ICTS Seminar

Title : Solvable models of metals with spatially random electron interactions

Speaker : Aavishkar Patel (Flatiron Institute, USA)

Date : Friday, 24 January 2025

Time : 11:30 AM (IST)

Abstract : I will describe the exact analytic solution of the Yukawa-Sachdev-Ye-Kitaev (YSYK) model, which is a variant of the Sachdev-Ye-Kitaev (SYK) model that describes random interactions between fermions and bosons, in the limit of a large number (N) of particle flavors. Upon extension to nonzero spatial dimensions, the YSYK model provides an transparent construction that allows for momentum-relaxing inelastic scattering of electrons by quantum critical bosons, which in two dimensions (2D) leads to a quantum critical point with linear-in-temperature DC electrical resistivity and a frequency dependence of the optical conductivity that match observations in experiments on strange metals. At finite N, the 2D YSYK model is no longer exactly solvable analytically, but a numerically exact solution is possible in terms of sign-problem-free models for quantum Monte Carlo. I will describe the construction of such models and their solution using the massively-parallelizable hybrid Monte Carlo algorithm that can be implemented efficiently on graphics processing units (GPUs). The numerical solution leads to the formation of an extended strange metal phase in lieu of a quantum critical point, the physics of which is underlain by gapless localized overdamped bosonic modes.

Venue : Madhava Lecture Hall
Zoom Link: https://icts-res-in.zoom.us/j/99870289819?pwd=Fx4QM0iilfb1ItB29i0xCpDWyhVywY.1
Meeting ID: 998 7028 9819
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