Markov chain quasi-Monte Carlo simulation using linear feedback shift register generators

Shin Harase
Ritsumeikan University
harase@fc.ritsumei.ac.jp

We consider the problem of estimating expectations using Markov chain Monte Carlo. We are interested in improving the accuracy by replacing IID uniform random points with quasi-Monte Carlo (QMC) points. Owen and Tribble [1] proved that Markov chain QMC remains consistent if the driving sequences are completely uniformly distributed (CUD). However, the definition of CUD sequences is not constructive, and thus there remains the problem of how we implement the Markov chain QMC algorithm in practice.

Harase [2,3] focused on the t-value, which is a measure of uniformity widely used in the study of QMC, and implemented short-period Tausworthe generators (i.e., linear feedback shift register generators) that approximate CUD sequences. In this talk, we outline recent progress and present some experimental results for Bayesian computation.

[1] A. B. Owen and S. D. Tribble, "A quasi-Monte Carlo Metropolis algorithm", Proc. Natl. Acad. Sci. USA, 102(25):8844–8849, 2005.

[2] S. Harase, "A table of short-period Tausworthe generators for Markov chain quasi-Monte Carlo", J. Comput. Appl. Math. 384 (2021), 113136, 12 pp.

[3] S. Harase, "A search for short-period Tausworthe generators over $\mathbb{F}_b$ with application to Markov chain quasi-Monte Carlo", to appear in J. Stat. Comput. Simul., 23 pp.