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D-Wave systems
Quantum and classical estimators for quantum Boltzmann statistics

We apply three methods to the task of estimating statistics of quantum Boltzmann distributions in the transverse field Ising model.
The first is based on drawing samples from a physical implementation of quantum annealing (QA). The second is based on simulated quantum annealing (SQA) using continuous-time quantum Monte Carlo. The third is based on parallel-tempering quantum Monte Carlo (PT-QMC).
QA and SQA have qualitatively similar error patterns, but the rate required in SQA to match the QA error increases both with system size, and with the ratio of problem energy scale to transverse field energy scale (roughness of the energy landscapes). Our PT-QMC implementations are capable of establishing exact statistics for large systems over long runs, but require resources that increase with system size to match the errors achieved by QA. These results indicate that the QA-based estimator we propose may be a good candidate for approximate sampling of certain complex transverse field Ising models.