



THE UNIVERSITY OF
CHICAGO

Department of Statistics

BAHADUR MEMORIAL LECTURES

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Emission Tomography and Bayesian Inverse Problems

MONDAY, April 15, 2013 at 4:00 PM

133 Eckhart Hall, 5734 S. University Avenue

Refreshments following the seminar in Eckhart 110

ABSTRACT

Inverse problems are almost ubiquitous in applied science and technology, so have long been a focus for intensive study, aimed at both methodological development and theoretical analysis. Formulating inverse problems as questions of Bayesian inference has great appeal in terms of coherence, interpretability and integration of uncertainty: the Bayesian formulation comes close to the way that most scientists intuitively regard the inferential task, and in principle allows the free use of subject knowledge in probabilistic model building. However, it is important to understand the relationship between the chosen Bayesian model and the resulting solution.

The Bayesian approach to reconstruction in single-photon emission computed tomography is discussed, with several empirical illustrations. Theoretical results, from joint work with Natalia Bochkina (Edinburgh), about consistency of the posterior distribution of the reconstruction are presented, along with a version of the Bernstein-von Mises theorem that quantifies the efficiency of Bayesian inference for such ill-posed generalised linear inverse problems with constraints.

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