# Independent Set Problem Report

Report generated on: 2024-11-15 16:46:20

## Graph Details

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

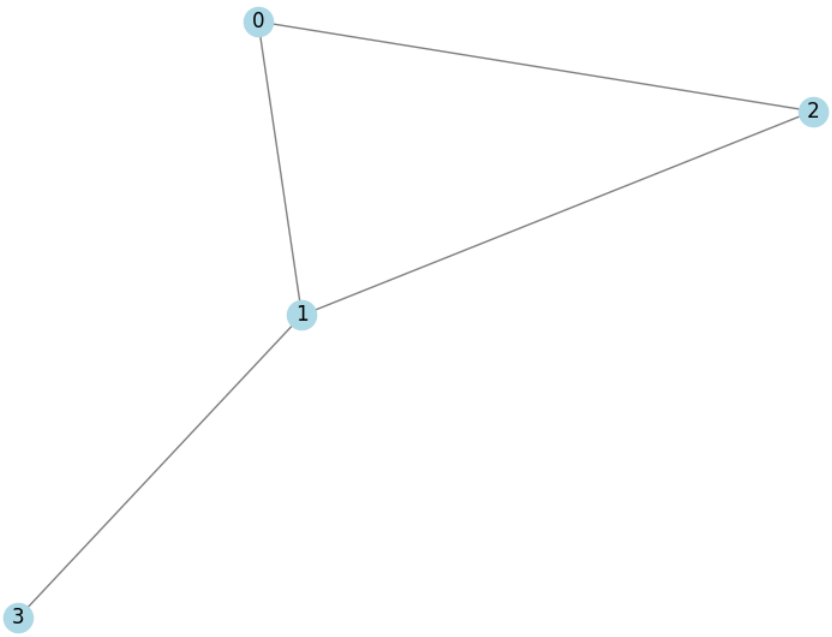


Figure 1: Graph Visualization

### 0.1 QUBO Matrix Visualization

Converted QUBO matrix visualization:

$$\begin{bmatrix} -1.0 & 2.0 & 2.0 & 0.0 \\ 0.0 & -1.0 & 2.0 & 2.0 \\ 0.0 & 0.0 & -1.0 & 0.0 \\ 0.0 & 0.0 & 0.0 & -1.0 \end{bmatrix}$$

## 0.2 Oracle Visualization

The corresponding oracle for the Independent Set problem is shown below:

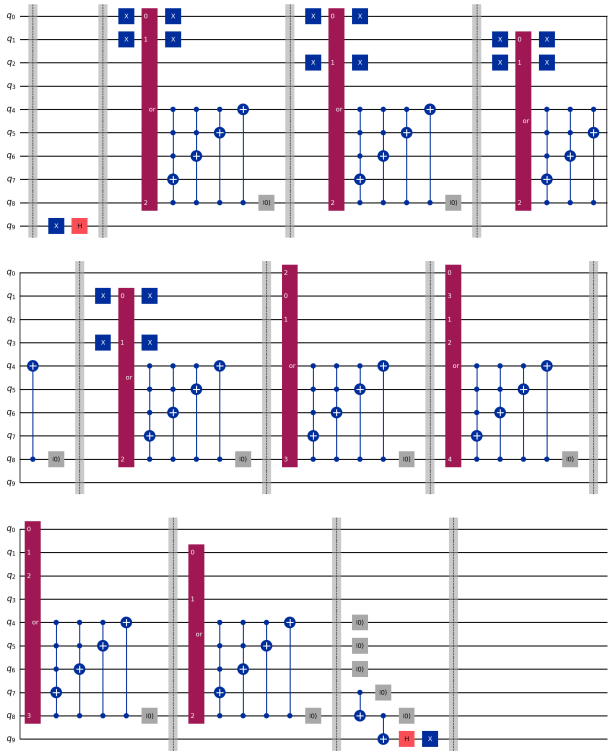

Figure 2: Corresponding Oracle Visualization for the Independent Set Problem

## 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 true
- Variable $x_4$ is set to true

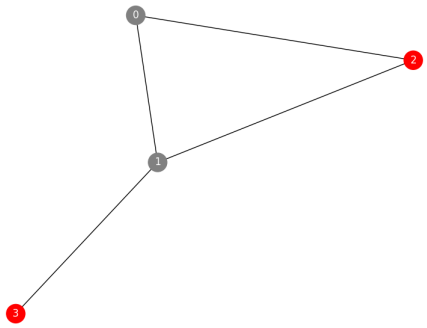


Figure 3: QAOA Result

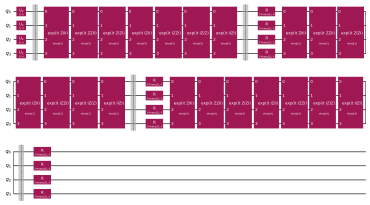

Figure 4: QAOA Quantum Circuit

## VQE Optimization Results

Most Probable Solution for VQE:

- Variable $x_1$ is set to false
- Variable $x_2$ is set to false
- Variable $x_3$ is set to true
- Variable $x_4$ is set to true

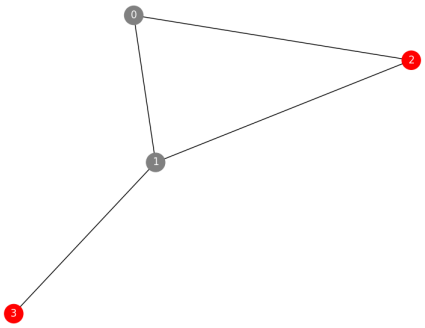


Figure 5: VQE Result

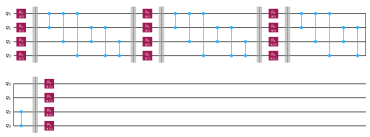

Figure 6: VQE Quantum Circuit

## Grover's Algorithm Results

Most Probable Solution for Grover's Algorithm:

- 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 true

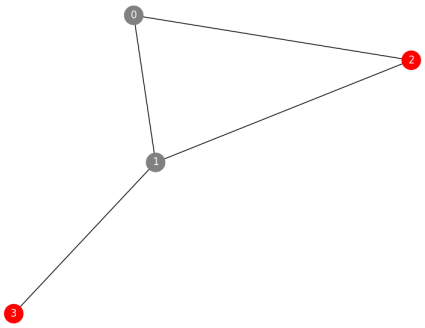


Figure 7: Grover' Algorithm Result

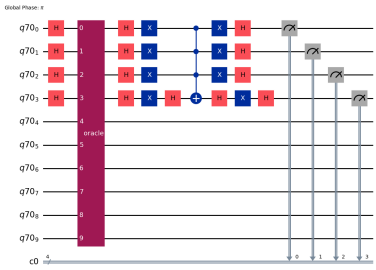


Figure 8: Grover's Quantum Circuit