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Title

Entanglement dynamics in hybrid quantum circuits

Abstract

An open quantum system is continuously "monitored" by its environment, so its dynamics consists of two competing processes: unitary evolution, which generates entanglement and generically leads to chaotic dynamics, and non-unitary operations resulting from measurements and noisy couplings to the environment, that tend to irreversibly destroy quantum information by revealing it. A minimal model that captures these competing processes consists of a quantum circuit made up of random unitary gates interlaced with local projective measurements. Remarkably, this minimal model undergoes a dynamical phase transition as the rate of measurements is increased. In this lecture, I will discuss the phenomenology of this transition, and introduce an exact replica statistical mechanics approach to this problem. I will briefly discuss recent progress in understanding measurement-induced symmetry-breaking and topological orders and related criticality, which would be forbidden in equilibrium and are stabilized by dissipation.