Yufei Zhang

CONTACT INFORMATION

Office: 803, Weeks Building, South Kensington Campus
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RESEARCH INTERESTS

My research interests lie at the intersection of machine learning, stochastic control and games, and mathematical finance.

ACADEMIC APPOINTMENTS

Imperial College London, United Kingdom

Senior Lecturer at Department of Mathematics — Sep. 2023-present

London School of Economics, United Kingdom

Assistant Professor at Department of Statistics — Sep. 2021-Aug. 2023

EDUCATION

University of Oxford, United Kingdom

D.Phil., Mathematics — Oct. 2017-June 2021

- Adviser: Professor Christoph Reisinger

The Chinese University of Hong Kong, Hong Kong

M.Phil., Mathematics — Aug. 2015-July 2017

M.Sc., Mathematics — Aug. 2013-June 2015

B.B.A., Insurance, Financial and Actuarial Analysis — Aug. 2008-June 2013

- Minor in Mathematics

REFEREED JOURNAL PUBLICATIONS

[1] Christoph Reisinger, Wolfgang Stockinger, and Yufei Zhang, *Linear convergence of a policy gradient method for some finite horizon continuous time control problems*, SIAM Journal on Control and Optimization, forthcoming, 2023 [Preprint version.]

[2] Lukasz Szpruch, Tanut Treetanthiploet, and Yufei Zhang, *Optimal scheduling of entropy regulariser for continuous-time linear-quadratic reinforcement learning*, SIAM Journal on Control and Optimization, forthcoming, 2023 [Preprint version.]

[3] Christoph Reisinger, Wolfgang Stockinger, and Yufei Zhang, *A posteriori error estimates for fully coupled McKean-Vlasov forward-backward SDEs*, IMA Journal of Numerical Analysis, online first, 2023 [Preprint version.]

[4] Xin Guo, Anran Hu and Yufei Zhang, *Reinforcement learning for linear-convex models with jumps via stability analysis of feedback controls*, SIAM Journal on Control and Optimization, 61 (2023), pp. 755-787. [Preprint version.]

[5] Matteo Basei, Xin Guo, Anran Hu and Yufei Zhang, *Logarithmic regret for episodic continuous-time linear-quadratic reinforcement learning over a finite-time horizon*, Journal of Machine Learning Research, 23 (2022), pp. 1–34. [Preprint version.]

[6] Christoph Reisinger and Yufei Zhang, *Regularity and stability of feedback relaxed controls*, SIAM Journal on Control and Optimization, 59 (2021), pp. 3118–3151. [Preprint version.]

[7] Kazufumi Ito, Christoph Reisinger, and Yufei Zhang, *A neural network based policy iteration algorithm with global H^2-superlinear convergence for stochastic games on domains*, Foundations of Computational Mathematics, 21 (2021), pp. 331–374. [Preprint version.]

[8] Christoph Reisinger and Yufei Zhang, *A penalty scheme and policy iteration for nonlocal HJB variational inequalities with monotone drivers*, Computers and Mathematics with Applications, 93 (2021), pp. 199-213. [Preprint version.]

[9] Roxana Dumitrescu, Christoph Reisinger, and Yufei Zhang, *Approximation schemes for mixed optimal stopping and control problems with nonlinear expectations and jumps*, Applied Mathematics & Optimization, 83 (2021), pp. 1387-1429.

[10] Christoph Reisinger and Yufei Zhang, *Rectified deep neural networks overcome the curse of dimensionality for nonsmooth value functions in zero-sum games of nonlinear stiff systems*, Analysis and Applications, 18 (2020), pp. 951-999. [Preprint version.]

[11] Christoph Reisinger and Yufei Zhang, *Error estimates of penalty schemes for quasi-variational inequalities arising from impulse control problems*, SIAM Journal on Control and Optimization, 58 (2020), pp. 243–276. [Preprint version.]

[12] Christoph Reisinger and Yufei Zhang, *A penalty scheme for monotone systems with interconnected obstacles: convergence and error estimates*, SIAM Journal of Numerical Analysis, 57 (2019), pp. 1625–1648. [Preprint version.]

REFEREED CONFERENCE PUBLICATIONS

[1] Xinshi Chen, Yufei Zhang, Christoph Reisinger, and Le Song, *Understanding deep architectures with reasoning layer*, Advances in Neural Information Processing Systems (NeurIPS 2020), 33 (2020), pp. 1240–1252. [Preprint version.]

PREPRINTS

[1] Bekzhan Kerimkulov, James-Michael Leahy, David Siska, Lukasz Szpruch, and Yufei Zhang, *A Fisher-Rao gradient flow for entropy-regularised Markov decision processes in Polish spaces*, arXiv:2310.02951, preprint, 2023.

[2] Xin Guo and Yufei Zhang, *Towards An Analytical Framework for Potential Games*, arXiv:2310.0225, preprint, 2023.

[3] Eyal Neuman, Wolfgang Stockinger, and Yufei Zhang, *An offline learning approach to propagator models*, Submitted, arXiv:2309.02994, 2023.

[4] Tanut Treetanthiploet, Yufei Zhang, Lukasz Szpruch, Isaac Bowers-Barnard, Henrietta Ridley, James Hickey, and Chris Pearce, *Insurance pricing on price comparison websites via reinforcement learning*, Submitted, arXiv:2308.06935, 2023.

[5] Eyal Neuman and Yufei Zhang, *Statistical learning with sublinear regret of propagator models*, Submitted, arXiv:2301.05157, 2023.

[6] Michael Giegrich, Christoph Reisinger, and Yufei Zhang, *Convergence of policy gradient methods for finite-horizon stochastic linear-quadratic control problems*, Revision, SIAM Journal on Control and Optimization, arXiv:2211.00617, 2022.

[7] Lukasz Szpruch, Tanut Treetanthiploet, and Yufei Zhang, *Exploration-exploitation trade-off for continuous-time episodic reinforcement learning with linear-convex models*, Revision, The Annals of Applied Probability, arXiv:2112.10264, 2021.

[8] Christoph Reisinger, Wolfgang Stockinger, and Yufei Zhang, *A fast iterative PDE-based algorithm for feedback controls of nonsmooth mean-field control problems*, Revised and resubmitted, SIAM Journal on Scientific Computing, arXiv:2108.06740, 2021.

[9] Christoph Reisinger, Wolfgang Stockinger, and Yufei Zhang, *Path regularity of coupled McKean-Vlasov FBSDEs*, preprint, arXiv:2011.06664, 2020.

[10] Christoph Reisinger, Wolfgang Stockinger, and Yufei Zhang, *Optimal regularity of extended mean field controls and their piecewise constant approximation*, preprint, arXiv:2009.08175v2, 2020.

AWARDS

- The Mathematical Institute DPhil Thesis Prize 2021, *University of Oxford*.
- G-Research PhD Prize in Maths and Data Science, *G-Research*, 2020.
- Academic Support Grands, *The Queen's College, University of Oxford*, 2017.
- Departmental Studentship, *Mathematical Institute, University of Oxford*, 2017–2021.
- Postgraduate Studentship, *The Chinese University of Hong Kong*, 2015–2017.
- Honours at Entrance, *The Chinese University of Hong Kong*, 2008–2013.

GRANTS

[1] Co-Investigator, "Reinforcement Learning for Insurance Pricing" in partnership with The Alan Turing Institute, £39,000, November 1, 2022 to April 28, 2023.

INVITED TALKS

[1] *7th London-Paris Bachelier Workshop on Mathematical Finance*, London, Sept. 18-19, 2023.

[2] *The Second HKSIAM Biennial Meeting*, Hong Kong, Aug. 28-Sept. 1, 2023.

[3] *Recent Advances on Quantitative Finance*, Hong Kong, Aug. 27-30, 2023

[4] *10th International Congress on Industrial and Applied Mathematics*, Tokyo, Aug. 20-25, 2023.

[5] *11th Advanced Mathematical Methods for Finance Conference*, Bielefeld, June 26-30, 2023.

[6] *Stochastic Analysis and Math Finance Seminar*, Berlin, June 22, 2023.

[7] *Berlin Probability colloquium*, Berlin, June 21, 2023.

[8] *North British Probability Seminar*, The University of Edinburgh, June 14, 2023.

[9] *Data Science Seminar*, The University of Essex, May 11, 2023.

[10] *2nd Workshop on Machine Learning for PDEs*, Imperial College London, Apr. 3-4, 2023.

[11] *Probability Seminar*, The University of Bath, Jan. 9, 2023.

[12] *World Online Seminars on Machine Learning in Finance*, Virtual, Nov. 22, 2022.

[13] *Machine Learning and Optimal Control*, Royal Statistical Society, Virtual, Oct. 19, 2022.

[14] *Finance and Stochastic Seminar*, The University of Sydney, Oct. 11, 2022.

[15] *London-Paris Bachelier Workshop on Mathematical Finance*, Paris, France, Sept. 15-16, 2022.

[16] *Machine learning for PDEs*, London, UK, Sept. 6-8, 2022.

[17] *The 9th International Colloquium on BSDEs and Mean Field Systems*, Annecy, France, June 26–July 1, 2022.

[18] *Machine Learning and Mean-Field Games Workshop*, The Institute for Mathematical and Statistical Innovation, Chicago, May 23–27, 2022.

[19] *Maxwell Institute Probability Seminar*, Heriot-Watt University and University of Edinburgh, Mar. 24, 2022.

[20] *Finance and Stochastic Seminar*, Imperial College London, Mar. 23, 2022.

[21] *Financial/Actuarial Mathematics Seminar*, University of Michigan, Virtual, Mar. 16, 2022.

[22] *SIAG/FME virtual seminar*, Virtual, Mar. 10, 2022.

[23] *15th German Probability and Statistics Days*, Virtual, Sept. 27-Oct. 1, 2021.

[24] *2nd Fudan-Warwick Workshop on Financial Mathematics and Stochastic Analysis*, University of Warwick, UK, July 30–31, 2019.

[25] *3rd International Conference on Computational Finance*, A Coruña, Spain, July 8–12, 2019.

[26] *International Workshop on PDE-Constrained Optimization, Optimal Controls and Applications*, Sanya, China, Dec. 10–14, 2018.

[27] *10th Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis*, Oxford, United Kingdom, Nov. 29–Dec. 1, 2018.

[28] *14th Viennese Conference on Optimal Control and Dynamic Games*, Vienna, Austria, July 3–6, 2018.

OTHER TALKS

[1] *8th Workshop on High-Dimensional Approximation*, ETH Zurich, Switzerland, Sept. 9–13, 2019.

[2] *12th European Summer School in Financial Mathematics*, Padova, Italy, Sept. 2–6, 2019.

[3] *SIAM Financial Mathematics and Engineering (FM19)*, Toronto, Ontario, Canada, June 4–7, 2019.

[4] *Scientific Computation using Machine-Learning Algorithms*, Nottingham, United Kingdom, Apr. 25–26, 2019.

[5] *Oxford–ETH Workshop in Mathematical & Computational Finance*, Oxford, United Kingdom, Mar. 14–15, 2019.

[6] *Robust Techniques in Quantitative Finance*, Oxford, United Kingdom, Sept. 3–7, 2018.

[7] *11th European Summer School in Financial Mathematics*, Paris, France, Aug. 27–31, 2018.

[8] *The Fourth Young Researchers Meeting on BSDEs, Nonlinear Expectations and Mathematical Finance*, Shanghai, China, Apr. 23–27, 2018.

PROFESSIONAL SERVICE

Referee Service

- *Automatica*
- *Advances in Computational Mathematics*
- *Advances in Continuous and Discrete Models: Theory and Applications*
- *Applied Mathematical Finance*
- *Applied Mathematics and Optimization*
- *Discrete and Continuous Dynamical Systems Series B*
- *Finance and Stochastics*
- *Journal of Computational Finance*
- *Journal of Mathematical Analysis and Applications*
- *Journal of Machine Learning*
- *Journal of Optimization Theory and Applications*
- *Market Microstructure and Liquidity*
- *SIAM Journal on Control and Optimization*
- *SIAM Journal on Financial Mathematics*
- *SIAM Journal on Financial Mathematics*
- *Stochastic Processes and Their Applications*

- *Advances in Neural Information Processing Systems (NeurIPS 2021)*
- *Conference on Mathematical and Scientific Machine Learning (MSML 2020)*

Committee Service

- Treasurer, University of Oxford SIAM Student Chapter, 2018-20.
- Mathematrix, University of Oxford, 2020-21.

Teaching Experience

London School of Economics, United Kingdom

- Lecturer
  - Stochastic Process — Fall 2021, 2022
  - Stochastic Simulation — Spring 2023
  - Computational Methods in Finance and Insurance — Spring 2022, 2023

University of Oxford, United Kingdom

- Tutor
  - Analysis II — Spring 2021
  - Fixed Income — Spring 2021
  - Financial Derivatives — Fall 2020
  - Introduction to Probability — Fall 2020
  - Advanced Numerical Methods — Spring 2020
  - Numerical Methods — Fall 2019
- Teaching Assistant
  - Analysis I — Fall 2020
  - Calibration — Spring 2019
  - Continuous Optimization — Spring 2019
  - Numerical Methods: Finite Differences — Fall 2018, Spring 2018, Spring 2019
  - Numerical Methods: Monte Carlo — Spring 2018

The Chinese University of Hong Kong, Hong Kong

- Teaching Assistant
  - Mathematical Analysis II — Spring 2016, Spring 2017
  - Numerical Methods for Differential Equations — Spring 2016
  - Mathematical Analysis I — Fall 2015, Fall 2016

Professional Memberships

- Institute of Mathematics and its Applications, Associate Member
- Society for Industrial and Applied Mathematics, Member

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