Tata Institute of Fundamental Research
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Seminar

Internal clock of many-body delocalisation

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We show that generic disordered quantum wires, e.g., the XXZ-Heisenberg chain, do not exhibit many-body localisation (MBL) – at least not in a strict sense within a reasonable window of disorder values. Specifically, computational studies of short wires exhibit an extremely slow but unmistakable flow of physical observables with increasing time and system size ('creep') that is consistently directed away from (strict) localisation. Our work sheds fresh light on delocalisation physics: Strong sample-to-sample fluctuations indicate the absence of a generic time scale, i.e., of a naive "clock rate"; however, the concept of an "internal clock" survives, at least in an ensemble sense.

We observe that the average entropy appropriately models the ensemble-averaged internal clock and reduces fluctuations. We take the tendency for faster-than-logarithmic growth of entanglement and smooth dependency on the disorder of all our observables within the entire simulation window as support for the cross-over scenario, discouraging an MBL transition within the traditional parametric window of computational studies.

Tuesday, Apr 16th 2024

11:00 Hrs (Tea / Coffee 10:45 Hrs)

Seminar Hall, TIFR-H