

UDRC Themed Meeting on Scalable Signal Processing with Bayesian Graphical Models

Plenary Talk by Mark Girolami, Imperial College London

Convergence Rates for a Class of Monte Carlo Estimators Based on Stein's Method

Abstract: Gradient information on the sampling distribution can be used to reduce the variance of Monte Carlo estimators via Stein's method. An important application is that of estimating an expectation of a test function along the sample path of a Markov chain, where gradient information enables convergence rate improvement at the cost of a linear system which must be solved. The contribution of this paper is to establish theoretical bounds on convergence rates for a class of estimators based on Stein's method. Our analysis accounts for (i) the degree of smoothness of the sampling distribution and test function, (ii) the dimension of the state space, and (iii) the case of non-independent samples arising from a Markov chain. These results provide insight into the rapid convergence of gradient-based estimators observed for low-dimensional problems, as well as clarifying a curse-of-dimension that appears inherent to such methods.