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## Variational Quantum Eigensolver for $SU(N)$ Fermions

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Variational quantum algorithms aim at harnessing the power of noisy intermediate-scale quantum computers, by using a classical optimizer to train a parameterized quantum circuit to solve tractable quantum problems. The variational quantum eigensolver is one of the aforementioned algorithms designed to determine the ground-state of many-body Hamiltonians. Here, we apply the variational quantum eigensolver to study the ground-state properties of  $N$ -component fermions. With such knowledge, we study the persistent current of interacting  $SU(N)$  fermions, which is employed to reliably map out the different quantum phases of the system. Our approach lays out the basis for a current-based quantum simulator of many-body systems that can be implemented on noisy intermediate-scale quantum computers.

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