

# Yi Sun

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- CONTACT INFORMATION** Address: Department of Mathematics, Columbia University, New York, NY 10027.  
Email: [yisun@math.columbia.edu](mailto:yisun@math.columbia.edu)  
Webpage: [yisun.io](http://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, *magna cum laude*, with secondary field in Economics (2006–2010).  
Phi Beta Kappa (one of 24 juniors inducted)
- GRANTS FELLOWSHIPS AND AWARDS** NSF Grant DMS-1701654, Algebra and Number Theory, 2017–2020.  
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<sup>th</sup> Place, 2009.  
COMAP Math Contest in Modeling, Outstanding Winner, SIAM Prize, 2008 and 2009.  
Intel Science Talent Search, 2<sup>nd</sup> Place, 2006.  
International Mathematical Olympiad, Silver Medal, 2006.  
Asian Pacific Mathematics Olympiad, Gold Medal, 2005.  
International Physics Olympiad, Gold Medal, 2004.
- MATHEMATICS RESEARCH** 12. *Affine Macdonald conjectures and special values of Felder-Varchenko functions* (with E. Rains and A. Varchenko), *Selecta Mathematica* (N.S.), to appear. [arXiv:1610.01917](https://arxiv.org/abs/1610.01917)  
11. *Laquerre and Jacobi analogues of the Warren process* (single author), preprint, 2016. [arXiv:1610.01635](https://arxiv.org/abs/1610.01635)  
10. *Traces of intertwiners for quantum affine algebras and difference equations (after Etingof-Schiffmann-Varchenko)* (single author), *Transformation Groups*, to appear. [arXiv:1609.09038](https://arxiv.org/abs/1609.09038)  
9. *Matrix models for multilevel Heckman-Opdam and multivariate Bessel measures* (single author), submitted, 2016. [arXiv:1609.09096](https://arxiv.org/abs/1609.09096)  
8. *Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions* (single author), *Communications in Mathematical Physics* **347** (2016), 573–653. [arXiv:1508.03918](https://arxiv.org/abs/1508.03918)  
7. *The polynomial representation of the type  $A_{n-1}$  rational Cherednik algebra in characteristic  $p \mid n$*  (with S. Devadas), *Communications in Algebra* **45** (2016), 1926–1934. [arXiv:1505.07891](https://arxiv.org/abs/1505.07891)  
6. *A representation-theoretic proof of the branching rule for Macdonald polynomials* (single author), *Mathematical Research Letters* **23** (2016), 887–927. Extended abstract in FPSAC 2015. [arXiv:1412.0714](https://arxiv.org/abs/1412.0714)  
5. *A new integral formula for Heckman-Opdam hypergeometric functions* (single author),

Advances in Mathematics **289** (2016), 1157–1204. [arXiv:1406.3772](#)

4. *Finite dimensional representations of the rational Cherednik algebra for  $G_4$*  (single author), Journal of Algebra **323** (2010), 2864–2887. [arXiv:0910.5527](#)

OTHER  
RESEARCH

3. *From random walks to distances on unweighted graphs* (with T. Hashimoto and T. Jaakkola), NIPS 2015. [arXiv:1511.00573](#)

2. *Metric recovery from directed unweighted graphs* (with T. Hashimoto and T. Jaakkola), NIPS 2014 workshop (Best Student Paper), AISTATS 2015. [arXiv:1411.5720](#)

1. *Axiomatic attribution for multilinear functions* (with M. Sundararajan), ACM Conf. on Electronic Commerce 2011. [arXiv:1102.0989](#)

RESEARCH  
PRESENTATIONS

33. Rochester: Probability Seminar April 2017

Laguerre and Jacobi analogues of the Warren process

32. Perimeter Institute: Mathematical Physics Seminar April 2017

Affine Macdonald conjectures and special values of Felder-Varchenko functions

31. Rutgers: Lie Group / Quantum Mathematics Seminar April 2017

Affine Macdonald conjectures and special values of Felder-Varchenko functions

30. Columbia-Princeton Probability Day March 2017

Laguerre and Jacobi analogues of the Warren process

29. ESI: Workshop on Elliptic Hypergeometric Functions March 2017

Affine Macdonald conjectures and special values of Felder-Varchenko functions

28. Columbia: Probability Seminar November 2016

Laguerre and Jacobi analogues of the Warren process

27. Columbia: Mathematical Physics Seminar October 2016

Affine Macdonald conjectures and special values of Felder-Varchenko functions

26. IESC: QIS's, CFT's, and Stochastic Processes (poster) September 2016

Laguerre and Jacobi analogues of the Warren process

25. MIT: Infinite-Dimensional Algebra Seminar March 2016

Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions

24. MIT: Integrable Probability Seminar February 2016

Laguerre and Jacobi analogues of the Warren process

23. HCM: Asymptotic Analysis in Strongly Coupled Systems (poster) January 2016

Laguerre and Jacobi analogues of the Warren process

22. NIPS 2015 (poster) December 2015

From random walks to distances on unweighted graphs

21. ETH Zurich: ITS Talks in Theoretical Sciences 2015 November 2015

Random matrices and representation theory

20. UC Berkeley: RTGC Seminar November 2015

Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions

19. ETH Zurich: Mathematical Physics Seminar October 2015

Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions

18. NEU: Geometry, Physics and Representation Theory Seminar October 2015

Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions

17. Columbia: Mathematical Physics Seminar October 2015

Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions

16. Yale: Geometry, Symmetry, and Physics Seminar September 2015

Traces of intertwiners for quantum affine  $\mathfrak{sl}_2$  and Felder-Varchenko functions

15. FPSAC 2015 (poster) July 2015

	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	14. Clay Math Inst.: Random Polymers and Algebraic Combinatorics	May 2015
	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	13. AISTATS 2015 (poster)	May 2015
	Metric recovery from directed unweighted graphs	
	12. ICERM: Workshop on Limit Shapes (poster)	April 2015
	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	11. NIPS 2014: Workshop on Networks (poster)	December 2014
	Metric recovery from directed unweighted graphs	
	10. UC Berkeley: GRASP Seminar	November 2014
	A representation-theoretic proof of the branching rule for Macdonald polynomials	
	9. IHP: Workshop on Macdonald Processes and Hecke Algebras	May 2014
	A new integral formula for Heckman-Opdam hypergeometric functions	
	8. MIT: Integrable Probability Seminar	April 2014
	A new integral formula for Heckman-Opdam hypergeometric functions	
OUTREACH PRESENTATIONS	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 PUBLICATIONS	6. <i>54<sup>th</sup> International Mathematical Olympiad</i> (with J. Berman and Z. Feng), <i>Mathematics Magazine</i> <b>86</b> (2013), 309–313.	
	5. <i>53<sup>rd</sup> International Mathematical Olympiad</i> (with Z. Feng), <i>Mathematics Magazine</i> <b>85</b> (2012), 312–317.	
	4. <i>52<sup>nd</sup> International Mathematical Olympiad</i> (with Z. Feng), <i>Mathematics Magazine</i> <b>84</b> (2011), 316–319.	
	3. <i>51<sup>st</sup> International Mathematical Olympiad</i> (with Z. Feng and P. Loh), <i>Mathematics Magazine</i> <b>83</b> (2010), 320–323.	
	2. <i>A simulation based model of traffic circles</i> (with C. Chang and Z. Fan), <i>The UMAP Journal</i> <b>30</b> (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> <b>29</b> (2008), 303–324.	
TEACHING	<b>US National Math Olympiad Summer Program</b>	Summers 2007–2017
	Instructor (2010, 2012–2017); Assistant (2007–2009). Design curriculum, give lectures, and personally coach US team to International Mathematical Olympiad.	

	<b>MIT MathROOTS</b>	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.	
	<b>MIT Undergraduate Research Opportunities Program</b>	Fall 2012–2015
	Mentor two undergraduate research projects, leading to published research paper.	
	<ul style="list-style-type: none"> <li>• Sheela Devadas (rational Cherednik algebras in char <math>p \leq n</math>), 2014–2015.</li> <li>• Ryan Yoo (characters of rational Cherednik algebras in char <math>p &gt; n</math>), 2012–2014.</li> </ul>	
	<b>Massachusetts Institute of Technology</b>	Spring 2015
	Teaching Assistant for Differential Equations. Evaluations: 6.2 (7.0)	
	<b>MIT Directed Reading Program</b>	January 2011
	Mentor reading project on representation theory of the symmetric group.	
	<b>Harvard University</b>	Spring 2009
	Course Assistant for Probability Theory. Evaluations: 4.3 (5.0)	
PROFESSIONAL ACTIVITIES	<b>Columbia Probability Seminar</b>	Fall 2016–Present
	Co-organize weekly probability seminar.	
	<b>Summer School in Probability</b>	Summer 2017
	Co-organize graduate summer school “Dyson-Schwinger equations, topological expansions, and random matrices” at Columbia.	
	<b>MIT Interacting Particle Systems Learning Seminar</b>	2012–2013
	Organize learning seminar on recent developments in interacting particle systems.	
	<b>Google Research</b>	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 <sup>A</sup> T <sub>E</sub> X, C++, Python	
REFERENCES	<b>Pavel Etingof (advisor)</b> , Professor, Massachusetts Institute of Technology, <a href="mailto:etingof@math.mit.edu">etingof@math.mit.edu</a> .	
	<b>Alexei Borodin</b> , Professor, Massachusetts Institute of Technology, <a href="mailto:borodin@math.mit.edu">borodin@math.mit.edu</a> .	
	<b>Vadim Gorin</b> , Assistant Professor, Massachusetts Institute of Technology, <a href="mailto:vadicgor@math.mit.edu">vadicgor@math.mit.edu</a> .	
	<b>Eric Rains</b> , Professor, California Institute of Technology, <a href="mailto:rains@caltech.edu">rains@caltech.edu</a> .	
	<b>Valerio Toledano-Laredo</b> , Professor, Northeastern University, <a href="mailto:V.ToledanoLaredo@neu.edu">V.ToledanoLaredo@neu.edu</a> .	
	<b>Po-Shen Loh (teaching)</b> , Associate Professor, Carnegie Mellon University, <a href="mailto:ploh@cmu.edu">ploh@cmu.edu</a> .	