

Assignment 2 Report – 20171112

1(a). What are eigen faces?

Eigenfaces is the name given to a set of eigenvectors when they are used in the computer vision problem of human face recognition.

1(b). How many eigen vectors/faces are required to “satisfactorily” reconstruct a person in these three datasets? (Don’t forget to make your argument based on eigen value spectrum) Show appropriate graphs, qualitative examples and make a convincing argument.

IMFDB

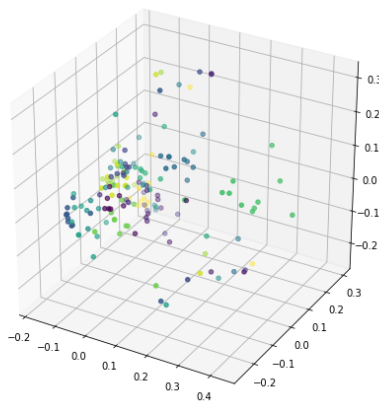
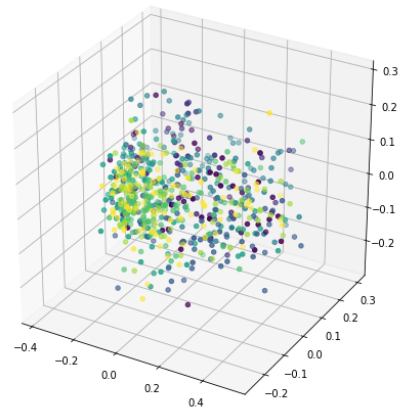
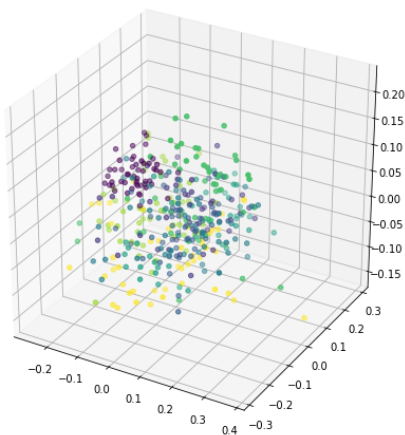
Dataset shape: (400, 32, 32, 3)

IIIT-CFW

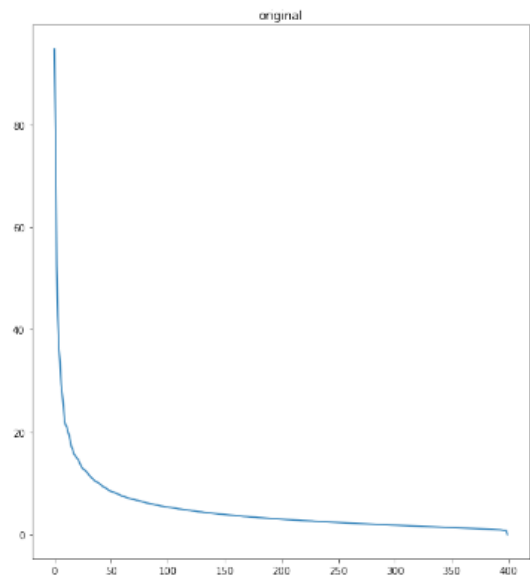
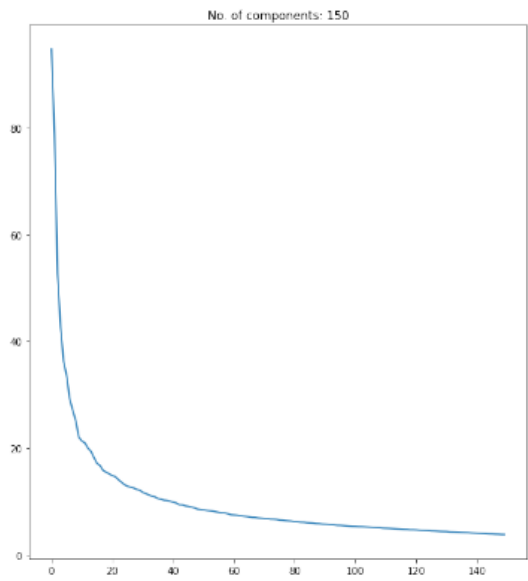
Dataset shape: (672, 32, 32, 3)

Yale Faces

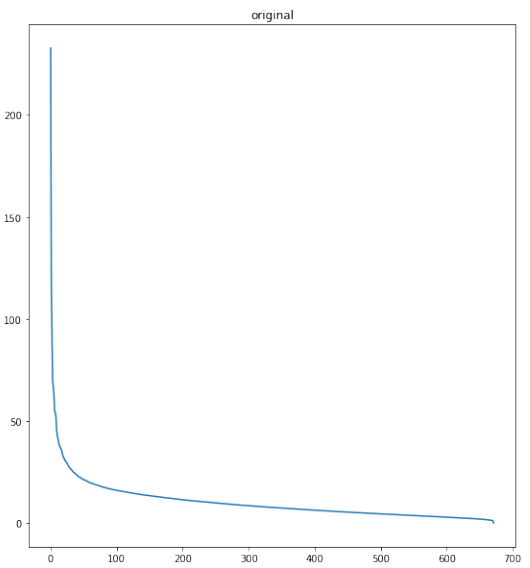
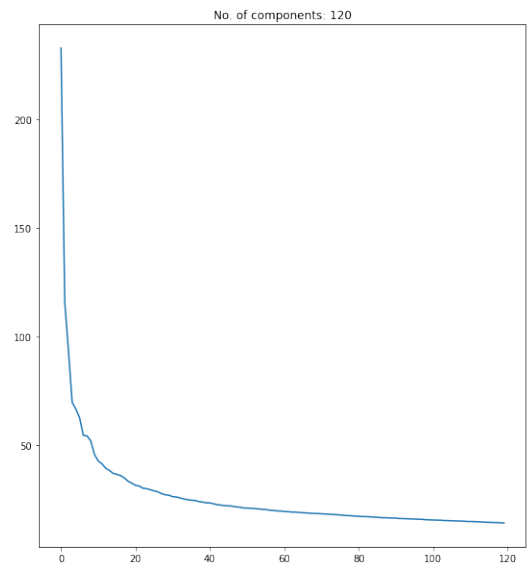
Dataset shape: (165, 32, 32, 3)



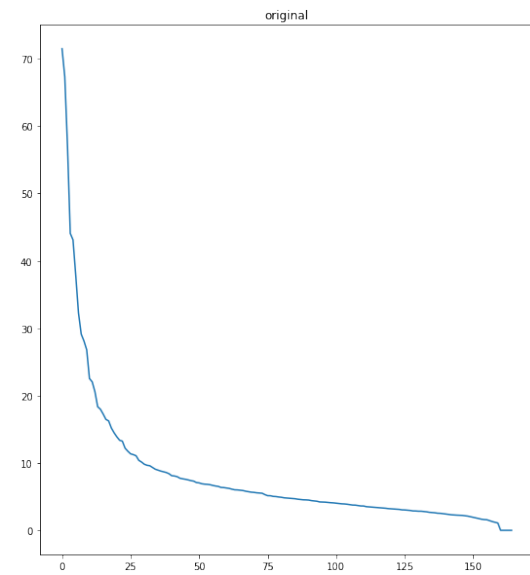
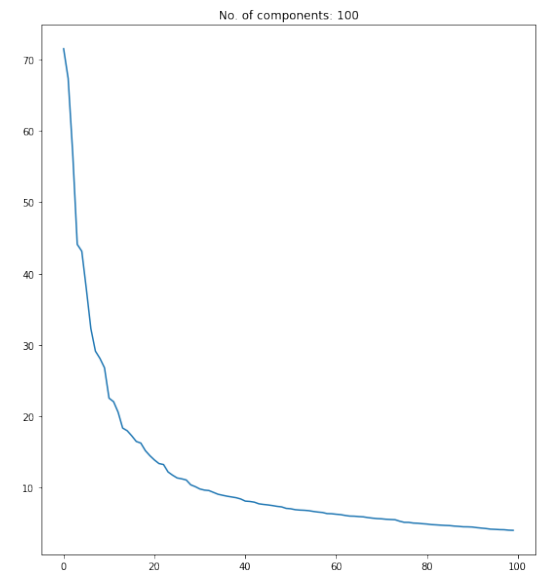
Eigen Spectrum of 3 datasets-
For IMFDB



For IIIT-CFW

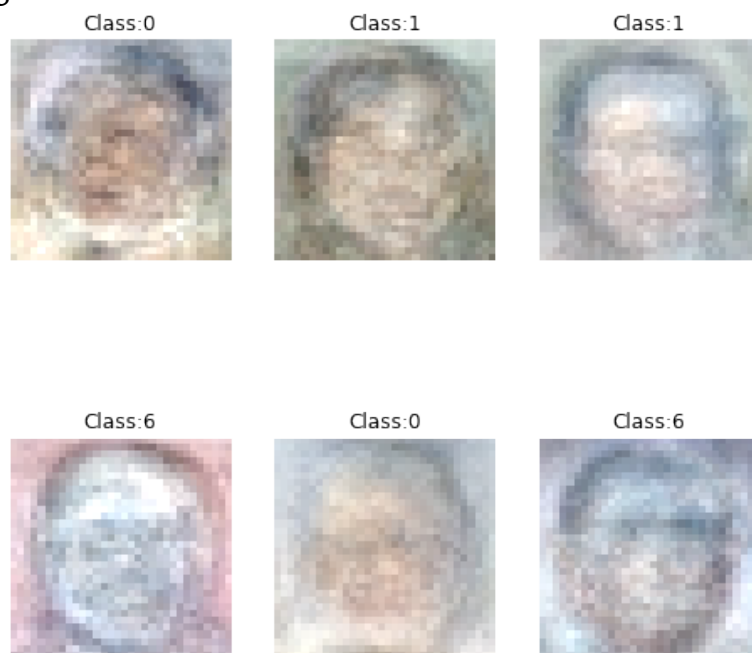


For Yale Faces



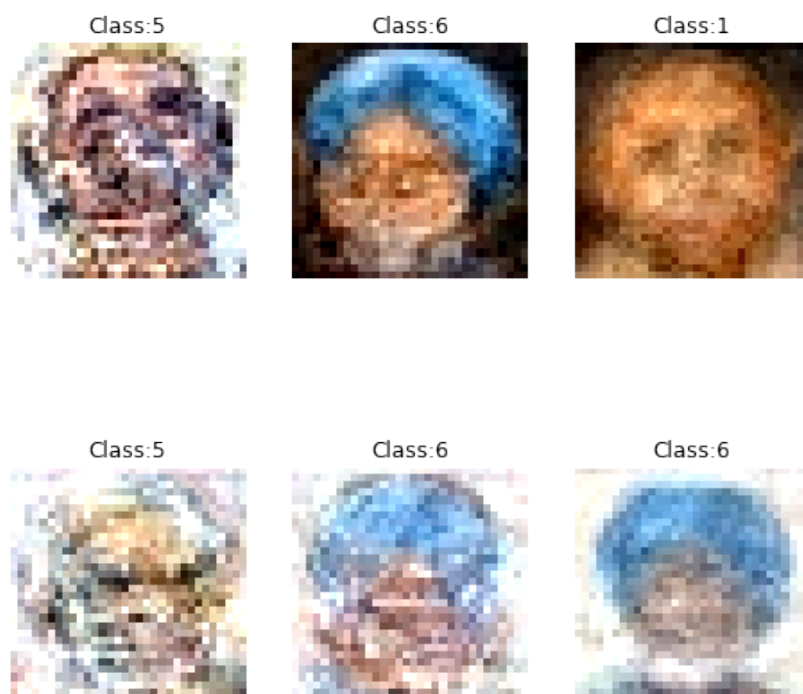
1(c).

Reconstructed images for IMFDB



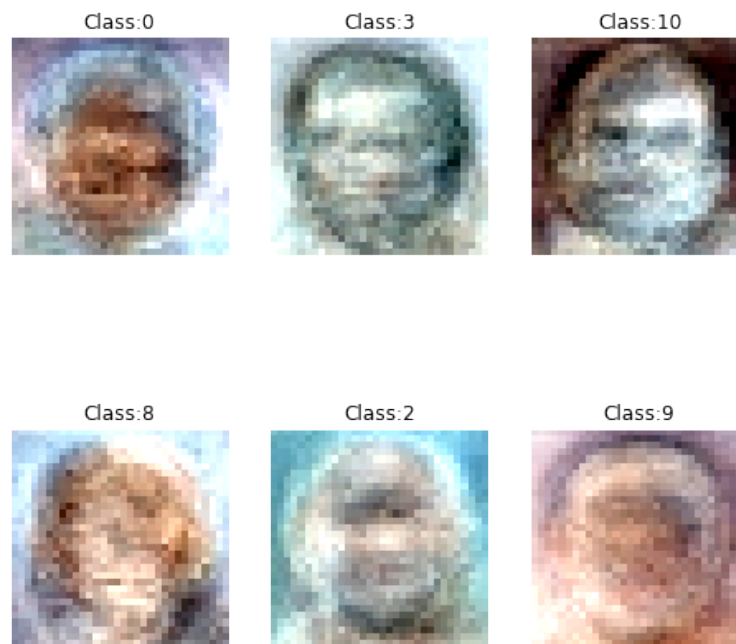
Reconstruction error = 0.033301628959622534

Reconstructed images for IIIT-CFW



Reconstruction error = 0.11631306018258532

Reconstruction for Yale faces



Reconstruction error = 0.006915223350195953

1(d). RMSE reconstruction error calculated for each class. The class with maximum error is the one hardest to reconstruct.

For IMFDB class with most error is 2 – Shah Rukh Khan
 For IIIT-CFW class with most error is 5 – Narendra Modi
 For Yale faces class with most error is 13

2] For IMFDB – Best: Resnet+LR

IMFDB

	Feature	Dimension	Space	Error	Accuracy	F1 Score
1	PCA+MLP		150	0.28	0.72	0.717168
2	PCA+LDA+SVM		7	0.24	0.76	0.768628
3	PCA+LDA+LR		7	0.19	0.81	0.805421
4	KPCA+SVM		150	0.92	0.08	0.011852
5	KPCA+DT		150	0.56	0.44	0.434009
6	LDA+LR		7	0.26	0.74	0.736352
7	LDA+DT		7	0.38	0.62	0.625177
8	PCA+LDA+LR		7	0.19	0.81	0.807009
9	VGG+SVM	(300, 4096)		0.15	0.85	0.850796
10	VGG+LR	(300, 4096)		0.11	0.89	0.890320
11	VGG+DT	(300, 4096)		0.17	0.83	0.833322
12	Resnet+MLP	(300, 2048)		0.03	0.97	0.969452
13	Resnet+SVM	(300, 2048)		0.05	0.95	0.949979
14	Resnet+LR	(300, 2048)		0.03	0.97	0.969425
15	Resnet+DT	(300, 2048)		0.09	0.91	0.910592

For IIIT-CFW – Best: Resnet+LR

IIIT-CFW

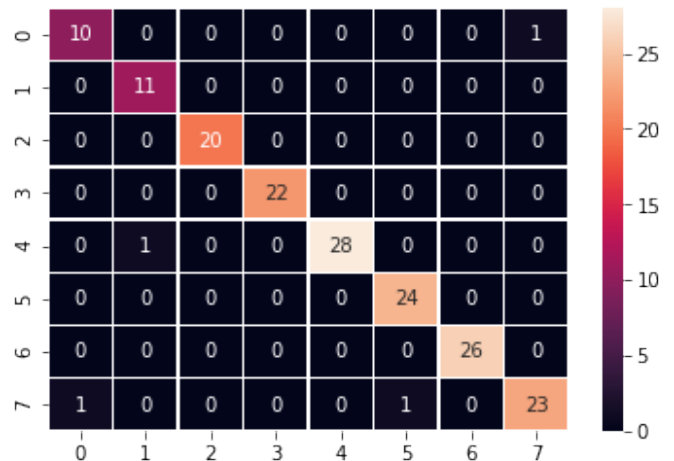
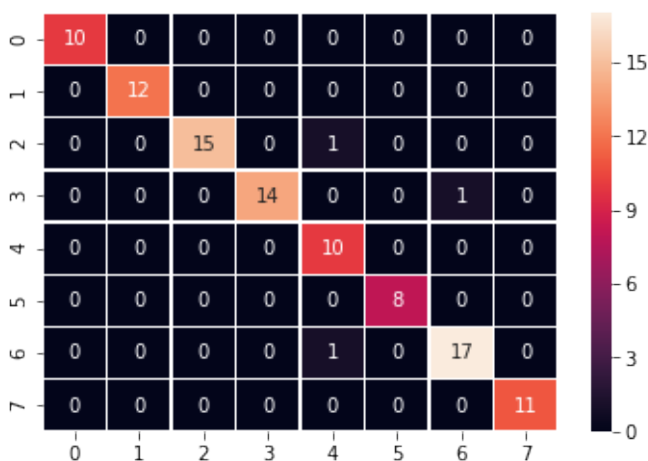
	Feature	Dimension	Space	Error	Accuracy	F1 Score
1	PCA+MLP	150		0.428571	0.571429	0.567378
2	PCA+LDA+SVM	7		0.452381	0.547619	0.550984
3	PCA+LDA+LR	7		0.446429	0.553571	0.556381
4	KPCA+SVM	150		0.869048	0.130952	0.030326
5	KPCA+DT	150		0.696429	0.303571	0.312176
6	LDA+LR	7		0.636905	0.363095	0.382471
7	LDA+DT	7		0.714286	0.285714	0.300456
8	PCA+LDA+LR	7		0.422619	0.577381	0.584014
9	VGG+SVM	(504, 4096)		0.386905	0.613095	0.594543
10	VGG+LR	(504, 4096)		0.357143	0.642857	0.644912
11	VGG+DT	(504, 4096)		0.410714	0.589286	0.591255
12	Resnet+MLP	(504, 2048)		0.029762	0.970238	0.970359
13	Resnet+SVM	(504, 2048)		0.035714	0.964286	0.964415
14	Resnet+LR	(504, 2048)		0.023810	0.976190	0.976235
15	Resnet+DT	(504, 2048)		0.071429	0.928571	0.929030

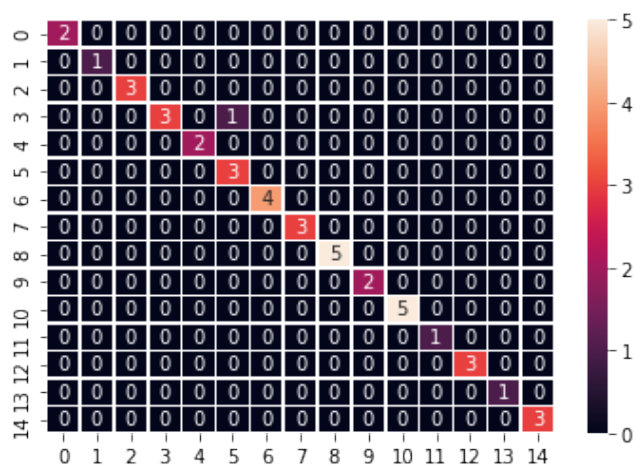
For Yale faces – Best: Resnet+MLP

Yale faces

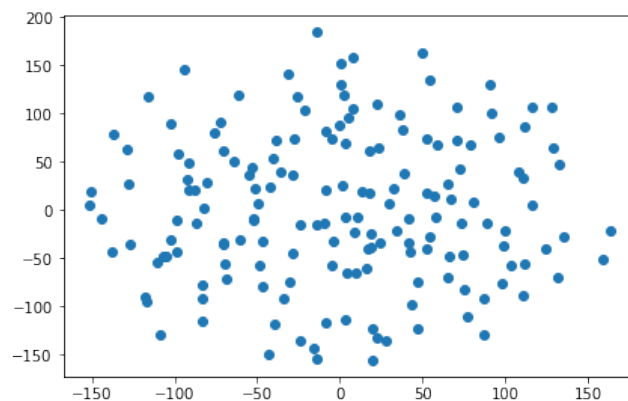
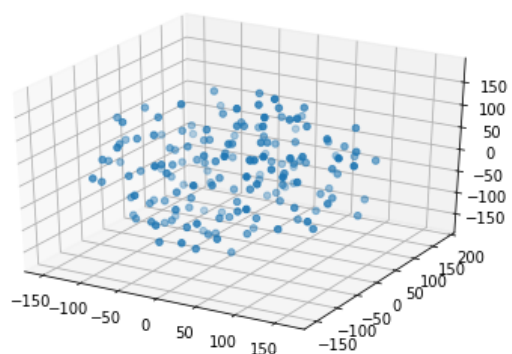
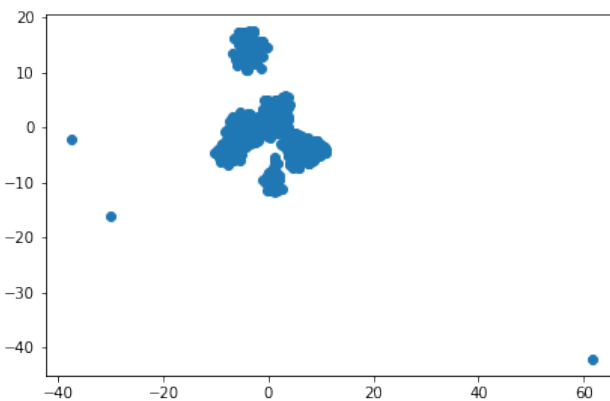
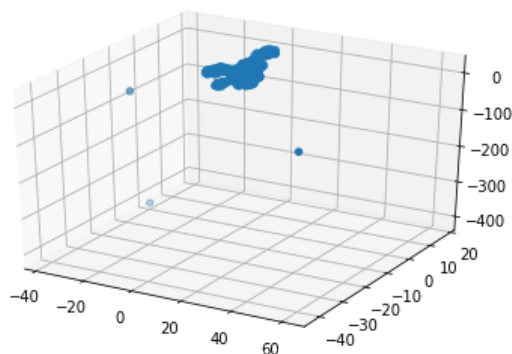
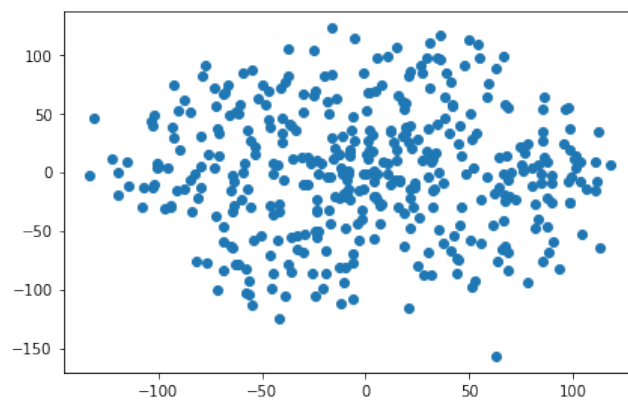
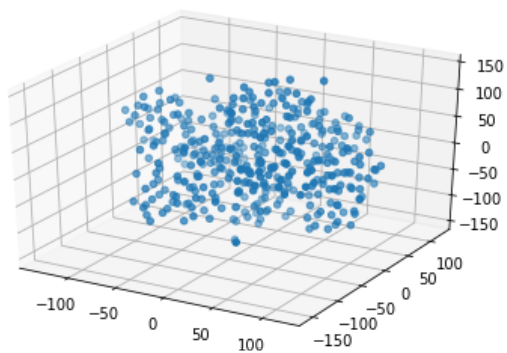
	Feature	Dimension	Space	Error	Accuracy	F1 Score
1	PCA+MLP	123		0.190476	0.809524	0.819312
2	PCA+LDA+SVM	14		0.523810	0.476190	0.497597
3	PCA+LDA+LR	14		0.523810	0.476190	0.440079
6	LDA+LR	14		0.071429	0.928571	0.922336
7	LDA+DT	14		0.285714	0.714286	0.709033
9	VGG+SVM	(123, 4096)		0.595238	0.404762	0.409096
10	VGG+LR	(123, 4096)		0.404762	0.595238	0.586693
11	VGG+DT	(123, 4096)		0.571429	0.428571	0.411640
12	Resnet+MLP	(123, 2048)		0.023810	0.976190	0.976190
13	Resnet+SVM	(123, 2048)		0.023810	0.976190	0.976190
14	Resnet+LR	(123, 2048)		0.023810	0.976190	0.976190
15	Resnet+DT	(123, 2048)		0.190476	0.809524	0.818405

Heatmaps of confusion matrices of best methods -





3] t-SNE plots of the resnet features of all the datasets -



4] Using KNN with various features for 3 datasets

IMFDB

	Features	Dimension Space	Verification Error	Accuracy	Precision
1	PCA	150	0.44	0.56	0.663357
2	LDA	7	0.22	0.78	0.784402
3	PCA+LDA	7	0.20	0.80	0.804246
4	VGG	7	0.09	0.91	0.916008
5	Resnet	7	0.06	0.94	0.943643

IIIT-CFW

	Features	Dimension Space	Verification Error	Accuracy	Precision
1	PCA	150	0.44	0.56	0.663224
2	LDA	7	0.22	0.78	0.784402
3	PCA+LDA	7	0.20	0.80	0.812657
4	VGG	7	0.09	0.91	0.916008
5	Resnet	7	0.06	0.94	0.943643

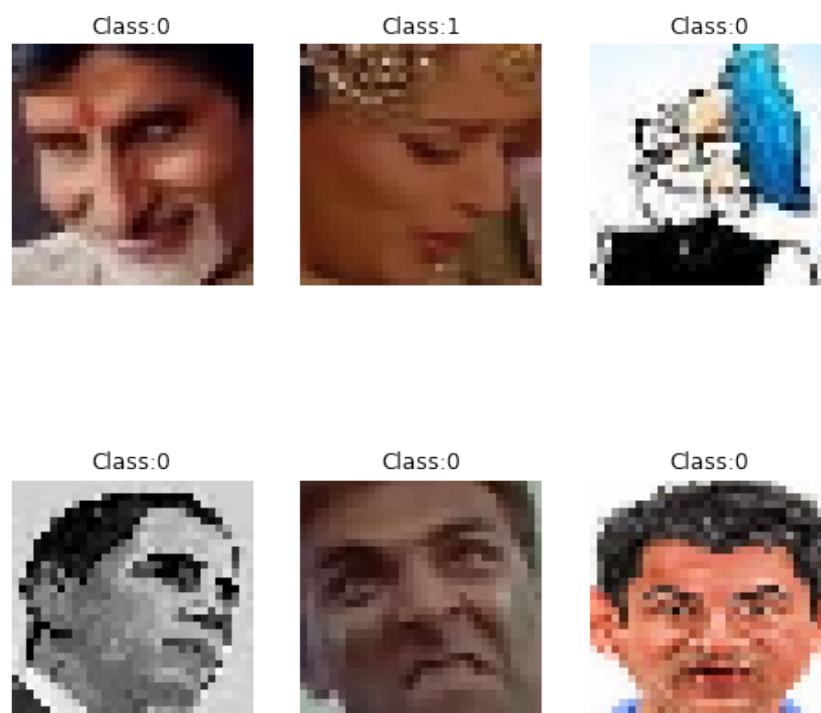
Yale faces

	Features	Dimension Space	Verification Error	Accuracy	Precision
1	PCA	123	0.43	0.57	0.658000
2	LDA	7	0.22	0.78	0.784402
3	PCA+LDA	7	0.19	0.81	0.832951
4	VGG	7	0.09	0.91	0.916008
5	Resnet	7	0.06	0.94	0.943643

Extension/Application -

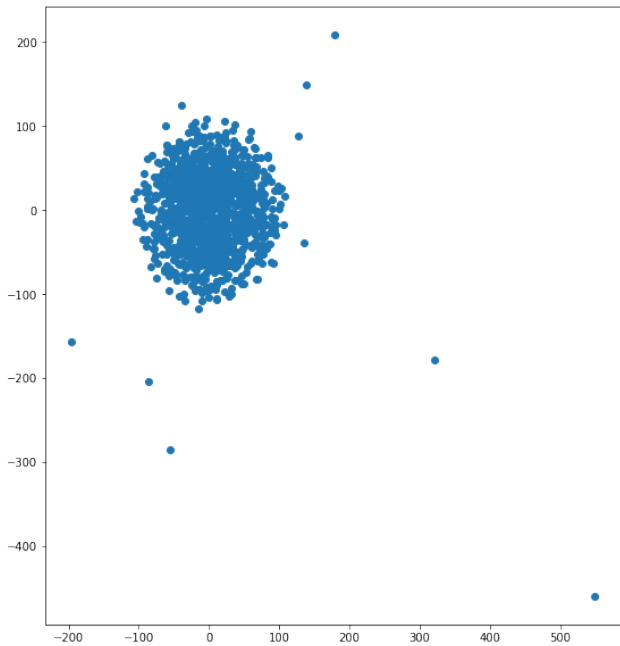
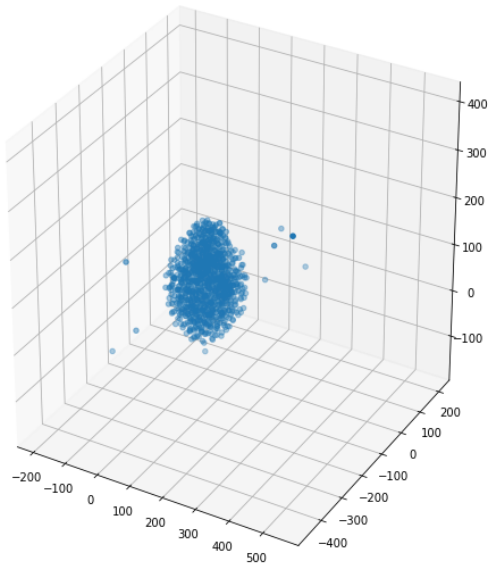
Gender prediction given different actors/actress in IMFDB+IIIT-CFW create new labels based on their gender.

Displaying images -

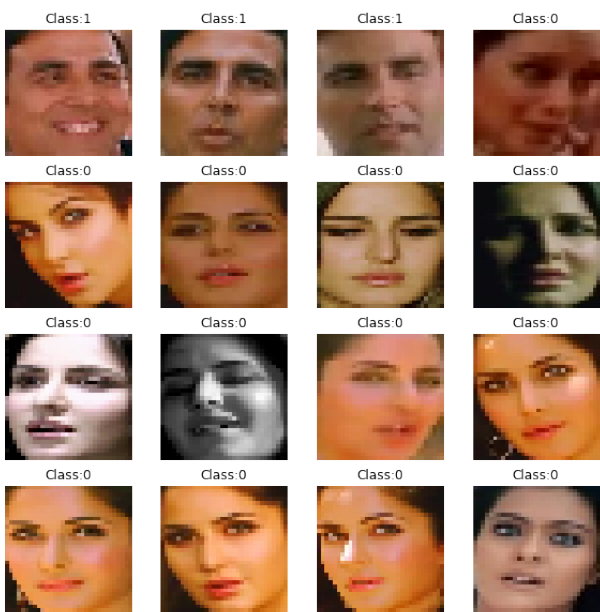


Using PCA+LDA+LR, Accuracy = 79.8507462686567 %

t-SNE plots -



Incorrect classifications



Correct Classifications

