Project 1

Quantum Walks and Monte Carlo

Team Name: Quantum Walkers

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Problem Statement

Our Project is about the implementation of the Quantum Galton Board using Quantum Circuits and how it can be tailored to create different probability distributions

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Task 1

In Task 1, we wrote a 2 page document on our understanding of the implementation of the Quantum Galton Board.

In short it talks about:

The quantum Galton board uses quantum superposition so the particle takes every possible path at once, and quantum interference determines which outcomes are amplified or suppressed. This interplay of probability waves leads to unique final distributions beyond the classical random walk pattern.

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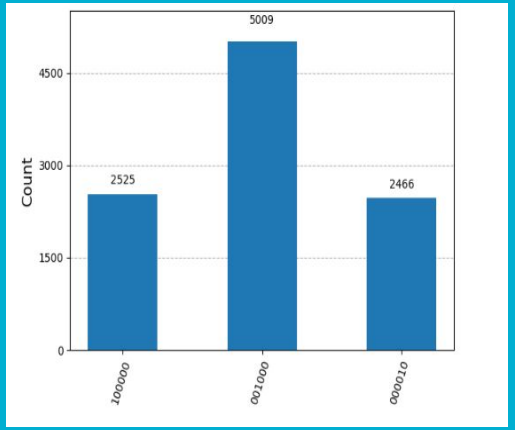
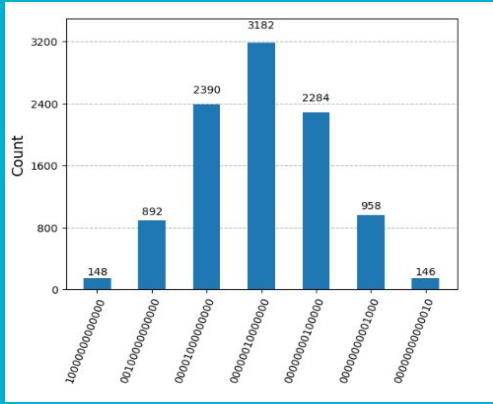
Task 2

In Task 2 we wrote a 1 and 2-layer Quantum Galton Board Quantum Circuit then a general algorithm that generates a circuit for any number of layers. We ran and verified that the output was a Gaussian distribution. The figure alongside shows the 2-layer and 6-layer QGB Gaussian distribution.





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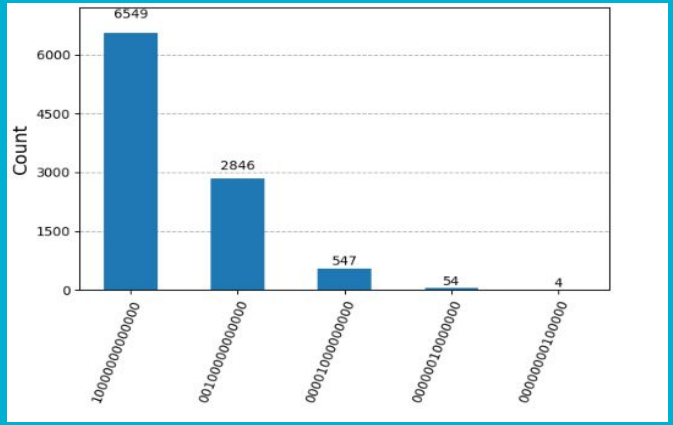
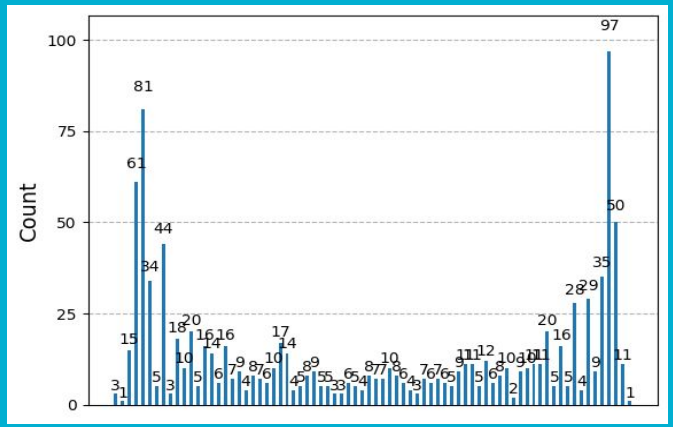
Task 3

In Task 3 modified the function so that it obtains a different target distributions:

- Exponential distribution
- Hadamard quantum walk





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Thank You