University of Miami, Physics Department Colloquium

Date: Wednesday, Jan 22, 2025
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Probing Fundamental Physics in a New Era of Computation

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Abstract

Over the last five decades, classical computing has played an important role in our understanding of nature, from the length scale of an atomic nucleus to galaxies millions of light years away. Specifically, it has helped us compute the mass of hadrons inside the nucleus and detect gravitational waves, ushering in a new tool to understand the universe. The upcoming decades hold the promise of another significant revolution, leveraging quantum properties to perform computations that surpass the capabilities of classical computing. Additionally, this allows us to explore a hybrid classical/quantum approach to a wide range of problems.

In this talk, I will explain the basics of quantum computing and then present our results on real-time dynamics of a quench disorder model of Majorana fermions on IBM's quantum hardware. Using the gate-based model of quantum computing, we compute a special four-point correlator used in the diagnosis of quantum chaos. We then focus on state preparation and show results for the variational approximation of a thermal state. Toward the end of the talk, I will elaborate on the importance of existing classical computing methods in studying quantum many-body systems and how it sets a benchmark for quantum computing in the coming decades.

Biography

I am a theoretical and computational physicist at Jefferson National Lab. I completed my PhD from Syracuse University in 2019 and my first postdoctoral appointment at Perimeter Institute for Theoretical Physics in 2022. Before starting my PhD, I completed my undergraduate degree in Physics in India from St. Stephen's College and attended Sorbonne Université in Paris for an MS in Nanoscience on an Erasmus Mundus scholarship. I completed my second MS in Astroparticle Physics from Bose Institute in 2013. My research explores a wide range of problems in fundamental physics using classical and quantum approaches to computation. Apart from physics, I enjoy traveling, reading about the history of science, and collecting coins and banknotes (i.e., numismatist).