Barcelona-Toulouse Probability Days

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Toulouse

Recueil des résumés

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Intermittency for the Hyperbolic Anderson Model with rough noise in space

Auteur: Lluís Quer-Sardanyons[1]

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We consider the stochastic wave equation on the real line driven by a linear multiplicative Gaussian noise which is white in time and whose
spatial correlation corresponds to that of a fractional Brownian motion with Hurst index $1/4 < H < 1/2$.
First, we prove that this equation has a unique mild solution in the
Skorohod sense and obtain an exponential upper bound for the moments of any order of the solution.
Secondly, we show that this solution coincides with the one obtained by
the speaker and his collaborators in a recent article, in which the solution is interpreted
in the Itô sense.
Finally, we prove that the solution of the equation in the Skorohod sense is weakly intermittent.
This talk is based on a joint collaboration with Raluca Balan (University of Ottawa)
and Maria Jolis (Autonomous University of Barcelona).

2

On a stochastic epidemic SEIHR model and its diffusion approximation

Auteur: Carles Rovira[1]

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To model the evolution of diseases with extended latency periods like varicella, we generalise a simple discrete time stochastic SIR-type epidemic model of Tuckwell and Williams. We include both latent periods as well as the presence of quarantine areas, to capture the evolutionary dynamics of such diseases. Analytical results of the proposed Markovian model are provided. The basic reproduction number of the former and new models as well as a diffusion approximation are derived, leading to a stochastic differential equation with multiple delays in a natural way.

3

Stability for a class of semilinear fractional stochastic integral equations

Auteur: David Márquez[1]

[1] *Universitat de Barcelona*

We study some stability criteria for some semilinear integral equations with a function as initial condition and with additive noise, which is a Young integral that could be a functional of fractional Brownian motion. Namely, we consider stability in the mean, asymptotic stability, stability, global stability and Mittag-Leffler stability. To do so, we

use comparison results for fractional equations and an equation (in terms of Mittag-Leffler functions) whose family of solutions includes those of the underlying equation.

4

A Malliavin-Skorohod calculus in L^0 and L^1 for additive Volterra-type processes

Auteur: Josep Vives[1]

[1] *Universitat de Barcelona*

We develop a Malliavin-Skorohod type calculus for additive processes in the L^0 and L^1 settings, extending the probabilistic interpretation of the Malliavin-Skorohod operators
to this context. We prove calculus rules and obtain a generalization of the Clark-Hausmann-Ocone formula for random variables in L^1. Our theory is then applied to extend the
stochastic integration with respect to volatility modulated Lévy-driven Volterra processes recently introduced in the literature. Our work yields to substantially weaker conditions that permit to cover integration with respect to e.g. Volterra processes driven by α-stable processes with $\alpha < 2$.

\begin{thebibliography}{99}

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{\sc G. Di Nunno and J. Vives, (2016)}: {\em A Malliavin-Skorohod calculus in L^0 and L^1 for additive and Volterra-type processes}. Stochastics: An International Journal of Probability and Stochastic Processes.
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A Markovian approach of the Central Limit Theorem

Auteur: Claire Delplancke[1]

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The aim of our work is to propose a new proof of the Central Limit Theorem in the case of real i.i.d random variables. More precisely, we show a Berry-Esseen-like theorem which estimates the speed of the convergence in the CLT for a natural quantity that has not been studied yet, the variance of the density with respect to the Gaussian measure. The originality of this work is to take advantage of the Markovian structure underlying the framework of the CLT.

6

Asymptotics of weighted random sums

Auteur: José Manuel Corcuera[1]

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In this paper we study the asymptotic behavior of weighted random sums when the sum process converges stably in law to a Brownian motion and the weight process has continuous trajectories, more regular than that of a Brownian motion. We show that these sums converge in law to the integral of the weight process with respect to the Brownian motion when the observation distances goes to zero. The result is obtained with the help of fractional calculus.

7

Extensions faibles et fortes des approximations de Kac-Stroock

Auteur: Xavier Bardina[1]

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Soit $N := \{N(t),\, t \geq 0\}$ un processus de Poisson standard. On considère, pour tout n, le processus continu :

$x_n = \{x_n(t) := \frac{1}{\sqrt{n}} \int_0^{nt} (-1)^{N(u)} du,\, t \in [0,T]\}$.

En 1982 Stroock démontra que les processus x_n convergent en loi vers un mouvement Brownien standard. C'est-à-dire, si (P^n) sont les lois des processus x_n dans l'espace de Banach $\mathcal{C}([0,T])$ des fonctions continues de $[0,T]$, alors (P^n) converge
en loi, lorsque n tend vers l'infini, à la mesure de Wiener.

Ces processus ont été introduits par Kac l'année 1956 pour écrire la solution de l'équation du télégraphe en fonction du processus de Poisson.

À partir de ces processus on trouve dans la littérature des extensions du résultat de Stroock en trois directions:

1. Modifier les processus x_n pour obtenir des approximations d'autres processus gaussiens.
2. Démontrer des convergences plus fortes que la convergence en loi dans l'espace des fonctions continues.
3. Obtenir des généralisations des processus qui approximent au-delà de $(-1)^{N(u)}$.

Dans cette exposée on verra d'abord que à partir du résultat de Kac la convergence de ses processus vers le mouvement Brownien apparait d'une façon tout à fait naturelle.

En suite on va rappeler quelques résultats, généralisations des processus de Kac-Stroock, en la première direction. On verra qu'on trouve des modifications pour approximer des équations différentielles stochastiques, le mouvement Brownien fractionnaire, le drap Brownien, des intégrales multiples, etc.

Dans la deuxième direction on verra que si on fait une petite modification de nos processus on obtient convergence presque sûre et on peut calculer un taux de convergence. On donnera aussi un résultat de convergence forte pour le mouvement Brownien complexe.

Finalement, dans la troisième direction, on verra qu'on peut faire des extensions des processus $(-1)^{N(u)}$ qui convergent aussi vers un mouvement Brownien. En particulier on va présenter une extension à partir de processus de Lévy.

8

Piecewise deterministic models for slow-fast prey-predator communities

Auteur: Manon Costa[1]

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In this talk we introduce piecewise deterministic markov processes in order to describe the demographic and phenotypic dynamics of slow-fast prey-predator communities such as trees-insects communities.
We study the ergodic properties of these processes using a Foster-Lyapunov approach. We then consider an accelerated time scale and prove that the process can then be described by an averaged prey process in which the predator dynamics are at equilibrium.

9

Stein methods for Brownian motion and enhanced Brownian motion

Auteur: Laure COUTIN[1]

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Motivated by a theorem of Barbour, we revisit some of the classical limit theorems in probability from the viewpoint of the Stein method. We setup the framework to bound Wasserstein distances between some distributions on infinite dimensional spaces. We show that the convergence rate for the Poisson approximation of the Brownian motion is as expected proportional to $\lambda^{-1/2}$ where λ is the intensity of the Poisson process. We also exhibit the speed of convergence for the Donsker Theorem and extend this result to enhanced Brownian motion.

10

Weighted quadratic variations of fractional Brownian sheets

Auteur: Anthony REVEILLAC[1]

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In this talk, we study weighted quadratic variations of fractional Brownian sheets with an arbitrary (finite) number of parameters. We will compare our results with those previously obtained by Nourdin, Nualart and Tudor for the classical (1-parameter) fractional Brownian motion and discuss some (apparently) universal behavior for these quantities. This talk is based on a joint work in progress with Mikko S. Pakkanen.