YData: An Introduction to Data Science

Lecture 35: Classifiers

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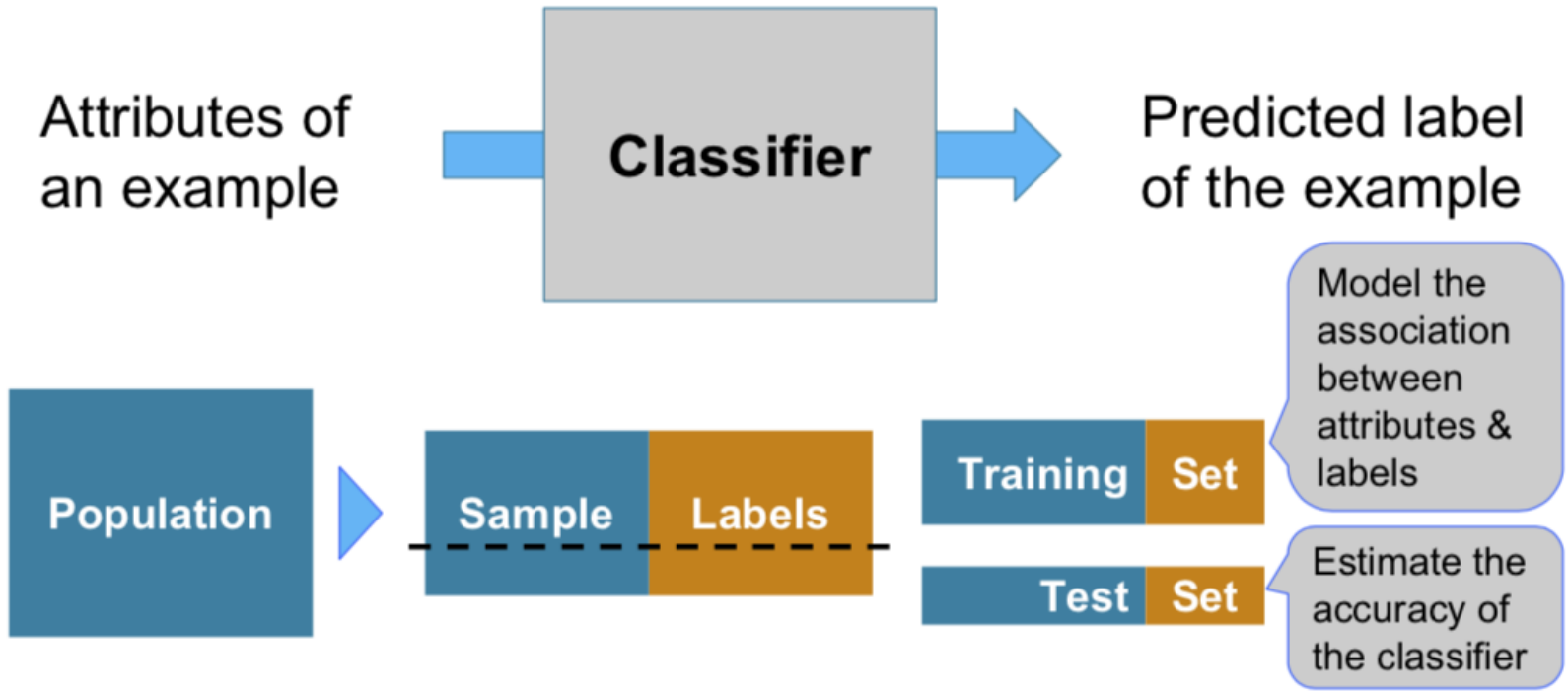
Credit: data8.org

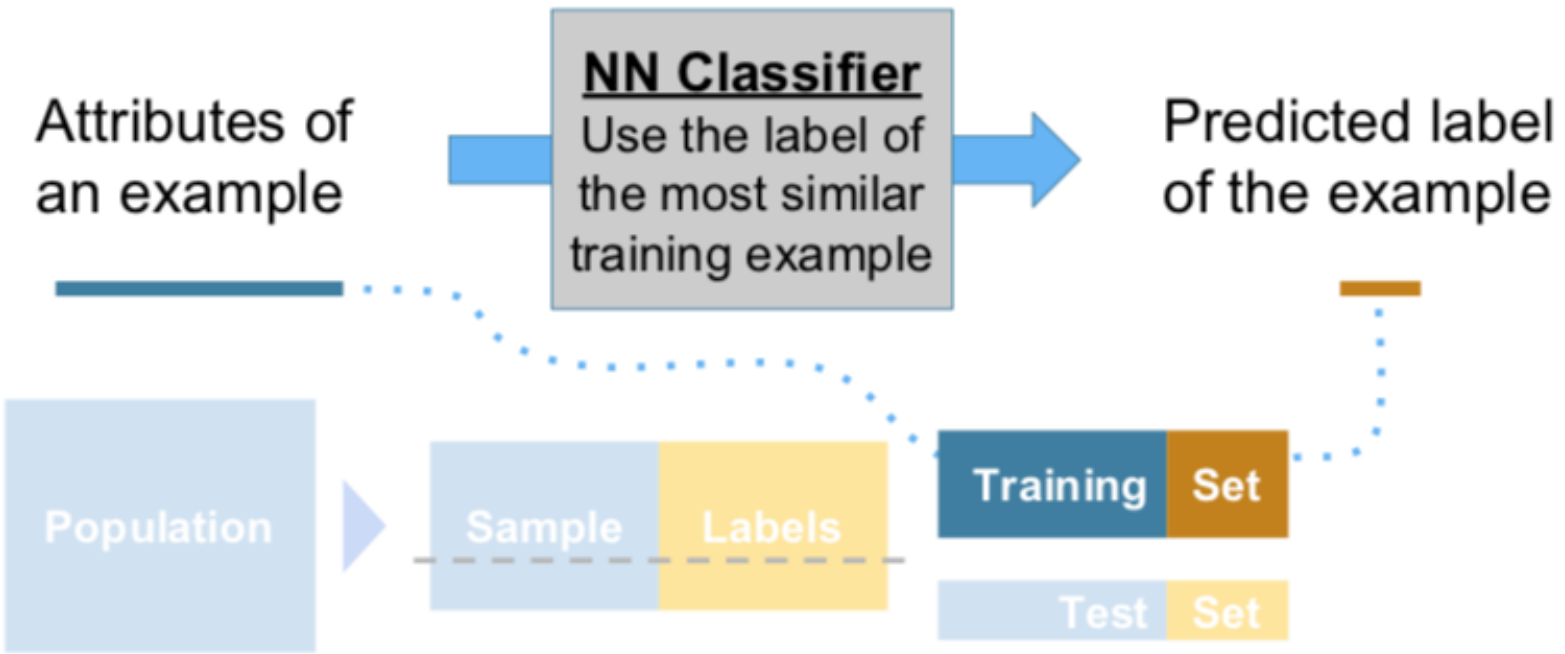
Announcements

Classifiers

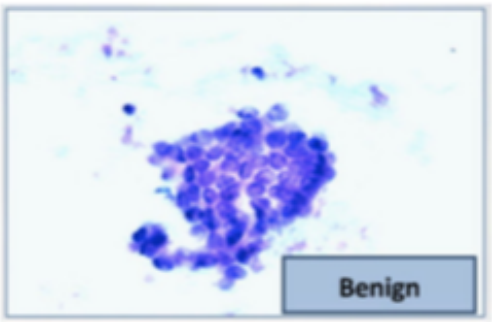
Training a Classifier

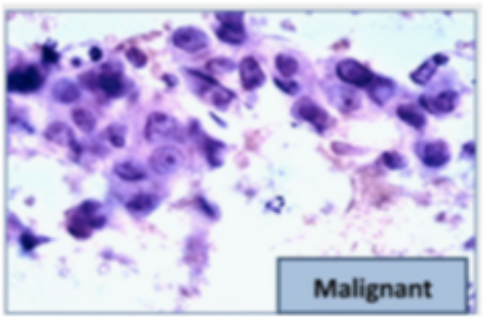


Nearest Neighbor Classifier



The Google Science Fair





- Brittany Wenger, a 17-year-old high school student in 2012
- Won by building a breast cancer classifier with 99% accuracy

(DEMO)

Distance

Rows of Tables

Each row contains all the data for one individual

- `t.row(i)` evaluates to `i`th row of table `t`
- `t.row(i).item(j)` is the value of column `j` in row `i`
- If all values are numbers, then `np.array(t.row(i))` evaluates to an array of all the numbers in the row.
- To consider each row individually, use

```
for row in t.rows:
...  row.item(j) ...
```

Distance Between Two Points

- Two attributes x and y:

$$D = \sqrt{(x_0 - x_1)^2 + (y_0 - y_1)^2 + (z_0 - z_1)^2}$$

- Three attributes x, y, and z:

$$D = \sqrt{(x_0 - x_1)^2 + (y_0 - y_1)^2}$$

- and so on ...

(DEMO)

Nearest Neighbors

Finding the k Nearest Neighbors

To find the k nearest neighbors of an example:

- Find the distance between the example and each example in the training set
- Augment the training data table with a column containing all the distances
- Sort the augmented table in increasing order of the distances
- Take the top k rows of the sorted table

(DEMO)

The Classifier

To classify a point:

- Find its k nearest neighbors
- Take a majority vote of the k nearest neighbors to see which of the two classes appears more often
- Assign the point the class that wins the majority vote

(DEMO)

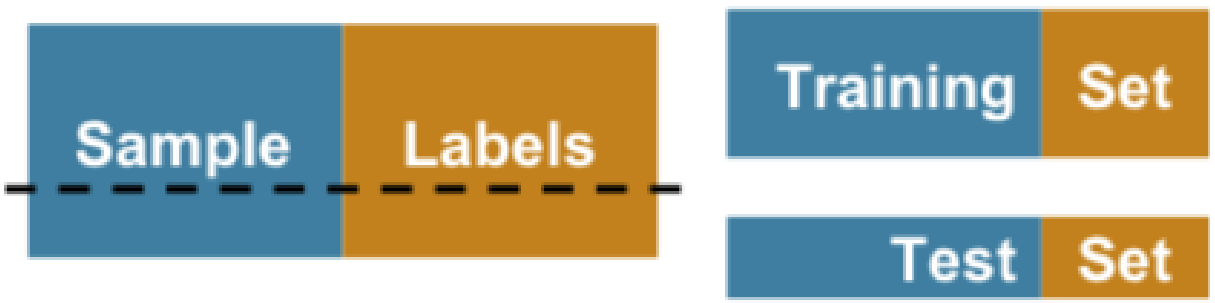
Evaluation

Accuracy of a Classifier

The accuracy of a classifier on a labeled data set is the proportion of examples that are labeled correctly

Need to compare classifier predictions to true labels

If the labeled data set is sampled at random from a population, then we can infer accuracy on that population



(DEMO)