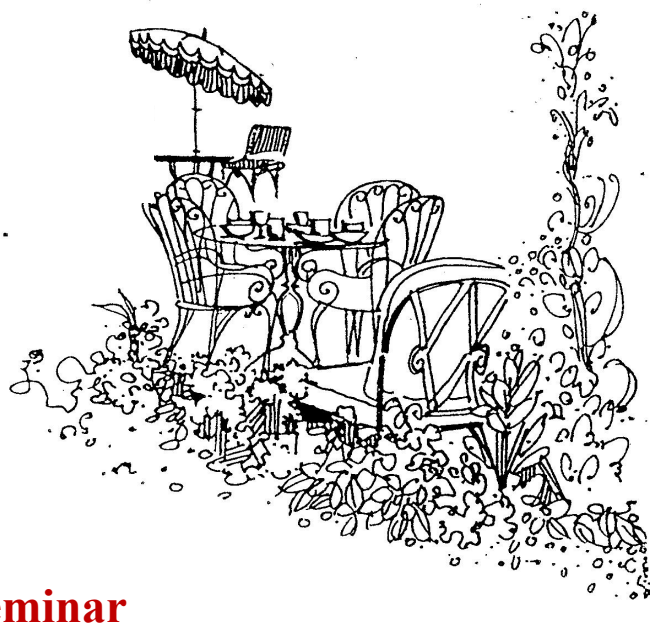
Chez Pierre

Presents ...

Monday, March 18, 2024
12:00 pm - 1:00 pm
Duboc Room - 4-331



Chez Pierre Seminar

Dmitri Abanin, Princeton University

“ Temporal entanglement and complexity of quantum many-body dynamics”.

Entanglement entropy and its scaling with system size determine the complexity of quantum many-body states. Non-equilibrium many-body dynamics is often accompanied by rapid growth of entanglement, and is therefore challenging to simulate classically. I will describe a new approach to a range of problems in quantum dynamics, based on viewing a many-body system as a quantum bath. The bath is characterized by the Feynman-Vernon influence functional. Viewing this object as a fictitious wave function in the temporal domain, I will characterize its complexity in terms of temporal entanglement. Temporal entanglement exhibits favorable, area-law scaling with evolution time for a range of important problems, including thermalization, quenches in integrable systems, and quantum impurity models. This observation yields rigorous bounds on simulation complexity of some of these problems, and underlies a new family of efficient computational methods.

Finally, time permitting, I will discuss a recent experiment with the Google Quantum Processor, where a quantum bath was emulated using a few auxiliary qubits periodically reset to remove quasiparticles from the system, thereby enabling robust preparation of correlated many-body states.