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Lattice Quantum Field Theory: Numerical Integration in an Infinite Number of Dimensions

Tuesday 27 June 2017 14:00 (1 hour)

Relativistic Quantum Field Theory (QFT) is the formalism upon which the Standard Model of particle physics is built, and it is remarkably successful and accurate. When the interactions are weak then the techniques of renormalized perturbation theory using Feynman diagrams works beautifully, but when the interactions are strong we have to turn to numerical evaluation of the functional integrals that define the quantum theory. The only way we know of to evaluate such infinite-dimensional integrals is to use Markov Chain Monte Carlo (MCMC) techniques. I shall attempt to give an overview of the functional integral formalism of QFT, and how MCMC integration works. If time permits I will discuss how fermions (half-integer spin) are dealt with, and maybe introduce the Hybrid (or Hamiltonian) Monte Carlo algorithm.

Title

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