Quasi-Monte Carlo for Bayesian optimal experimental design

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Abstract

Contemporary quasi-Monte Carlo (QMC) methods are based on tailoring specially designed cubature rules for high-dimensional integration problems. By leveraging the smoothness and anisotropy of an integrand, it is possible to achieve faster-than-Monte Carlo convergence rates. To this end, QMC methods have become a popular tool for numerical treatment of partial differential equations involving random coefficients. Meanwhile, the goal in Bayesian optimal experimental design is to maximize the expected information gain for the reconstruction of unknown quantities when there is a limited budget for collecting measurement data. In this talk, we derive tailored QMC cubature rules to alleviate the computational burden associated with Bayesian optimal experimental design problems governed by partial differential equations.