CS 6375 Machine Learning Programming Assignment 4

Prepared By:

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**Problem: Implement Bagging and AdaBoost based on the decision tree code that you developed in Programming Assignment 1. This code must be modified to work with ensemble methods.**

PART A.

(**Bagging**, 20 points) Construct four models for each combination of maximum depth *d* = 3*,*5 and bag size (*k* = 10*,*20). Report the confusion matrix for these four settings.

The required confusion matrices are as follows:

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Figure 1: Bagging - Depth 3, Size 10

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Figure 2: Bagging - Depth 3, Size 20

Table

Description automatically generated

Figure 3: Bagging - Depth 5, Size 10

Table

Description automatically generated

Figure 4: Bagging - Depth 5, Size 20

PART B.

(**Boosting**, 20 points) Construct four models for each combination of maximum depth *d* = 1*,*2 and bag size (*k* = 20*,*40). Report the confusion matrix for these four settings.

The required confusion matrices are as follows:

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Description automatically generated

Figure 5: Boosting – Depth 1, Size 20

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Figure 6: Boosting – Depth 1, Size 40

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Figure 7: Boosting – Depth 2, Size 20

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Figure 8: Boosting – Depth 4, Size 40

PART C.

(**scikit-learn**, 40 points) Use scikit-learn’s bagging and AdaBoost learners and repeat the experiments as described in parts (a) and (b) above. Report the confusion matrices for these sets of settings.

The required confusion matrices are as follows:

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Description automatically generated

Figure 9: skBagging – Max Depth 3, Size 10

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Figure 10: skBagging – Max Depth 3, Size 20

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Figure 11: skBagging – Max Depth 5, Size 10

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Figure 12: skBagging – Max Depth 5, Size 20

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Figure 13: skBoosting – Max Depth 1, Size 20

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Figure 14: skBoosting – Max Depth 1, Size 40

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Description automatically generated

Figure 15: skBoosting – Max Depth 2, Size 20

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Description automatically generated

Figure 16: skBoosting – Max Depth 2, Size 40