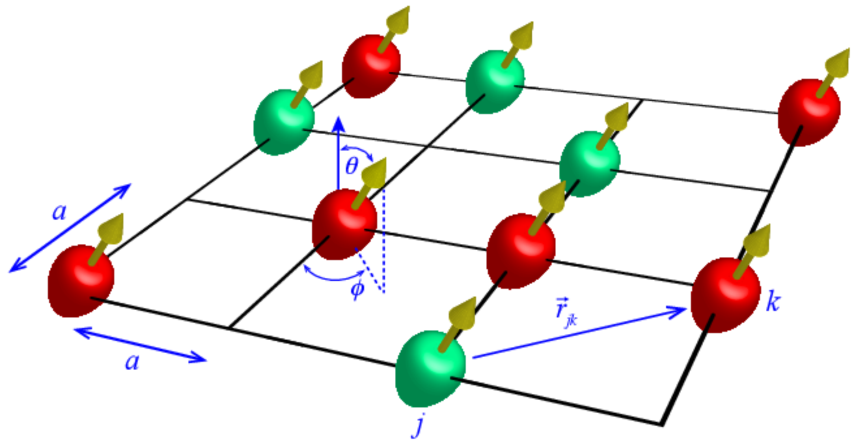
PHYSICS COLLOQUIUM



Dr. Eduardo Ibarra García Padilla
UC Davis and SJSU

Quantum Simulation of the Hubbard Model: Higher Symmetries and New Architectures

Abstract

The discovery of novel phases of matter not readily accessible in solid state systems is made possible using ultracold atomic systems as effective instruments for quantum simulation. Experiments with ultracold alkaline-earth-like atoms (AEAs), which exhibit SU(N=2I+1) symmetric interactions, have seen improvement in their capabilities. When these atoms are loaded in an optical lattice, they are described by the SU(N) Fermi Hubbard Model (FHM), which is a generalization of the SU(2) FHM. From theoretical calculations, the SU(N) FHM exhibits a wide variety of matter phases, including spin liquids. However, such predictions have been restricted to ground state calculations at one particle per site in the strong interacting regime. In this talk we report on the numerical study of the SU(N) FHM at finite temperature, interaction strengths which span the non-interacting to the strongly interacting limits, as well as different fillings. These results represent an important step in understanding the thermodynamic and magnetic properties in the SU(N) FHM and provide guidance for experimental efforts in quantum simulations with AEAs. An important milestone of the results of this study corresponds to the record temperatures achieved with this quantum simulation architecture: the coldest fermions ever created in nature in absolute temperature and in cold atoms.

3:00 p.m. – 4:30 pm, Friday, October 21st,
In-Person: McLane 162