Bagging Quiz

Before starting out on the quiz, we would like you to draw a mental map of what you have learned so far. By far, you should be familiar with terminologies such as bias and variance, ensemble and bagging, bootstrapping, random forest etc. The first question is a self examination concept check, if you have any problem giving the definition of the terms, please refer back to notes.

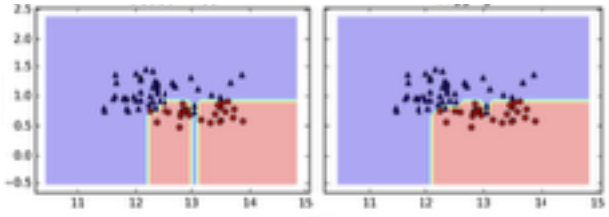
1. In your own words, give the definition of the following terms, and draw a visual map of how these terms are correlated:
    a. Bias variance decomposition
    b. Bagging
    c. Ensemble methods
    d. Bootstrap

2. True or False, explain your answer: One example of bagging is random forest, it is used for classification. Thus bagging is a method specifically for classification problem but not regression problem.

3. Apart from decision tree, what kind of base learner can be used for bagging? Give at least two examples. Explain why these models are suitable for bagging.

4. Every model has it pros and cons. Please name one circumstance that bagging can go wrong.

5. Here are the two images of a classifier's decision boundary. Which of them is a bagged example and explain why.



6. There are two main kinds of sampling in statistics: sampling with replacement and sampling without replacement. Which sampling is being used here? Explain why.

7. How will bagging effect the bias and variance of the base learner?

a. Decrease bias, increase variance

b. Increase bias, decrease variance

c. Same bias, same variance

d. None of above

8. Which of the following is / are true about weak learners used in ensemble model?

a. They have low variance and they don't usually overfit

b. They have high bias, so they can not solve hard learning problems

c. They have high variance and they ~~don't~~ usually overfit

9. Which of the following is true about bagging?

a. Bagging can be parallel

b. The aim of bagging is to reduce bias not variance

c. Bagging helps in reducing overfitting

10. Which of the following parameters can be tuned for finding good ensemble model in bagging based algorithms?

a. Max number of samples

b. Max features

c. Bootstrapping of samples

d. Bootstrapping of features

Bagging Quiz Solution

1. In your own words, give the definition of the following terms, and draw a visual map of how these terms are correlated:

a. Bias variance decomposition an interpretable error metrics

b. Bagging averaging out the results of multiple learner based off bootstrapped samples

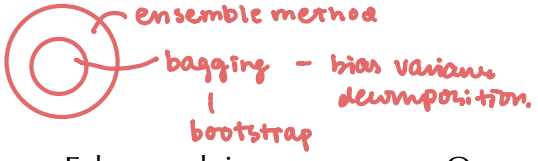
c. Ensemble methods deals with a collection of learners

d. Bootstrap sample without replacement

Student's answer may vary but here are some key points to hit:

Students are free to draw any mind map that links the terms above:

A reference answer would be:



2. True or False, explain your answer: One example of bagging is random forest, it is used for classification. Thus bagging is a method specifically for classification problem but not regression problem.

False.

Bagging can be used for both classification and regression.

3. Apart from decision tree, what kind of base learner can be used for bagging? Give at least two examples. Explain why these models are suitable for bagging.

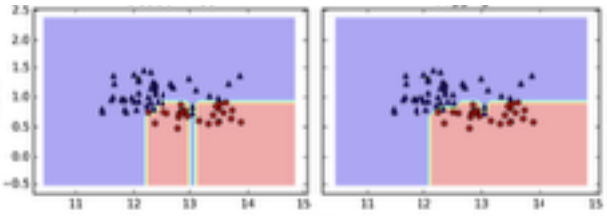
Any high variance low bias learner will do.

For example, KNN. neural network. high degree polynomial

4. Every model has it pros and cons. Please name one circumstance that bagging can go wrong.

Consider a random forest with sparse good features. Since good features are sparse, we end up getting a lot of bad results. and averaging them out is no good.

5. Here are the two images of a classifier's decision boundary. Which of them is a bagged example and explain why.



The second is a bagged example. Since the decision boundary looks more regularized.

6. There are two main kinds of sampling in statistics: sampling with replacement and sampling without replacement. Which sampling is being used here? Explain why.

Sampling without replacement because we want independent data to generate independent learners.

7. How will bagging effect the bias and variance of the base learner?

a. Decrease bias, increase variance
b. Increase bias, decrease variance
c. Same bias, same variance
d. None of above

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