DAMOP20-2020-000247

Abstract for an Invited Paper
for the DAMOP20 Meeting of
the American Physical Society

Generative modeling of quantum simulators[1]

GIACOMO TORLAI, Simons Foundation

The recent advances in qubit manufacturing and coherent control of synthetic quantum matter are leading to a new generation of intermediate-scale quantum hardware, with promising progress towards simulation of quantum matter and materials. In order to enhance the capabilities of this class of quantum devices, some of the more arduous experimental tasks can be off-loaded to classical algorithms running on conventional computers. In this talk, I will present a framework based on industry-standard machine learning algorithms to perform approximate quantum state reconstruction from qubit measurement data. The resulting neural-network wavefunctions can be deployed to perform measurements of observables that may not be directly accessible in the original experimental platform, or that may entail a substantial experimental overhead in terms of both quantum resources and classical post-processing. I will demonstrate this approach for extracting the entanglement entropy from experimental cold-atom data, and for variational quantum chemistry simulations using superconducting qubits.

[1]The Flatiron Institute is supported by the Simons Foundation