

Quantum Benchmarking

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Schwerpunktmodul activity in the Quantum Computing course

Benchmarking

Introduction

A new algorithm to benchmark quantum processors was created and tested on a variety of systems. After the initial approach proved to have some issues, a modified version of the algorithm was tested as well.

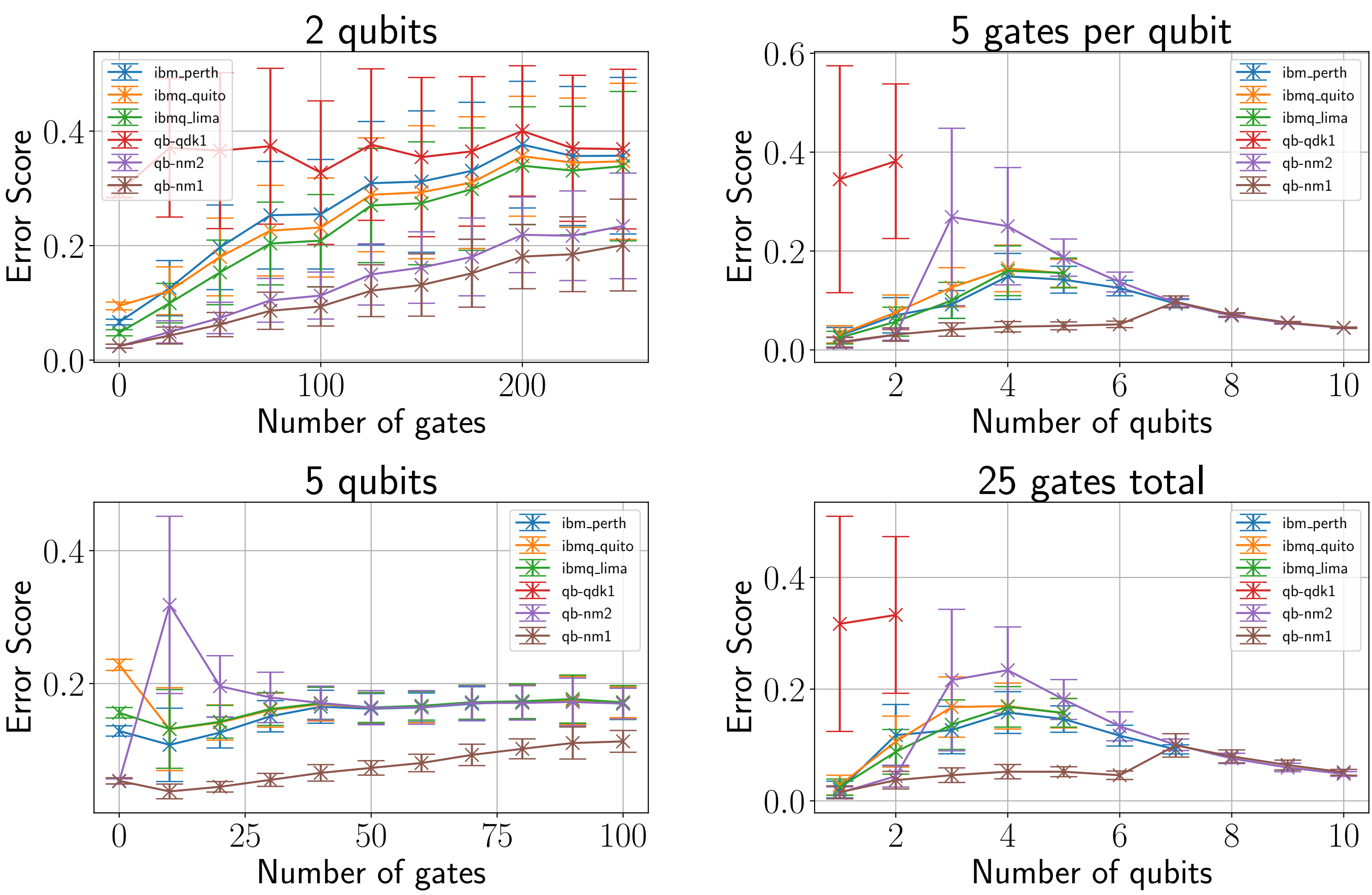
IBMQ and Quantum Brilliance

Algorithms are tested on emulated versions of IBM Quantum and Quantum Brilliance systems. The error data of several IBMQ processors available on their free tier is requested through their API to simulate quantum circuits in Qiskit on backends that approximate the IBMQ systems.

Using the Quantum Brilliance Emulator software, the same quantum circuits are simulated on several Noise Models available from the Quantum Brilliance servers. The benchmarking algorithms determine how the circuits are generated and how the measured counts are processed. Running the algorithms on real quantum processors would be possible, but was not attempted due to long wait times when using a free IBMQ account.

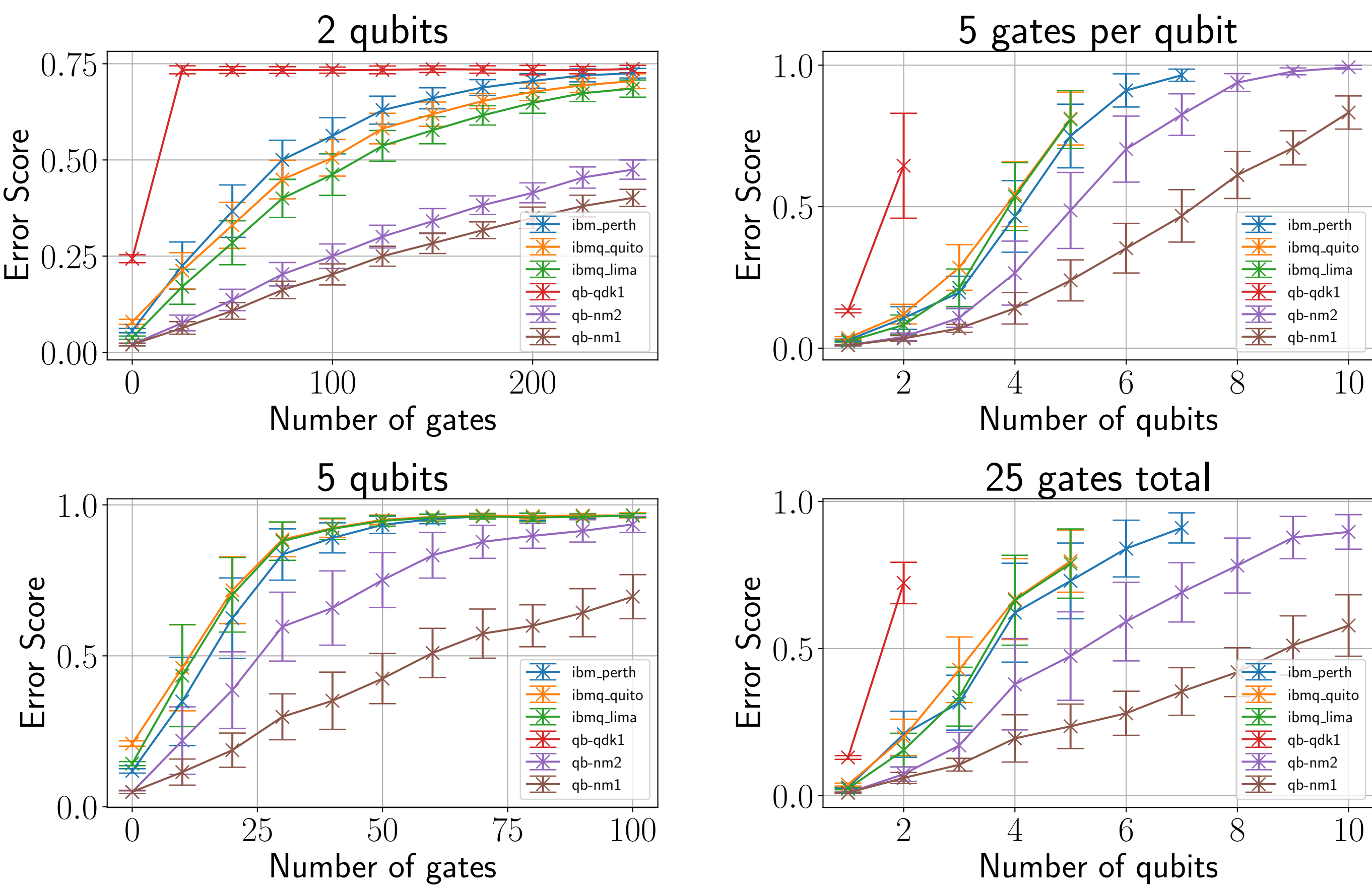
First approach

Results of first approach



Second approach

Results of second approach



Problems

References

[1] IBMQ Resources, <https://quantum-computing.ibm.com/services/resources>, 2023