Text Analysis with Python

Arieda Muço

Central European University

Machine learning

Applying algorithms that iteratively learn from data.

- Used for: Fraud detection, pattern and image recognition, text sentiment analysis, email spam filtering, credit scoring, new pricing models, recommendation engines...

Types of learning

- Supervised Learning
  - The program is “trained" on a pre-defined set of "training examples", which facilitate its ability to reach an accurate conclusion when given new data
  - In this case, we have a “target’" or dependent variable
  - We also have "labeled" data
- Unsupervised Learning
  - Find patterns and relationships between the data
  - No ”target” or dependent variable
  - We don’t have "labeled" data
- Deep Learning (Artificial Neutral Networks)

Some references

- Books
  - An Introduction to Statistical Learning `http://www-bcf.usc.edu/~gareth/ISL/ISLR%20Sixth%20Printing.pdf`
  - Introduction to Machine Learning `http://robotics.stanford.edu/people/nilsson/MLBOOK.pdf?`
  - Elements of Statistical Learning `https://statweb.stanford.edu/~tibs/ElemStatLearn/printings/ESLII_print10.pdf?`
  - Machine Learning with Python by Sara Guido and Andreas Muller
- Andrew Ng
  - Notes `http://cs229.stanford.edu/materials.html`
  - Video `https://www.coursera.org/learn/machine-learning`

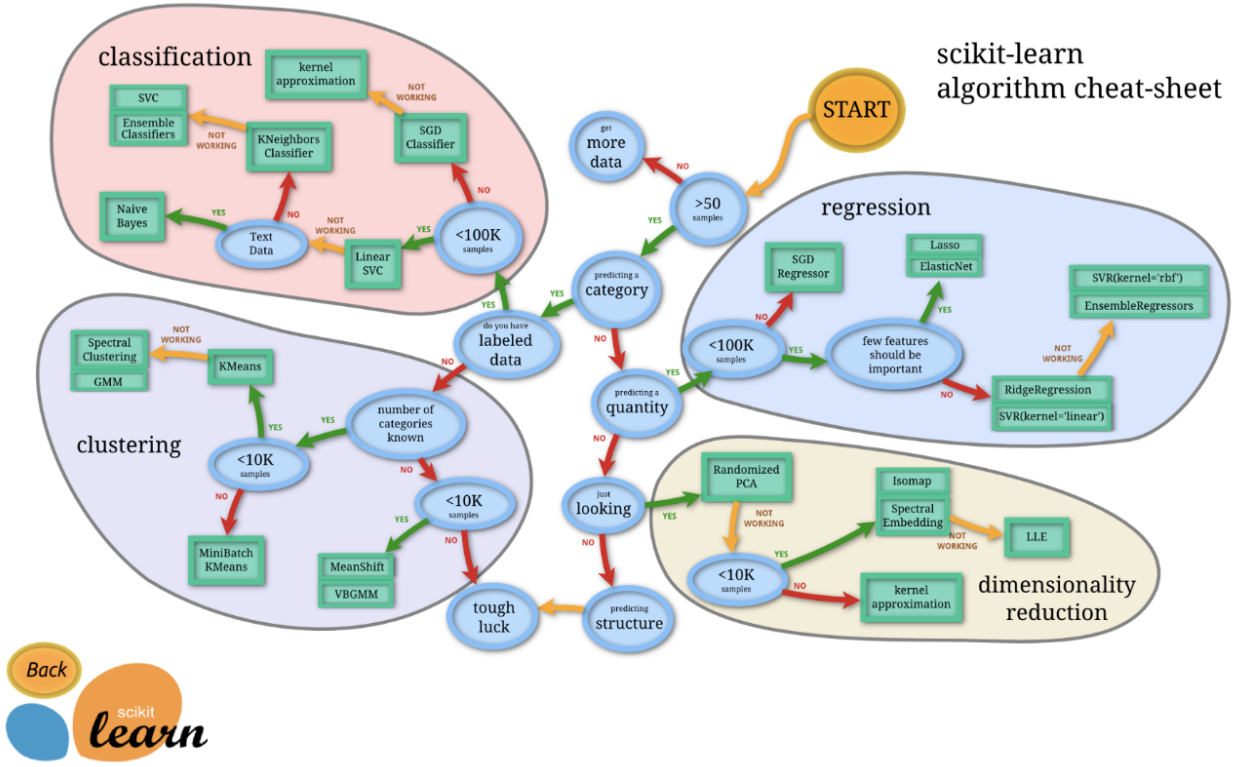
Python Libraries

We are mainly going to use the following libraries

- pip install scikit-learn or conda install scikit-learn (Machine Learning)
- pip install nltk or conda install nltk (Text Analysis)

The most used libraries

Algorithm Cheat Sheet



Learning Machine Learning

Machine Learning takes time to learn

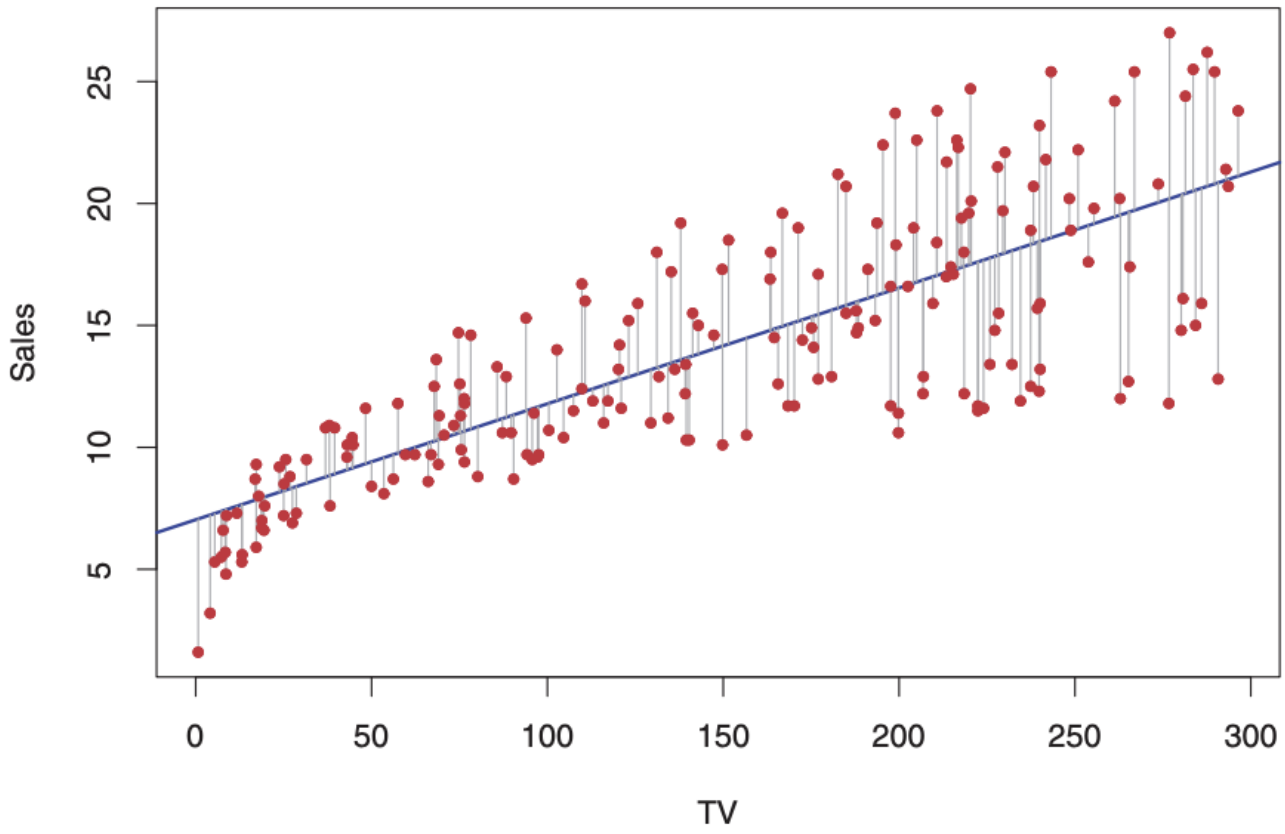
- Be patient with yourself
- Ask questions. I'm happy to answer questions to point you towards material where you can further deepen your understanding
- Most importantly: Google

Linear Regression

Scikit-learn regression model

- Train the regressor using the fit() method
- Predict new labels using the predict() method
- Using the housing price dataset

Linear Regression



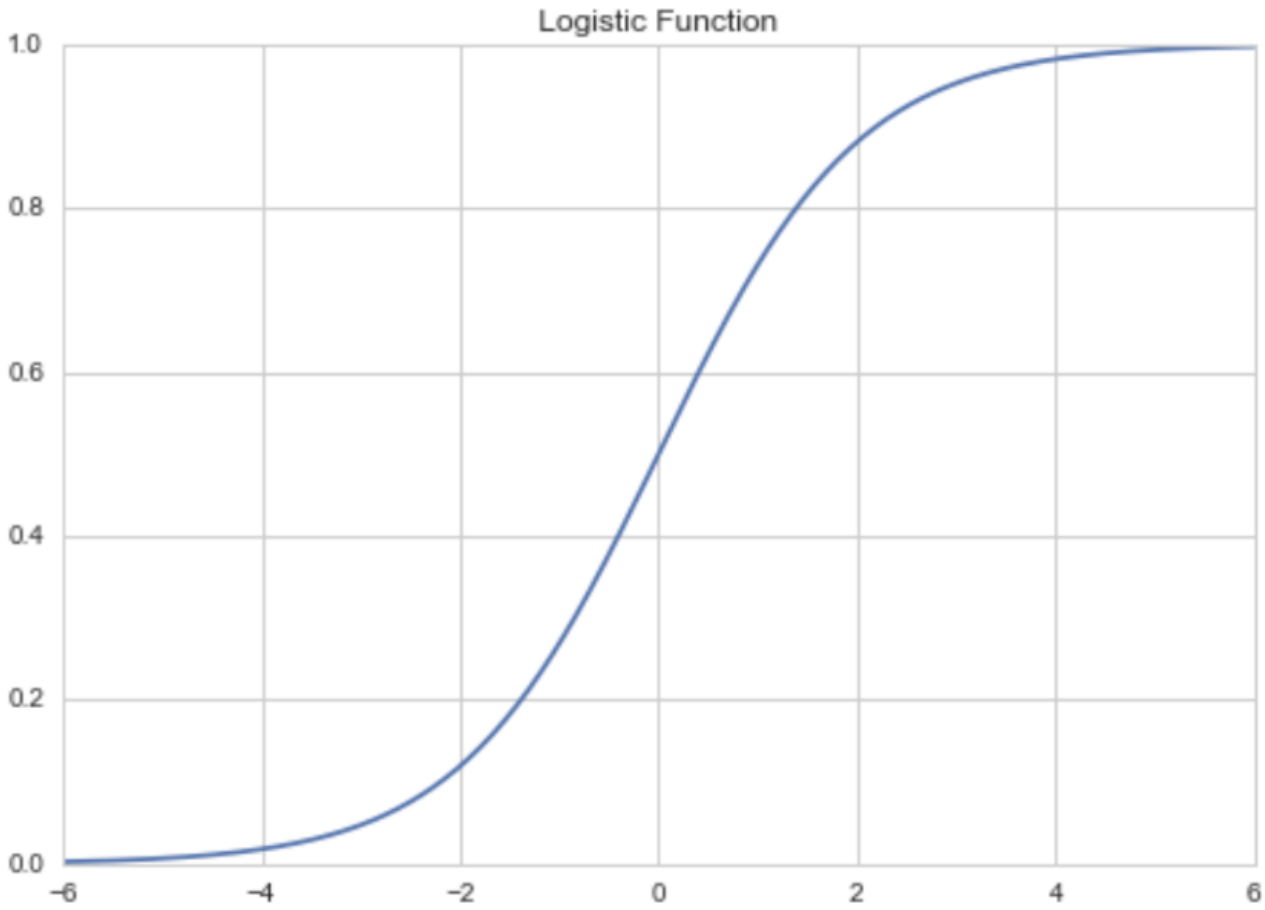
Let's try it out!!!

Logistic Regression

Perform a binary classification, so that we have two outputs, yes or not

- Emails: spam or not spam
- Credit: default or not

It is also possible to have more than two classes (Multinomial)


Logistic Function
1.0
0.8
0.6
0.4
0.2
0.0
−6
−4
−2
0
2
4
6

Let's try it out!!!

Naive Bayes

- Naive Bayes is one of the most practical machine learning algorithms
- It performs very well with text data
- It learns and predicts very fast and it does not require lots of storage
- It takes the name after Bayes as the Bayes theorem is applied. It's called "NAIVE" because all features are assumed to be independent of each other
  - This is rarely the case, however, the algorithm still returns very good accuracy in practice even when the independent assumption does not hold

Let's try it out!!!