**Team Members:** Arushi Tibrewal, Rithwik Bhardwaj, Noah Kanter, Saniya Nazeer

**Contact Person:** Saniya Nazeer

**Description/Abstract:**

In this research project, we took a pretrained image classifier ML model and aimed to improve efficiency of the model by replacing its traditional convolutional neural network (CNN) layers with quantum layers that were executed via a quantum computer simulator. We accomplished this through a hybrid classical-quantum network using quantum transfer learning. Transfer learning is a machine learning technique that utilizes a pretrained model (i.e., the source model) on a large dataset as the foundation for training a new model for a related task. Specifically, we utilized a ResNet18 model pre-trained on images, removed the final layer, and added multiple quantum layers. We then trained only the quantum layers using the Adam optimizer and a learning rate scheduler to adjust the model’s weights based on the cross-entropy loss function. The train function received these inputs and updated the model’s weight based on the loss. Our optimized model successfully classified images as either a bee or ant, using only quantum layers to accomplish this task. Our primary aim is to improve our current model and prove that a quantum computer can accomplish the same task more efficiently than a classical computer. In addition, we plan to run our code on a real quantum device as a part of our future objectives.

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