Ciclo de Conferências em Estatística Bayesiana
Data: 21 de março de 2014
Local: Sala 2076- ICEx-UFMG
Horário: 13h30 às 16h30

Title: Bayesian estimation of thermal conductivity in polymethyl methacrylate
Speaker: Fabrizio Ruggeri (IMATI-CNR, Italy)

ABSTRACT
A Bayesian approach is developed for estimating the thermal conductivity of a homogeneous material from the temperature evolution acquired in few internal points. Temperature evolution is described by the classical one-dimensional heat equation, in which the thermal conductivity is one of the coefficients. Noisy measurements lead to a partial differential equation with stochastic coefficients and, after discretisation in time and space, to a stochastic differential equation. Euler approximation at sampled points leads to a likelihood function, used in the Bayesian estimation of the thermal conductivity under different prior densities. An approach for generating latent observations over time in points where the temperature is not acquired is also included. Finally, the methodology is experimentally validated, considering a heated piece of polymethyl methacrylate (PMMA) with temperature measurements available in few points of the material and acquired at high frequency.

Title: Objective Bayesian Analysis of Skew-t Distributions.
Speaker: Prof. Márcia Branco (IME-USP, Brazil)

ABSTRACT
We study the Jeffreys prior and its properties for the shape parameter of univariate skew-t distributions with linear and nonlinear Student's t skewing functions. In both cases, we show that the resulting priors for the shape parameter are symmetric around zero and proper. Moreover, we propose a Student's t approximation of the Jeffreys prior that makes an objective Bayesian analysis easy to perform. We carry out a Monte Carlo simulation study that demonstrates an overall better behaviour of the maximum a posteriori estimator compared with the maximum likelihood estimator. We also compare the frequentist coverage of the credible intervals based on the Jeffreys prior and its approximation and show that they are similar.We further discuss location-scale models under scale mixtures of skew-normal distributions and show some conditions for the existence of the posterior distribution and its moments. Finally, we present three numerical examples to illustrate the implications of our results on inference for skew-t distributions.

Title: Cluster Analysis of Curved-Shaped Data with Species-Sampling Mixture Models
Speaker: Prof. Raffaele Argiento (IMATI-CNR, Italy)

(Joint work with Andrea Cremaschi and Alessandra Guglielmi)

ABSTRACT
We are interested in clustering data whose support is "curved". Recently we have addressed this problem, introducing a model which combines two ingredients: species sampling mixtures of parametric densities on one hand, and a deterministic clustering procedure (DBSCAN) on the other. In short, under this model two observations share the same cluster if the distance between the densities corresponding to their latent parameters is smaller than a threshold. However, in this case, the prior cluster assignment is based on the geometry of the space of kernel densities rather than a direct random partition prior elicitation. Following the latter alternative, a new hierarchical model for clustering is proposed here, where the data in each cluster are parametrically distributed around a curve (principal curve), and the prior cluster assignment is given on the latent variables at the second level of hierarchy according to a species sampling model. These two mixture models are compared here with respect to cluster estimates obtained for a simulated bivariate dataset from two clusters, one being banana-shaped. As an application we will consider the detection of seismic faults using data coming from Italian earthquake catalogues.