

Hierarchical Modelling for Spatial Data Analysis

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Abstract

In this course we will describe hierarchical modelling methods for spatial data analysis. We will begin by describing different types of spatial data: point level, areal and point-process. We will concentrate on the geostatistical and areal modelling, starting with a brief presentation of exploratory methods and moving on to more sophisticated modelling. We will discuss some formal modelling concepts that underlie areal modelling (such as the conditional autoregressive modes - CAR) and also develop theory and methods for both univariate and multivariate spatial response data – both in point-level and areal settings. Our discussion will include some advanced topics such as spatially varying coefficients models, coregionalization models and directional derivative processes. Computer implementation for different models via WinBUGS and R will be described throughout the course as appropriate.

Although, the basics of spatial statistics will be covered briefly, knowledge of Bayesian statistics will be assumed. Most of the material for the course will come from our recently published book:

"Hierarchical Modeling and Analysis of Spatial Data", by Banerjee, S., Carlin, B.P. and Gelfand, A.E. (Chapman and Hall/CRC Press, 2004).