

# Application of the worm algorithm to the 1D Bose-Hubbard model

## Content

The Worm Algorithm is a versatile Path Integral Monte Carlo method which circumvents some of the near-critical limitations present in local update algorithms, such as Metropolis. It achieves this by sampling an extended configuration space called the Z-Sector, which contains the unphysical open worldlines corresponding to off-diagonal elements in the density matrix.

In this work, the worm algorithm is applied to the Bose-Hubbard model: a prototypical model for interacting bosons, and which can be experimentally realized by optical lattices. The B-H model experiments a quantum phase transition which is of the Berezinskii-Kosterlitz-Thouless type in 1D. By simulating equilibrium configurations using the worm algorithm and measuring the superfluid index, the well known phase diagram of the B-H model is captured.

## Summary

**Primary author(s)** : Mr. GARCIAPINA, Omahr (UNAM)

**Presenter(s)** : Mr. GARCIAPINA, Omahr (UNAM)