

## STATISTICS COLLOQUIUM

MONDAY, FEBRUARY 27, 2012

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM - SCIENCE CENTER, 7TH FLOOR

**“MCMC methods derived from diffusions, geodesics and  
orthogeodesics on Riemannian manifolds”**

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### ABSTRACT

Markov chain Monte Carlo (MCMC) provides the dominant methodology for inference over statistical models with non-conjugate priors. Despite a wealth of theoretical characterisation of mixing times, geometric ergodicity, and asymptotic step-sizes, the design and implementation of MCMC methods remains something of an engineering art-form. An attempt to address this issue in a systematic manner leads one to consider the geometry of probability distributions, as has been the case previously in the study of e.g. higher-order efficiency in statistical estimators. By considering the natural Riemannian geometry of probability distributions MCMC proposal mechanisms based on Langevin diffusions that are characterised by the metric tensor and associated manifold connections are proposed and studied. Furthermore, optimal proposals that follow the geodesic paths related to the metric are defined via the Hamilton-Jacobi approach and these are empirically evaluated on some challenging modern-day inference tasks. Finally the exploitation of orthogeodesics in defining proposal mechanisms for hierarchical Bayesian models provides a tantalising glimpse of potential general methodology for efficient sampling for these notoriously challenging problems.