Quantum information and computing

Alberto Salvador (February 11th – March 11th)

Quantum circuit for inferring Gene Regulatory Network from single cell transcriptomic data

Reference: *Quantum gene regulatory network* https://www.nature.com/articles/s41534-023-00740-6

1. Read the reference article where the authors devise a quantum circuit to infer the presence of regulatory interaction between genenes.
2. Starting from the reference article, implement the quantum circuit (including the classical optimization of the circuit parameters) using qiskit to reproduce some of the results reported in Fig.3 (such as 3a). What are the resources required by the algorithm in terms of qubits and number of gates?
   How does this approach compare with the classical state of the art? What is the main advantage or bottleneck? You may also refer to the github repository reported in the reference paper.

By the due date please submit the presentation and the code. The final presentation will be 20 minutes long and you have to present the problem, methods and results. A final question on the program of the Quantum Information and Computing course will conclude the exam.