Tom Fletcher, University of Utah

Bayesian Statistics on Manifolds: Beyond MAP

Much of the work on manifold statistics has focused on point estimates, e.g., means, variances, regression functions, etc. Such estimates can be formulated probabilistically as maximum-likelihood estimates, Frchet expectations, or in the Bayesian setting, maximum a posteriori (MAP) estimates. However, reducing the posterior distribution to a single point loses much of the advantage of the Bayesian point of view. In this talk, I will present some ideas on how to more fully use the posterior distribution. The basic tools for doing this are Markov Chain Monte Carlo sampling methods for manifold-valued random variables. I will show two examples of how sampling from the posterior distribution can be useful. First, in diffeomorphic image registration, posterior sampling provides a method for estimating parameters to the metric that control the level of regularization of the transformations. Second, a Bayesian analysis of a normal distribution law on manifolds provides a method for understanding the uncertainty of the Frchet mean.