TSP Problem Report

Report generated on: 2025-12-10 20:54:48

Graph Details

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

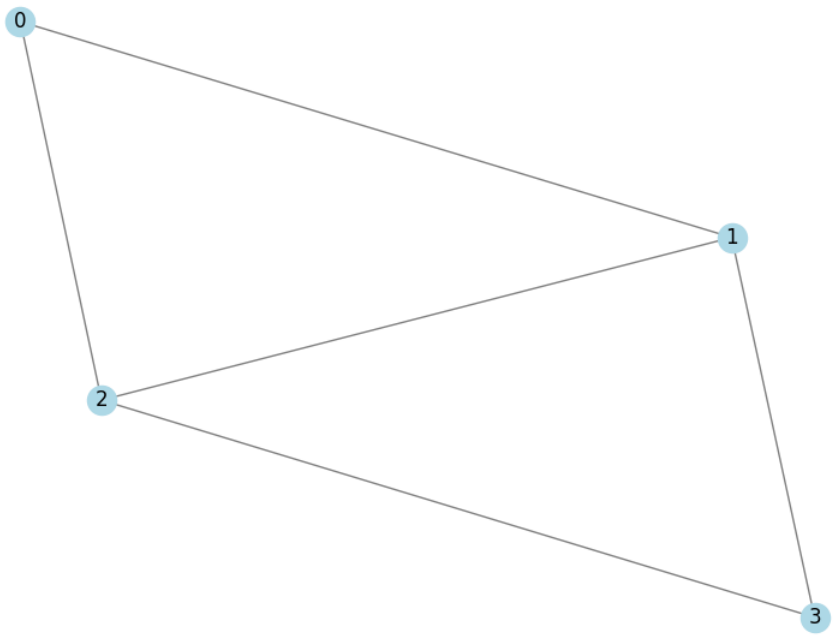


Figure 1: Graph Visualization

0.1 QUBO Matrix Visualization

Converted QUBO matrix visualization:

−22.0	22.0	22.0	22.0	22.0	1.0	0.0	0.0	22.0	1.0	0.0	0.0	22.0	11
0.0	−22.0	22.0	22.0	0.0	22.0	1.0	0.0	0.0	22.0	1.0	0.0	0.0	22
0.0	0.0	−22.0	22.0	0.0	0.0	22.0	1.0	0.0	0.0	22.0	1.0	0.0	0.
0.0	0.0	0.0	−22.0	0.0	0.0	0.0	22.0	0.0	0.0	0.0	22.0	0.0	0.
0.0	1.0	0.0	0.0	−22.0	22.0	22.0	22.0	22.0	1.0	0.0	0.0	22.0	1.
0.0	0.0	1.0	0.0	0.0	−22.0	22.0	22.0	0.0	22.0	1.0	0.0	0.0	22
0.0	0.0	0.0	1.0	0.0	0.0	−22.0	22.0	0.0	0.0	22.0	1.0	0.0	0.
0.0	0.0	0.0	0.0	0.0	0.0	0.0	−22.0	0.0	0.0	0.0	22.0	0.0	0.
0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	−22.0	22.0	22.0	22.0	22.0	1.
0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	−22.0	22.0	22.0	0.0	22
0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	−22.0	22.0	0.0	0.
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−22.0	0.0	0.
0.0	11.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	−22.0	22
0.0	0.0	11.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	−2
0.0	0.0	0.0	11.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.

0.2 Oracle Visualization

The corresponding oracle for the TSP 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 true
- 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 false
- Variable x_{12} is set to true
- Variable x_{13} is set to false
- Variable x_{14} is set to true
- Variable x_{15} is set to false
- Variable x_{16} is set to false

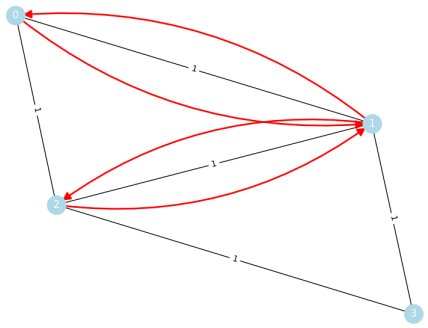


Figure 2: QAOA Result

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 false
- Variable x_6 is set to true
- Variable x_7 is set to false
- Variable x_8 is set to false

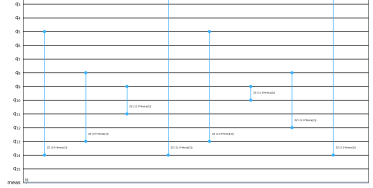
- Variable x_9 is set to false
- Variable x_{10} is set to false
- Variable x_{11} is set to true
- Variable x_{12} is set to false
- Variable x_{13} is set to false
- Variable x_{14} is set to false
- Variable x_{15} is set to false
- Variable x_{16} is set to true

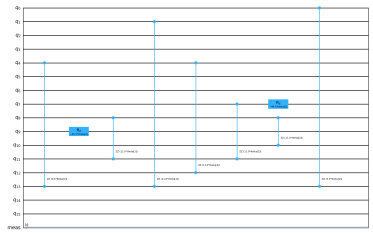
Grover's Algorithm Results

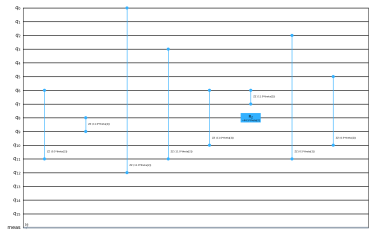
not implemented yet

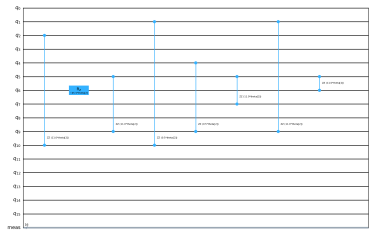
Device Recommendation Summary

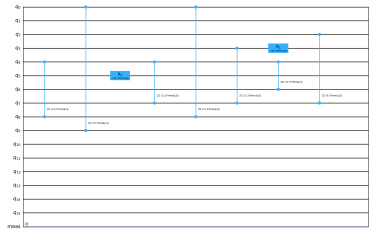
- Lowest error: Quantinuum H1 from Azure Quantum with a calculated error of 38.42%, time to execute: 4670.4 seconds and a price of $751500.0.
- Lowest time: IQM Garnet from Amazon Braket with a calculated error of 99.8%, time to execute: 1.779 seconds and a price of $87.5.
- Lowest price: ibm_sherbrooke from IBM Quantum with a calculated error of 100.0%, time to execute: 19.44008 seconds and a price of $31.1.

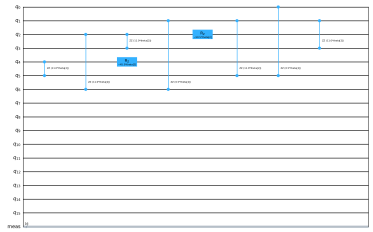


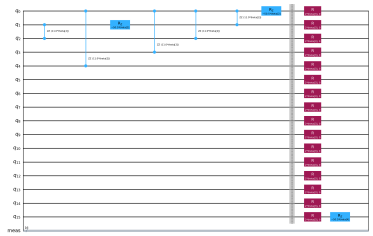


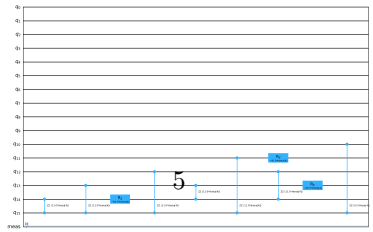


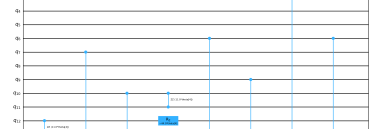












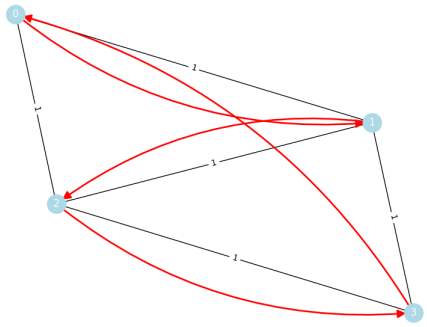
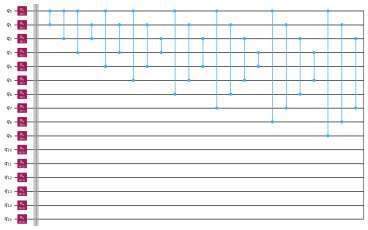
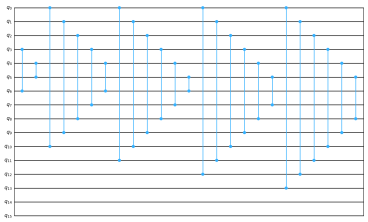
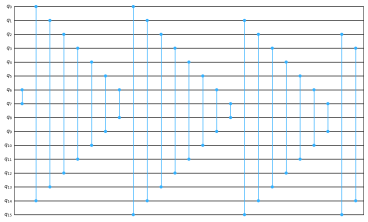
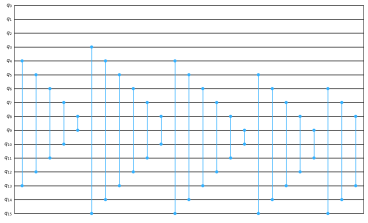


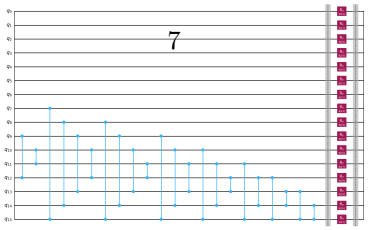
Figure 4: VQE Result











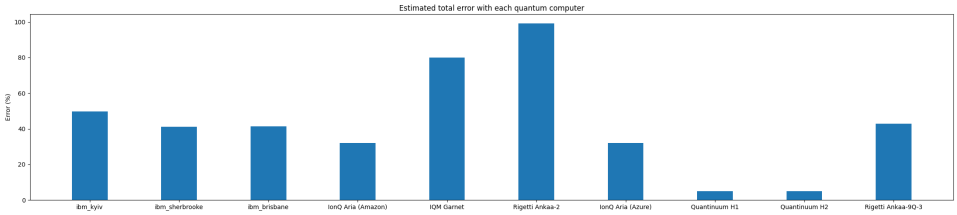


Figure 6: Estimated total error with each quantum computer

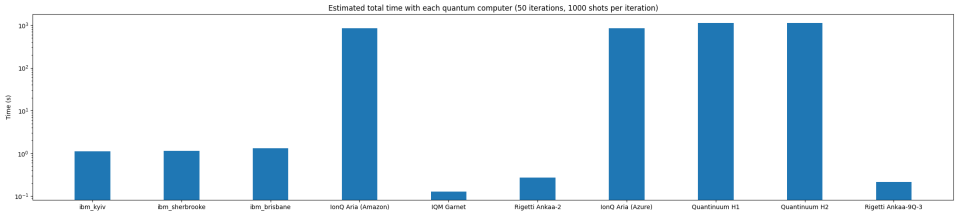


Figure 7: Estimated total time with each quantum computer

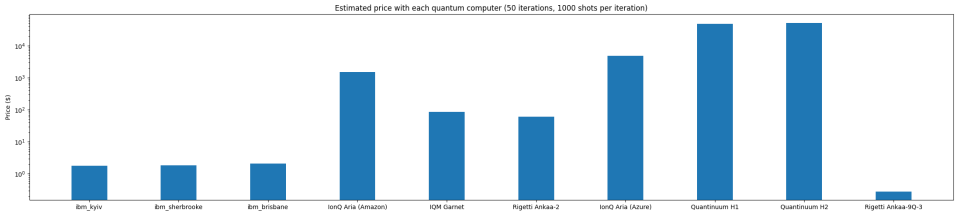


Figure 8: Estimated price with each quantum computer