

QAMP Second Checkpoint

Computing Rigid Body Rotations with Qiskit

A Variational Approach

We are working on creating a Quantum Neural Network Regressor which can learn patterns from N-dimensional linear transforms, in particular rotations. Once trained properly we could use such a Regression model to obtain the rotation of any vector in that space. The model is based on the Euler angles formula and an initial angle. The circuit below shows a basic layout for 3 dimensional rotation which requires two qubits. The encoding maps a (x,y,z) position as the components of the state vector represented in the first unitary. The encoding of Euler angles uses U3 gates for the encoding. The developed Neural Network uses measurement of expectation value as the output of each layer, then these values are used in order to reinitialize the next layer using R_y gates. Finally, we used a SWAP test in order to check the accuracy of our output and train our neural network. The biggest motivation for this approach is that it can be very easily generalized to any number of dimensions. State tomography can be used in order to obtain the final rotated vector.

