# Title: Hilbert space approach for non-Fermi liquids


## *Abstract:*

Quasiparticles are constructs for simplifying the complicated many-body description of solids, providing a useful way to think about the physics of a wide class of interacting systems. But how should one think of the problem when the quasiparticle picture breaks down? These situations present a serious theoretical challenge. Fortunately, one can still work directly with Hilbert space wavefunctions and associated many-body formalisms for dynamics and transport. Explorations in this direction occupy a central role in this talk and the work my group has been pursuing, which I briefly review. I will focus my attention on addressing the puzzle of linear in temperature (T-linear) resistivity seen in non-Fermi liquid phases that occur in several strongly correlated condensed matter systems (cuprates, heavy fermions and twisted graphene). I will state a simple criterion for the occurrence of T-linear resistivity based on an analysis of the contributions to the many-body Kubo formula, determined by an energy invariant "f-function" involving current matrix elements and energy eigenvalues that describes the DC conductivity of the system in the microcanonical ensemble [1]. Using full diagonalization, this criterion is tested for the f-function in the spinless nearest neighbor Hubbard model, in a system of Sachdev-Ye-Kitaev dots coupled by weak single particle hopping, and the spin-1/2 Heisenberg model (from the point of view of its spin transport). The work suggests that a general principle is at the core of the occurrence of T-linear resistivity in a wide range of systems. I conclude with a possible explanation of the emergence of this principle [2].



[1] A. Patel*, H. J. Changlani*, arXiv:2106.01381 (* equal contribution) [2] H J. Changlani, A. Patel (in preparation)