RICE QUANTUM GROUP MEETING SEMINAR SERIES

Multipartite Entanglement Structures in Quantum Stabilizer States

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Vaibhav Sharma is an SCI postdoctoral fellow working with Prof. Kaden Hazzard. His research primarily focuses on quantum many-body theory and quantum dynamical systems, particularly in ultracold atoms and qubit-based quantum simulator platforms. My current interests include pursuing research that enables quantum simulators to reveal interesting dynamical phenomena in gauge theories, and that helps us to better understand highly entangled quantum states with multipartite entanglement.

ABSTRACT

In this talk, I describe a method for visualizing the internal structure of multipartite entanglement in pure stabilizer states. The method graphically organizes the many-body correlations in a hierarchical structure. This provides a rich taxonomy from which one can extract a number of traditional quantities, such as entanglement depth and entanglement entropy. This construction is gauge invariant and goes beyond traditional entanglement measures by visually revealing how quantum information and entanglement is distributed in a many-body state. This tool can be used to analyze the internal structures of prototypical stabilizer states (GHZ state, cluster state, stabilizer error correction codes) and is able to contrast the complexity of highly entangled volume law states generated by random unitary operators and random projective measurements.