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Reducing Memory Cost of Exact Diagonalization using Singular Value Decomposition MARVIN WEINSTEIN, SLAC National Accelerator Laboratory, RAVI CHANDRA, ASSA AUERBACH, Technion, Haifa — We present a modified Lanczos algorithm to diagonalize lattice Hamiltonians with dramatically reduced memory requirements. In contrast to variational approaches and most implementations of DMRG, Lanczos rotations towards the ground state do not involve incremental minimizations, (e.g. sweeping procedures) which may get stuck in false local minima. The lattice of size N is partitioned into two subclusters. At each iteration the rotating Lanczos vector is compressed into two sets of $n_{\rm svd}$ small subcluster vectors using singular value decomposition. For low entanglement entropy S_{ee}, (satisfied by short range Hamiltonians), the truncation error is bounded by $\exp(-n_{\rm svd}^{1/S_{ee}})$. Convergence is tested for the Heisenberg model on Kagomé clusters of 24, 30 and 36 sites, with no lattice symmetries exploited, using less than 15GB of dynamical memory. Generalization of the Lanczos-SVD algorithm to multiple partitioning is discussed, and comparisons to other techniques are given. Reference: arXiv:1105.0007

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