Athanasios Kottas
Applied Mathematics and Statistics
University of California, Santa Cruz

Title:
Nonparametric Bayesian inference under stochastic order constraints, with an application in epidemiology

Abstract:
In comparing two or more populations, sometimes a model incorporating a certain stochastic order is desired. The Bayesian paradigm provides a convenient framework for development of related modeling and inference methods, since any stochastic order restriction imposed a priori is preserved to the posterior analysis. We present a Bayesian nonparametric approach to modeling and inference for stochastically ordered distributions. We also consider modeling for distributions subject to a stochastic precedence constraint, a weaker restriction than the more commonly utilized stochastic order constraint. The nonparametric prior models are developed using structured Dirichlet process mixtures. Posterior inference is obtained through Markov chain Monte Carlo techniques. A motivating application involves study of the discriminatory ability of continuous diagnostic tests in epidemiologic research. Here, stochastic ordering, and in particular stochastic precedence, provide natural restrictions for the distributions of test scores corresponding to the non-infected and infected groups. The methodology is illustrated with data from diagnostic tests for Johne's disease in dairy cattle.