

BME 572 HW3  
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## Problem 1

Discussion: 100 random points (x,y) were generated with random uniform, normal, and exponential distribution (*shown in Figure 1 to Figure 3 respectively.*) As SOM uses input data and sort & assign regional data points to districts of neurons (in this case, 100 neurons), the density estimation is visually performed – the more data points a certain neuron contains within its region, more density it is. Collectively, SOM successfully configured and represented the training data for all types of variations, with the areas of the highest densities were at par for gaussian and exponential distribution.

Figure 1:

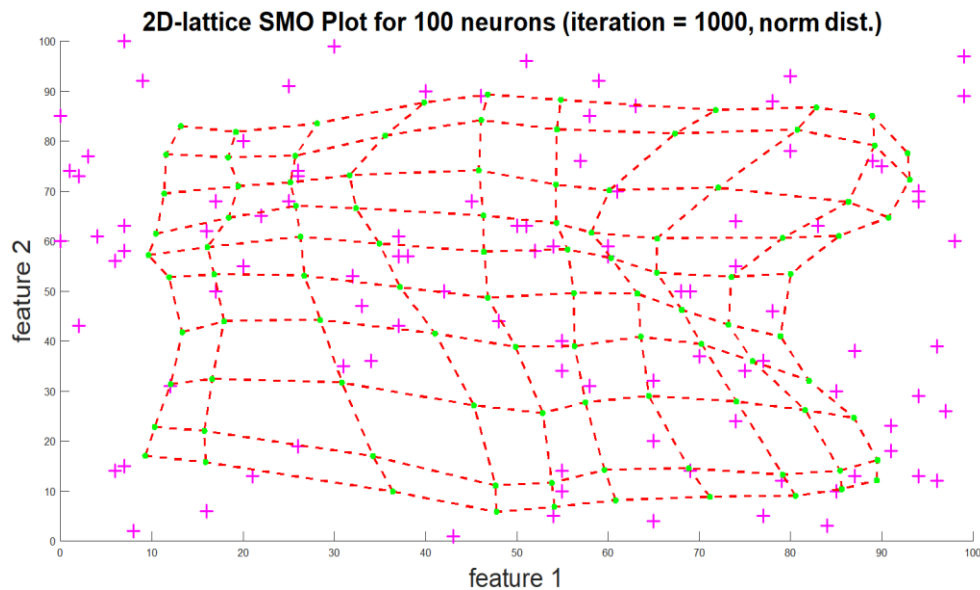


Figure 2:

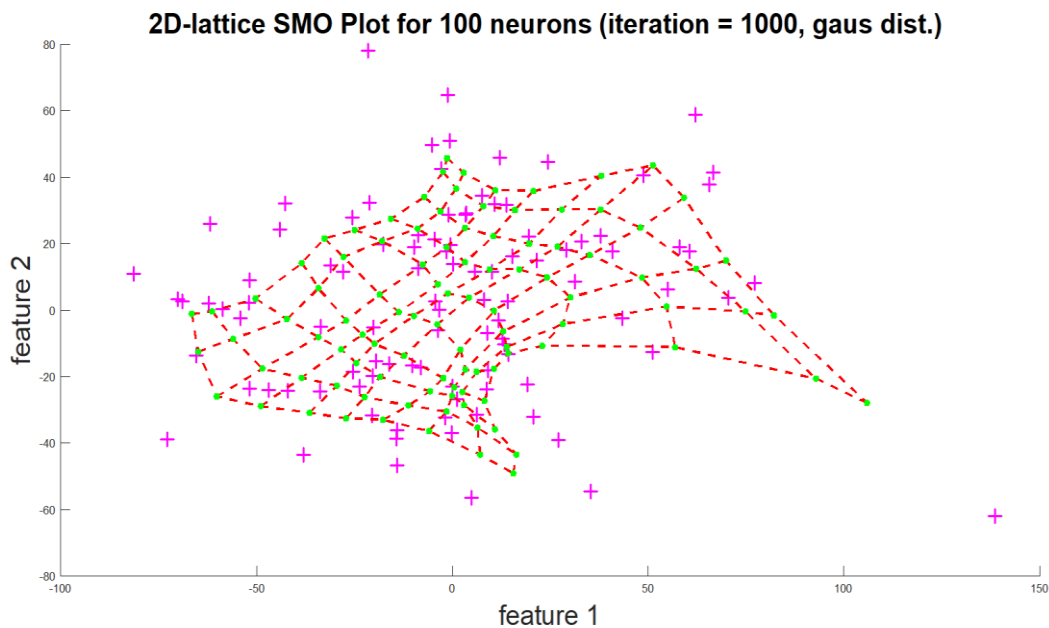
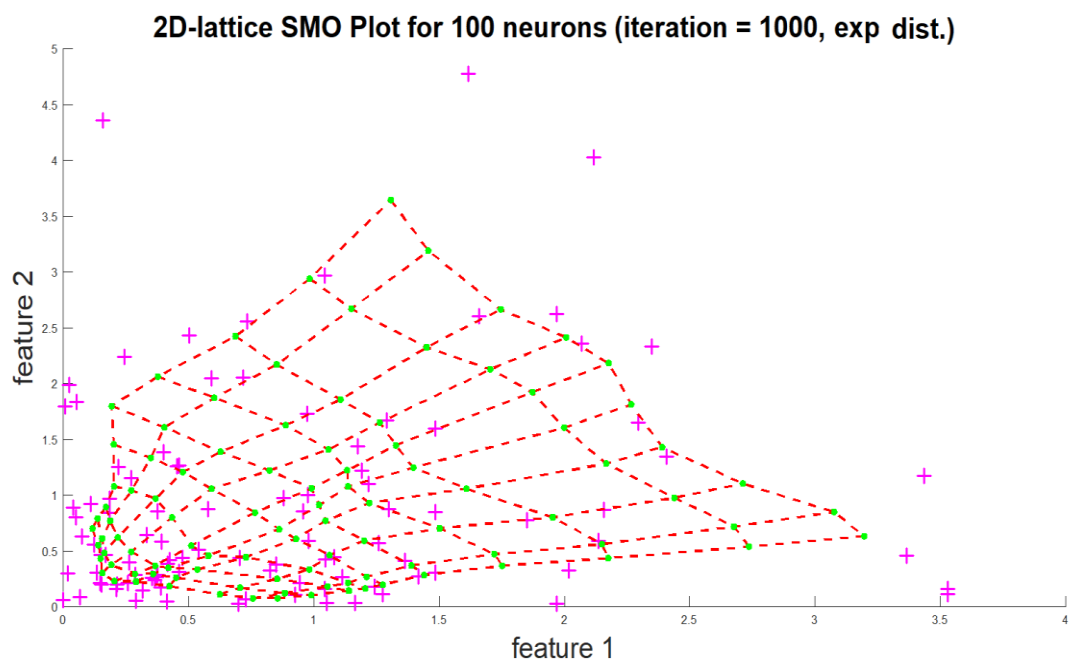


Figure 3:



## Problem 2

Discussion: Four figures below show trials in principal component analysis and running LDA analysis using the two components. The first two figures show two different data sets which LDA is surely distinguishable around its mean (first figure) and the second figure which its data points are so widely dispersed that the output of the prediction value of a new data point is more probabilistic than the other. This demonstrates that LDA works better with highly mean-centered around data with less variance.

The next two figure shows LDA and PCA analysis using a data from Wisconsin Breast Cancer Dataset (bigger variances than data used for figure 1 and 2). Initially starting with 9 features for feature analysis, PCA was used to reduce the dimensionality to 2-D space. After, the principal components were used to compute LDA and test whether a new point would be categorized successfully. Conclusively, it identified correctly. Nonetheless, PCA works better for high-variant data.

Figure1: LDA Succeed

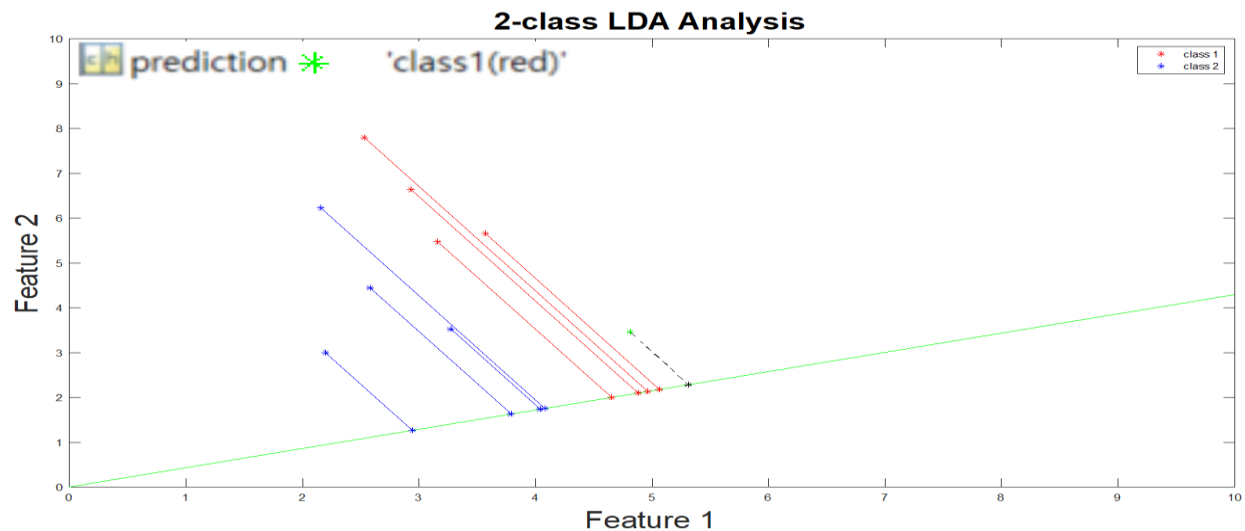


Figure 2: LDA Fail

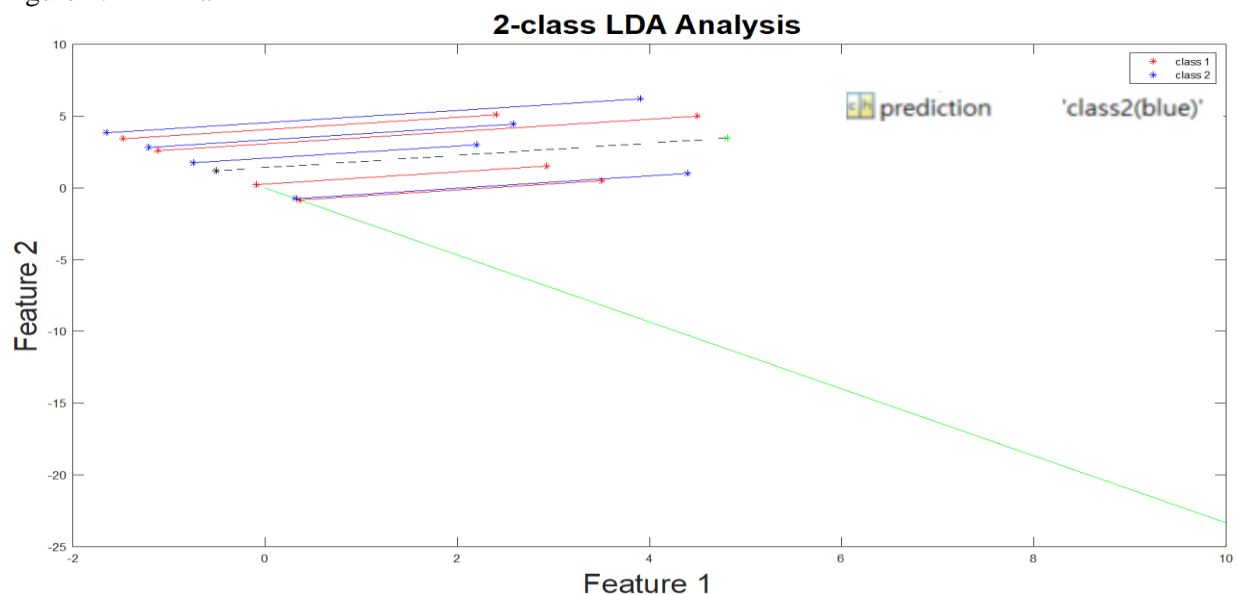


Figure 3: PCA on Cancer data (PCA Succeed)

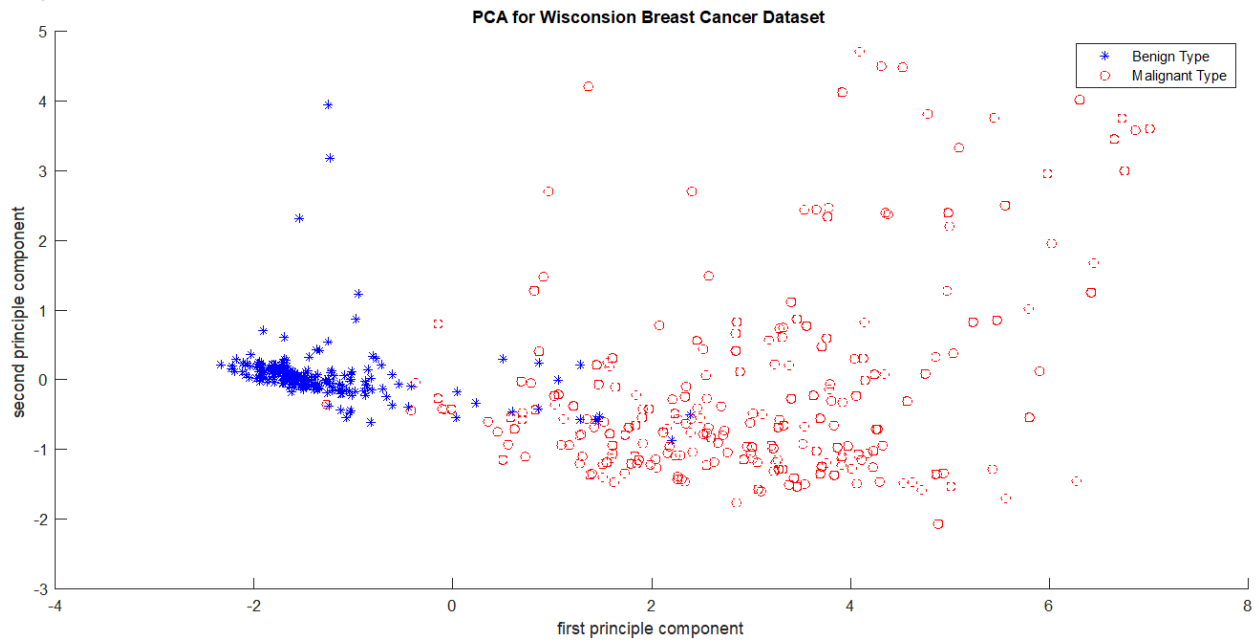
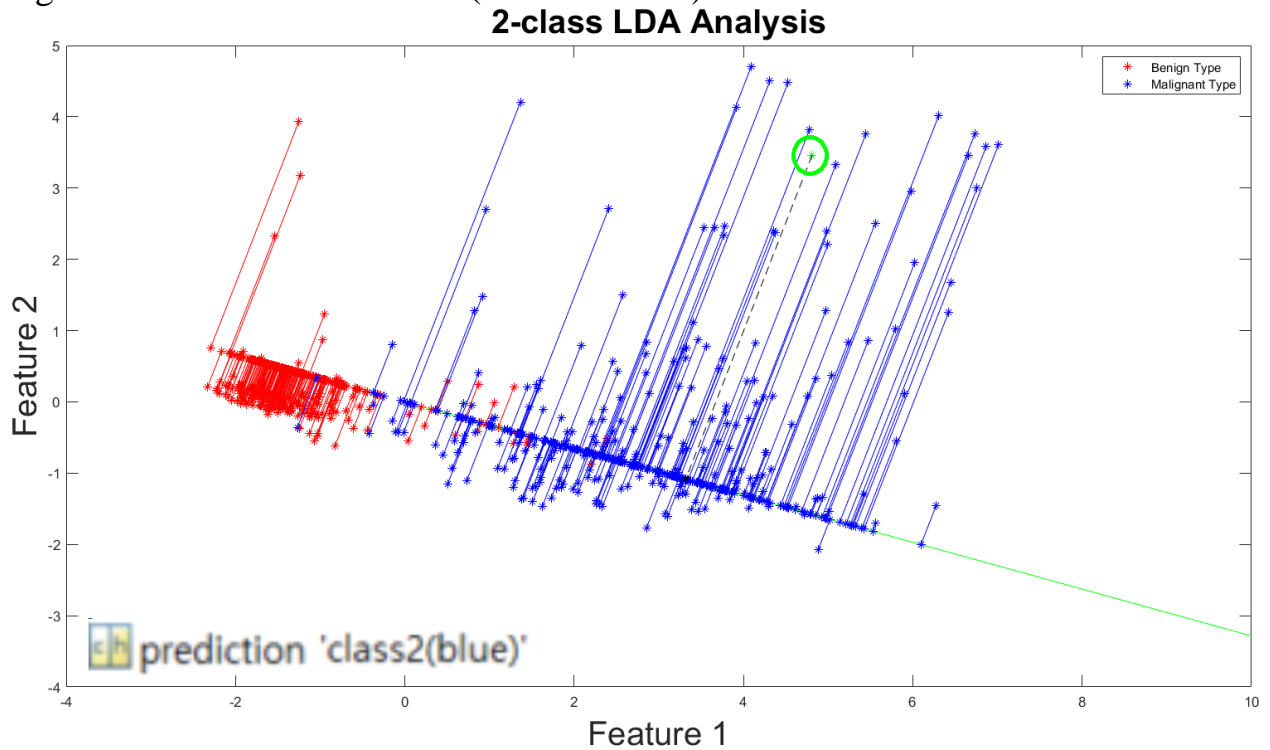


Figure 4: LDA on Cancer data (LDA Succeed)



# References

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