RICE QUANTUM GROUP MEETING SEMINAR SERIES

Date: September 24, 2021

Time: 3PM - 4PM

Venue: SST 300

Research Group: Prof. Kaden Hazzard's Group

Presenter: EDUARDO IBARRA GARCIA PADILLA

Title: Universality and Quantum Magnetism in the SU(N) Symmetric Fermi Hubbard Model

Abstract: The SU(2) symmetric Fermi Hubbard model (FHM) plays an essential role in the understanding of strongly correlated fermionic many-body systems. When the system is in the one particle per site and strongly interacting limit U>>t, it is effectively described by the Heisenberg Hamiltonian. In this limit, extending the typical SU(2) symmetry to SU(N) is predicted to give exotic phases of matter in the ground state, with complicated dependence on N. The question we address in this talk is whether the situation is similarly complicated at finite temperature, and we calculate the SU(N) Fermi-Hubbard model's thermodynamic, magnetic, and transport properties numerically with Determinant Quantum Monte Carlo, Exact Diagonalization, and Numerical Linked Cluster Expansion. One of our main findings is that for temperatures above the superexchange energy, where the different N systems are dominated by short-range correlations, the energy, double occupancy, and kinetic energy collapse upon a simple rescaling with 1/N. Although the physics in the regime studied is well beyond that captured by low-ordered high-temperature series, we show that an analytic description of the scaling is possible in terms of only one- and two-site correlations. On the other hand, comparison with experiments demonstrates that nearest neighbor antiferromagnetic correlations are stronger for larger N and in lower dimensions, reaching some of the coldest temperatures in the Universe.

Short Bio: Eduardo Ibarra-Garcia-Padilla received his B. Sc. at Universidad Nacional Autónoma de México (UNAM), where he graduated as Class Valedictorian in Physics. His undergraduate thesis involved the design and construction of the first ultracold atomic physics lab to produce quantum degenerate gases of 6Li in Latin America. Eduardo then moved to Houston to pursue his PhD in Atomic Physics at Rice University. He now works with Dr. Kaden Hazzard, in projects regarding quantum simulators which display exotic phases of matter, as well as protocols to reach lower temperatures in experiments. During his PhD trajectory he has received a series of awards regarding his academic trajectory and its service to the graduate student population. He loves baseball, board games, playing the guitar and cooking with friends.

Note: *Snacks and Coffee will be served during the event.*