Yi Sun

CONTACT INFORMATION	Address:	Department of Mathematics, Columbia University, New York, NY 10027.
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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)

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, 10th Place, 2009.
COMAP Math Contest in Modeling, Outstanding Winner, SIAM Prize, 2008 and 2009.
Intel Science Talent Search, 2nd 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), preprint, 2016. `arXiv:1610.01917`

11. *Laguerre and Jacobi analogues of the Warren process* (single author), preprint, 2016. `arXiv:1610.01635`

10. *Traces of intertwiners for quantum affine algebras and difference equations (after Etingof-Schiffmann-Varchenko)* (single author), submitted, 2016. `arXiv:1609.09038`

9. *Matrix models for multilevel Heckman-Opdam and multivariate Bessel measures* (single author), submitted, 2016. `arXiv: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`

7. *The polynomial representation of the type A_{n-1} rational Cherednik algebra in characteristic $p \mid n$* (with S. Devadas), Communications in Algebra (2016). `arXiv: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`

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	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
	1. MIT: Integrable Probability Seminar A new integral formula for Heckman-Opdam hypergeometric functions	April 2014
OUTREACH PRESENTATIONS	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. 54th *International Mathematical Olympiad* (with J. Berman and Z. Feng), Mathematics Magazine **86** (2013), 309–313.

5. 53nd *International Mathematical Olympiad* (with Z. Feng), Mathematics Magazine **85** (2012), 312–317.

4. 52nd *International Mathematical Olympiad* (with Z. Feng), Mathematics Magazine **84** (2011), 316–319.

3. 51st *International Mathematical Olympiad* (with Z. Feng and P. Loh), Mathematics Magazine **83** (2010), 320–323.

2. *A simulation based model of traffic circles* (with C. Chang and Z. Fan), The UMAP Journal **30** (2009), 225–244.

1. `hsolve`: *A difficulty metric and puzzle generator for Sudoku* (with C. Chang and Z. Fan), The UMAP Journal **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.
- 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　　　　　　　　　　　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, LaTeX, 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`.

Last updated: October 10, 2016.