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Matrix product states for anyonic systems and efficient simulation of dynamics\(^1\) SUKHBINDER SINGH, Macquarie University, ROBERT PFEIFER, GUIFRE VIDAL, Perimeter Institute for Theoretical Physics, GAVIN BRENNEN, Macquarie University — Anyons are exotic quasiparticles that exhibit non-trivial exchange statistics and arise as low lying excitations of topological phases of matter. Many-body systems of anyons offer a realm of new physics to explore that depends on their topological properties. The formalism of Matrix Product States [1] (MPS) has led to significant advances in the study of quantum many-body systems with local degrees of freedom such as spins or bosons. The MPS also forms the basis of the highly successful “time-evolving block decimation” [2] (TEBD) algorithm, which can be used to efficiently simulate dynamics of 1D systems. I will describe how to extend the MPS formalism and the TEBD algorithm to study lattice systems of anyons, which carry non-local degrees of freedom. I will also present supporting simulation results for chains of interacting anyons, including results for an anyonic Hubbard-type model [3] that give insight into the transport properties of anyons.
