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Improved lattice method for determining entanglement measures in $SU(N)$ gauge theories

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The determination of entanglement measures in $SU(N)$ gauge theories is a non-trivial task. With the so-called “replica trick”, a family of entanglement measures, known as “Rényi entropies”, can be determined with lattice Monte Carlo. Unfortunately, the standard implementation of the replica method for $SU(N)$ lattice gauge theories suffers from a severe signal-to-noise ratio problem, rendering high-precision studies of Rényi entropies prohibitively expensive.

In this work, we propose a method to overcome the signal-to-noise ratio problem and show some first results for $SU(N)$ in 3 and 4 dimensions.

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