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【124】Hybrid Tree Tensor Networks for quantum simulation

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Hybrid Tensor Networks (hTNs) offer a promising solution for encoding variational quantum states beyond the capabilities of efficient classical methods or noisy quantum computers alone. However, their practical usefulness and many operational aspects of hTN-based algorithms have not been thoroughly investigated yet. In this contribution, we introduce a novel algorithm to perform ground state optimizations of hybrid Tree Tensor Networks (hTTNs), discussing its advantages and roadblocks. We benchmark our approach on two paradigmatic models, namely the Ising model at the critical point and the Toric code Hamiltonian. In both cases, we successfully demonstrate that hTTNs can improve upon classical equivalents with equal bond dimension in the classical part.

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