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, *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), Selecta Mathematica (N.S.), to appear. `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), Transformation Groups, to appear. `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 **45** (2016), 1926-1934. `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

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 A representation-theoretic proof of the branching rule for Macdonald polynomials	May 2015
	13. AISTATS 2015 (poster) Metric recovery from directed unweighted graphs	May 2015
	12. ICERM: Workshop on Limit Shapes (poster) A representation-theoretic proof of the branching rule for Macdonald polynomials	April 2015
	11. NIPS 2014: Workshop on Networks (poster) Metric recovery from directed unweighted graphs	December 2014
	10. UC Berkeley: GRASP Seminar A representation-theoretic proof of the branching rule for Macdonald polynomials	November 2014
	9. IHP: Workshop on Macdonald Processes and Hecke Algebras A new integral formula for Heckman-Opdam hypergeometric functions	May 2014
	8. MIT: Integrable Probability Seminar A new integral formula for Heckman-Opdam hypergeometric functions	April 2014

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.

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

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: April 14, 2017.