Harrison Waldon

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Research interests	Deep Learning, Optimal Control, PDE Solving, Quant Finance

Positions Held

Postdoctoral Research Assistant   September 2023 – present
Oxford-Man Institute of Quantitative Finance   Oxford, UK
Mentor: Álvaro Cartea.

Education

PhD, Mathematics   September 2018 – May 2023
The University of Texas at Austin   Austin, TX
Advisor: Professor Thaleia Zariphopoulou, *GPA: 4.0.*

Visiting Student   April 2022- July 2022, January 2023
Oxford-Man Institute of Quantitative Finance   Oxford, UK
Sponsor: Prof. Álvaro Cartea

Fulbright Research Fellow, Ethnomusicology   October 2017- June 2018
Tuvan Institute for the Humanities   Kyzyl, Tuva, Russia
Mentor: Dr. Valentina Suzukei

BA, Mathematics   September 2013 – June 2017
Princeton University
Advisor: Professor Vlad Vicol, *Cumulative GPA: 3.67, Departmental GPA: 3.7*

Industry Experience

Equity Quant Intern   June 2023 – August 2023
Bank of America   New York, NY
Developed neural network based derivatives pricing algorithms in PyTorch for structured products

Preprints, Current Projects

DARE: The Deep Adaptive Regulator for Closed-Loop Predictive Control, *with Faycal Drissi, Yannick Limmer, and Álvaro Cartea, 2023*

The Algorithmic Learning Equations: Evolving Strategies in Dynamic Games, *with Álvaro Cartea, José Penalva, and Patrick Chang, 2022*

Algorithmic Collusion and a Folk Theorem from Learning with Bounded Rationality, *with Álvaro Cartea, José Penalva, and Patrick Chang, 2023*

Path Signature Driven Stochastic Optimal Control

Publications	**Rough Transformers for Continuous and Efficient Time-Series Modelling**, *with Fernando Moreno-Pino, Álvaro Arroyo, Xiaowen Dong, Álvaro Cartea*, (ICLR TS4H 2024)
	Forward robust portfolio selection: The binomial case (PUQR 2024)
Theses	**The Algorithmic Learning Equations**, *Doctoral Dissertation, Supervisor: Thaleia Zariphopoulou, 2023*
	Degrees of Freedom for Long Time Dynamics of Forced Critical Burgers and SQG Equation, *Senior Thesis, Supervisor: Vlad Vicol, 2017*
	Stability and Attractors of Dynamical Systems, *Junior Paper, Supervisor: Vlad Vicol, 2016*

Tutorials	**DARE: The Deep Adaptive Regulator** Illinois Institute of Technology	February 2024
	Deep Transfer Learning for Adaptive MPC Oxford University Stochastic Analysis Seminar	February 2023
	The Algorithmic Learning Equations CFEM and UBS AI & Data Research, Cornell University	April 2023
	Learning to Collude: A Folk Theorem for Algorithms UT Austin Economics Department Theory Writing Seminar	April 2023
	Learning to Collude: Smooth Fictitious Play Western Conference of Mathematical Finance (UC Berkeley)	March 2023
	Market Making and Collusion Junior Mathematical Finance Seminar Series (UT Austin)	February 2022
	TD Learning in Stochastic Environments Junior Applied Math Seminar Series (UT Austin)	January 2022
	Mean Field Games and Mathematical Finance Junior Probability Seminar Series (UT Austin)	November 2020
	Racial and Ethnic Disparities in STEM Inequality in STEM Seminar Series (UT Austin)	July 2020

Graduate Coursework	**Selected Courses**
	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), Statisical Machine Learning and Optimization (Ho)

Qualifying Exams

Real Analysis, Probability I, Applied Mathematics I

Honors and Scholarships		
Visiting Student (Oxford-Man Institute)		January 2023
Visiting Student (Oxford-Man Institute)	April 2022 - July 2022
Frank Gerth III Teaching Excellence Award (UT Austin)		2021
Summer Research Fellowship (UT Austin)		2021
David Bruton Jr. Graduate Fellowship in Mathematics (UT Austin)		2019
Phi Kappa Phi Honor Society		2019
Fulbright Research Fellowship (US Department of State)		2017-2018
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

Teaching Experience	**Graduate Teaching Assistant (UT Austin)**

M 385D: Graduate Probability II   Spring 2023

Advanced continuous-time probability including Brownian motion, stochastic integration, Ito formula, Girsanov Theorem, and Tanaka's formula for semi-martingales

M 385C: Graduate Probability I   Fall 2022

Foundations of measure-theoretic probability including Caratheodory extension theorem, L^p spaces, strong and weak laws of large numbers, central limit theorems, and discrete time martingales

M 378K: Intro to Mathematical Statistics   Fall 2021

Introduction to estimation of parameters, MLE, statistics and confidence intervals, theoretical and applied statistics

M 362K: Probability   Spring 2021, Spring 2020, Spring 2022

Introduction to undergraduate combinatorics, counting, and calculus based probability theory

M s325K: Discrete Mathematics   Summer 2020

Introduction to logic, combinatorics, and proof based mathematics. Accelerated summer course

M 408M: Multivariable Calculus   Fall 2019

Computational multivariable calculus, vectors, directional derivatives, gradients, integrating surfaces, Stokes' Theorem

Undegraduate Teaching Assistant (Princeton University)

MAT 215: Honors Analysis   Spring 2015, Fall 2014

Introduction to rigorous, proof based analysis. Textbook: Principles of Mathematical Analysis, Rudin

Skills

Programming

Python (proficient), Java (familiar)

Languages

English (native), Russian (advanced), German (reading)

Service and Outreach

Organizer: Junior Mathematical Finance Seminar	Spring 2022
Graduate Representative (UT Austin Math Department)	Fall 2020 – Fall 2021
Directed Reading Program Mentor (4 students)	Fall 2018 – Fall 2021
Organizer: Inequality in STEM Seminar	Summer 2020
Alt. Representative, Graduate Student Assembly (UT Austin)	2018 – 2019