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Entanglement witnessing for lattice gauge theories

LGTs are at the core of fundamental physics and, recently, substantial theoretical and experimental efforts have gone into simulating LGTs using quantum technologies.

In the quantum realm, entanglement plays a crucial role and its detection can be efficiently performed using entanglement witnesses.

Yet, entanglement witnessing in LGTs is extremely challenging due to the gauge constraints, that severely limit the operators that can be employed to detect quantum correlations.

In this work, we develop the theoretical framework of entanglement witnessing in lattice gauge theories and, by way of illustration, consider bipartite entanglement witnesses in a $U(1)$ LGT (with and without fermionic matter).

Our framework, which avoids the costly measurements required, e.g., by full-tomography, opens the way to future theoretical and experimental studies of entanglement in an important class of many-body models.

Abstract category

Other

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