

Hardware Implementation of the Projective Quantum Eigensolver

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Abstract: The projective quantum eigensolver (PQE) is an iterative hybrid quantum-classical algorithm inspired by the "gold standard" coupled cluster method of classical computing. This presents the first hardware implementation of PQE on noisy intermediate-scale quantum devices and best practices for its use. We are able to compute an accurate and swiftly converging dissociation curve for H_2 in the STO-6G basis set using qubit tapering techniques, both for the ground and first excited states. We also study the Transverse Field Ising Model. With limited computational resources, a judicious choice of qubit encoding allows highly accurate results to be obtained without CNOT gates. Error extrapolation techniques improve the accuracy of a more sophisticated circuit with CNOT gates are also explored but prove less accurate for this system.

References

- [1] J. P. Misiewicz and F. A. Evangelista, Hardware Implementation of the Projective Quantum Eigensolver. (in preparation)
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