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# The shell model in a quantum computer

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The nuclear shell model is one of the prime many-body methods to study the structure of atomic nuclei, but it is hampered by an exponential scaling on the basis size as the number of valence particles increases. I will discuss a quantum circuit design strategy to find nuclear ground states by exploiting an adaptive variational quantum eigensolver algorithm. This circuit implementation is in excellent agreement with classical shell-model simulations for a dozen of light and medium-mass nuclei, including neon and calcium isotopes. Simulated circuits approach the benchmark results with a polynomial scaling in quantum resources for each nucleus. I will also discuss entanglement measures, their connection to nuclear structure observables as well as potential strategies to exploit entanglement forging in nuclear physics. This work paves the way for quantum computing shell-model studies across the nuclear chart.

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