Gaps of frustration-free Lindbladians

Carolyn Zhang, Harvard University

In equilibrium systems, recent work at the interface of condensed matter theory and quantum information theory has shown that gapless frustration-free Hamiltonians can only admit a finite-size spectral gap that scales as 1/L^z with z\geq 2. This rules out, for example, realizing a conformal field theory with a frustration-free Hamiltonian. Many examples of Lindbladian dynamics, such as those stabilizing classical and quantum memories, are also frustration-free: the global steady state is also stabilized by each local Lindbladian term. In this work, we show that the constraints on the spectral gap also apply to frustration-free Lindbladians in some cases, but can also be evaded.