Exercise Set 4

Nov 18th 2021

Quantum Computer Programming - 2021-II

Exercises from [Asfaw19] 1.4 Single Qubit Gates:

1.

  (a) Write the H-gate as the outer products of vectors $|0\rangle$,$|1\rangle$, $|+\rangle$ and $|-\rangle$

  (b) Show that applying the sequence of gates: HZH, to any qubit state is equivalent to applying an X-gate.

  (c) Find a combination of X, Z and H-gates that is equivalent to a Y-gate (ignoring global phase).

2.

  (a) If we initialize our qubit in the state $|+\rangle$, what is the probability of measuring it in state $|-\rangle$?

  (b) Use Qiskit to display the probability of measuring a $|0\rangle$ qubit in the states $|+\rangle$ and $|-\rangle$ (Hint: you might want to use `.get_counts()` and `plot_histogram()`).

  (c) Try to create a function that measures in the Y-basis.

References

[Asfaw19] Abraham Asfaw et al., Learn Quantum Computation using Qiskit. Qiskit Development Team. 2019