *On the Todd class of the permutohedral variety*, Algebraic Combinatorics **4** (2021), no. 3, 387–407.
6. (with Brian Osserman, Montserrat Teixidor I Bigas, and Naizhen Zhang) *Limit linear series and ranks of multiplication maps*, Transactions of the American Mathematical Society **374** (2021), no. 1, 367–405.
7. (with Ben Braun) *h^* -polynomials with roots on the unit circle*, Experimental Mathematics **30** (2021), no. 3, 332–348.
8. (with Federico Castillo) *Deformation cones of nested Braid fans*, International Mathematics Research Notices (2020), rnaa090.
9. (with Liam Solus) *On the relationship between Ehrhart unimodality and Ehrhart positivity*, Annals of Combinatorics **23** (2019), no.2, 347–365.
10. (with Akiyoshi Tsuchiya) *Stanley’s non-Ehrhart-positive order polytopes*, Advances in Applied Mathematics **108** (2019), 1–10.
11. *On positivity of Ehrhart polynomials*, Recent Trends in Algebraic Combinatorics (2019), pp 189–237. Association for Women in Mathematics Series, Vol 16, Springer, Cham.
12. (with Federico Castillo) *Berline-Vergne valuation and generalized permutohedra*, Discrete and Computational Geometry **60** (2018), no. 4, 885–908.
13. (with Federico Castillo, Benjamin Nill, and Andreas Paffenholz) *Smooth polytopes with negative Ehrhart coefficients*, Journal of Combinatorial Theory Ser. A. **160** (2018), 316–331.
14. (with Brian Osserman), *Severi degrees on toric surfaces*, Journal für die reine und angewandte Mathematik (Crelle’s journal) **739** (2018), 121–158. ISSN (Online) 1435-5345, ISSN (Print) 0075-4102, DOI:10.1515/crelle-2015-0059, October 2015.
15. *A combinatorial analysis of Severi degrees*, Advances in Mathematics **298** (2016), 1–50.
16. (with Federico Castillo), *Ehrhart positivity for generalized permutohedra*, DMTCS proceedings **FPSAC’15** (2015), 865–876.
17. *On bijections between monotone rooted trees and the comb basis*, DMTCS proceedings **FP-SAC’15** (2015), 453–464.
18. (with Richard P. Stanley) *A distributive lattice connected with arithmetic progression of length three*, Ramanujan Journal **36** (2015), no.1, 203–226.
19. (with Rosena R. X. Du) *Factorizations of cycles and multi-noded rooted trees*, Graphs and Combinatorics **31** (2015), no. 3, 551–575.
20. (with Richard P. Stanley) *The lecture-hall parallelepiped*, Annals of Combinatorics **18** (2014), no.3, 473–488.
21. *Perturbation of transportation polytopes*, Journal of Combinatorial Theory Ser. A **120** (2013), no. 7, 1539–1561.
22. *Perturbation of central transportation polytopes of order $kn \times n$* , 24th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2012), 961–973, Discrete Math. Theor. Comput. Sci. Proc., AR, Assoc. Discrete Math. Theor. Comput. Sci., Nancy, 2012.

23. *Higher integrality conditions, volumes and Ehrhart polynomials*, Advances in Mathematics, **226** (2011), no.4, 3467–3494.
24. *Combinatorial bases for multilinear parts of free algebras with two compatible brackets*, Journal of Algebra, **323** (2010), no.1, 132–166.
25. *Moduli of crude limit linear series*, International Mathematics Research Notices, **2009** (2009), no. 21, 4032–4050. 5arXiv:0902.4289.
26. *A note on lattice-face polytopes and their Ehrhart polynomials*, Proceedings of the American Mathematical Society, **137** (2009), no. 10, 3247–3258.
27. (with Jesus A. De Loera and Ruriko Yoshida) *A generating function for all semi-magic squares and the volume of the Birkhoff polytope*, Journal of Algebraic Combinatorics, **30** (2009), no. 1, 113–139.
28. *Hook length polynomials for plane forests of a certain type*, Annals of Combinatorics, **13** (2009), no. 3, 315–322.
29. (with Brian Osserman) *The irreducibility of certain pure-cycle Hurwitz spaces*, American Journal of Mathematics **130** (2008), no. 6, 1687–1708.
30. *Ehrhart polynomials of lattice-face polytopes*, Transactions of the American Mathematical Society **360** (2008), no. 6, 3041–3069.
31. (with Rosena R. X. Du) *(k, m) -Catalan numbers and hook length polynomials for plane trees*, European Journal of Combinatorics **28** (2007), no. 4, 1312–1321.
32. (with Brian Osserman) *Mochizuki’s indigenous bundles and Ehrhart polynomials*, Journal of Algebraic Combinatorics **23** (2006), no. 2, 125–136.
33. *Ehrhart polynomials of cyclic polytopes*, Journal of Combinatorial Theory Ser. A **111** (2005), no. 1, 111–127.

Preprints:

1. (with Federico Castillo) *Symmetrizing Polytopes and Posets*, arXiv:2408.02771.

Extended abstracts:

1. *A combinatorial analysis of Severi degrees*, DMTCS proceedings **BC** (2016), 779–790.
2. (with Federico Castillo) *On the Todd class of the permutohedral variety*, Séminaire Lotharingien de Combinatoire **84B** (2020), Article #88, 12pp.

Invited Talks:

- 2024 June *Pecha Kucha Talks at The Many Combinatorial Legacies of Richard P. Stanley*, Harvard University, Cambridge, Massachusetts.
- 2023 Oct. *Colloquim*, California State University, Chico, California.
- 2022 May *AIM Workshop on “Ehrhart polynomials: inequalities and extremal constructions”*, San Jose, California.
- May *Deformation Theory Seminar*, University of Pennsylvania. (Online)
- 2021 Apr. *(Polytop)ics: Recent advances on polytopes*, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany. (Online)
- Mar. *Discrete C.A.T.S. Seminar*, University of Kentucky, Lexington. (Online)
- 2019 Apr. *Geometry, Combinatorics and Integrable Systems Seminar*, The Ohio State University, Columbus, Ohio.
- 2018 Jun. *Combinatorics Seminar*, East China Normal University, Shanghai, P.R.China.

- Apr. *Combinatorics Seminar*, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Apr. *Colloquium*, University of Miami, Coral Gables, Florida.
- Jan. *AMS Special Session on Combinatorial Commutative Algebra and Polytopes*, Joint Mathematics Meetings, San Diego, California.
- Jan. *AMS Special Session on Combinatorics and Geometry*, Joint Mathematics Meetings, San Diego, California.
- 2017 Sep. *Mini-Workshop: Lattice Polytopes: Methods, Advances, Applications*, Oberwolfach, Germany.
- Sep. *Introductory Workshop: Geometric and Topological Combinatorics*, MSRI, Berkeley, California.
- May *Special Session on Ehrhart Theory and its Applications*, AMS meeting, Hunter College, New York, New York.
- Apr. *AWM Research Symposium 2017*, University of California, Los Angeles, California.
- Apr. *Combinatorics Seminar*, University of Southern California, Los Angeles, California.
- Apr. *Combinatorics Seminar*, University of California, Los Angeles, California.
- 2016 Dec. *Algebra-Geometry-Combinatorics Seminar*, San Francisco State University, San Francisco, California.
- Aug. *International Congress of Chinese Mathematicians*, Beijing, P.R.China.
- Aug. *Workshop on Computational Commutative Algebra and Convex Polytopes*, RIMS, Kyoto University, Kyoto, Japan.
- May *CombinaTexas 2016*, Texas A&M University, College Station, Texas.
- 2015 Nov. *Davis Math Conference*, University of California-Davis, California.
- Jul. *Formal Power Series and Algebraic Combinatorics*, Daejeon, South Korea. (Poster)
- Jun. *Combinatorics Seminar*, East China Normal University, Shanghai, P.R.China.
- Apr. *Special Session on Algebraic and Enumerative Combinatorics*, University of Nevada-Las Vegas, Nevada.
- Mar. *Special Session on Convexity and Combinatorics*, Georgetown University, Washington, DC.
- 2014 Oct. *Special Session on Polyhedral Number Theory*, AMS meeting, San Francisco State University, California.
- Oct. *Special Session on Topological Combinatorics and Combinatorial Commutative Algebra*, AMS meeting, San Francisco State University, San Francisco, California.
- Apr. *Workshop on Specialization of Linear Series for Algebraic and Tropical Curves*, Banff International Research Station, Banff, Canada. (Invited participant)
- Jan. *Workshop on Polyhedra, Lattices, Algebra, and Moments*, Institute for Mathematical Sciences, Singapore.
- 2013 Aug. *SIAM conference on applied algebraic geometry*, Colorado State University, Fort Collins, Colorado.
- Apr. *D.W. Weeks Lecture Series*, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Mar. *AWM Research Symposium 2013*, Santa Clara University, Santa Clara, California.
- 2012 Aug. *Conference on Algebraic Combinatorics*, Shanghai Jiao Tong University, Shanghai, P.R.China.
- Aug. *Formal Power Series and Algebraic Combinatorics*, Nagoya University, Nagoya, Japan. (Poster)
- Jul. *Workshop on Convex Polytope*, RIMS, Kyoto University, Kyoto, Japan.
- Jun. *SIAM conference on Discrete Mathematics*, Dalhousie University, Halifax, Nova Scotia, Canada.
- Feb. *Student-Run Algebraic Geometry Seminar*, University of California, Davis, California.
- 2010 Dec. *Special Session on Discrete Mathematics*, CMS meeting, Vancouver, British Columbia, Canada.
- Nov. *Special Session on Convexity and Combinatorics*, AMS meeting, University of Richmond, Virginia.
- Jun. *Combinatorics Seminar*, East China Normal University, Shanghai, P.R.China.

- Apr. *Special Session on Geometric Combinatorics*, AMS meeting, University of New Mexico, Albuquerque, New Mexico.
- Apr. *Combinatorics Seminar*, University of California, Berkeley, California.
- Mar. *Discrete C.A.T.S. Seminar*, University of Kentucky, Lexington, Kentucky.
- Mar. *Clifford Lectures*, Tulane University, New Orleans.
- 2009 Dec. *Combinatorics Seminar*, University of Washington, Seattle, Washington.
- Oct. *Workshop: Combinatorial Geometry*, IPAM, Los Angeles, California.
- 2008 Dec. *Combinatorics Seminar*, East China Normal University, Shanghai, P.R.China.
- Dec. *Combinatorics and Discrete Dynamical Systems*, SMS-AMS meeting, Fudan University, Shanghai, P.R. China.
- 2007 Apr. *Bay Area Discrete Math Day*, San Francisco State University, San Francisco, California.
- Apr. *Colloquium*, University of California, Davis, California.
- Mar. *Algebra-Geometry-Combinatorics Seminar*, San Francisco State University, San Francisco, California.
- 2006 Nov. *Special Session on Algebraic Combinatorics*, AMS meeting, University of Arkansas, Fayetteville, Arkansas.
- Oct. *Topological Combinatorics Seminar*, MSRI, Berkeley, California.
- Sep. *Postdoc Seminar*, MSRI, Berkeley, California.
- Jun. *Formal Power Series and Algebraic Combinatorics*, University of California, San Diego, California.
- Apr. *Special Session on Enumerative Aspects of Polytopes*, AMS meeting, San Francisco State University, San Francisco, California.
- Jan. *Discrete Mathematics & Representation Theory Seminar*, University of California, Davis, California.
- 2005 Jun. *Formal Power Series and Algebraic Combinatorics*, University of Messina, Italy.
- Jun. *P-doc Seminar*, Institut Mittag-Leffler, Sweden.
- May *Institute Seminar*, Institut Mittag-Leffler, Sweden.
- Apr. *Algebra-Geometry-Combinatorics Seminar*, San Francisco State University, San Francisco, California.
- Feb. *Combinatorics seminar*, University of California, Berkeley, California.
- 2004 Jun. *Kyoto University/RIMS joint Number Theory Seminar*, Kyoto, Japan.
- May *Combinatorics Seminar*, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Professional Activities:

- Journals refereed:

Advances in Applied Mathematics
 Algebraic Combinatorics
 Annals of Combinatorics
 Ars Mathematica Contemporanea
 Discrete Mathematics
 Forum of Mathematics, Sigma
 Journal of Combinatorics
 Journal of the London Mathematical Society
 Mathematische Zeitschrift
 Proceedings of the AMS
 Transactions of the AMS

Advances in Mathematics
 American Mathematical Monthly
 Ars Combinatoria
 Bulletin of ICA
 Discrete & Computational Geometry
 Graphs and Combinatorics
 Journal of Combinatorial Theory Ser. A
 Linear Algebra and Its Applications
 Pacific Journal of Mathematics
 SIAM Journal on Discrete Mathematics

- Organization:

Member of the organization committee for FPSAC 2023

One of the organizers for the AIM Workshop “Ehrhart polynomials: inequalities and extremal constructions”, May, 2022.

Member of the program committee for FPSAC 2010, FPSAC 2017 and FPSAC 2021

Member of the organization committee for FPSAC 2010

Member of the Bay Area Discrete Math Day Committee: fall 2007 to spring 2010.

UC Davis Algebra and Discrete Math Seminar, fall 2008, spring 2009, and fall 2009.