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Tensor renormalization group approach to higher-dimensional lattice field theories

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The tensor renormalization group (TRG) approach is a variant of the real-space renormalization group to evaluate the path integral defined on the thermodynamic lattice, without resorting to any probabilistic interpretation for the given Boltzmann weight. Moreover, since the TRG can directly deal with the Grassmann variables, this approach can be formulated in the same manner for the systems with bosons, fermions, or both. These advantages of the TRG approach have been confirmed by the earlier studies of various lattice theories, which suggest that the TRG potentially enables us to investigate the parameter regimes where it is difficult to access with the standard stochastic numerical methods, such as the Monte Carlo simulation.
In this talk, explaining our recent applications of the TRG approach to several (3+1)-dimensional field theories on a lattice, we demonstrate the efficiency of the TRG as a tool to investigate higher-dimensional theories and future perspectives.

Recording and publishing

yes

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