

WORKSHOP ON SOME PROSPECTIVE ASPECTS IN MATHEMATICS AND STATISTICS

University of Évora **December 20th 2013**

Espírito Santo | Sala 124

PROGRAM

10h-10h30 **Constantino Lagoa (The Pennsylvania State University)**
Convex Relaxations of Chance Constrained Algebraic Problems

10h30-11h **Maria Rosário Ramos (Universidade Aberta)**
Estimation of HMM, questions and algoritms

11h-11h30 **Coffee-break**

11h30-12h **Fernando Costa (Universidade Aberta)**
On a model of cluster annihilation

12h-12h30 **Joaquim Correia (University of Évora)**
The hyperbolic paradigma

Scientific Committee

Manuela Oliveira (University of Évora)
Teresa Oliveira (Universidade Aberta)
Amílcar Oliveira (Universidade Aberta)
Joaquim Correia (University of Évora)

Informations

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OPEN WORKSHOP

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WORKSHOP ON
SOME PROSPECTIVE ASPECTS IN MATHEMATICS AND STATISTICS

University of Évora **December 20th 2013** **Espírito Santo | Sala 124**

Title: Convex Relaxations of Chance Constrained Algebraic Problems

Speaker: Constantino Lagoa, **Professor at the Pennsylvania State University,**
205 Electrical Engineering West
University Park, PA 16802, USA

Abstract: In this talk, we discuss some preliminary results on a general approach to chance constrained algebraic problems. In this type of problems, one aims at maximizing the probability of a set defined by polynomial inequalities. This class of problems is quite general and includes many problems in control systems where the system of interest is subject to stochastic disturbances and/or random uncertainty.
Maximizing probability of a semialgebraic set is, in general, non-convex and computationally complex. With the objective of developing systematic numerical procedures to solve such problems, a sequence of convex relaxations is provided, whose optimal value is shown to converge to solution of the original problem. In other words, we provide a sequence of convex (semidefinite) programs of increasing dimension and complexity which can arbitrarily approximate the solution of the probability maximization problem.

Title: Estimation of HMM, questions and algoritms

Speaker: Maria do Rosário Ramos, **Professor at Universidade Aberta**

Abstract: Hidden Markov Models (HMM) form a class of stochastic process models with a wide range of application in signal processing like speech recognition, image processing, telecommunications, and others like finance and protein research. HMM extend the Markov models to include the case where the observation is a probabilistic function of the state. The model is based on a Markov chain $\{x_i\}$ wich describes the evolution of a state of a system. Given a realized sequence of state variables {xi}, the observed variables {Yt} are conditionally independent, with a distribution law in each x_i.
In this talk we will review the three main questions that we can ask about an HMM, and some results for their existence. The Maximum Likelihood Estimation for a HMM is addressed, the difficulties that arise when we try to solve this optimization problem for a given a sequence of observations of {Yt} and unknown parameters. Som The focus will be the trade off between the maximum likelihood and number of states of the underlying Markov Model, for particular output process. This is joint work with M. Oliveira (UÉ) and Lagoa, C. (Penn State, USA).

Title: On a model of cluster annihilation

Speaker: Fernando Costa, **Professor at Universidade Aberta**

Abstract: We consider a model of cluster annihilation, and point out its difference relative to more common models of cluster coagulation and fragmentation, such as Smoluchowski's equation. WE briefly present some recent results on the behaviour of solutions and point to some work still in progress. This is joint work with J.T.Pinto (IST) and R. Sasportes (UAb).

Title: The hyperbolic paradigma

Speaker: Joaquim Correia, **Professor at Universidade de Évora**

Abstract : As nonlinear hyperbolic partial differential equations have non unique global solutions, I am concerned with two, related, issues: what about physical solutions? and when can we use such a type of equations?

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