



KU LEUVEN

## Statistics and Econometrics Seminar

Joint organization by  
ORSTAT, Faculty of Business and Economics and the Statistics Research Group,  
Faculty of Science  
Leuven Statistics Research Center

**Prof. Dr. Catia Scricciolo**

Bocconi University, Milan, Italy

### “Rates of convergence for Bayesian density estimation with Dirichlet process mixtures of super-smooth kernels”

Thursday, March 15, 2012

12.00–13.00h

Location: Room HOG 03.101, Naamsestraat 69, Leuven.

Supporting research project: GOA-project 2007/04

**Abstract.** We consider Bayesian density estimation using a Dirichlet process (DP) kernel mixture as the prior distribution on Lebesgue univariate densities, the emphasis being on the achievability of a nearly parametric error rate, up to a logarithmic factor, depending upon the kernel choice. We show that a nearly parametric rate is attainable in all  $L^p$ -norms, beyond the Hellinger or total variation distance, for estimating super-smooth densities that are mixtures of more general kernels than the Gaussian, whose Fourier transforms satisfy an exponential moment condition. The result relies on a new approximation result for the sampling density within the model, combined with the approach of Giné and Nickl (2011, AOS) to the nonparametric testing problem involved in the derivation of posterior contraction rates. We further show that ordinary smooth densities in Hölder classes can be adaptively estimated at minimax-optimal rate, up to a logarithmic factor, in Hellinger distance using a DP mixture of analytic kernels satisfying exponential tail conditions, thus extending the convergence result beyond finitely supported mixture priors as in Kruijer et al. (2010, EJS) to DP mixtures, meanwhile employing a fixed prior for the scale/smoothing parameter, with no bandwidth shrinkage as, instead, in Ghosal and van der Vaart (2007, AOS). Finally, we discuss an open conjecture.