Bulk-boundary correspondence and tensor network states

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Tensor networks states describe many-body quantum systems with local interactions in thermal equilibrium. At zero temperature, they correspond to ground states of frustration-free local Hamiltonians, and fulfill the so-called area law: the entropy of the reduced state corresponding to a connected region scales with the area surrounding that region, and not with its volume. This indicates that there should be a holographic map between the bulk and the boundary of any connected region. We derive such a map, and show how the bulk properties of the state can be obtained from a theory that leaves at the boundary, described by a boundary Hamiltonian. For gapped systems, that Hamiltonian is local and becomes non-local as one approaches a gapless phase. For topological phases, the Hamiltonian can be splitted into a universal one, which is constant in the whole phase, and a local Hamiltonian which depends on the microscopic details. Finally, I will also mention some results on quantum simulations of high-energy physics models.