

CECS 451
Assignment 12
Total: 34 Points

General Instruction

- Submit uncompressed file(s) in the Dropbox folder via BeachBoard (Not email).
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1. Using `scikit learn`, evaluate the classification accuracy of the decision tree, bagging, AdaBoost, and Random forest.
 - (a) Load the *Breast cancer data* using `sklearn.datasets.load_breast_cancer`.
 - (b) (2 points) Print out the names of the features (`X`) and the name of the target (`y`).
 - (c) (2 points) Allocate the half of the data to *Train* (`X_train`, `y_train`) and the remaining half to *Test* (`X_test`, `y_test`).
 - (d) The common goal of the classifiers is predicting target using features.
 - (e) The classifiers should be trained using *Train* set and be tested using *Test* set.
 - (f) Use the ‘Gini’ index as the criterion and fix the maximum depth of trees as 2.
 - (g) (5 points) Write a program that generates a decision tree from `X_train`, `y_train` and predict `y_pred` from `X_test`. You can compute accuracy of the classifier by comparing `y_pred` and `y_test`. Please print out the accuracy.
 - (h) (5 points) Visualize the tree using `sklearn.tree.plot_tree`. Each node of trees should include feature name.
 - (i) (5 points) Similarly, write a program that generates multiple decision trees using the bagging. This method should record its prediction accuracy at `bagging_score` by varying the parameter `n_estimators`. Draw a 2D line plot whose X-axis is `n_estimators` and Y-axis `bagging_score`, and the plot should have more than 20 data points of different X-axis values.
 - (j) (5 points) Similarly, write a program that generates multiple decision trees using the AdaBoost. Draw a 2D line plot whose X-axis is `n_estimators` and Y-axis `boost_score`, and the plot should have more than 20 data points of different X-axis values.
 - (k) (10 points) Similarly, write a program that generates multiple decision trees using the random forest. Draw a 3D surface plot whose X-axis is `n_estimators`, Y-axis `max_features`, and Z-axis `forest_score`. The plot should have more than 100 data points of different pair of X-axis and Y-axis values.
 - (l) Submit your `Assn12.ipynb` which includes all the plots.