Multidimensional Integration Techniques

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Abstract

Multi-dimensional integration arises in a variety of disciplines including particle physics, PDEs with random coefficients, statistical mechanics, and notably mathematical finance. In this report, we use a variety of methods to estimate a multivariate integral, namely classic Monte Carlo, quasi-Monte Carlo, and lattice techniques. We consider a simple two-dimensional function to study the aspects of each method. Numerical results are provided for each technique as well as comparisons in terms of error convergence between methods. From a two-dimensional domain, we discuss difficulties and limitations in the extension into higher dimensions among the various approaches.