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Quantum Hybrid vs Classical Methods

Comparative Analysis of Iris Classification

01

This presentation aims to compare the Iris classification using Quantum-Hybrid and Classical methods. The Iris dataset is a popular benchmark in machine learning. We will analyze the performance, accuracy, and computational complexity of both approaches. By the end, we will have a clear understanding of the advantages and limitations of each method.

02

IRIS DATASET

Before diving into the comparison, let's have a brief overview of Iris classification. The Iris dataset consists of measurements of four features: sepal length, sepal width, petal length, and petal width. The goal is to classify Iris flowers into three species: setosa, versicolor, and virginica. Various machine learning algorithms can be employed to solve this classification problem.

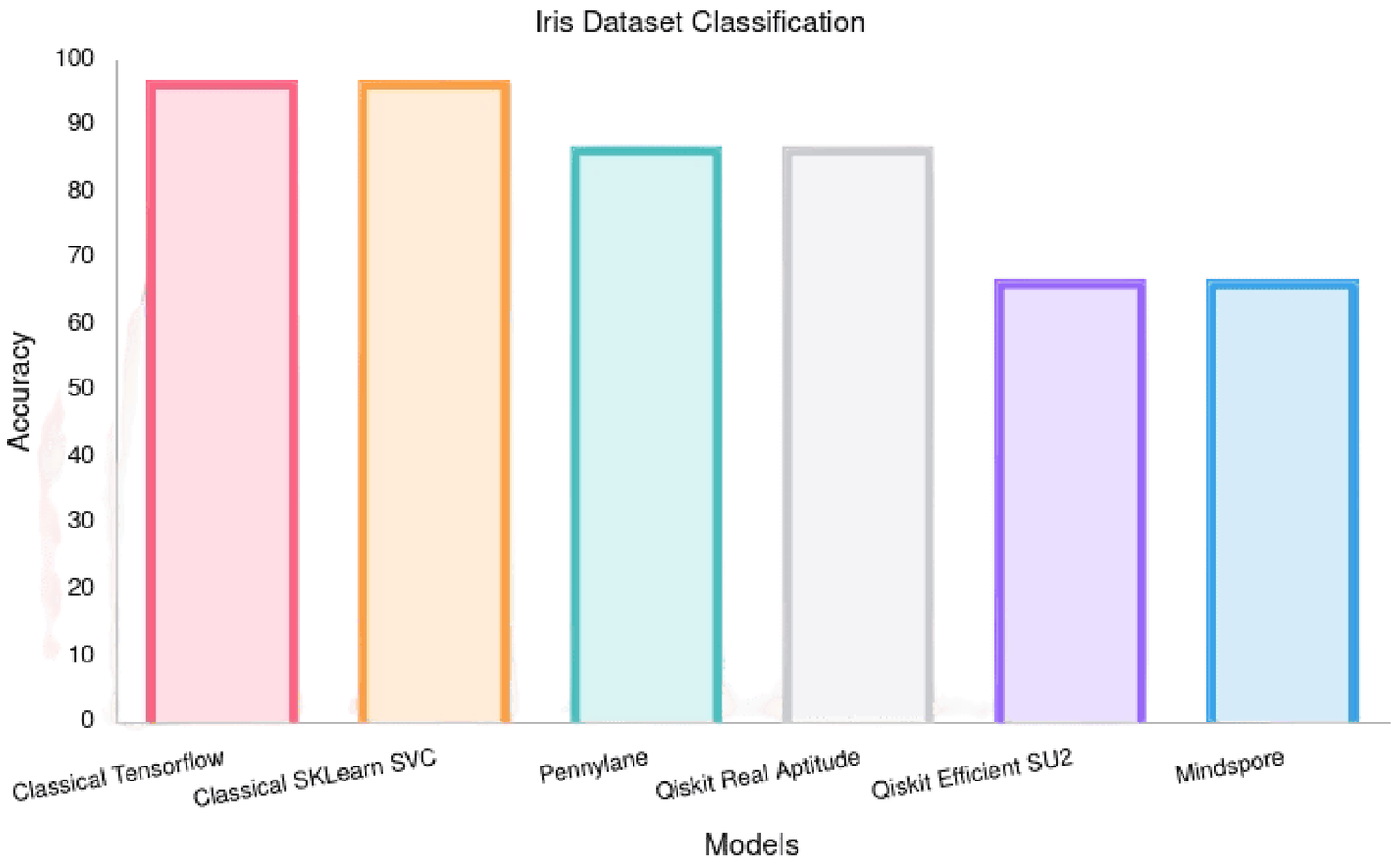
03

Methods

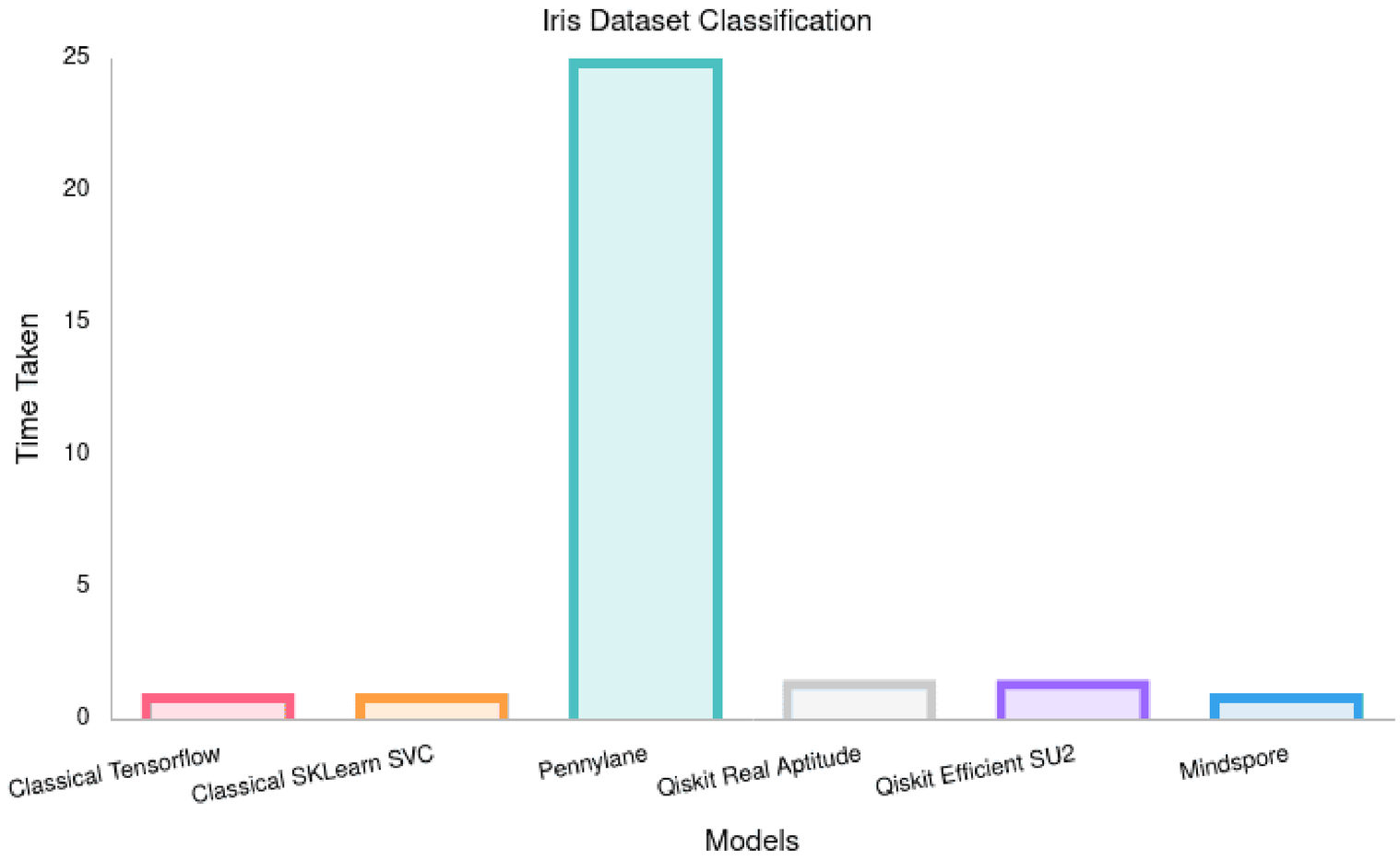
Classical :
Tensorflow
SKLearn SVC
Hybrid :
Pennylane
Mindspore
Qiskit Real Aptitude
Qiskit Efficient SU2

- First trained the models on the entire dataset
- Also trained the model on the first 100 samples to get only two species

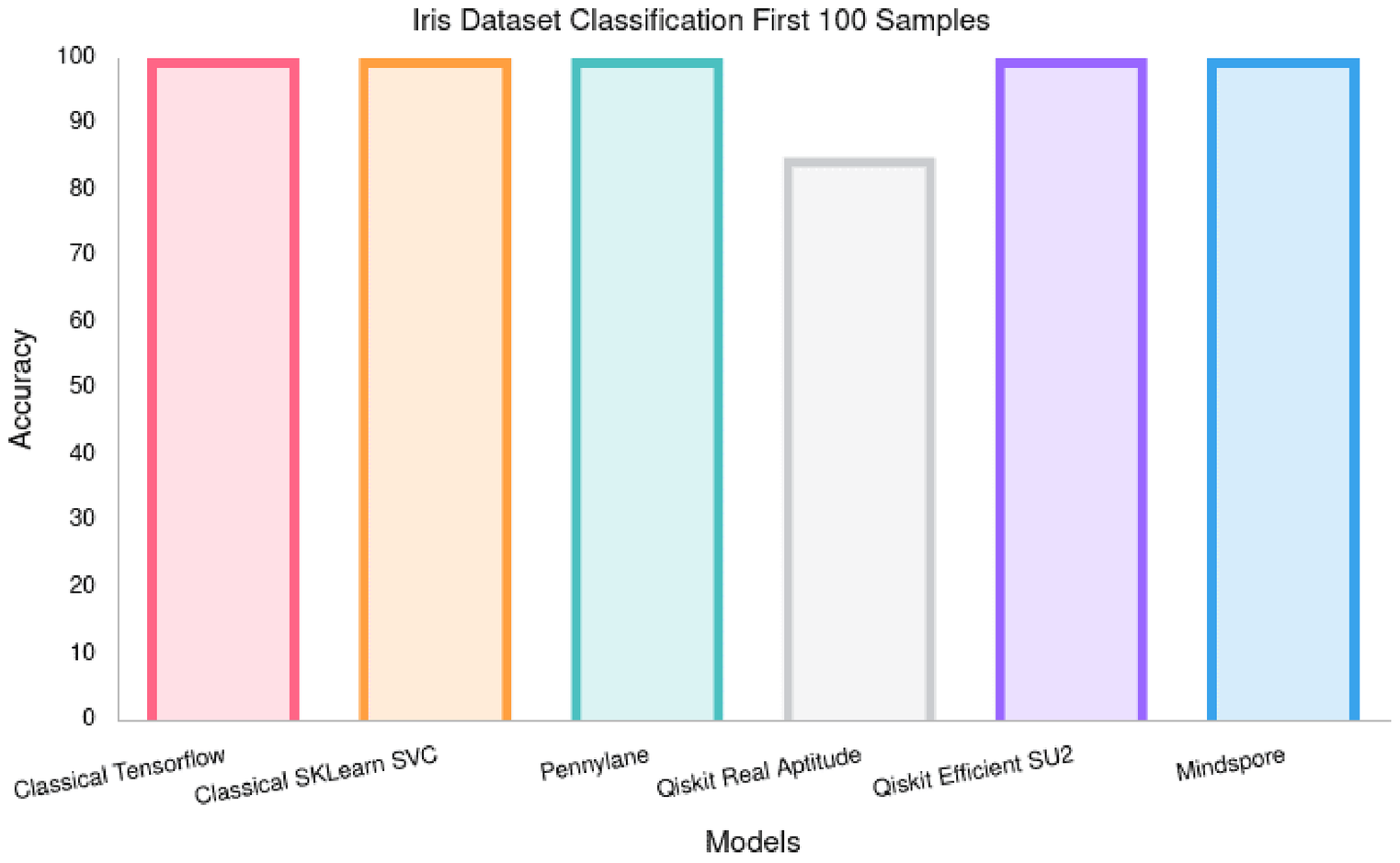
The entire IRIS dataset Results - Accuracy



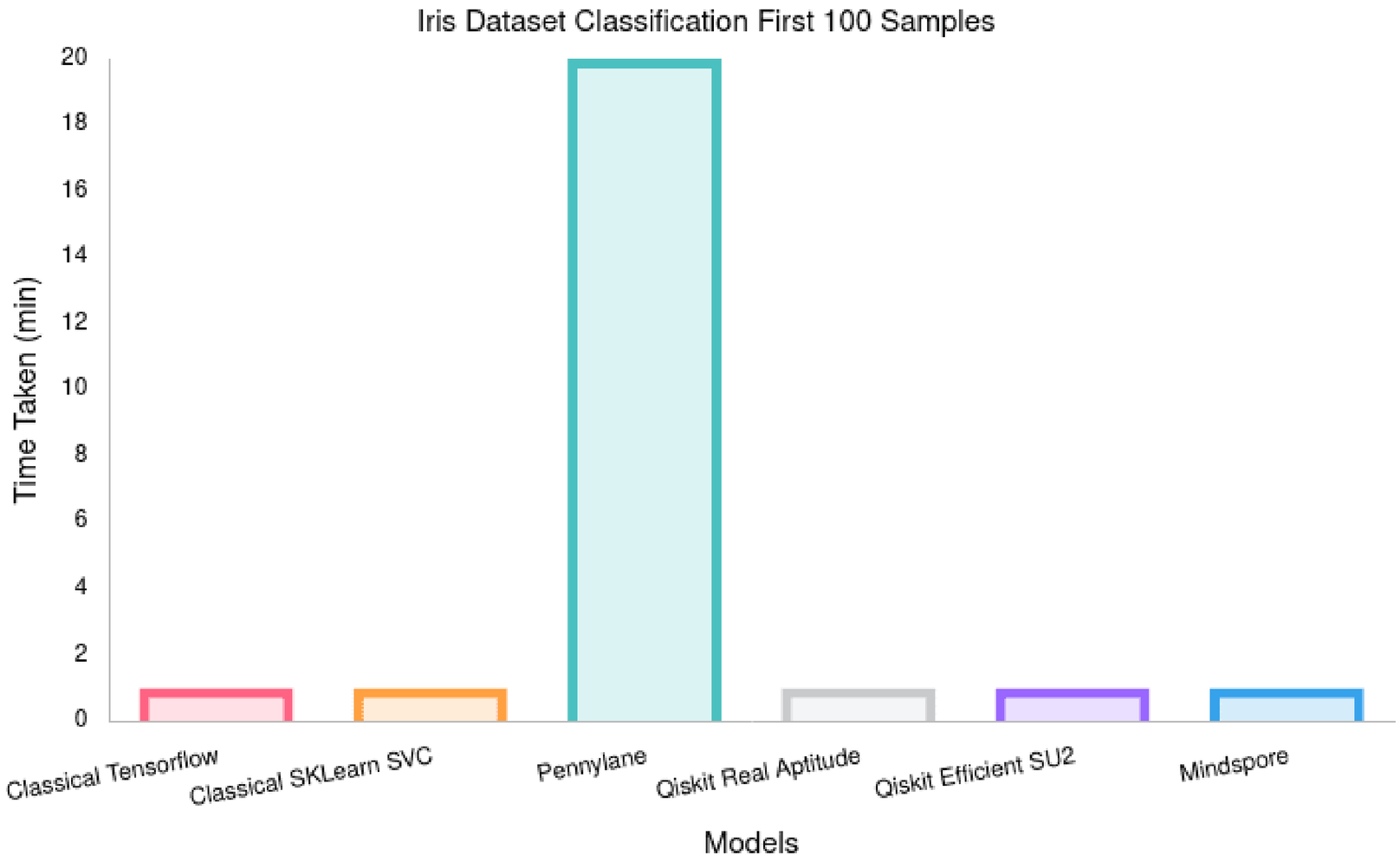
The entire IRIS dataset Results - TIME



The First 100IRIS dataset Results – Accuracy



The First 100 IRIS dataset Results - Time



04

Results

Classical models superior

Classification models are far superior to hybrid models when it comes to classical datasets, datasets which are already getting good results with existing models.

Ansatz

Different types of ansatz are designed for different types of datasets, no one size fits all.

Qiskit

Qiskit seems to be the superior of the ones tested due to ease of implementing, time taken to train the models and the accuracy achieved.

Tensorflow

Pennylane with Tensorflow and stawberryfields took the most time to train due to lack of efficiency of the classical optimisers of tensorflow

05. Conclusion

In conclusion, the comparative analysis of Iris classification using Quantum-Hybrid and Classical methods reveals interesting insights. Classical methods offer good accuracy and are well-established. Even though Quantum-Hybrid methods do not show potential in improving accuracy in classical datasets but they might help in addressing the limitations of classical approaches. Further research and advancements in quantum computing are expected to unlock new possibilities in Iris classification and other machine learning tasks.

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Thank You!