Contact Information

Department of Statistical Sciences
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Research Areas

Mathematical finance, stochastic control, mean field games, applied probability.

Employment

- Assistant Professor (tenure-track), Department of Statistical Sciences, University of Toronto, May 2018–present
- Assistant Professor (limited-term), Department of Statistics, Columbia University, New York, July 2015–June 2018

Education

University of Michigan, Ann Arbor, USA, 2010-2015

Ph.D. in Applied and Interdisciplinary Mathematics **May 2015**

Chinese University of Hong Kong (CUHK), Shatin, Hong Kong, 2006-2010

B.Sc., Mathematics (with First Class Honors) **July 2010**

University of Pennsylvania, Philadelphia, USA, August 2008-May 2009

Exchange Student

Grants

- NSERC Discovery Grant RGPIN-2020-06290, 2020-2025 (sole PI, CA$130,000)
- NSERC Discovery Launch Supplement DGECR-2020-00373, 2020-2021 (CA$12,500)
- NSF Grant in Applied Mathematics, DMS-1714607, 2017-2020 (sole PI, US$148,160)
  The grant was terminated in 2018 due to the PI moving to a non-US institution.

Teaching Experience

University of Toronto

- ACT 240 Mathematics of Investment and Credit, Fall 2022.
- STA 4246 Research Topics in Mathematical Finance, Winter 2019 (1st half), Winter 2020, Winter 2021, Winter 2022.
- STA 4526 Stochastic Control and Applications in Finance, Fall 2019, Fall 2021.
- STA 2570 Numerical Methods for Finance and Insurance, Winter 2020 (1st half), Winter 2021, Winter 2022.
- ACT 460/STA 2502 Stochastic Methods for Actuarial Science, Fall 2018, Fall 2020, Fall 2021.

Columbia University

- Stat GU4264/GR5264 Stochastic Processes-Applications I, Fall 2015, Spring 2016, Fall 2017.
- Stat GU4265/GR5265 Stochastic Methods in Finance, Spring 2016, Fall 2016, Spring 2017.
- Stat GU4281 Theory of Interest, Spring 2017, Fall 2017.

University of Michigan

- Math 216 Differential Equations, instructor for labs and recitations, Fall 2014.
- Math 526 Discrete Stochastic Processes, teaching assistant, Winter 2013.
- Math 506 Stochastic Analysis for Finance, teaching assistant, Fall 2012, Fall 2013.

- Math 115 Calculus I, primary instructor, Fall 2011, Winter 2012.
- Math 105 Pre-Calculus, primary instructor, Fall 2010, Winter 2011.

Advising

- Ph.D. co-supervisor of Steven Campbell (Toronto Statistics), 2019–
- MFI project with Saeed Mohamed, summer 2020.
- Undergraduate thesis supervisor of Boyi Li (Toronto Engineering Science), 2018–2019.
- Doctoral dissertation committee member of Zheng Wang (Columbia IEOR, 2016), Brian Ward (Columbia IEOR, 2017), Arvind Shrivats (Toronto Statistics), Xin Ning (Toronto Statistics).
- Oral exam committee member of Zhi Li (Columbia Math, 2015), Emma Holmes (Toronto Statistics), Madhu Gunasingam (Toronto Statistics), Vedant Choudhary (Toronto Statistics).
- Informal reading project with master student Zida Lin, summer 2016.

Service

- Service to the Department of Statistical Sciences
  - Master of Financial Insurance Committee, 2018–2022
  - Graduate Committee, 2018–2022
  - Research Committee, 2018–2022
  - Search Committee, 2018–2022
  - PTR Committee, 2019–2020
- Associate Editor for Finance & Stochastics, 2021–
- Reviewer for 17 journals: Annals of Applied Probability, Applied Mathematics and Optimization, Finance & Stochastics, Insurance: Mathematics and Economics, Journal of Applied Probability, Journal of Mathematical Analysis and Applications, Journal of Optimization Theory and Applications, Mathematics and Financial Economics, Mathematical Finance, Mathematics of Operations Research, Operations Research, Operations Research Letters, Probability in the Engineering and Informational Sciences, Quantitative Finance, SIAM Journal on Control and Optimization, SIAM Journal on Financial Mathematics, Stochastic Processes and their Applications.
- Reviewer for Mathematical Reviews/MathSciNet.
- Reviewer for NSERC Grant – Mathematics and Statistics, 2021.
- 2021 SIAG/FME Conference Paper Prize selection committee.
- Co-organizer of
  - Mini-symposium *Mean Field Theory and Its Applications* at the International Congress on Industrial and Applied Mathematics (ICIAM), Valencia, Spain, July 15–19, 2019
  - 2nd Berkeley-Columbia Meeting in Engineering and Statistics, 2018.
  - Mathematical Finance Seminar, Department of Mathematics and Statistics, Columbia University, 2015–2018.

Publications and Preprints

1. Goal Based Investment Management, with Agostino Capponi. Available at SSRN: `https://ssrn.com/abstract=4121931`, 2022. Submitted.
2. GANs as Gradient Flows that Converge, with Yu-Jui Huang, preprint arXiv:2205.02910, 2022. Submitted.
3. Mean Field Contest with Singularity, with Marcel Nutz, **Mathematics of Operations Research**, Articles In Advance, available at `https://doi.org/10.1287/moor.2022.1297`.
4. Reward Design in Risk-Taking Contests, with Marcel Nutz, **SIAM Journal on Financial Mathematics**, 13(1), 129-146, 2022.

5. Teamwise Mean Field Competitions, with Xiang Yu and Zhou Zhou, **Applied Mathematics & Optimization**, 84, 903-942, 2021.
6. Terminal Ranking Games, with Erhan Bayraktar, **Mathematics of Operations Research**, 46(4), 1349-1365, 2021.
7. Conditional Optimal Stopping: A Time-Inconsistent Optimization, with Marcel Nutz, **Annals of Applied Probability**, 30(4), 1669-1692, 2020.
8. Large Tournament Games, with Erhan Bayraktar and Jakša Cvitanić, **Annals of Applied Probability**, 29(6), 3695-3744, 2019.
9. A Mean Field Competition, with Marcel Nutz, **Mathematics of Operations Research**, 44(4), 1245-1263, 2019.
10. A Rank-Based Mean Field Game in the Strong Formulation, with Erhan Bayraktar, **Electronic Communications in Probability**, 21, paper no. 72, 1-12, 2016.
11. Lifetime Ruin Under Ambiguous Hazard Rate, with Virginia R. Young, **Insurance: Mathematics and Economics**, 70, 125-134, 2016.
12. Fundamental Theorem of Asset Pricing Under Transaction Costs and Model Uncertainty, with Erhan Bayraktar, **Mathematics of Operations Research**, 41(3), 1039-1054, 2016. Winner of the 2016 SIAG/FME Conference Paper Prize.
13. Stochastic Perron's Method for the Probability of Lifetime Ruin Problem Under Transaction Costs, with Erhan Bayraktar, **SIAM Journal on Control and Optimization**, 53(1), 91-113, 2015.
14. Minimizing the Probability of Lifetime Ruin Under Ambiguity Aversion, with Erhan Bayraktar, **SIAM Journal on Control and Optimization**, 53(1), 58-90, 2015.
15. A Note on the Fundamental Theorem of Asset Pricing Under Model Uncertainty, with Erhan Bayraktar and Zhou Zhou, **Risks**, 2(4), 425-433, 2014.

Honors and Awards

- OWLG travel grant from the Mathematisches Forschungsinstitut Oberwolfach, 2017.
- SIAG/FME Conference Paper Prize, 2016.
- SIAM Student Travel Award to attend FM14, 2014.
- Rackham International Travel Grant to attend the 7th ESSFM, 2014.
- Funding from the organizers of the 7th ESSFM, 2014.
- SIAM Student Travel Award to attend LLB-SSFM, 2014.
- Rackham International Travel Grant to attend LLB-SSFM, 2014.
- Rackham International Student Fellowship, University of Michigan, Spring/Summer 2012.
- Mathematics Departmental Scholarship, University of Michigan, Spring/Summer 2011, 2013, 2014.
- Research bursary, University of Michigan, 2010.
- College Head's List, CUHK, 2010.
- Dean's List, CUHK, 2007, 2008, 2010, University of Pennsylvania, 2009.
- Heung To Educational Fund Scholarship in Mathematics, CUHK, 2009.
- Shaw College Department/Programme Scholarship, CUHK, 2008.
- Hong Kong Jockey Club Scholar, 2008.
- CNOOC Scholarship, CUHK, 2008.
- AllianceBernstein Exchange Scholarship, CUHK, 2008.
- Shaw College Faculty Scholarship, CUHK, 2007.
- Admission scholarship covering four-year tuition and living expenses, CUHK, 2006.

Extended Research Visits

- Columbia University, August 25-31, 2019. Host: Agostino Capponi.
- Columbia University, July 16-31, 2018. Host: Marcel Nutz.
- University of Colorado Boulder, February 18-25, 2018. Host: Yu-Jui Huang.
- Hong Kong Polytechnic University, Hong Kong, December 26-30, 2017. Host: Xiang Yu.
- University of Michigan, Ann Arbor, July 12-18, 2017. Host: Erhan Bayraktar.

Invited Talks

- Financial Mathematics Seminar, King's College London, UK, November 7, 2022.
- Quantitative Finance Seminar, Fields Institute, Toronto, September 28, 2022.
- Math Finance Session, CAIMS Annual Meeting, University of British Columbia Okanagan, BC, June 13-16, 2022.
- CRM Workshop: Mean-Field Games, University of Montreal, April 11-15, 2022.
- Financial Mathematics Seminar, Florida State University, April 7, 2022.
- 10th General AMaMeF Conference, Universita Degli Studi Di Padova, Italy, June 22-25, 2021.
- Stochastic optimal control in Economics, Finance, and Learning theory, in honour of Martin Schweizer's 60th birthday, Forschungsinstitut Mathematik (FIM), ETH Zurich, June 7-11, 2021. (Postponed)
- Stochastic Analysis and Mathematical Finance Seminar, University of Oxford, June 7, 2021.
- Mini-symposium at the SIAM Conference on Financial Mathematics and Engineering (FM21), Philadelphia, June 1-4, 2021.
- BIRS Workshop: Applications of Stochastic Control to Finance and Economics, Banff, May 9-14, 2021 (Cancelled)
- BIRS Workshop: Modeling, Learning and Understanding: Modern Challenges between Financial Mathematics, Financial Technology and Financial Economics, Banff, June 28-July 3, 2020. (Cancelled)
- 8th Asian Quantitative Finance Conference, Taipei, Taiwan, August 5-7, 2020. (Cancelled)
- Financial Mathematics Seminar, CMAP - Ecole Polytechnique, France, May 18, 2020.
- Broad Directions in Mathematical Finance, Rutgers University, New Jersey, April 3-4, 2020. (Postponed)
- Advances in Stochastic Analysis for Risk Modeling, CIRM - Luminy, Marseille, France, October 21-25, 2019.
- Mini-symposium at the International Congress on Industrial and Applied Mathematics (ICIAM19), Valencia, Spain, July 15-19, 2019.
- Math Finance Session, CAIMS Annual Meeting, Whistler, BC, June 9-13, 2019.
- Mini-symposium at the SIAM Conference on Financial Mathematics and Engineering (FM19), Toronto, June 4-7, 2019.
- Financial Mathematics and Actuarial Research Seminar, UC Santa Barbara, April 22, 2019.
- Actuarial Science and Financial Mathematics Seminar, University of Waterloo, April 5, 2019.
- Mathematical Finance Seminar, Columbia University, November 29, 2018.
- Mini-symposium at the SIAM Annual Meeting (AN18), Portland, Oregon, July 9-13, 2018.
- Financial Math Seminar, Princeton ORFE, March 28, 2018.
- IEOR Seminar, UC Berkeley, March 9, 2018.
- Probability and Computational Finance Seminar, Carnegie Mellon University, March 5, 2018.
- Mathematical Finance and Applied Probability Seminar, University of Connecticut, February 28, 2018.

- Stochastics Seminar, University of Colorado Boulder, February 22, 2018.
- Department of Applied Mathematics Colloquium, Hong Kong Polytechnic University, Hong Kong, December 27, 2017.
- Advances in Stochastic Analysis for Risk Modeling, CIRM - Luminy, Marseille, France, November 13-17, 2017.
- Mathematical Finance and Probability Seminar, Rutgers University, October 24, 2017.
- ICERM Workshop: Robust Methods in Probability & Finance, Brown University, June 19-23, 2017.
- Mathematical Finance Seminar, Imperial College London, United Kingdom, May 24, 2017.
- National Meeting of Women in Financial Mathematics, IPAM, UCLA, April 28, 2017.
- Oberwolfach Workshop: Mathematics of Quantitative Finance, Mathematisches Forschungsinstitut Oberwolfach, Germany, February 26 - March 4, 2017.
- (Statistical Sciences) Departmental Seminar Series, University of Toronto, February 16, 2017.
- IEOR Seminar, Columbia University, February 7, 2017.
- Mini-symposium and Conference Paper Prize Session at the SIAM Conference on Financial Mathematics and Engineering (FM16), Austin, Texas, November 17-19, 2016.
- Byrne Workshop on Stochastic Analysis in Finance and Insurance, University of Michigan Ann Arbor, June 7, 2016.
- IBM Research Seminar, IBM Watson Research Center, April 19, 2016.
- Berkeley-Columbia Meeting in Engineering and Statistics, UC Berkeley, March 24, 2016.
- Mathematical Finance Seminar, Columbia University, January 28, 2016.
- Mathematical Finance and Probability Seminar, Rutgers University, October 6, 2015.
- Columbia-JAFEE Conference, Columbia University, October 3, 2015.
- ORFE Colloquium, Princeton University, February 12, 2015.
- Statistics and Actuarial Science Department Seminar, University of Waterloo, January 26, 2015.
- Institute of Mathematical Sciences PDE Seminar, Chinese University of Hong Kong, Hong Kong, December 18, 2014. (Visited the IMS on December 16-19, 2014.)
- Mini-symposium at the SIAM Conference on Financial Mathematics and Engineering (FM14), Chicago, November 13-15, 2014.
- Financial and Actuarial Mathematics Seminar, University of Michigan, September 4, 2013, February 19, 2014 and November 5, 2014.

Contributed Presentations

- (Poster session) Methods of Mathematical Finance - a conference in honor of Steve Shreve's 65 birthday (MMF), Carnegie Mellon University, June 1-5, 2015.
- 7th European Summer School in Financial Mathematics (ESSFM), University of Oxford, United Kingdom, September 1-5, 2014.
- (Poster session) Labex Louis Bachelier - SIAM-SMAI Conference on Financial Mathematics (LLB-SSFM), University Paris 7, France, June 17-20, 2014.

Other Conferences

- Thera Stochastics – A Mathematics Conference in Honor of Ioannis Karatzas, Fira, Santorini, Greece, May 31 - June 2, 2017.
- 9th World Congress of the Bachelier Finance Society, New York, July 15-19, 2016.
- Probability, Control and Finance – A Conference in Honor of Ioannis Karatzas, Columbia University, New York, June 4 - June 8, 2012.

Skills

- Progamming: Python, MATLAB, LaTeX.

- Language: English, Chinese.

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