

Yi Sun

CONTACT	Address:	Department of Mathematics, Columbia University, New York, NY 10027.
INFORMATION	Email:	yisun@math.columbia.edu
	Webpage:	yisun.io
RESEARCH	Integrable probability, random matrix theory, machine learning, representation theory.	
EMPLOYMENT	Columbia University	New York, NY
	Joseph F. Ritt Assistant Professor (2019–present), Simons Fellow (2016–2019).	
EDUCATION	Massachusetts Institute of Technology	Cambridge, MA
	Ph.D., Mathematics (2011–2016), advised by Pavel Etingof.	
	University of Cambridge	Cambridge, UK
	M.A.St., Mathematics, with distinction (2010–2011).	
	Harvard University	Cambridge, MA
	A.M., Mathematics (2006–2010).	
	A.B., Mathematics, <i>magna cum laude</i> , with secondary field in Economics (2006–2010).	
	Phi Beta Kappa (one of 24 juniors inducted)	
GRANTS	NSF Grant DMS-1701654, Alg. and NT, 2017–2020. (\$141,999, Highly Recommended)	
FELLOWSHIPS	Simons Junior Fellowship, 2016–2019. (\$364,214)	
AND AWARDS	Open Philanthropy Project Grant, 2019. (\$10,000, co-PI)	
	NSF Mathematical Sciences Postdoctoral Research Fellowship, 2016–2019 (declined).	
	Johnson Prize for best research paper by MIT graduate student in mathematics, 2016.	
	NSF Graduate Research Fellowship, 2012–2015.	
	Churchill Scholarship, 2010–2011. / MIT Praecis Presidential Fellowship, 2011–2012.	
	COMAP Math Contest in Modeling, Outstanding Winner, SIAM Prize, 2008 and 2009.	
	Intel Science Talent Search, 2 nd Place, 2006. / Putnam Competition, 10 th Place, 2009.	
	Int'l Math Olym., Silver Medal, 2006. / Asian Pacific Math Olym., Gold Medal, 2005.	
	Int'l Physics Olympiad, Gold Medal, 2004. / USA Computing Olympiad, Finalist, 2005.	
MATHEMATICS	17. <i>Principal components in linear mixed models with general bulk</i> (with Z. Fan and Z. Wang), submitted, 2019. arXiv:1903.09592	
RESEARCH	16. <i>Gaussian fluctuations for products of random matrices</i> (with V. Gorin), submitted, 2019. arXiv:1812.06532	
	15. <i>Spiked covariances and principal components analysis in high-dimensional random effects models</i> (with Z. Fan and I. Johnstone), preprint, 2018. arXiv:1806.09529	
	14. <i>Affine Macdonald conjectures and special values of Felder-Varchenko functions</i> (with E. Rains and A. Varchenko), Sel. Math. N. S. 24 (2018), 1549–1591. arXiv:1610.01917	
	13. <i>Laguerre and Jacobi analogues of the Warren process</i> (single author, with an appendix by A. Sarantsev), submitted, 2017. arXiv:1610.01635	
	12. <i>Traces of intertwiners for quantum affine algebras and difference equations (after Etingof-Schiffmann-Varchenko)</i> (single author), Transform. Groups 23 (2018), 1167–1215. arXiv:1609.09038	
	11. <i>Matrix models for multilevel Heckman-Opdam and multivariate Bessel measures</i> (single author), submitted, 2016. arXiv:1609.09096	
	10. <i>Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions</i> (single author), Commun. Math. Phys. 347 (2016), 573–653. arXiv:1508.03918	
	9. <i>The polynomial representation of the type A_{n-1} rational Cherednik algebra in characteristic $p \mid n$</i> (with S. Devadas), Commun. Algebra 45 (2016), 1926–1934. arXiv:1505.07891	
	8. <i>A representation-theoretic proof of the branching rule for Macdonald polynomials</i> (single author), Math. Res. Lett. 23 (2016), 887–927. arXiv:1412.0714	
	7. <i>A new integral formula for Heckman-Opdam hypergeometric functions</i> (single author), Adv. Math. 289 (2016), 1157–1204. arXiv:1406.3772	

COMPUTER SCIENCE RESEARCH	6. <i>Finite dimensional representations of the rational Cherednik algebra for G_4</i> (single author), J. Algebra 323 (2010), 2864–2887. arXiv:0910.5527	
	5. D. Kang*, Y. Sun*, D. Hendrycks, T. Brown, and J. Steinhardt, <i>Testing robustness against unforeseen adversaries</i> , submitted, 2019. arXiv:1908.08016	
	4. T. Hashimoto, Y. Sun, and T. Jaakkola, <i>From random walks to distances on unweighted graphs</i> , NIPS 2015. arXiv:1511.00573	
	3. T. Hashimoto, Y. Sun, and T. Jaakkola, <i>Metric recovery from directed unweighted graphs</i> , NIPS 2014 workshop (Best Student Paper), AISTATS 2015. arXiv:1411.5720	
	2. Y. Sun and M. Sundararajan, <i>Axiomatic attribution for multilinear functions</i> , ACM Conf. on Electronic Commerce 2011. arXiv:1102.0989	
OTHER RESEARCH	1. R. G. Yang*, P. Y. Wang*, Y. Sun, A. Litwin-Kumar, R. Axel, and LF Abbott, <i>Evolving the olfactory system</i> , submitted, 2019. CCN 2019, NeurIPS 2019 Neuro+AI Workshop.	
RESEARCH PRESENTATIONS	46. Google X Testing robustness against unforeseen adversaries	March 2020
	45. UW Madison: Mathematics Colloquium Fluctuations for products of random matrices	February 2020
	44. UChicago: Statistics Colloquium Fluctuations for products of random matrices	January 2020
	43. AMS Fall Western Sectional Meeting Fluctuations for products of random matrices	November 2019
	42. ICML 2019 Workshop: Uncertainty and Robustness in DL (poster) Transfer of robustness against adversarial and stochastic distortions	June 2019
	41. OpenAI Transfer of robustness against adversarial and stochastic distortions	June 2019
	40. Virginia: Integrable Probability Summer School Fluctuations for products of random matrices	June 2019
	39. UCSD: Probability Seminar Fluctuations for products of random matrices	January 2019
	38. Yale: Geometry, Symmetry, and Physics Seminar Affine Macdonald conjectures and special values of Felder-Varchenko functions	April 2018
	37. Simons Society of Fellows Retreat A probabilistic view on random covariance matrices	February 2018
	36. PCMI: Research Program on Random Matrices Algebraic structures for multilevel eigenvalue densities	July 2017
	35. Rochester: Probability Seminar Laguerre and Jacobi analogues of the Warren process	April 2017
	34. Perimeter Institute: Mathematical Physics Seminar Affine Macdonald conjectures and special values of Felder-Varchenko functions	April 2017
	33. Rutgers: Lie Group / Quantum Mathematics Seminar Affine Macdonald conjectures and special values of Felder-Varchenko functions	April 2017
	32. Columbia-Princeton Probability Day Laguerre and Jacobi analogues of the Warren process	March 2017
	31. ESI: Workshop on Elliptic Hypergeometric Functions Affine Macdonald conjectures and special values of Felder-Varchenko functions	March 2017
	30. Columbia: Probability Seminar Laguerre and Jacobi analogues of the Warren process	November 2016
	29. Columbia: Mathematical Physics Seminar Affine Macdonald conjectures and special values of Felder-Varchenko functions	October 2016

	28. IESC: QIS's, CFT's, and Stochastic Processes (poster) Laguerre and Jacobi analogues of the Warren process	September 2016
	27. MIT: Infinite-Dimensional Algebra Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	March 2016
	26. MIT: Integrable Probability Seminar Laguerre and Jacobi analogues of the Warren process	February 2016
	25. HCM: Asymptotic Analysis in Strongly Coupled Systems (poster) Laguerre and Jacobi analogues of the Warren process	January 2016
	24. NIPS 2015 (poster) From random walks to distances on unweighted graphs	December 2015
	23. ETH Zurich: ITS Talks in Theoretical Sciences 2015 Random matrices and representation theory	November 2015
	22. UC Berkeley: RTGC Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	November 2015
	21. ETH Zurich: Mathematical Physics Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	October 2015
	20. NEU: Geometry, Physics and Representation Theory Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	October 2015
	19. Columbia: Mathematical Physics Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	October 2015
	18. Yale: Geometry, Symmetry, and Physics Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	September 2015
	17. FPSAC 2015 (poster) A representation-theoretic proof of the branching rule for Macdonald polynomials	July 2015
	16. Clay Math Inst.: Random Polymers and Algebraic Combinatorics A representation-theoretic proof of the branching rule for Macdonald polynomials	May 2015
	15. AISTATS 2015 (poster) Metric recovery from directed unweighted graphs	May 2015
	14. ICERM: Workshop on Limit Shapes (poster) A representation-theoretic proof of the branching rule for Macdonald polynomials	April 2015
	13. NIPS 2014: Workshop on Networks (poster) Metric recovery from directed unweighted graphs	December 2014
	12. UC Berkeley: GRASP Seminar A representation-theoretic proof of the branching rule for Macdonald polynomials	November 2014
	11. IHP: Workshop on Macdonald Processes and Hecke Algebras A new integral formula for Heckman-Opdam hypergeometric functions	May 2014
	10. MIT: Integrable Probability Seminar A new integral formula for Heckman-Opdam hypergeometric functions	April 2014
OUTREACH PRESENTATIONS	9. Math Olympiad Program 2018 Threshold signatures	June 2018
	8. MIT "Meta-Math" Meetup 2017 How to do a Literature Search	May 2017
	7. Summer Program in Applied Rationality and Cognition 2016 Problem Solving: Contests vs. Real Life	August 2016
	6. Math Olympiad Summer Program 2016 Distribution Testing: Is this die fair?	June 2016
	5. MIT Open House 2016 Universality: Mathematics in the real world	April 2016
	4. Math Olympiad Summer Program 2015 Fair coin flips from unfair coins	June 2015

	3. Math Olympiad Summer Program 2014 The Ising model	June 2014
	2. Math Olympiad Summer Program 2013 Random matrices	June 2013
	1. Math Olympiad Summer Program 2012 Random partitions and Fock space	June 2012
OTHER PUBLICATIONS	6. 54 th <i>International Mathematical Olympiad</i> (with J. Berman and Z. Feng), <i>Mathematics Magazine</i> 86 (2013), 309–313.	
	5. 53 rd <i>International Mathematical Olympiad</i> (with Z. Feng), <i>Mathematics Magazine</i> 85 (2012), 312–317.	
	4. 52 nd <i>International Mathematical Olympiad</i> (with Z. Feng), <i>Mathematics Magazine</i> 84 (2011), 316–319.	
	3. 51 st <i>International Mathematical Olympiad</i> (with Z. Feng and P. Loh), <i>Mathematics Magazine</i> 83 (2010), 320–323.	
	2. <i>A simulation based model of traffic circles</i> (with C. Chang and Z. Fan), <i>The UMAP Journal</i> 30 (2009), 225–244.	
	1. <i>hsolve: A difficulty metric and puzzle generator for Sudoku</i> (with C. Chang and Z. Fan), <i>The UMAP Journal</i> 29 (2008), 303–324.	
TEACHING	Columbia University Instructor. Fall 2017: Calculus II, eval 3.9 (5.0). Spring 2019: Graduate reading course on representation theory. Fall 2019: Calculus II, eval 3.7 (5.0). Spring 2020: Calculus II.	Fall 2017–2020
	US National Math Olympiad Summer Program Instructor (2010, 2012–2018); Assistant (2007–2009). Design curriculum, give lectures, and personally coach US team to International Mathematical Olympiad.	Summers 2007–2018
	MIT MathROOTS Academic Coordinator. Design curriculum, give lectures, and manage academic team, guest lectures, and website for first two years of outreach program in problem solving for underrepresented minority students. Covered on MIT homepage and Notices of the AMS.	Summers 2015–2016
	MIT Undergraduate Research Opportunities Program Mentor two undergraduate research projects, leading to published research paper.	Fall 2012–2015
	• Sheela Devadas (rational Cherednik algebras in char $p \leq n$), 2014–2015.	
	• Ryan Yoo (characters of rational Cherednik algebras in char $p > n$), 2012–2014.	
	Massachusetts Institute of Technology Teaching Assistant for Differential Equations. Evaluations: 6.2 (7.0)	Spring 2015
	MIT Directed Reading Program Mentor reading project on representation theory of the symmetric group.	January 2011
	Harvard University Course Assistant for Probability Theory. Evaluations: 4.3 (5.0)	Spring 2009
PROFESSIONAL ACTIVITIES	Columbia Probability Seminar Co-organize weekly probability seminar.	Fall 2016–Present
	Summer School in Probability Co-organize graduate summer school “Dyson-Schwinger equations, topological expansions, and random matrices” at Columbia.	Summer 2017
	MIT Interacting Particle Systems Learning Seminar Organize learning seminar on recent developments in interacting particle systems.	2012–2013
	Google Research Research intern. Research attribution and cost-sharing methods, leading to paper published in EC 2010. Mentor: Mukund Sundararajan	Summer 2010
SERVICE	Reviewer: Probability Theory and Related Fields, <i>Selecta Mathematica</i> (N.S.), <i>SIGMA</i> , <i>Journal of Theoretical Probability</i> , <i>Europhysics Letters</i> , <i>Information and Inference</i> .	

Qualifying Exam Committee: Ivan Danilenko (Columbia), Maithreya Sitaraman (Columbia)

LANGUAGES Python, PyTorch, C++, L^AT_EX, Magma, Mathematica / Mandarin (native), French