Institute colloquium

Quantum circuit and the hierarchy of many-body entanglement

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Entanglement in many-body quantum systems is notoriously hard to characterize due to the exponentially many parameters involved to describe the state. On the other hand, we are usually not interested in all the microscopic details of the entanglement pattern but only some of its global features. It turns out, quantum circuits of different levels of complexity provide a useful way to establish a hierarchy among many-body entanglement structures. A circuit of a finite depth generates only short range entanglement which is in the same gapped phase as an unentangled product state. A linear depth circuit on the other hand can lead to chaos beyond thermal equilibrium. In this talk, we discuss how to reach the interesting regime in between that contains nontrivial gapped orders. This is achieved using the Sequential Quantum Circuit — a circuit of linear depth but with each layer acting only on one subregion in the system. We discuss how the Sequential Quantum Circuit can be used to generate nontrivial gapped states with long range correlation or long range entanglement, perform renormalization group transformation in foliated fracton order, and create defect excitations inside the bulk of a higher dimensional topological state.

Monday, April 8, 2024 11:30am - 12:30pm
Raiffeisen Lecture Hall

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.
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