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# Neural quantum states for the simulation of nonequilibrium quantum systems

*Monday, 19 September 2022 18:00 (3 hours)*

The state space of a quantum-mechanical system grows exponentially in the number of its classical degrees of freedom. Thus, efficient approximations are crucial for extracting physical information from this vast space. In the variational approach, computations are performed on trial states determined by a tractable number of parameters. Neural quantum states (NQS) provide a large family of such trial states by using a neural-network ansatz to parametrize probability amplitudes. NQS-based methods can be applied to learning both ground states and dynamics of quantum many-body system.

In this poster, we present our current efforts in applying NQS methods to simulating strongly correlated quantum systems in and out of equilibrium. In particular, we highlight our recent work on understanding the stability properties of time-evolution algorithms for NQS based on the time-dependent variational Monte Carlo method (Hofmann et al., SciPost Phys. 12, 2022). Furthermore, we will present results of our ongoing research into the application of NQS for representing states in quantum spin liquid systems. Our computational work is based on NetKet, a collaboratively developed open-source software framework providing models and algorithms for machine learning in quantum many-body physics (Carleo et al., SoftwareX 10, 2019; Vicentini et al., arXiv:2112.10526).

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