Documentation:

Data Visualization 1:

- Imported FakeVigo, to create a simulated quantum backend of the quantum hardware device, Vigo.

- Create a noise model from the backend to simulate noise

- Create a coupling map to understand which qubits can directly interact. One example of an interaction could be using the CNOT gate. The two qubits will need to be directly connected for this gate.

- From here, we create a circuit with one qubit using Hadamard's Gate to analyze the difference in the 50 / 50 output, and two extra qubits to measure any extra noise

- To run the AerSimulator, we create a backend with the noise_model, coupling_map, and basis_gates

- We then transpile the circuit, and print the result

- The result counted nearly the same for 0's and 1's for the first qubit where the H-Gate was applied, which fit the 50 / 50 randomness. The 2nd and 3rd qubits counted the noise that flipped the qubits. For about every 100 qubits, there was about 1 qubit that was flipped due to noise.

Data Visualization Two:

- Import qiskit-experiments packages to measure the T1 relaxation time of a qubit

- Create a Noise Model using FakePerth as the mode. Set thermal relaxation to true. This will simulate the natural loss of coherence in a qubit over time.

- We assign a T1 Time for the first qubit from the qubit properties

- The np.arange() function creates an array of evenly spaced values from (start, to stop, with a step)

- Our start = 1e-6 second, and our stop = 3 * qubit0-t1 because it has a high probability of being in the ground state, each step = 3e - 5 second

- Create an experiment for qubit 0 with the specified time intervals
- For the transpile, we set the scheduling method to ‘asap’, as soon as possible, so the transpiler will minimize idle times between delays so the decay curve stays smooth
- Now we run the experiment, and display the results

Results:

The results estimate the T1 to be 58.6 +- 2.85 microseconds, and chi-squared to be 0.6698 which shows similarity to the expected value.