

Yi Sun

CONTACT INFORMATION	Address: Department of Mathematics, Columbia University, New York, NY 10027. Email: yisun@math.columbia.edu Webpage: yisun.io
RESEARCH INTERESTS	Representation theory, integrable systems, and applications to probability theory and random matrices.
EMPLOYMENT	Columbia University New York, NY Simons Fellow (2016–present).
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)
FELLOWSHIPS AND AWARDS	Simons Junior Fellowship, 2016–2019. 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. MIT Praecis Presidential Fellowship, 2011–2012. Churchill Scholarship for study at Cambridge, 2010–2011. William Lowell Putnam Competition, 10 th Place, 2009. COMAP Math Contest in Modeling, Outstanding Winner, SIAM Prize, 2008 and 2009. Intel Science Talent Search, 2 nd Place, 2006. International Mathematical Olympiad, Silver Medal, 2006. Asian Pacific Mathematics Olympiad, Gold Medal, 2005. International Physics Olympiad, Gold Medal, 2004.
MATHEMATICS RESEARCH	12. <i>Affine Macdonald conjectures and special values of Felder-Varchenko functions</i> (with E. Rains and A. Varchenko), preprint, 2016. arXiv:1610.01917 11. <i>Laquerre and Jacobi analogues of the Warren process</i> (single author), preprint, 2016. arXiv:1610.01635 10. <i>Traces of intertwiners for quantum affine algebras and difference equations (after Etingof-Schiffmann-Varchenko)</i> (single author), submitted, 2016. arXiv:1609.09038 9. <i>Matrix models for multilevel Heckman-Opdam and multivariate Bessel measures</i> (single author), submitted, 2016. arXiv:1609.09096 8. <i>Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions</i> (single author), Communications in Mathematical Physics 347 (2016), 573–653. arXiv:1508.03918 7. <i>The polynomial representation of the type A_{n-1} rational Cherednik algebra in characteristic $p \mid n$</i> (with S. Devadas), Communications in Algebra (2016). arXiv:1505.07891 6. <i>A representation-theoretic proof of the branching rule for Macdonald polynomials</i> (single author), Mathematical Research Letters 23 (2016), 887–927. Extended abstract in FPSAC 2015. arXiv:1412.0714 5. <i>A new integral formula for Heckman-Opdam hypergeometric functions</i> (single author), Advances in Mathematics 289 (2016), 1157–1204. arXiv:1406.3772 4. <i>Finite dimensional representations of the rational Cherednik algebra for G_4</i> (single author), Journal of Algebra 323 (2010), 2864–2887. arXiv:0910.5527

OTHER RESEARCH	3. <i>From random walks to distances on unweighted graphs</i> (with T. Hashimoto and T. Jaakkola), NIPS 2015. arXiv:1511.00573	
	2. <i>Metric recovery from directed unweighted graphs</i> (with T. Hashimoto and T. Jaakkola), NIPS 2014 workshop (Best Student Paper), AISTATS 2015. arXiv:1411.5720	
	1. <i>Axiomatic attribution for multilinear functions</i> (with M. Sundararajan), ACM Conf. on Electronic Commerce 2011. arXiv:1102.0989	
RESEARCH PRESENTATIONS	21. Columbia: Probability Seminar Laguerre and Jacobi analogues of the Warren process	November 2016
	20. Columbia: Mathematical Physics Seminar Affine Macdonald conjectures and special values of Felder-Varchenko functions	October 2016
	19. IESC: QIS's, CFT's, and Stochastic Processes (poster) Laguerre and Jacobi analogues of the Warren process	September 2016
	18. MIT: Infinite-Dimensional Algebra Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	March 2016
	17. MIT: Integrable Probability Seminar Laguerre and Jacobi analogues of the Warren process	February 2016
	16. HCM: Asymptotic Analysis in Strongly Coupled Systems (poster) Laguerre and Jacobi analogues of the Warren process	January 2016
	15. NIPS 2015 (poster) From random walks to distances on unweighted graphs	December 2015
	14. ETH Zurich: ITS Talks in Theoretical Sciences 2015 Random matrices and representation theory	November 2015
	13. UC Berkeley: RTGC Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	November 2015
	12. ETH Zurich: Mathematical Physics Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	October 2015
	11. NEU: Geometry, Physics and Representation Theory Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	October 2015
	10. Columbia: Mathematical Physics Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	October 2015
	9. Yale: Geometry, Symmetry, and Physics Seminar Traces of intertwiners for quantum affine \mathfrak{sl}_2 and Felder-Varchenko functions	September 2015
	8. FPSAC 2015 (poster) A representation-theoretic proof of the branching rule for Macdonald polynomials	July 2015
	7. Clay Math Inst.: Random Polymers and Algebraic Combinatorics A representation-theoretic proof of the branching rule for Macdonald polynomials	May 2015
	6. AISTATS 2015 (poster) Metric recovery from directed unweighted graphs	May 2015
	5. ICERM: Workshop on Limit Shapes (poster) A representation-theoretic proof of the branching rule for Macdonald polynomials	April 2015
	4. NIPS 2014: Workshop on Networks (poster) Metric recovery from directed unweighted graphs	December 2014
	3. UC Berkeley: GRASP Seminar A representation-theoretic proof of the branching rule for Macdonald polynomials	November 2014
	2. IHP: Workshop on Macdonald Processes and Hecke Algebras A new integral formula for Heckman-Opdam hypergeometric functions	May 2014

OUTREACH PRESENTATIONS	1. MIT: Integrable Probability Seminar A new integral formula for Heckman-Opdam hypergeometric functions	April 2014
	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
OTHER PUBLICATIONS	1. Math Olympiad Summer Program 2012 Random partitions and Fock space	June 2012
	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	MIT MathROOTS	Summers 2015–2016
	Academic Coordinator. Design curriculum, give lectures, and manage academic team, guest lectures, website, and sponsorships for first two years of outreach program teaching problem solving to underrepresented minority students. Program received media coverage on MIT homepage and in Notices of the AMS.	
	US National Math Olympiad Summer Program	Summers 2007–2016
	Instructor (2010, 2012–2016); Assistant (2007–2009). Design curriculum, give lectures, and personally coach US team to International Mathematical Olympiad.	
	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
PROFESSIONAL ACTIVITIES	Mentor reading project on representation theory of the symmetric group.	
	Harvard University	Spring 2009
	Course Assistant for Probability Theory. Evaluations: 4.3 (5.0)	
	Columbia Probability Seminar	Fall 2016–Present

Co-organize weekly probability seminar.

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

LANGUAGES Mandarin (native), French (conversational)

COMPUTER Sage, Magma, Mathematica, L^AT_EX, C++, Python

REFERENCES **Pavel Etingof (advisor)**, Professor, Massachusetts Institute of Technology, etingof@math.mit.edu.

Alexei Borodin, Professor, Massachusetts Institute of Technology, borodin@math.mit.edu.

Vadim Gorin, Assistant Professor, Massachusetts Institute of Technology, vadicgor@math.mit.edu.

Eric Rains, Professor, California Institute of Technology, rains@caltech.edu.

Valerio Toledano-Laredo, Professor, Northeastern University, V.ToledanoLaredo@neu.edu.

Po-Shen Loh (teaching), Associate Professor, Carnegie Mellon University, ploh@cmu.edu.