

Abstract Submitted
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Verification of a translationally invariant Ising Spin Quantum Simulator¹ ANIMESH DATTA, THEODOROS KAPOURNIOTIS, University of Warwick — We present a verification scheme for a quantum simulator to sample the partition function of the Ising model at imaginary temperatures. Based on a two dimensional lattice of interacting spins in a fixed local magnetic field that can simulate natural quantum many body systems, this sampling problem is believed to be hard to simulate classically. It is therefore a candidate for demonstrating the supremacy of quantum simulation over classical computing. However, to demonstrate quantum supremacy one needs to verify that the sampler is indeed producing a sample that is close to the correct one in total variation distance. We propose a verification scheme that achieves this by requiring the verifier to be capable of imperfect single qubit preparation. Our scheme has a quadratic improvement over the original protocol (by Gao/Wang/Duan) in the number of elementary operations. Moreover, the extra computation required from the simulator for the test is simpler than the original computation. Finally, our scheme is proven to be secure in a composable setting, that is, in a setting where the device may run other protocols in serial or parallel composition.

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