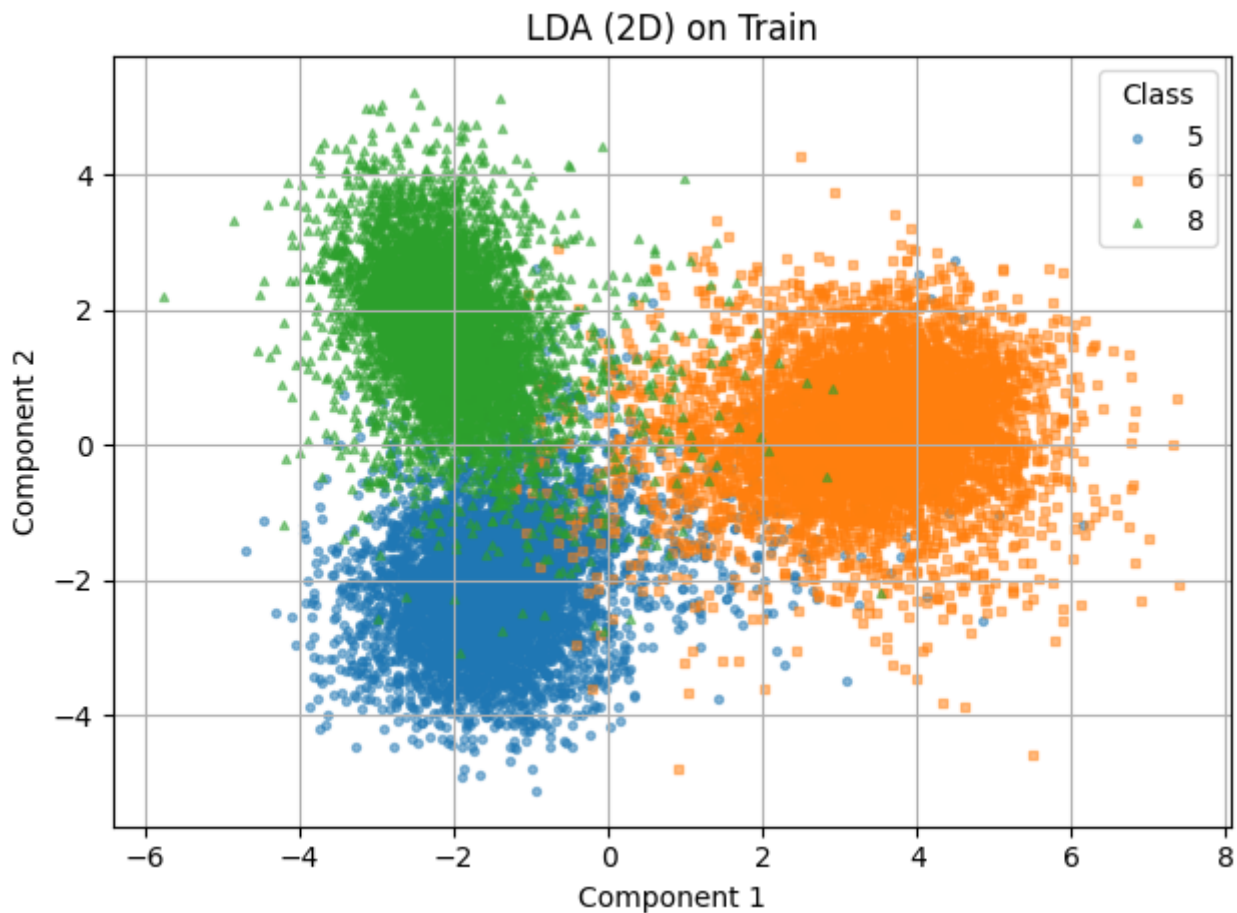


# Assignment 3 - Dimensionality Reduction

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## Exercise 1

- From the 10-class database, choose three classes (5, 6 and 8) and then reduce dimension to 2 using LDA



## Exercise 2

- Perform 3-class classification based on the generated 2-dimensional data.

## Dataset

- Train:** (17190, 784) features, (17190,) labels
- Test:** (2824, 784) features, (2824,) labels
- Classes:** [5, 6, 8]

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## LDA — 2D Gaussian Bayes

**Test accuracy:** 0.9444

**Confusion Matrix (rows = true, cols = predicted):**

True \ Pred	5	6	8
5	829	25	38
6	23	928	7
8	47	17	910

### Classification Report:

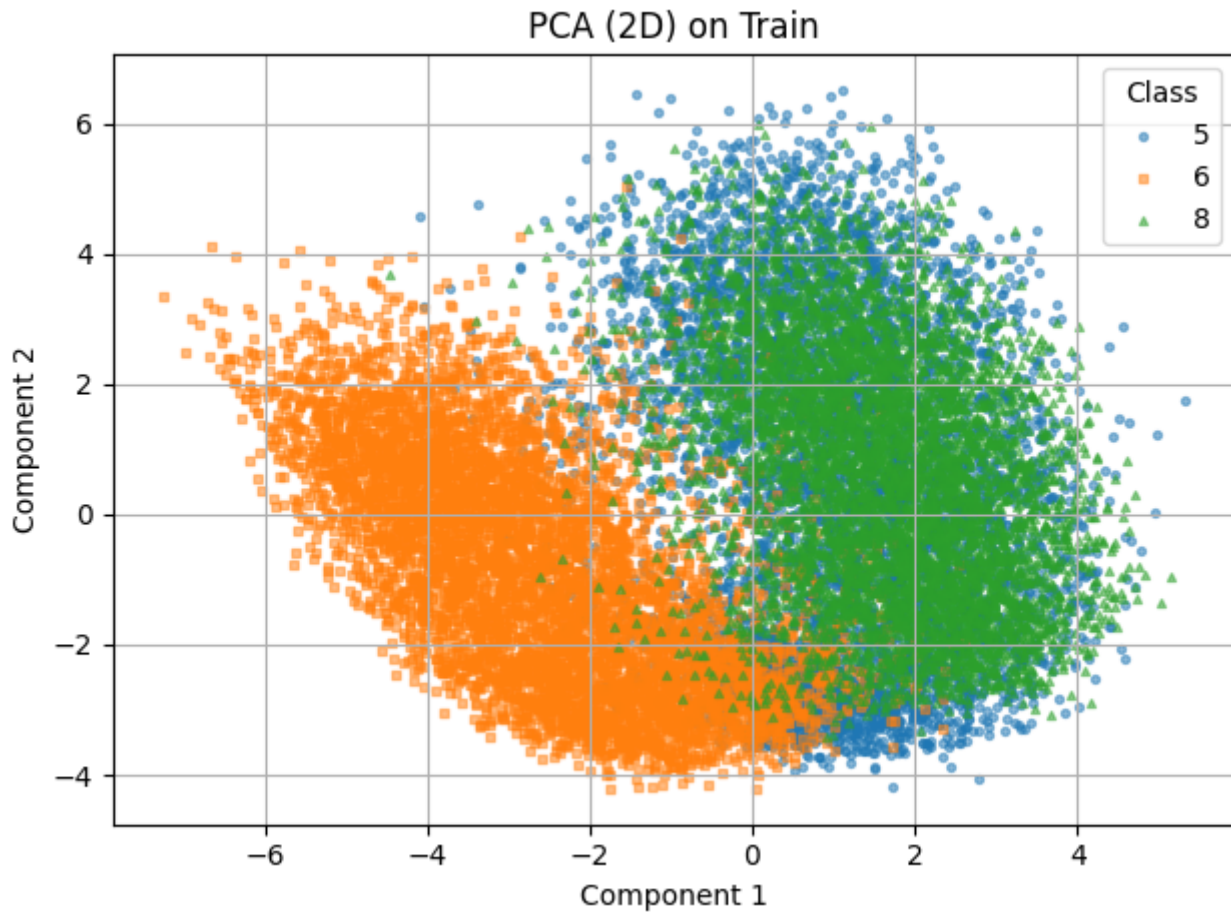
Class	Precision	Recall	F1-score	Support
5	0.9221	0.9294	0.9257	892
6	0.9567	0.9687	0.9627	958
8	0.9529	0.9343	0.9435	974

### Averages:

- Accuracy: **0.9444**
- Macro avg: Precision **0.9439**, Recall **0.9441**, F1-score **0.9440**
- Weighted avg: Precision **0.9445**, Recall **0.9444**, F1-score **0.9444**

### Optional Task

- (An additional optional (i.e. non-mandatory) exercise is to redo (2) using PCA instead, and then compare the results with the ones obtained using LDA.)



## PCA — 2D Gaussian Bayes

Test accuracy: 0.7100

Confusion Matrix (rows = true, cols = predicted):

True \ Pred	5	6	8
5	365	76	451
6	58	897	3
8	216	15	743

Classification Report:

Class	Precision	Recall	F1-score	Support
5	0.5712	0.4092	0.4768	892
6	0.9079	0.9363	0.9219	958
8	0.6207	0.7628	0.6845	974

Averages:

- Accuracy: 0.7100
- Macro avg: Precision 0.6999, Recall 0.7028, F1-score 0.6944

- Weighted avg: Precision 0.7025, Recall 0.7100, F1-score 0.6994

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## LDA vs PCA (Comparison)

Method	Accuracy	Macro Precision	Macro Recall	Macro F1
LDA	0.9444	0.9439	0.9441	0.9440
PCA	0.7100	0.6999	0.7028	0.6944

**LDA significantly outperforms PCA** for this 3-class classification task.