



“Nuclear Lattice Simulations”

by Dean Lee (Michigan State University)

Dates: December 9-11th 2020

Registration: <https://us02web.zoom.us/meeting/register/tZlkdO2urTwuG92SwMPpKW8KYkcDi1iovBa->

▶ Lecture 1: Lattice Formalism and Monte Carlo Methods **22:00-24:00**, Wed Dec 9th

In this lecture we present Grassmann path integrals on a lattice and the connection to transfer matrix operators. We then study how auxiliary fields are used to reproduce particle interactions. Next we cover Markov chain Monte Carlo and how projection Monte Carlo with auxiliary fields are applied to compute the properties of quantum many-body systems.

▶ Lecture 2: Effective Field Theory and Nuclear Forces **22:00-24:00**, Thu Dec 10th

In this lecture we introduce chiral effective field theory and its implementation on the lattice. We demonstrate how nucleon-nucleon scattering is computed on the lattice and discuss applications of a method called eigenvector continuation. We then conclude with some computational details of lattice simulations using chiral effective field theory.

▶ Lecture 3: Lattice Simulations **22:00-24:00**, Fri Dec 11th

In this lecture we present some recent results from lattice simulations of nuclear structure and thermodynamics. We consider evidence that nuclear physics is near a quantum phase transition. We then introduce the pinhole algorithm for probing nuclear correlations and discuss model independent probes for nuclear clustering. We conclude with a discussion of the pinhole trace algorithm and its application to nuclear thermodynamics.