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Effectiveness of Symmetry Verification for the Variational Quantum Eigensolver Algorithm

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The Variational Quantum Eigensolver algorithm (VQE) offers a potential near-term implementation of state preparation on a quantum computer. A significant barrier in the current hardware landscape is the occurence of noise, and full fault tolerance through quantum error correction is not currently feasible. Thus, it is important to consider possible quantum error mitigation techniques and their effectiveness. I will show the impact of a technique called symmetry verification, where output is post-processed to only keep states that are in an expected symmetry sector, when applied to VQE preparation of the ground state of the Schwinger Model. I will demonstrate the potential to be misled by results, and argue that a lot of care should taken to justify this use case.

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