KColor Problem Report

Report generated on: 2025-08-14 10:33:14

Graph Details

Number of Nodes: 4
Edges of Nodes: [(0,1), (0,3), (1,2), (2,3)]

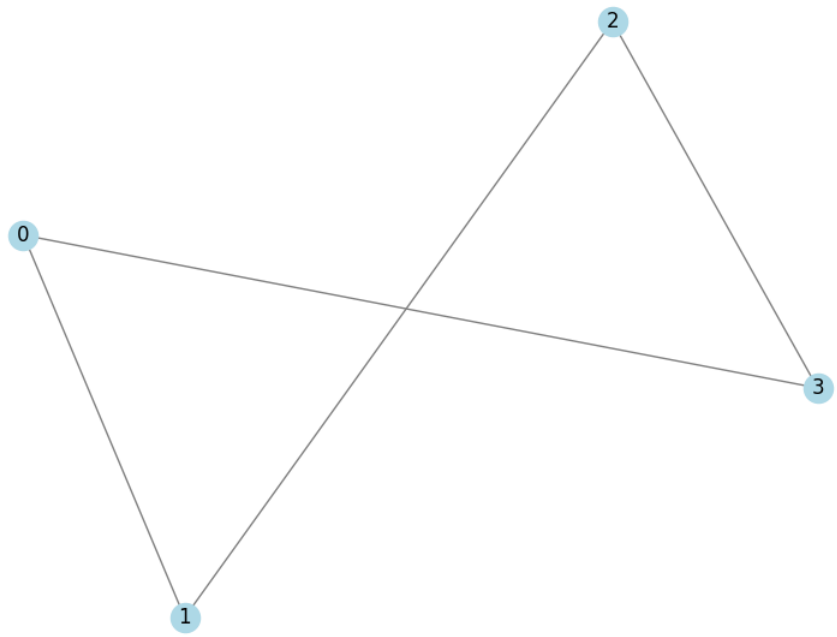


Figure 1: Graph Visualization

0.1 QUBO Matrix Visualization

Converted QUBO matrix visualization:

−2.0	4.0	4.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
0.0	−2.0	4.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
0.0	0.0	−2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0
0.0	0.0	0.0	−2.0	4.0	4.0	2.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	−2.0	4.0	0.0	2.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	−2.0	0.0	0.0	2.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	−2.0	4.0	4.0	2.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	−2.0	4.0	0.0	2.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−2.0	0.0	0.0	2.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−2.0	4.0	4.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−2.0	4.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−2.0

0.2 Oracle Visualization

The corresponding oracle for the KColor is shown below:
not implemented yet

QAOA Optimization Results

Most Probable Solution for QAOA:

- Variable x_1 is set to false
- Variable x_2 is set to false
- Variable x_3 is set to false
- Variable x_4 is set to false
- Variable x_5 is set to false
- Variable x_6 is set to true
- Variable x_7 is set to true
- Variable x_8 is set to false
- Variable x_9 is set to false
- Variable x_{10} is set to false
- Variable x_{11} is set to true
- Variable x_{12} is set to false

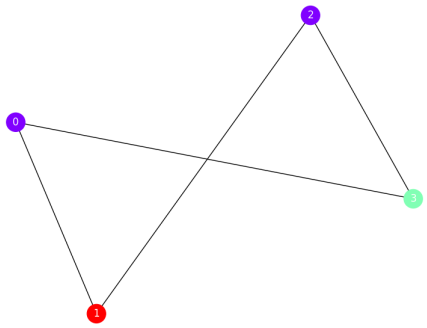


Figure 2: QAOA Result

VQE Optimization Results

Most Probable Solution for VQE:

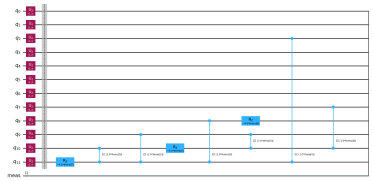
- Variable x_1 is set to true
- Variable x_2 is set to false
- Variable x_3 is set to false
- Variable x_4 is set to false
- Variable x_5 is set to true
- Variable x_6 is set to false
- Variable x_7 is set to true
- Variable x_8 is set to false
- Variable x_9 is set to false
- Variable x_{10} is set to false
- Variable x_{11} is set to true
- Variable x_{12} is set to false

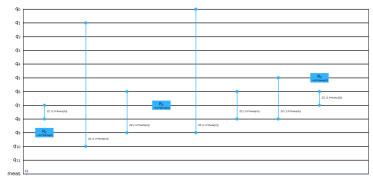
Grover's Algorithm Results

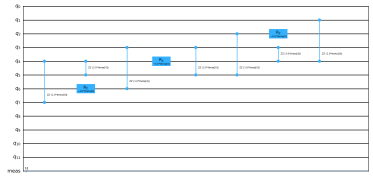
not implemented yet

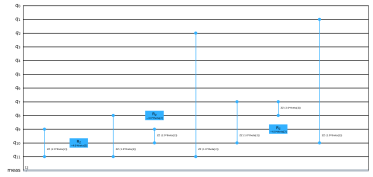
Device Recommendation Summary

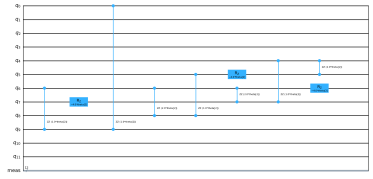
\textbf{Here is the device recommendation summary based on error, time, and price:}\
- Lowest error: Quantinuum H1 from Azure Quantum with a calculated error of 18.09%, time to execute: 6253.2 seconds and a price of $304750.0.
- Lowest time: IQM Garnet from Amazon Braket with a calculated error of 100.0%, time to execute: 0.778 seconds and a price of $87.5.
- Lowest price: ibm_kyiv from IBM Quantum with a calculated error of 100.0%, time to execute: 8.060444 seconds and a price of $12.9.

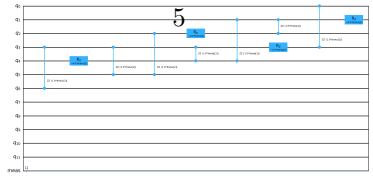












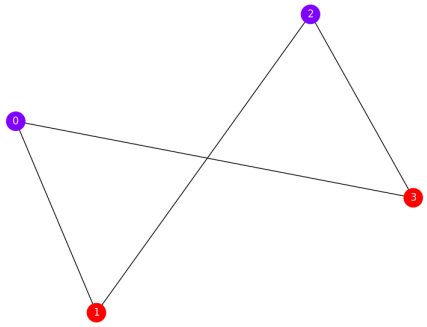
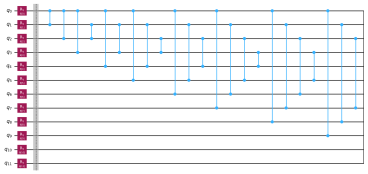
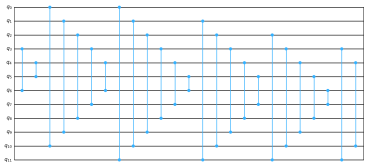
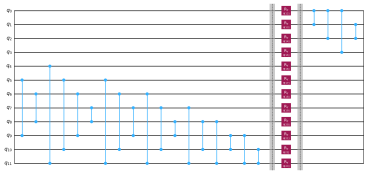
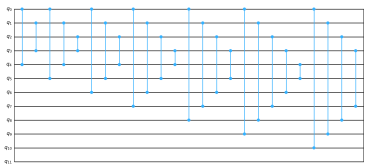


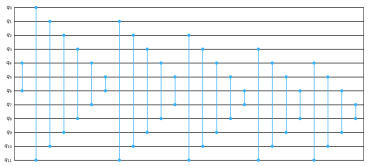
Figure 4: VQE Result

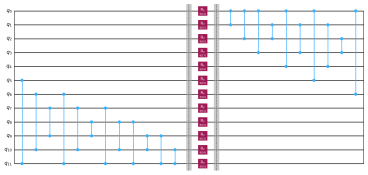


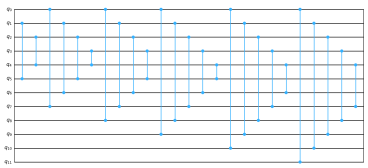


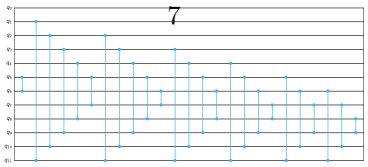












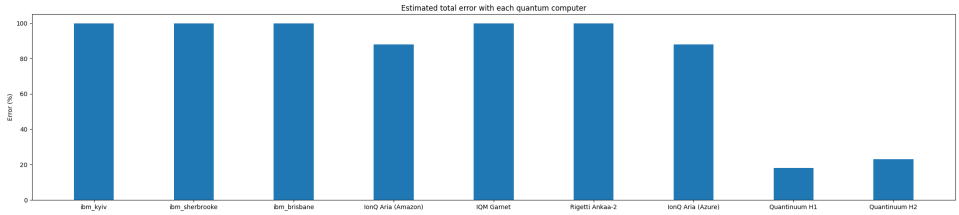


Figure 6: Estimated total error with each quantum computer

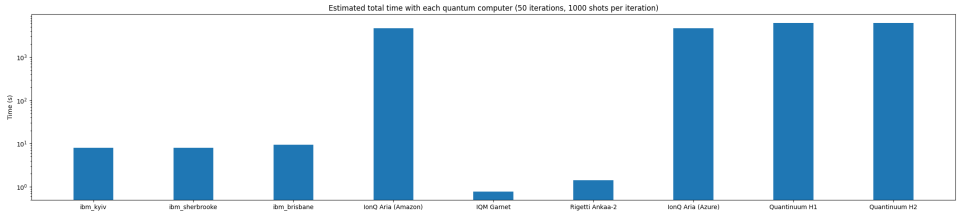


Figure 7: Estimated total time with each quantum computer

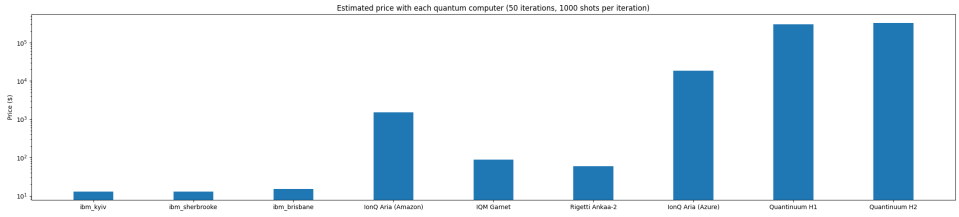


Figure 8: Estimated price with each quantum computer