Harrison Waldon

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Profiles: LinkedIn | GitHub | Google Scholar | Website

Summary

Postdoctoral researcher with expertise in combining and applying deep learning, stochastic analysis, and optimal control. Extensive academic and industrial experience with Python, PyTorch, and neural network optimization. Strong domain expertise in quantitative finance.

Education

Ph.D. in Mathematics, The University of Texas at Austin, *2018 - 2023*

- Dissertation: "The Algorithmic Learning Equations"
- Advisor: Thaleia Zariphopoulou

A.B. in Mathematics, Princeton University, *2013 - 2017*

- Senior Thesis: "Degrees of Freedom for Long Time Dynamics of Forced Critical Burgers and SQG Equation"
- Junior Paper: "Stability and Attractors of Dynamical Systems"
- Advisor: Vlad Vicol

Research Experience

Postdoctoral Research Assistant, Oxford-Man Institute of Quantitative Finance, University of Oxford, *2023 – Present*

- Supervisor: Alvaro Cartea
- Lead multiple first-author research projects on deep learning methods for optimal control, deep PDE solving, and time-series modeling
- Co-supervise three Masters in Computational Finance students
- Founded and lead research labs on machine learning and finance
- Interface with Man Group PLC to generate industry-relevant research problems

Equity Quant, Intern, Bank of America, *June 2023 - August 2023*

- Developed pricing algorithms for exotic options under Chiyan Luo
- Used PyTorch to study neural network regressors in Monte Carlo based pricing algorithms for products with over 1B notional

Fulbright Student Researcher, Ethnomusicology, U.S. Department of State, *2017 - 2018*

- Host Institution: Tuvan Institute for the Humanities and Applied Social Sciences, Russia
- Conducted original research on Tuvan throat singing and published work in proceedings of conference on Central Asian folk music

Research & Publications

In Preparation

1. "Smoothing Methods for Deep DC Optimal Power Flow," **Harrison Waldon***, Jack Umenberger*

2. "Optimal Portfolio Rebalancing with Reinforcement Learning," Alvaro Cartea*, **Harrison Waldon***
3. "Measure-Flow Hamiltonian Neural Networks for the Vlasov Equation," Joseph Miller*, **Harrison Waldon***
4. "Algorithmic Collusion and a Folk Theorem from Learning with Bounded Rationality," Álvaro Cartea*, Patrick Chang*, Jose Penalva*, **Harrison Waldon***, (Under Review)
5. "The Algorithmic Learning Equations: Evolving Strategies in Dynamic Games," Álvaro Cartea*, Patrick Chang*, Jose Penalva*, **Harrison Waldon***

Conference and Workshop Papers

1. "DARE: The Deep Adaptive Regulator for Control of Uncertain Continuous-Time Systems," **Harrison Waldon***, Fayçal Drissi*, Yannick Limmer, Uljad Berdica, Jakob Nicolaus Foerster, Alvaro Cartea, ICML ForLaC 2024
2. "Rough Transformers: Lightweight Continuous-Time Sequence Modelling with Path Signatures," Fernando Moreno-Pino*, Alvaro Arroyo*, **Harrison Waldon***, Xiaowen Dong, Alvaro Cartea, ICML NGSM 2024

Journal Articles

1. "Forward robust portfolio selection: The binomial case," **Harrison Waldon***, Probability, Uncertainty and Quantitative Risk, 2024

*Note: * denotes joint first-authorship*

Skills

- **Programming**: Python, PyTorch, Numpy, Git, Copilot, WandB
- **Mathematics**: Probability, Statistics, Stochastic Analysis, [Ordinary, Stochastic, Partial] Differential Equations

Graduate Level Coursework

UT Austin:

- Fundamentals of Machine Learning (Ward)
- Mathematical Finance (Zariphopoulou)
- Stat Models for Big Data (Sarkar)
- Optimal Transportation (Maggi)
- Numerical Analysis (Engquist)
- Mathematics of Deep Learning (Tsai)
- Stochastic Processes (Zariphopoulou)
- Volatility Modeling (Zitkovic)
- Optimal Stopping (Sirbu)
- Statistical Machine Learning and Optimization (Ho)

Princeton:

- Partial Differential Equations (Klainerman)
- Functional Analysis (Lieb)
- Hydrodynamic PDE (Constantin)

Teaching Experience

- M 385D: Graduate Probability II, UT Austin, Spring 2023
- M 385C: Graduate Probability I, UT Austin, Fall 2022
- M 378K: Intro to Mathematical Statistics, UT Austin, Fall 2021
- M 362K: Probability, UT Austin, Spring 2021, Spring 2020, Spring 2022
- M s325K: Discrete Mathematics, UT Austin, Summer 2020 I
- M 408M: Multivariable Calculus, UT Austin, Fall 2019
- MAT 215: Honors Analysis Spring 2015, Princeton, Fall 2014

Invited Talks

- Stochastic Analysis Seminar, Oxford University (2024)
- Mathematical Finance Seminar, Illinois Institute of Technology (2024)
- CFEM and UBS AI & Data Research, Cornell University (2023)
- UT Austin Economics Department Theory Seminar (2023)
- Western Conference of Mathematical Finance (2023)
- Junior Mathematical Finance Seminar Series, UT Austin (2022)
- Junior Applied Math Seminar Series, UT Austin (2022)
- Junior Probability Seminar Series, UT Austin (2020)
- Inequality in STEM Seminar Series, UT Austin (2020)

Honors & Awards

- Visiting Student (Oxford-Man Institute), April 2022 - July 2022, January 2023
- Summer Research Fellowship (UT Austin), 2021
- Frank Gerth III Teaching Excellence Award (UT Austin), 2021
- David Bruton Jr. Graduate Fellowship in Mathematics (UT Austin), 2019
- Phi Kappa Phi Honor Society, 2019
- St. Anthony Hall Education Fund (St. Anthony Hall), 2017
- Mathematics Summer Research Award (Princeton), 2016
- Martin Dale '53 Summer Award (Princeton), 2015
- Princeton German Book Award (Princeton), 2015

Service and Outreach

- Organizer, OMI Machine Learning Research Lab, Oxford, 2024
- Organizer, OMI Finance Research Lab, Oxford, 2024
- Organizer: Junior Mathematical Finance Seminar, UT Austin, Spring 2022
- Graduate Representative, UT Austin Math Department, 2020 - 2021
- Directed Reading Program Mentor (4 students), UT Austin, 2018 - 2021
- Organizer: Inequality in STEM Seminar, UT Austin, Summer 2020
- Alt. Representative, Graduate Student Assembly, UT Austin, 2018 - 2019

Mentorship Experience

- Nuri Hasan (MCF, Oxford '24)
- Yuxuan Guo (MCF, Oxford '24)
- Yassir Farchi (MCF, Oxford '24)