Seminar, Department of Physical Sciences, Bose Institute, Kolkata

Hidden quantum criticality and entanglement in quench dynamics

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Abstract: Entanglement exhibits universal behavior near the ground state of a critical point, where correlations are long-ranged, and the thermodynamic entropy is vanishing. Conversely, a quantum quench imparts extensive energy, resulting in a build-up of entropy, thereby negating the expectation of critical behavior in a long-time stationary state. In our work, we introduce a new paradigm in the quench dynamics of integrable spin chains that demonstrate a ground-state order-disorder phase transition at a critical line. We demonstrate that during a critical-to-critical quench, a genuine quantum critical behavior emerges in the long-time stationary state. This critical behavior is manifested in higher-order correlations and remains invisible to local observables. Moreover, our results exhibit universality across models whose low-energy or long-wavelength dynamics are well described by a free fermionic field theory. This work contributes to a deeper understanding of quantum critical phenomena in integrable systems, offering insights into the intricate interplay between entanglement, quench dynamics, and universal behavior.

Date/time: March 07, 2025 (Friday) at 12:00 Noon

Venue: Room 204, Physics Seminar Room, (Second floor, UAC, BI)