10^{th} LONDON–PARIS BACHELIER WORKSHOP
September 17-18, 2026

Presentation of the workshop. The London–Paris Bachelier Workshop on Mathematical Finance is a two-day conference that brings together researchers from the two communities. This year marks the 10^{th} edition of the workshop, which took place for the first time in Paris in 2014. In the continuity of the previous editions, the aim is to continue discussions about recent research developments and encourage cross-channel research collaborations.

Location. The workshop takes place in Paris, in the amphitheater Hermite at the Institut Henri Poincaré.

Organising comittee.

PARIS:

Olivier Guéant
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Programme

Thursday 17 September

Time	Speaker	Title
13:30	Registration	
13:50	Welcome remarks	
14:00	Emmanuel Gobet	Another numerical scheme for solving Reflected BSDE
14:30	Alex Tse	Reinforcement Learning for Speculative Trading under Exploratory Framework
15:00	Sergio Pulido	When do Volterra processes have a finite-dimensional Markovian representation?
15:30	Coffee break	
Contributed Session 1		
16:00	Elie Attal	Affine Structure of the Brownian Signature
16:20	Aranzazu Natividad-Avila	Economic Outlook from Climate Conditions
16:40	Thibault Jeannin	The martingale property in Volterra volatility models
17:00	Philipp Planck	Learning Distributed Equilibria in Linear-Quadratic Stochastic Differential Games: An alpha-Potential Approach
17:20	Roxana Dumitrescu	Fast-slow mean-field games
17:50	End of first day	
19:30	Conference dinner (invitation only)	

Friday 18 September

Time	Speaker	Title
9:00	Johannes Ruf	The Numeraire E-Variable and Reverse Information Projection
9:30	Benjamin Jourdain	Discretization of a calibrated local and stochastic volatility model
10:00	Giulia Livieri	Testing for endogeneity of irregular sampling schemes
10:30	Coffee break	
Contributed Session 2		
11:00	Nicholas Martin	Optimal Market Making with Memory: A Hawkes–Mercer Approach
11:20	Laura d'Andolfi	Coarse correlated equilibria for electricity market
11:40	Justin Ruelland	Option-Surface Fitting as a Dynamical Optimal Transport Problem
12:00	John Armstrong	An ergodic theorem for mutual insurance
12:30	Lunch break	
14:00	Antoine Jacquier	Novelty detection on path space
Contributed Session 3		
14:30	Yifan Jiang	Local-Global Convergence and Optimal Control on Graphings
14:50	Youssef Ouazzani Chahdi	Exact conditional simulation of Point processes: Application to pathwise market impact estimation
15:10	Rohan Hobbs	Learning Optimal Collective Pension Investment and Consumption for Differing Preferences
15:30	Mathias Grau	Agentic AI for Mathematical Research: Tools, Multi-Agent Collaboration, and Discovery Pipelines
16:00	QRT prize award	Committee: Pierre Henry-Labordère, Caroline Hilairet, Andreas Søjmark
16:20	End of the workshop	

ABSTRACTS

Emmanuel Gobet

LPSM, Sorbonne Université

Another numerical scheme for solving Reflected BSDE

Abstract. We design a numerical scheme to approximate the solution of reflected backward stochastic differential equations (RBSDEs), using the regularization approach of Bally, Caballero, Fernandez, and El Karoui.This provides approximation of the solution from above, as a difference with other numerical schemes. We study the order convergence between the continuous regularized solution, possibly with time discretization, and the exact solution. To illustrate these results, we perform several numerical experiments for one-dimensional American put options. Joint work with A. Agarwal and Y Zou.

Alex Tse

University College London

Reinforcement Learning for Speculative Trading under Exploratory Framework

Abstract. We study a speculative trading problem within the exploratory reinforcement learning (RL) framework. The problem is formulated as a sequential optimal stopping problem over entry and exit times under general utility function and price process. We first consider a relaxed version of the problem in which the stopping times are modeled by the jump times of Cox processes driven by bounded, non-randomized intensity controls. Under the exploratory formulation, the agent's randomized control is characterized via the probability measure over the jump intensities, and their objective function is regularized by Shannon's differential entropy. This yields a system of the exploratory HJB equations and Gibbs distributions in closed-form as the optimal policy. Error estimates and convergence of the RL objective to the value function of the original problem are established. Finally, an RL algorithm is designed, and its implementation is showcased in a pairs-trading application. This is joint work with Yun Zhao and Harry Zheng.

Sergio Pulido

LPSM, Université Paris Cité

When do Volterra processes have a finite-dimensional Markovian representation?

Abstract. Finite-dimensional Markovian representations of Volterra processes are important for practical applications. In this talk, we provide a characterization of the kernels that enable such representations, based on geometric arguments in an infinite-dimensional lifting framework. We also highlight connections with finite-dimensional realizations in HJM fixed income models. Joint work with Alexandre Pannier.

Elie Attal

École Polytechnique

Affine Structure of the Brownian Signature

Abstract. We derive signature series expansions of the Fourier-Laplace and log-Fourier-Laplace transforms of suitable linear functionals of the time-augmented Brownian signature. The first expansion is shown to converge globally, with coefficients solving a linear differential equation on the extended tensor algebra. The logarithm expansion is proved to be intrinsically local, with coefficients solving a system of Riccati differential equations on the tensor algebra. However, a global representation is recovered through a recentering procedure. These results yield applications to Fourier pricing in signature volatility models, and to solving stochastic control problems beyond the classical linear-quadratic Markovian setting.

Aranzazu Natividad Avila

London School of Economics

Economic Outlook from Climate Conditions

Abstract. We analyse the relationship between temperatures and the distribution of economic growth in the US. We fit multi-level dynamic factor models (ML-DFMs) to centre and log-range temperatures observed across the US between 1931 and 2024 to extract global and regional climate factors. We then estimate factor-augmented quantile regressions (FA-QRs) for US GDP growth across different horizons using the obtained climate factors. These regressions allow us to estimate conditional growth distributions and construct Growth-at-Risk and Growth-in-Stress measures. Our estimates indicate a strongly horizon-dependent relationship between climate conditions and growth, as well as additional exposure to downside growth risk under climate stress scenarios. Joint work with Vladimir Rodríguez-Caballero (ITAM) and Esther Ruiz (UC3M).

Thibault Jeannin

École Nationale des Ponts et Chaussées

The martingale property in Volterra volatility models

Abstract. We develop a unified framework for studying the martingale property of a broad class of stochastic and path-dependent Volterra volatility models. We identify the key mechanisms leading to martingality and to strict local martingality and provide sufficient conditions for both. The framework recovers known results for classical stochastic volatility models and yields new conclusions for popular Volterra and path-dependent models.

Philipp Planck

Imperial College London

Learning Distributed Equilibria in Linear-Quadratic Stochastic Differential Games: An alpha-Potential Approach

Abstract. This talk analyzes independent policy-gradient learning in N-player linear-quadratic stochastic differential games. Each player employs a distributed policy that depends only on its own state and updates its policy independently by following the gradient of its own objective. We show that the game admits an alpha-potential structure, where alpha is determined by the degree of pairwise interaction asymmetry. We further establish global linear convergence of these methods to an approximate equilibrium, with suboptimality proportional to the degree of asymmetry. We also construct an affine distributed equilibrium beyond the mean field setting for both symmetric and asymmetric interactions. Based on joint work with Yufei Zhang (Imperial College London).

Roxana Dumitrescu

CREST, ENSAE

Fast-slow mean-field games

Abstract. We propose a framework for constructing approximate Nash equilibria in mean-field games (MFG) with common noise based on a two-time-scale structure. In our model, the common noise is carried by a fast variable evolving under ergodic dynamics, while the slow variable is either optimally controlled or stopped. The fast variable enters the dynamics of the slow one through the drift coefficient. The key idea is to construct an approximation to the solution of the full MFG with common noise using an "effective" MFG without common noise, where the coefficients are averaged with respect to the stationary measure of the fast-scale process. We construct an explicit ε-MFG equilibrium for the full MFG from the equilibrium for the effective MFG with randomized control and stopping. To this end, we obtain new results on existence of MFG equilibria with randomized stopping. We rely on strong convergence results for two-scale diffusions under structural assumptions on the MFG, and show that the time-scale separation parameter controls the error in the Nash equilibrium condition.

Johannes Ruf

London School of Economics

The Numeraire E-Variable and Reverse Information Projection

Abstract. A recent approach to statistical inference is based on the concept of an e-variable: a nonnegative sample statistic whose expected value is at most one if a given null hypothesis is true. This approach has been found to produce strong statistical error bounds and high statistical power and is easily extendible to sequential, or online, settings. E-variables admit a natural interpretation as the payoff of a financial bet. In this talk I will discuss how classical ideas from mathematical finance, in particular the numeraire portfolio, enables an optimality theory for e-variables that significantly generalizes earlier results. Our results also lead to a duality theory which yields the so-called reverse information projection in complete generality. Our work showcases the power of financial methods in a setting where information-theoretic tools have traditionally been preferred. (Joint work with Martin Larsson and Aaditya Ramdas.)

Benjamin Jourdain

École Nationale des Ponts et Chaussées

Discretization of a calibrated local and stochastic volatility model

Abstract. Local stochastic volatility refers to a popular model class in applied mathematical finance that allows for "calibration-on-the-fly", typically via a particle method, derived from a formal McKean-Vlasov equation. Well-posedness of this limit is a well-known problem in the field; the general case is largely open, despite recent progress in Markovian situations. Our take is to start with a well-defined Euler approximation to the formal McKean-Vlasov equation, followed by a newly established half-step-scheme, allowing for good approximations of conditional expectations. In a sense, we do Euler first, particle second in contrast to previous works that start with the particle approximation. We show weak order one for the Euler discretization, plus error terms that account for the said approximation. The case of particle approximation is discussed in detail and the error rate is given in dependence of all parameters used.

Giulia Livieri

London School of Economics

Testing for endogeneity of irregular sampling schemes

Abstract. In the context of high frequency financial data, it is often assumed that sampling times are non-endogenous. We derive statistical tests capable of determining whether or not, and to what extent, this hypothesis is rejected by the data. We propose two kinds of testing procedures: one suitable for moderate sampling frequencies, where the observed price can be assumed to be a noiseless Brownian semi martingale, and a second applicable even for tick-by-tick sampling. Using a large dataset of financial asset prices, we give empirical evidence that, time endogeneity is frequency-dependent. At the ultra-high-frequency tick level, the all-trades clock appears close to exogenous for most liquid stocks, with some evidence of departures among the least liquid stocks in the sample. At moderate frequencies, by contrast, endogenous sampling is a robust empirical feature. These findings highlight the importance of treating the sampling scheme as part of the econometric model rather than as a neutral recording device. Extensive Monte Carlo simulations confirm the good finite-sample performance of the proposed tests and provide micro-founded justification for the empirical results.

Nicholas Martin

University College London

Optimal Market Making with Memory: A Hawkes–Mercer Approach

Abstract. Modern electronic markets exhibit strong temporal dependence in both order flow and liquidity, making effective market-making a fundamentally non-Markovian control problem. In this talk, I introduce a market-making model in which these dynamics are captured by Hawkes processes. I then present a Markovian lifting technique based on truncated Mercer expansions, allowing the original infinite-dimensional problem to be approximated by a finite-dimensional one that can be solved using dynamic programming. I

discuss theoretical convergence guarantees for the approximation and demonstrate numerically that accounting for persistent order flow and liquidity significantly improves trading performance by reducing adverse selection and increasing profitability.

Laura D'Andolfi

CREST, ENSAE

Coarse correlated equilibria for electricity market

Abstract. We introduce a novel class of mean-field coarse correlated equilibria (MFCCEs) in a linear-quadratic setting. Specifically, we define the concept of extended MFCCEs (EMFCCEs) and incorporate a regulator randomization device directly into the cost functional. By applying this mathematical setting to a demand-side management scenario, we theoretically prove that a specific subset of EMFCCEs can close the gap between the decentralized Nash equilibrium and the socially optimal solution, providing a novel decentralized implementation mechanism.

Justin Ruelland

BNP Paribas & LPSM, Université Paris Cité

Option-Surface Fitting as a Dynamical Optimal Transport Problem

Abstract. We study the well-posedness of fitting an option-price surface to a finite set of European option prices using semimartingale optimal transport (SMOT). We establish market conditions ensuring existence, uniqueness, and stability of the solution to the corresponding optimal transport problem. The fitting is exact, and the resulting surface is arbitrage-free. The problem is addressed through its associated dual formulation, which involves an HJB equation and leads us to investigate properties of the corresponding solution map, including differentiability and convexity. We also discuss some of the theoretical and numerical difficulties inherent to the method, together with possible directions for future work to address them. Finally, we discuss examples of more flexible formulations of the finite-price SMOT framework, involving weaker constraints and allowing for a broader variety of settings.

John Armstrong

King's College London

An ergodic theorem for mutual insurance

Abstract. Suppose that there are N heterogeneous investors in a market with idiosyncratic risks but no uninsurable systematic risk factors. These investors may agree arbitrary contracts with one another subject to the conditions that i) all investors will remain solvent at all times ii) the contracts are self-enforcing. I will show that under very mild conditions, this uniquely determines limiting utility of each investor as N tends to infinity. In the case of pension investment, this optimal utility can be achieved by a tontine structure. Thus there is no potential for additional welfare benefit from more complex contracts. This result is an "ergodic theorem" in the sense that we prove that the finite system converges to a

simpler infinite system with many less degrees of freedom. For one-period insurance problems ergodicity already follows from the law of large numbers. In multi-period insurance, however, ergodicity is usually simply assumed. This result closes that gap.

Antoine Jacquier

Imperial College London

Novelty detection on path space

Yifan Jiang

Imperial College London

Local-Global Convergence and Optimal Control on Graphings

Abstract. We develop a general framework for optimization and stochastic control problems on large sparse graphs, where control profiles are assigned across network vertices and the objective aggregates local cost functionals depending on neighboring vertices. We establish that local-global convergence provides the appropriate notion for studying the asymptotic behavior of control problems on sparse graphs, with graphings serving as the limiting objects. For a broad class of graph optimization problems, we prove the convergence of optimal values to their graphing counterparts and derive first-order optimality conditions for the limiting problem. Furthermore, we extend the theory to dynamic decentralized stochastic control problems and establish a stochastic maximum principle for the corresponding graphing control problem. This talk is based on a joint work with Eyal Neuman and Sturmius Tuschmann.

Youssef Ouazzani Chahdi

MICS, CentraleSupélec

Exact conditional simulation of Point processes: Application to pathwise market impact estimation

Abstract. Market impact is defined as the difference between the observed price trajectory under a given execution strategy and the counterfactual trajectory that would have prevailed without it. Since this counterfactual is unobservable, estimating market impact requires simulating alternative paths under the same realized market randomness. We address this by studying the conditional simulation of point processes under perturbed intensities. Given an observed counting process whose intensity is determined by its own history, we characterize the conditional law of the latent Poisson random measure in a thinning representation. This yields an exact, event-driven algorithm that reconstructs counterfactual paths on a common randomness source, enabling rigorous pathwise market impact estimation for aggressive, passive, and mixed strategies.

Rohan Hobbs

King's College London

Learning Optimal Collective Pension Investment and Consumption for Differing Preferences

Abstract. We train a recurrent neural network to learn optimal pension investment and consumption strategies for a range of preferences. To address high variance in our utility function across parameters, we propose a novel architecture that ensures the network learns the optimum. This allows us to infer utility functions from individuals by observing the outcomes they prefer.

Mathias Grau

Qube Research Technology

Agentic AI for Mathematical Research: Tools, Multi-Agent Collaboration, and Discovery Pipelines

Abstract. Artificial intelligence is evolving from a passive problem-solving tool into an active collaborator in mathematical research. This talk introduces the tools, multi-agent architectures, and research pipelines that enable AI agents to formulate conjectures, explore ideas, search the literature, generate proofs, and verify results. Through practical examples, we will examine their current capabilities, limitations, and potential to accelerate mathematical discovery.