Physical Sciences Seminar

Magic in many body systems

Marcello Dalmonte
ICTP

Host: Maksym Serbyn

Quantum resources have entered the many body state over the last two decades. Apart from the prototypical case of entanglement, relatively little is known about how such resources relate to physical phenomena, a question that is of pivotal importance for the understanding of quantum simulators and computers as many-body systems.In this talk, I will show how magic - a type of resource that is fundamental in determining quantum advantage - is directly related to many-body phenomena. First, I will review recent developments in quantum information theory that have demonstrated stabilizer Renyi entropies as measures of magic. Based on that, I will present method(s) to measure magic in tensor network simulations, based on the concept of Markov chains over the Clifford group, and on replicated matrix product states. Finally, I will illustrate a series of applications, including (a) how state magic and long-range magic behave in conformal field theories - illustrating the limit of the former, and the capabilities of the latter; (b) the scaling of magic in two-dimensional systems, showing how the latter detects phase transitions in Z2 lattice gauge theories with a precisions that is considerably better than those of ordinary order parameters; and (c) how it is possible to have a distinct series of complexity transitions in monitored quantum dynamics. I will close discussing the applicability of our methods to experiments, pointing out possibilities and challenges.

Tuesday, January 23, 2024 11:00am - 12:00pm
Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101)

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.
Please find a schedule of the ISTA Shuttle on our webpage:
https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.