Foreword

The organizing committee is pleased to welcome you to Angers for the international conference *Self-similar processes and their applications.*

The conference is organized under the auspices of the Fédération de Recherche CNRS *Mathématiques des Pays de la Loire.* Its aim is to bring together experts of different aspects of self-similarity, encouraging them to exchange on their research and enabling them to share their knowledge with young researchers. Throughout the week, plenary lectures, talks and poster sessions will highlight recent advances in various fields of research which are currently studied.

We also hope this conference will be an opportunity for you to visit Angers and its area. The cultural and historical heritage of the region Anjou is very rich and we encourage you to make the most of it during the week.

The organization of the conference is much indebted for the financial support of *Région des Pays de La Loire, ANR, Ministère de l'Enseignement Supérieur et de la Recherche, CNRS, Conseil Général de Maine et Loire, Angers Loire Métropole, Université d'Angers.*

Thanks are also due to the members of the scientific committee: Jean Bertoin, Włodzimierz Bryc, Serge Cohen, Jacques Lévy Véhel, Makoto Maejima, Anne Philippe, Ken-iti Sato, Wendelin Werner and Marc Yor.

Finally, we are very grateful to all of you for attending and making the conference worthwhile by your contributions.

Angers, July 2009
The organizing committee.

Schedule

Monday, July 20th

8:30 - 9:00 *Welcome*

9:00 - 10:00 **Gennady Samorodnitsky** *What self-similar processes best describe the input to communication network models ?*

10:00 - 10:30 **Yimin Xiao** *Self-similar Gaussian Random Fields and Their Properties*

10:30 - 11:00 *Coffee break*

11:00 - 11:30 **Ron Doney** *The density of the maximum of a stable process*

11:30 - 12:00 **Sonia Fourati** *Explicit formulaes solving the exit problem for a class of Lévy processes and applications*

12:00 - 12:30 **Juan Carlos Pardo** *The upper envelope of positive self-similar Markov processes*

12:30 - 14:30 *Lunch*

14:30 - 15:30 **Kenneth Falconer** *Multistable and Multifractional Processes*

15:30 - 16:00 **Károly Simon** *Difference of random Cantor sets*

16:00 - 16:30 *Coffee break*

16:30 - 17:00 **Thomas Duquesne** *The packing measure*

17:00 - 17:30 **Matthias Winkel** *Regenerative tree growth: binary self-similar continuum random trees and Poisson-Dirichlet compositions*

17:30 - 18:00 **Alexander Gnedin** *Limit laws for stick-breaking partitions*

18:00 - 18:30 *Poster session*

Tuesday, July 21st

9:00 - 10:00 **Andreas Kyprianou** *The n-tuple laws*

10:00 - 10:30 **Maria Emilia Caballero** *Lamperti Stable processes*

10:30- 11:00 *Coffee break*

11:00 - 11:30 **Ernst Eberlein** *Valuation of exotic options in Lévy models*

11:30 - 12:00 **Jacques Istas** *Fractional fields indexed by metric spaces*

12:00 - 12:30 **Albert Benassi** *Self-similar Divergence free Gaussian Random Vectors Fields with Stationary Increments and Multiscale Sampling Analysis of Divergence Free Vectors Fields*

12:30 - 14:30 *Lunch*

14:30 - 15:00 **Stéphane Jaffard** *Detection of oscillating singularities in signals: A new avatar of multifractal analysis*

15:00 - 15:30 **Vincent Beffara** *Monochromatic arm exponents for percolation*

15:30 - 16:00 **Clément Hongler** *Energy density in 2D Ising model*

16:00 - 16:30 *Coffee break*

16:30 - 17:00 **Pierre Vallois** *On subexponentiality of the Lévy measure of the diffusion inverse local time. Application to penalization*

17:00 - 17:30 **Cyprian Tudor** *Application of Malliavin calculus to long-memory parameter estimation for non-Gaussian processes*

17:30 - 18:00 **Anthony Réveillac** *Convergence of the weighted quadratic variations of some fractional Brownian sheets*

18:30 - 19:30 *Greeting from the local authorities*

Wednesday, July 22nd

9:00 - 10:00 **Murad Taqqu** *A multiple stochastic integral criterion for an almost sure central limit theorem with applications to increments of fractional Brownian motion*

10:00 - 10:30 **Laurent Decreusefond** *Time reversal of fractional Brownian motion driven SDE*

10:30 - 11:00 *Coffee break*

11:00 - 11:30 **Jean-Christophe Breton** *Rescaled weighted random balls models and stable self-similar random fields*

11:30 - 12:00 **Erik Broman** *Connectivity phase transitions in fractal percolation I*

12:00 - 12:30 **Federico Camia** *Connectivity phase transitions in fractal percolation II*

12:30 - 14:30 *Lunch*

Free afternoon - Excursion

Thursday, July 23rd

9:00 - 10:00 **Gérard Letac** *Exit times of Brownian motion and random convex sets in the plane*

10:00 - 10:30 **Jacek Wesolowski** *Quadratic harnesses-transformations and conditioning*

10:30 - 11:00 *Coffee break*

11:00 - 11:30 **Gerónimo Uribe Bravo** *Markovian Bridges: weak continuity and pathwise constructions*

11:30 - 12:00 **Pierre Patie** *Law of the absorption time of self-similar Markov processes*

12:00 - 12:30 **Tomasz Jakubowski** *Green function estimates for α-stable Ornstein-Uhlenbeck processes*

12:30 - 14:30 *Lunch*

14:30 - 15:30 **Grégory Miermont** *Scaling limits of random planar maps with large faces*

15:30 - 16:00 **Bénédicte Haas** *Asymptotic behavior of solutions to the fragmentation equation with shattering: an approach via self-similar Markov processes*

16:00 - 16:30 *Coffee break*

16:30 - 17:00 **Laure Coutin** *Multifractional random walk*

17:00 - 17:30 **Ivan Nourdin** *Combining Stein's method with Malliavin calculus, I: general theory*

17:30 - 18:00 **Giovanni Peccati** *Combining Stein's method with Malliavin calculus, II: optimal bounds and universality*

18:00 - 18:30 *Poster session*

Friday, July 24th

Special day dedicated to the 60th birthday of **Marc Yor**

9:00 - 10:00 **Jean-François Le Gall** *The continuous limit of large random planar maps*

10:00 - 10:30 **Jean-François Delmas** *A continuum-tree-valued Markov process*

10:30 - 11:00 *Coffee break*

11:00 - 12:00 **Marc Yor** *Processus croissant pour l'ordre convexe et martingales*

12:00 - 12:30 **Larbi Alili** *Further results on exponential factorizations and applications*

12:30 - 14:30 *Lunch*

14:30 - 15:00 **Michal Rams** *Projections of percolation fractals*

15:00 - 15:30 **Hideki Tanemura** *Noncolliding Processes and Random Matrices*

15:30 - 16:00 **Makoto Katori** *Zeros of Airy Function and Relaxation Process*

16:00 - 16:30 *Coffee break*

16:30 - 17:00 **Włodzimierz Bryc** *Quadratic harnesses and Askey-Wilson integral*

Plenary lectures

Multistable and Multifractional Processes

Kenneth Falconer

(Monday 14:30 – 15:30)

We consider the construction of stochastic processes with varying local form, for example with varying Hölder exponent and/or stability index. On the one hand we discuss the restrictions on the possible local forms. On the other hand we consider various methods of constructing processes with prescribed local forms, for example using Poisson sums or characteristic functions. This is joint work with Jacques Lévy Vehel, Ronan Le Guevel and Lining Li.

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The n-tuple laws

Andreas Kyprianou

(Tuesday 9:00 – 10:00)

We discuss recent developments in the first exit problem from a strip and a half line for both Lévy processes and positive self-similar Markov processes.

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The continuous limit of large random planar maps

Jean-François Le Gall

(Friday 9:00 – 10:00)

Planar maps are connected graphs embedded in the plane.We discuss the convergence in distribution of rescaled random planar maps viewed as random metric spaces.More precisely, we consider a random planar map $M(n)$, which is uniformly distributed over the set of all planar maps with n faces in a certain class. We equip the set of vertices of $M(n)$ with the graph distance rescaled by the factor $n^{-1/4}$. We then discuss the convergence in distribution of the resulting random metric spaces as n tends to infinity, in the sense of the Gromov-Hausdorff distance between compact metric spaces. In the case of bipartite planar maps, we establish a compactness result showing that a limit exists along a suitable subsequence. Furthermore this limit, which is called the Brownian map, can be written as a quotient space of the Continuum Random Tree (CRT) for an equivalence relation which has a simple definition in terms of Brownian labels attached to the vertices of the CRT. The Brownian map is known to be homeomorphic to the 2-sphere, although its Hausdorff dimension is 4.

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Exit times of Brownian motion and random convex sets in the plane

Gérard Letac

(Thursday 9:00 – 10:00)

Consider a plane convex set obtained by the intersection of some half planes containing the unit circle and whose limiting line is tangent to this circle. The exit time of the Brownian motion is linked with the distribution of the perimeter of a certain random convex set obtained by the convex hull of the Brownian curve. This lecture will compute the distributions of these exit times in a number of particular cases, obtaining sometimes unexpected identities in law. Work with Philippe Biane.

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Scaling limits of random planar maps with large faces

Grégory Miermont

(Thursday 14:30 – 15:30)

A planar map is an embedding of a connected graph into the two-dimensional sphere. Random planar maps appear as natural discrete models of random surfaces, and have attracted much interest in combinatorics, theoretical physics and probability in the recent years. In this joint work with J.-F. Le Gall, we discuss asymptotics of large random maps in which the distribution of the degree of a typical face has a polynomial tail. When the number of vertices of the map goes to infinity, the appropriately rescaled distances from a base vertex can be described in terms of a new random process, defined in terms of a field of Brownian bridges over the so-called stable trees. This work takes part of its motivation from statistical physics models on random maps.

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What self-similar processes best describe the input to communication network models ?

Gennady Samorodnitsky

(Monday 9:00 – 10:00)

Standard models connecting the empirical facts of heavy tails, self-similarity and long-range dependence are the so-called ON/OFF and $M/G/\infty$ models.

It was shown in Mikosch et al. (2002) that for both ON/OFF model and $M/G/\infty$ model, when the number of input "streams" is getting large, and the time scale increases as well, the deviation from the mean of the total work input into the system converges to one of the two well known processes, either Lévy stable motion, or Fractional Brownian motion, depending on the relative rates at which the number of "streams" and the time scale grow.

From this point of view, the input to such a network looks like performing either stable motion or Fractional Brownian motion around its mean.

However, the assumptions underlying this limiting behavior are very specific, and we will consider the possible limiting behavior of the queue under a very general scenario of input forming a marked stationary point process, with the points being the moments the jobs arrive to the quere, and the marks being the work requirements for each job. Using the Palm theory, we will see that there are many more different self-similar processes can describe the limiting behavior of a queue than just a stable motion or a Fractional Brownian motion. In fact, the Fractional Brownian motion scenario turns out to be much more robust towards changing the specific assumptions than the stable motion scenario does.

Furthermore, we will see that, in fact, in some cases, the Fractional Brownian motion limit can appear exactly one would, naively, expect a the stable limit instead.

This is joint work with Vicky Fasen.

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A multiple stochastic integral criterion for an almost sure central limit theorem with applications to increments of fractional Brownian motion

Murad Taqqu

(Wednesday 9:00 – 10:00)

We shall present an almost sure central limit theorem for multiple stochastic integrals with respect to a Gaussian measure. These integrals are characterized by a kernel. We provide a criterion for an almost sure central limit theorem based on the nature of the kernel. Techniques involve using a fundamental result from Ibragimov and Lifshits together with Malliavin calculus.

We apply our result to normalized partial sums of Hermite polynomials of increments of fractional Brownian motion. It is known that such normalized sums may or may not converge to a Gaussian distribution based on how dependent the increments of the underlying fractional Brownian motion are. They will converge to a Gaussian distribution if the Hurst parameter H is low enough. We obtain in this case almost sure central limit theorems for these normalized sums.

This is joint work with Bernard Bercu and Ivan Nourdin.

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Processus croissant pour l'ordre convexe et martingales

Marc Yor

(Friday 11:00 – 12:00)

On étudie une classe de processus qui admettent les marginales unidimensionnelles de martingales et on construit les martingales correspondantes.

Travail commun avec F . Hirsch et B. Roynette.

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Talks

Further results on exponential factorizations and applications

Larbi Alili
(University of Warwick)

We review some known results on the factorization of an exponential random variable as a product of an exponential functional of a subordinator and another random variable. This is applied to the study of the semi-group of a self-similar Markov process obtained from the subordinator through Lamperti's transform.

Monochromatic arm exponents for percolation

Vincent Beffara
(UMPA-ENS, Lyon)

We investigate the so-called *monochromatic arm exponents* for critical percolation in two dimensions. These exponents, describing the probability of observing j disjoint macroscopic paths, are shown to exist and to form a different family from the (now well-understood) polychromatic exponents. Though there exact values are unknown, numerical simulations strongly suggest that they could be more strongly related to their polychromatic counterparts than they should ... This is joint work with Pierre Nolin (Courant).

Self-similar Divergence free Gaussian Random Vectors Fields with Stationary Increments and Multiscale Sampling Analysis of Divergence Free Vectors Fields

Albert Benassi
(Université de Clermont-Ferrand)

In this paper we are interested in divergence free vectors fields and particularly the Gaussian Random Vector Fields with stationary increments, Self-similar and with free divengence.We give, for those gaussian fields not only their complete structure but also a wavelet's like decomposition on a basis constituted of functions with matrix values and free divergence. We are inspired by the theory of turbulence on a theoretical level and by image processing technics and motivated by the possibility of proposing new methods of fast simulation of free divergence vector fields for modeling purposes on a practical level. We define then a new multi resolution analysis based on multi-scale sampling and on the use of "Morphlet's basis", a new form of wavelet's basis. And we extend this to the analysis (and synthesis) of free divergence vector fields, and so proposing an original Vectorial MultiresolutionAnalysis.We also give some examples of fast simulation of Gaussian Random Vector Fields with stationary increments, Self-similar and with free divergence on this new "matrix-function" basis with free divergence.

Rescaled weighted random balls models and stable self-similar random fields

Jean-Christophe Breton
(Université de La Rochelle)

We consider weighted random balls in $\mathbb{R}^d$ distributed according to a random Poisson measure with heavy-tailed intensity and study the asymptotic behaviour of the total weight of some configurations in $\mathbb{R}^d$. This procedure amounts to be very rich and several regimes appear in the limit, depending on the intensity of the balls, the zooming factor, the tail parameters of the radii and of the weights. Statistical properties of the limit fields are also evidenced, such as isotropy, self-similarity or dependence. One regime is of particular interest and yields alpha-stable stationary isotropic self-similar generalized random fields which recovers Takenaka fields, Telecom process or fractional Brownian motion.

Connectivity phase transitions in fractal percolation I

Erik Broman
(University of Gothenburg)

Mandelbrot's fractal percolation process generates random fractal sets by an iterative procedure which starts by dividing the unit cube $[0, 1]^d$ in

$\mathbb{N}^d$ subcubes, and independently retaining or discarding each subcube with probability p or 1-p respectively. This step is then repeated within the retained subcubes at all scales. As p is varied, there is a percolation phase transition in terms of paths for all d greater than or equal to 2, and in terms of $(d-1)$-dimensional "sheets" for all d greater than or equal to 3. After introducing the model and some known results, I will present new results concerning the discontinuity of crossing probabilities in all dimensions larger than 2. (Joint work with Federico Camia.)

Quadratic harnesses and Askey-Wilson integral

Wlodzimierz Bryc
(University of Cincinnati)

We use the Askey-Wilson distribution to give an elementary construction of a large class of quadratic harnesses on finite and infinite time intervals.

Lamperti Stable processes

Maria Emilia Caballero
(UNAM, Mexico)

The Lamperti stable processes form a new class of Lévy processes that have many interesting properties.They share many of them with the tempered and layered stable processes and many tractable mathematical expressions can be computed in this case. Based on joint work with Juan Carlos Pardo Millan and Jose Luis Perez Garmendia.

Connectivity phase transitions in fractal percolation II

Federico Camia
(University of Amsterdam)

Partly motivated by the desire to better understand the "discontinuous" behavior of the percolation phase transition in Mandelbrot's fractal percolation (see E. Broman's talk with the same title as this one), I will introduce a class of statistically self-similar fractal percolation models that generalizes the scale invariant Poisson Boolean model (in which balls of different radii are positioned in space according to a marked Poisson process). The models present a "discontinuous" connectivity phase transition analogous to that of Mandelbrot's fractal percolation. Moreover, the origin of the "discontinuity" can be traced to their statistical self-similarity. In two dimensions, a notable example of the type of models considered in this talk is the Brownian loop soup recently introduced by Lawler and Werner. (Joint work with Erik Broman.)

Multifractional random walk

Laure Coutin
(Université Paris 5)

We integrate a multiplicative cascade with respect to the fractional Brownian motion and study its self similarity property .

Time reversal of fractional Brownian motion driven SDE

Laurent Decreusefond
(ENST, Paris)

We consider stochastic differential equations driven by multi-dimensional fBm. Under time reversal, these equations are transformed into past dependant stochastic differential equations driven by a standard Brownian motion.

A continuum-tree-valued Markov process

Jean-Françcois Delmas
(CERMICS)

We present a construction of a Levy continuum random tree (CRT) associated with a super-critical continuous state branching process. We extend the pruning procedure to this super-critical case using Girsanov transformation technics. This procedure allows to construct a Levy-CRT-valued Markov process $(G_\theta, \theta \in \Theta)$, with $\Theta \subset R$ such that, when $\theta > 0$, G_θ is a CRT associated to a sub-critical branching process whereas, when $\theta < 0$, the associated branching process is super-critical. We then consider the explosion time A of the CRT: the smaller (negative) time θ for which G_θ has finite mass. We describe the law of A as well as the distribution of the CRT just after this explosion time. The CRT just after explosion can be seen as a CRT conditioned not to be extinct which is pruned with an independent intensity related to A. We also study the evolution of the CRT-valued process after the explosion time. This extends results from Aldous and Pitman on Galton-Watson trees. For the particular case of the quadratic branching mechanism, we show that after explosion the total mass of the CRT behaves like the inverse of a stable subordinator with index 1/2. This result is related to the size of the tagged fragment for the fragmentation of the Aldous CRT. This is joint work with Romain Abraham.

The density of the maximum of a stable process

Ronald Doney
(University of Manchester)

New results about the asymptotic behaviour of this density, both for small and large times, are described. This is joint work with M.S. Savov, Université Paris 6.

The packing measure

Thomas Duquesne
(Université Paris 6)

We prove that the total range of Super-Brownian motion with quadratic branching mechanism has an exact packing measure with respect to the gauge function $g(r) = r^4(\log\log 1/r)^{-3}$ in super-critical dimensions $d \geq 5$. More precisely, we prove that the total occupation measure of Super-Brownian motion is equal to the g-packing measure restricted to its range, up to a deterministic multiplicative constant that only depends on space dimension d

Valuation of exotic options in Lévy models

Ernst Eberlein
(University of Freiburg)

We will exploit results from the fluctuation theory of Lévy processes to derive expressions for the extended characteristic function of the supremum and the infimum of a Lévy process. These will be used in valuation formulas for a number of exotic options in exponential Lévy models. This is joint work with Katrin Glau and Antonis Papapantoleon.

Explicit formulaes solving the exit problem for a class of Lévy processes and applications

Sonia Fourati
(INSA de Rouen)

After relating the exit problem for Lévy processes to an inverse spectral problem, we exhibit a class of Lévy processes where this problem can be fully solved. A financial application to pricing double barrier options is given.

Limit laws for stick-breaking partitions

Alexander Gnedin
(University of Utrecht)

Combinatorial partitions induced by stick-breaking appear in various contexts such as fragmentation, coalescent trees and data structures. In this talk we discuss (i) possible limit laws for the total number of blocks, (ii) point process convergence in the small-blocks problem, (iii) application to the number of collisions in exchangeable coalescents.

Asymptotic behavior of solutions to the fragmentation equation with shattering: an approach via self-similar Markov processes

Bénédicte Haas
(Université Paris 9)

The subject of this talk is a fragmentation equation with non-conservative solutions, some mass being lost to a dust of zero-mass particles as a consequence of an intensive splitting. Under some assumptions of regular variation on the fragmentation rate, we describe the large-time behavior of solutions. Our approach is based on probabilistic tools: the solutions to the fragmentation equation are constructed via non-decreasing self-similar Markov processes that reach continuously 0 in finite time. Our main probabilistic result describes the asymptotic behavior of these processes conditioned on non-extinction and is then used for the solutions to the fragmentation equation.We notice that two parameters influence significantly these large-time behaviors: the rate of formation of "nearly-1 relative masses" (this rate is related to the behavior near 0 of the Lévy measure associated to the corresponding self-similar Markov process) and the distribution of large initial particles. Correctly rescaled, the solutions then converge to a non-trivial limit which is related to the quasi-stationary solutions to the equation. Besides, these quasi-stationary solutions, or equivalently the quasi-stationary distributions of the self-similar Markov processes, are entirely described.

Energy density in 2D Ising model

Clément Hongler
(Université de Genève)

We will present some rigorous and exact results on Ising model at critical temperature using conformal invariance techniques / SLE techniques. In particular we will give a computation of the energy density in an arbitrary bounded domain and a general class of lattices (isoradial graphs) as the mesh size tends to 0. This is joint work with Stanislav Smirnov.

Fractional fields indexed by metric spaces

Jacques Istas
(Université de Grenoble)

We define fractional fields indexed by metric spaces, and investigate their properties (existence, spectral representation), statistical estimation and simulations.

Detection of oscillating singularities in signals: A new avatar of multifractal analysis

Stéphane Jaffard
(Université Paris 12)

Oscillating singularities are Hölder singularities which display fast oscillations in the neighborhood of a point x_0, such as

$$|x - x_0|^H \sin\left(\frac{1}{|x - x_0|^\beta}\right);$$

the detection of such behaviors is a key issue in signals issued from several areas of physics, such as turbulence of gravitational waves.

It is well known that the Hölder exponent of a function f can be derived from the scaling behavior of "wavelet leaders", which are local suprema of the coefficients of the signal f on either an orthonormal wavelet basis, or a biorthogonal wavelet basis. In contrast, oscillating behaviors can be detected by comparing the wavelet leaders of f and of fractional integrals of f. Based on this argument, one can derive multifractal formalisms, which are expected to yield either oscillating singularity spectra, which are either of the form $\Delta(\beta)$ (Hausdorff dimensions of the sets of points where the oscillation exponent takes the value β), or $d(H,\beta)$ where the Hölder exponent takes the value H and the oscillation exponent takes the value β. In particular the fact that $\Delta(\beta)$ is supported at the origin, indicates that no oscillating singularities are present in the signal.

These formalisms are based on alternative scaling functions, which encode new notions of self-similarity, fitted to the oscillation exponent β.

We will give the mathematical foundations of such formalisms, and their use for real-life signals.

This talk is based on joint work with P. Abry and S. Roux.

Green function estimates for α-stable Ornstein-Uhlenbeck processes

Tomasz Jakubowski
(Wroclaw University of Technology)

We consider the Ornstein-Uhlenbeck process X driven by isotropic α-stable process Y. We prove that for index of stability $\alpha > 1$, the Green functions of processes X and Y are comparable in smooth domains. We give some applications.

Zeros of Airy Function and Relaxation Process

Makoto Katori
(Chuo University)

Dyson's model is a one-dimensional system of Brownian motions with long-range repulsive forces acting between any pair of particles with strength proportional to the inverse of distances with proportionality constant $\beta/2$. When $\beta = 2$, this is realized as the Brownian motions in one dimension conditioned never to collide with each other. For any initial configuration, it is proved that Dyson's model with N particles, $\mathbf{X}(t) = (X_1(t), ..., X_N(t)), t \in [0, \infty), 2 \leq N < \infty$, is determinantal in the sense that any multitime correlation function is given by a determinant with a continuous kernel. The Airy function $\mathrm{Ai}(z)$ is an entire function with zeros all located on the negative part of the real axis $\mathbf{R}$. We consider Dyson's model starting from the first N zeros of $\mathrm{Ai}(z)$, $0 > a_1 > \cdots > a_N, N \geq 2$. In order to properly control the effect of such initial confinement of particles in the negative region of $\mathbf{R}$, we impose a drift term to each Brownian motion, which increases in time as a parabolic function : $Y_j(t) = X_j(t) + t^2/4 + \{d_1 + \sum_{l=1}^{N}(1/a_l)\}t$, $1 \leq j \leq N$, where $d_1 = \mathrm{Ai}'(0)/\mathrm{Ai}(0)$. We show that, as the $N \to \infty$ limit of $\mathbf{Y}(t) = (Y_1(t), ..., Y_N(t))$, we obtain an infinite particle system, which is the relaxation process from the configuration, in which every zero of $\mathrm{Ai}(z)$ on $\mathbf{R}$ is occupied by one particle, to the stationary state μ_{Ai}. The stationary state μ_{Ai} is the determinantal point process with the Airy kernel, which is spatially inhomogeneous on $\mathbf{R}$ and the distribution of the position of the rightmost particle obeys the Tracy-Widom distribution. (This is a joint work with Hideki Tanemura, Chiba University.)

Combining Stein's method with Malliavin calculus, I: general theory

Ivan Nourdin
(Université Paris 6)

We show how to combine Stein's method and Malliavin calculus, in order to obtain explicit bounds in the normal approximation of functionals of Gaussian fields. When applied to random variables living on a fixed Wiener chaos, our method yields a drastic simplification of the method of moments and cumulants. Several applications of these ideas are discussed in G. Peccati's talk.

The upper envelope of positive self-similar Markov processes

Juan Carlos Pardo
(University of Bath)

In this talk, we establish integral tests in connection with laws of the iterated logarithm at 0 and at ∞, for the upper envelope of positive self-similar Markov processes. Our arguments are based on the Lamperti representation and on the study of the upper envelope of the future infimum.

Law of the absorption time of self-similar Markov processes

Pierre Patie
(University of Bern)

Consider a self-similar Markov process with the point 0 as an absorbing state. In this talk, we discuss the problem of finding the law of this absorption time.

Combining Stein's method with Malliavin calculus, II: optimal bounds and universality

Giovanni Peccati
(Université Paris 10)

We pursue the circle of ideas discussed in the previous talk by I. Nourdin, by showing how to use Stein's method and Malliavin calculus in order to obtain optimal rates of convergence in CLTs involving functional of Gaussian fields. Our results are related to Edgeworth expansions. In the final part of the talk, we will also state and prove a universality result for normal approximations on a general (not necessarily Gaussian) chaos.

Projections of percolation fractals

Michal Rams
(Polish Academy of Sciences)

I am going to present my recent results (joint with Károly Simon and Yuval Peres) on projections of percolation fractals. We prove for them stronger versions of Marstrand Theorem, both for sets and for measures.

Convergence of the weighted quadratic variations of some fractional Brownian sheets

Anthony Réveillac
(Université de La Rochelle)

In this talk we present a central limit theorem for the weighted quadratic variations of the standard Brownian sheet. This result leads to the construction of an asymptotically normal estimator of the diffusion coefficient of some two-parameter processes. In addition, we study the asymptotic behavior of the quadratic variations of some fractional Brownian sheets. We finally compare our results with those obtain very recently in the fractional Brownian motion case by I. Nourdin, D. Nualart, C.A. Tudor and myself.

Difference of random Cantor sets

Károly Simon
(University of Budapest)

This is survey of my joint results with M. Dekking, B. Solomyak and P. Mora about the algebraic difference of random Cantor sets. We give some conditions under which the algebraic difference of two random Cantor sets contains interval or has positive Lebesgue measure.

Noncolliding Processes and Random Matrices

Hideki Tanemura
(Chiba University)

Some systems of one-dimensional diffusion processes conditioned never to collide with each other is realized as processes of eigenvalues of hermitian matrix valued diffusion processes. In this talk we show that these systems are determinantal, in the sense that any multi-time correlation function is given by a determinant specified by a kernel. We also study asymptotic behaviors of the systems, and infinite particle systems obtained by taking appropriate scaling limits.

Application of Malliavin calculus to long-memory parameter estimation for non-Gaussian processes

Ciprian Tudor
(Université Paris 1)

We discuss recent results concerning the variations and the wavelet analysis of self-similar stochastic processes by using the techniques of the Malliavin calculus and the chaos expansion into multiple stochastic integrals. Our examples are the fractional Brownian motion and the Rosenblatt process. We discuss the application of these results to the estimation of the self-similarity order.

Markovian Bridges: weak continuity and pathwise constructions

Gerónimo Uribe Bravo
(UNAM, Mexico)

A Markovian bridge is a probability measure taken from a disintegration of the law of an initial part of the path of a Markov process given its terminal value. As such, Markovian bridges admit a natural parametrization in terms of the state space of the process. In the context of Feller processes with continuous transition densities, we construct by weak convergence considerations the only versions of Markovian bridges which are weakly continuous with respect to their parameter. We use this weakly continuous construction to provide an extension of the strong Markov property in which the flow of time is reversed. In the context of self-similar Feller process, the last result is shown to be useful in the construction of Markovian bridges out of the trajectories of the original process. This is joint work with Loïc Chaumont (Université d'Angers).

On subexponentiality of the Lévy measure of the diffusion inverse local time. Application to penalization

Pierre Vallois
(Université de Nancy)

For a recurrent linear diffusion on $\mathbb{R}_+$ we study the asymptotics of the distribution of its local time at 0 as the time parameter tends to infinity. Under the assumption that the Lévy measure of the inverse local time is subexponential this distribution behaves asymtotically as a multiple of the Lévy measure. Using spectral representations we find the exact value of the multiple. For this we also need a result on the asymptotic behavior of the convolution of a subexponential distribution and an arbitrary distribution on $\mathbb{R}_+$. The exact knowledge of the asymptotic behavior of the distribution of the local time allows us to analyze the process derived via a penalization procedure with the local time. This result generalizes the penalizations obtained in Roynette, Vallois and Yor for Bessel processes. This is joint work with P. Salminen (Turku University, Finland).

Quadratic harnesses-transformations and conditioning

Jacek Wesolowski
(Warsaw University of Technology)

Quadratic harnesses are stochastic processes with linear conditional expected values and quadratic conditional variances. These properties are preserved by a class of space and time transformations defined in terms of bivariate affine maps, though the parameters (there are five numerical parameters, which define a quadratic harness) are changing. Such transformations, while applied to quadratic harness bridges, lead to new examples of such harnesses. Also they allow to study glueing constructions for quadratic harnesses. This is a joint work with Wlodzimierz Bryc (Univ. of Cincinnati).

Regenerative tree growth: binary self-similar continuum random trees and Poisson-Dirichlet compositions

Matthias Winkel
(University of Oxford)

We use a natural ordered extension of the Chinese Restaurant Process to grow a two parameter family of binary self-similar continuum fragmentation trees. We provide an explicit embedding of Ford's sequence of alpha model trees in the continuum tree which we identified in a previous article as a distributional scaling limit of Ford's trees. In general, the Markov branching trees induced by the two-parameter growth rule are not sampling consistent, so the existence of compact limiting trees cannot be deduced from previous work on the sampling consistent case. We develop here a new approach to establish such limits, based on regenerative interval partitions and the urn-model description of sampling from Dirichlet random distributions. This is joint work with Jim Pitman, to appear in the Annals of Probability.

Self-similar Gaussian Random Fields and Their Properties

Yimin Xiao
(Michigan State University)

In this talk, we discuss the properties of anisotropy, self-similarity, long range dependence and local nondeterminism of Gaussian random fields. We also present some recent results on the hitting probabilities, intersection local times and fractal properties of anisotropic Gaussian random fields.

Posters

Occupation time problem for fractional Brownian motion and other self-similar processes

Mohamed Ait Ouahra
(Université d'Oujda)

We study the regularity of the fractional derivative of the local time of some self-similar processes and we establish limit theorems for occupation time problems for a class of self-similar processes. Finally, we get the strong approximation analogues of our limit theorems. Fractional derivative and Hilbert transform of the local time of self-similar processes are limits of occupation time problems.

Moments method for Geiger-Heckerman characterization of the Dirichlet distribution

Konstancja Bobecka-Wesolowska
(Warsaw University of Technology)

Geiger and Heckerman (1997) characterized an array of random probabilities using neutralities with respect to row and column partitions of the set of indices. Their method of proof was based on a functional equation for densities. To obtain the result they used a sophisticated regularization technique due to Jarai. We will show how the result follows through the method of moments without any smoothness assumptions. The characterization will be further extended to multi-way tables of random probabilities.

Modeling trading fluctuations in the financial market by means of spatio-temporal interacting agents

Maria Boguta
(University of Halmstad)

A space-time model for volatility clustering in the trading moods of interacting agents in the financial market is considered. For the spatial part this means a Curie-Weiss model and for the temporal dependence structure the model of Järpe (Markov Processes and Related Fields, 2005). A test for independence between agents is derived and the use of it illustrated in an example with data from trading with the share Swedish Steel in the Stockholm stock exchange market. The goal with this project is to provide an accurate model for recognizing situations which could threaten the national financial stability.

Two optimality results about sample paths properties of Operator Scaling Gaussian Random Fields

Marianne Clausel
(Université Paris 12)

We study the sample paths properties of a large class of Operator scaling Gaussian random fields (OSGRF). Such fields are anisotropic generalizations of self- similar fields. We proved that any anisotropy of these fields have some specific features. More precisely, the best way of measuring smoothness is related to these anisotropies and thus to the genuine geometry of these fields.

On the scaling property in fluctuation theory for α-stable processes

Fernando Cordero
(Université Paris 6)

Let X be an α-stable process with $\alpha \in]1, 2[$. For a fixed instant $t > 0$, we are interested in the joint distribution of the following three random variables: (1) the value of the process X at t, (2) the maximum value of the process until t and, (3) the last time $s \leq t$ where the value of X at s equals maximum value of X until t. Given $x > 0$ we also study the joint distribution of the time t for which the process exceeds the barrier x and the position of the process at this instant. Pecherskii and Rogozin studied both joint distributions in the more general framework of independent increment processes, and obtained expressions for some exponential transforms of them when t

and x are supposed to be independent and exponentially distributed. In this work we show that the scaling property allows to invert these expressions and thus allows to obtain the previous exponential transforms when the variables x and t are deterministic instead of exponentially distributed. Finally, from these new formulas we re-obtain classical results of fluctuation theory.

Monitoring of Credit Default Swaps by means of a Cusum procedure

Eric Järpe
(University of Halmstad)

Credit default swaps (CDS) are the most traded kind of credit derivatives in the financial market. However they are "over-the-counter deals" which means that there is no central authority registering statistics about these transactions. Instead statistical inference is based on CDS spreads which is a function of a reference entity. The model considered for the CDS spreads is the AR model with ARCH errors.

Now, assume that the expectation function of the process at a random time-point shifts from a constant to linearly increasing function. The problem of consideration is the on-line detection of this change as accurately and quickly as possible. To this end a Cusum stopping rule is derived, the performance is examplified using real data and theoretically evaluated by the conditional expected delay of motivated alarm having calibrated such that the in-control runlength is 100.

The conclusions are that the method work well, but could be radically improved by allowing for a simultaneous shift in both variance and mean. Also more examples are needed to realize the relevance of the assumptions made.

Processus cumulatifs, approximation en loi au sens fonctionnel. Exemples d'applications

Wissem Jedidi
(University of Tunis)

In traffic modeling theory, many authors are interested by models dealing with cumulative input processes. Particular Poisson shot noise occur in the representation of the cumulative input processes. In numerous situations, these processes are self-decomposable. In our work, we propose a model based on a general Poisson shot noise representation. Under minimal assumptions, we obtain an approximation of the cumulative input process by a stable Lévy motion via a functional limit theorem.

Max-stable processes and negative definite functions

Zakhar Kabluchko
(University of Goettingen)

Let $W_i, i \in \mathbb{N}$, be independent copies of a zero mean Gaussian process $\{W(t), t \in \mathbb{R}^d\}$ with stationary increments and variance $\sigma^2(t)$. Independently of W_i, let $\sum_{i=1}^{\infty} \delta_{U_i}$ be a Poisson point process on the real line with intensity $e^{-y}dy$. We show that the law of the random family of functions $\{V_i(\cdot), i \in \mathbb{N}\}$, where $V_i(t) = U_i + W_i(t) - \sigma^2(t)/2$, is translation invariant. In particular, the process $\eta(t) = \bigvee_{i=1}^{\infty} V_i(t)$ is a stationary max-stable process with standard Gumbel margins. The class of processes described above arises naturally in the study of the pointwise maximum of a large number of independent Gaussian processes. Let X_i, $i \in \mathbb{N}$, be independent copies of a stationary Gaussian process $\{X(t), t \in \mathbb{R}^d\}$ whose covariance function varies regularly at zero. Then we show that for suitable a_n, b_n, s_n the pointwise maximum $\eta_n(t) = a_n(\max_{i=1,\dots,n} X_i(s_n t) - b_n)$ converges as $n \to \infty$ to a process η of the form η described above. Conversely, a process η is a limit of a suitably normalized and rescaled pointwise maximum of n i.i.d. stationary Gaussian processes as $n \to \infty$ if and only if the generating Gaussian process W is a (non-isotropic) fractional Brownian motion on $\mathbb{R}^d$. If the time allows, we discuss also the corresponding problem for the pointwise minima (of absolute values of) stationary Gaussian processes. The resulting limiting processes have the property of semi-min-stability.

Strong law of large numbers for fragmentation processes

Robert Knobloch
(University of Bath)

For self-similar fragmentation processes we prove the almost sure convergence of an empirical measure, associated with the stopping line corresponding to the first fragments of size strictly smaller than η, as η tends to zero.

Long range percolation on a class of hierarchical lattices generated by trees

Vyacheslav Koval
(University of Utrecht)

We consider a long range percolation on a class of hierarchical lattices formed by a countable set of points with an ultrametric distance generated by a regular tree. On a certain class of connection functions we give the critical value which separates the percolating and not percolating regimes.

Hardy Spaces of functions harmonic with respect to the Laplacien perturbated by gradient in smooth domains

Tomasz Luks
(Université d'Angers)

We investigate Hardy spaces h^p for the L-harmonic functions on smooth domains, where $L = \frac{1}{2}\Delta + b(\cdot) \cdot \nabla$ and b is a vector field satisfying some conditions of Kato type. In this context we show the classical correspondence between the L^p spaces on the boundary and h^p spaces of functions.

Spectral Analysis of Multivariate Self-similar Processes

Navideh Modarresi
(University of Tehran)

A stochastic discrete-time scale invariance process (DT-SI) is proposed and its properties is studied. Such processes are invariant by dilation for certain preferred scaling factor l. We decide about the number of observations in each scale, say T and find α by the equation $l = \alpha^T$. We provide the spectral density matrix of the process. Associated to these process, multivariate self-similar process is introduced and their spectral density matrix is obtained.

Self-similar processes in finance from the compound Poisson process

Carlos Pacheco-Gonzalez
(CINVESTAV-IPN, Mexico)

We construct self-similar processes using the discounted version of the compound Poisson process (CPP). The construction arises using the limit of a Orstein-Uhlenbeck process driven by the CPP, also called a perpetuity. We are motivated by the model developed in Carr, Geman, Madam and Yor (2007) for financial modeling. One of the key features of these models is that they posses self-decomposability properties.

On operator fractional Brownian motions

Vladas Pipiras
(UNC Chapel Hill)

We obtain several new results on operator fractional Brownian motions (OFBMs), which are Gaussian operator self-similar processes with stationary increments. They are multivariate analogues of the one-dimensional fractional Brownian motion. We establish integral representations of OFBMs in the spectral and time domains. We study basic properties of OFBMs such as time reversibility and the behavior of the spectral density around zero, explore the notion of Operator Brownian Motion and study questions of uniqueness.

Discrete Time Scale Invariant Markov Processes

Saeid Rezakhah
(University of Tehran)

In this paper we consider a discrete scale invariant Markov process with scale l which by a scheme of sampling at discrete points we provide discrete time scale invariant Markov (DT-SIM) process. We also define quasi Lamperti transformation as a basic tool in relation with such sampling. We study the properties of a DT-SIM process and find the covariance function of it which is specified by the values of $\{R_j^H(1), R_j^H(0), j \in \mathbf{Z}^+, 0 \leq j \leq T-1\}$, where $R_j^H(\cdot)$ is the covariance function of jth and $(j+1)$th observations of DT-SIM and T is the number of observations in each scale. We show that the process is long memory if and only if $l > 1$. We also define T-dimensional self-similar Markov process corresponding to DT-SIM process and characterize its covariance matrix.

Is long-range dependence we observe in stock prices best modeled by fBm?

Georgiy Shevchenko
(University of Kiev)

In this talk I will give a partial answer to the question given in the title. Namely, a simple model of an exchange will be considered and the scaling limit of the pricing process will be found.

Random fragmentation on a Lévy continuum random tree

Guillaume Voisin
(Université d'Orléans)

We present here a general fragmentation on a critical or sub-critical continuum random tree (CRT). In order to construct this fragmentation, we define marks on the nodes and on the skeleton of the CRT and we construct a pruning procedure according to these marks.

The CRT is associated with a continuous state branching process (CSBP) defined by a branching mechanism ψ and it can be studied by a Lévy process. Using this Lévy process, we define the height process of the CRT that can be viewed as the "generations" of the individuals of the tree. We use it to construct the marks on the nodes and the marks on the skeleton of the tree. We also use Lévy Poisson snakes to define the marks on the skeleton.

In a first part, we fix a general tree associated with the branching mechanism ψ and we fix an another branching mechanism ψ_0. Then, we construct the marks process on the entire tree and we obtained a pruned random tree that represents the sub-tree "under" the first marks. We obtain that the height process associated with this sub-tree has the same distribution as the height process associated with ψ_0.

In a second part, we consider all the marks put in the CRT and we increase the number of marks when a time parameter increases. By the same pruning procedure, we obtain fragments of the CRT and each of them break when time increases. This construction gives us a fragmentation on the CRT. We compute the Laplace transform of the fragmentation measure which describes how a fragment breaks into other fragments.

Tree structured independence for exponential Brownian functionals

Piotr Witkowski
(Warsaw University of Technology)

The product of GIG and gamma distributions is preserved under the transformation $(x, y) \mapsto ((x+y)^{-1},\ x^{-1} - (x+y)^{-1})$. It is also known that this independence property may be reformulated and extended to that on trees. The bivariate case was interpreted through conditional independencies of functionals of exponential Brownian motions by Matsumoto and Yor. The purpose of this talk is to extend this approach to the independence property on trees which originally was derived outside of the framework of stochastic processes. The main result is formulated in terms of conditional independencies of functionals of a family of exponential Brownian motions built upon a single Brownian motion. This is a joint work with H. Matsumoto and J. Wesolowski.

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