

Contracting Tensor Network on a Noisy Quantum Computer

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I will argue that even a medium-scale (50 to ~ 100 qubits) quantum computer can significantly speed up the existing tensor network calculations. This is because the classical tensor network contraction algorithms have hit a plateau, and because the contraction time on a quantum computer scales much favorably compared to the classical methods. What makes this proposal realistic is the fact that the method is noise-resilient. Under the standard noise model, the effect of noise on low-point correlation functions remains controlled even in the large system limit. I expect this method to primarily help understand challenging quantum many-body systems, but we will also muse on other speculative possibilities (e.g., machine learning) as well.

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