THE UNIVERSITY OF CHICAGO

Departments of Computer Science, Mathematics, Statistics, and the Computation Institute

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

OMIROS PAPASPILIOPOULOS

ICREA and Universitat Pompeu Fabra, Barcelona

Hierarchical Bayesian Modelling in Inverse Problems: Methods and Algorithms

THURSDAY, May 23, 2013, at 4:30 PM

Eckhart 133, 5734 S. University Avenue

ABSTRACT

We will review recent work on Bayesian inference for unknown functions using Gaussian-Markov prior distributions. We will focus on two examples: inference for the drift function of a non-linear stochastic differential equation and linear ill-posed inverse problems.

The prior distributions are Gaussian measures with differential precision (i.e., inverse covariance) operators, and they are the natural analogue of Gaussian Markov random field priors on lattices, which have been very popular in spatial statistics and pattern recognition. We illustrate how conjugate posterior inference can be done efficiently via a finite element implementation.

We will explore the connections of this paradigm to some classical nonparametric problems and methods, such as inference for the so-called white noise model and spline models for nonparametric regression.

We will see how to embed this modelling/inference framework outside conjugate settings, when either dealing with partial observations or when inferring hyperparameters. This is done using Gibbs sampling and related Markov chain Monte Carlo methods. However, the high dimensionality of the unknowns generates challenges which we will illustrate and address.

This talk is based on joint work with different subsets of the following people: Andrew Stuart, Gareth Roberts, Sergios Agapiou (Warwick, UK), Yvo Pokern (UCL, UK), Jonathan Bardsley (Montana, USA)

Organizers:

Lek-Heng Lim, Department of Statistics, lekheng@galton.uchicago.edu,

Ridgway Scott, Departments of Computer Science and Mathematics, ridg@cs.uchicago.edu,

Jonathan Weare, Department of Mathematics and the Computation Institute, weare@math.uchicago.edu.

SSC Seminar URL: `http://www.stat.uchicago.edu/seminars/SSC_seminars.shtml`

If you wish to subscribe to our email list, please visit the following website:

`https://lists.uchicago.edu/web/arc/statseminars.`