Opening Workshop Full Programm
3-5 September 2014, Moscow, Russia

September 3, Wednesday

10.00-11.30

S. Molchanov (UNCC, Charlotte)

Title**: Global limit theorems and their applications**

Abstract:

The random walks in R^d play the central role in analysis of many practically important stochastic systems (Cramer – Lundberg risk models in the insurance business, contact processes in the population dynamics, phase transition for the polymers etc.). Their distributions in the area of the "typical deviations" are the subject of the classical theory of summation of i.i.d.r.v. But as a rule, in the applications we need the large deviation results. The corresponding theory for the light tails essentially goes to Cramer, but the large deviations for the heavy tailed random walks attracted the attention of the specialists just recently (the school of A. A. Borovkov and many others). The theory is not yet complete, especially in multi-dimensional case. The part of the talk will contain a brief review of some recent results in this area. In the second part we will discuss the applications. They will include the analysis of the intermittency phenomena in the population dynamics and Cramer – Lundberg type theory based on the empirical data.

12.00-12.45

Alexander Gushchin (MIRAN+HSE)

Title: **On embedding of processes**

Abstract:

In his seminal papers (1972, 1978) Monroe proves two theorems on embeddings of stochastic processes in a Brownian motion. In the talk we present some complements to these results. This is joint work with Mikhail Urusov.

12.45-13.30

Denis Belomestny (University Duisburg-Essen)

Title: **Statistical Skorohod embedding problem and its generalizations**

Abstract:

Given a Levy process L, we consider the so-called statistical Skorohod embedding problem of recovering the distribution of an independent random time T based on i.i.d. sample from

L_{T}. Our approach is based on the genuine use of the Mellin and Laplace transforms. We propose a consistent estimator for the density of T, derive its convergence rates and prove their optimality. It turns out that the convergence rates heavily depend on the decay of the Mellin transform of T. We also consider the application of our results to the problem of statistical inference for variance-mean mixture models and for time-changed Levy processes.

15.00-16.30

Alexandre Tsybakov (CREST-ENSAE, France)

Title: **Linear and Conic Programming Approaches to High-Dimensional Errors-in-variables Models.**

Abstract:

We consider the regression model with observation error in the design when the dimension can be much larger than the sample size and the true parameter is sparse. We propose two new estimators, based on linear and conic programming, and we prove that they satisfy oracle inequalities similar to those for the model with exactly known covariates. The only difference is that they contain additional scaling with the l_1 or l_2 norm of the true parameter. The scaling with the l_2 norm is minimax optimal and it is achieved on conic programming, while the scaling with the l_1 norm is achieved on the linear programming estimator, which is easier to implement. This is a joint work with Alex Belloni and Mathieu Rosenbaum.

17.00-17.45

Hilmar Mai (WIAS, Berlin)

Title: **Robustness of likelihood estimators for diffusions via rough paths**

Abstract:

We consider the estimation problem of the drift coefficient within the classes of diffusion processes. The Maximum Likelihood Estimator (MLE) is analyzed with regard to its pathwise stability properties and robustness towards misspecification in volatility and even the very nature of noise. We show that in dimension larger than one the classical MLE suffers from stability problems. To resolve this issue we construct a version of the estimator based on rough integrals (in the sense of T. Lyons) and present strong evidence that this construction resolves a number of stability issues inherent to the standard MLEs. We will also discuss some numerical examples to demonstrate the relevance of our results for applications.

September 4, Thursday

10.00-11.30

Denis Talay (Sophia-Antipolice, France)

Title: **On some singular McKean-Vlasov particle systems arising in Neurosciences: existence, uniqueness, propagation of chaos, means field limits.**

Abstract:
We present recent results on some McKean-Vlasov particle systems arising in Neurosciences with, either non smooth coefficients, or non classical interactions by means of hitting times at a given threshold. We prove that the particle systems are well posed and propagate chaos, and we prove that the mean field limits are well posed.

12.00-12.45

Alexander Veretennikov (Leeds, UK)

Title: **On Poisson equation with potential**

Abstract:
Poisson equations in the whole space for ``ergodic'' generators with a potential which may have a ``wrong sign'' are studied. In several cases it is shown that such equations are well-defined and, hence, possess correct and uniquely determined solution in appropriate function classes.

12.45-13.30

S. Menozzi (Univ. Evry, France)

Title: **The Landau Equation for Maxwellian molecules and the Brownian Motion on SO_R(N)**

Abstract:
In this paper we prove that the spatially homogeneous Landau equation for Maxwellian molecules can be represented through the product of two elementary processes. Using this representation, we establish sharp multi-scale upper and lower bounds for the transition density of the Landau equation.

September 5, Friday

10.00-11.30

M. Nussbaum (Cornell University, Ithaca, NY, USA)

Title: **Asymptotic Error Rates in Quantum Hypothesis Testing**

Abstract:

Quantum communication protocols which are secure against eavesdropping utilize exponential error bounds for discrimination between probability measures, such as the classical Chernoff bound. This motivates the study of more general testing problems between different possible states of a quantum system, represented by density operators on a complex Hilbert space. A test or detector in this setting combines a quantum measurement, creating a probability space, with a classical statistical test. We consider testing for fixed hypotheses and an increasing number of identical copies of a quantum system, which implies that the error rates tend to zero exponentially and the focus is on the exponent. Recently many classical large deviation type results on hypothesis testing have been generalized to the quantum setting, such as Stein's lemma, the Sanov theorem, and also the Chernoff and Hoeffding bounds. We present a unified perspective on some of these problems, where it is possible to derive performance benchmarks from classical minimax risk bounds. We also discuss progress on the problem of discrimination between several quantum hypotheses.

12.00-12.45

Mark Kel'bert (HSE, Moscow)

Title: **Mermin-Wagner theorem and Dobrushin-Lanford-Ruelle (DLR) equations in quantum statistics and quantum gravity.**

Abstract:

The Mermin-Wagner principle in classical statistical mechanic states that in dimensions $d=1, 2$ an external magnetic field cannot destroy the symmetry of interaction potential. We establish a similar principle for a number of models of quantum statistical mechanic.

12.45-13.30

Dasha Loukianova (University of Evry, France)

Title: **Parametric estimation for Random Walk in Random environment (RWRE) and DNA unzipping.**

Abstract:
We study the asymptotic properties of Maximum likelihood estimator for a parameter of the law of the environment in the model of one-dimensional RWRE and explain how this model is used by biophysicists to describe the DNA unzipping experiment. When the walk is transient (ballistic and sub-ballistic), we show that the underlying process of left steps, which exhibits a structure of branching process in random environment, is recurrent. This process permits to find out the MLE's asymptotic in this case. When the RWRE is recurrent, this last process of left steps explodes and became useless. We propose instead to use the localization of the RWRE in its main valley.

15.00-15.45

Q. Paris (HSE, Moscow)

Title: " Supervised classification of Cox processes"

Abstract:
In this talk, we will address the problem of functional supervised classification of Cox process trajectories, whose random intensity is driven by some exogenous random covariable. The classification task is achieved through a regularized convex empirical risk minimization procedure, and a nonasymptotic oracle inequality is derived. We will show that the algorithm provides a Bayes-risk consistent classifier. Furthermore, it is proved that the classifier converges at a rate which adapts to the unknown regularity of the intensity process. Our results are obtained by taking advantage of martingale and stochastic calculus arguments, which are natural in this context and fully exploit the functional nature of the problem.

15.45-16.30

V. Panov (HSE, Moscow)

Title: **"Maximal deviation distribution for the projection estimates of Levy densities"**

Abstract:
This talk is devoted to projection estimates for Levy densities in high-frequency setup. After a short introduction to the theory of statistical inference for Levy processes, I will present new results concerning the convergence rates of the projection estimates. These

results are based on some fresh ideas, which allow to reformulate the problem in terms of Gaussian processes and to find the asymptotic distribution of the supremum of these processes.

17.00-17.45

V. Spokoiny (Humboldt Univ.+WIAS, Berlin)

Title: **"Construction of the sharp confidence bands using multiplier bootstrap"**

Abstract:

The talk discusses the use of a multiplier bootstrap procedure for constructing sharp confidence bands in generalized regression. Theoretical results justify this procedure for finite samples and a possible model misspecification.