

VO Quantum Monte Carlo methods

Summer term 2016, Thomas C. Lang

1. Introduction
 - 1.1 Monte Carlo
 - 1.2 Data analysis
 - 1.3 Finite size scaling
 - 1.4 The sign problem
2. QMC (mostly) for spin systems
 - 2.1 World line QMC
 - 2.2 Stochastic series expansion
 - 2.3 Valence bond projector QMC
3. QMC for fermions
 - 3.1 Determinantal QMC
 - 3.1.1 Projector/Auxiliary field QMC
 - 3.1.2 Majorana QMC
 - 3.2 Continuous time QMC
 - 3.2.1 Interaction expansion
 - 3.2.2 Hybridization expansion
 - 3.3 Dynamical mean field theory
 - 3.3.1 Reminder: classical mean field theory
 - 3.3.2 DMFT
4. Algorithms to improve QMC
 - 4.1 Tempering
 - 4.2 Reweighting
 - 4.3 Hybrid Monte Carlo