HW #5 Due: 5/14/2021

For problem 4 and 5, you can use whatever packages you are familiar with to complete these problems. If you have no preference, you may try sci-kit learn.

1. Follow problem 7 in MT exam to find the weight vector $\boldsymbol{w}$ and bias b that provides the maximum margin.
2. In the adaboost ppt file, we showed an example of using three linear classifiers with voting to behave like a nonlinear classifier. Explain where the nonlinearity is from.
3. The problem follows the example on pp. 15 - 17 of the adaboost ppt file. If the error weight is $\boldsymbol{w} = [0.5,\ 0.125,\ 0.125,\ 0.125,\ 0.125]^T$, find the optimal weak classifier and the associated error weight $\boldsymbol{w}$ for next iteration.
4. Use the SVM classifier with RBF kernel for the classification task of the cancer dataset. Do a 70/30 split for training and test set. Repeat the trials 50 times and compute the average accuracy. Observe and plot the variation of training and testing accuracy when C is from 0.1 to 3.0 in an increment of 0.1. The parameter C is an L2 regularization parameter, particularly useful if the classes are imbalanced.
5. Repeat problem 4, but using the Adaboost approach for this problem. Use the CART tree with depth of 2 as the weak classifier. How many weak classifiers are needed to have no training error? Plot the accuracy curve for number of trees from 5 to 95 in an increment of 10. Do we observe any accuracy improvement along with the number of weak classifiers? If we use a tree depth of one, can we get satisfactory results using less than 100 classifiers?