EE657: Pattern Recognition and Machine Learning

Matlab Assignment Report

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Task 1: Character Recognition using Bayesian Classifier

a) For "e"

Total misclassifications for "e" = 6

Actual class	Image no.	Classification
1	1	2
1	22	2
1	30	2
1	40	2
1	45	2
1	47	2

For "c"

    Total misclassifications for "c" = 12

Actual class	Image no.	Classification
2	3	1
2	5	1
2	21	1
2	22	1
2	23	1
2	38	1
2	42	1
2	74	1
2	88	1
2	93	1
2	95	1
2	99	1

For "i"

    Total misclassifications for "i" = 2

Actual class	Image no.	Classification
3	26	1
3	39	2

b) For "e"

Total misclassifications for "e" = 7

Actual class	Image no.	Classification
1	15	2
1	18	2
1	36	2
1	45	2
1	54	2
1	57	2
1	64	2

For "c"

Total misclassifications for "c" = 8

Actual class	Image no.	Classification
2	23	1
2	32	3
2	34	1
2	79	1
2	81	3
2	92	1
2	95	1
2	100	3

For "i"

Total misclassifications for "i" = 3

Actual class	Image no.	Classification
3	39	2
3	44	2
3	86	2

c) For "e"

Total misclassifications for "e" = 13

Actual class	Image no.	Classification
1	15	2
1	16	2
1	18	2
1	19	2
1	22	2
1	23	2
1	29	2
1	30	2
1	36	3
1	41	3
1	45	2
1	54	2
1	55	3

For "c"

Total misclassifications for "c" = 15

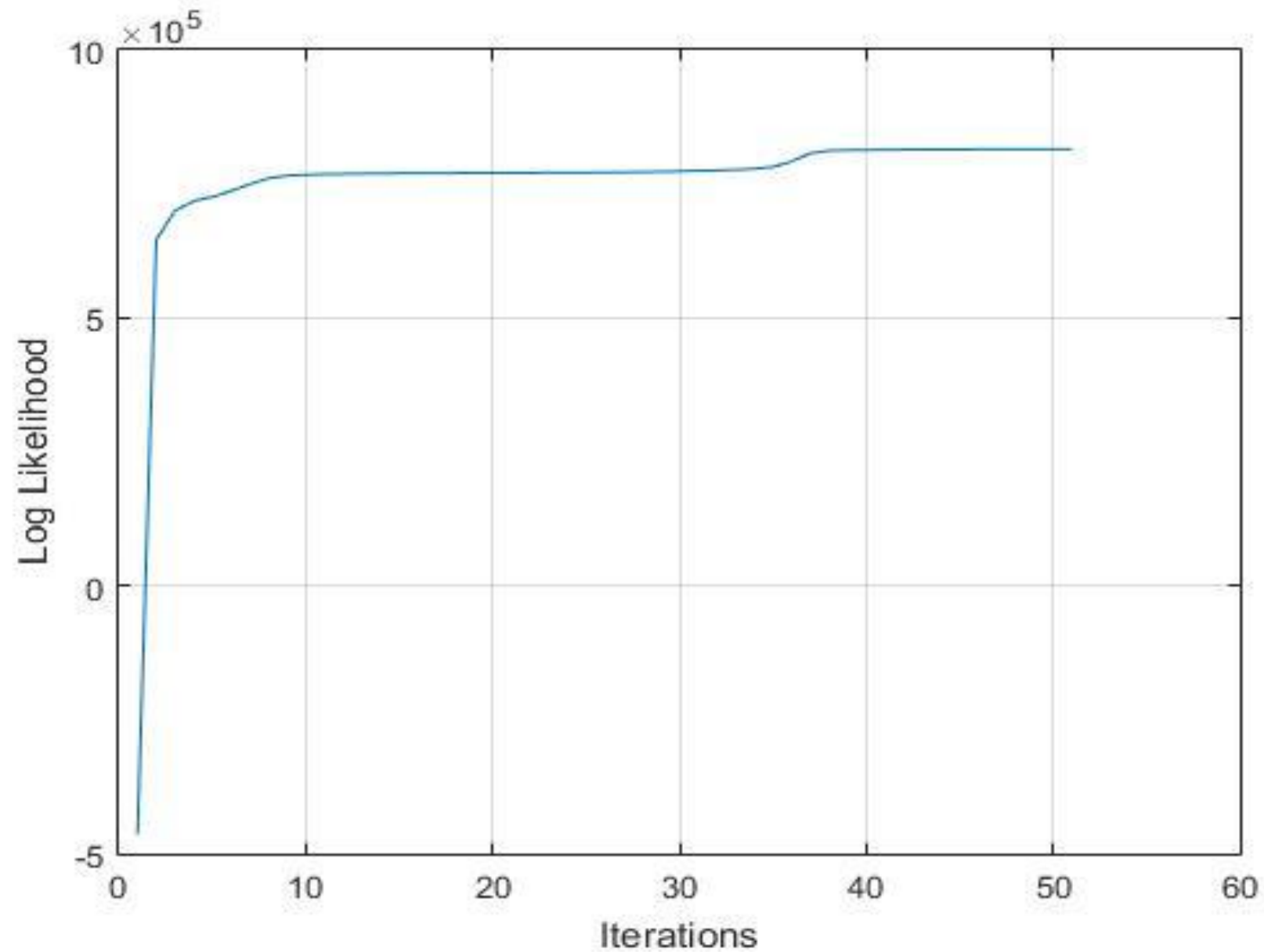| Actual class	Image no.	Classification
2	10	3
2	12	3
2	14	1
2	21	1
2	23	1
2	34	3
2	38	1
2	42	1
2	45	1
2	50	1
2	56	3
2	73	1
2	74	1
2	83	3
2	85	1

For "i"

Total misclassifications for "i" = 0

Task 2: GMM based clustering

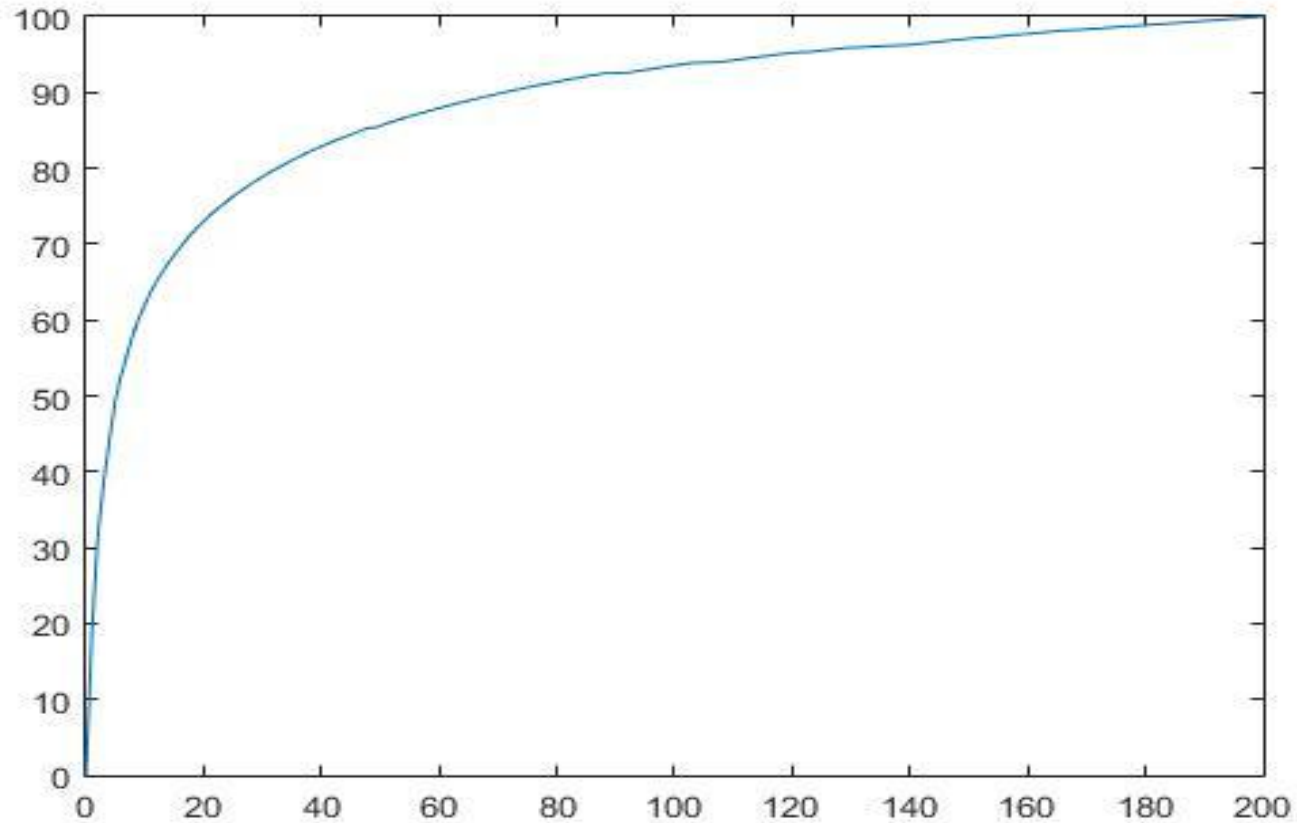a) Segmented output
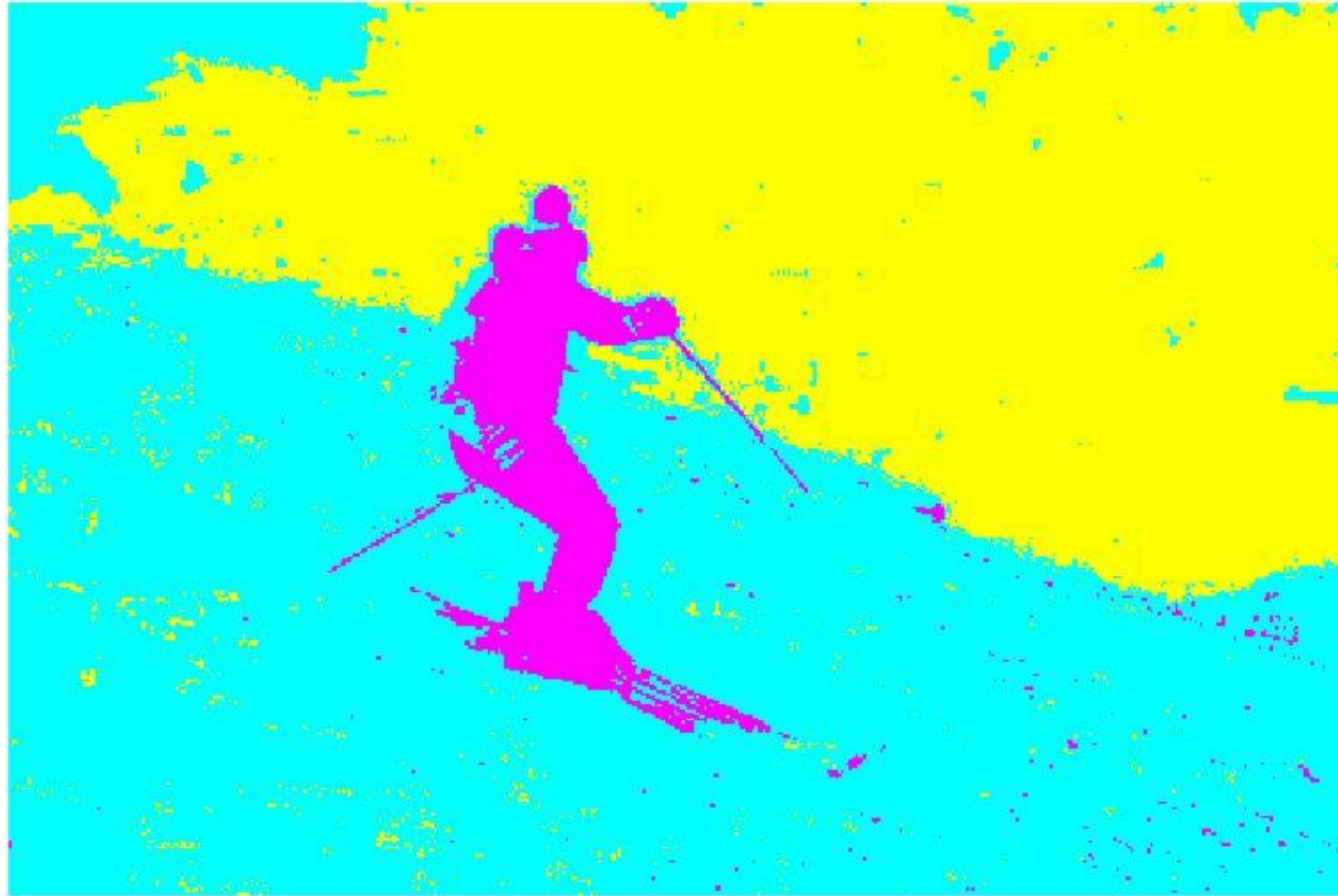
b) Graph depicting the convergence of the log likelihood values

Task 3: Face Recognition using PCA

a) Eigen-face images corresponding to the top 5 Eigen values of the covariance matrix

b) Graph depicting the percentage of the total variance of the original data retained in the reduced space versus the number of dimensions
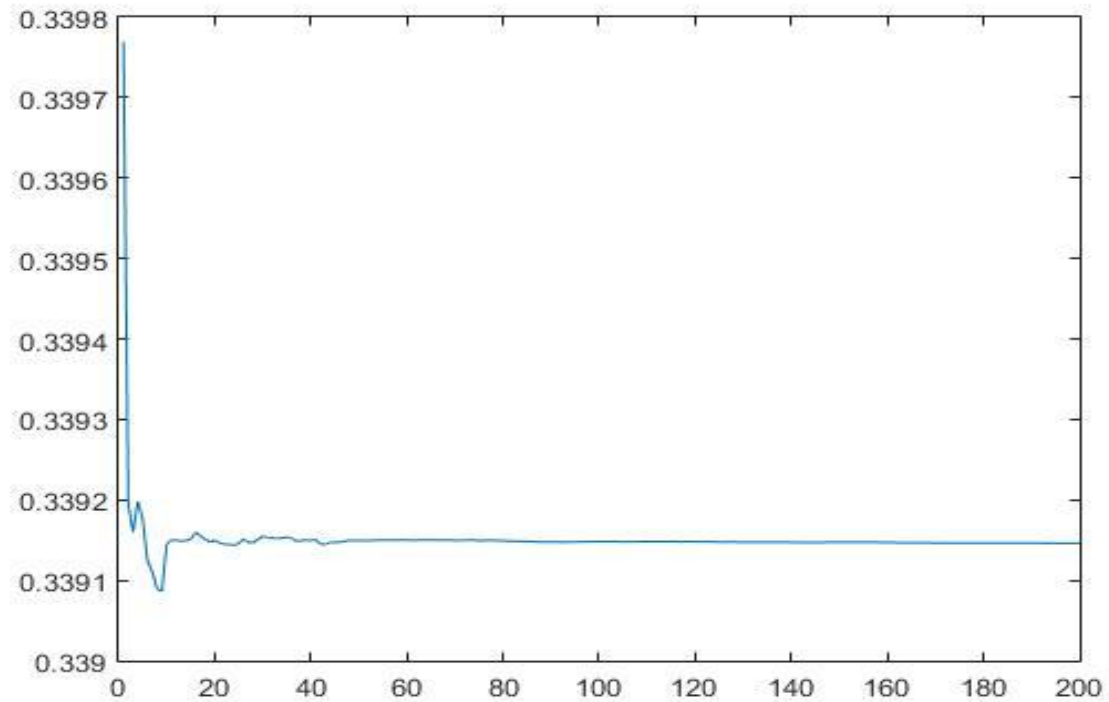

The number of dimensions required for projecting the face vectors so that at least 95% of the total variance of the original data is accounted for in the reduced space are $\geq$ 119

c) Reconstructing the image 'face input 1.pgm'
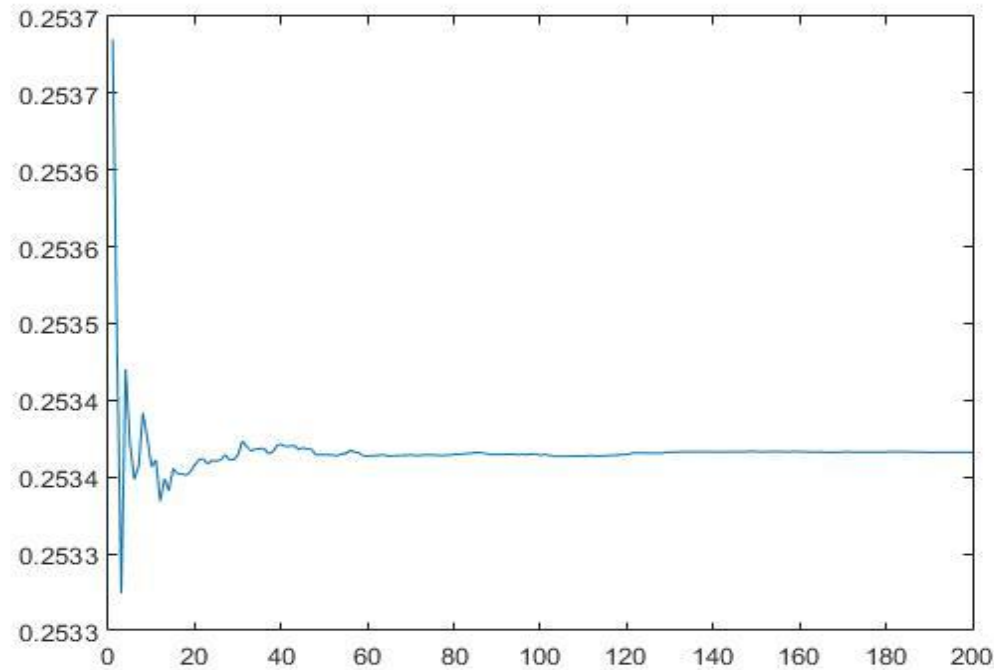

d) Graph of the mean squared error
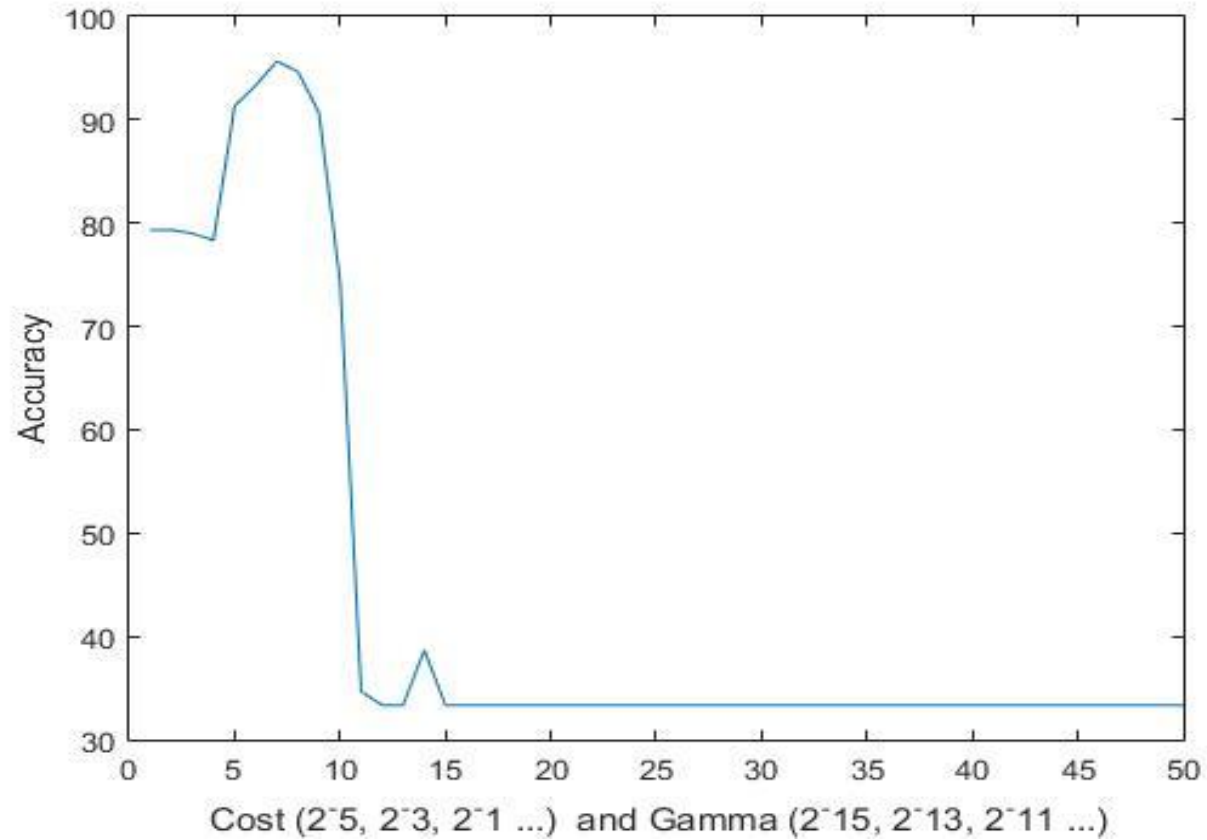
e) For the image 'face input 2.pgm'

Graph of the mean squared error

Comment : The Second image can be easily reconstructed as compared to the first image because the eigenvectors are
on result almost along the direction of image vectors, So it can be easily reconstructed as the linear combination of
eigen vectors.

Task 4 : Support Vector Machines

$$\begin{bmatrix} \text{Cost} \\ \text{Gamma} \end{bmatrix} = \begin{bmatrix} 2^{-5} \\ 2^{-15} \end{bmatrix} , \begin{bmatrix} 2^{-3} \\ 2^{-13} \end{bmatrix} , \begin{bmatrix} 2^{-1} \\ 2^{-11} \end{bmatrix} , \dots$$