

Othmane Mazhar

POSTDOCTORAL RESEARCHER · PROBABILITY, MATHEMATICAL STATISTICS, AND OPTIMAL TRANSPORT

Institute Louis Bachelier — Fondation du Risque, Chair in Artificial Intelligence and Quantitative Methods for Finance, Paris, France

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Research Profile

I develop mathematical and statistical foundations for learning and generating stochastic systems from dependent data, with particular emphasis on generative modelling, optimal transport, stochastic control, and PDE methods. My work combines finite-sample statistical guarantees, transport and control formulations for stochastic generative models, and analytical methods for reliable scientific machine learning.

Research areas

Research programme: mathematical foundations of Schrödinger–Bass transport for synthetic financial time-series generation, including multi-marginal extensions, convergence and stability of training schemes, and statistical error propagation.

Academic Appointments

Institute Louis Bachelier

Paris, France

Postdoctoral Researcher

2026–Present

- Hosted within Fondation du Risque. Scientific supervisor: Prof. Nizar Touzi, New York University. Industry-funded research position supported by Jump Trading.
- Research programme: mathematical foundations of Schrödinger–Bass transport for synthetic financial time-series generation, including multi-marginal extensions, convergence and stability of training schemes, and statistical error propagation.

Laboratoire de Probabilités, Statistique et Modélisation

Paris, France

Postdoctoral Researcher

2023–2026

- Sorbonne University and Université Paris Cité. Scientific supervisor: Prof. Huyên Pham, École polytechnique. Industry-funded research programme supported by BNP Paribas.
- Developed a Schrödinger–Bass programme for generative modelling of financial time series, leading to works on SBBTS, LightSBBM, semimartingale Schrödinger–Bass transport, Gaussian Schrödinger–Bass bridges, and statistical estimation of Schrödinger-bridge time-series drifts.

Graduate Teaching Assistant

Stockholm, Sweden

KTH Royal Institute of Technology

2017–2023

- Appointments in the Department of Mathematics and the School of Electrical Engineering and Computer Science.

Education

PhD in Applied and Computational Mathematics: Probability and Statistics

Stockholm, Sweden

KTH Royal Institute of Technology

2017–2023

- Thesis: *Data-Driven Modeling in the Presence of Time Series Structure: Improved Bounds and Effective Algorithms*.
- Advisor: Boualem Djehiche.

MSc in Applied and Computational Mathematics

Stockholm, Sweden

KTH Royal Institute of Technology

2014–2016

- Perfect GPA (4.0/4.0); KTH Scholarship for Academic Excellence.
- Thesis: *Optimal Consensus and Opinion Dynamics*. Advisor: Xiaoming Hu.

BSc in Pure Mathematics and Theoretical Physics; MSc in Industrial Engineering

Rabat, Morocco

École Mohammadia d'Ingénieurs

2008–2013

- Highest GPA and Best Master's Thesis Award.
- Thesis: *Statistical Control for a Silver Production Process*. Advisor: Loubna Benabbou.

Publications and Manuscripts

Peer-Reviewed Journal Articles

- S. E. Choutri, B. Djehiche, **O. Mazhar**. “Empirical validation of novel non-asymptotic bounds on the least squares estimator for LTI systems with applications in economics.” *Asian Journal of Economics and Banking*, 2025.
- S. Shi, **O. Mazhar**, B. De Schutter. “Finite-sample analysis of identification of switched linear systems with arbitrary or restricted switching.” *IEEE Control Systems Letters* 7 (2023), 121–126.
- B. Djehiche, **O. Mazhar**, C. R. Rojas. “Finite impulse response models: A non-asymptotic analysis of the least squares estimator.” *Bernoulli* 27 (2021), 976–1000.

Peer-Reviewed Conference Papers

- S. E. Choutri, P. Chauhan, **O. Mazhar**, S. E. Jabar. “Monte Carlo-Type Neural Operator for Differential Equations.” *International Conference on Machine Learning and Applications (ICMLA)*, 2025.
- A. Athrey, **O. Mazhar**, M. Guo, B. De Schutter, S. Shi. “Regret analysis of learning-based linear quadratic Gaussian control with additive exploration.” *European Control Conference (ECC)*, 2024, 1795–1801.
- O. Mazhar**, C. R. Rojas, C. Fischione, M. R. Hesamzadeh. “Bayesian Model Selection for Change Point Detection and Clustering.” *Proceedings of the 35th International Conference on Machine Learning*, PMLR 80 (2018), 3433–3442.

Book Chapter

- B. Djehiche, **O. Mazhar**. “An optimal non-asymptotic journey through system identification with least squares.” In *Studies in Systems, Decision and Control*. Springer, 2025.

Submitted Manuscripts

- O. Mazhar**, H. Pham. “Direct Estimation of Schrödinger Bridge Time-Series Drifts: Finite-Sample, Asymptotic, and Adaptive Guarantees.” Under review, 2026.
- P. Henry-Labordère, G. Loeper, **O. Mazhar**, H. Pham, N. Touzi. “Bridging Schrödinger and Bass: A Semimartingale Optimal Transport Problem with Diffusion Control.” Under review, 2026.
- A. Alouadi, G. Loeper, C. Marsala, **O. Mazhar**, H. Pham. “SBBTS: A Unified Schrödinger–Bass Framework for Synthetic Financial Time Series.” Under review, 2026.
- A. Alouadi, P. Henry-Labordère, G. Loeper, **O. Mazhar**, H. Pham, N. Touzi. “LightSBB-M: Bridging Schrödinger and Bass for Generative Diffusion Modeling.” Under review, 2026.
- A. Alouadi, P. Henry-Labordère, G. Loeper, **O. Mazhar**, H. Pham, N. Touzi. “A PDE Derivation of the Schrödinger–Bass Bridge.” Under review, 2026.
- B. Djehiche, **O. Mazhar**. “Minimax Lower Bounds and Adaptivity for LTI State-Space Models with van Trees.” Under review, 2025.
- B. Djehiche, **O. Mazhar**. “Efficient Learning of Hidden-State LTI State-Space Models of Unknown Order.” Under review, 2025. arXiv:2202.01625.

Theses and Earlier Preprints

- O. Mazhar. *Data-driven modeling in the presence of time series structure: improved bounds and effective algorithms*. PhD thesis, KTH Royal Institute of Technology, 2022.
- O. Mazhar. *Optimal consensus and opinion dynamics*. Master’s thesis, KTH Royal Institute of Technology, 2016. Advisor: Xiaoming Hu.
- B. Djehiche and O. Mazhar. *Non-asymptotic estimation lower bounds for LTI state-space models with Cramér–Rao and van Trees*. Earlier preprint; material extended in subsequent submitted manuscripts.

Manuscripts in Preparation

Gaussian Schrödinger–Bass Bridges

Gaussian bridge structure, covariance geometry, optimal potentials, and finite-dimensional characterizations of the associated stochastic-control problem.

Nonlinear Path-Space Transport–Information Inequalities

Transport-information inequalities for mean-field diffusions, interacting particle systems, and empirical path measures.

Proof-Carrying Neural PDE Solvers

Learned error spaces, residual correction, and instance-wise certification for neural PDE solution operators.

Selected Talks and Presentations

2025	An Optimal Interpolation Diffusion Model for Time Series: Bridging Schrödinger and Bass , Long talk, LPSM Workshop on Financial and Actuarial Mathematics and Numerical Probability	Paris, France
2024	Bridging Schrödinger and Bass , Long talk, Workshop on Stochastic Control, Optimal Transport, Calibration, and Applications in Finance	Carry-le-Rouet, France
2019	Finite Impulse Response Models in Low and High Dimension , Poster, ERNSI Workshop	Maastricht, Netherlands
2018	Bayesian Model Selection for Change Point Detection and Clustering , Oral presentation, International Conference on Machine Learning	Stockholm, Sweden
2018	Multiple Regime-Switching Regression for Electricity Spot-Price Prediction , Poster, ERNSI Workshop	Cambridge, UK
2017	Model Selection for Change Point Detection and Clustering , Poster, ERNSI Workshop	Sainte-Foy-lès-Lyon, France

Teaching Experience

High-Dimensional Probability and Statistics for Data Science

KTH 2021

Instructor and course developer

- Developed and delivered a graduate-level lecture series of fourteen two-hour lectures for doctoral students and colleagues interested in non-asymptotic probability, concentration, and high-dimensional statistics.
- The course was based primarily on high-dimensional probability material, including concentration inequalities, random vectors, random matrices, chaining, and applications to statistical learning.

Statistical Machine Learning

KTH 2020

Instructor and course developer

- Developed and delivered a graduate-level lecture series of eighteen one-hour lectures for colleagues interested in statistical learning theory and modern machine-learning methods.
- Topics included statistical learning, kernel methods, large-scale and stochastic optimization, and bandit problems.

EL2820 Modelling of Dynamical Systems

KTH 2018–2020

Teaching Assistant

- Delivered nine two-hour exercise sessions per offering and supervised laboratory and computer-lab components for large engineering cohorts, including computer-lab sessions with approximately 200 students.
- Redesigned computer-lab material and contributed to exam preparation and grading across multiple course offerings.

Student Supervision and Research Mentoring

Bachelor's Thesis Supervision

2020	Daniel Hirsch and Tim Steinholtz, Bachelor's thesis supervision	KTH
2019	Emil Backman and David Petersson, Bachelor's thesis supervision	KTH
2019	David Mainwaring and Jonathan Österberg, Bachelor's thesis supervision	KTH
2018	Mikaela Åstrand and Oscar Bergqvist, Bachelor's thesis supervision	KTH

Research Mentoring

Archith Athrey

TU Delft

Master's thesis co-supervisor, research mentor, and collaborator

2023–2024

- Co-supervised his master's research, contributing to problem formulation, theoretical development, methodology, and analysis.
- The collaboration continued beyond the thesis and led to a joint ECC publication on learning-based linear-quadratic Gaussian control.

Carl-Johan Larsson and Fredrik Håkansson

KTH / Linköping
University / Spotify

Industrial master's thesis supervisor and research mentor

2018–2019

- Supervised the joint thesis *User-Based Predictive Caching of Streaming Media*, undertaken by two experienced software engineers completing master's studies alongside their professional careers.
- Primarily mentored the machine-learning component, including problem formulation, recurrent-neural-network modelling, trajectory prediction, and evaluation using large-scale mobility data.
- The project integrated predicted vehicle trajectories with cellular-coverage information to trigger predictive media caching before connectivity loss.

Alexandre Alouadi, PhD candidate

Paris, France

Research collaborator on doctoral projects

2025–2026

- Collaborated regularly on two projects forming part of his doctoral research.
- Contributed to problem formulation, theoretical development, methodology, experimental design, and preparation of joint manuscripts.

Awards, Fellowships, and Grants

2015	KTH Scholarship for Academic Excellence, KTH Royal Institute of Technology	SEK 180,000
2013	Best Master's Thesis Award, École Mohammadia d'Ingénieurs	
2013	Highest GPA Award, École Mohammadia d'Ingénieurs	

Academic Service and Professional Development

Peer review	Artificial Intelligence and Statistics (AISTATS); Conference on Learning Theory (COLT); International Conference on Machine Learning (ICML); Neural Information Processing Systems (NeurIPS)
Reviewing recognition	Gold Technical Reviewer, International Conference on Machine Learning (ICML), 2026
Conference service	Volunteer organizer, Conference on Learning Theory, Stockholm, 2018

Selected Schools and Workshops

2025	Optimal Transport: From Robust Pricing to Model Calibration , Dolomites Winter School	<i>Folgarida, Italy</i>
2025	Advances in Stochastic Control and Reinforcement Learning , BIRS workshop organized by NYU Paris	<i>Paris, France</i>
2024	Stochastic Control, Optimal Transport, Calibration, and Applications in Finance , Workshop and winter school	<i>Carry-le-Rouet, France</i>
2021	The Interplay between High-Dimensional Geometry and Probability , Hausdorff Research Institute for Mathematics	<i>Bonn, Germany</i>
2019	High-Dimensional Probability and Algorithms , PSL Mathematics Summer School	<i>Paris, France</i>

Technical Skills and Languages

Programming	Python; C/C++; Go; MATLAB
Languages	English; Arabic; French
Citizenship	Swedish; Moroccan

References

Boualem Djehiche	Professor of Mathematical Statistics, KTH Royal Institute of Technology, boualem@kth.se
Henrik Hult	Professor of Mathematical Statistics, KTH Royal Institute of Technology, hult@kth.se
Jimmy Olsson	Professor of Mathematical Statistics, KTH Royal Institute of Technology, jimmyol@kth.se
Nizar Touzi	Professor, Finance and Risk Engineering, New York University, nizar.touzi@nyu.edu