MECHANICAL & AEROSPACE ENGINEERING GRAD STUDENT SEMINAR

# Taming the Quantum Complexity of Strongly Interacting Electrons

**Friday, November 13**
**11:00 AM**
**AME Room 106**




## Hitesh J. Changlani Ph.D.

**ASSOCIATE PROFESSOR**
**Florida State University and National High Magnetic Field Laboratory**



**ABSTRACT:** In his 1929 paper on quantum mechanics, Paul Dirac observed that the laws underlying much of physics and chemistry are completely known, but that the resulting equations are far too complicated to solve exactly. Almost a century later, the reliable numerical simulation of "strongly correlated" quantum systems, those for which the large-scale physics is not well-approximated by a non-interacting model, remains a major challenge in physics, chemistry, and engineering. Such systems host remarkable and technologically relevant phenomena, including high-temperature superconductivity, the quantum Hall effect, and quantum spin liquids. In this talk, I will describe how advanced (classical) computation is meeting this challenge. I will introduce tensor networks, wavefunctions that compress the exponentially large description of a quantum system into a tractable form. I will show how they have provided insight into the physics of quantum magnets and yielded concrete predictions that experiments can test. I will conclude by highlighting open challenges in reliably simulating the out-of-equilibrium quantum dynamics of strongly correlated electrons.



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