Diagonalization with matrix-product states\textsuperscript{1} CHEN LIU, ANDERS SANDVIK, Boston University — We consider matrix-product states (MPSs) combined with diagonalization as a method to study correlated quantum many-body systems. The Hamiltonian matrix is constructed in a non-orthogonal basis of MPSs. Diagonalizing this matrix (a generalized eigenvalue problem) gives the ground state as well as excitations. The accuracy is significantly improved compared to individual optimized MPSs. We discuss several ways to generate the MPS basis states in a suitable way and present results for one- and two-dimensional quantum spin systems.

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