

Yi Sun

CONTACT INFORMATION	Address: Department of Statistics, The University of Chicago, Chicago, IL 60637. Email: ysisun@statistics.uchicago.edu Webpage: ysisun.io
RESEARCH	Probability and applications to machine learning and high-dimensional statistics.
EMPLOYMENT	The University of Chicago Chicago, IL Assistant Professor (tenure-track), 2020–present. Columbia University New York, NY Joseph F. Ritt Assistant Professor, 2019–2020; Simons Fellow, 2016–2019.
EDUCATION	Massachusetts Institute of Technology Cambridge, MA Ph.D., Mathematics, advised by Pavel Etingof, 2011–2016. 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-2054838, 2021–2024. (\$238,603, Highly Recommended)
FELLOWSHIPS	NSF Grant DMS-1701654/2039183, 2017–2021. (\$141,999, Highly Recommended)
AND AWARDS	Simons Junior Fellowship, 2016–2019. (\$364,214) 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 AND STATISTICS RESEARCH	22. <i>Maximum likelihood for high-noise group orbit estimation and single-particle cryo-EM</i> (with Z. Fan, R. Lederman, T. Wang, and S. Xu). arXiv:2107.01305 21. <i>Likelihood landscape and maximum likelihood estimation for the discrete orbit recovery model</i> (with Z. Fan, T. Wang, and Y. Wu), Comm. Pure Appl. Math., to appear. arXiv:2004.00041 20. <i>Probabilistic conformal blocks for Liouville CFT on the torus</i> (with P. Ghosal, G. Remy, and X. Sun), submitted, 2020. arXiv:2003.03802 19. <i>Principal components in linear mixed models with general bulk</i> (with Z. Fan and Z. Wang), Ann. Stat. 49 (2021), 1489–1513. arXiv:1903.09592 18. <i>Gaussian fluctuations for products of random matrices</i> (with V. Gorin), Amer. J. Math, to appear. arXiv:1812.06532 17. <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 16. <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 15. <i>Laguerre and Jacobi analogues of the Warren process</i> (single author, with an appendix by A. Sarantsev), submitted, 2017. arXiv:1610.01635 14. <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 13. <i>Matrix models for multilevel Heckman-Opdam and multivariate Bessel measures</i> (single

- author), submitted, 2016. [arXiv:1609.09096](#)
12. *Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions* (single author), Commun. Math. Phys. **347** (2016), 573-653. [arXiv:1508.03918](#)
 11. *The polynomial representation of the type A_{n-1} rational Cherednik algebra in characteristic $p \mid n$* (with S. Devadas), Commun. Algebra **45** (2016), 1926-1934. [arXiv:1505.07891](#)
 10. *A representation-theoretic proof of the branching rule for Macdonald polynomials* (single author), Math. Res. Lett. **23** (2016), 887-927. [arXiv:1412.0714](#)
 9. *A new integral formula for Heckman-Opdam hypergeometric functions* (single author), Adv. Math. **289** (2016), 1157-1204. [arXiv:1406.3772](#)
 8. *Finite dimensional representations of the rational Cherednik algebra for G_4* (single author), J. Algebra **323** (2010), 2864-2887. [arXiv:0910.5527](#)
- COMPUTER
SCIENCE
RESEARCH
7. D. Kang*, J. Guibas*, P. Bailis, T. Hashimoto, Y. Sun, and M. Zaharia, *Accelerating Approximate Aggregation Queries with Expensive Predicates*, VLDB 2021. [arXiv:2108.06313](#)
 6. B. Hanin* and Y. Sun*, *Data augmentation as stochastic optimization*, submitted, 2020. DeepMath 2020, OPT 2020. [arXiv:2010.11171](#)
 5. D. Kang*, Y. Sun*, D. Hendrycks, T. Brown, and J. Steinhardt, *Testing robustness against unforeseen adversaries*, submitted, 2019. [arXiv:1908.08016](#)
 4. T. Hashimoto, Y. Sun, and T. Jaakkola, *From random walks to distances on unweighted graphs*, NIPS 2015. [arXiv:1511.00573](#)
 3. T. Hashimoto, Y. Sun, and T. Jaakkola, *Metric recovery from directed unweighted graphs*, NIPS 2014 workshop (Best Student Paper), AISTATS 2015. [arXiv:1411.5720](#)
 2. Y. Sun and M. Sundararajan, *Axiomatic attribution for multilinear functions*, ACM Conf. on Electronic Commerce 2011. [arXiv:1102.0989](#)
- OTHER
RESEARCH
1. P. Y. Wang, Y. Sun, A. Litwin-Kumar, R. Axel, LF Abbott, and R. G. Yang, *Evolving the olfactory system with machine learning*, Neuron, to appear, 2021. CCN 2019, NeurIPS 2019 Neuro+AI Workshop.
- RESEARCH
PRESENTATIONS
51. UChicago: Statistics Consulting Seminar February 2021
Learning under a group action and the orbit recovery problem
 50. UChicago: Probability Seminar February 2021
Probabilistic conformal blocks for Liouville CFT on the torus
 49. NeurIPS 2020 Workshop: OPT 2020 December 2020
Data augmentation as stochastic optimization (poster)
 48. DeepMath 2020 November 2020
Data augmentation as stochastic optimization
 47. Bernoulli-IMS One World Symposium August 2020
Likelihood landscape and maximum likelihood estimation for the discrete orbit recovery model
 46. Google X March 2020
Testing robustness against unforeseen adversaries
 45. UW Madison: Mathematics Colloquium February 2020
Fluctuations for products of random matrices
 44. UChicago: Statistics Colloquium January 2020
Fluctuations for products of random matrices
 43. AMS Fall Western Sectional Meeting November 2019
Fluctuations for products of random matrices
 42. ICML 2019 Workshop: Uncertainty and Robustness in DL (poster) June 2019
Transfer of robustness against adversarial and stochastic distortions
 41. OpenAI June 2019

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40. Virginia: Integrable Probability Summer School June 2019
Fluctuations for products of random matrices
 39. UCSD: Probability Seminar January 2019
Fluctuations for products of random matrices
 38. Yale: Geometry, Symmetry, and Physics Seminar April 2018
Affine Macdonald conjectures and special values of Felder-Varchenko functions
 37. Simons Society of Fellows Retreat February 2018
A probabilistic view on random covariance matrices
 36. PCMI: Research Program on Random Matrices July 2017
Algebraic structures for multilevel eigenvalue densities
 35. Rochester: Probability Seminar April 2017
Laguerre and Jacobi analogues of the Warren process
 34. Perimeter Institute: Mathematical Physics Seminar April 2017
Affine Macdonald conjectures and special values of Felder-Varchenko functions
 33. Rutgers: Lie Group / Quantum Mathematics Seminar April 2017
Affine Macdonald conjectures and special values of Felder-Varchenko functions
 32. Columbia-Princeton Probability Day March 2017
Laguerre and Jacobi analogues of the Warren process
 31. ESI: Workshop on Elliptic Hypergeometric Functions March 2017
Affine Macdonald conjectures and special values of Felder-Varchenko functions
 30. Columbia: Probability Seminar November 2016
Laguerre and Jacobi analogues of the Warren process
 29. Columbia: Mathematical Physics Seminar October 2016
Affine Macdonald conjectures and special values of Felder-Varchenko functions
 28. IESC: QIS's, CFT's, and Stochastic Processes (poster) September 2016
Laguerre and Jacobi analogues of the Warren process
 27. MIT: Infinite-Dimensional Algebra Seminar March 2016
Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions
 26. MIT: Integrable Probability Seminar February 2016
Laguerre and Jacobi analogues of the Warren process
 25. HCM: Asymptotic Analysis in Strongly Coupled Systems (poster) January 2016
Laguerre and Jacobi analogues of the Warren process
 24. NIPS 2015 (poster) December 2015
From random walks to distances on unweighted graphs
 23. ETH Zurich: ITS Talks in Theoretical Sciences 2015 November 2015
Random matrices and representation theory
 22. UC Berkeley: RTGC Seminar November 2015
Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions
 21. ETH Zurich: Mathematical Physics Seminar October 2015
Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions
 20. NEU: Geometry, Physics and Representation Theory Seminar October 2015
Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions
 19. Columbia: Mathematical Physics Seminar October 2015
Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions
 18. Yale: Geometry, Symmetry, and Physics Seminar September 2015
Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions
 17. FPSAC 2015 (poster) July 2015
A representation-theoretic proof of the branching rule for Macdonald polynomials
 16. Clay Math Inst.: Random Polymers and Algebraic Combinatorics May 2015

	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	15. AISTATS 2015 (poster)	May 2015
	Metric recovery from directed unweighted graphs	
	14. ICERM: Workshop on Limit Shapes (poster)	April 2015
	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	13. NIPS 2014: Workshop on Networks (poster)	December 2014
	Metric recovery from directed unweighted graphs	
	12. UC Berkeley: GRASP Seminar	November 2014
	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	11. IHP: Workshop on Macdonald Processes and Hecke Algebras	May 2014
	A new integral formula for Heckman-Opdam hypergeometric functions	
	10. MIT: Integrable Probability Seminar	April 2014
	A new integral formula for Heckman-Opdam hypergeometric functions	
OUTREACH	9. Math Olympiad Program 2018	June 2018
PRESENTATIONS	Threshold signatures	
	8. MIT “Meta-Math” Meetup 2017	May 2017
	How to do a Literature Search	
	7. Summer Program in Applied Rationality and Cognition 2016	August 2016
	Problem Solving: Contests vs. Real Life	
	6. Math Olympiad Summer Program 2016	June 2016
	Distribution Testing: Is this die fair?	
	5. MIT Open House 2016	April 2016
	Universality: Mathematics in the real world	
	4. Math Olympiad Summer Program 2015	June 2015
	Fair coin flips from unfair coins	
	3. Math Olympiad Summer Program 2014	June 2014
	The Ising model	
	2. Math Olympiad Summer Program 2013	June 2013
	Random matrices	
	1. Math Olympiad Summer Program 2012	June 2012
	Random partitions and Fock space	
OTHER	6. 54 th <i>International Mathematical Olympiad</i> (with J. Berman and Z. Feng), <i>Mathematics Magazine</i> 86 (2013), 309–313.	
PUBLICATIONS	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	University of Chicago	2020–present
	Instructor for: Introduction to Mathematical Probability (2020), Topics in Deep Learning: Discriminative Models (2021), Statistical Theory and Methods I (2021).	
	Columbia University	2017–2020
	Instructor for: Calculus II (2017), Graduate reading course on representation theory (2019), Calculus II (2019), Calculus II (2020).	

	Cyberspace Mathematical Competition	Summer 2020
	Problem Captain. Manage grading team for one of 8 problems for first year of international online math competition.	
	US National Math Olympiad Summer Program	Summers 2007–2018
	Instructor (2010, 2012–2018); Assistant (2007–2009). Design curriculum, give lectures, and personally coach US team to International Mathematical Olympiad.	
	MIT MathROOTS	Summers 2015–2016
	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.	
	MIT Undergraduate Research Opportunities Program	Fall 2012–2015
	Mentor two undergraduate research projects, leading to published research paper.	
	<ul style="list-style-type: none"> • 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	Spring 2015
	Teaching Assistant for Differential Equations. Evaluations: 6.2 (7.0)	
	MIT Directed Reading Program	January 2011
	Mentor reading project on representation theory of the symmetric group.	
	Harvard University	Spring 2009
	Course Assistant for Probability Theory. Evaluations: 4.3 (5.0)	
PROFESSIONAL ACTIVITIES	Columbia Probability Seminar	2016–2020
	Co-organize weekly probability seminar.	
	Summer School in Probability	Summer 2017
	Co-organize graduate summer school “Dyson-Schwinger equations, topological expansions, and random matrices” at Columbia.	
	MIT Interacting Particle Systems Learning Seminar	2012–2013
	Organize learning seminar on recent developments in interacting particle systems.	
	Google Research	Summer 2010
	Research intern. Research attribution and cost-sharing methods, leading to paper published in EC 2010. Mentor: Mukund Sundararajan	
SERVICE	Reviewer: Probability Theory and Related Fields, Selecta Mathematica (N.S.), SIGMA, Journal of Theoretical Probability, Europhysics Letters, Information and Inference, Algebraic Combinatorics.	
	Qualifying Exam Committee: Ivan Danilenko (Columbia), Maithreya Sitaraman (Columbia)	
	Dissertation Committee: Qing Yan (UChicago)	
LANGUAGES	Python, PyTorch, C++, \LaTeX , Magma, Mathematica / Mandarin (native), French	