國立中央大學統計研究所

學 術 演 講

主 講 人:王友鐘 教授(Camden College of Arts and Science Rutgers University)

講　　題: Global Likelihood Sampler

時　　間:113年3月26日（星期二）上午11：00 ～ 12：00

地　　點:鴻經館M429室

茶　　會:上午 10：30 ～ 11：00　　地　點：鴻經館M510室

ABSTRACT

A mechanism that generates samples from a distribution is called a *sampler* and it is one of the most useful tools in statistics. Until the invention of Markov Chain Monte Carlo (MCMC), Bayesian computation could only deal with very limited models because most samplers are confined to Gaussian-related multivariate distributions. The unique advantage of MCMC is that it can generate samples based on the kernel of any distribution. MCMC samplers have two characteristics: (1) the samples are Markov dependent, and (2) a proposal mechanism is required. Since 2009, I have been thinking of replacing MCMC with a simpler method that generates iid samples. In this talk, I present the global likelihood sampler (GL), and I sincerely solicit your comments.

GL begins with quasi-random numbers over the support of the target distribution and treats them as a pool of candidates. For each candidate, a relative likelihood is computed from the given kernel. The collection of all the likelihoods and candidates is used to form a multinomial distribution. GL randomly selects a batch of samples from the pool according to this multinomial. The batch size is about one-tenth of the pool size. Once the samples have been selected, we give the pool a random perturbation. The perturbed pool becomes the pool of candidates and the next batch of samples are randomly selected from them. After iterating *n* times among pool perturbation, likelihood calculations, and sample selection, we obtain *n* batches of samples. Taking one sample from each batch constitutes a ***thread*** of IID samples, from which estimates of parameters can be computed. The number of different treads is very large, which can be used to approximate the sampling distributions and Monte Carlo standard errors (MCSD). For univariate distribution, quasi-random numbers are equally spaced points in the real line; for multivariate support, they are the uniformly-spaced points used to numerically approximate integrals.

We first compare GL with univariate samplers in R and no difference is observed. Using three multivariate kernels, we demonstrate GL's ability to explore multimodal distributions. Comparisons are made with the slice sampler, Metropolis-Hastings method, parallel tempering, evolution Monte Carlo, equal-energy sampler, and many parametric IID samplers. Implementation of GL is quite straightforward and requires simple tuning.

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