Justin Ko

Department of Statistics and Actuarial Science — University of Waterloo
justin.ko@uwaterloo.ca

Research High-dimensional probability, spin glasses, random matrices.

Employment

University of Waterloo 2023 -
- Postdoctoral Researcher
- Supervisors: Aukosh Jagannath

École Normale Supérieure de Lyon 2020 - 2023
- Postdoctoral Researcher
- Supervisors: Alice Guionnet, Florent Krzakala, and Lenka Zdeborová

Education

University of Toronto 2015 - 2020
- PhD Mathematics
- Thesis: The Free Energy of Spherical Vector Spin Glasses
- Advisor: Dmitry Panchenko

University of Toronto 2014 - 2015
- MSc Mathematics
- Research Project: Diluted spin glass models

University of British Columbia 2009 - 2014
- Bachelor of Commerce, Finance Co-op, Minor Mathematics

Papers

1. A multiscale cavity method for sublinear-rank symmetric matrix factorization. (with Jean Barbier and Anas Rahman) *International Zurich Seminar on Information and Communication (IZS 2024)*
2. 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*
3. 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*
4. Spectral Phase Transitions in Non-Linear Wigner Spiked Models. (with Alice Guionnet, Florent Krzakala, Pierre Mergny and Lenka Zdeborová) arXiv:2310.14055 (2023) *Submitted.*
5. Estimating rank-one matrices with mismatched prior and noise: universality and large deviations. (with Alice Guionnet, Florent Krzakala and Lenka Zdeborová) arXiv:2306.09283 (2023) *Submitted. Revisions at Communications in Mathematical Physics*
6. 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*
7. Optimal Algorithms for the Inhomogeneous Spiked Wigner Model (with Aleksandr Pak, and Florent Krzakala) *Advances in Neural Information Processing Systems 36 (NeurIPS 2023)*

8. 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*
9. Spherical Integrals of Sublinear Rank (with Jonathan Husson) arXiv:2208.03642 (2022) *Submitted.*
10. The Crisanti–Sommers Formula for Spherical Spin Glasses with Vector Spins, arXiv:1911.04355 (2019) *Under Revision.*
11. Free Energy of Multiple Systems of Spherical Spin Glasses with Constrained Overlaps, Electron. J. Probab. 2020, Vol. 25, No. 28, 1-34
12. 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

1. Georgia Tech Stochastic Seminar — Sept 2024
2. Rockin' AI Conference in Roccella — Sept 2024
3. Conference on Learning Theory (COLT) 2024 — June 2024
4. CMS Winter Session on Random Matrix Theory — Dec 2023
5. Northwestern University Probability Seminar — Oct 2023
6. University of Waterloo Probability Seminar — Oct 2023
7. Cargese Summer School: Statistical physics and machine learning — August 2023
8. ICTP Learning and Inference from Structured Data — July 2023
9. LN-UMN Joint Probability Seminar — February 2023
10. LPSM Probability Seminar — February 2023
11. Grenoble-Lyon-Geneva Probability Meeting — November 2022
12. Les Diablerets Spin Glass Workshop — October 2022
13. St Flour Probability School — July 2022
14. ICTP Youth In High Dimensions — June 2022
15. University of Toulouse III Probability Seminar — June 2021
16. University of Waterloo Probability Seminar — March 2021
17. University of Basel Probability Seminar — March 2020

Teaching

Course Instructor Positions

- ACTSC 624 — 2025
- STAT 230 — 2023 - 2024
- MAT186, APM346 — 2019 - 2020
- MAT186, MAT136 — 2018 - 2019

Teaching Assistant Positions

- 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 -
   - 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) 2013 - 2014
- Natural Resources Canada, Ottawa, On