Optimizing annealing schedules with hybrid quantum optimization algorithms.

Quantum Annealing (QA) is a strategy to solve hard optimization problems through a continuous-time adiabatic evolution of an appropriate quantum Hamiltonian. A crucial ingredient in the QA strategy is, therefore, the construction of a suitable adiabatic driving schedule for the quantum Hamiltonian. However, traditional schedule optimization in QA requires spectral information on the problem (e.g., the location of the minimum gaps), which is usually inaccessible. We revisit the issue of schedule optimization in QA, using the Quantum Approximate Optimization Algorithm (QAOA) framework. In the benchmark models of the Ising chain and the XY chain, we show how to obtain optimal adiabatic digital schedules, without any prior spectral information on the problem. Finally, we discuss recent results which suggest that tools from machine learning can be used to extend the construction to more general problems.

[1] G. B. Mbeng, R. Fazio, and G. Santoro, arXiv:1906.08948 [quant-ph] (2019)

[2] Matteo M. Wauters, Emanuele Panizon, Glen B. Mbeng, and Giuseppe E. Santoro, Phys. Rev. Research 2, 033446 (2020)