

Jordan

Title: QMA-complete problems for stoquastic Hamiltonians and Markov matrices

Abstract: Many spin models (e.g. Ising with transverse field and ferromagnetic Heisenberg) can be put in stoquastic form. This means that all off-diagonal matrix elements are non-positive. Stoquastic Hamiltonians are not believed to be universal for adiabatic quantum computation, and the problem of estimating the ground energy of stoquastic Hamiltonians appears to be easier than for general local Hamiltonians (that is, not QMA-hard). I will discuss recent results with Peter Love and David Gosset showing that for stoquastic Hamiltonians, the highest eigenstate is universal for adiabatic quantum computation and estimating the highest eigen-energy is QMA-hard. This holds even if the stoquastic Hamiltonian has a frustration-free ground state. Using the same techniques we also obtain a QMA-complete problem relating to classical Markov chains.