**Report**

**Assignment 2 Bonus**

The ID3 method always performs better than and produces a tree with lesser nodes as compare to the algorithm with random nodes selection.

This is also imminent from the following output on one of the runs:

Tree constructed using ID3:: Average Depth= 8 Number of nodes= 391

Tree constructed using random attribute selection:: Average Depth= 9 Number of nodes= 811

Run# | Accuracy

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| Accuracy of the model on the training set: 92.167%

1 | Accuracy of the model on the validation set: 62.95%

| Accuracy of the model on the test set: 64.8%

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| Accuracy of the model on the training set: 86.833%

2 | Accuracy of the model on the validation set: 58.0%

| Accuracy of the model on the test set: 59.5%

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| Accuracy of the model on the training set: 87.0%

3 | Accuracy of the model on the validation set: 58.75%

| Accuracy of the model on the test set: 61.05%

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| Accuracy of the model on the training set: 85.833%

4 | Accuracy of the model on the validation set: 59.25%

| Accuracy of the model on the test set: 59.15%

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| Accuracy of the model on the training set: 92.333%

5 | Accuracy of the model on the validation set: 62.55%

| Accuracy of the model on the test set: 63.35%

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Usually the average accuracy on the test set attained by using the ID3 algorithm reaches to 70% whereas no run (out of the five above) is able to even reach close to that accuracy. Thus, this algorithm is much better than any random selection algorithm. This is also because it has a specific selection of attributes at each nodes out of which one is selected based on its merit, here merit being the information gain it provides to the decision tree at that particular node.