

Day 1

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Title: Testing Quantumness in the Transverse-Field Ising Model using the Perturbed Ferromagnetic Chain

Abstract:

The stoquasticity of Hamiltonians in the Transverse-Field Ising model (TFIM) allows for accessible classical simulation and emulation of these quantum systems. However, problems that are highly frustrated can prove difficult to solve efficiently for both quantum and classical methods. Here, we introduce the perturbed ferromagnetic chain (PFC), a chain of frustrated sub-systems whereby the occurrence of a false minimum and the exponential degeneracy of the first excited state manifold can trap semi-classical algorithms in the first excited state. We explore the algorithmic performance of the adiabatic quantum master equation, path-integral Monte Carlo and spin-vector Monte Carlo (including its variants) to highlight the difficulty classical systems have in the TFIM when solving this frustrated problem.

This work was done in collaboration with Louis Fry-Bouriaux and Paul Warburton