Model Comparison Report

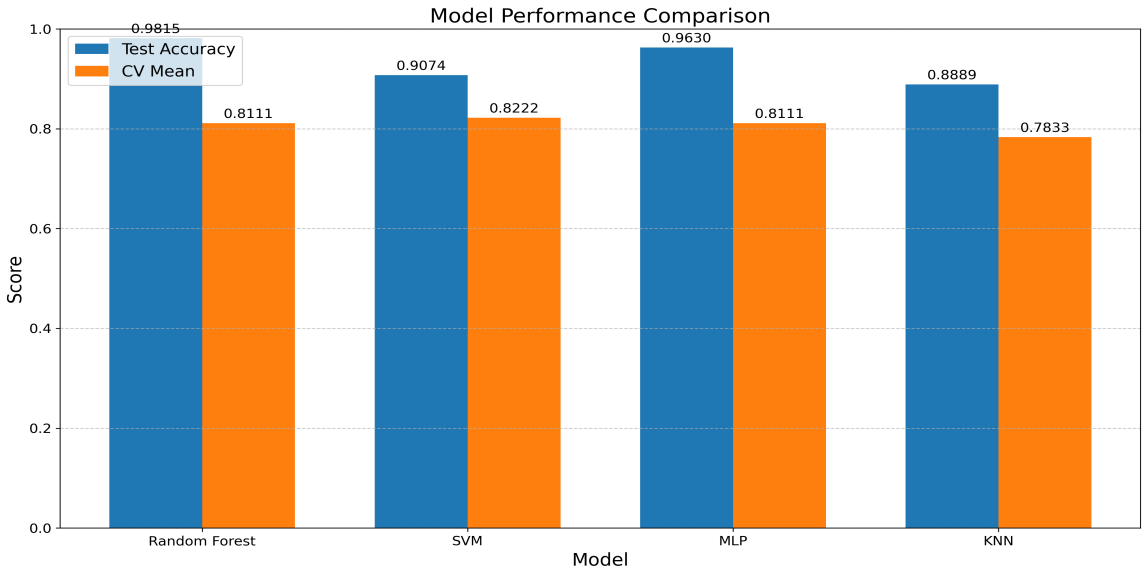
Date: 03/07/2025 19:12:32

Dataset: gradient_eng.csv

Results Summary

Model	Test Accuracy	Cross-Validation
Random Forest	0.9815	0.8111
SVM	0.9074	0.8222
MLP	0.9630	0.8111
KNN	0.8889	0.7833

Performance Comparison

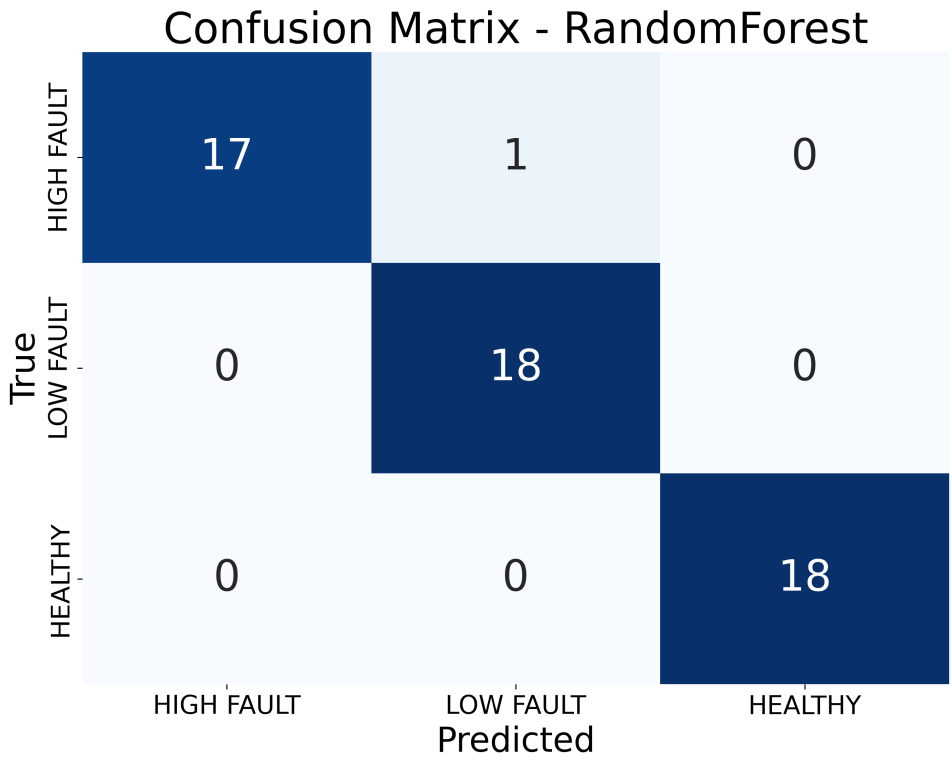


Model Details: Random Forest

Evaluation Metrics:

Class	Precision	Recall	F1-Score	Support
HIGH FAULT	1.0000	0.9444	0.9714	18.0
LOW FAULT	0.9474	1.0000	0.9730	18.0
HEALTHY	1.0000	1.0000	1.0000	18.0
macro avg	0.9825	0.9815	0.9815	54.0
weighted avg	0.9825	0.9815	0.9815	54.0

Confusion Matrix:

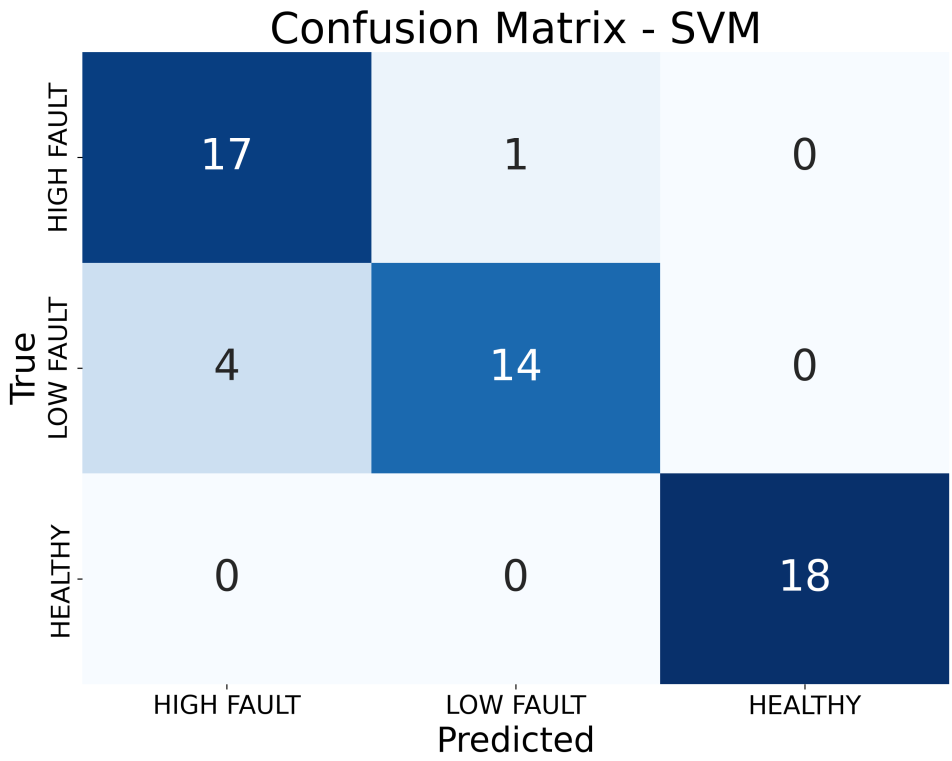


Model Details: SVM

Evaluation Metrics:

Class	Precision	Recall	F1-Score	Support
HIGH FAULT	0.8095	0.9444	0.8718	18.0
LOW FAULT	0.9333	0.7778	0.8485	18.0
HEALTHY	1.0000	1.0000	1.0000	18.0
macro avg	0.9143	0.9074	0.9068	54.0
weighted avg	0.9143	0.9074	0.9068	54.0

Confusion Matrix:

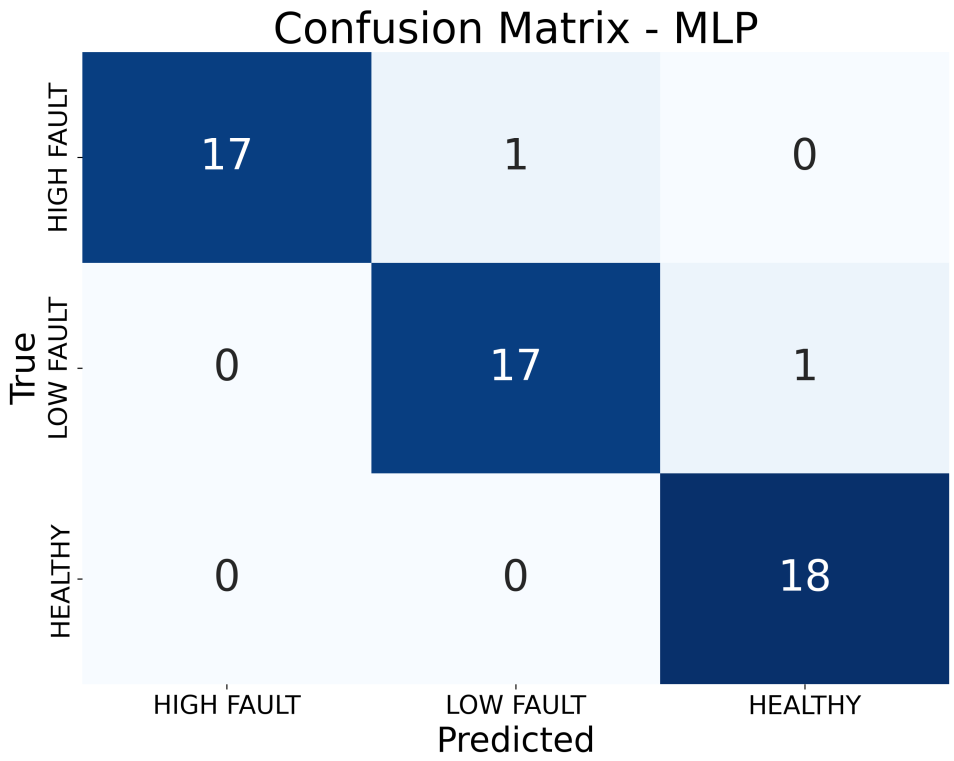


Model Details: MLP

Evaluation Metrics:

Class	Precision	Recall	F1-Score	Support
HIGH FAULT	1.0000	0.9444	0.9714	18.0
LOW FAULT	0.9444	0.9444	0.9444	18.0
HEALTHY	0.9474	1.0000	0.9730	18.0
macro avg	0.9639	0.9630	0.9629	54.0
weighted avg	0.9639	0.9630	0.9629	54.0

Confusion Matrix:

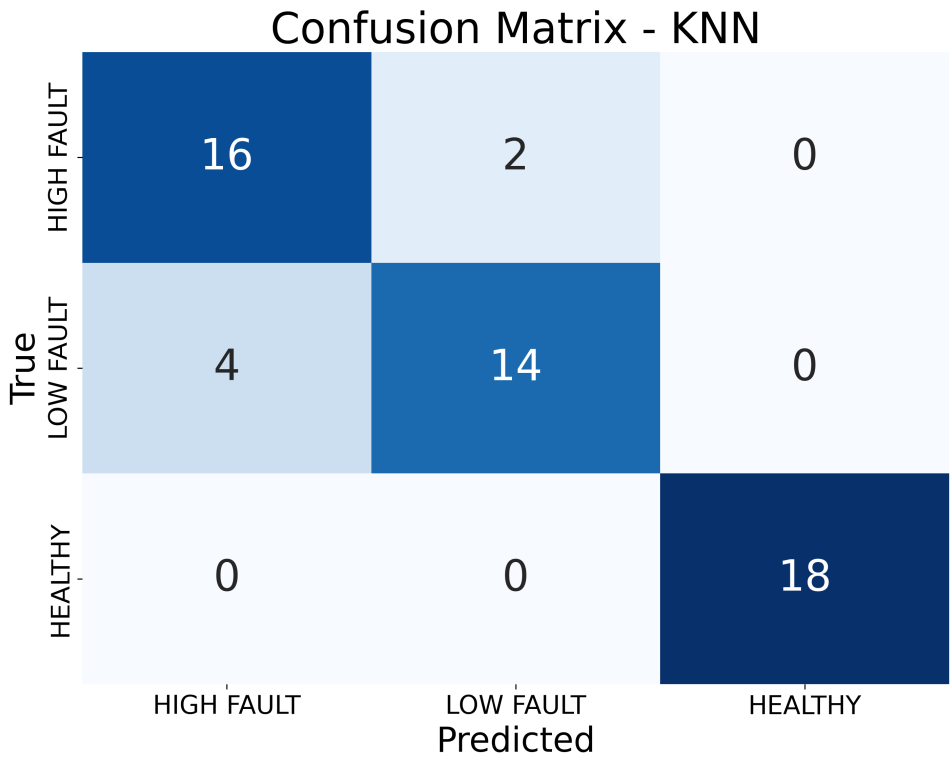


Model Details: KNN

Evaluation Metrics:

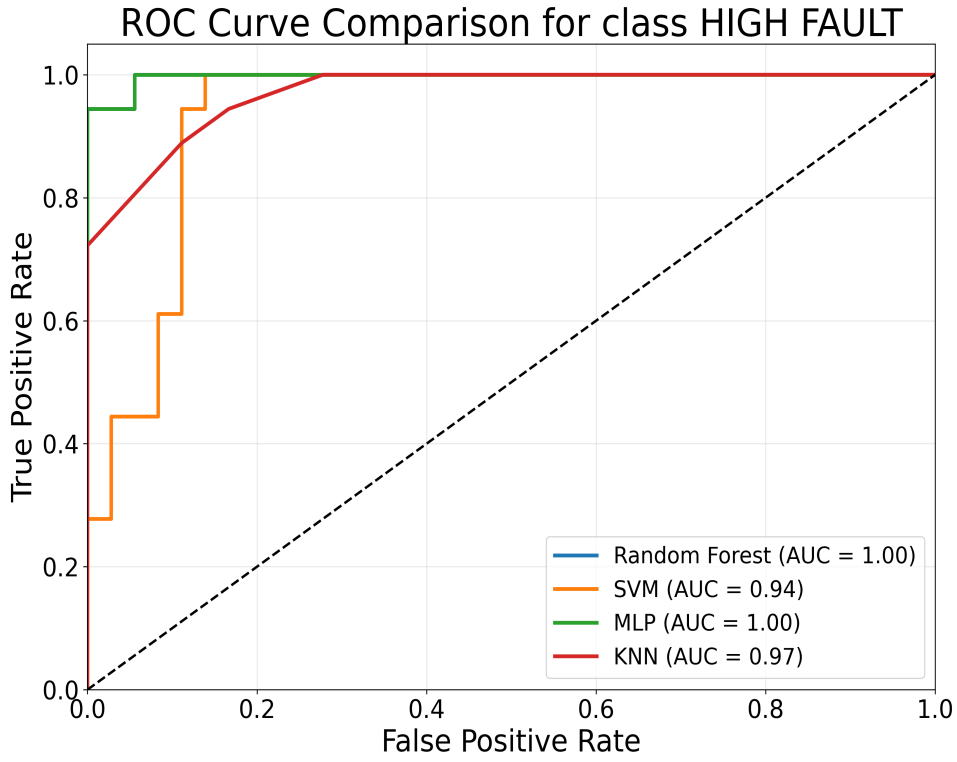
Class	Precision	Recall	F1-Score	Support
HIGH FAULT	0.8000	0.8889	0.8421	18.0
LOW FAULT	0.8750	0.7778	0.8235	18.0
HEALTHY	1.0000	1.0000	1.0000	18.0
macro avg	0.8917	0.8889	0.8885	54.0
weighted avg	0.8917	0.8889	0.8885	54.0

Confusion Matrix:

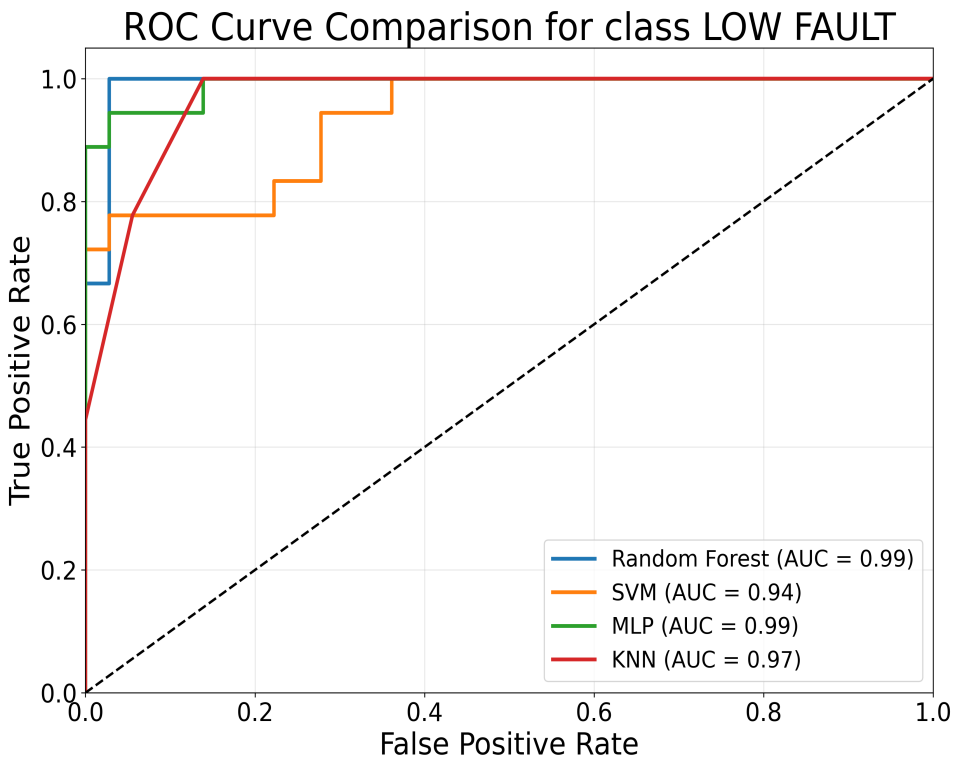


ROC Curves by Class

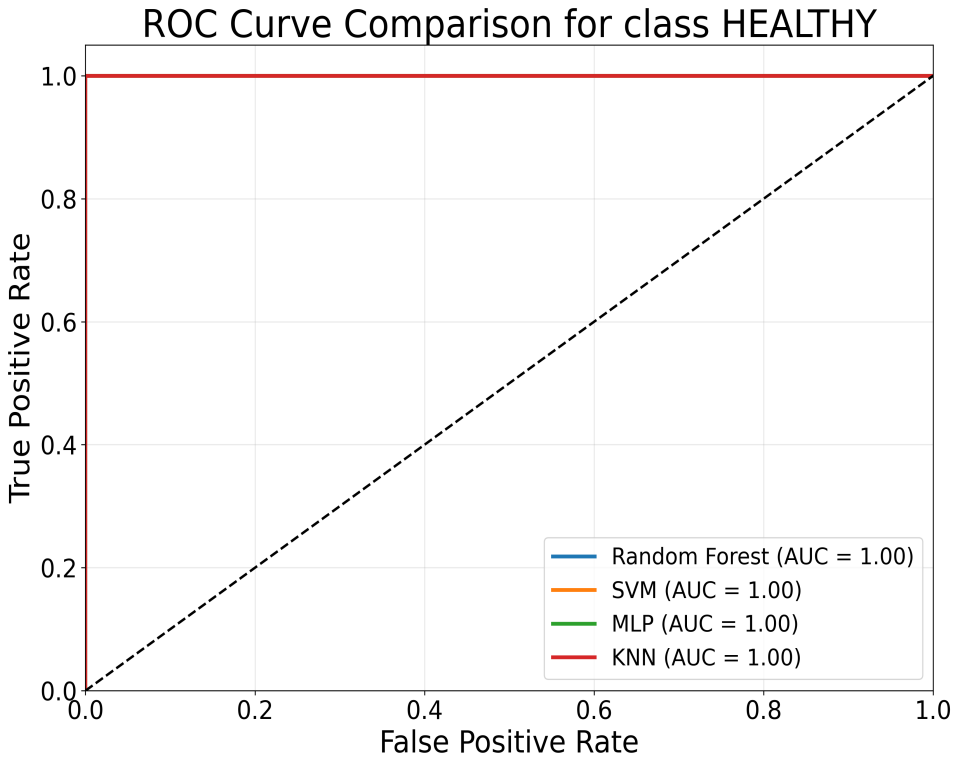
Class 0:



Class 1:


ROC Curve Comparison for class LOW FAULT
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
Random Forest (AUC = 0.99)
SVM (AUC = 0.94)
MLP (AUC = 0.99)
KNN (AUC = 0.97)

Class 2:


ROC Curve Comparison for class HEALTHY
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
Random Forest (AUC = 1.00)
SVM (AUC = 1.00)
MLP (AUC = 1.00)
KNN (AUC = 1.00)

Conclusions

Based on the results, the best performing model is Random Forest with an accuracy of 0.9815 on the test set and 0.8111 in cross-validation.