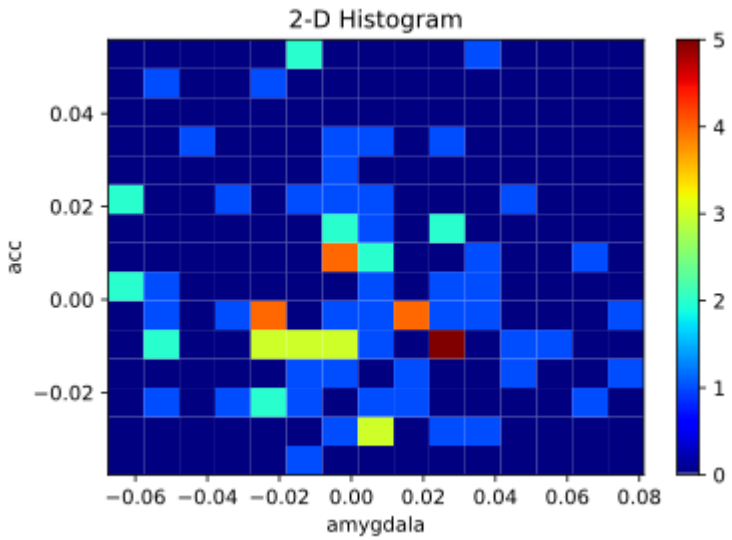
Rubric:

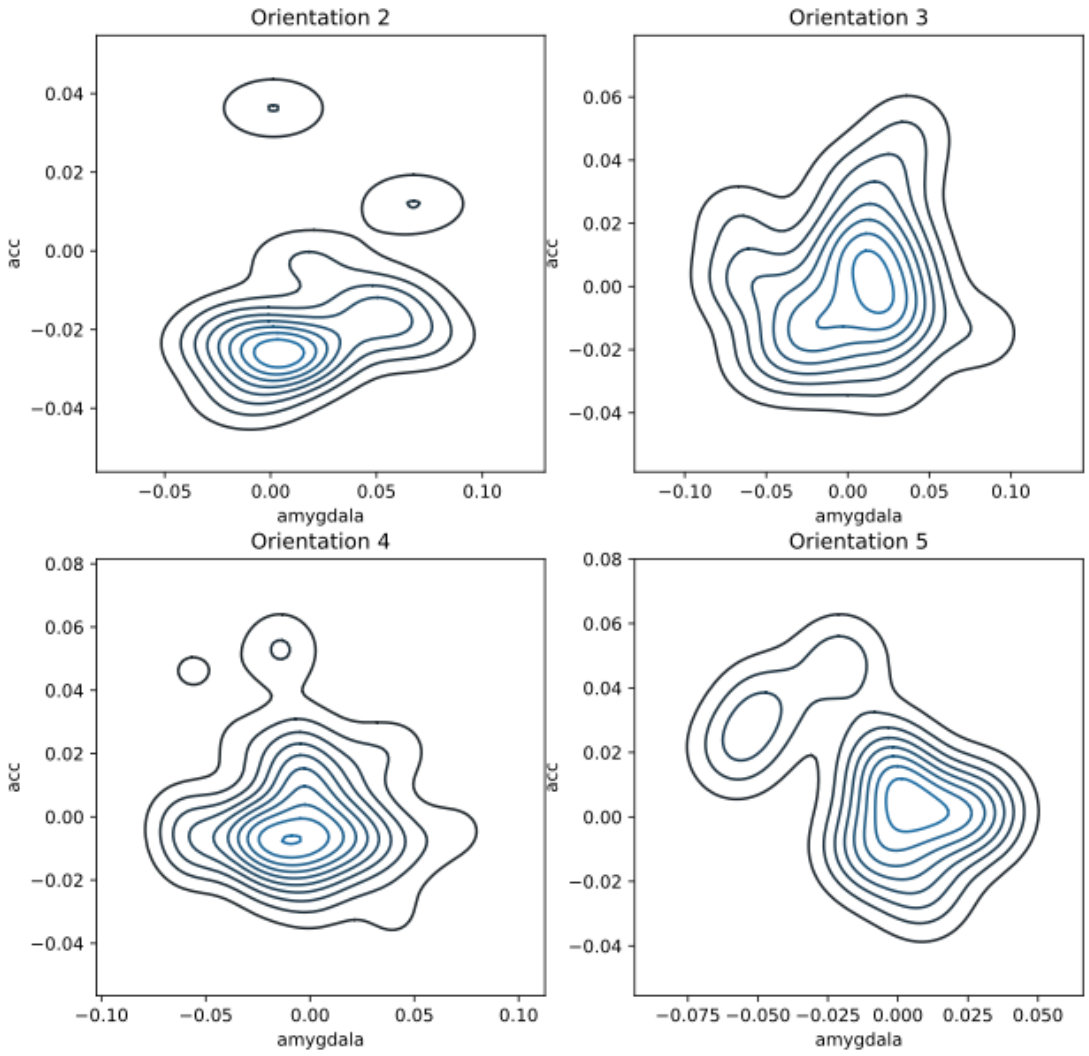
Question	Score
1.a Plot 2-d histogram for the pairs of variables (10')	7:' provide the histogram 3' the graph is clear and meaningful
1.b Plot the contour plots (20') (It is better to plot 4 plots for different orientation, but it is still ok if they draw one plot)	For each orientation 3' plot the contour 2' the figure is reasonable
1.c Plot the condition distribution for two variables (20'), 10' for each plot	For each plot, 7' get the distribution correctly 3' plot the distribution
2.a Visualize one raw image of 2 and 6 (10') (Deduct 2 point totally if they do not rotate the figure)	5' image of 2 5' image of 6
2.b Plot the log-likelihood function versus the number of iterations (24')	6' set correct initial conditions 12' write correct codes of EM-GMM 3' plot the figure of log-likelihood function vs. iterations 3' convergence can be shown from the plot
2.c Get the GMM model (16')	6' weight of each components (3' for each one) 10' mean vectors (5' for each one)

Results might vary a lot according to different input parameter. My solution is just for reference. All reasonable answers should be accepted.

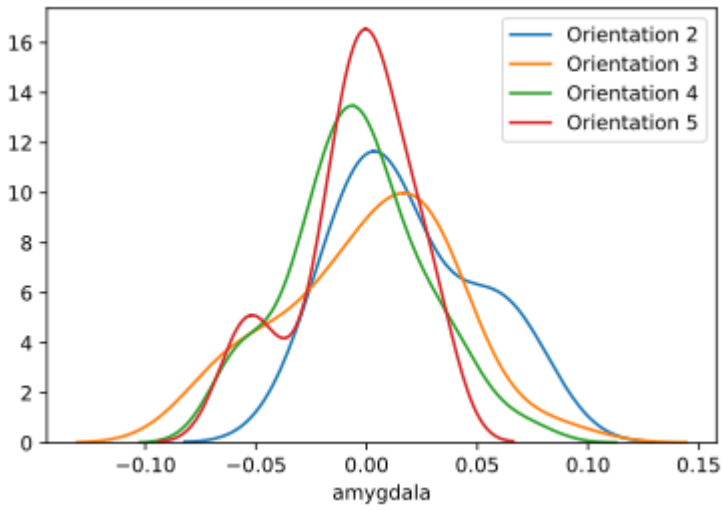
1.a

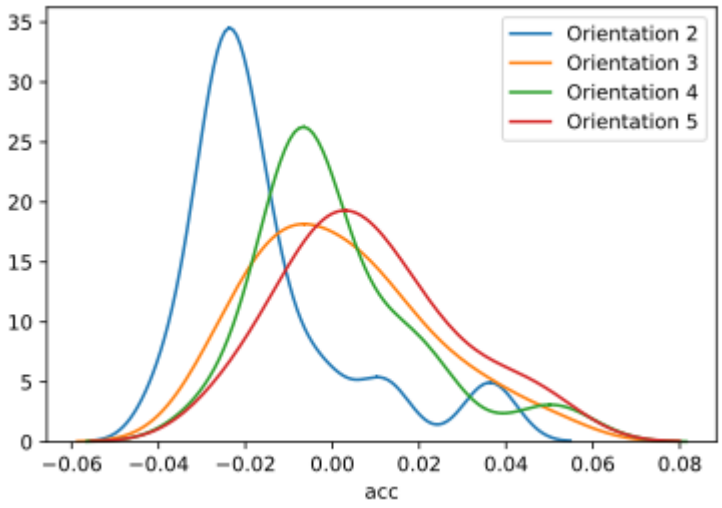


1.b

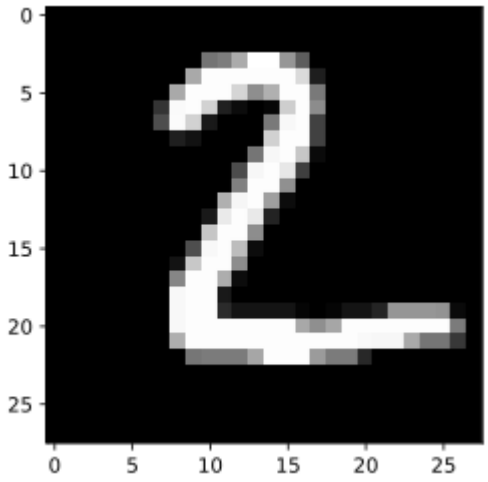

Orientation 2
Orientation 3
Orientation 4
Orientation 5
acc
amygdala

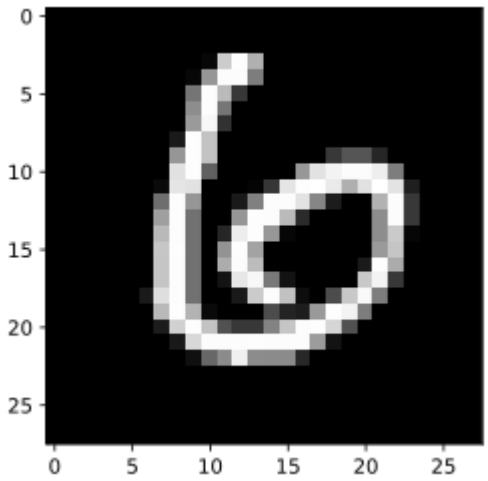
1c


Orientation 2
Orientation 3
Orientation 4
Orientation 5
amygdala

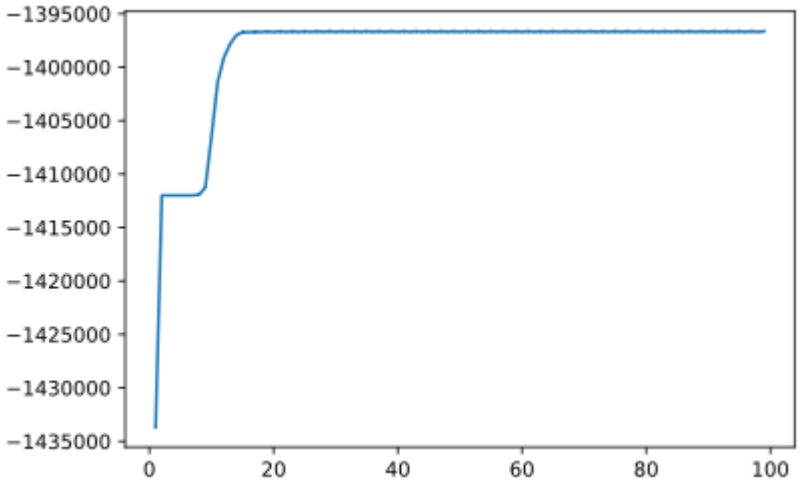

Orientation 2
Orientation 3
Orientation 4
Orientation 5
35
30
25
20
15
10
5
0
−0.06
−0.04
−0.02
0.00
0.02
0.04
0.06
0.08
acc

2a

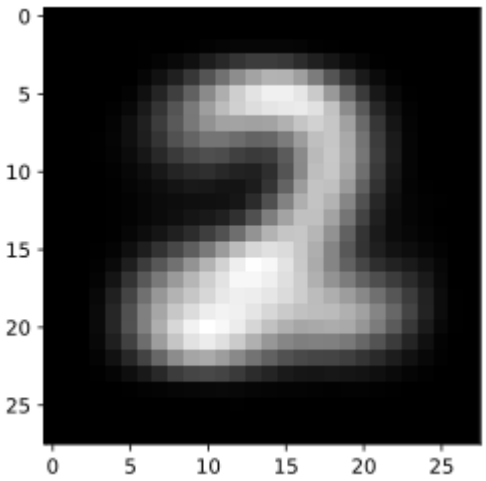

0
5
10
15
20
25
0
5
10
15
20
25

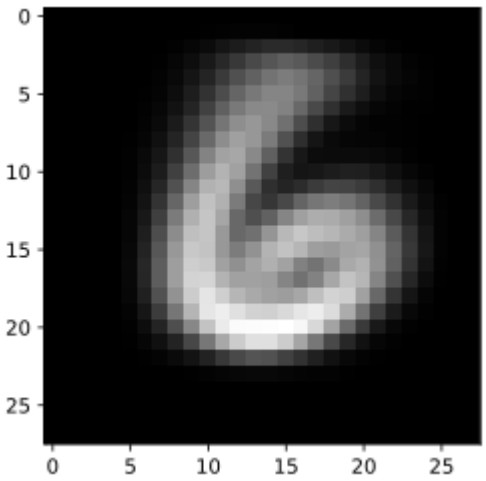

0
5
10
15
20
25
0
5
10
15
20
25

2b



2c





Pi: (weight)

2: 0.52

6: 0.48

2d
Accuracy for EM: 0.99
Accuracy for K-means: 0.94