Importance sampling type correction of Markov chain Monte Carlo and exact approximations

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We use an importance sampling (IS) type correction of approximate Markov chain Monte Carlo (MCMC) output to provide consistent estimators. The IS approach, based on unbiased estimators, provides a natural alternative to delayed acceptance (DA) MCMC, but contrary to DA-MCMC, benefits from straightforward parallelisation. We focus on the case where the MCMC simulation is conducted on an approximate marginal distribution, and the IS type correction leads to consistent inference on the corresponding joint distribution. Such a case allows for importance sampling analogues of pseudo-marginal type MCMC methods, such as the grouped independence Metropolis-Hastings and the particle marginal Metropolis-Hastings. We detail strong consistency of the suggested estimators under mild assumptions, and provide central limit theorems with expressions for asymptotic variances. The methods are illustrated in practice with state space models, where our experimental results are promising and show that IS type approach can be favourable against a computationally comparable DA scheme.

This is joint work with Jouni Helske and Jordan Franks.