Fermionic iPEPS with non-Abelian symmetries

BENEDIKT BRUOGNOLO, JAN VON DELFT, ANDREAS WEICHSELBAUM, Ludwig Maximilians University, Munich, Germany — Tensor network (TN) techniques have emerged as one of the most promising tools to resolve many open questions in two-dimensional (2D) lattice models with fermions and frustration. An infinite projected entangled-pair state (iPEPS) represents a particularly versatile TN ansatz working directly in the thermodynamic limit, whose competitiveness has been demonstrated only recently in the context of the 2D $t$-$J$ and Hubbard model [1,2]. Above all, this method makes it possible to study competing low-energy states by constraining specific unit-cell structures or by enforcing that the wavefunction breaks or conserves particular symmetries. In this work, we explore the benefits of conserving global non-Abelian symmetries in the iPEPS ansatz using the QSpace tensor library [3]. To this end, we study an iPEPS with SU(2) spin rotation symmetry for interacting fermionic systems on the square lattice.