

Quantum Machine Learning for DNA Sequence Classification

A Comparative Study of Classical and Quantum Approaches

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Executive Summary

Our evaluation shows that SVM_onehot achieves the highest F1-score of 0.954 on the test set.

Performance Results

Model	Accuracy	F1-Score	ROC-AUC	PR-AUC
Svm Onehot	0.918	0.954	nan	0.956
Svm Kmer	0.917	0.954	nan	0.939
Vqc	0.866	0.928	nan	0.880
Qsvm Kernel	0.866	0.928	nan	0.907
Qsvm Kernel Nystrom	0.866	0.928	nan	0.907

Visualizations

Figure: ROC (test)



Figure: PR (test)



Figure: ROC (QSVM test)



Figure: PR (QSVM test)



Figure: F1 bar (test)



Figure: Composite scorecard



Figure: Metric radar (top models)



Figure: Calibration overlay



Figure: Calibration vs AUC



Figure: Confusion (svm_kmer)



Figure: Confusion (svm_onehot)



Figure: Confusion (qsvm_kernel)



Figure: heat_QSVM_shots256



Figure: heat_VQC_shots256



Figure: calibration_QSVM_kernel



Figure: calibration_SVM_kmer



Figure: calibration_SVM_onehot

