Hyperparameters for Decision Trees

In order to create decision trees that will generalize to new problems well, we can tune a number of different aspects about the trees. We call the different aspects of a decision tree "hyperparameters". These are some of the most important hyperparameters used in decision trees:

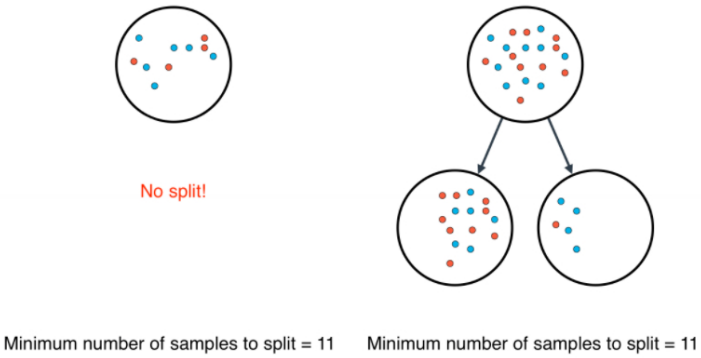
Maximum Depth

The maximum depth of a decision tree is simply the largest possible length between the root to a leaf. A tree of maximum length k can have at most 2^k leaves.

Maximum depth of a decision tree

Minimum number of samples to split

A node must have at least `min_samples_split` samples in order to be large enough to split. If a node has fewer samples than `min_samples_split` samples, it will not be split, and the splitting process stops.

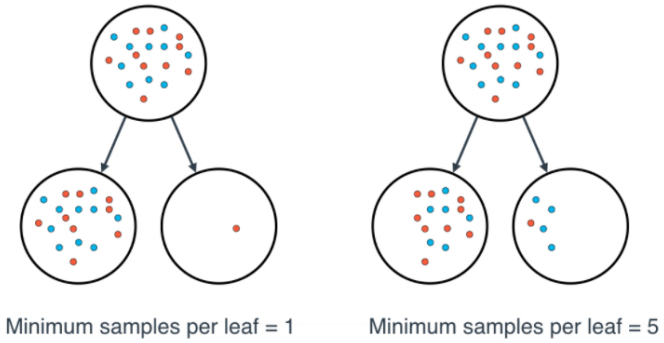


Minimum number of samples to split

However, `min_samples_split` doesn't control the minimum size of leaves. As you can see in the example on the right, above, the parent node had 20 samples, greater than `min_samples_split` = 11, so the node was split. But when the node was split, a child node was created with that had 5 samples, less than `min_samples_split` = 11.

Minimum number of samples per leaf

When splitting a node, one could run into the problem of having 99 samples in one of them, and 1 on the other. This will not take us too far in our process, and would be a waste of resources and time. If we want to avoid this, we can set a minimum for the number of samples we allow on each leaf.



Minimum number of samples per leaf

This number can be specified as an integer or as a float. If it's an integer, it's the minimum number of samples allowed in a leaf. If it's a float, it's the minimum percentage of samples allowed in a leaf. For example, 0.1, or 10%, implies that a particular split will not be allowed if one of the leaves that results contains less than 10% of the samples in the dataset.

If a threshold on a feature results in a leaf that has fewer samples than `min_samples_leaf`, the algorithm will not allow *that* split, but it may perform a split on the same feature at a *different threshold*, that *does* satisfy `min_samples_leaf`.

QUIZ QUESTION

Let's test your intuition. Which sizes of features are associated with underfitting and which with overfitting? Drag the answers to the corresponding boxes.

Submit to check your answer choices!

FEATURE	UNDERFITTING/OVERFITTING
Small maximum depth	Underfitting
Large maximum depth	Overfitting
Small minimum samples per split	Overfitting
Large minimum samples per split	Underfitting

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