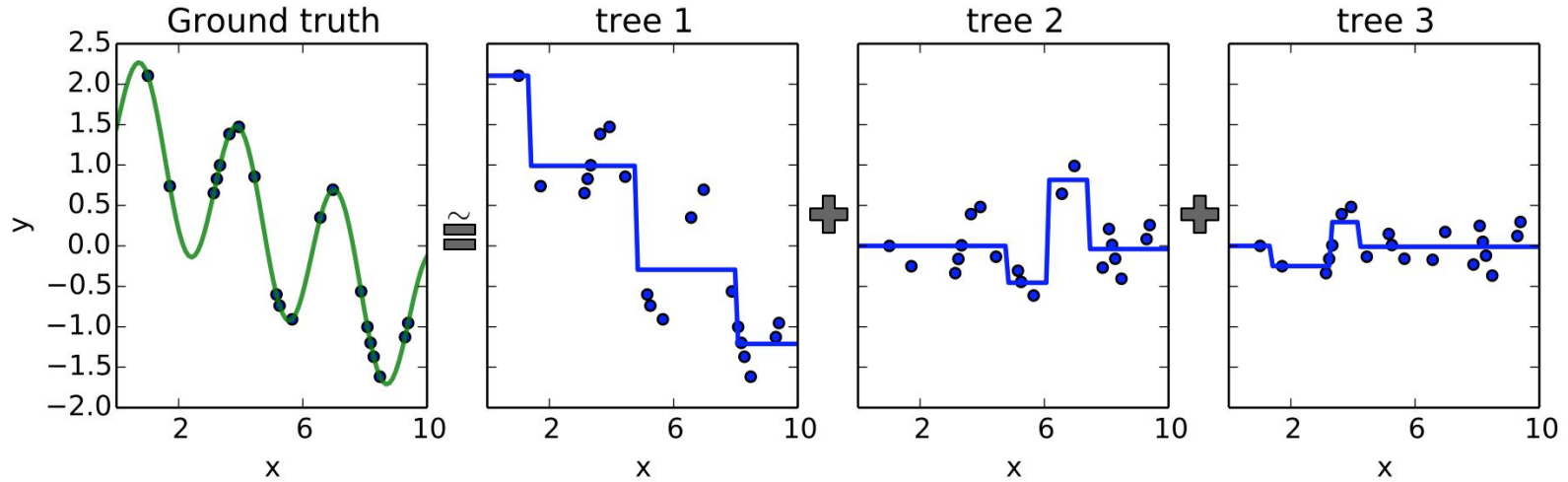# Gradient Boosting Breakout

Pair up!

Part 1: Pair Discussion

1. What is a *weak learner*?

2. How do bias & variance relate to a weak learner?

3. How are weak learners used in boosting?

Part 1 With your partner:

1. How many leaf nodes are in **tree 1**?
2. Draw the decision tree in **tree 1**.
3. Calculate the predicted y-value from the full 3-tree model, for new data points: x=2 and x=6. In the process, quantify how much each tree contributes to the answer.

Part 2: Pair Discussion

1. What happens in Boosting when you increase the number of trees?

2. Does increasing the number of trees affect performance? Why?

3. How does this compare with Random Forests?

Part 2: Pair Discussion

1. Define each of these hyperparameters associated with a Gradient Boosting Regressor:

    learning_rate, n_estimators, max_depth, min_samples_split, min_samples_leaf, subsample, max_features

2. How does each tuning parameter affect bias & variance?