Conference ProbaGeo

11-13 June 2012

Titles and Abstracts

Antoniouk Alexandra

Title : Properties of stochastic flows and contraction of manifolds

Abstract : In this talk we are going to present some properties of the solution to SDE equation with monotone coefficients which may be, in particular, not locally Lipschitz. Such a kind of systems has motivation from physical applications. We consider these equations on the non-compact Riemannian manifold which suppose that the coefficients may grow at infinity. We state the continuous and smooth properties of solutions with respect to the initial data as well the smooth properties of corresponding Markov semi-group. Besides this we give a result, which shows the interplay between the moment stability of a SDE and the topology of the underlying manifold.

Bauer Robert

Title : Stochastic processes inspired by the geometry of the cell

Bell Denis

Title : Divergence theorems in path space

Abstract : We describe a method for constructing the divergence operator for the law of a diffusion processes defined on a closed finite-dimensional smooth manifold. The argument is based on lifting to the underlying Wiener space and is valid for degenerate as well as for elliptic diffusions. In the special case of a gradient system, we use our method to prove Driver's divergence formula for Wiener measure on a compact Riemannian manifold.

Cruzeiro Ana Bela

Title : On stochastic variational principles

Elworthy K. David

Title : A Rice type formula for fixed points of stochastic flows and the McKean-Singer formula

Abstract : I will describe a Rice type formula for the expected number of fixed points of a class of stochastic flows at a given time.

It is closely related to the McKean-Singer formula for the Euler characteristic of a compact Riemannian manifold : this would give the algebraic number of fixed points of our flow. The original proof of this by McKean and Singer was operator theoretic. It was shown by Kusuoka in 1987, to be a consequence of an infinite dimensional degree theorem. To do that he had to use stochastic analysis to overcome several technical difficulties because of the lack of differentiabilty of Brownian paths.

These difficulties do not arise if one uses processes with C^1 paths instead of Brownian motion. For a class of such processes the Rice formula can be proved and a similar formula to McKean-Singer's for the Euler-characteristic arises in terms of a supertrace. It is not clear how the latter could be proved analytically. If one approximates the Brownian motion by paths of Ornstein -Uhlenbeck processes, one gets a result for certain operators to which Bismut & Lebeau's techniques should be applicable in order to recover the usual formula.

The talk is based on joint work with AbdulRahman Al-Hussein.

Flandoli Franco

Title : The effect of a noise of transport type on certain PDEs

Abstract : The general problem addressed by this research is the possibility that noise may improve the theory of certain PDEs from the viewpoint of well posedness, specifically the questions of uniqueness of weak solutions and of singularities of solutions starting from regular initial conditions.

In analogy with the finite dimensional theory, the most natural noise would be a nondegenerate additive one but the results proved until now, very good for abstract equations, do not fit with usual fluid dynamic equations yet.

On the contrary, we have a number of examples where a bilinear multiplicative noise of transport type has positive effects. These results will be reviewed, in particular in connection with the problem of singularities.

Gradinaru Mihai

Title : Asymptotic behaviour of some time-inhomogneous diffusions

Guillin Arnaud

Title : Uniform convergence in Wasserstein distance for Fokker-Planck equation and granular media equation.

Juillet Nicolas

Title : Optimal transport in the Heisenberg group : Ricci curvature and diffusion

Léonard Christian

Title : Some transformations of Markov processes leading to curvature

Abstract : The first transformation we have in mind is a time-symmetric analogue of Doob's h-transform which we call (f, g)-transform. It leads to the notion of "entropic interpolation" between two probability measures on a state space. It is a stochastic analogue of McCann's interpolation which allows both recovering the basic results of the Bakry-Emery theory on a Riemannian manifold and extending it to a graph structure when considering continuous-time random walks, suggesting a natural definition of Ricci curvature on a graph.

The second transformation consists of slowing down to constant paths the (f, g)-transformed processes. In this limit, the entropic interpolation tends to some transport interpolation : a quadratic transport interpolation (McCann) in the Riemmannian setting and a metric transport interpolation in the graph setting.

We also consider some related functional inequalities : modofied logarithmic Sobolev and Talagrand transport inequalities.

Li Xue-Mei

Title : Convergence of stochastic processes on manifolds

Liao Ming

Title : Markov processes invariant under Lie group actions

Abstract : It is well known that a Markov process in a Euclidean space that is invariant under translations may be characterized by independent and stationary increments, and is called a Lévy process. By Lévy-Khinchin formula, it is represented by a triple of a drift, a covariance matrix and a Lévy measure. This representation may be extended to a Markov process in a Lie group G or a more general homogeneous space G/K that is invariant under the action of G. Such a process may also be characterized by independent and stationary (multiplicative) increments, and hence will be called a Lévy process in G or in G/K. By Hunt's generator formula, it may be represented by a triple just as its counter part in Euclidean space. More generally, we may consider a time inhomogeneous Markov process in G or G/K that is invariant under the G-action. Such a process may be characterized by independent increments (but not necessarily stationary), and may be called an inhomogeneous Lévy process. It can be shown that an inhomogeneous Lévy process is represented by a time-dependent triple through a martingale property. In the case of an irreducible homogenous space, such as a sphere, this representation takes a very simple form in which there is no drift and the covariance is a multiple of the identity matrix. This leads to a skew product decomposition for Markov processes invariant under a non-transitive action, extending the well known skew-product of Brownian motion in Euclidean spaces.

Savaré Giuseppe

Title : Spaces with Riemannian Ricci curvature bounded from below, heat flow and Dirichlet forms

Abstract : The talk will summarize some results (in collaboration with Luigi Ambrosio and Nicola Gigli) on the generation and the properties of the heat flow in a metric measure space (X, d, m) satisfying a $RCD(K, \infty)$ condition, a notion of lower Ricci curvature bound stronger than the one introduced by Sturm and Lott-Villani but still stable with respect to measured Gromov-Hausdorff convergence. Starting from the distance and the measure, in RCD-spaces it is possible to construct a canonical Dirichlet form satisfying the Bakry-Emery condition and to prove the corresponding gradient estimates. The deep relations between this approach and the contraction-regularization properties of the heat flow in the Wasserstein spaces will also be discussed.

Veysseire Laurent

Title : TBA

Wünsch Marcus

Title : Stable models for the distribution of capital

Abstract : The distribution of capital, or, equivalently, the size distribution of firms, is an important descriptive characteristic of equity markets. A particularly convenient way to study this feature is by looking at the capital distribution curve, which refers to the log-log plot of the market weights arranged in descending order, i.e., the logarithms of the market weights versus the logarithms of their respective ranks. This curve has exhibited a remarkable stability for the US equity market for the last eight decades. In this talk, I will review the existing literature on this phenomenon, and compare it with two new models based on the particle approximation of the Wasserstein diffusion, as well as Wishart processes. Numerical examples promoting this approach will also be presented. (This is joint work with Josef Teichmann.)