

Pattern Recognition Assignment 1

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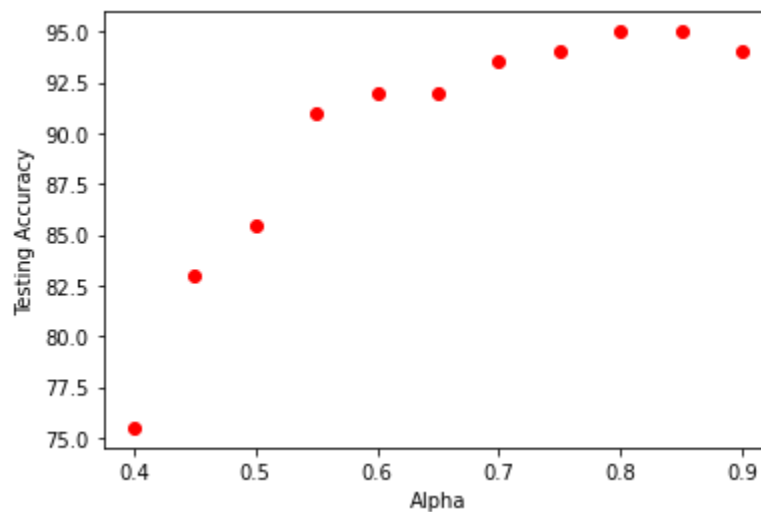
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PCA Accuracy Vs Alpha (50% : 50% split)

Alpha	0.8	0.85	0.9	0.95
Validation Accuracy (k=1)	94.5%	94.5%	93.5%	94%
Validation Accuracy (k=3)	85%	88%	86%	86%
Validation Accuracy (k=5)	80%	79%	77.5%	77.5%
Validation Accuracy (k=7)	70.5%	72%	71.5%	70%
Testing accuracy (best at k = 1)	95%	95%	94%	94%

Relation between Alpha and testing accuracy



LDA Accuracy (50% : 50% split)

Validation Accuracy (k=1)	93 %
Validation Accuracy (k=3)	83 %
Validation Accuracy (k=5)	73.5 %
Validation Accuracy (k=7)	71 %
Testing accuracy (best at k = 1)	93 %

Compare the results between PCA and LDA (50% : 50% split)

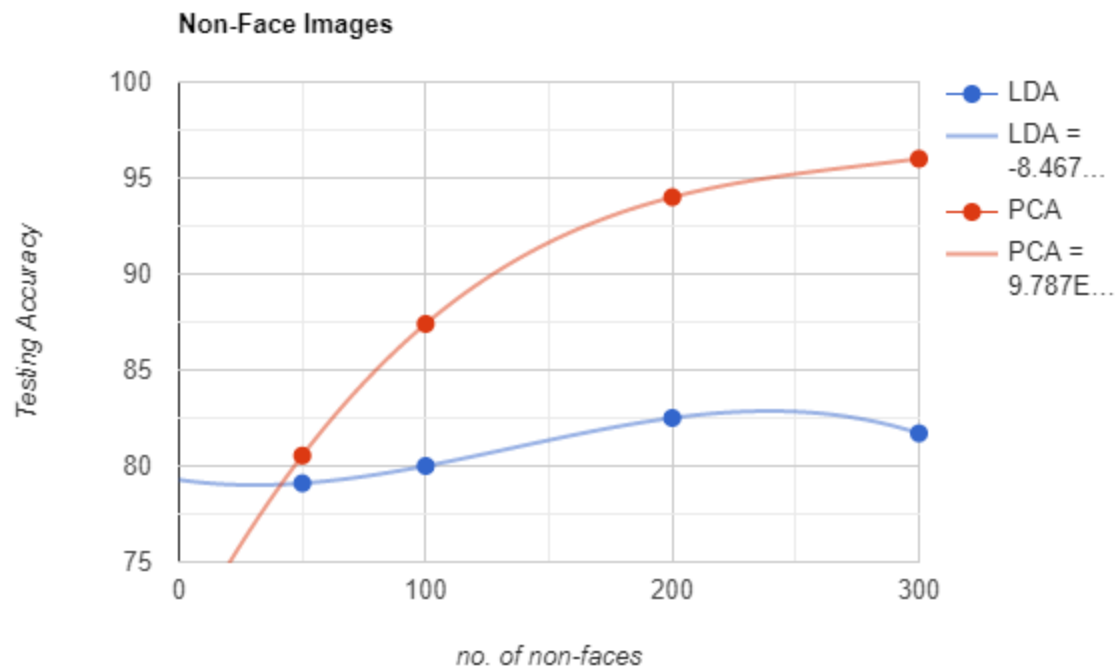
- PCA has slightly higher validation and testing accuracy than LDA, for all used values of alpha.
- Number of resulting dimensions in PCA adapts with the data according to alpha, while number of resulting dimension in LDA is fixed to 39 (number of classes -1). This means that PCA can return more eigen vectors than LDA and hence less information loss.

Comparing vs Non-Face Images

- The number of faces samples is fixed at 200 for training and 200 for testing.
- Total number of non-faces samples is 400.

Comparison between different testing accuracies :

no. of non-faces for training	50	100	200	300
LDA	79.1% (K = 7)	80% (K = 7)	82.5% (K = 7)	81.7% (K = 5)
PCA (Alpha =0.65)	83.81% (K = 1)	90.8% (K = 1)	94.5% (K = 1)	95.33% (K = 1)
PCA (Alpha =0.8)	80.54% (K = 1)	87.4% (K = 1)	94.0% (K = 1)	96.0% (K = 1)
PCA (Alpha =0.85)	78.72% (K = 1)	85.39% (K = 1)	93.0% (K = 1)	95.67% (K = 1)
PCA (Alpha =0.9)	77.45% (K = 1)	83.2% (K = 1)	92.75% (K = 1)	95.33% (K = 1)
PCA (Alpha =0.95)	76.18% (K = 1)	80.60% (K = 1)	90.25% (K = 1)	93.33% (K = 1)



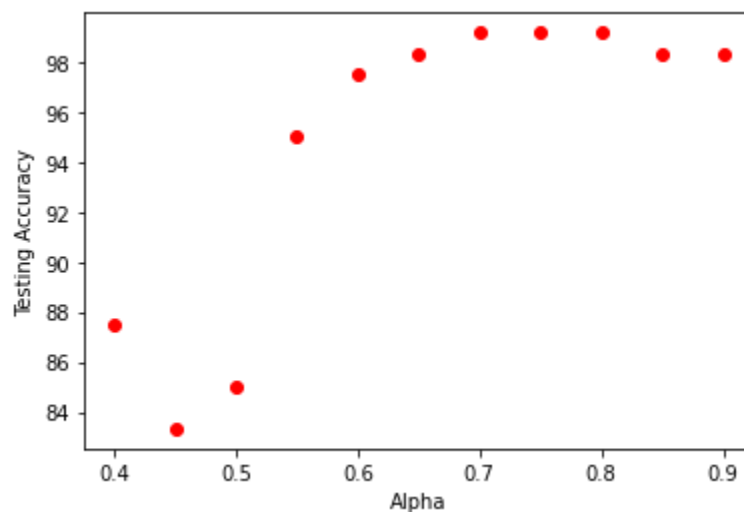
- Accuracy after running LDA doesn't remarkably improve when number of samples increase.
- Unlikely, Accuracy after running PCA improves when number of non-face samples increase.

Bonus : 70% : 30% split

PCA Accuracy Vs Alpha

Alpha	0.8	0.85	0.9	0.95
Validation Accuracy (k=1)	95.71	95.36	96.43	94.64
Validation Accuracy (k=3)	90	90	88.57	90
Validation Accuracy (k=5)	82.86	87.86	84.64	79.29
Validation Accuracy (k=7)	78.93	79.64	76.78	75.36
Testing accuracy (best at k = 1)	98.33	98.33	99.16	97.5

Relation between Alpha and validation accuracy

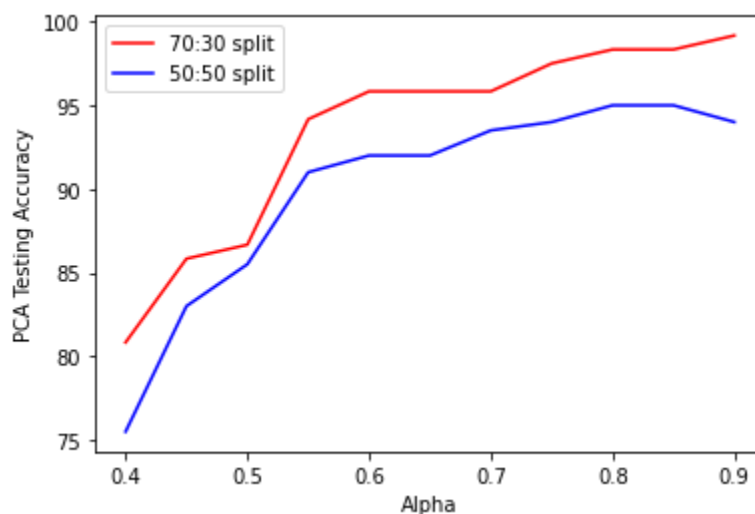


LDA Accuracy

Validation Accuracy (k=1)	96.4%
Validation Accuracy (k=3)	90%
Validation Accuracy (k=5)	83.9%
Validation Accuracy (k=7)	78.6%
Testing accuracy (best at k = 1)	96.7%

Compare the results between PCA and LDA

- Like the 50%:50% split, PCA have slightly higher validation and testing accuracy than LDA.
- Both LDA and PCA gives better accuracies in the 70:30 split.



[Colab Notebook Link](#)