Yi Sun

Contact Information

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Research Interests

Representation theory, integrable systems, and applications to probability theory and random matrices.

Education

Massachusetts Institute of Technology Cambridge, MA
Ph.D. (expected), 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

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

10. *Laguerre and Jacobi analogues of the Warren process* (single author), in preparation, 2015.
9. *Matrix models for multilevel Heckman-Opdam and multivariate Bessel measures* (single author), preprint, 2015. yisun.mit.edu/papers/20150909-multilevel.pdf
8. *Traces of intertwiners for quantum affine $\mathfrak{sl}_2$ and Felder-Varchenko functions* (single author), Communications in Mathematical Physics, to appear. arXiv:1508.03918
7. *The polynomial representation of the type A_{n-1} rational Cherednik algebra in characteristic $p \mid n$* (with S. Devadas), submitted, 2015. arXiv:1505.07891
6. *A representation-theoretic proof of the branching rule for Macdonald polynomials* (single author), Mathematical Research Letters, to appear. 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

16. HCM: Asymptotic Analysis in Strongly Coupled Systems (poster) January 2016
Laguerre and Jacobi analogues of the Warren process
15. NIPS 2015 (poster) December 2015

From random walks to distances on unweighted graphs

14. ETH Zurich: ITS Talks in Theoretical Sciences 2015 — November 2015
Random matrices and representation theory

13. UC Berkeley: RTGC Seminar — November 2015
Traces of intertwiners for quantum affine $\mathfrak{sl}_2$ and Felder-Varchenko functions

12. ETH Zurich: Mathematical Physics Seminar — October 2015
Traces of intertwiners for quantum affine $\mathfrak{sl}_2$ and Felder-Varchenko functions

11. NEU: Geometry, Physics and Representation Theory Seminar — October 2015
Traces of intertwiners for quantum affine $\mathfrak{sl}_2$ and Felder-Varchenko functions

10. Columbia: Mathematical Physics Seminar — October 2015
Traces of intertwiners for quantum affine $\mathfrak{sl}_2$ and Felder-Varchenko functions

9. Yale: Geometry, Symmetry, and Physics Seminar — September 2015
Traces of intertwiners for quantum affine $\mathfrak{sl}_2$ and Felder-Varchenko functions

8. FPSAC 2015 (poster) — July 2015
A representation-theoretic proof of the branching rule for Macdonald polynomials

7. Clay Math Inst.: Random Polymers and Algebraic Combinatorics — May 2015
A representation-theoretic proof of the branching rule for Macdonald polynomials

6. AISTATS 2015 (poster) — May 2015
Metric recovery from directed unweighted graphs

5. ICERM: Workshop on Limit Shapes (poster) — April 2015
A representation-theoretic proof of the branching rule for Macdonald polynomials

4. NIPS 2014: Workshop on Networks (poster) — December 2014
Metric recovery from directed unweighted graphs

3. UC Berkeley: GRASP Seminar — November 2014
A representation-theoretic proof of the branching rule for Macdonald polynomials

2. IHP: Workshop on Macdonald Processes and Hecke Algebras — May 2014
A new integral formula for Heckman-Opdam hypergeometric functions

1. MIT: Integrable Probability Seminar — April 2014
A new integral formula for Heckman-Opdam hypergeometric functions

Other Publications

6. 54^{th} *International Mathematical Olympiad* (with J. Berman and Z. Feng), Mathematics Magazine **86** (2013), 309–313.

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

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

3. 51^{st} *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 — Summer 2015
Academic Coordinator. Design curriculum, give lectures, and manage academic team for first year 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 2007–2015

Instructor (2010, 2012–2015); 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 research paper in submission.

- 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

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

Expository Talks

11. MIT Integrable Probability Reading Seminar — March 2015
    Random matrices and sample covariance matrices.
10. MIT-NEU Graduate Representation Theory Seminar — February 2015
    Introduction to rational Cherednik algebras.
9. MIT-NEU Graduate Representation Theory Seminar — October 2014
    Schur-Weyl duality for affine Hecke algebras.
8. MIT Integrable Probability Reading Seminar — September 2014
    Whittaker functions and directed polymer models.
7. UT Austin: Workshop on Yangians and Quantum Loop Algebras — May 2014
    The trigonometric Casimir connection.
6. MIT-NEU Graduate Representation Theory Seminar — February 2014
    Quantum Hamiltonian reduction.
5. MIT-NEU Graduate Representation Theory Seminar — September 2013
    Grothendieck's simultaneous resolution and the Springer correspondence.
4. MIT Interacting Particle Systems Learning Seminar — March 2013
    Whittaker processes.
3. MIT Interacting Particle Systems Learning Seminar — February 2013
    Macdonald measures and processes.
2. MIT Interacting Particle Systems Learning Seminar — November 2012
    Bethe ansatz for ASEP.
1. MIT Interacting Particle Systems Learning Seminar — October 2012
    TASEP with step initial conditions.

Conferences Attended

16. HCM: Asymptotic Analysis in Strongly Coupled Systems — January 2016
15. NIPS 2015 — December 2015
14. FPSAC 2015 — July 2015
13. CMI: Random Polymers and Algebraic Combinatorics — May 2015
12. NEU: Rep. Theory and Geometry of Symplectic Resolutions — May 2015
11. IU Bloomington: Seymour Sherman Lectures on Probability — May 2015

10.	AISTATS 2015	May 2015
9.	ICERM: Workshop on Limit Shapes	April 2015
8.	NIPS 2014	December 2014
7.	IMA: Modern Applications of Representation Theory	August 2014
6.	IHP: Workshop on Macdonald Processes and Hecke Algebras	May 2014
5.	UT Austin: Yangians and Quantum Loop Algebras	May 2014
4.	Independent University of Moscow: Feigin 60	December 2013
3.	NEU: Zelevinsky Memorial Conference	April 2013
2.	NEU: Geometry of Derived Categories and Representation Theory	May 2012
1.	Yale: Frenkel 60	May 2012

LANGUAGES Mandarin (native), French (conversational)

COMPUTER Sage, Magma, Mathematica, LaTeX, C++, Python

Last updated: December 23, 2015.