Mean estimation for Randomized Quasi Monte Carlo method

Emmanuel Gobet
Ecole polytechnique, France
emmanuel.gobet@polytechnique.edu

We are given a simulation budget of B points to calculate an expectation $\mu = \mathbb{E}(F(U))$. A Monte Carlo method achieves a root mean squared risk of order $1/\sqrt{B}$, while a Randomized Quasi Monte Carlo (RQMC) method achieves an accuracy $\sigma_B \ll 1/\sqrt{B}$. The question we address in this work is, given a budget B and a confidence level δ, what is the optimal size of error tolerance such that $\mathbb{P}(|\texttt{Est} - \mu| > \texttt{TOL}) \leq \delta$ for an estimator `Est` to be determined? We show that a judicious choice of "robust" aggregation methods coupled with RQMC methods allows to reach the best `TOL`. This study is supported by numerical experiments, ranging from bounded $F(U)$ to heavy-tailed $F(U)$.

Joint work with Matthieu Lerasle (CREST, ENSAE, Institut Polytechnique de Paris) and David Métivier (INRAE Montpellier).