Accuracy of LDA and QDA Classifiers

-seed used 10

- FDA + LDA → Train: 100.00%, Test: 89.33%

- FDA + QDA → Train: 100.00%, Test: 73.67%

- PCA (81D) + LDA → Train: 99.67%, Test: 97.67%

- PCA (49D, 90% variance) + LDA → Train: 98.67%, Test: 96.00%

- PCA (2D) + LDA → Train: 65.33%, Test: 63.00%

Effect of PCA on Classification Performance

- we got 81 dim reducing to 95% variance and 49 while retaining 90% variance and 32% variance in top 2 eigenvector

- Reducing dimensions with PCA before LDA improves generalization while retaining most variance.

- Higher dimensions (81D, 49D) maintain accuracy, but drastic reduction (2D) made it go down in performance.

- FDA improves QDA/LDA performance, but QDA struggles more with test accuracy.

- Best performance: PCA (49D) + LDA achieving 96% test accuracy.

- While applying FDA, the singular matrix eigenvalues were very large, even with regularization.

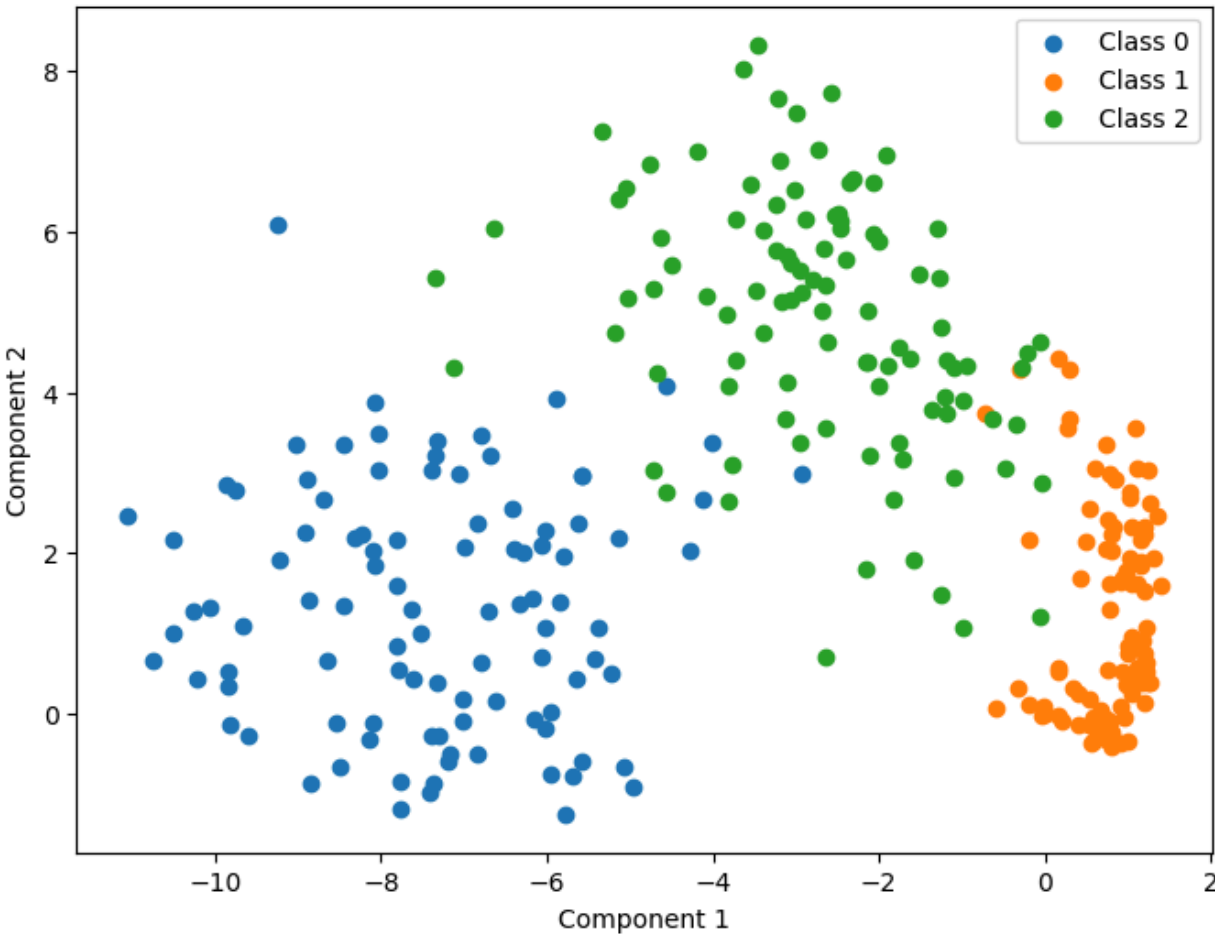-This affected QDA performance significantly.

- LDA was also impacted, but performed better than QDA.

- Dataset Loader: Used from the Kaggle dataset.

- Eigenvalue Sorting: Implemented using insights from Math Stack Exchange.

The plots for PCA and FDA were as follows:

PCA: Transformed Training Data

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FDA: Transformed Test Data