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Spins, pseudo-Majoranas and the functional RG

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Frustrated three-dimensional quantum magnets bear a rich phenomenology but are notoriously hard to treat theoretically. We show how a $SO(3)$ Majorana representation of spin operators, in combination with the functional renormalization group allows for quantitative simulations at finite temperatures. Focusing on Heisenberg magnets, we establish a finite-size scaling approach and extract critical temperatures and -exponents. For the Pyrochlore lattice, we discuss the improvements introduced by two-loop contributions in the flow equations. We also show how the method can be applied so meet some challenges of long-range interacting spin Hamiltonians arising in the context of Rydberg atom array quantum simulators.

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