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Question a:

```
Use my bagging learner for maximum depth = 3 and bag size = 5
Test Error = 4.23%.  Precision = 93.46%.  Recall = 96.56%.
[[1130   57]
 [  29  815]]
Use my bagging learner for maximum depth = 3 and bag size = 10
Test Error = 4.23%.  Precision = 93.46%.  Recall = 96.56%.
[[1130   57]
 [  29  815]]
Use my bagging learner for maximum depth = 5 and bag size = 5
Test Error = 0.15%.  Precision = 100.00%.  Recall = 99.64%.
[[1187    0]
 [   3  841]]
Use my bagging learner for maximum depth = 5 and bag size = 10
Test Error = 0.20%.  Precision = 99.53%.  Recall = 100.00%.
[[1183    4]
 [   0  844]]
```

Question b:

```
Use my AdaBoost learner for maximum depth = 1 and ensemble size = 5
Test Error = 11.18%.  Precision = 81.84%.  Recall = 93.96%.
[[1011  176]
 [  51  793]]
Use my AdaBoost learner for maximum depth = 1 and ensemble size = 10
Test Error = 11.18%.  Precision = 81.84%.  Recall = 93.96%.
[[1011  176]
 [  51  793]]
Use my AdaBoost learner for maximum depth = 2 and ensemble size = 5
Test Error = 5.07%.  Precision = 99.73%.  Recall = 88.03%.
[[1185    2]
 [ 101  743]]
Use my AdaBoost learner for maximum depth = 2 and ensemble size = 10
Test Error = 5.07%.  Precision = 99.73%.  Recall = 88.03%.
[[1185    2]
 [ 101  743]]
```

Question c:

```
Use scikit-learn's bagging learner for maximum depth = 3 and bag size = 5
Test Error = 5.86%.  Precision = 99.73%.  Recall = 86.14%.
[[1185    2]
 [ 117  727]]
Use scikit-learn's bagging learner for maximum depth = 3 and bag size = 10
Test Error = 5.86%.  Precision = 99.73%.  Recall = 86.14%.
[[1185    2]
 [ 117  727]]
Use scikit-learn's bagging learner for maximum depth = 5 and bag size = 5
Test Error = 1.67%.  Precision = 99.03%.  Recall = 96.92%.
[[1179    8]
 [  26  818]]
Use scikit-learn's bagging learner for maximum depth = 5 and bag size = 10
Test Error = 0.59%.  Precision = 99.41%.  Recall = 99.17%.
[[1182    5]
 [   7  837]]
```

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```
Use scikit-learn's AdaBoost learner for maximum depth = 1 and ensemble
size = 5
Test Error = 6.79%.  Precision = 86.85%.  Recall = 98.58%.
[[1061  126]
 [  12  832]]
Use scikit-learn's AdaBoost learner for maximum depth = 1 and ensemble
size = 10
Test Error = 0.34%.  Precision = 99.76%.  Recall = 99.41%.
[[1185    2]
 [   5  839]]
Use scikit-learn's AdaBoost learner for maximum depth = 2 and ensemble
size = 5
Test Error = 0.00%.  Precision = 100.00%.  Recall = 100.00%.
[[1187    0]
 [   0  844]]
Use scikit-learn's AdaBoost learner for maximum depth = 2 and ensemble
size = 10
Test Error = 0.00%.  Precision = 100.00%.  Recall = 100.00%.
[[1187    0]
 [   0  844]]
```

Comments:
Generally, as the maximum depth, bag size and ensemble size increase, the test error becomes lower, the precision and recall become higher. Due to randomness, the test error of my bagging learner is a little bit lower than scikit-learn's. The test error of my AdaBoost learner is a little higher than scikit-learn's. But the tendency between my implementation and that of scikit-learn are basically the same.