Quantum Support Vector Machines (QSVMs) for Breast Cancer Detection on IBM's Hardware

Liu, Alice (School: Boston Latin School)

Around 3.8 million women in the US are diagnosed with breast cancer. In terms of the survival rate, late or misclassified diagnosis decreases an individual’s chance of survival from 90% to just 15%. With the rise of quantum computing that relies on mechanical properties such as superposition, entanglement and tanging, this will allow for speedups in optimization methods. Quantum machine learning, a hybrid of quantum computing and AI, enables faster and more accurate processing of data compared to our current classical machine learning techniques, which has the potential for detecting breast cancer at an earlier stage. This may lead to better treatment options and a higher chance of survival. This specific proposal utilizes the quantum support vector machines (qSVM), a supervised learning algorithm, to classify breast cancer cells as benign or malignant based on set numerical parameters of the cells. Within the qSVM algorithm, there will be a 2-qubit simulation, 4-qubit simulation and 8-qubit simulation run on IBM’s hardware. The classification accuracy for these simulations are compared to the accuracy from a classical support vector machine algorithm acting as the control. The method that employs the quantum support vector machine algorithm with a 2-qubit simulation yielded the highest result, with a classification accuracy of 90%.

Awards Won:

Third Award of $1,000

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