



UNIVERSITY OF CYPRUS  
DEPARTMENT OF MATHEMATICS AND STATISTICS

## INVITATION

The Department of Mathematics and Statistics  
of the University of Cyprus  
invites you to the

### 5<sup>th</sup> Probability and Statistics Seminar Series

Speakers:

Professor Dag Tjøstheim, (University of Bergen, Norway)

Professor Alexander Lindner, ( Department of Mathematics, University of Braunschweig, Germany)

Professor Ilia Frenkel & Professor Lev Khvatskin, (Shami Shammon College of Engineering of Israel)

Dr Alexandros Beskos, (University College London, UK)

Professor Yosef Rinott, (The Hebrew University of Jerusalem, Israel)



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# Professor Dag Tjøstheim

(University of Bergen, Norway)

## “Measuring and analysing statistical dependence. Some old and new approaches”

Friday, 25 September 2009, 16:00-18:00  
Room 039

### Abstract:

We will give a survey of dependence measures as these are used in statistics. We start with the ordinary correlation function, and demonstrate how this measure may fail completely for non-Gaussian and nonlinear models. We then go on to discuss alternatives. First, global measures are presented. For these the dependence is given by one single number as in the correlation coefficient for two stochastic variables.

Next, local dependence is treated, where the dependence measure is allowed to vary with the values of the variables involved. For example it is a well known fact that there is stronger dependence between financial returns when the market is going down compared to when the market is stable. A substantial part of the lecture will be spent on the newly developed concept of local Gaussian correlation. It will be shown that this new measure can be used to describe asymmetries of financial returns, as observed for example during the current financial crises, and to model nonlinear relationships between stochastic variables.



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# Professor Alexander Lindner

(Department of Mathematics, University of Braunschweig, Germany)

## “Levy processes and Levy driven Ornstein-Uhlenbeck processes”

Friday, 9<sup>th</sup> October 2009, 16:00-18:00  
Room 039

### Abstract:

Levy processes are processes with stationary and independent increments. They have recently received much attention, since they have various applications in finance. In this talk we shall give an introduction to Levy processes where we give some examples and present the Levy-Kintchine formula as well as the Levy-Ito decomposition. We shall then motivate the Levy driven Ornstein-Uhlenbeck process as a natural continuous time analogue of AR(1) processes with i.i.d. noise and present examples where it is used.



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**Professor Ilia Frenkel**  
&  
**Professor Lev Khvatskin**

(Center for Reliability and Risk Management, Industrial Engineering and Management Department,  
SCE- Shamoon College of Engineering, Israel)

**“Reliability Measures Calculation of Multi-state Systems”**

Friday, 16<sup>th</sup> October 2009, 16:00-18:00  
Room 039

**Abstract:**

**Keywords:** reliability measures, Multi-state system, Markov reward models

This paper presents a method for calculation the reliability measures of a multi-state supermarket refrigeration system, where the system and its components can have different performance levels ranging from perfect functioning to complete failure. The suggested approach is based on the Markov reward models for computation of reliability measures for multi-state system, such as system availability, total number of failures, expected performance deficiency, expected output performance, total time till the first failure, reliability function. Corresponding procedure for reward matrix definition is suggested. A numerical example is presented in order to illustrate the approach.



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## Dr Alexandros Beskos

(University College London, UK)

### “Exact Simulation of non-linear Stochastic Differential Equations”

#### Abstract:

Exact solution of non-linear differential equations is well-known to be infeasible. At the introduction of noise however, the potential changes. We have developed a novel algorithm, labelled the “Exact Algorithm” that samples exactly from the dynamics of non-linear Stochastic Differential Equations, thus presenting a solution to a notorious problem in the applied probability community. Surprisingly, the algorithm is extremely simple, and builds on the dynamics of the two most common stochastic processes: Brownian motion and Poisson process.

### “MCMC methods in high dimensions”

#### Abstract:

We investigate the properties of some well-known MCMC algorithms in the context of a high-dimensional state space. In particular we will look at the Random-Walk Metropolis, the Langevin algorithm, and an algorithm popular in physics, the Hybrid Monte-Carlo algorithm. I will spend some time introducing the less familiar of these algorithms. Then, I will review some simple and elegant theory from the literature that demonstrates that, in high dimensions, MCMC trajectories resemble the sample paths of particular diffusion processes. The very practical consequence of such a theoretical connection is that one can identify the optimal acceptance probability related with these algorithms.

Friday, 23<sup>rd</sup> October 2009, 16:00-18:00  
Room 039



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# Professor Yosef Rinott

(The Hebrew University of Jerusalem, Israel)

## “Some probabilistic aspects in game theory”

Friday, 20<sup>th</sup> November 2009, 16:00-18:00

Room 039

### Abstract:

I will describe games where the payoff contains random elements. The study of optimal strategies, the distribution of the number of equilibria of the game, and other aspects of such games, requires various probabilistic tools. These include various probability inequalities and notions of dependence, Stein's method for Poisson and normal approximations, and more.