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BIG QUANTUM HACKATHON QATAR 2025

QATAR'S FIRST GLOBAL QUANTUM COMPUTING HACKATHON

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Enhanced Retail Credit Risk Scoring Using Quantum Machine Learning (QML) - Qatar Islamic Bank

QIB المصرف

QUANDELA

TEAM 8: H-bar heroes

Ghada Ben Slama
QbitSoft

Chayma Faraji
Ecole Polytechnique

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HBKU

Jawaher Mohamed Ali A M Kaldari
HBKU

Asma Al-Othni
HBKU

Introduction & Context

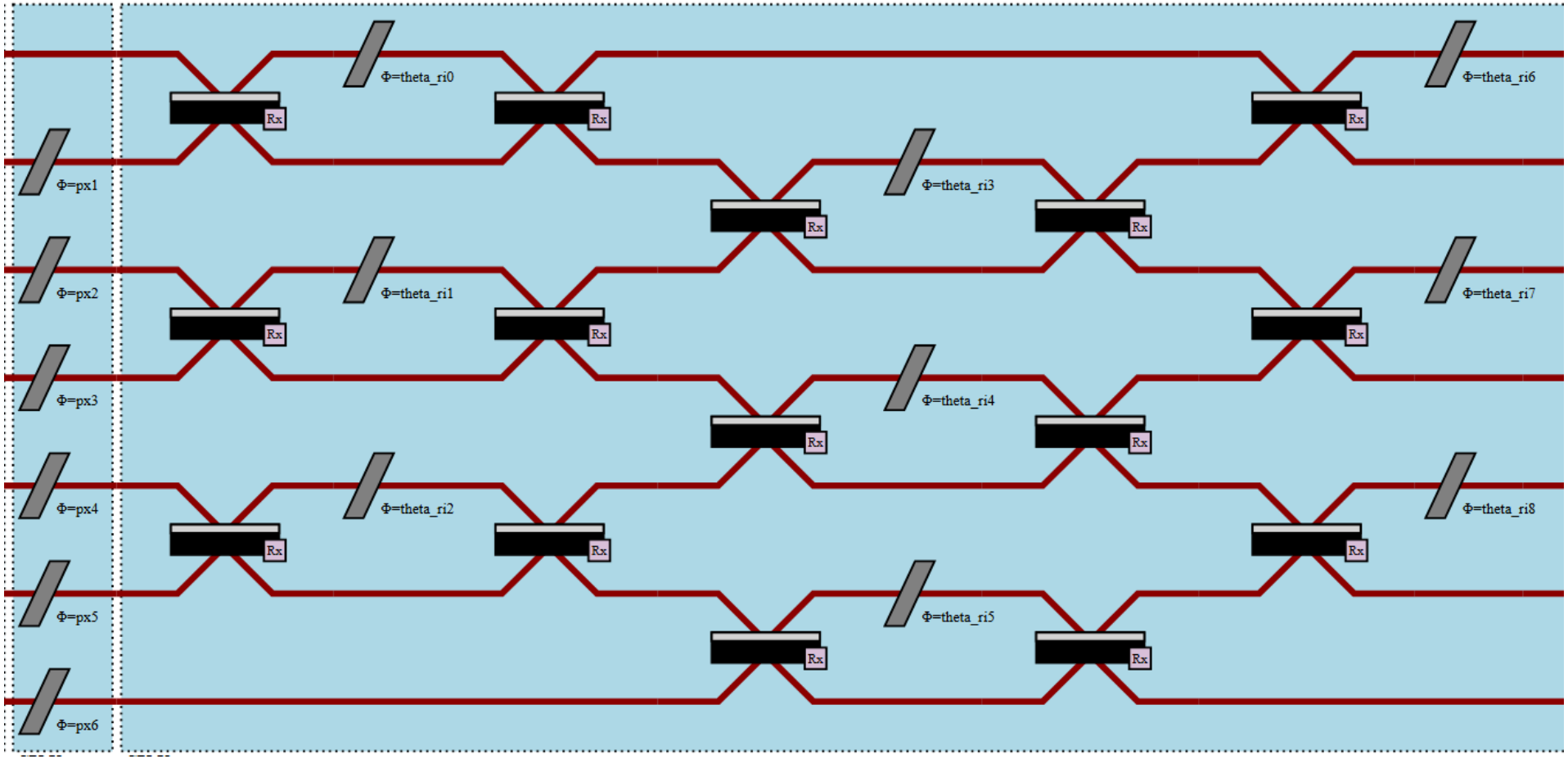
Default Risk

Classical methods: imbalanced dataset, high dimension, thin file applicants...

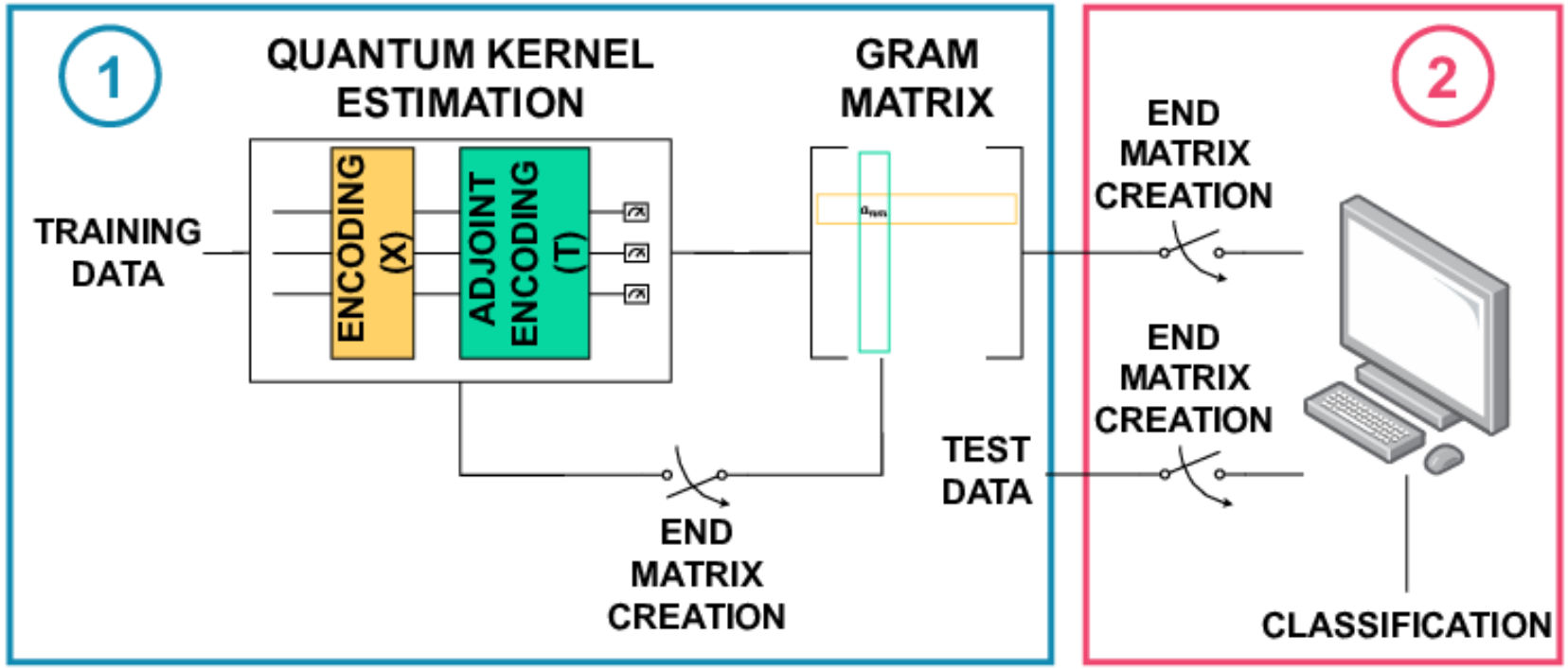
Problem

Can Quantum Machine Learning overcome the limitations of classical models in credit risk scoring?

MerLin - Photonic Quantum Machine Learning Framework

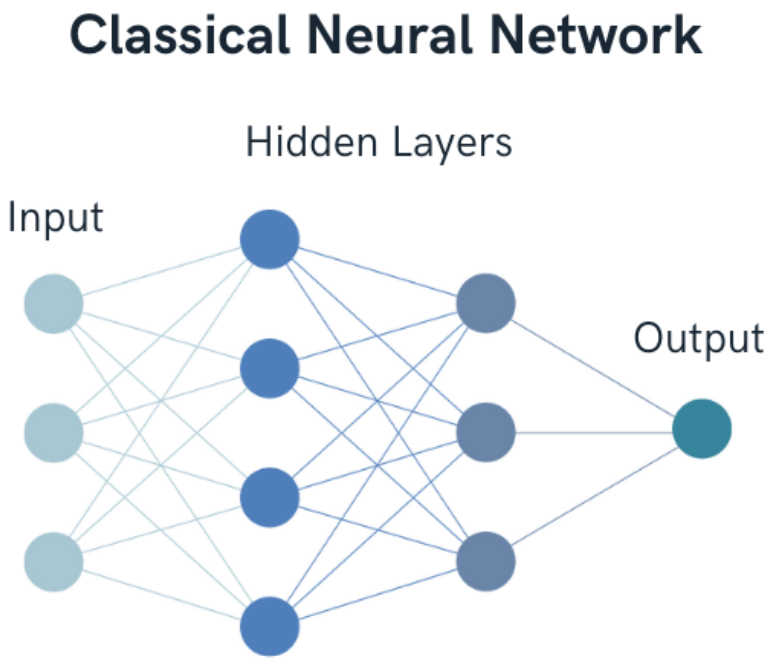


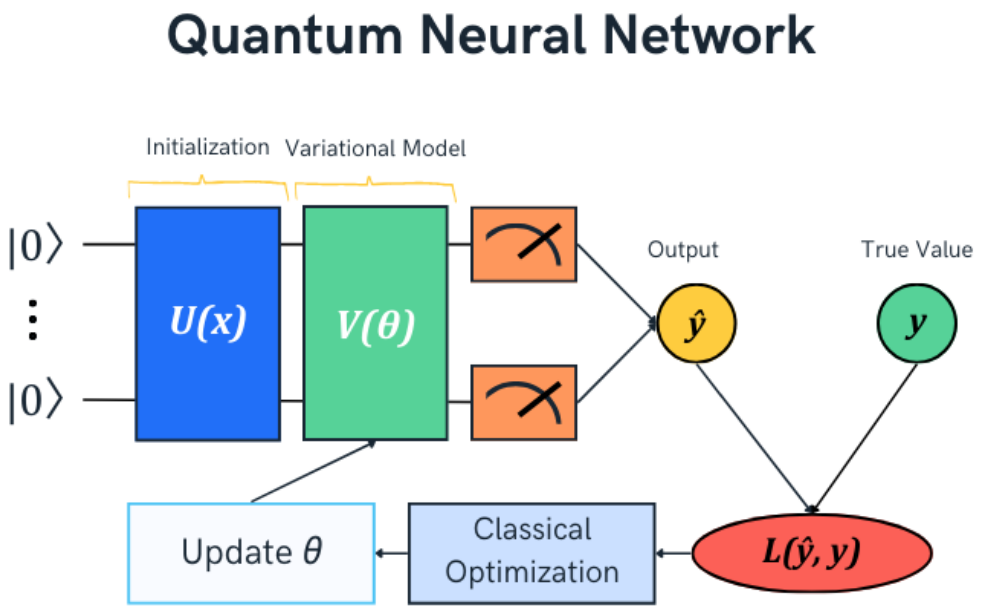
Quantum solution 1: QSVM



Quantum Support Vector machine QSVM

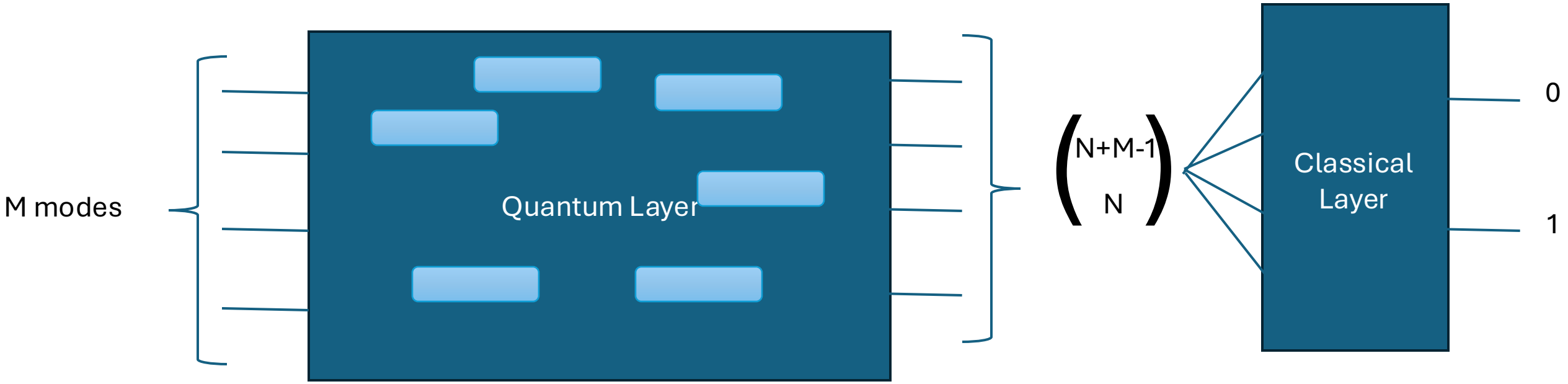
Quantum solution 2 : QNN





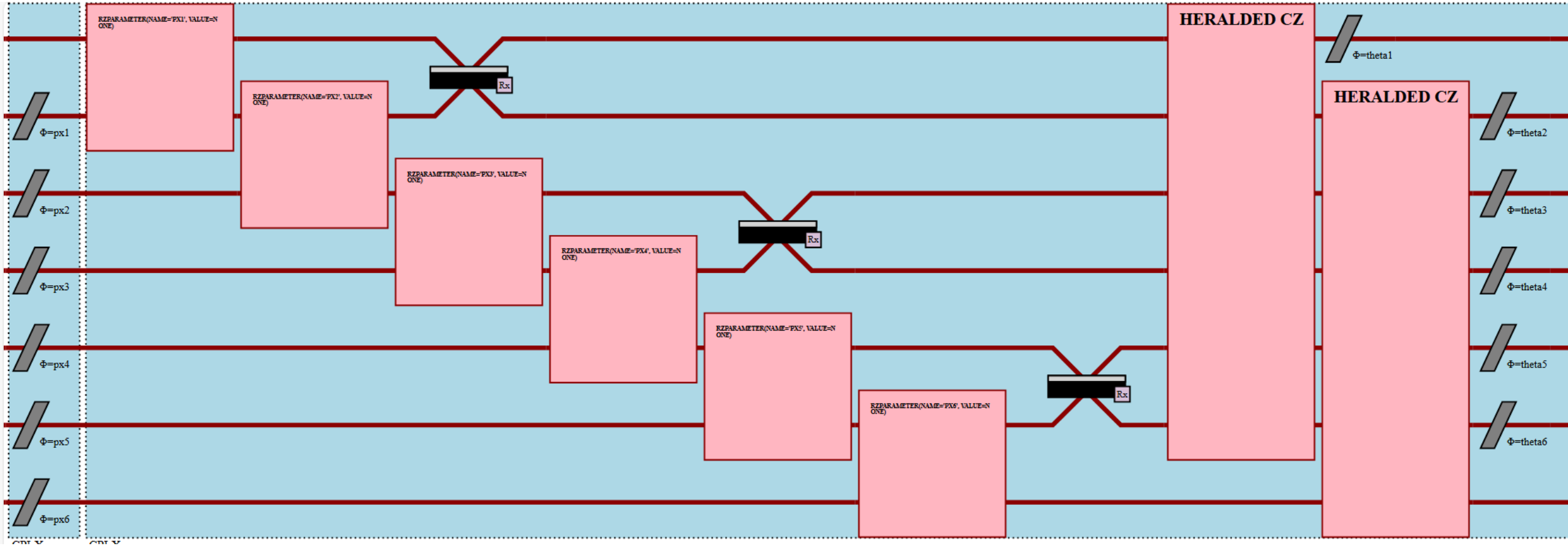
Quantum solution 2 : QNN

N: number of photons



If N=3, M=6, we have 56 outputs

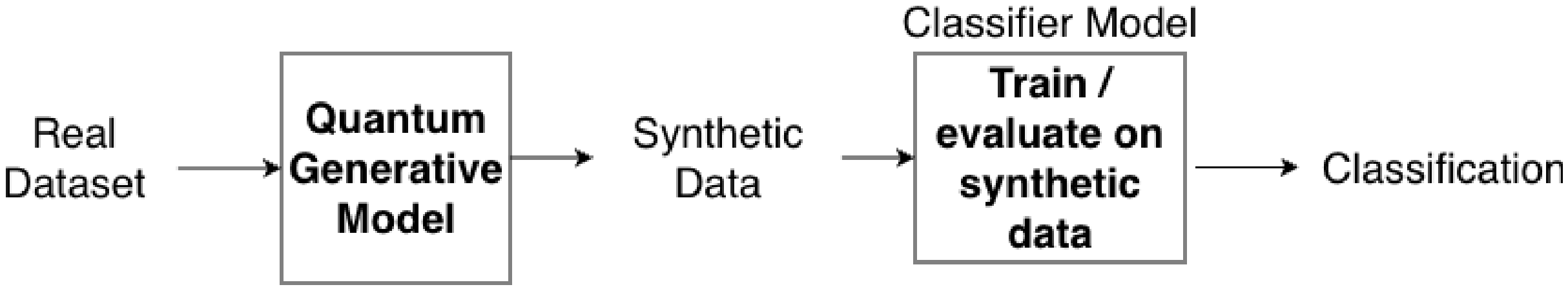
Improved circuit inspired from the IQP feature map



[1] Quantum Circuits, Feature Maps, and Expanded Pseudo-Entropy:
A Categorical Theoretic Analysis of Encoding Real-World Data into a Quantum Computer, Andrew Vlasic

Quantum Generative Model Architecture

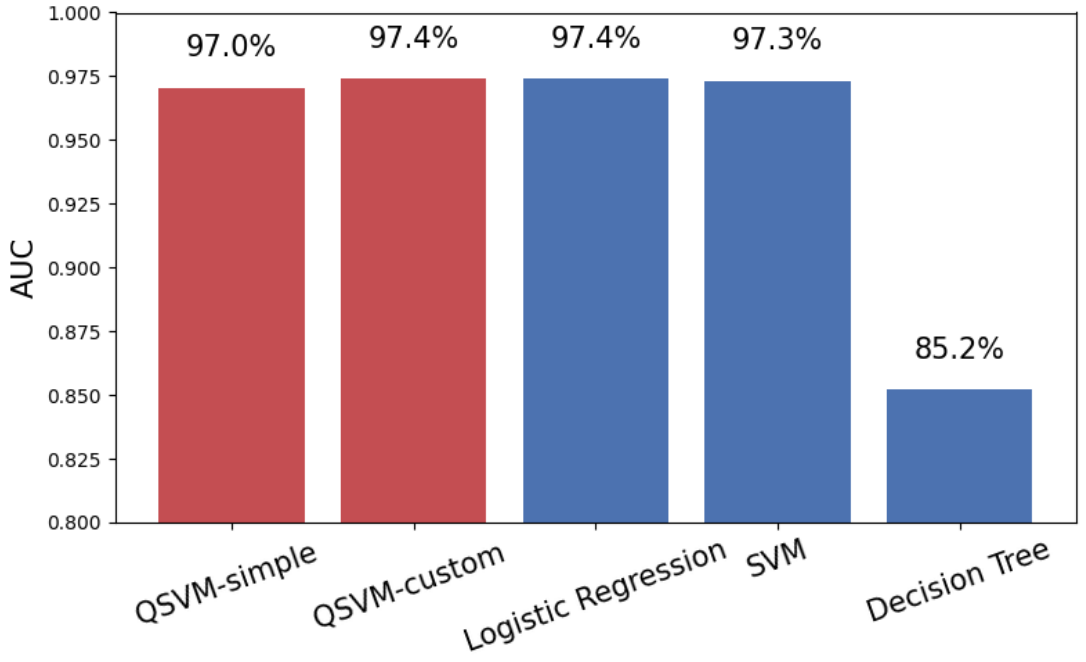
Motivation: mitigate customer privacy risks by training classifiers on quantum-generated synthetic credit profiles instead of real customer data.



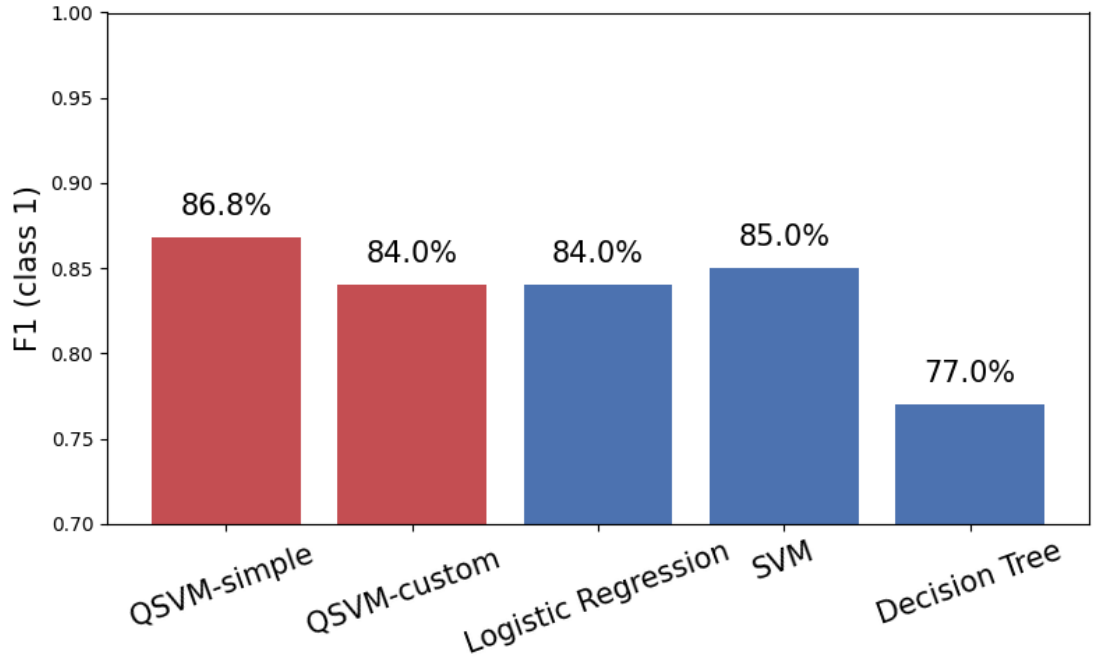
Results

QSVM VS Classical methods

AUC



F1 – score

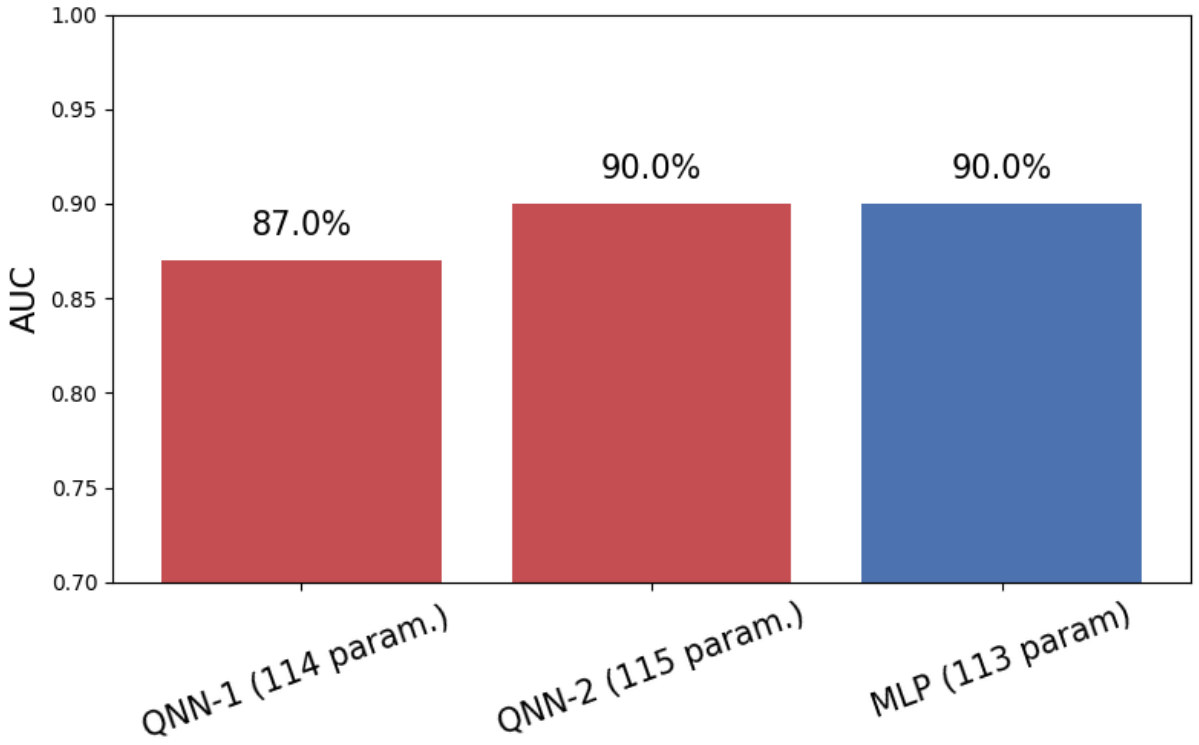


Quantum

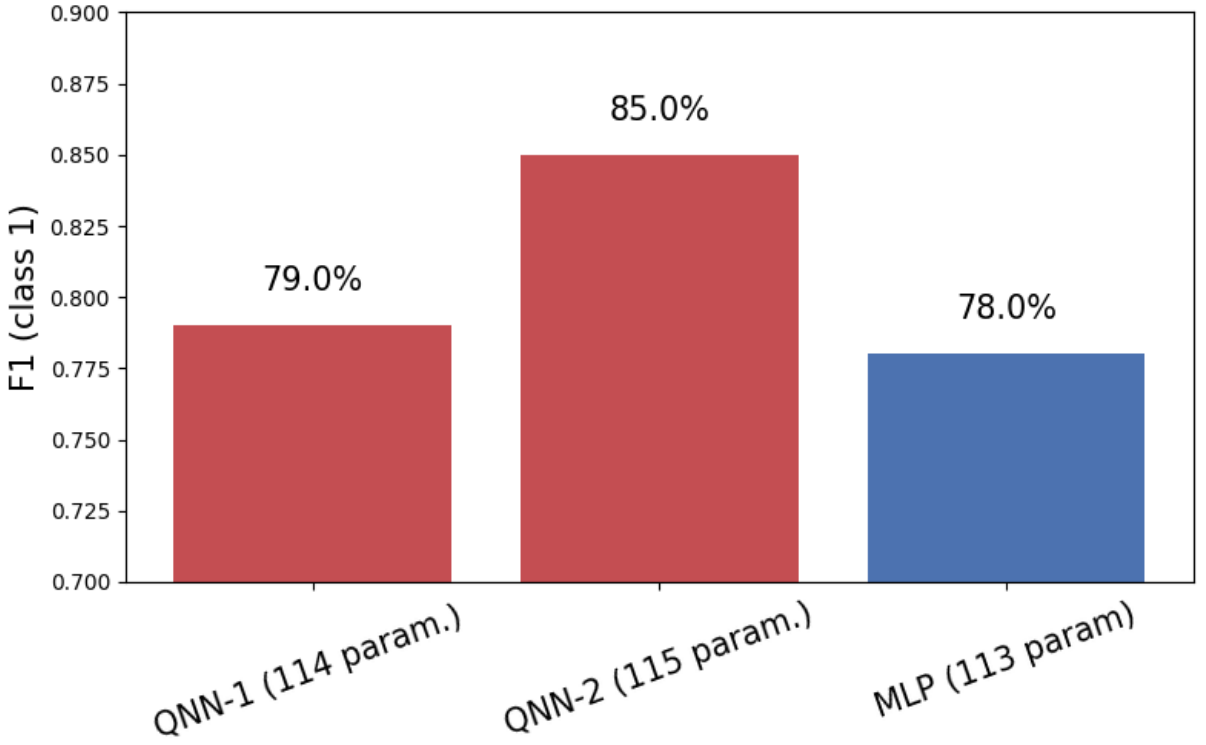
Classical

QNN Results 1

AUC



F1 - score

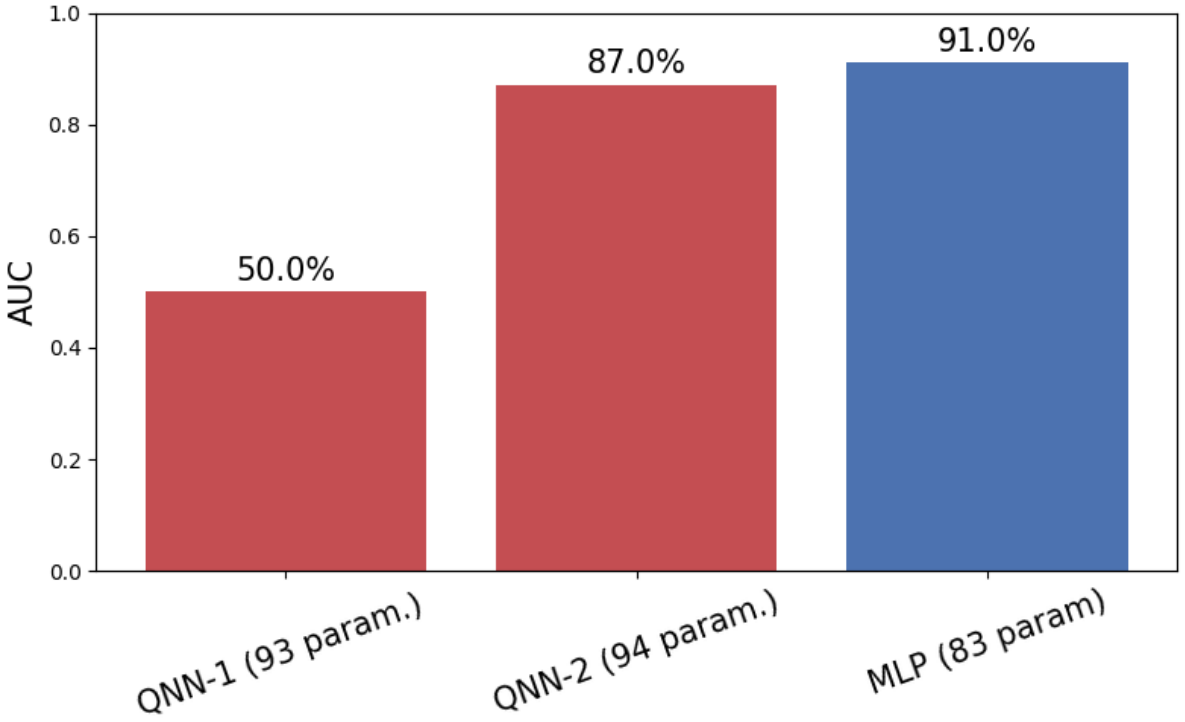


Quantum

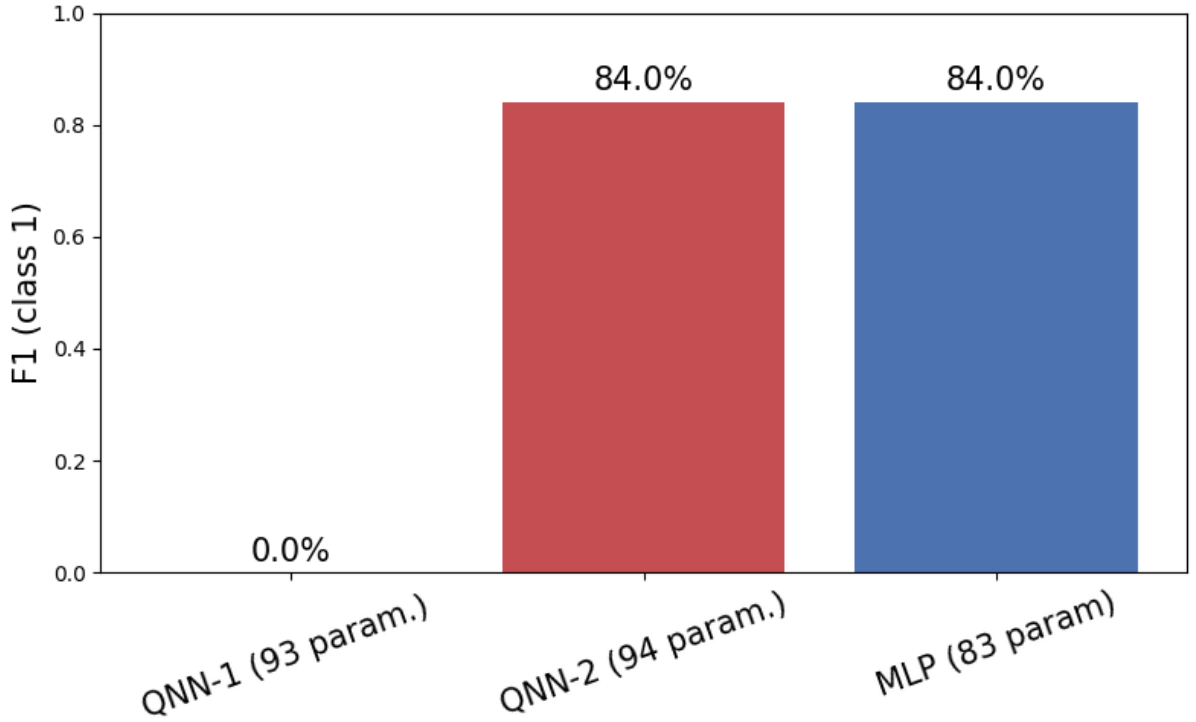
Classical

QNN Results 2

AUC



F1 - score



Quantum

Classical

Generative model Results

To evaluate our generative model, we train the QSVM on the synthetic data and tested it on the real dataset.

Results:

Model	Train data	Test data	Precision	Recall	AUC	F1 Score
QSVM (TRTR)	Real	Real	0.868	0.868	0.970	0.868
QSVM (TSTR)	Synthetic	Real	0.588	0.943	0.962	0.725

Conclusion

- QSVM
- QSVM with QGAN
- QNN
- QNN with feature map

THANK YOU!

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