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Clifford-augmented Grassmann tensor networks for efficient fermionic system simulations

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We propose a Grassmann variant of the recently-proposed Clifford-augmented matrix product state (CA-MPS) algorithm for efficiently simulating fermionic quantum systems. By incorporating Clifford circuits into Grassmann MPS to locally reduce the entanglement entropy, our method enhances the expressive power of traditional fermionic tensor network algorithms. Applied to various benchmark systems, CA-GMPS achieves better energy convergence and reduced entanglement entropy compared to standard DMRG. These results highlight the potential of Clifford-augmented schemes as lightweight quantum-inspired enhancements for fermionic simulations.

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