Renyuan Xu

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POSITIONS

University of Southern California *August 2021 -*
WiSE Gabilan Assistant Professor, Epstein Department of Industrial System Engineering, Los Angeles

University of Oxford
Research Fellow, St Hugh's College, Oxford
September 2019 -
Hooke Research Fellow, Mathematical Institute, Oxford
Mentor: Rama Cont
September 2019 - August 2021

EDUCATIONS

University of California, Berkeley *August 2014 - August 2019*
Ph.D., Industrial Engineering and Operations Research Department
Thesis Title: Stochastic Games: Nash Equilibrium, Pareto Optimality, Price of Anarchy, and Learning
Advisor: Xin Guo
University of Science and Technology of China *August 2010 - June 2014*
B.S. Mathematics
University of Sydney *August 2012 - December 2012*
Exchange Student, Mathematics Department

RESEARCH INTERESTS

- Stochastic Modeling, Control Theory and Stochastic Games
- Reinforcement Learning and Data-driven Decision Making
- Deep Learning Theory
- Mathematical Finance, Market Microstructure and High Frequency Trading

HONORS

- Recognition Award, University of Oxford December, 2020
- Outstanding Graduate Instructor, UC Berkeley March, 2019
- Finalist, Applied Probability Society Best Paper Competition INFORMS 2018 November, 2018
- Second Place, Citadel Data Competition, Berkeley September, 2018
- Berkeley IEOR Summer Research Grant 2018
- Berkeley IEOR First Year Fellowship 2014-2015
- National Scholarship in China (2% of the department) 2013-2014
- UCLA Summer School Fellowship 2013
- National Scholarship in China (2% of the department) 2012-2013

RESEARCH

- R. Cont, A. Kotlicki, and R. Xu. " COVID-19 Contagion in England: Heterogeneous Dynamics and Targeted Mitigation Policies," *Royal Society Open Science*, 2021.
- R. Cont, X. Guo, R. Xu. " Interbank Lending with Benchmark Rate: Pareto Optima for a Class of Singular Control Games," *Mathematical Finance*, 2021.
- A.S. Cohen, R. Cont, A. Rossier, and R. Xu. " Scaling Properties of Deep Residual Networks," *International Conference on Machine Learning*, 2021.
- B. Hambly, R. Xu, and H. Yang. " The Policy Gradient Method for the Noisy Linear Quadratic Regulator over a Finite Horizon," *SIAM Journal on Control and Optimization*, 2021.
- H. Gu, X. Guo, X. Wei, and R. Xu "Dynamic Programming Principles for Learning Mean-Field Controls", Revision, *Operations Research*, 2020.
- H. Gu, X. Guo, X. Wei, and R. Xu "Q-Learning Algorithm for Mean-Field Controls, with Convergence and Complexity Analysis", To appear, *SIAM Journal on Mathematics of Data Science*, 2020.
  - Short version accepted by ICML 2020 Workshop on Theory of Reinforcement Learning.
- X. Guo, R. Xu, T. Zariphopoulou "Entropy Regularization for Mean Field Games with Learning", Accepted, *Mathematics of Operations Research*, 2021.
- B. Hambly, R. Xu, and H. Yang, "The Policy Gradient Method Finds the Nash Equilibrium in N-player General-sum Games," *Accepted, SIAM Control on Mathematics of Data Science*, 2021.
- H. Gu, X. Guo, X. Wei, and R. Xu "Mean-Field Multi-Agent Reinforcement Learning: A Decentralized Network Approach", Submitted, 2021.
- R. Cont, M. Cucuringu, R. Xu, and C. Zhang. "TailGAN: Nonparametric Scenario Generation for Tail Risk Estimation", Submitted, 2021.
- A. Ananova, R. Cont, and R. Xu, "Excursion Risk," Submitted, 2020.
- X. Guo, R. Xu. "Stochastic Games for Fuel Followers Problem: N vs MFG," *SIAM Journal of Control and Optimization*, 2019.
- X. Guo, A. Hu, R. Xu and J. Zhang. "Learning Mean Field Games," *NeurIPS*, 2019.
- Z. Zhou, R. Xu and J. Blanchet. " Delay-Adaptive Learning in Generalized Linear Contextual Bandits," Revision, *Mathematics of Operations Research*, 2021.
- Z. Zhou, R. Xu and J. Blanchet. "Learning in Generalized Linear Contextual Bandits with Stochastic Delays," *NeurIPS*, 2019.
- X. Guo, W. Tang, and R. Xu. "A Class of Stochastic Games and Moving Free Boundary Problems," Revision, *SIAM Journal of Control and Optimization*, 2019.
- X. Guo, A. Hu, R. Xu and J. Zhang. "Consistency and Computation of Regularized MLEs for Multivariate Hawkes Processes," Working Paper, 2019.
  - Short version accepted by NeurIPS 2018 Workshop on Causality.

- X. Guo, CA Lehalle, and R. Xu. "Transaction Cost Data Analytics for Corporate Bonds," Revision, *Quantitative Finance*, 2020.

INDUSTRY EXPERIENCE

Quantitative Researcher Intern June 2017 - August 2017
Quantitative Brokers, New York, NY

- Apply statistical learning techniques to build an ensemble model for the prediction of the probability of order fulfillments. Techniques include Random Forest, Gradient Boosting and Recurrent Neural Network.
- Model integrated in cash treasury market production system.

AFFILIATED SCIENTIFIC COMMUNITIES

- Member, Institute for Operations Research and the Management Sciences (INFORMS)
- Member, Applied Probability Society (APS)
- Member, Society for Industrial and Applied Mathematics (SIAM)
- Member, Bachelier Finance Society
- Member, Institute of Mathematical Statistics (IMS)

EDITOR

- Co-editor for the special issue on "Machine Learning in Finance" in *Mathematical Finance*, 2021

REVIEWERS

- Journals: SIAM Journal on Control and Optimization, Annuals of Applied Probability, Operations Research, Mathematics of Operations Research, Management Science, Quantitative Finance, Applied Mathematics and Optimization, Applied Mathematical Finance, Market Microstructure and Liquidity, Journal of Economic Dynamics and Control.
- Conferences: NeurIPS, International Conference on Machine Learning, International Conference on Learning Representations

ORGANIZERS

- World Online Seminar on Machine Learning in Finance (March 2021 -)
- Panelist Committee for ICML 2020 Workshop on Theory of Reinforcement Learning
- Session Chair at 15th International Conference on Computational and Financial Economics, King's College, London. (December 2021)
- Organizer of Oxford Mathematical and Computational Finance Seminar (September 2019-June 2021)
- Organizer of Oxford Data Science Seminar (September 2020-June 2021).
- Session Co-chair at INFORMS Annual Meetings (2019, 2020, 2021)
- Co-organizer of Mini-symposium at SIAM Conference on Financial Mathematics and Engineering (June 2021)

INVITED TUTORIALS

- Summer School of the Bachelier Finance Society. (September 2021)
- Oxford Machine Learning Summer School. (September 2021)
- Reinforcement Learning China (RLChina) Summer Camp. (August 2021, July 2020)

INVITED TALKS

- Industrial Engineering & Management Sciences Department Seminar, Northwestern University, Evanston, IL, US. (October 2021)
- Probability and Computational Finance Seminars, Carnegie Mellon University, Pittsburgh, PA, US. (September 2021)
- Workshop on "Advances in Stochastic Analysis for Handling Risks in Finance and Insurance", CIRM, France. (September 2021)
- Berlin Workshop for young Researchers (Virtual). (August 2021)
- Bernoulli-IMS 10th World Congress in Probability and Statistics (Virtual). (July 2021)
- SIAM Annual Meeting (Virtual). (July 2021)
- SIAM Conference on Financial Mathematics and Engineering (Virtual). (June 2021)
- Data Science Seminar, National University of Singapore. (April 2021)
- Optimal Transport and Mean Field Games Online Seminar. (March 2021)
- One World Optimal Stopping and Related Topics Online Seminar . (March 2021)
- Informs Annual Meeting (Virtual). (November 2020)
- Berlin Research Seminar on Stochastic Analysis and Stochastic Finance (Virtual). (November 2020)
- Virtual Workshop on New Challenges in the Interplay between Finance and Insurance. (October 2020)
- 2020 SIAM-CAIMS 2nd Joint Annual Meeting (Virtual). (July 2020)
- Computer Science Department (Virtual), University College London, UK. (June 2020)
- Data Science Lab (Virtual), MIT, Boston, US. (June 2020)
- Math Department (Virtual), UCLA, Los Angeles, US. (June 2020)
- JP Morgan. (Feb 2020)
- Computer Science Department, University College London. (Jan 2020)
- NeurIPS 2019, Vancouver, Canada. (December 2019)

- Joint Risk & Stochastics and Financial Mathematics Seminar, Department of Mathematics, London School of Economics and Political Sciences, UK. (December 5, 2019)
- 12th Oxford-Berlin Young Researchers Meeting in Stochastic Analysis, Oxford, UK. (December 4, 2019)
- Probability and Financial Mathematics Seminar, School of Mathematics, University of Leeds, UK. (November 21, 2019)
- Finance and Stochastics Seminar, Department of Mathematics, Imperial College London, UK. (November 20, 2019)
- Warwick Stochastic Finance Seminar, Department of Statistics, Warwick University, UK. (November 8, 2019)
- Bielefeld Stochastic Afternoon, Center for Mathematical Economics, Bielefeld University, Germany. (October 30, 2019)
- INFORMS Annual Meeting, Seattle, WA, US. (October 20-23, 2019)
- 9^{th} Western Conference in Mathematical Finance, University of Southern California, Los Angeles, CA, US. (November 2018)
- Informs Annual Meeting, Phoenix, AZ, US. (November 2018)
    - Selected as one of the four finalists to present in the Applied Probability Society Best Student Paper Competition
- Mathematical Finance Seminars, University of Southern California, Los Angeles, CA, US. (September 2018)
- Probability and Computational Finance Seminars, Carnegie Mellon University, Pittsburgh, PA, US. (August 2018)
- Berkeley-Stanford Workshop on Mathematical and Computational Finance, Stanford, CA, US. (July 2018)
- Berkeley-Columbia Meeting in Engineering and Statistics, Columbia University, New York, NY. (April 2018)
- Probability Seminar, University of Science and Technology of China, Hefei, China. (December 2017)
- Informs Annual Meeting, Houston, TX, US. (October 2017)
- Fourth Annual Young Researchers Workshop on Data-driven and Decision Making, Cornell University, Ithaca, NY, US. (October 2017)

TEACHING EXPERIENCE

- Tutor at University of Oxford: provide bi-weekly tutorial sessions.
    - Stochastic Control, Hilary Term 2020
    - Machine Learning, Hilary Term 2020
    - Market Microstructure and Algorithmic Trading, Hilary Term 2020

- Statistics and Financial Data Analysis, Michaelmas Term 2019

- Graduate Student Instructor at UC Berkeley: provide weekly discussion sessions, office hours, and homework solutions.
  - Capstone project mentor for IEOR master students, Spring 2018.
  - IEOR 222: Financial Engineering System (Graduate), Fall 2016/Spring 2018.
  - IEOR 241: Risk Modeling, Simulation, and Data Analysis (Graduate), Fall 2017.
  - IEOR 263B: Applied Stochastic Processes II (Graduate), Spring 2017.
  - IEOR 161: Operations Research II, Spring 2016.
  - E120: Introduction to Financial Economics, Fall 2015.
  - UGBA 103: Introduction to Finance, Summer 2015.

TECHNOLOGY SKILLS

- Programming:
  - Expert level at development in R, Python, Pandas, PostgreSQL.
  - Proficient at MATLAB, C, C++, Scala, Q/KDB+.
  - Experience with Spark.
- Optimization: CPLEX, AMPL.