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Toward tensor renormalization group study of three-dimensional non-Abelian gauge theory

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We propose a method to represent the path integral over gauge fields as a tensor network. We introduce a trial action with variational parameters and generate gauge field configurations with the weight defined by the trial action. We construct initial tensors with indices labelling these gauge field configurations. We perform the tensor renormalization group with the initial tensors and optimize the variational parameters. As a first step to the TRG study of non-Abelian gauge theory in more than two dimensions, we apply this method to three-dimensional pure $SU(2)$ gauge theory. Our result for the free energy agrees with the analytical results in weak and strong coupling regimes.

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