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Quantum entanglement in symmetric spin systems

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We present a method to quantify entanglement in mixed states of highly symmetric spin systems. Symmetry constrains interactions between spins and predicts the degeneracies of the states. While symmetry alone produces entangled eigenstates, the mixed state (density) which contains all of the eigenstates (weighted by their Boltzmann factors) is not necessarily as entangled as the eigenstates themselves because generally the density can be re-expressed as a sum over states which are less entangled. The entanglement of the density is the minimum obtained by considering all such re-expressions, but there is no well-defined method to do this in general. Our method uses symmetry to explicitly construct unentangled contributions to the density, which are then optimally included in the density, resulting in a quantitative measure of entanglement that correctly accounts for the reduction of entanglement arising from degenerate states. We present results for several small spin systems.

Keyword-1

Entanglement

Keyword-2

Spin Sytems

Keyword-3

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