Name: Shaian Khan ID: 16351052

Link: https://colab.research.google.com/drive/1OX5g5gtpzJxOX-Xm4v_HQpqcvEc_V4je?usp=sharing
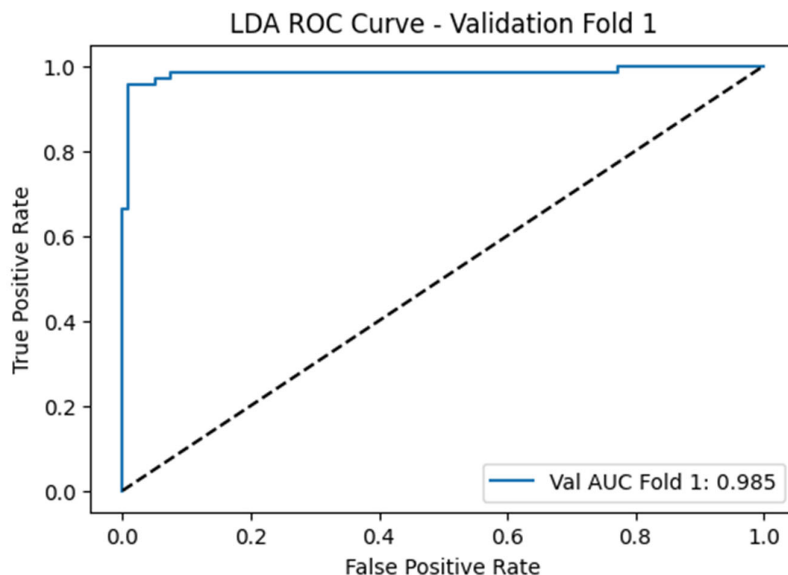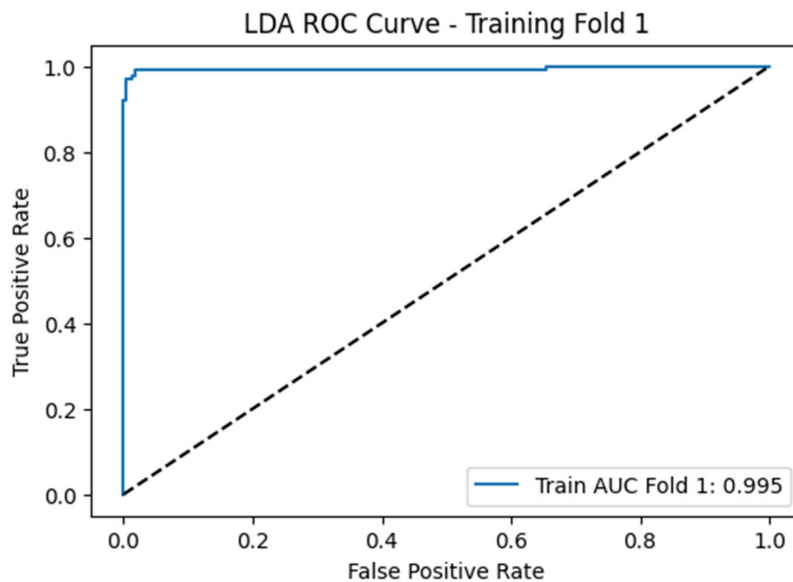
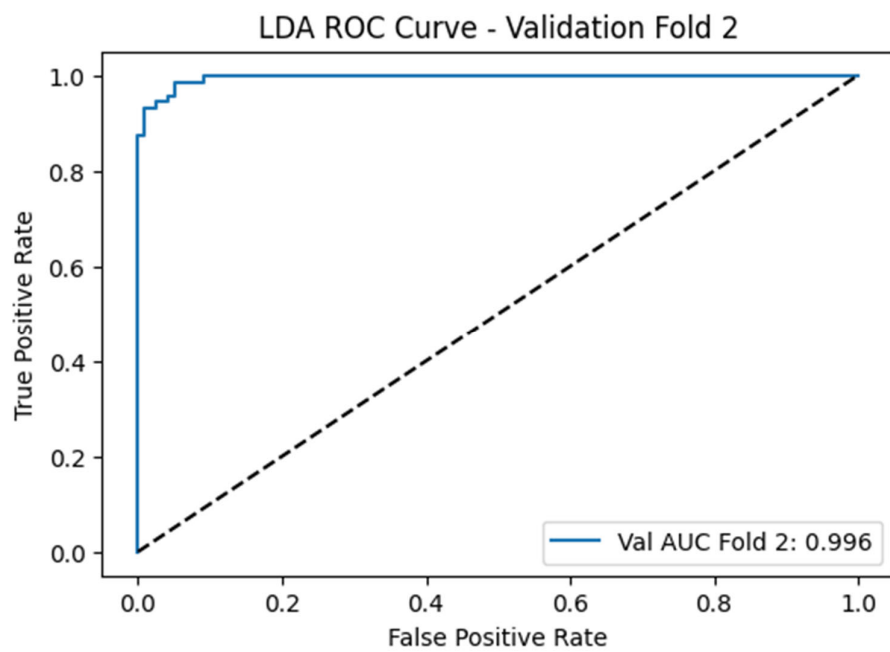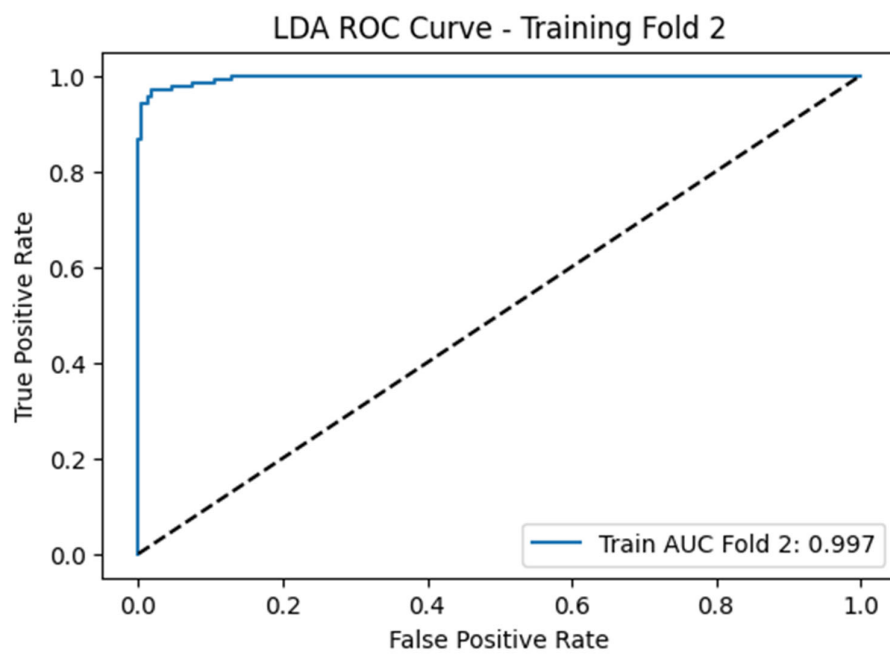## Linear and Quadratic Discriminant Analysis for Breast Cancer Detection

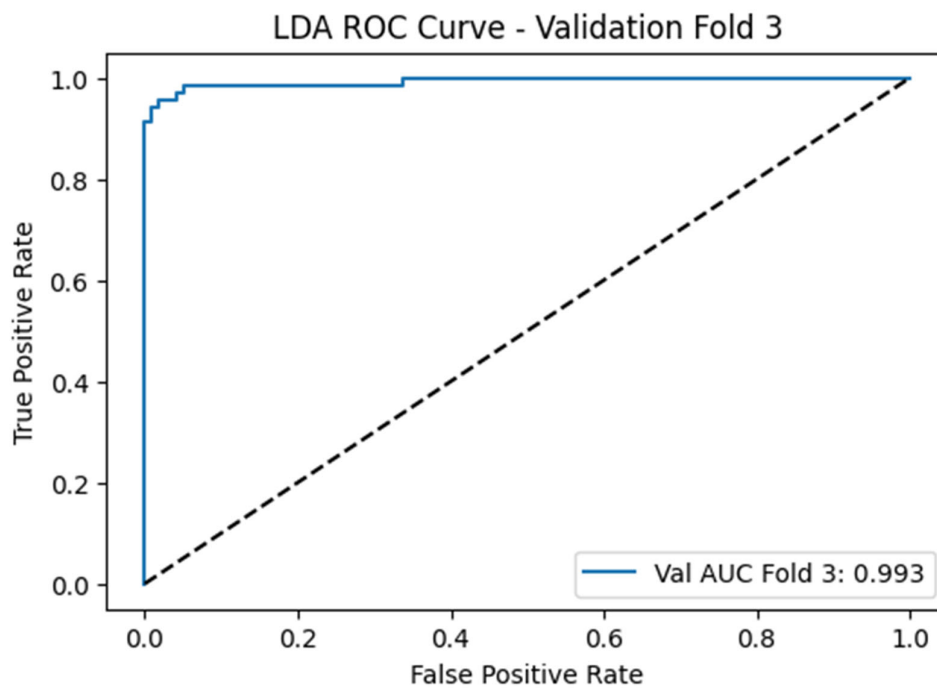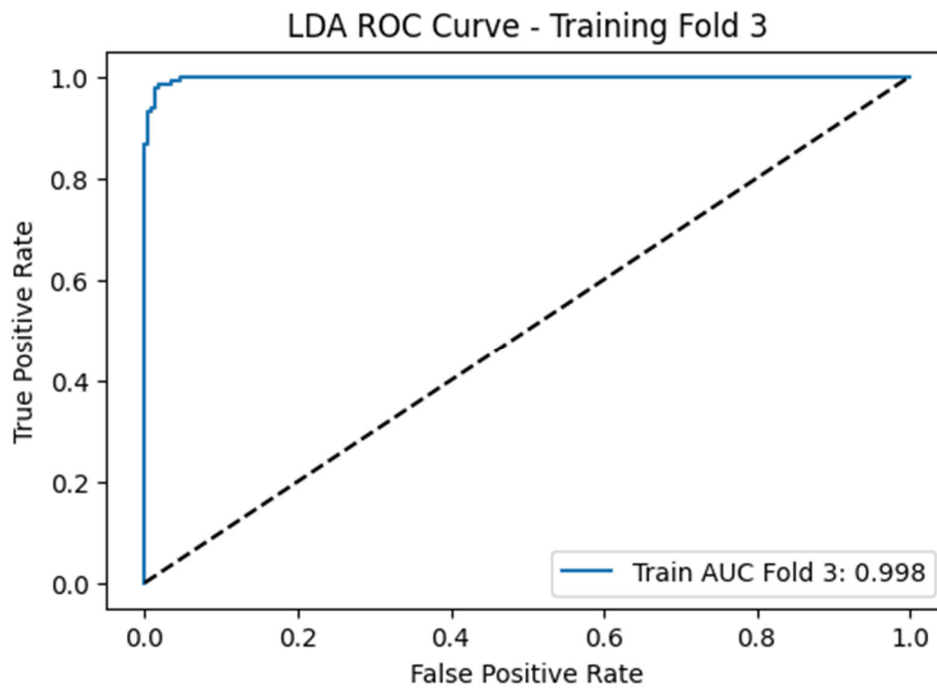### Task 1: Linear Discriminants for Breast Cancer Detection

Using linear discriminants and 3-fold cross-validation, the model produced all the training and validation ROC curves (6 altogether) and calculated the average training and validation AUC, approximate EER, and d-prime.

Results:

- **ROC curves**: The Linear Discriminant Analysis (LDA) with 3-fold cross-validation was successfully executed, producing ROC curves for each fold.

LDA ROC Curve - Training Fold 2

True Positive Rate vs False Positive Rate

Train AUC Fold 2: 0.997

LDA ROC Curve - Validation Fold 2

True Positive Rate vs False Positive Rate

Val AUC Fold 2: 0.996

LDA ROC Curve - Training Fold 3

LDA ROC Curve - Validation Fold 3

- **Metrics**:
  - Average training AUC: 0.997
  - Validation AUC: 0.991
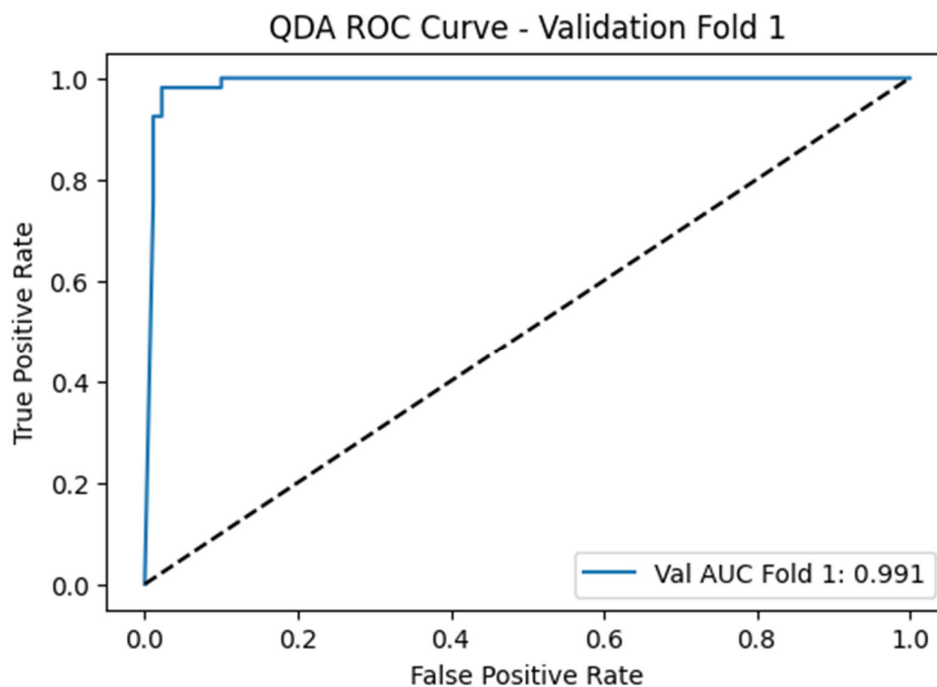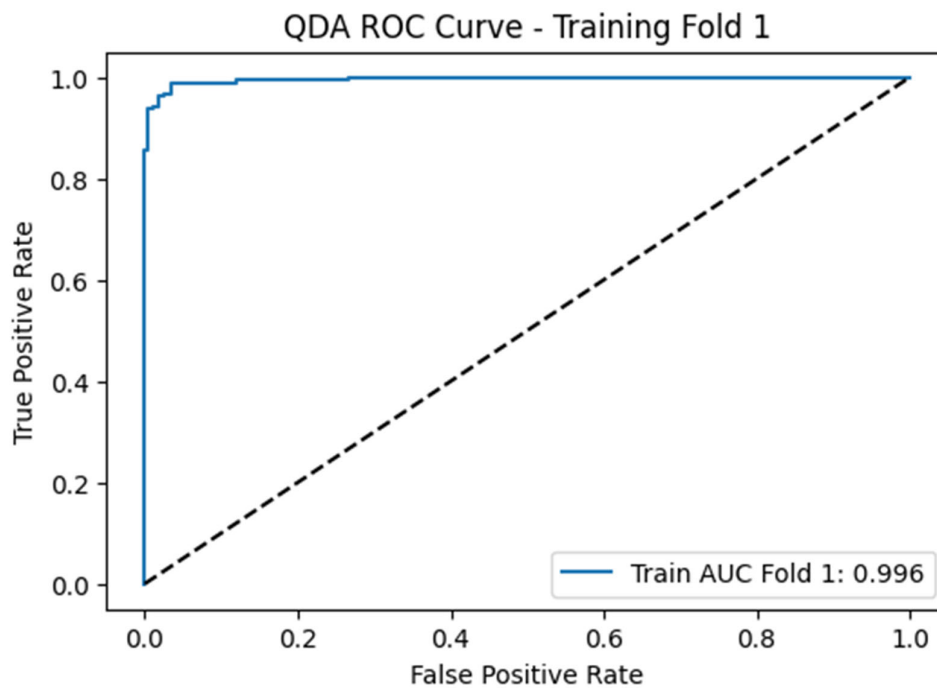 - EER: 0.045
  - d-prime: 5.353

These metrics, along with the ROC curves, indicate high model performance in detecting breast cancer.

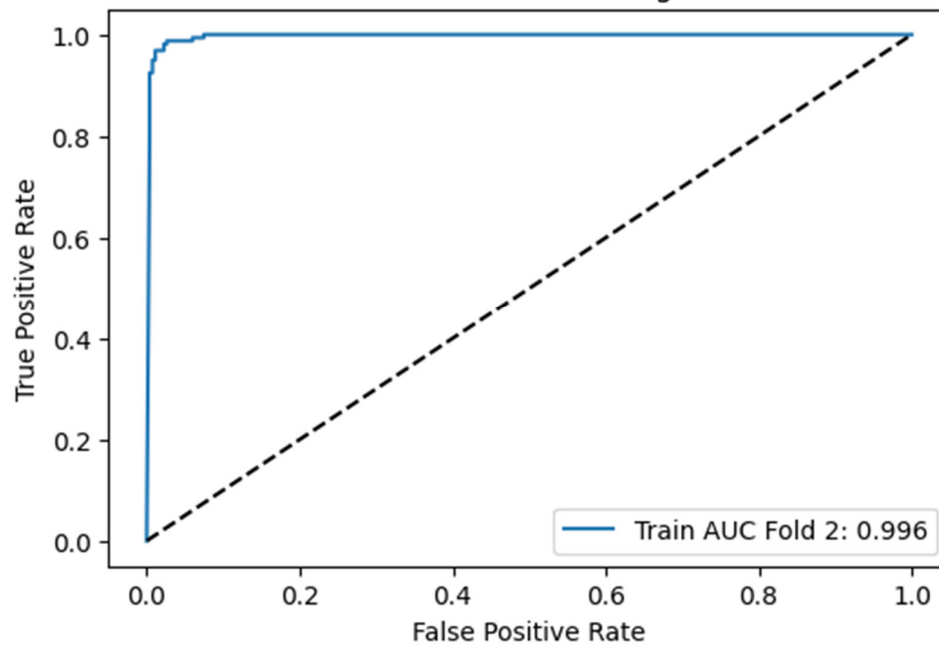# Task 2: Quadratic Discriminants for Breast Cancer Detection

Using quadratic discriminants and 4-fold cross-validation, the model produced all the training and validation ROC curves (8 altogether) and calculated the average training and validation AUC, approximate EER, and d-prime.
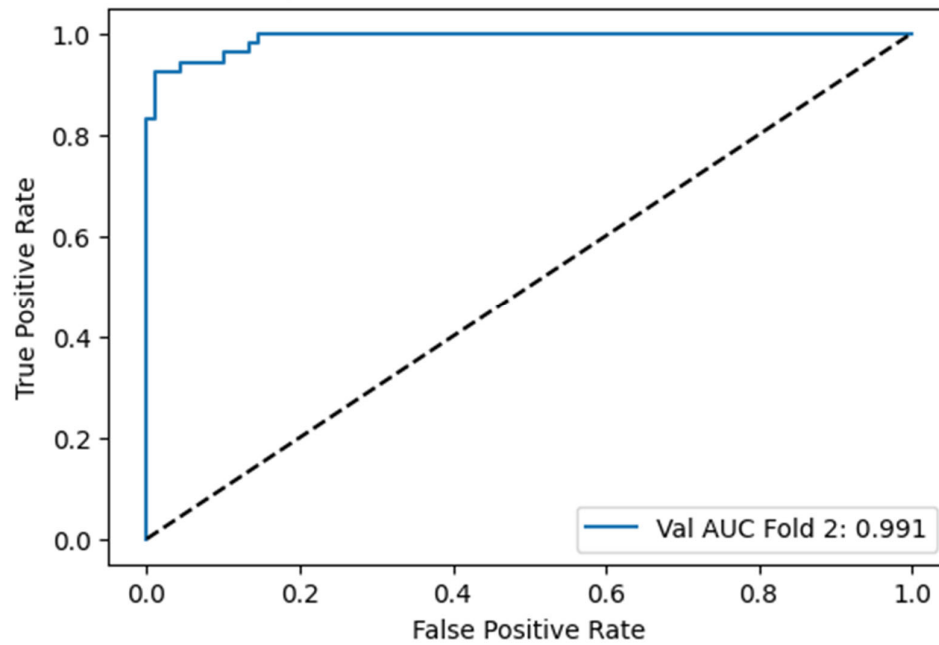
Results:

- **ROC curves**: The Quadratic Discriminant Analysis (QDA) with 4-fold cross-validation was successfully executed, producing ROC curves for each fold.
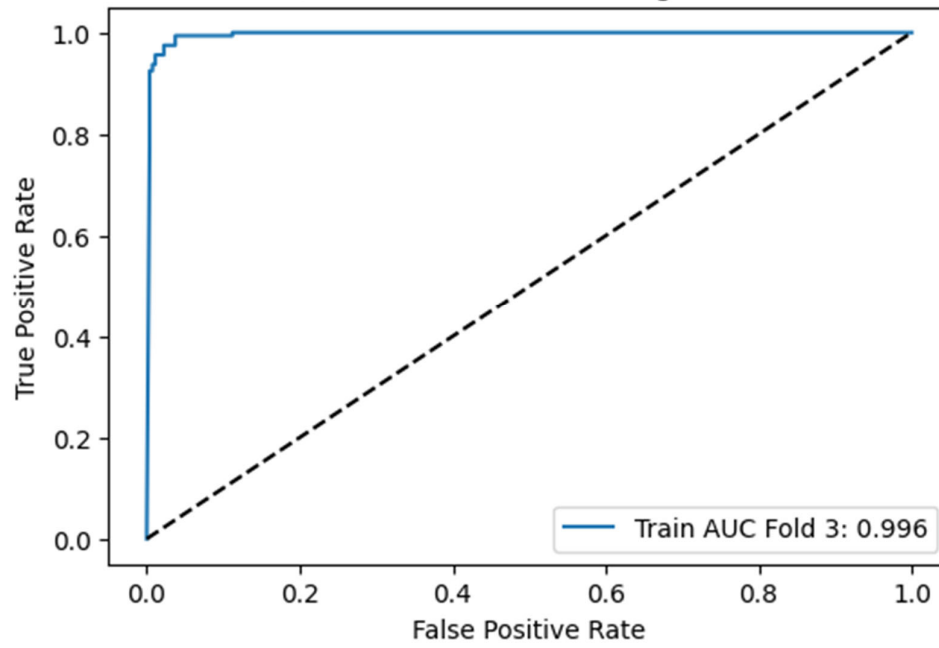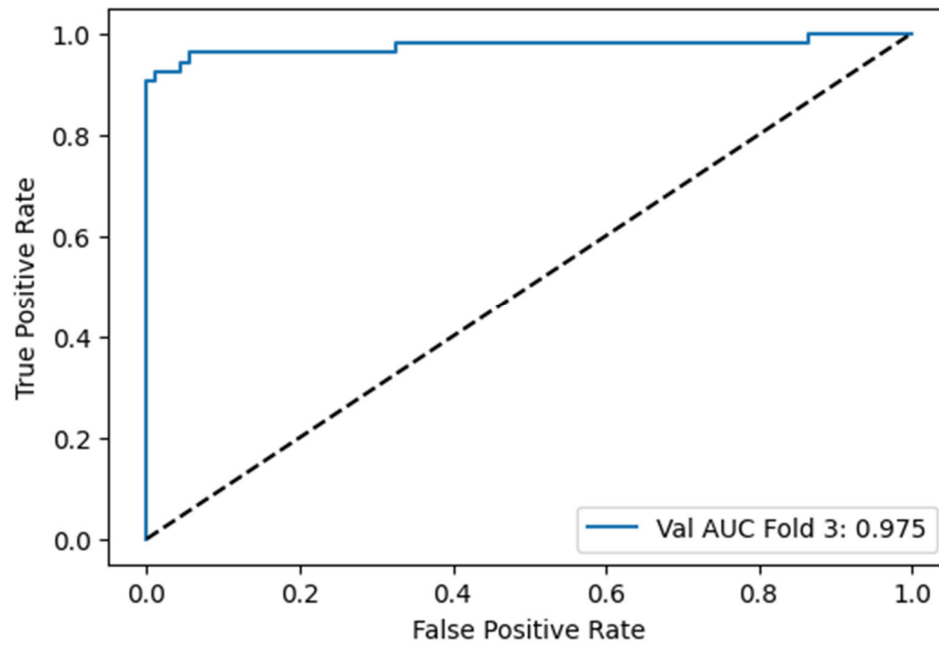
QDA ROC Curve - Training Fold 2

Train AUC Fold 2: 0.996

QDA ROC Curve - Validation Fold 2

Val AUC Fold 2: 0.991

QDA ROC Curve - Training Fold 3

Train AUC Fold 3: 0.996

QDA ROC Curve - Validation Fold 3
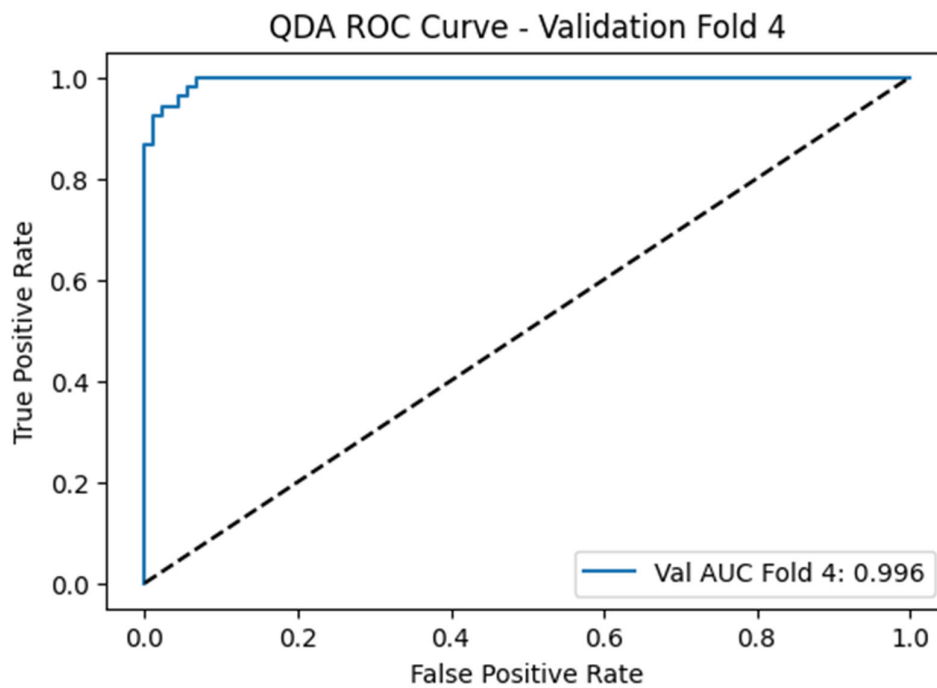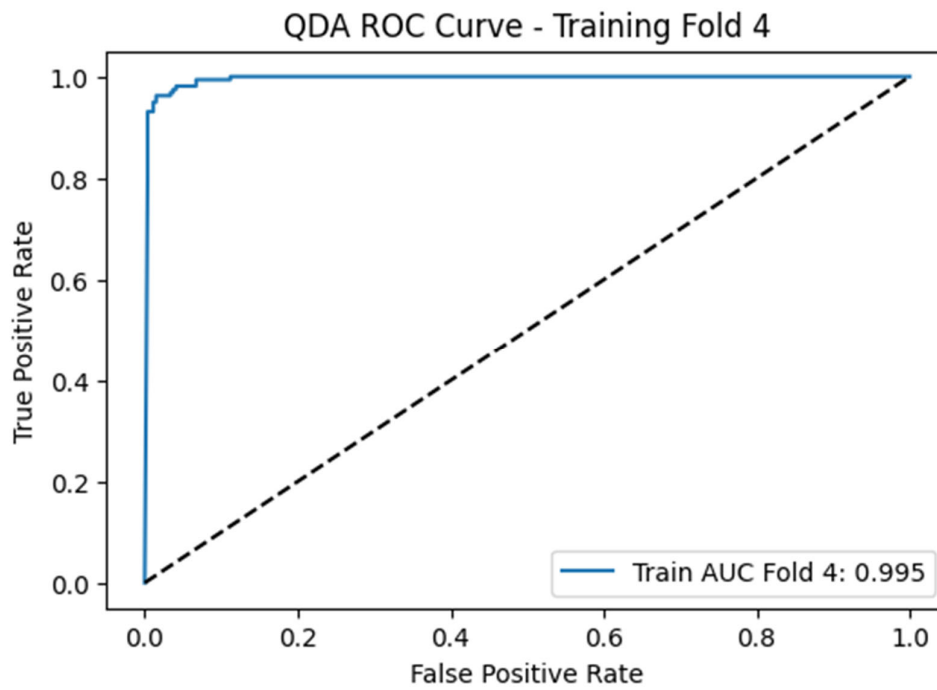
Val AUC Fold 3: 0.975

QDA ROC Curve - Training Fold 4

QDA ROC Curve - Validation Fold 4

- **Metrics**:
  - Average training AUC: 0.996
  - Validation AUC: 0.988
  - EER: 0.042
  - d-prime: 5.835

These metrics, along with the ROC curves, demonstrate the model's robustness and effectiveness in classifying breast cancer.