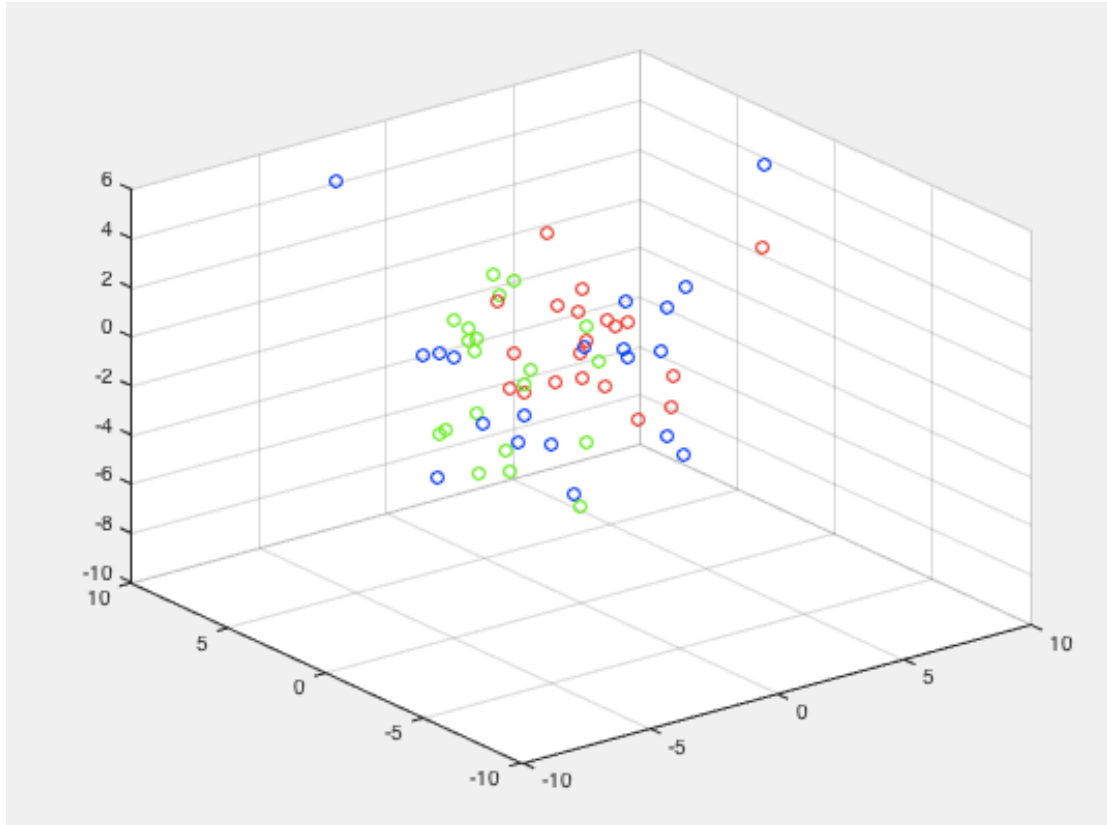24-787 Assignment2

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1.

(a)

I used "chol" to get Gaussian distribution with specific mean and covariance and used randn to generate random number. The plot will be shown by running the "mainfile.m"

(b)

mean1 =   -0.8765

            0.3930

            0.1779

mean2 =   0.8674

            5.2219

            -3.5954

mean3 =   1.1234

            -0.4003

            -1.3315

cov1 =

    2.1894   -0.4252   -0.1651
   -0.4252   3.6398   0.9603
   -0.1651   0.9603   1.4788

cov2 =

    0.8277   0.1883   0.7736
    0.1883   2.5929   0.5624
    0.7736   0.5624   5.6225

cov3 =

    6.4923   -1.2451   -1.7485
   -1.2451   8.9496   4.5501
   -1.7485   4.5501   10.3515

(c)
I used the three Gaussian distributions above, put those six points in them, and find out which those points belongs to by finding the maximum probability.
I think the result makes sense or not depends on how many random points we generated. In this case, we generated 20 points and get estimated mean and covariance, which is not bad in accuracy. But if we estimate the parameters with less points, the results will not make sense.(the result is shown below)
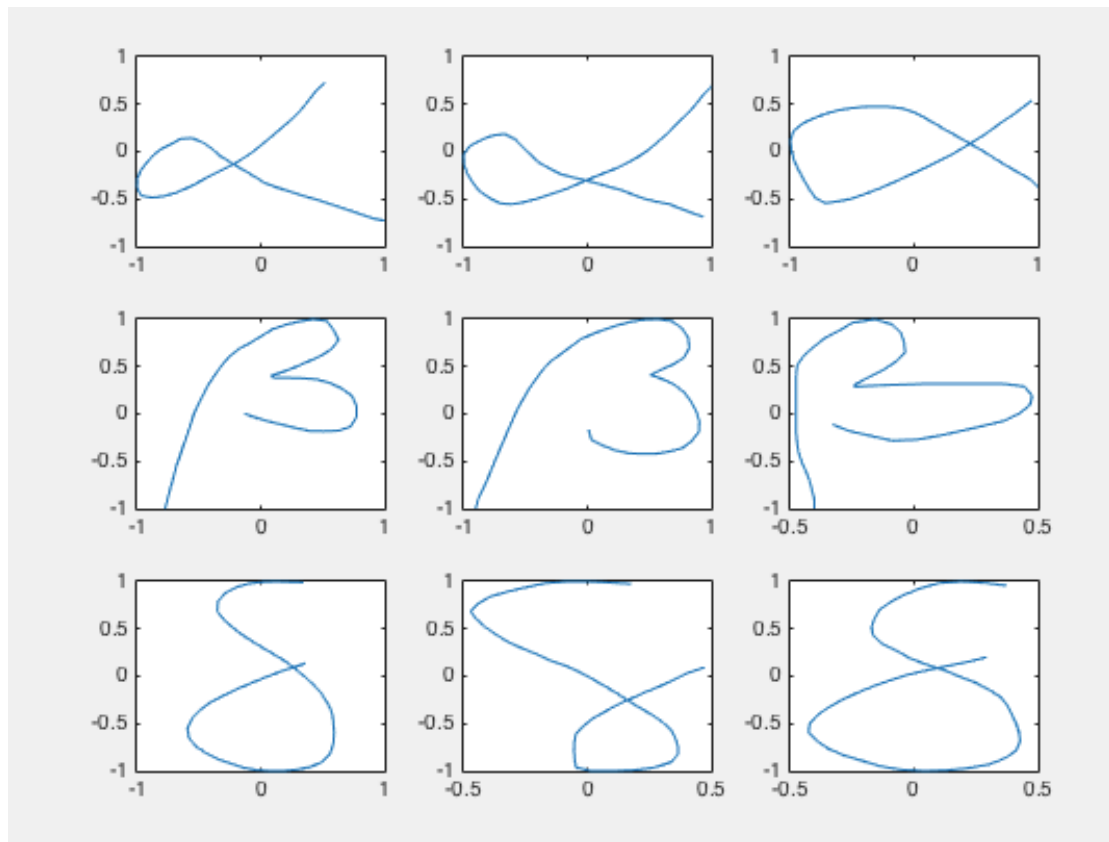class1   = 1   2   2   3   1   2

(d)
the steps are quite similar to problem (c) but the third became three times. It doesn't make sense because if we make the third class as likely as the other, we will misclassify points into class three(because of higher probability).(the result is shown below)
class2   = 1   2   2   3   1   3

6.

(a)

(b)

Feature1 is the distance from the start point to the end point.

feature1 =

    0.7678   0.8857   1.0436

Feature2 is the height of the word divide by the width of the word.

feature2 =

    -4.4286   -1.5498   4.2486

Feature3 is the angle of the line between start and end point.
feature3 =

    1.3713   0.6712   0.4978

(c)

alpha mean =

    0.6912
   -3.9292
    1.5169

beta mean =

    0.8920
   -1.4612
    0.6970

delta mean =

    1.0663
   -2.1626
    0.5177

alpha covariance =

0.0110	0.2846	-0.0181
0.2846	57.2590	-0.4570
-0.0181	-0.4570	0.0341

beta covariance =

0.0223	-0.0585	-0.0195
-0.0585	0.1732	0.0524
-0.0195	0.0524	0.0249

delta covariance =

0.0335	-0.8934	-0.0080
-0.8934	345.9104	0.0864

-0.0080   0.0864   0.0082