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# Jimmy He

## 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

J. He, **Boundary current fluctuations for the half space ASEP and six vertex model**, 60 pp., submitted. arXiv:2303.16335

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

## Accepted papers

2023 J. He, T. Müller, T. Verstraaten, **Cycles in Mallows random permutations**, accepted to *Random Structures Algorithms*, 42 pp. arXiv:2201.11610

J. He, A. Ottolini, **Card guessing and the birthday problem for sampling without replacement**, accepted to *Ann. Appl. Probab.*, 28 pp. arXiv:2108.07355

## Publications

2023 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 2023-present)
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)

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.