

Thursday:

Berislav Buca

Title: Eigenoperator thermalization theory

Abstract: I will provide a framework for time-averaged dynamics in locally interacting systems in any dimension. It is based on pseudolocal dynamical symmetries generalising pseudolocal charges and unifies seemingly disparate manifestations of quantum non-ergodic dynamics including quantum many-body scars, continuous, discrete and dissipative time crystals, Hilbert space fragmentation, lattice gauge theories, and disorder-free localization. In the process novel pseudo-local classes of operators are introduced: "projected local", which are local only for some states, and "crypto-local", whose locality is not manifest in terms of any finite number of local densities. Using the theory two novel types of phase transitions are introduced: 1) The "scarring phase transition" where the order parameter is the locality of the projected local quantities - for certain initial states persistent oscillations are present. 2) The "fragmentation phase transition" for which long-range order is established in an entire phase due to presence of certain non-local strings. Two prototypical, but otherwise mostly intractable, models are solved using the theory: 1) a spin 1 scarred model and 2) the t-J_z model with fragmentation.