Abstracts

Speaker: **Mikhail Lifshits** (St. Petersburg State University)

Title: Coding of Poisson random sets: large deviations

Abstract: Consider a random set (or "picture") in the unit cube of d-dimensional Euclidean space as a union of balls centered at points of a Poissonian random field and having i.i.d. radii.
Let K be the minimal number of balls needed to reproduce the picture.
We study large deviation probabilities for K and prove in some cases that for large n
$$\ln P(K > n) \sim - A \ n \ln n$$
where the constant A may explicitly depend on dimension, on the distribution of radii, and on the norm under consideration. In many cases the problem of finding the value of A remains open although some upper and lower bounds are available.
This asymptotics has natural corollaries in high dimensional quantization problems.

This is a joint work with F. Aurzada (TU Darmstadt).

Speaker: **Alexander Gushchin** (Steklov Mathematical Institute)

Title: The Skorokhod embedding problem and single jump martingales

Abstract: We consider the class of local martingales that start from zero and such that their running maximum is continuous and the global maximum is a.s. finite. For such processes, the change of time generated by the running maximum process transforms a local martingale into a process of a very specific structure (in particular, it has a single jump down). At the same time, this change of time leaves unchanged the terminal value of the process and its global maximum. Assuming additionally that the time-changed process is a proper martingale, we characterize the corresponding set of joint distributions of the terminal value of a process and its global maximum. Finally, we show how each joint distribution from this set can be realized as a solution to the Skorokhod embedding problem with a minimal stopping time.

Speaker: **Yakov Nikitin** (St. Petersburg State University)

Title: A survey of tests for exponentiality with application to historic data

Abstract: Testing exponentiality is one of important statistical problems due to applications in survival analysis, reliability, queuing theory, biology, etc. There exist numerous tests of exponentiality, and we aim to classify them and discuss their properties including asymptotic efficiency. Some new tests are also proposed and studied. In the second part of the talk we will apply several powerful tests of exponentiality to certain famous historical problems related to the distribution of reigns of various rulers in various epochs.

Speaker: **Enkelejd Hashorva** (HEC Lausanne)

Title: Max-stable stationary random fields and Pickands/Piterbarg constants

Abstract: The classical Pickands and Piterbarg constant appear in problems related to extremes of Gaussian processes and random fields. In this talk we shall discuss various generalisations of those constants which relate to max-stable random fields. Our main results concern new formulas, upper and lower bounds, and examples where these constants appear in different contexts including extremes of Gaussian and Levy processes.

This is a joint work with K. Debicki (U. Wroclaw).

Speaker: **Oleg Rusakov** (St. Petersburg State University)

Title: On double stochastic pseudo-Poisson processes and their properties of self-similarity

Abstract: Pseudo-Poisson processes have been introduced in chapter X of the famous monograph of William Feller ``An Introduction to Probability Theory and Its Applications.'' II, John Willey & Sons 1971. Pseudo-Poisson process represents a random change (Poisson randomization) of the discrete ``mathematical'' time of a Markov sequence to the continuous time. Thus Pseudo-Poisson processes are a type of subordinators for random sequences, when the leading process is a Poisson one. We consider a generalization of the leading Poisson processes to the case of random intensity. So, our subordination is driven by a Double Stochastic Poisson process, and such kind of subordinator for sequences we call as ``Double Stochastic Pseudo-Poisson Process'' or ``Double Stochastic Poisson Stochastic Index process'' (DS PSI process). Key lemma states that in the case when the subordinated sequence consists of i.i.d. random variables with a finite variance the corresponding Double Stochastic Pseudo-Poisson process has a property of stationarity in both wide and strict senses, and the covariance function explicitly is a Laplace transform of the random intensity. In simplest case when the random intensity degenerates at any fixed point \lambda >0 the corresponding covariance coincides with the covariance of Ornstein-Uhlenbeck process (stationary, Gaussian, Markov process). This fact explains the same property of a linear self-similarity as well for the Poisson process as for the Ornstein-Uhlenbeck process. Next we consider special cases of distribution of the random intensity which generates the covariance coinciding with covariance of the fractional Brownian motion (fBm) equipped with the Hurst exponent of self-similarity H in (0,1). We will discuss a number of applications to Actuarial science and to stochastic models of ``Information flows''.