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Perturbative tensor network varieties for correlated excitations

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The Mott insulator–superfluid transition in the one-dimensional Bose–Hubbard model is a paradigmatic example of a second-order quantum phase transition. While mean-field approaches capture the transition itself, they fail to describe correlated excitations in the Mott phase.
We present a perturbative tensor network ansatz based on Bogoliubov–de Gennes (BdG) equations that overcomes this limitation. Our results show that BdG excitations provide both conceptual understanding and quantitative accuracy for correlated excitations in the Mott phase.

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