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Neural-network variational Monte Carlo for atomic nuclei

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Quantum Monte Carlo approaches based upon Feynman path integrals are powerful for addressing quantum many-body problems. However, they generally suffer from the "fermion-sign problem" that leads to exponential scaling of the computation effort with system size. As an alternative, the variational Monte Carlo (VMC) approach avoids such sign problems, but the challenge becomes how to construct an efficient and accurate variational ansatz. In this talk, I will introduce our recent developments in the neural-network ansatz for the VMC approach. I will show that the VMC calculations with neural-network ansatz can provide accurate solutions for the ground states of few- and many-body nuclei while keeping the computational cost polynomially scaling with system size, thanks to the strong expressive power of neural networks.

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