Rotman

INTRODUCTION TO SCIKIT-LEARN

A Python Package for Machine Learning

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Agenda

1. What is Scikit-Learn?
2. Machine Learning
3. Installation
4. Hands-on Implementation

What is Scikit-Learn?

What is Scikit-Learn? 1/4

- Scikit-Learn (Sklearn) is a powerful and robust open-source machine learning library for Python.
- Sklearn provides tools for efficient implement of classification, regression, clustering and dimensionality reduction techniques.
- Sklearn has a clean and uniform API as well as complete online documentation.
- Basic knowledge of NumPy, Pandas, SciPy and Matplotlib is required to successfully use Sklearn for machine learning.

What is Scikit-Learn? 1/4

- 2007: Sklearn was initially developed by David Cournapeau as a Google summer code project.

- 2010: Developers from French Institute for Research in Computer Science and Automation took sklearn to another level and made its first public release (v0.1)

- Since then there have been many versions of iterations and improvements. The latest version is 0.24.0.

What is Scikit-Learn? 1/4

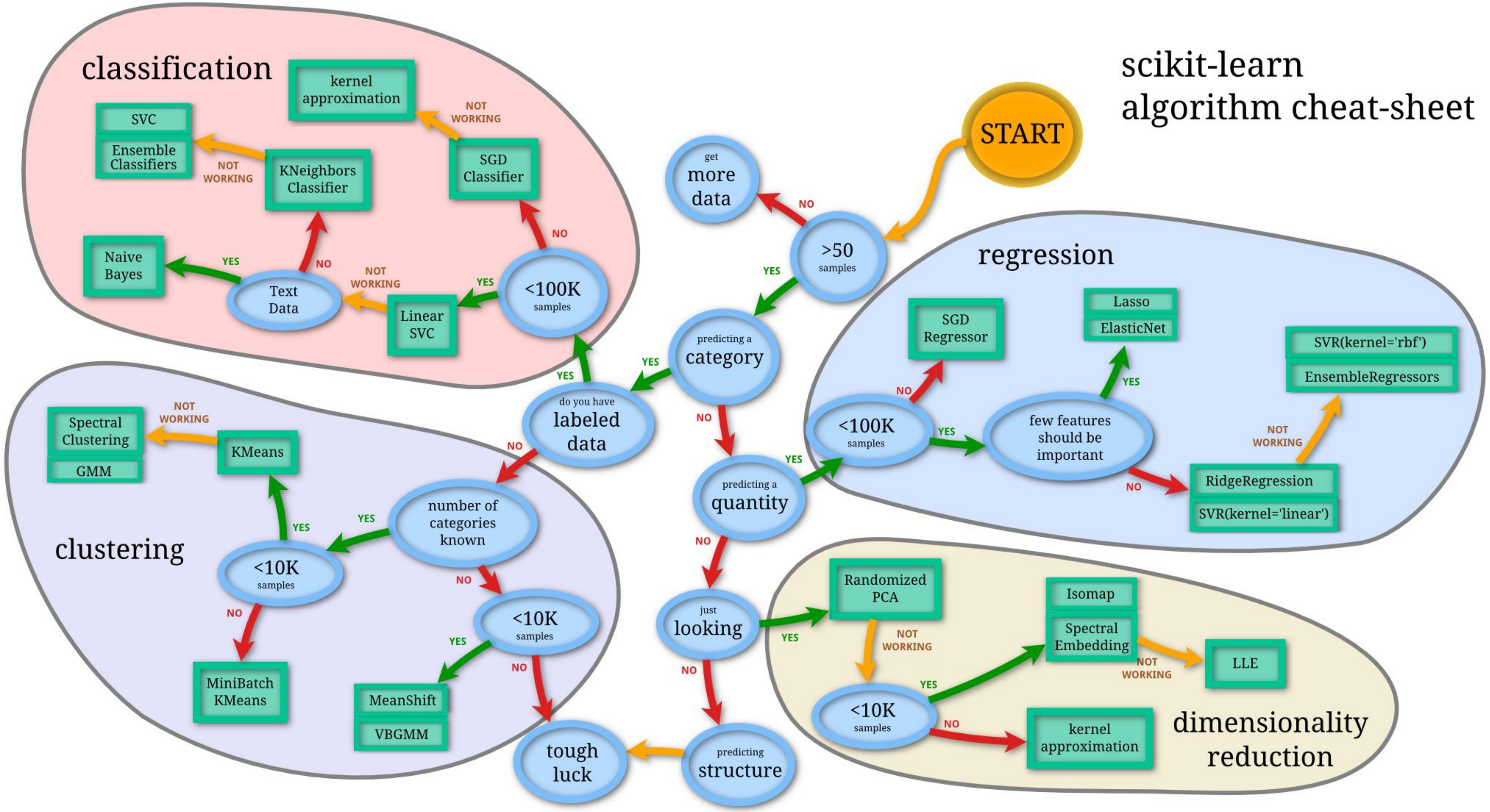
- Sklearn is an community project and anyone can contribute to it.
- Currently, there are more than 2058 contributors on its github repository.
- Various organizations including booking.com, JP Morgan, Evernote, Spotify use Sklearn.

Data Modelling 1/4

- Sklearn offers numerous tools for
  - efficient data modelling
  - preprocessing support such as data encoding
  - feature selection & extraction
  - hyper-parameter search tools
  - end to end data modelling pipeline

Machine Learning

Machine Learning 2/4



Source: https://scikit-learn.org/stable/tutorial/machine_learning_map/index.html

Machine Learning 2/4

- Machine Learning (ML) is a study of algorithms that can learn to solve a specified task using data.

- ML models are trained using a sample of historical data called the training data and the model itself is evaluated based on its performance on an unseen data called the test data.

- ML has wide variety of application from research to health to finance to speech recognition and language translation.

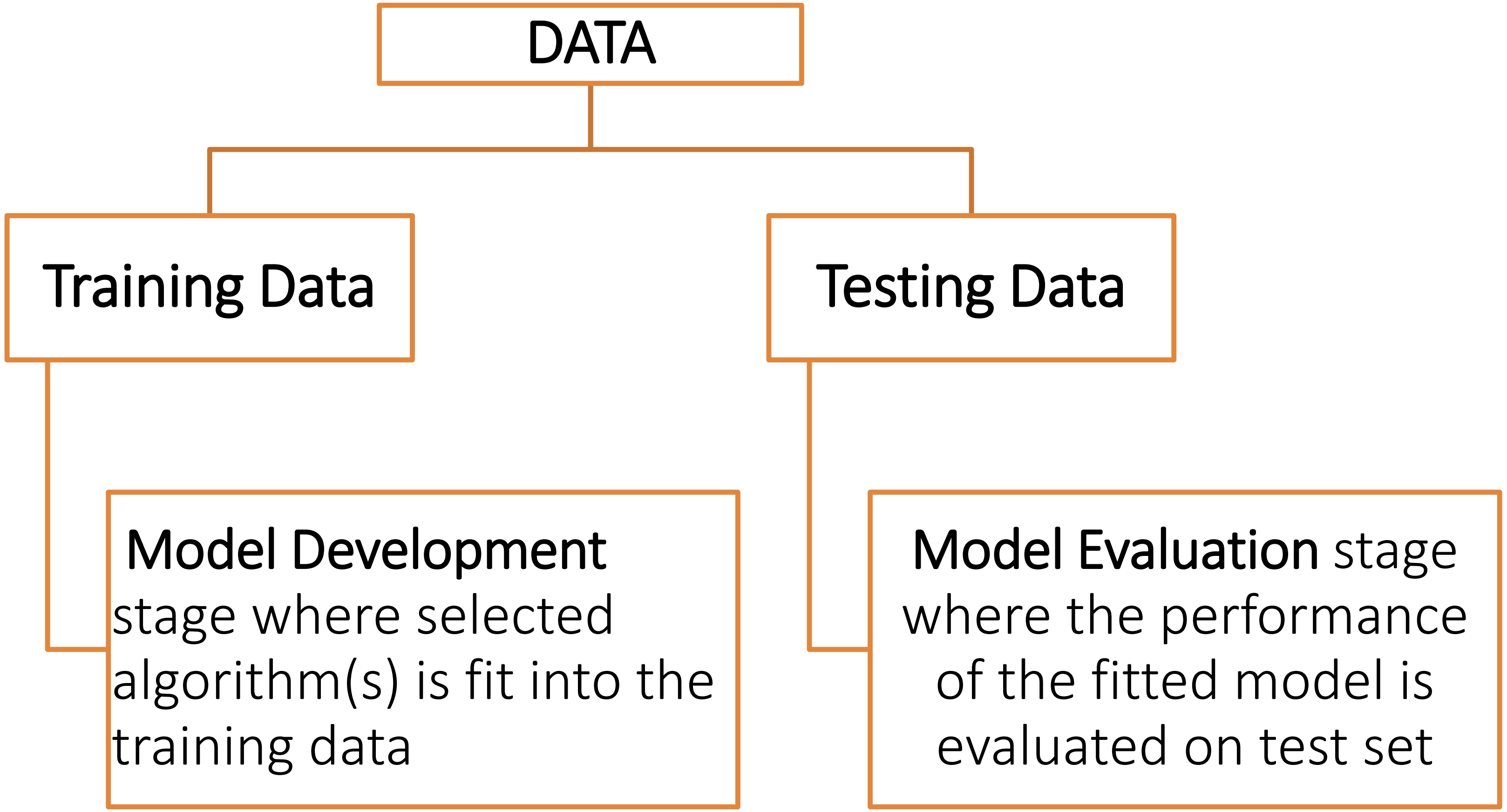
Machine Learning 2/4

- There are two main types of ML models:

1. Supervised:
   - ➢ Model learns to identify pattern in data using inputs and desired outputs called labels.
   - ➢ Each training example has an array of properties, known as feature vector or input vector and a label, known as output.
   - ➢ Examples: Linear Regression, Logistic Regression, Random Forest Classifier, Decision Trees

2. Unsupervised
   - ➢ Model learns to identify pattern and structure in the data without any labels
   - ➢ Examples: K-means Clustering, Principal Component Analysis, etc.

Machine Learning 2/4



DATA

Training Data

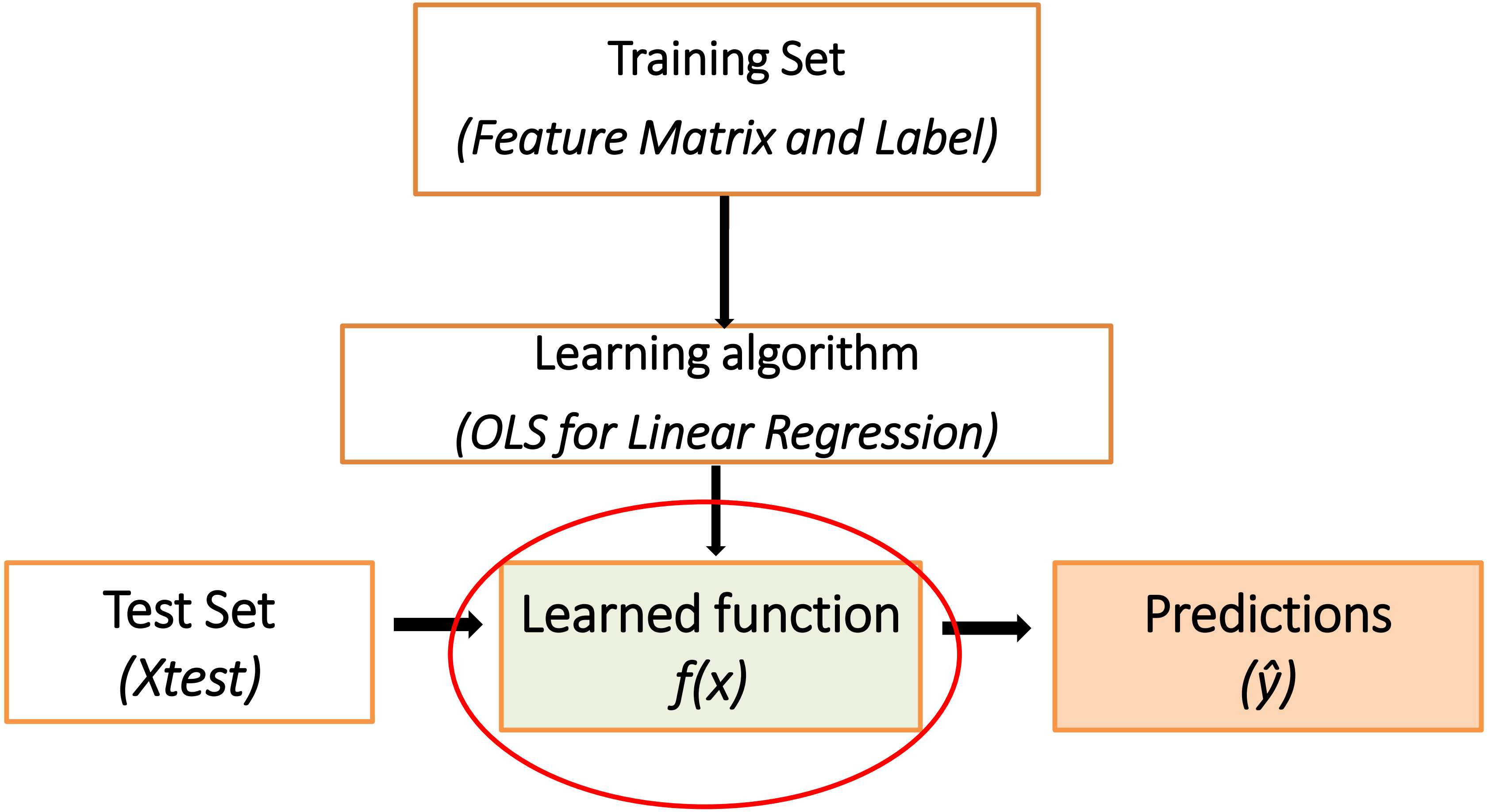
Testing Data

Model Development stage where selected algorithm(s) is fit into the training data

Model Evaluation stage where the performance of the fitted model is evaluated on test set

- Both model development and model evaluation stage comprises additional steps. For example:
  - ➢ Crossvalidation
  - ➢ Hyperparameter search
- All these steps can be neatly packed into a pipeline object.

Machine Learning 2/4



- Goal is to learn this function f(x) that is a "good" predictor for y i.e. minimizes the error
- To do so, it starts with some initial guess and then makes changes to make the error smaller
- It iterates until hopefully it has converged to a value that is minimum

Source: Andrew Ng Lectures

Installation

Installation 3/4

To install sklearn:

```
conda install -c conda-forge scikit-learn
```

Type and enter on your Anaconda prompt application

Prerequisite packages will also be installed

Installation

3/4

To check sklearn version installed:

```
conda list scikit-learn
```

Type and enter on your Anaconda prompt application

Or to a see list of installed packages:

```
conda list
```

Hands-on Implementation

Hands-on Implementation 4/4

- Go to https://tdmdal.github.io/sklearn-workshop/

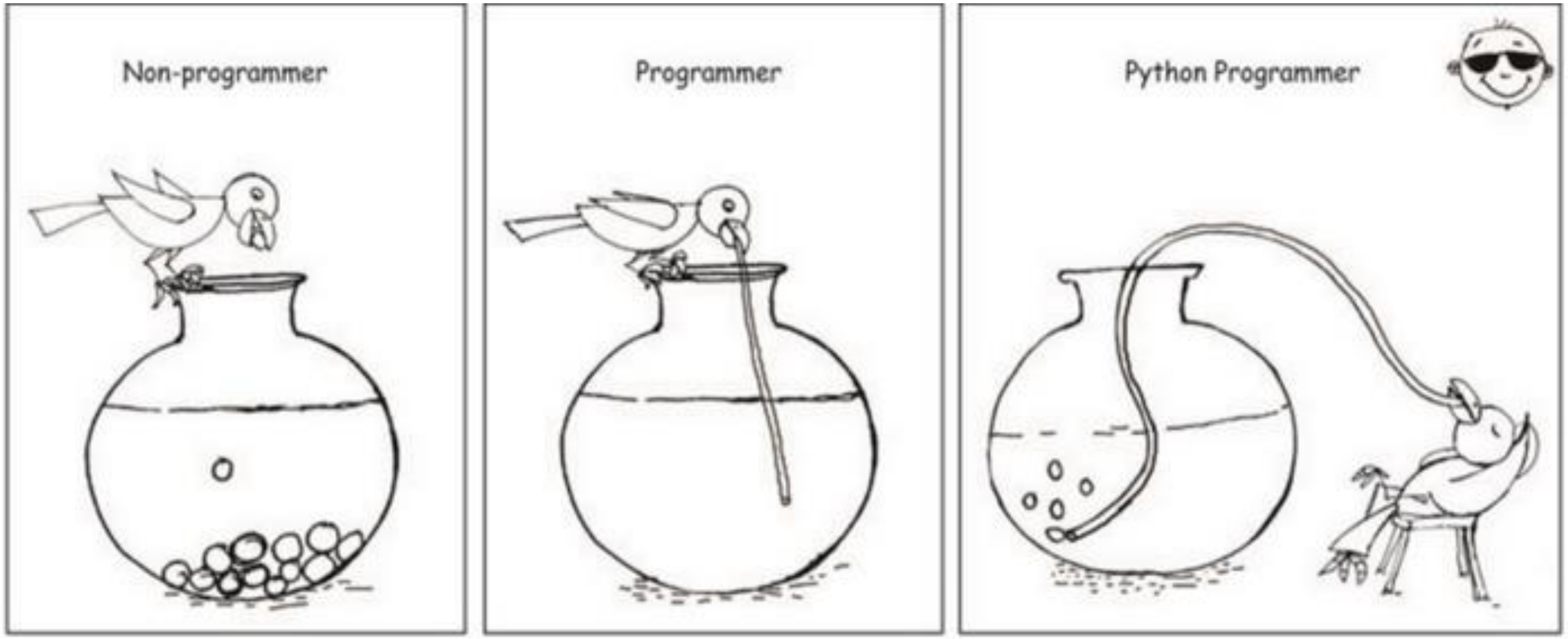
- To open notebook on your local jupyter notebook
  - Download “Introduction to Scikit-learn” under Python Notebook Notebooks
  - Download “Advertising and Sales” under Data
  - Save both file in one folder
  - Open jupyter notebook from that folder

- To open notebook on google drive
  - Go to “Introduction to Scikit-learn” under Python Notebook Notebooks
  - Click on “Open in Colab”
  - Download “Advertising and Sales” under Data and upload on google drive
  - Mount your google drive to the drive folder where the data is uploaded

Hands-on Implementation 4/4

- Tutorials:
  - Linear Regression in Python https://realpython.com/linear-regression-in-python/#simple-linear-regression-with-scikit-learn
  - Sklearn Quick Start Tutorial http://scikit-learn.org/stable/tutorial/basic/tutorial.html
  - Sklearn User Guide http://scikit-learn.org/stable/user_guide.html
  - Sklearn API Reference http://scikit-learn.org/stable/modules/classes.html
  - PyCon 2014 Scikit-learn Tutorial by Jake VanderPlas (https://github.com/ogrisel/sklearn_pycon2014)
  - Introducing Sklearn https://jakevdp.github.io/PythonDataScienceHandbook/05.02-introducing-scikit-learn.html

- Books:
  - Python Data Science Handbook (2016)
  - Learning scikit-learn: Machine Learning in Python (2013)
  - Hands-On Machine learning with Scikit-Learn and Tensorflow (2017)



Who wants to become a Python Programmer?

Questions?

Thank you