Variational Quantum Eigensolver: How to Use Any Quantum Device in Your Lab to Perform Quantum Simulation

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Quantum devices offer a way to simulate and study states that currently cannot be efficiently stored or manipulated on classical computers. Unfortunately, many quantum algorithms designed to simulate such states are prohibitively expensive in terms of quantum resources such as coherence time. In this talk I will review a recently introduced technique, the Variational Quantum Eigensolver, that has minimal coherence and can utilize any quantum device capable of basic state preparation and measurement for a quantum advantage in the simulation of physical quantum states. I will also introduce the problem of simulation of molecular systems in quantum chemistry and discuss recent advances in understanding and reducing the costs associated with this problem in our and related algorithms.