



Statistics Seminar Series

Session 2, 2006



Michael Smith

Discipline of Econometrics and Business Statistics, Faculty of Economics and Business
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Spatial Bayesian variable selection with application to functional magnetic resonance imaging

In this talk a procedure to undertake Bayesian variable selection and model averaging for a series of regressions that are located on a lattice is proposed. For those regressors which are in common in the regressions, we consider using an Ising prior to smooth spatially the indicator variables representing whether or not the variable is zero or non-zero in each regression. This smooths spatially the probabilities that each independent variable is non-zero in each regression, and indirectly smooths spatially the regression coefficients. It is discussed how single site or multi-site sampling schemes can be used to evaluate the joint posterior distribution. The approach is applied to the problem of functional magnetic resonance imaging in medical statistics, where massive datasets arise that need prompt processing. Here, the Ising prior with a three dimensional neighborhood structure is used to spatially smooth activation maps from regression models of blood oxygenation. The Ising prior also has the advantage of providing a natural way of incorporating anatomical prior information through the external field. It is shown using data from a visual experiment how a single site sampling scheme can provide fast evaluation of the posterior activation maps and activation amplitudes. The approach is shown to provide substantially improved maps than those derived by a recent Bayesian approach using a continuous Markov random field for the activation amplitude, as well as in comparison to the more widely used methods in medical imaging. It is also shown how specific expert medical knowledge can be incorporated through the prior structure. The relative strengths and weaknesses of using the Ising prior over alternative binary Markov random fields will also be discussed.

About the speaker: Michael Smith is Associate Professor in Econometrics and Business Statistics at the University of Sydney. His primary area of research is in business statistics and its application to finance and marketing.

Time: 4pm, Friday, 15th September

Location: Room 4082, Red Centre

Please join us after the seminar for wine and cheese in the staffroom.

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