For Favour of Posting

THE CHINESE UNIVERSITY OF HONG KONG

Department of Statistics

will present a seminar entitled

Spectral Analysis of Faint Astronomical Objects: Bayesian Modeling, Computation, and Inference

by

Professor David A. van Dyk
Department of Statistics
University of California, Irvine.

on

Tuesday, 17 April 2007
2:00 pm – 3:00 pm
in
Lady Shaw Building C2
The Chinese University of Hong Kong

Abstract:

The development of ever more sophisticated space-based telescopes brings forth richer astronomical data that are opening a new window on the cosmos. Instruments designed to record high-energy electromagnetic radiation (X-rays and gamma-rays), for example, are clarifying our understanding of some of the most energetic events in the universe. Matter falling into black holes, the birth and death of stars, and the collisions of galaxies all can be explored through their high-energy spectra. This cosmic exploration, however, requires careful quantitative analysis of sometimes very limited photon counts. Statistical methods must account not only for the complexity of the astronomical objects themselves, but also of the instruments and the scientific questions that are posed. In this talk we discuss the search for narrow emission lines in spectra. The spectra are the distribution of photon energies and the emission lines are narrow ranges of energy with excess photon emission. The search for lines involves constructing a multi-level model that accounts for data degradation, instrumental effects, and the structure in the astronomical sources. The complexity of the model leads to highly multimodal likelihoods and complicated inferential questions. Standard test statistics cannot be directly used to evaluate the evidence for including lines and computational methods must be specially tailored to the problem. In the talk I will emphasize the use of profile methods for exploratory data analysis and a generalization of the Gibbs sampler that samples incompatible conditional distributions but is guaranteed to have the target posterior distribution as its stationary distribution.

This is a joint work with Taeyoung Park and the California-Harvard Statistics Collaboration.

All are Welcome