

# Justin Ko

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|-------------------|--|-------------|
| <b>Research</b>   | High-dimensional probability, spin glasses, random matrices.   |             |
| <b>Employment</b> | <b>University of Waterloo</b>  | 2023 -      |
|                   | <ul style="list-style-type: none"><li>• Postdoctoral Researcher</li><li>• Supervisor: Aukosh Jagannath</li></ul>   |             |
|                   | <b>École Normale Supérieure de Lyon</b>  | 2020 - 2023 |
|                   | <ul style="list-style-type: none"><li>• Postdoctoral Researcher</li><li>• Supervisors: Alice Guionnet, Florent Krzakala, and Lenka Zdeborová</li></ul>   |             |
| <b>Education</b>  | <b>University of Toronto</b>   | 2015 - 2020 |
|                   | <ul style="list-style-type: none"><li>• PhD Mathematics</li><li>• Thesis: The Free Energy of Spherical Vector Spin Glasses</li><li>• Advisor: Dmitry Panchenko</li></ul>   |             |
|                   | <b>University of Toronto</b>   | 2014 - 2015 |
|                   | <ul style="list-style-type: none"><li>• MSc Mathematics</li><li>• Research Project: Diluted spin glass models</li></ul>  |             |
|                   | <b>University of British Columbia</b>  | 2009 - 2014 |
|                   | <ul style="list-style-type: none"><li>• Bachelor of Commerce, Finance Co-op, Minor Mathematics</li></ul>   |             |
| <b>Papers</b>     | <ol style="list-style-type: none"><li>1. On the phase diagram of extensive-rank symmetric matrix denoising beyond rotational invariance (with Jean Barbier, Francesco Camilli, Koki Okajima) arXiv:2411.01974 (2024) <i>Submitted</i></li><li>2. 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></li><li>3. Fundamental limits of Non-Linear Low-Rank Matrix Estimation. (with Florent Krzakala, Pierre Mergny and Lenka Zdeborová) <i>Proceedings of Thirty Seventh Conference on Learning Theory (COLT 2024)</i>, PMLR 247:3873-3873</li><li>4. Spectral Phase Transition and Optimal PCA in Block-Structured Spiked models. (with Florent Krzakala and Pierre Mergny) <i>Proceedings of the 41st International Conference on Machine Learning (ICML 2024)</i>, PMLR 235:35470-35491</li><li>5. Spectral Phase Transitions in Non-Linear Wigner Spiked Models. (with Alice Guionnet, Florent Krzakala, Pierre Mergny and Lenka Zdeborová) arXiv:2310.14055 (2023) <i>Submitted</i>.</li><li>6. Estimating rank-one matrices with mismatched prior and noise: universality and large deviations. (with Alice Guionnet, Florent Krzakala and Lenka Zdeborová), <i>Commun. Math. Phys.</i> 406, 9 (2025)</li><li>7. TAP variational principle for the constrained multiple spherical SK model. (with David Belius and Leon Fröber) arXiv:2304.04031 (2023) <i>Submitted. Major Revisions at the Annals of Applied Probability</i></li></ol> |             |

8. Optimal Algorithms for the Inhomogeneous Spiked Wigner Model (with Florent Krzakala and Aleksandr Pak) *Advances in Neural Information Processing Systems 36 (NeurIPS 2023)*
9. Low-rank Matrix Estimation with Inhomogeneous Noise (with Alice Guionnet, Florent Krzakala and Lenka Zdeborová) arXiv:2208.05918 (2022) *Submitted. Major Revisions at Information and Inference*
10. Spherical Integrals of Sublinear Rank (with Jonathan Husson) arXiv:2208.03642 (2022) *Submitted.*
11. The Crisanti–Sommers Formula for Spherical Spin Glasses with Vector Spins, arXiv:1911.04355 (2019) *Under Revision.*
12. Free Energy of Multiple Systems of Spherical Spin Glasses with Constrained Overlaps, *Electron. J. Probab. 2020, Vol. 25, No. 28, 1-34*
13. MAX  $\kappa$ -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. University of Toronto Probability Seminar                       | Nov 2024 |
| 2. Georgia Tech Stochastic Seminar                                 | Sep 2024 |
| 3. Rockin' AI Conference in Roccella                               | Sep 2024 |
| 4. Conference on Learning Theory (COLT) 2024                       | Jun 2024 |
| 5. CMS Winter Session on Random Matrix Theory                      | Dec 2023 |
| 6. Northwestern University Probability Seminar                     | Oct 2023 |
| 7. University of Waterloo Probability Seminar                      | Oct 2023 |
| 8. Cargese Summer School: Statistical physics and machine learning | Aug 2023 |
| 9. ICTP Learning and Inference from Structured Data                | Jul 2023 |
| 10. LN-UMN Joint Probability Seminar                               | Feb 2023 |
| 11. LPSM Probability Seminar                                       | Feb 2023 |
| 12. Grenoble-Lyon-Geneva Probability Meeting                       | Nov 2022 |
| 13. Les Diablerets Spin Glass Workshop                             | Oct 2022 |
| 14. St Flour Probability School                                    | Jul 2022 |
| 15. ICTP Youth In High Dimensions                                  | Jun 2022 |
| 16. University of Toulouse III Probability Seminar                 | Jun 2021 |
| 17. University of Waterloo Probability Seminar                     | Mar 2021 |
| 18. University of Basel Probability Seminar                        | Mar 2020 |

## Teaching

### Course Instructor Positions

|  |             |
|--|-------------|
| • ACTSC 624 - Stochastic Processes for Actuarial Science       | 2025        |
| • STAT 230 - Probability                                       | 2023 - 2024 |
| • MAT186 - Calculus I, APM346 - Partial Differential Equations | 2019 - 2020 |
| • MAT186 - Calculus I, MAT136 - Calculus I(B)                  | 2018 - 2019 |

### Teaching Assistant Positions

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|--|-------------|
| • 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 |

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| <b>Awards</b>                                       | 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        |
| <b>Conferences &amp;<br/>Seminars<br/>Organized</b> | 1. Waterloo Probability Seminar (Co-organizer)                    | 2023 -      |
|   | • 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  |             |
| <b>Industry<br/>Experience</b>                      | <b>Economist (SmartWay Program)</b>                               | 2013 - 2014 |
|   | • Natural Resources Canada, Ottawa, On                            |             |