Abstract

This report adresses different numerical methods for solving a six-dimensional integral. The integral of interest is the energy between to electrons in a helium atom repelling eachother due to the Coloumb interaction. We assume that the wave function for each electron can be modelled like the single-particle wave function of an electron in the hydrogen atom. The integral is solved with Gaussian-Quadrature with Legendre and Laguerre polynomials, as well as two approaches to the Monte Carlo method. The standard deviation of these solutions are also calculated.
We find that while Gauss-Laguerre and Gauss-Legandre have different areas of performance, Monte Carlo integration is an overall better numerical integral solver - at least for multi-dimensional integrals.