



Contribution ID: 460

Type: **Poster**

C1: Hybrid stochastic method for the tensor renormalization group

Wednesday, 28 July 2021 08:45 (15 minutes)

We study a hybrid stochastic method for the tensor renormalization group (TRG) approach.

The TRG is known as a powerful tool to study the many-body systems and quantum field theory on the lattice.

It is based on a low-rank approximation of the tensor using the truncated singular value decomposition (SVD), whose computational cost significantly increases as the bond dimension increases, so that efficient cost reduction techniques are highly demanded.

We use a noise vector for the low-rank approximation with combining the truncated SVD, by which the truncation error is replaced with a statistical error due to noise, and an improvement of the error estimation could be expected.

We test this method in the classical Ising model in comparison with the original TRG method, and also discuss other applications of the method for further error reductions.

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Session Classification: Poster

Track Classification: Algorithms (including Machine Learning, Quantum Computing, Tensor Networks)