Conference Singular SPDEs, invariant measures and discrete models

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Abstract

Conference organised in Nancy from 4 to 6 of December 2024, funded by the ERC Starting Grant LoRDeT (Low Regularity Dynamics via Decorated Trees) `https://cordis.europa.eu/project/id/101075208`. The PI of the project is Yvain Bruned.

Wednesday 4 December 2024

Talks take place at FST, Bâtiment Victor Grignard, Amphi 5.

- 14h00-14h50: Lorenzo Zambotti.

Convergence of dynamical stationary fluctuations

We present a general result that ensures convergence of a sequence of stationary Markov processes, provided a few assumptions are satisfied. Our approach builds on the characterization of the resolvents of the limit Markov process through an identity involving the associated Dirichlet form. We first illustrate our result by presenting a simple proof of the convergence of the fluctuations of the one-dimensional zero-range process towards the stochastic heat equation, in which case our approach allows to circumvent the use of the classical Boltzmann-Gibbs principle. Then we apply our result to an evolving pair of reflected interfaces. The result is new and it is unclear whether existing methods could prove such a convergence. Joint work with Cyril Labbé, Benoît Laslier and Fabio Toninelli.

- 14H50-15h40: Pawel Duch.

Construction of measure of fractional Φ_3^4 model in full subcritical regime

We present a construction of the Gibbs measure of the fractional Φ^4 model of Euclidean quantum field theory in three-dimensions. The measure is obtained as a perturbation of the Gaussian measure with covariance given by the inverse of a fractional Laplacian. Since the Gaussian measure is supported in the space of Schwartz distributions and the quartic interaction potential of the model involves pointwise products, to construct the measure it is necessary to solve the so-called

renormalization problem. To this end, we study the stochastic quantization equation, which is a nonlinear parabolic PDE driven by the white noise. We prove a certain a priori estimate for solutions of this equation using the flow equation approach to singular stochastic PDEs and the maximum principle. We consider the entire range of powers of the fractional Laplacian for which the model is subcritical (i.e. super-renormalizable). Based on joint work with M. Gubinelli and P. Rinaldi.

- 15h40-16h10: Coffee break.
- 16h10-17h00: Xue-Mei Li.

- 19h30-22h30: Conference dinner.

Thursday 5 December 2024

Talks take place at FST, Bâtiment Victor Grignard, Amphi 5.

- 9h30-10h20: Sarah-Jean Meyer.

- 10h20-10h50: Coffee break.
- 10h50-11h40: Martin Hairer.

- 11h40-12h30: Máté Gerencsér,.

  Discretisations of stochastic Allen-Cahn equations

  We study discrete approximations of the Allen-Cahn equations driven by space-time white noise. Focusing on strong convergence rates, we address the questions of the effect of the error topology on the error rate, revisit an old question on accelerating schemes by sampling from the underlying Ornstein-Uhlenbeck process, and take a look at higher dimensions, where renormalisation also has to be taken into accoount. Based on joint works with Ana Djurdjevac, Helena Kremp, and Harprit Singh.

- 12h30-14h30: Lunch.

  Talks take place at IECL, Salle Conférence.

- 14h30-15h20: Cyril Labbé.

- 15h20-15H50: Coffee break.

- 15H50-16h40: Guillaume Barraquand.

  Stationary measures for the open KPZ equation

  It is well-known that a Brownian motion is left invariant by the KPZ equation on R, modulo a global height shift. For the KPZ equation on domains with boundaries, such as $\mathbb{R}_+$ or $[0, L]$, stationary measures are more complicated and have been determined recently, taking the scaling limit of discrete integrable models. My talk will review this, presenting works by Corwin-Knizel, Bryc-Kuznetsov-Wang-Wesolowski, as well as my joint works with Pierre Le Doussal and Ivan Corwin.

- 16h40-17h30: Giuseppe Cannizzaro.

  Superdiffusive Central Limit Theorem for the critical Stochastic Burgers Equation

  The Stochastic Burgers Equation (SBE) was introduced in the eighties by van Beijren, Kutner and Spohn as a way to encode the fluctuations of driven diffusive systems with one conserved quantity. In the subcritical dimension $d = 1$, it coincides with the derivative of the KPZ equation whose large-scale behaviour is polynomially superdiffusive and given by the KPZ Fixed Point, and in the super-critical dimensions $d > 2$, it was recently shown to be diffusive and rescale to a biased Stochastic Heat equation. At the critical dimension $d = 2$, the SBE was conjectured to be logarithmically superdiffusive with a precise exponent but this has only been shown up to lower order corrections. In the present talk, we pin down the logarithmic superdiffusivity exactly by identifying the limit of the so-called diffusion coefficient and show that, once the logarithmic corrections to the scaling are taken into account, the solution of the SBE satisfies a central limit theorem. Joint work with Q. Moulard and F. Toninelli.

Friday 6 December 2024

Talks take place at FST, Bâtiment Victor Grignard, Amphi 5.

- 9h00-9h50: Ajay Chandra.

  Non-commutative singular SPDE

  In this talk, I will describe some recent progress on singular stochastic partial differential equations in the setting of non-commutative probability theory - examples will include the stochastic quantization of Fermionic quantum field theories and also the setting of free probability. This is based on joint work with Martin Hairer and Martin Peev.

- 9h50-10h20: Coffee break.

- 10h20-11h10: Ludovic Goudenège.

- 11h10-12h00: Katharina Schratz.