Contribution ID : 42 Type : Invited oral

Simulating dissipative quantum many-body dynamics via the time-dependent Variational Monte Carlo method

Monday, 23 September 2024 10:00 (30)

The rapid advancement in quantum technologies has heightened interest in surpassing classical simulators through quantum supremacy. A significant challenge in this endeavor is the effective understanding and manipulation of open quantum systems, which are crucial for the progression of advanced quantum technologies. While several approximate methods have been proposed to simulate the dynamics of open quantum systems, their applicability has largely been confined to small-scale systems [1].
In this study, we introduce a novel approach utilizing the time-dependent Variational Monte Carlo (tVMC) method. Our method employs the unravelling of master equations to produce a series of quantum trajectories governed by a stochastic Schrödinger equation (SSE). When the effect of the environment can be well approximated by a Markovian master equation, by solving multiple independent trajectories we reconstruct time-dependent observables consistently.
We apply this method to dissipative quantum many-body models, exploring various variational ansätze, ranging from Jastrow wavefunctions to more advanced Neural Networks Quantum States (NNQS) [2, 3].

References

[1] H. Weimer, A. Kshetrimayum and R. Orús, Rev. Mod. Phys. 93, 015008 (2021).
[2] G. Carleo and M. Troyer, Science 355, 602 (2017).
[3] M. J. Hartmann and G. Carleo, Phys. Rev. Lett. 122, 250502 (2019).

Primary author(s) : Dr D'ALBERTO, Jacopo (Dipartimento di Fisica "Aldo Pontremoli", Università degli Studi di Milano, Milano, Italy); Dr APOSTOLI, Christian (Dipartimento di Fisica "Aldo Pontremoli", Università degli Studi di Milano, Milano, Italy); Dr BERTAINA, Gianluca (Istituto Nazionale di Ricerca Metrologica, Torino, Italy); Prof. GALLI, Davide Emilio (Dipartimento di Fisica, Università degli Studi di Milano)

Presenter(s) : Prof. GALLI, Davide Emilio (Dipartimento di Fisica, Università degli Studi di Milano)

Session Classification : Session

Track Classification : Computational quantum many-body physics