



The University of Chicago

Department of Statistics

Seminar Series

DAVID VAN DYK

Department of Statistics
University of California, Irvine

“Highly Structured Models in High Energy Astrophysics”

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133 Eckhart Hall, 5734 S. University Avenue
Refreshments following the seminar in Eckhart 110.

ABSTRACT

In recent years, an important new trend has been growing in applied statistics—it is becoming ever more feasible to build application specific models which are designed to account for the hierarchical and latent structures inherent in any particular data generation mechanism. Such multi-level models have long been advocated on theoretical grounds, but recently the development of new computational tools (e.g., hardware, software, and algorithms) for statistical analysis has begun to bring such model fitting into routine practice. This talk illustrates the power of multi-level models to solve real scientific problems in High-Energy Astrophysics. In particular, we use a class of new highly structured models that are designed to handle both the inherent complexity of astronomical objects and the complexity of the modern space-based instruments that study them; our methods are designed specifically for the Chandra X-ray Observatory. Three examples will be discussed: spectral analysis, image analysis, and the reconstruction of the temperature distribution of hot matter in a stellar corona. Our methods aim to answer scientific questions as to the physical properties, such as the temperature, composition, and structure, of the astronomical sources. From a statistical point of view, we discuss model construction, model fitting, model checking, and inference, all in the context of the examples.