K-NN

Given an odd positive integer k and a test observation x0

Identify the k points in your training data close to x0

Assign the x0 to the class which is most common in the set of neighbors.

Lazy learner: All training or computation is postponed until classification. The algorithm avoids generalizing a specific training dataset during the learning phase. Instead, it memorizes the training instances and their corresponding labels. When given a new unseen instance, the lazy learner retrieves the most similar instances from the training set and uses them to make predictions or decisions.

To summarize, it delays the learning process until a prediction is needed, making them computationally efficient during the training phase but potentially slower during the prediction phase.

Q: Is k-NN a parametric or non-parametric learning algorithm?
A: It is non-parametric since we don't have a predefined shape (e.g. polynomial) that we fit the data

Q: Is k a hyperparameter?
A: Yes, we decide what k to use before we start.

Closeness

Assume x and y are two vectors in $\mathbb{R}^n$, then

1. The *Euclidean distance* between x and y is defined as:

$$d(x, y) = \sqrt{(x_1 - y_1)^2 + \ldots (x_n - y_n)^2}.$$

2. The *Manhattan distance* between x and y is defined as:

$$d(x, y) = |x_1 - y_1| + \ldots |x_n - y_n|.$$