Abstract Submitted
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Detecting Goldstone Modes Using Entanglement Entropy in Quantum Monte Carlo BOHDAN KULCHYTSKYY, CHRIS HERDMAN, University of Waterloo, STEPHEN INGLIS, Ludwig Maximilian University of Munich, ROGER MELKO, University of Waterloo, Perimeter Institute — Bipartite entanglement entropy has emerged as a multifunctional tool in the study of condensed matter systems. In the context of systems with a spontaneously broken continuous symmetry, the scaling of this quantity has been predicted by Metlitski and Grover to have logarithmic subleading universal contribution to the boundary law [1]. To test this, we conduct large-scale Quantum Monte Carlo simulations for a two-dimensional spin-1/2 XY-model at temperatures below the finite-system energy gap. Based on the predicted Renyi entropy scaling form, we are able to extract the number of Goldstone modes through the coefficient of the subleading logarithm. Further, we confirm that an additional subleading geometrical constant is present, which can be expressed in terms of a quantity in a free scalar field theory. This work illustrates the striking quantitative agreement that can be achieved between analytical continuum theory and lattice numerics, through calculations of Renyi entanglement entropies.
[1] M. Metlitski and T. Grover, arXiv:1112.5166 (2011)

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