

Justin Ko

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Research	High-dimensional probability, spin glasses, random matrices.	
Employment	Syracuse University	2025 -
	<ul style="list-style-type: none">• Assistant Professor• Department: Mathematics• Research Groups: Probability and Statistics	
	University of Waterloo	2023 - 2025
	<ul style="list-style-type: none">• Postdoctoral Researcher• Supervisor: Aukosh Jagannath	
	École Normale Supérieure de Lyon	2020 - 2023
	<ul style="list-style-type: none">• Postdoctoral Researcher• Supervisors: Alice Guionnet, Florent Krzakala, and Lenka Zdeborová	
Education	University of Toronto	2015 - 2020
	<ul style="list-style-type: none">• PhD Mathematics• Thesis: The Free Energy of Spherical Vector Spin Glasses• Advisor: Dmitry Panchenko	
	University of Toronto	2014 - 2015
	<ul style="list-style-type: none">• MSc Mathematics• Research Project: Diluted spin glass models	
	University of British Columbia	2009 - 2014
	<ul style="list-style-type: none">• Bachelor of Commerce, Finance Co-op, Minor Mathematics	
Papers	<ol style="list-style-type: none">1. Dynamical mean-field analysis of adaptive Langevin diffusions: Replica-symmetric fixed point and empirical Bayes (with Zhou Fan, Bruno Loureiro, Yue M. Lu and Yandi Shen) arXiv:2504.15558 (2025)2. Dynamical mean-field analysis of adaptive Langevin diffusions: Propagation-of-chaos and convergence of the linear response (with Zhou Fan, Bruno Loureiro, Yue M. Lu and Yandi Shen) arXiv:2504.15556 (2025)3. Pseudo-Maximum Likelihood Theory for High-Dimension Rank One Inference (with Curtis Grant and Aukosh Jagannath) arXiv:2503.01708 (2024) <i>Submitted</i>4. On the phase diagram of extensive-rank symmetric matrix denoising beyond rotational invariance (with Jean Barbier, Francesco Camilli, Koki Okajima) Phys. Rev. X. 2025, Vol 15, 0210855. A multiscale cavity method for sublinear-rank symmetric matrix factorization. (with Jean Barbier and Anas Rahman) <i>International Zurich Seminar on Information and Communication (IZS 2024)</i>	

6. Fundamental limits of Non-Linear Low-Rank Matrix Estimation. (with Florent Krzakala, Pierre Mergny and Lenka Zdeborová)
Proceedings of Thirty Seventh Conference on Learning Theory (COLT 2024), PMLR 247:3873-3873
7. Spectral Phase Transition and Optimal PCA in Block-Structured Spiked models. (with Florent Krzakala and Pierre Mergny)
Proceedings of the 41st International Conference on Machine Learning (ICML 2024), PMLR 235:35470-35491
8. Spectral Phase Transitions in Non-Linear Wigner Spiked Models. (with Alice Guionnet, Florent Krzakala, Pierre Mergny and Lenka Zdeborová)
arXiv:2310.14055 (2023) *Submitted*.
9. Estimating rank-one matrices with mismatched prior and noise: universality and large deviations. (with Alice Guionnet, Florent Krzakala and Lenka Zdeborová),
Commun. Math. Phys. 406, 9 (2025)
10. TAP variational principle for the constrained multiple spherical SK model. (with David Belius and Leon Fröber)
arXiv:2304.04031 (2023) *Submitted. Major Revisions at the Annals of Applied Probability*
11. Optimal Algorithms for the Inhomogeneous Spiked Wigner Model (with Florent Krzakala and Aleksandr Pak)
Advances in Neural Information Processing Systems 36 (NeurIPS 2023)
12. Low-rank Matrix Estimation with Inhomogeneous Noise (with Alice Guionnet, Florent Krzakala and Lenka Zdeborová)
Inf. Inference. 2025, Vol 14, Issue 2, 1 - 80
13. Spherical Integrals of Sublinear Rank (with Jonathan Husson)
Probab. Theory Relat. Fields (2025)
14. The Crisanti–Sommers Formula for Spherical Spin Glasses with Vector Spins,
arXiv:1911.04355 (2019) *Under Revision*.
15. Free Energy of Multiple Systems of Spherical Spin Glasses with Constrained Overlaps,
Electron. J. Probab. 2020, Vol. 25, No. 28, 1-34
16. MAX κ -CUT and the inhomogeneous Potts spin glass (with Aukosh Jagannath and Subhabrata Sen),
Ann. Appl. Probab. 2018, Vol. 28, No. 3, 1536-1572

Invited Talks

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| 1. Log Gasses in Caeli Australi | Aug 2025 |
| 2. INFORMS Applied Probability Society Conference | July 2025 |
| 3. Phase Transitions and Dynamics in Random Media | June 2025 |
| 4. University of Toronto Probability Seminar | Nov 2024 |
| 5. Georgia Tech Stochastic Seminar | Sep 2024 |
| 6. Rockin' AI Conference in Roccella | Sep 2024 |
| 7. Conference on Learning Theory (COLT) 2024 | Jun 2024 |
| 8. CMS Winter Session on Random Matrix Theory | Dec 2023 |
| 9. Northwestern University Probability Seminar | Oct 2023 |
| 10. University of Waterloo Probability Seminar | Oct 2023 |
| 11. Cargese Summer School: Statistical physics and machine learning | Aug 2023 |

12. ICTP Learning and Inference from Structured Data	Jul 2023
13. LN-UMN Joint Probability Seminar	Feb 2023
14. LPSM Probability Seminar	Feb 2023
15. Grenoble-Lyon-Geneva Probability Meeting	Nov 2022
16. Les Diablerets Spin Glass Workshop	Oct 2022
17. St Flour Probability School	Jul 2022
18. ICTP Youth In High Dimensions	Jun 2022
19. University of Toulouse III Probability Seminar	Jun 2021
20. University of Waterloo Probability Seminar	Mar 2021
21. University of Basel Probability Seminar	Mar 2020

Teaching

Course Instructor

• MAT521 - Introduction to Probability	2025
• ACTSC624 - Stochastic Processes for Actuarial Science	2025
• STAT230 - Probability	2024
• APM346 - Partial Differential Equations	2020
• MAT186 - Calculus I	2019
• MAT136 - Calculus I(B)	2019
• MAT186 - Calculus I	2018

Teaching Assistant

• MAT377, MAT1600, APM346	2019 - 2020
• MAT377, APM346	2018 - 2019
• MAT1600, MAT1601, MAT133, MAT223, APM346	2017 - 2018
• MAT457, MAT236, MAT267, MAT244, MAT232, APM346	2016 - 2017
• MAT133, MAT237, MATA35, STAB52, STA256	2015 - 2016
• MAT135, MAT136, MAT133	2014 - 2015

Awards

1. Ida Bulat Teaching Award for Graduate Students, UofT	2020
2. Queen Elizabeth II Graduate Scholarship, UofT	2019 - 2020
3. Scotiabank Scholarship, UBC	2009 - 2013
4. Sauder School of Business Dean's Scholarship, UBC	2010

Conferences & Seminars Organized

1. Waterloo Probability Seminar (Co-organizer)	2023 - 2025
• Waterloo, Canada	
2. High Dimensional Statistics and Random Matrices (Co-organizer)	2023
• Porquerolles, France	
3. Large Deviations and Random Matrices Working Group	2022 - 2023
• Lyon, France	

Industry Experience

Economist (SmartWay Program)

• Natural Resources Canada, Ottawa, On	2013 - 2014
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