

Jimmy He

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Current position

2021-2024 **C.L.E. Moore Instructor**, MIT, Cambridge, MA.

Education

2016-2021 **PhD in Mathematics**, *Stanford University*, Stanford, CA.

Advisor: Persi Diaconis

2011-2016 **Bachelor of Mathematics**, *University of Waterloo*, Waterloo, ON.

Major: Pure Mathematics and Statistics

Research interests

Probability and algebraic combinatorics: integrable probability, random walks, permutation statistics, representation theory

Preprints

2023 J. He, M. Wheeler, **Periodic q -Whittaker and Hall–Littlewood processes**, 36 pp., preprint. arXiv:2310.03527

J. He, D. Schmid, **Limit profile for the ASEP with one open boundary**, 15 pp., submitted. arXiv:2307.14941

2022 J. He, **Shift invariance of integrable half space models**, 64 pp., submitted. arXiv:2205.13029

Accepted papers

2024 J. He, **Boundary current fluctuations for the half space ASEP and six vertex model**, 60 pp., accepted at *Proc. London Math. Soc.* arXiv:2303.16335

Publications

2023 J. He, A. Ottolini, **Card guessing and the birthday problem for sampling without replacement**, *Ann. Appl. Probab.* 33 (2023), no. 6B, 5208-5232. arXiv:2108.07355

J. He, T. Müller, T. Verstraaten, **Cycles in Mallows random permutations**, *Random Structures Algorithms* 63 (2023), no. 4, 1054-1099. arXiv:2201.11610

J. He, H. T. Pham, M. W. Xu, **Universality for low degree factors of random polynomials over finite fields**, *Int. Math. Res. Not.* 2023, no. 17, 14752-14794. arXiv:2201.06156

- 2022 J. He, H. T. Pham, M. W. Xu, **Mixing time of fractional random walk on finite fields**, *Electron. J. Probab.* 27 (2022), Paper No. 133, 15 pp. arXiv:2102.02781
- J. He, **A central limit theorem for descents of a Mallows permutation and its inverse**, *Ann. Inst. Henri Poincaré Probab. Stat.* 58 (2022), no. 2, 667-694. arXiv:2005.09802
- J. He, **A characteristic map for the symmetric space of symplectic forms over a finite field**, *Int. Math. Res. Not.* 2022, no. 9, 6854-6902. arXiv:1906.05966
- J. He, **Markov chains on finite fields with deterministic jumps**, *Electron. J. Probab.* 27 (2022), Paper No. 28, 17 pp. arXiv:2010.10668
- 2021 P. Diaconis, J. He, I. M. Isaacs, **The-square-and-add Markov chain**, *Math. Intelligencer* 43 (2021), no. 2, 27-36. arXiv:2008.11253
- 2020 J. He, **Random walk on the symplectic forms over a finite field**, *Algebr. Comb.* 3 (2020), no. 5, 1165-1181. arXiv:1910.10823
- 2019 J. He, **A power series identity and Bessel-type integrals over unitary groups**, *J. Math. Phys.* 60 (2019), no. 2, 023506, 11 pp. arXiv:1806.02441
- 2018 K. Hare, J. He, **A geometric proof of the L^2 -singular dichotomy for orbital measures on Lie algebras and groups**, *Boll. Un. Mat. Italian* 11 (2018), no. 4, 573-580. arXiv:1611.09105
- 2017 K. Hare, J. He, **The absolute continuity of convolution products of orbital measures in exceptional symmetric spaces**, *Monatsh. fur Math.* 182 (2017), no. 3, 619-635. arXiv:1511.05799
- 2016 K. Hare, J. He, **Smoothness of convolution products of orbital measures on rank one compact symmetric spaces**, *Bull. Aust. Math. Soc.* 94 (2016), no. 1, 131-143. arXiv:1510.06259

Conference proceedings

- 2019 J. He, **A characteristic map for the symmetric space of symplectic forms over a finite field**, (extended abstract of "A characteristic map for the symmetric space of symplectic forms over a finite field"), *Sém. Lothar. Combin.* 84B (2020), Art. 5, 12 pp.

Invited seminar talks

- 2023 Duke University, Probability Seminar
 Tokyo Probability Seminar
 Harvard CMSA, Probability Seminar
 NYU Courant Institute, Probability and Mathematical Physics Seminar
 University of Chicago, Probability and Statistical Physics Seminar
- 2022 University of Groningen, Probability and Statistics Seminar (online)
 McMaster University, Statistics Seminar
 Columbia, Integrable Probability Seminar
 University of Maryland, Probability Seminar
 Brown, Probability Seminar

- Princeton, Probability Seminar
- MIT, Integrable Probability Seminar
- Columbia, Applied Probability Seminar
- Bilkent University, Analysis Seminar (online)
- 2021 MIT-Harvard-MSR Combinatorics Seminar
- Cornell, Probability Seminar
- MIT, Probability Seminar
- Webinar in Additive Combinatorics (online)
- Integrable Probability and Related Fields from a Safe Distance (online)
- University of Southern California, Probability Seminar (online)
- University of British Columbia, Probability Seminar (online)
- 2020 Junior Integrable Probability Seminar (online)
- Stanford, Probability Seminar (online)
- UC Berkeley, Probability Seminar
- 2016 University of Waterloo, Analysis Seminar

Invited conference talks

- 2024 AMS-AWM Special Session on Solvable Lattice Models and their Applications Associated with the Noether Lecture, Joint Math Meetings, San Francisco
- 2023 Workshop on "The Asymmetric Simple Exclusion Process", Simons Center for Geometry and Physics
- Conference on New Developments in Lie Superalgebras and Quantum Groups, University of Ottawa
- Invited Session on "Mixing Times, Cutoff and Limit Profiles", 43rd Conference on Stochastic Processes and their Applications, Lisbon
- Simons Symposium on "Solvable Lattice Models and Interacting Particle Systems", Schloss Elmau

Other research presentations

- 2020 Bernoulli-IMS One World Symposium (online)
- Formal Power Series and Algebraic Combinatorics (online, poster)

Awards

- 2023-2025 AMS-Simons Travel Grant
- 2021 US Junior Oberwolfach Fellow
- 2017-2020 NSERC Post-Graduate Scholarship
- 2016 Jessie W. H. Zou Memorial Award for Excellence in Undergraduate Research

Teaching Experience

- 2021-Now **Instructor**, MIT, Cambridge, MA.
- 18.204, Undergraduate Seminar in Discrete Mathematics (Fall 2021, Fall 2022, Spring 2024)
- 18.615, Introduction to Stochastic Processes (Spring 2022, Spring 2023, Fall 2023)

2016-2021 **Teaching Assistant**, *Stanford University*, Stanford, CA.
 Math 19, Calculus (Winter 2021)
 Math 51, Linear Algebra, Multivariable Calculus, and Modern Applications (Winter 2019, Summer 2020, Fall 2020)
 Math 108, Introduction to Combinatorics and its Applications (Winter 2018)
 Math 122, Modules and Group Representations (Spring 2021)
 Math 136, Stochastic Processes (Winter 2020)
 Math 158, Basic Probability and Stochastic Processes with Engineering Applications (Spring 2017)
 Math 159, Discrete Probabilistic Methods (Fall 2016)
 Math 382, Qualifying Examination Seminar (Summer 2019)

Mentorship Experience

2022-2023 **Undergraduate research**, *MIT*.
 Howard Beck–Markov chain mixing (UROP, Jun-Dec 2023)
 Unubold Munkhbat–Markov chain mixing (UROP, Mar 2023-present)
 Bhavya Agrawalla–Half space TASEP (jointly with Promit Ghosal, Jan 2023-Jun 2023)
 Maxwell Sun–Mallows permutations (UROP, Sept 2022-May 2022)
 Esha Bhatia–Mallows permutations (UROP, Sept-Dec 2022)

2023 **Directed reading program**, *MIT*.
 Mentored two students on reading in algebraic graph theory.

2022 **PRIMES Mentor**, *MIT*.
 Mentored 2 high school students on reading on the probabilistic method.

2017-2021 **Directed Reading Program**, *Stanford University*.
 Mentored 8 undergraduates in various reading projects.

Service

2022-Now Co-organizer of Integrable Probability Seminar (MIT)

2021-Now Co-organizer of Probability Seminar (MIT)

2018 Organizer of Faculty Area Research Seminar (Stanford)

Qualifying exam committee member for: Joel Been (MIT, 2024), Dain Kim (MIT, 2024)

Referee for: Adv. in Appl. Probab./J. Appl. Probab.
 Ann. Inst. Henri Poincaré D
 Ann. Probab.
 Bernoulli
 Combin. Probab. Comput.
 Comm. Math. Phys.
 Electron. Commun. Probab.
 Electron. J. Combin.
 Electron. J. Probab.
 European J. Combin.
 Probab. Theory Related Fields

2021-Now MathSciNet reviewer

Work Experience

- 2014 **Actuarial Intern**, *Ernst & Young*, New York, NY.
- 2014 **Actuarial Analyst**, *Munich Re*, Toronto, ON.
- 2013 **Actuarial Intern**, *Manulife Financial*, Toronto, ON.
- 2012 **Quantitative Analyst**, *Manulife Financial*, Toronto, ON.