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Scale-renormalized matrix-product states for correlated quantum systems[1] ANDERS SANDVIK, Boston University — A generalization of matrix product states (MPS) is introduced which is suitable for describing interacting quantum systems in two and three dimensions. These *scale-renormalized matrix-product states* (SR-MPS) are based on a course-graining of the lattice in which the blocks at each level are associated with matrix products that are further transformed (scale renormalized) with other matrices before they are assembled to form blocks at the next level. Using variational Monte Carlo simulations of the two-dimensional transverse-field Ising model as a test, it is shown that the SR-MPS converge much more rapidly with the matrix size than a standard MPS. It is also shown that the use of lattice-symmetries speeds up the convergence very significantly.

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