Quantum Computing in MATLAB

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Abstract

We present the new MATLAB Support Package for Quantum Computing, which provides utilities to build, simulate, and visualize quantum circuits. Additionally, it is possible to connect to hardware providers and run circuits on their quantum computers.

The capabilities of this software package include

- Constructing a circuit from a set of quantum gates, which are applied to specific qubits. In addition to a set of standard simple gates, more complex gates are available: mcxGate [1]; initGate, unitaryGate, ucrxGate, ucryGate, and ucrzGate [2, 3].
- Verifying the quantum algorithm by simulating it on the local computer or sending it to a remote simulator through cloud services.
- Executing the circuit by connecting to quantum computing hardware through cloud services (specifically, IBM Qiskit Runtime Services and Amazon Web Services). This involves sending hardware-specific quantum assembly (OpenQASM) code to these services.
- Creating quadratic unconstrained binary optimization (QUBO) problems and solving them on the local computer using Tabu search [4].

This package enables the prototyping of quantum algorithms that have applications in optimization, scenario simulation, machine learning, as well as chemistry and material simulations.

References

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