Jacob Richey

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I am a postdoctoral fellow at the Rényi Institute in Budapest. My research field is combinatorial probability and statistics, including current projects related to: stochastic particle systems, probabilistic aspects of dynamical systems, data science and mixing times for Markov chains.

Employment

- (2023-) Postdoctoral fellow, Alfréd Rényi Institute of Mathematics (Budapest, Hungary).
  Faculty advisors: Gábor Pete, Balázs Ráth
- (2020-2023) Postdoctoral fellow, University of British Columbia (Vancouver, Canada).
  Faculty advisors: Omer Angel, Gordon Slade.

Education

- (2014-2020) PhD Mathematics, University of Washington.
  Advisor: Christopher Hoffman
- (2010-2014) B.A. Mathematics and Chinese Language, Dartmouth College.
  Mathematics honors thesis: *Counting clusters on a grid*, advised by Peter Winkler

Papers

Published

1. *Shifts of Finite Type Obtained by Forbidding a Single Pattern*. Nishant Chandgotia, Brian Marcus, Jacob Richey, Chengyu Wu. Discrete and Continuous Dynamical Systems. Volume 48: 538-576 (2026). doi: 10.3934/dcds.2025152. arXiv:2409.09024.
2. *Diffusion-limited annihilating-coalescing systems*. Sungwon Ahn, Matt Junge, Hanbaek Lyu, Lily Reeves, Jacob Richey, David Sivakoff. Electron. J. Probab. 30: 1-20 (2025). doi: 10.1214/25-EJP1286. arXiv:2305.19333
3. *Random walks on regular trees cannot be slowed down*. Omer Angel, Jacob Richey, Yinon Spinka, Amir Yehudayoff. Electron. J. Probab. 29: 1-15 (2024). doi: 10.1214/24-EJP1109. arXiv:2302.00760
4. *Active phase for activated random walk on $\mathbb{Z}$*. Chris Hoffman, Jacob Richey, Leonardo Rolla. Commun. Math. Phys. 399: 717–735 (2023). doi: 10.1007/s00220-022-04572-x. arXiv:2009.09491
5. *Intersections of random sets.* Jacob Richey, Amites Sarkar. Journal of Applied Probability. 59(1):131-151 (2022). doi:10.1017/jpr.2021.34. arXiv:2006.01323
6. *Rumor source detection with multiple observations under adaptive diffusion protocols.* Miklos Z. Racz, Jacob Richey. IEEE Transactions on Network Science and Engineering, 8(1): 2-12 (2021). doi: 10.1109/TNSE.2020.3022621. Extended version: arXiv:2006.11211
7. *Activated random walk on a cycle*. Riddhipratim Basu, Shirshendu Ganguly, Chris Hoffman, Jacob Richey. Ann. Inst. H. Poincaré Probab. Statist. 55(3): 1258-1277 (2019). doi: 10.1214/18-AIHP918. arXiv:1709.09163

8. *A smooth transition from Wishart to GOE*. Miklos Racz, Jacob Richey. J Theor Probab 32: 898–906 (2019). doi: 10.1007/s10959-018-0808-2. arXiv:1611.05838

Accepted

9. *Word length, bias, and bijections in Penney's ante*. Matthew Drexel*, Peter Peng*, and Jacob Richey. *Undergraduate. arXiv: 2409.19195. Accepted July 2025 in the Electronic Journal of Combinatorics. 20 pages.

Submitted

10. *Active phase for the Stochastic Sandpile on $\mathbb{Z}$*. Chris Hoffman, Yiping Hu, Jacob Richey, Douglas Rizzolo. arXiv:2212.08293 (2022). Submitted to Communications on Pure and Applied Mathematics. 44 pages.

11. *The odometer in subcritical activated random walk*. Tobias Johnson, Jacob Richey. arXiv:2510.05514 (2025). Submitted to Ann. Inst. H. Poincaré Probab. Statist. 11 pages.

University Teaching

- (Spring 2025) Taught a graduate level probability topics course at BME (Budapst University of Technology and Economics), titled *A random walk in a random park*. Topics: random walks, Bernoulli percolation, and first passage percolation in $\mathbb{Z}^d$. Class size: 15. Students presented research papers for credit.
- (2020-2023) Lead instructor for courses in probability and calculus at the University of British Columbia. Class sizes ranged from 80 to 120. I was often in charge of one or two TAs/graders.
  - MATH 302, Introduction to Probability. Quarters taught: Su23, W22, Su21
  - MATH 102, Differential Calculus with Applications to Life Sciences. W21.
  - MATH 303, Introduction to Stochastic Processes. W20.
- (2016-2020) Lead instructor for undergraduate courses in advanced multivariable calculus and linear algebra at the University of Washington. Class sizes ranged from 30 to 50.
  - MATH 308, Matrix Algebra with Applications. Quarters taught: W20, Sp18.
  - MATH 324, Advanced Multivariable Calculus I. F19, Sp19, F18, W18, F17, Su17, Sp17, W17, Su16.
- (2014-2016) Teaching assistant for courses in precalculus and calculus at the University of Washington. Led homework sections, usually two groups of 50 students, and helped with exam grading.
  - MATH 120, Precalculus. Quarters taught: F16, Sp16, F15.
  - MATH 111, Algebra with Applications. W15.
  - MATH 112, Application of Calculus to Business and Economics. Sp15.
  - MATH 125, Calculus with Analytic Geometry II. Su15, F14.

Advising & Mentorship

- (2025-) Currently advising a Masters student, Miklós Salánki, in a research project related to activated random walk, at the Budapest University of Technology and Economics. We plan to submit our work to TDK, a national Hungarian science competition.
- (2021-2023) Undergraduate Research Opportunities REX at UBC. Mentor for year-long undergraduate research projects (three students each) in '21-22 and '22-23, culminating in a poster session. One project recently led to a submitted publication. Topics: street light percolation, coin bias in Penney's ante.
- (2015-2020) Washington Experimental Mathematics Lab (WXML). Co-led two undergraduate research projects, usually 3 or 4 students, over the course of a year or more, culminating in a poster presentation. Topics: statistics for random walks, randomness of the discrete logarithm.

- (Summer, 2015) University of Washington Inverse Problems REU. Gave a lecture at the REU colloquium, and advised an undergraduate student research project that resulted in a publication (link). Topic: counting clusters in Bernoulli percolation on lattices.

Other Teaching & Outreach

- (Spring, 2024) Taught a two-month-long minicourse on topics in large deviations at the Rényi Institute for graduate students, postdocs and faculty.
- (September 2022) Volunteer at STEM Britannia science event for youth. Vancouver, BC.
- (2016-2021) Ran the advanced course at UW Math Circle, an NSF-supported math outreach program for advanced middle and high school students. Designed, tested, and taught new interactive lessons and activities in game theory, group theory, geometry, probability, and number theory.
- (Summer, 2015) Junior staff at Hampshire College Summer Studies in Mathematics. Led problem sessions, wrote and graded problem sets, taught a mini-course, and gave a 'prime time' lecture. (Six days a week, 8 hours a day for 2 months.)
- (2012-2014) Private tutor for students in mathematics courses at Dartmouth College.

Organizing & Service

- (May 2025) Organizer, Focused Workshop on Activated Random Walk at the Erdős Center (link). Led a week-long research workshop on Activated Random Walk (11 participants, 7 international visitors).
- (2022) Co-organizer, PIMS Probability Summer School. Coordinator for invited speakers.
- (2021-2023) Organizer, UBC probability seminar. Selected and coordinated speaker visits (some zoom), and maintained the seminar website (link) and youtube page.
- Peer reviewer for: *Proceedings of the AMS*, *Journal of the London Mathematical Society*, *Electronic Journal of Probability*, *Stochastic Models*, *Information and Computation*
- (2023-) Reviewer for MR reviews (10 articles total)

Invited Talks

- *Hitting times and entropy for shifts of finite type* (slides)
  - Random Structures and Algorithms '25 (Vienna, Austria)
  - University of Illinois, Chicago discrete math seminar, November '24
  - University of Chicago probability seminar, November '24
  - Los Angeles probability forum, October '24
  - Kutszem research seminar '24 (Rényi Institute, Budapest)
  - Rutgers combinatorics seminar '23
  - PIMS dynamics seminar '23 (UBC, Vancouver, Canada)
- *Finding the source of a random diffusion.* (slides)
  - Cornell probability seminar '23
  - CUNY probability seminar '23
  - Dartmouth colloquium '21
  - University of Victoria probability seminar '21

- *Phase transition for activated random walk and the stochastic sandpile* (slides)
  - University of Indiana, Bloomington probability seminar, November '24
  - Purdue probability seminar, November '24
  - Ohio State University probability seminar, November '24
  - University of Wisconsin Madison probability seminar, October '24
  - Kutszem research seminar '23 (Rényi Institute, Budapest)
  - University of Delaware probability seminar '23
  - Cornell probability seminar '20
  - Random Structures and Algorithms '23 (Carnegie Mellon, Pittsburgh)
  - CRM Workshop '22 (Montreal)
  - AMS Special Session on Stochastic Spatial Models, JMM '20 (Denver)
- *Rumor source detection with multiple observations under adaptive diffusion protocols* (slides)
  - SIAM Workshop on Network Science '18 (Portland, OR)
  - Dynasnet Workshop '23 (Lednice, Czech Republic)
- *Phase transition for parking with coalescence*
  - Northwest Probability Seminar '22.

Selected Conferences & Visits

- Attended and presented a talk
  - Random Structures and Algorithms, July 2025 (Vienna, Austria), and June 2023 (Pittsburgh, PA)
  - Northwest Probability Seminar, October 2022. Seattle, WA
  - CRM Workshop on Interacting Particle Systems and Hydrodynamic Limits, March 2022. Montreal, Canada
  - JMM 2020. Denver, CO
- Attended
  - Saint-Flour Probability Summer School, July 2024. Saint-Flour, France
  - Permutations and Probability (BIRS), September 2021. Banff, Canada
  - AMS MRC on Stochastic Spatial Models, Summer 2019. Providence, RI
  - Virginia Integrable Probability Summer School 2019. UVA, Charlottesville, VA
  - Visitor at NYU Shanghai for two weeks in May 2019. Sponsor: Leonardo Rolla. Shanghai, China
  - Northwestern Probability Summer School, 2018. Northwestern University, Evanston, IL
  - Recent trends in Continuous and Discrete Probability, 2018. Georgia Tech, Atlanta, GA

Awards

- Gerald B. Folland Fellowship (2019) – Graduate student award for research excellence. (Amount: $1000)

Other

- US citizen, resident of New York City
- Languages: English, Mandarin Chinese (conversational), Spanish (intermediate)
- Programming languages: Python, Mathematica, Matlab, LaTeX

Last updated: October 21, 2025