

Ricky Ini Liu

CONTACT INFORMATION	Department of Mathematics University of Washington Box 354350 Seattle, WA 98195	Email: riliu@uw.edu Website: http://sites.math.washington.edu/~riliu
CITIZENSHIP	USA	
EMPLOYMENT	2023–	University of Washington Associate Professor
	2021–2023	University of Washington Assistant Professor
	2020–2021	North Carolina State University Associate Professor
	2014–2020	North Carolina State University Assistant Professor
	2011–2014	University of Michigan T. H. Hildebrandt Research Assistant Professor National Science Foundation Postdoctoral Fellow Sponsoring scientist: Thomas Lam
	2010–2011	University of Minnesota National Science Foundation Postdoctoral Fellow Sponsoring scientist: Victor Reiner
EDUCATION	2006–2010	Ph.D. in Mathematics Massachusetts Institute of Technology Adviser: Alexander Postnikov
	2002–2006	A.B. in Mathematics, <i>magna cum laude</i> Harvard University
RESEARCH INTERESTS	Algebraic combinatorics, connections to geometry and representation theory	
PAPERS AND PREPRINTS	<ul style="list-style-type: none">◇ Plane partitions and rowmotion on rectangular and trapezoidal posets (with J. Johnson). Available at arxiv:2311.07133.◇ Shuffle bases and quasisymmetric power sums (with M. Tang). Available at arXiv:2310.09371.◇ Piecewise-linear promotion and RSK in rectangles and moon polyominoes (with J. Johnson). Available at arXiv:2210.04326.◇ Birational rowmotion and the octahedron recurrence (with J. Johnson). Available at arXiv:2204.04255.◇ Twisted Schubert polynomials, <i>Selecta Mathematica, New Series</i>, Volume 28, Issue 87, 2022.◇ Schubert polynomials as projections of Minkowski sums of Gelfand-Tsetlin polytopes (with K. Mészáros and A. St. Dizier), <i>Combinatorial Theory</i>, Volume 2, Issue 3, 2022.	

- ◇ Determinantal formulas for SEM expansions of Schubert polynomials (with H. Hatam, J. Johnson, and M. Macaulay), *Annals of Combinatorics*, Volume 25, Issue 4, December 2021, pp. 1049–1074.
- ◇ P -partitions and quasisymmetric power sums (with M. Weselcouch), *International Mathematics Research Notices*, Volume 2021, Issue 16, August 2021, pp. 12707–12747.
- ◇ Up- and down-operators on Young’s lattice (with C. Smith), *Electronic Journal of Combinatorics*, Volume 28, Issue 3, 2021, Article P3.30.
- ◇ Channels, billiards, and perfect matching 2-divisibility (with G. Barkley), *Electronic Journal of Combinatorics*, Volume 28, Issue 2, 2021, Article P2.51.
- ◇ The algebra of Schur operators (with C. Smith), *European Journal of Combinatorics*, Volume 87, June 2020, Article 103130.
- ◇ P -partition generating function equivalence of naturally labeled posets (with M. Weselcouch), *Journal of Combinatorial Theory, Series A*, Volume 170, February 2020, Article 105136.
- ◇ Gelfand-Tsetlin polytopes: a story of flow & order polytopes (with K. Mészáros and A. St. Dizier), *SIAM Journal on Discrete Mathematics*, Volume 33, Issue 4, December 2019, pp. 2394–2415.
- ◇ Flow polytopes and the space of diagonal harmonics (with K. Mészáros and A. Morales), *Canadian Journal of Mathematics*, Volume 71, Issue 6, December 2019, pp. 1495–1521.
- ◇ Kronecker coefficients and noncommutative super Schur functions (with J. Blasiak), *Journal of Combinatorial Theory, Series A*, Volume 158, August 2018, pp. 315–361.
- ◇ A simplified Kronecker rule for one hook shape, *Proceedings of the American Mathematical Society*, Volume 145, Issue 9, September 2017, pp. 3657–3664.
- ◇ Subalgebras of the Fomin–Kirillov algebra (with J. Blasiak and K. Mészáros), *Journal of Algebraic Combinatorics*, Volume 44, Issue 3, November 2016, pp. 785–829.
- ◇ On the commutative quotient of Fomin–Kirillov algebras, *European Journal of Combinatorics*, Volume 54, May 2016, pp. 65–75.
- ◇ Complete branching rules for Specht modules, *Journal of Algebra*, Volume 446, January 2016, pp. 77–102.
- ◇ Positive expressions for skew divided difference operators, *Journal of Algebraic Combinatorics*, Volume 42, Issue 3, November 2015, pp. 861–874.
- ◇ Coefficients of a relative of cyclotomic polynomials, *Acta Arithmetica*, Volume 165, Issue 4, 2014, pp. 301–326.
- ◇ Laurent polynomials, Eulerian numbers, and Bernstein’s theorem, *Journal of Combinatorial Theory Series A*, Volume 124, May 2014, pp. 244–250.
- ◇ Nonconvexity of the set of hypergraph degree sequences, *Electronic Journal of Combinatorics*, Volume 20, Issue 1, January 2013.
- ◇ Matching polytopes and Specht modules, *Transactions of the American Mathematical Society*, Volume 364, Number 2, February 2012, pp. 1089–1107.
- ◇ Matrices with restricted entries and q -analogues of permutations (with J. Lewis, A. Morales, G. Panova, S. Sam, and Y. Zhang), *Journal of Combinatorics*, Volume 2, Number 3, 2011, pp. 355–395.
- ◇ Specht modules and Schubert varieties for general diagrams. Thesis. May 2010. Available at <http://hdl.handle.net/1721.1/60196>.
- ◇ An algorithmic Littlewood–Richardson rule, *Journal of Algebraic Combinatorics*, Volume 31, Issue 2, February 2010, pp. 253–266.

- ◇ Counting subrings of \mathbf{Z}^n of index k , *Journal of Combinatorial Theory Series A*, Volume 114, Issue 2, February 2007, pp. 278–299.

HONORS AND
AWARDS

- ◇ National Science Foundation Research Grant DMS-1700302/2204415, “Combinatorics and geometry of symmetric group representations,” \$185,174, 2017–2022, PI
- ◇ National Science Foundation Conference Grant DMS-1758187, “Triangle Lectures in Combinatorics,” \$30,000, 2018–2021, PI
- ◇ North Carolina State University Faculty Research and Professional Development Program, \$2,000, 2015–2016
- ◇ National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship, \$135,000, 2010–2013,
- ◇ National Science Foundation Graduate Research Fellowship, 2007–2010
- ◇ School of Science Presidential Fellowship, Massachusetts Institute of Technology, 2006–2007
- ◇ Elected to Phi Beta Kappa, 2006
- ◇ William Lowell Putnam Mathematical Competition, Fellow (Top 6), 2005, Top 16, 2003, Honorable Mention, 2002 and 2004
- ◇ International Mathematical Olympiad, Gold Medal, 2002, Silver Medal, 2000
- ◇ United States of America Mathematical Olympiad, Winner, 2000–2002

INVITED
PRESENTATIONS

- ◇ Special Session on Combinatorics and Representation Theory, Spring Western AMS Sectional Meeting, May 2023
- ◇ Combinatorics and Geometry Seminar, University of Washington, February 2023
- ◇ Cascade Lectures in Combinatorics, University of Oregon, October 2022
- ◇ Monthly Math Hour at UW, University of Washington, May 2022
- ◇ Discrete Combinatorics, Algebra, Topology, and Statistics Seminar, University of Kentucky, February 2022
- ◇ Combinatorics and Geometry Seminar, University of Washington, October 2021
- ◇ Algebra, Combinatorics, and Number Theory Seminar, University of North Carolina at Charlotte, April 2021
- ◇ Computer Science and Discrete Mathematics Seminar, Institute for Advanced Study, March 2021
- ◇ Colloquium, University of Illinois at Chicago, February 2020
- ◇ Colloquium, Georgia Institute of Technology, February 2020
- ◇ Colloquium, University of Washington, January 2020
- ◇ Combinatorics Seminar, Georgia Institute of Technology, October 2019
- ◇ Discrete Combinatorics, Algebra, Topology, and Statistics Seminar, University of Kentucky, October 2018
- ◇ AMS Special Session on Macdonald Polynomials and Related Structures, Spring Southeastern AMS Sectional Meeting, April 2018
- ◇ Special Session on Algebraic and Enumerative Combinatorics, The Third Pacific Rim Mathematical Association Congress, August 2017
- ◇ Algebra and Combinatorics Seminar, North Carolina State University, October 2016
- ◇ Positivity in Algebraic Combinatorics workshop, Korea Institute for Advanced Study, June 2016

- ◇ Discrete Geometry and Combinatorics Seminar, Cornell University, April 2016
- ◇ Philadelphia Area Combinatorics and Algebraic Geometry Seminar, Drexel University, May 2015
- ◇ Algebra, Geometry, and Combinatorics Seminar, University of Illinois at Urbana-Champaign, April 2015
- ◇ Algebra and Combinatorics Seminar, North Carolina State University, March 2015
- ◇ Algebra and Discrete Mathematics Seminar, University of California Davis, November 2014
- ◇ Combinatorics Seminar, University of California Berkeley, September 2014
- ◇ Seminar, University of Waterloo, February 2014
- ◇ Special Seminar, North Carolina State University, February 2014
- ◇ Combinatorics Seminar, University of Michigan, November 2013
- ◇ Special Session on Enumerative and Algebraic Combinatorics, Mathematical Congress of the Americas, August 2013
- ◇ Discrete Geometry and Combinatorics Seminar, Cornell University, October 2012
- ◇ Combinatorics Seminar, University of Michigan, October 2012
- ◇ Combinatorics Seminar, University of Minnesota, March 2011
- ◇ Combinatorics Seminar, University of Washington, December 2010
- ◇ Combinatorics Seminar, University of Minnesota, October 2010
- ◇ Combinatorics Seminar, University of Michigan, January 2010
- ◇ Combinatorics Seminar, Massachusetts Institute of Technology, March 2009

PROFESSIONAL
ACTIVITIES

- ◇ Organizer for the UW Combinatorics and Geometry Seminar, 2021–
- ◇ Associate Editor for the American Invitational Mathematics Examination, 2019–
- ◇ Co-chair of organizing committee for Formal Power Series and Algebraic Combinatorics, 2026
- ◇ Program committee member for Formal Power Series and Algebraic Combinatorics, 2023
- ◇ Steering committee member for the Triangle Lectures in Combinatorics, 2018–2022
- ◇ Local organizer for the Triangle Lectures in Combinatorics, Spring 2015, Fall 2016, Spring 2018, Spring 2020
- ◇ Organizer for the NCSU Algebra and Combinatorics seminar, 2015–2020
- ◇ Organizer for Special Session on Combinatorial Representation Theory, AMS Eastern Sectional Meeting, 2018
- ◇ Referee for *Advances in Applied Mathematics*; *Advances in Mathematics*; *Algebra Colloquium*; *Algebraic Combinatorics*; *Annals of Combinatorics*; *Ars Mathematica Contemporanea*; *Cambridge University Press*; *Combinatorial Theory*; *Communications in Algebra*; *Discrete & Computational Geometry*; *Discrete Mathematics*; *Electronic Journal of Combinatorics*; *European Journal of Combinatorics*; *Formal Power Series and Algebraic Combinatorics*; *Forum of Mathematics*; *Sigma*; *Integers*; *International Mathematics Research Notices*; *Journal of Algebra*; *Journal of Algebraic Combinatorics*; *Journal of Combinatorial Theory Series A*; *Journal of Mathematical Physics*; *Proceedings of the American Mathematical Society*; *Springer*; *Symmetry, Integrability and Geometry: Methods and Applications*; *Transactions of the American Mathematical Society*.
- ◇ Judge for UW Math Hour Olympiad, 2022–2023

- ◇ National Science Foundation review panelist, 2019
- ◇ Problem proposer for the USA Mathematical Olympiad, 2004–

OTHER RESEARCH
EMPLOYMENT

- ◇ Member, Institute for Advanced Study, Fall 2020–Spring 2021
- ◇ Visiting scholar, Simons Institute for the Theory of Computing, Fall 2014.
- ◇ Adjunct researcher, Institute for Defense Analyses/Center for Communications Research Princeton, SCAMP summer conference, 2005–2015
- ◇ Researcher, Research Experience for Undergraduates at University of Minnesota Duluth, 2004

ADVISING

- ◇ Michael Tang, expected Ph.D. 2026
- ◇ Joseph Johnson, Ph.D. 2023
- ◇ Christian Smith, Ph.D. 2021
- ◇ Michael Weselcouch, Ph.D. 2019

TEACHING
EXPERIENCE

- ◇ Math 461 Combinatorial Theory I, University of Washington, Autumn 2023
- ◇ Math 342 The Art of Problem Solving, University of Washington, Autumn 2023
- ◇ Math 462 Combinatorial Theory II, University of Washington, Spring 2023
- ◇ Math 461 Combinatorial Theory I, University of Washington, Winter 2023
- ◇ Math 581 Special Topics: Combinatorial Hopf Algebras, University of Washington, Autumn 2022
- ◇ Math 563 Foundations of Combinatorics III: Algebraic Combinatorics, University of Washington, Spring 2022
- ◇ Math 125 Calculus with Analytic Geometry II, University of Washington, Winter 2022
- ◇ Math 208 Matrix Algebra with Applications, University of Washington, Autumn 2021
- ◇ Math 796 Special Topics: Schubert Calculus, North Carolina State University, Spring 2020
- ◇ Math 225 Foundations of Advanced Mathematics, North Carolina State University, Fall 2019
- ◇ Math 724 Combinatorics II, North Carolina State University, Spring 2018
- ◇ Math 524 Combinatorics I, North Carolina State University, Fall 2018
- ◇ Math 437 Applications of Algebra, North Carolina State University, Spring 2018
- ◇ Math 493 Special Topics: Combinatorial Game Theory, North Carolina State University, Fall 2017
- ◇ Math 416 Introduction to Combinatorics, North Carolina State University, Spring 2017
- ◇ Math 591 Special Topics: Algebraic Combinatorics, North Carolina State University, Fall 2016
- ◇ Math 724 Combinatorics II, North Carolina State University, Spring 2016
- ◇ Math 524 Combinatorics I, North Carolina State University, Fall 2015
- ◇ Math 437 Applications of Algebra, North Carolina State University, Spring 2015
- ◇ Math 416 Introduction to Combinatorics, North Carolina State University, Spring 2015
- ◇ Math 465 Introduction to Combinatorics, University of Michigan, Winter 2014

- ◇ Math 215 Calculus III, University of Michigan, Fall 2013
- ◇ Math 412 Introduction to Modern Algebra, University of Michigan, Winter 2013
- ◇ Math 465 Introduction to Combinatorics, University of Michigan, Fall 2012
- ◇ Math 217 Linear Algebra, University of Michigan, Winter 2012
- ◇ Math 115 Calculus I, University of Michigan, Fall 2011
- ◇ Teaching Assistant, 18.02 Multivariable Calculus, Massachusetts Institute of Technology, Fall 2009
- ◇ Research Adviser, Research Experience for Undergraduates at University of Minnesota Duluth, 2006–2008
- ◇ Instructor, Mathematical Olympiad Summer Program, 2007, 2009, 2011–2013, 2016, 2019, 2021, Grader, 2003–2005

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