

Research team : Particle Physics at CPT

Savvas Zafeiropoulos <Savvas.Zafeiropoulos@cpt.univ-mrs.fr>

M2-internship

Title :

Conformal maps to improve the accuracy of the saddle point approximation: case study for 1-site Hubbard model

Abstract

The saddle point approximation to the full path integral for quantum systems is a powerful tool for building analytical descriptions of correlated quantum systems. However, in the case of fermionic systems, the performance of the saddle point approximation is often hindered by the presence of the points of non-analyticity of the action. These points limit the radius of convergence of the Taylor series centered at saddle points, thus limiting the ability of the gaussian approximation to describe the variations of the action around the saddle point.

Here we explore the possibility to improve the accuracy of the saddle point approximation using conformal maps of the configuration space, specifically designed to move the points of non-analyticity away of saddle points of the action (ideally, to infinity). We will use simple analytically solvable 1-site Hubbard model in our case study.