

Title: Topological orders, symmetries, and dualities

Abstract:

We show how symmetries and dualities can lead to a dimensional reduction and topological orders. In particular, we discuss the effects of thermal fluctuations using a generalization of Elitzur's theorem. We illustrate that, depending on the system geometry, there are both quantum and classical systems that have degeneracies that depend on the system topology or are exponentially large in the system boundary area. We briefly discuss the "bond algebraic" approach to dualities and explain why dualities are often conformal. Using this approach, we illustrate that the nearest neighbor "XXZ honeycomb compass" (a two component (XY) analog of the Kitaev model on the honeycomb lattice) and square lattice Majorana Hubbard model both exhibit exact 3D Ising type transitions. With these dualities, we further compute the free energies of the X-cube model and other topologically ordered systems. We show that, at irrational filling, various systems exhibit emergent quasiperiodicity.