Bayesian analysis with orthogonal matrix parameters

Statistical models for multivariate data are often parametrized by a set of orthogonal matrices. Bayesian analyses of models with orthogonal matrix parameters present two major challenges: posterior simulation on the constrained parameter space and incorporation of prior information such as sparsity or row dependence. We propose methodology to address both of these challenges. To simulate from posterior distributions defined on a set of orthogonal matrices, we propose polar parameter expansion, a parameter expanded Markov chain Monte Carlo approach suitable for routine and flexible posterior inference in standard simulation software. To incorporate prior information, we introduce prior distributions for orthogonal matrix parameters constructed via the polar decomposition of an unconstrained random matrix. Prior distributions constructed in this way satisfy a number of appealing properties and posterior inference can again be carried out in standard simulation software. We illustrate these techniques by fitting Bayesian models for a protein interaction network and gene expression data.

Refreshments will be served following the seminar in 1181 Comstock Hall.