ECE595 Advanced Machine Learning HW1

1

The code is written in Python.

2

The function is done in GMM.py: GMM() function.

3

The function is done in gData.py: gData() function

In Main.py, the gData function was called to generate 100 data for first, 100 data for second and 200 for third Gaussian distributions.

4

The function to update mixture parameter pi: in GMM.py: updatePi()

The function to update mean and variance: in GMM.py: updateMuVa()

The functions GMM(), updatePi(), updateMuVa() were combined into one function GMMiterate()

5.1

The script for executing is Main.py

5.2

The computed log likelihood is presented in subplot 2.

Stopping criterion: log likelihood difference between iteration lower than a threshold

Alternate criterion: difference of mean lower than threshold

Compare:

Computing Burden: difference of mean is much easier to compute.

Accurancy: log likelihood looks better. When running the algorithm, I’ve seen mean converges but the variance is still changing. So we need a better measure than only considering the mean.

5.3

The unsupervised classification can be shown when main.py is running.

To measure its accuracy, in this case, since we generated the data, we can compare the final classification result with class assigned during the data generation.

Occam’s razor is implicitly embedded in Bayes learning in the form of likelihood.

5.4

5.4.1

The function is in Mahalanobis.py : Mahalanobis()

5.4.2

The function is in Kmeans.py: Kmeans()

5.4.3

The function is in Kmeans.py: KmeansUpdate()

The main function for K-means method is Kmeans.py: Kmeansrun() which use a stop criterion of difference of mean < 0.001

5.4.4

Parameter initialization:

Choose the means at random, and spreading out.

Model selection:

Use different number for the model and use information theoretical criteria for model selection.

The data.m function in matlab is re-coded in python in data.py

Since here the stopping criterion is not specified, a meandiff() function is used to calculate if the algorithm is converging by averaging the norm of the difference of means.