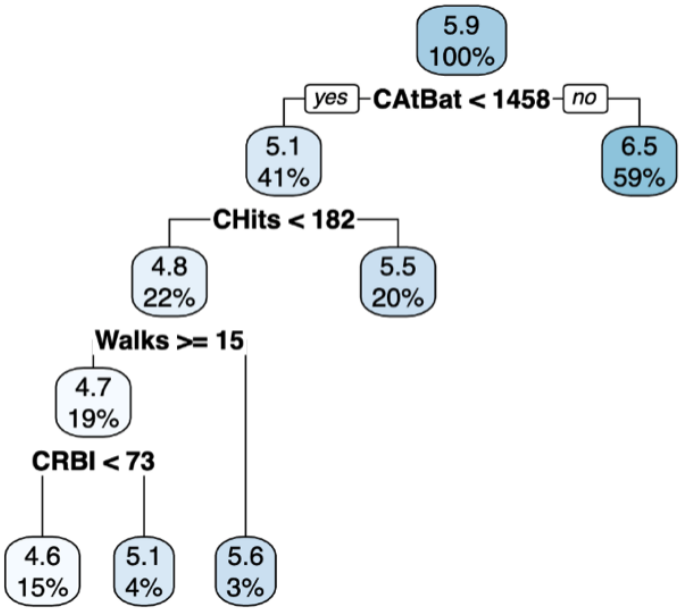
Quiz 4

You have 30 minutes to complete this 10-question quiz. The questions, a mix of multiple choice, fill-in-the-blank, and numeric answers, are weighted equally. You can consult any course materials, the internet, or R. However, you must complete the quiz individually.

Stimulus

For Questions 1-3, consider this regression tree:



1 Numeric 0.5 points

How many terminal nodes does the regression tree have?

5

2 Numeric 0.5 points

What is the interaction depth of the regression tree?

4

3 Fill in the Blank 0.5 points

The training observations with CAtBat < 1458 comprise

41 %

of the training data and have mean response

5.1 .

4 Numeric 0.5 points

Suppose we chose the decision tree with the minimum CV error (instead of using the one-standard-error rule as usual) based on the CP table below. How many terminal nodes would this decision tree contain?

CP	nsplit	rel error	xerror	xstd
0.567669	0	1.00000	1.00411	0.072613
0.063293	1	0.43233	0.47843	0.062225
0.060590	2	0.36904	0.45832	0.066787
0.033764	3	0.30845	0.36500	0.063361
0.029146	4	0.27468	0.38646	0.071271
0.015175	5	0.24554	0.37791	0.072805
0.011737	6	0.23036	0.35152	0.068380
0.010248	7	0.21863	0.35856	0.068482
0.010000	8	0.20838	0.36327	0.068681

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5 Multiple Answer 0.5 points

Which of the following increases model complexity (other parameters being held equal)? Select all that apply.

- [ ] Increasing α for decision trees.
- [ ] Increasing B for random forests.
- [x] Increasing B for boosting.
- [x] Increasing d for boosting.

6 Multiple Answer 0.5 points

Which of the following statements about bagging are true? Select all that apply.

- [ ] There must be at least one out-of-bag observation for each bootstrap sample.
- [x] The number of out-of-bag observations depends on the bootstrap sample.
- [ ] At the end of the aggregation step, we arrive at one big tree, which we use for prediction.
- [x] The trees for different bootstrap samples are grown independently of one another.

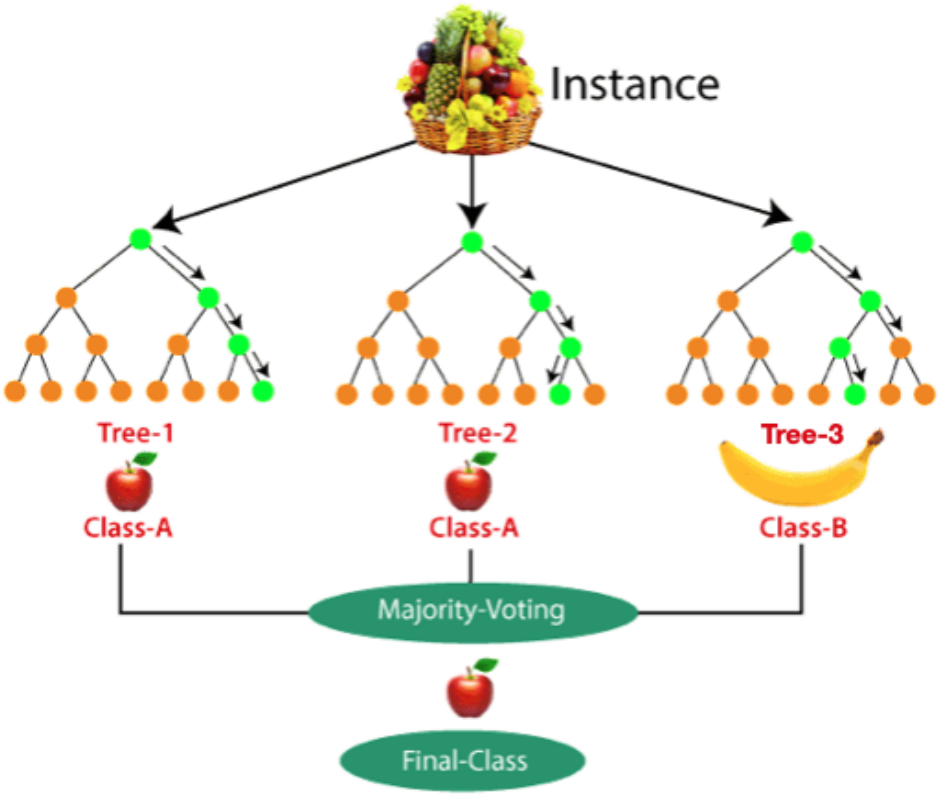
7 Multiple Answer 0.5 points

Which of the following curves would we expect to be U-shaped, i.e. decreasing at first and then increasing? Select all that apply.

- [ ] Training error versus m for random forests.
- [ ] Out-of-bag error versus B for random forests.
- [x] CV error versus α for decision trees.
- [x] CV error versus B for boosting.

8 Numeric 0.5 points

Below is a depiction of a prediction being made by a random forest with $B = 3$. During the training of this random forest, how many times was a subset of features sampled in order to determine a feature to split on?



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9 Multiple Choice 0.5 points

Partial dependence plots are less meaningful for random forests than for boosting because

- ○ For random forests, we typically use more trees.
- ◉ For random forests, we typically grow trees deeper.
- ○ For random forests, we typically use fewer features to determine each split.
- ○ For random forests, we bootstrap our observations.

10 Numeric 0.5 points

Below is the set of observations in each bootstrap sample for a random forest with $B = 5$. How many trees' predictions will be averaged together to obtain the OOB prediction for observation 4?

Bootstrap sample 1	Bootstrap sample 2	Bootstrap sample 3	Bootstrap sample 4	Bootstrap sample 5
Observation 2	Observation 4	Observation 4	Observation 5	Observation 6
Observation 5	Observation 2	Observation 3	Observation 6	Observation 5
Observation 5	Observation 1	Observation 1	Observation 6	Observation 4
Observation 1	Observation 5	Observation 6	Observation 1	Observation 2
Observation 5	Observation 2	Observation 5	Observation 3	Observation 1
Observation 3	Observation 6	Observation 2	Observation 3	Observation 2

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