Data Analysis in Python

Course for SEA/UAB 2017-2018

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https://github.com/jmlago/DA_python

Structure of the Course

1 **Aerial perspective**
Basic concepts of Data Analysis and Python. A global view of the environment...

$2_{4.5}$ **Data Gathering**
How to extract real and quality data from Internet...

3 **Exploratory Analysis and Cleaning**
Now with real data, how to prepare this data, understand the data, and do visualizations...

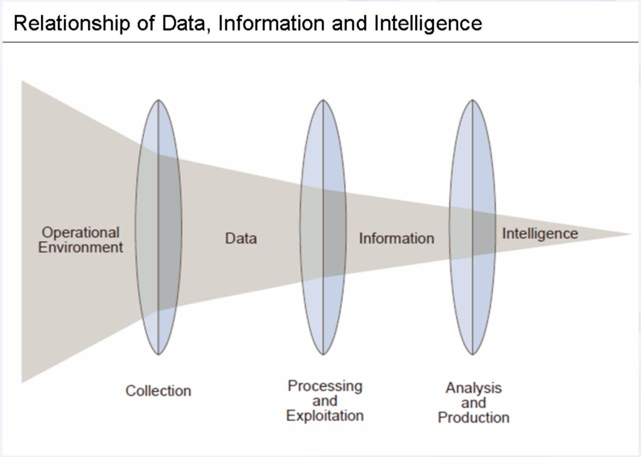
4 **Algorithm Selection**
A tiny view of algorithms world and how to use them...

5 **Performance Engineering**
Usually, when we work with big amounts of data, we need to speed up our algorithms ...

6 **Deep Learning**
A tiny view of the deep learning world...

What is Data Analysis?

Analysis of data is a process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making.



What is Python?

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics.

- Interpreted:
  Compile and execute by any size blocks in any time.
- Object Oriented:
  Uses classes objects and attributes.
- High-Level:
  Can not allocate memory manually.
- Dynamic semantics:
  Python doesn't have static types.

Why use Python?

Strengths

- Glue language
- Simple and easy to learn
- Program modularity and code reuse
- Edit-test-debug really fast
- General purpose language
- Cross platform

Weaknesses

- Slower than compiled languages
- Python2 not compatible with Python3
- Lack of static types
- Can't free memory in usual way

Python vs Others

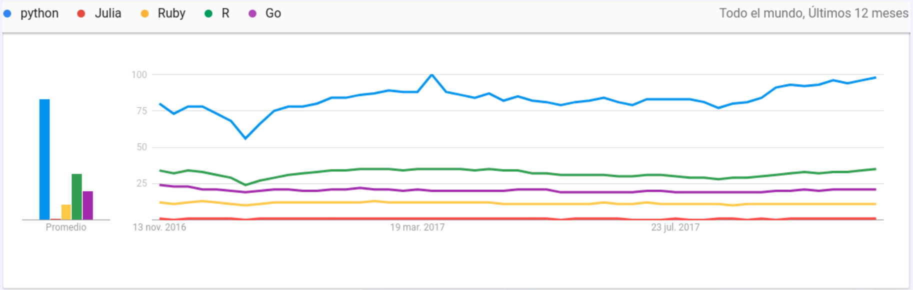


Figure: Python vs Julia vs R vs Go (Google Trends)

- **Community**
- Multi-purpose
- Easy to learn

- Juila is faster? And Go? (Numpy/Numba/Torch/CuPy...)
- Frameworks and wrappers

Conda

Anaconda

We are going to use Python3 in all this course !!!

Definition

Anaconda is an easy-to-install free package manager, environment manager, Python distribution, and collection of over 720 open source packages offering free community support.

Why?

Because Anaconda's packages are for data analytics, data science, and scientific computing.
Also Conda makes sure that all packages and environments works fine together.

Installation

- Go to: https://www.continuum.io/downloads
- Choose your OS
- Download the installer
- Follow the steps on the webpage

Warning

For Linux users, you may use:

```
bash Anaconda3-5.0.1-Linux-x86_64.sh
```

To install Anaconda.

Anaconda tips

For Windows users, you should open `AnacondaPrompt` terminal. For Mac and Linux users, you can open the regular terminal.

- List available pythons:

```
conda search "^python$"
source ~/.bashrc #(Linux users)
```

- Create and activate the environment:

```
conda create --name my_env python=3
source activate my_env
```

- Install packages:

```
conda install some_package
pip install some_package
```

- Remove environment:

```
conda remove --name my_env --all
```

Alternative Installations

Linux

Linux

```
sudo apt-get install python3-pip python3-dev
 ↪  python-virtualenv
pip3 install --upgrade pip3
cd /usr/local/share
sudo mkdir virtualenvs
sudo chown -R root:sudo virtualenvs/
sudo chmod -R g+w virtualenvs/
virtualenv --system-site-packages -p python3
 ↪  /usr/local/share/virtualenvs/v1
source /usr/local/share/virtualenvs/v1/bin/activate
pip3 install -r requirements.txt
```

Alternative Installations

Mac and Windows

Mac

Same script that in Linux, but changing the `sudo apt-get install` for `brew install`

Windows

- Download Python3 from `https://www.python.org/downloads/windows/`
- open the cmd and type `python get-pip.py`
- After that, execute:
  - `pip install virtualenv`
  - `pip install virtualenvwrapper-powershell`
  - `mkdir '~\.virtualenvs'`
  - `Import-Module virtualenvwrapper`
- To see the lists of commands that we can use, just type: `Get-Command *virtualenv*`

Spyder

Integrated Development Enviroment

Definition

Scientific PYthon Development EnviRonment

- Similar to RStudio and MATLAB IDE's
- IDE for Science
- Exploratory
- Easy debugging

Other IDEs

Figure: Atom + Hydrogen

Figure: Jupyter

Figure: Eclipse + PyDev

All IDEs have advantages and disadvantages, you will need to choose what suits you most. In this course we will use SPYDER for simplicity, but each IDE has different purposes.

Verify that all is working OK

- Open SPYDER
- Try to execute the next code:

```
import pandas as pd
import os
import mxnet as mx
import scipy as sp

print("Everything is working OK!!!")
```

Type the code, select all the code and press CTRL+INTRO

Python Basics 1

Libraries

In Python we need to set the modules that we are going to use at the beginning of the script. We do in the following way:

```
import somelibrary as somename
somename.somefunctioninthelib()
```

Generic Data Types

Python really has dynamic semantics so a variable is somehow dynamic type, for instance:

```
a = [1,2,3] #--> list of numbers
a = a[1] #--> position in a list
a = "abcd" #--> string
...
```

Python Basics 2

Functions

We can use functions very easy because of the dynamic semantics. Also in Python the most important thing is **INDENTATION** this is how we determine the loops and the range of the functions.
Beautiful and readable code.

```
def somefunction(param1,param2):
    a = param1*param2
    return a
```

Python Basics 3

Classes

Here is the OO part.
Easy example:

```
class Complex:
    def __init__(self, realpart, imagpart):
        self.r = realpart
        self.i = imagpart

x = Complex(3.0, -4.5)

x.r, x.i
(3.0, -4.5)
```

Let's practice a little bit !!!
Open the `practice0.py`
After this open `oo.py`

Python Basics 4

Reserved words

```
if __name__ == "__main__":
        print("Hello main")
########
class C2(C1):
        def __len__(self,...):
```

Relative paths and modules

What is a python module? What is `__init__.py`?

```
from ..outer.inner import foo
```

```
hello/
    __init__.py
    params.py
    bye/
        __init__.py
        params2.py
```

Exercise: Try to import in `params2.py` some variable defined in `params.py` without executing the main script.

Help!

- `StackOverFlow` and `How To "do something" in Python`
- Python documentation
- External libraries documentation

Warning

Be careful of `StackOverFlow` because it's easy to copy and paste the code but if you don't understand what are you doing you'll have several problems.

Libraries that we need

- Pandas
- BeautifulSoup
- Matplotlib
- NumPy
- SciPy

And many others...

- Scikit-learn
- Plotly
- Mxnet
- Multiprocessing

Numpy 1

What is numpy ?

NumPy is the fundamental package for scientific computing with Python. It contains among other things:

- A powerful N-dimensional array object
- Sophisticated (broadcasting) functions
- Tools for integrating C/C++ and Fortran code
- Useful linear algebra, Fourier transform, and random number capabilities

Numpy 2

Now we have numeric arrays (not lists) and we can apply operations:

Numpy arrays

```
import numpy as np
a = np.array(1,2,3,4)    # WRONG
a = np.array([1,2,3,4])  # RIGHT
b = np.array([(1.5,2,3), (4,5,6)])
print(b)
        array([[ 1.5,  2. ,  3. ],
               [ 4. ,  5. ,  6. ]])
c = np.array( [ [1,2], [3,4] ], dtype=complex )
print(c)
        array([[ 1.+0.j,  2.+0.j],
               [ 3.+0.j,  4.+0.j]])
```

Numpy 3

As we can see in the previous slide there are many `dtypes` for an array of NumPy. More precisely a `dtype` follow the next properties:

Properties

- Type of the data (integer, float, Python object, etc.)
- Size of the data (how many bytes is in e.g. the integer)
- Byte order of the data (little-endian or big-endian)
- If the data type is structured (an aggregate of other data types).

Dtypes sample

int16,bool,float64,complex,str,unicode,buffer,object,...

Numpy 4

Some useful algebraic functions, better to see as example:

Numpy useful functions

```
a = np.array([[1.0, 2.0], [3.0, 4.0]])
a.transpose() #transposed matrix
np.linalg.inv(a) #inverse matrix
np.dot (a, a) # matrix product
np.trace(a) #trace of the matrix
y = np.array([[5.], [7.]]) #independent term
np.linalg.solve(a, y) #solver of a system
```

Numpy 5

Polynomial fit functions that minimize the SSE:

Polynomial fit functions

```
x = np.array([0.0, 1.0, 2.0, 3.0,  4.0,  5.0])
y = np.array([0.0, 0.8, 0.9, 0.1, -0.8, -1.0])
z = np.polyfit(x, y, 3)#3 is the degree
#of the fitting polynomial
print(z)
        array([ 0.08703704, -0.81349206,
    1.69312169, -0.03968254])
p = np.poly1d(z)
p(0.5)
        0.6143849206349179
p30 = np.poly1d(np.polyfit(x, y, 30))
        RankWarning: Polyfit may be poorly conditioned
```

Practice again!!!

Open the `numpy_practice.py`

Matplotlib 1

What is matplotlib ?

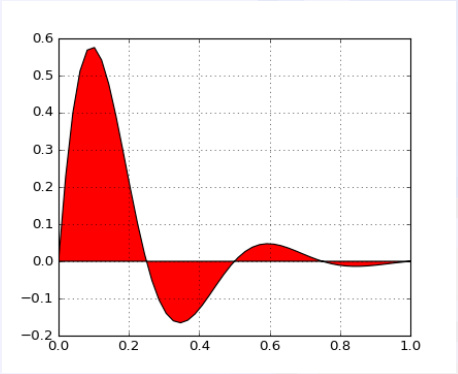
Matplotlib is a python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms.

Basic example

```
import numpy as np
import matplotlib.pyplot as plt
x = np.linspace(0, 1)
y = np.sin(4 * np.pi * x) * np.exp(-5 * x)
plt.fill(x, y, 'r') #fills the curve with red color
plt.grid(True) #draws the grid
plt.show() #shows the plot
```

Matplotlib 2

Show of the previous plot:



Matplotlib 3

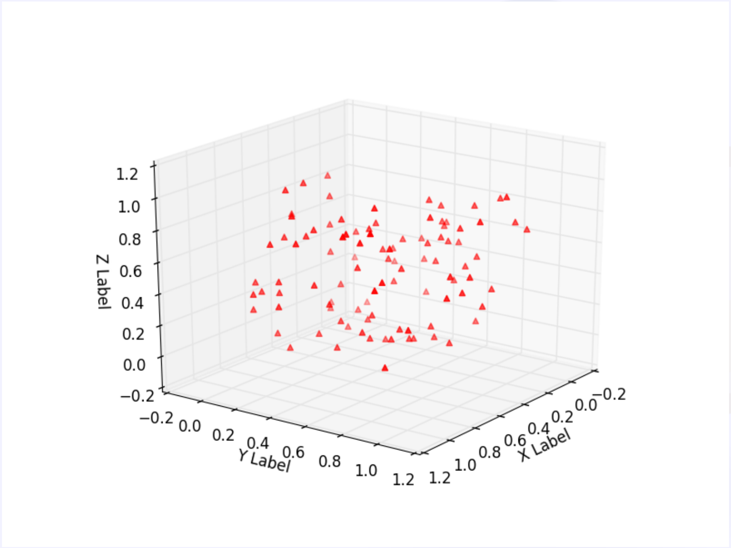
Now we are going to draw some data in 3D just as an example:

3D example

```
import numpy as np
from mpl_toolkits.mplot3d import Axes3D
import matplotlib.pyplot as plt
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
n = 100
xs = np.random.uniform(0,1,n)
ys = np.random.uniform(0,1,n)
zs = np.random.uniform(0,1,n)
ax.scatter(xs, ys, zs,color="r",marker="^")
ax.set_xlabel('X Label')
ax.set_ylabel('Y Label')
ax.set_zlabel('Z Label')
plt.show()
```

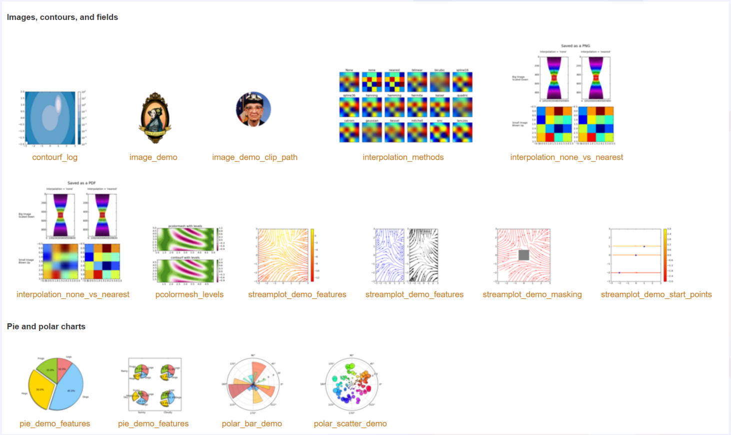
Matplotlib 4

Show of the previous plot:



Matplotlib 5

The most important part of `matplotlib` is...
The gallery: `http://matplotlib.org/gallery.html`


Images, contours, and fields

contourf_log
image_demo
image_demo_clip_path
interpolation_methods
interpolation_none_vs_nearest
interpolation_none_vs_nearest
pcolormesh_levels
streamplot_demo_features
streamplot_demo_features
streamplot_demo_masking
streamplot_demo_start_points

Pie and polar charts

pie_demo_features
pie_demo_features
polar_bar_demo
polar_scatter_demo

Practice again !!!
Open `practice1.py`

Pandas 1

This library is the CORE of Data Analysis in Python.
And It's most powerful tool...

DataFrame class

This is our table and our database structure in Python.
Has many many attributes and most libraries were build using this structure as a link.

Example

```python
import pandas as pd
d = [['Pepito',22],['Juanito',43],['Pablito',20]]
c = ["Name","Age"]
df = pd.DataFrame(data=d,columns = c)
```

Pandas 2

Knowing a little bit more about `DataFrame` class:

Continuing Example

```
df.Age #--> Sometimes correct
df["Age"] #--> Correct
df["Age"].mean()
df["Age"].var()
```

Let's take a look at the documentation:
http://pandas.pydata.org/pandas-docs/stable/generated/pandas.DataFrame.html

Pandas 3

Getting information in different formats:

Some format to DataFrame

```
##All this sentences return a DataFrame object
pd.read_csv(file)
pd.read_excel(file)
pd.read_html(path) # directly from the web
pd.read_json(path) # directly from the web
pd.read_sas(file)
pd.read_sql(file)
pd.read_sql_table(file)
pd.read_stata(file)
df.from_csv(file)
df.from_dict(dict)
...
```

To see how it works, just open **easy_plot.py**

Pandas 4

Querys inside `DataFrame` class:

Query in Python

```
x = df[(df["label1"] == "some1") &
(df["label2"] == "some2")]["label3"]
```

This could be a set of numbers coming from the DataFrame as a request. The request is like we want all elements on the DataFrame that have in the column named `label1` the value `some1` **and** that have in the column named `label2` the value `some2`. And from this set of rows that follow the answer we want the values of column named `label3`. Then put all this values in a variable named `x`.

DataFrame to LaTeX

```
df2.to_latex().replace("\n","")
# generates a table in LaTeX format
```

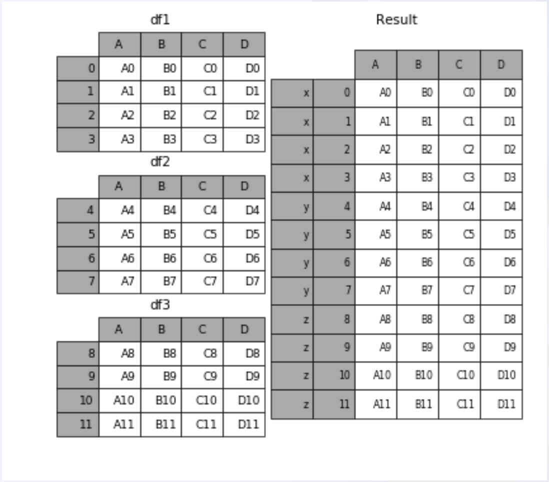
Pandas 5

Few more posibilities

```
df.dropna(axis=1, how='any',inplace=True) #drop NA values
agg_col = df.groupby('label1').aggregate(sum)
agg_col.index = ['bar1', 'bar2', 'bar3']
agg_col.plot(kind='bar') #see other kinds in documentation
```

Pandas 6

```
df = pd.concat(df1,df2,df3)
```



df1

	A	B	C	D
0	A0	B0	C0	D0
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3

df2

	A	B	C	D
4	A4	B4	C4	D4
5	A5	B5	C5	D5
6	A6	B6	C6	D6
7	A7	B7	C7	D7

df3

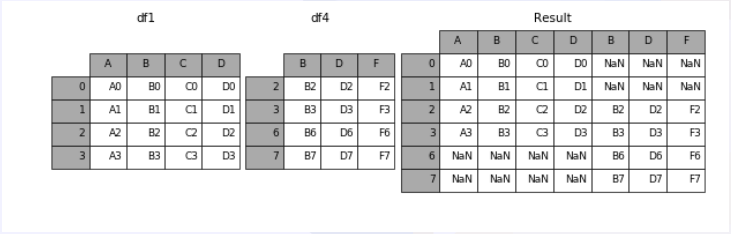
	A	B	C	D
8	A8	B8	C8	D8
9	A9	B9	C9	D9
10	A10	B10	C10	D10
11	A11	B11	C11	D11

Result

		A	B	C	D
x	0	A0	B0	C0	D0
x	1	A1	B1	C1	D1
x	2	A2	B2	C2	D2
x	3	A3	B3	C3	D3
y	4	A4	B4	C4	D4
y	5	A5	B5	C5	D5
y	6	A6	B6	C6	D6
y	7	A7	B7	C7	D7
z	8	A8	B8	C8	D8
z	9	A9	B9	C9	D9
z	10	A10	B10	C10	D10
z	11	A11	B11	C11	D11

Pandas 7

```
result = pd.concat([df1, df4], axis=1)
```



df1

	A	B	C	D
0	A0	B0	C0	D0
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3

df4

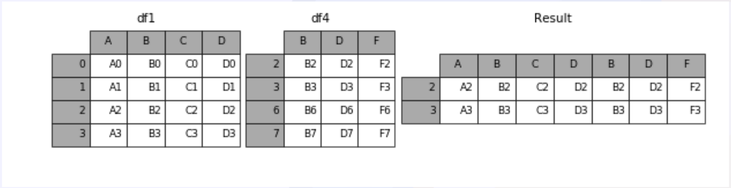
	B	D	F
2	B2	D2	F2
3	B3	D3	F3
6	B6	D6	F6
7	B7	D7	F7

Result

	A	B	C	D	B	D	F
0	A0	B0	C0	D0	NaN	NaN	NaN
1	A1	B1	C1	D1	NaN	NaN	NaN
2	A2	B2	C2	D2	B2	D2	F2
3	A3	B3	C3	D3	B3	D3	F3
6	NaN	NaN	NaN	NaN	B6	D6	F6
7	NaN	NaN	NaN	NaN	B7	D7	F7

Pandas 8

```
result = pd.concat([df1, df4], axis=1, join='inner')
```



df1

	A	B	C	D
0	A0	B0	C0	D0
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3

df4

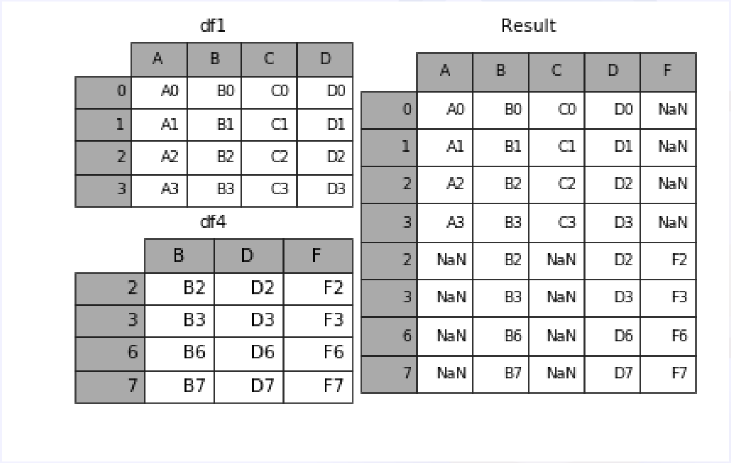
	B	D	F
2	B2	D2	F2
3	B3	D3	F3
6	B6	D6	F6
7	B7	D7	F7

Result

	A	B	C	D	B	D	F
2	A2	B2	C2	D2	B2	D2	F2
3	A3	B3	C3	D3	B3	D3	F3

Pandas 9

```
result = df1.append(df4)
```



df1

	A	B	C	D
0	A0	B0	C0	D0
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3

df4

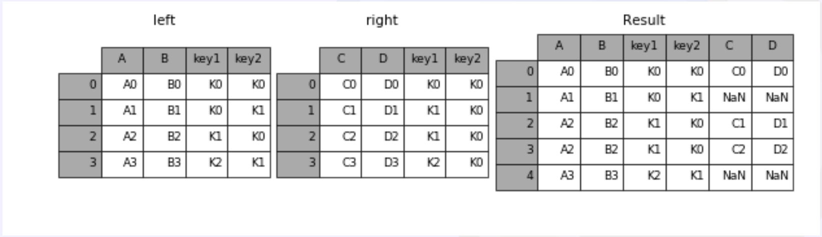
	B	D	F
2	B2	D2	F2
3	B3	D3	F3
6	B6	D6	F6
7	B7	D7	F7

Result

	A	B	C	D	F
0	A0	B0	C0	D0	NaN
1	A1	B1	C1	D1	NaN
2	A2	B2	C2	D2	NaN
3	A3	B3	C3	D3	NaN
2	NaN	B2	NaN	D2	F2
3	NaN	B3	NaN	D3	F3
6	NaN	B6	NaN	D6	F6
7	NaN	B7	NaN	D7	F7

Pandas 10

```
result = pd.merge(left, right,
how='left', on=['key1', 'key2'])
```



left

	A	B	key1	key2
0	A0	B0	K0	K0
1	A1	B1	K0	K1
2	A2	B2	K1	K0
3	A3	B3	K2	K1

right

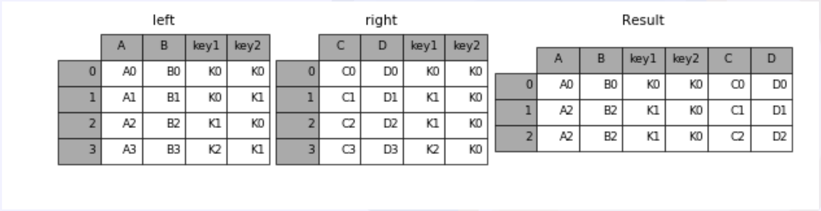
	C	D	key1	key2
0	C0	D0	K0	K0
1	C1	D1	K1	K0
2	C2	D2	K1	K0
3	C3	D3	K2	K0

Result

	A	B	key1	key2	C	D
0	A0	B0	K0	K0	C0	D0
1	A1	B1	K0	K1	NaN	NaN
2	A2	B2	K1	K0	C1	D1
3	A2	B2	K1	K0	C2	D2
4	A3	B3	K2	K1	NaN	NaN

Pandas 11

```
result = pd.merge(left, right,
how='outer', on=['key1', 'key2'])
```



left

	A	B	key1	key2
0	A0	B0	K0	K0
1	A1	B1	K0	K1
2	A2	B2	K1	K0
3	A3	B3	K2	K1

right

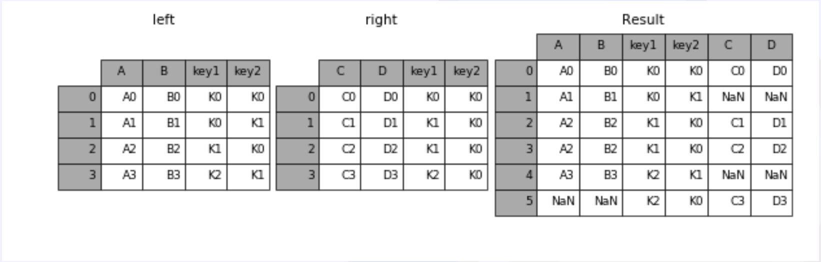
	C	D	key1	key2
0	C0	D0	K0	K0
1	C1	D1	K1	K0
2	C2	D2	K1	K0
3	C3	D3	K2	K0

Result

	A	B	key1	key2	C	D
0	A0	B0	K0	K0	C0	D0
1	A2	B2	K1	K0	C1	D1
2	A2	B2	K1	K0	C2	D2

Pandas 12

```
result = pd.merge(left, right,
how='inner', on=['key1', 'key2'])
```



left

	A	B	key1	key2
0	A0	B0	K0	K0
1	A1	B1	K0	K1
2	A2	B2	K1	K0
3	A3	B3	K2	K1

right

	C	D	key1	key2
0	C0	D0	K0	K0
1	C1	D1	K1	K0
2	C2	D2	K1	K0
3	C3	D3	K2	K0

Result

	A	B	key1	key2	C	D
0	A0	B0	K0	K0	C0	D0
1	A1	B1	K0	K1	NaN	NaN
2	A2	B2	K1	K0	C1	D1
3	A2	B2	K1	K0	C2	D2
4	A3	B3	K2	K1	NaN	NaN
5	NaN	NaN	K2	K0	C3	D3

... and many other ways to fusion DataFrames.

Practice again!!!

Open the `practice2.py`

Titanic Dataset

In this first real example, we are going to study and analyze the data corresponding to the titanic. Open `titanic_preprocessing.py`!!!

Machine Learning

What is ML

Machine learning is the subfield of computer science that gives computers the ability to learn without being explicitly programmed.
The main task that ML perform is interpolation.

ML is another useful tool for DA, and we can classify all this methods into three branches:

- **Classifying**: inputs are divided into classes, and the learner must produce a model that assigns unseen inputs to one or more (multi-label classification) of these classes.
- **Clustering**: a set of inputs is to be divided into groups. Unlike in classification, the groups are not known beforehand, making this typically an unsupervised task.
- **Regressions**: predicting a continuous-valued attribute associated with an object.

Types of learning

There are many ways to train the models, but the most famous are:

- **Unsupervised learning**: No labels are given to the learning algorithm, leaving it on its own to find structure in its input. Unsupervised learning can be a goal in itself (discovering hidden patterns in data) or a means towards an end (feature learning).
- **Supervised learning**: The computer is presented with example inputs and their desired outputs, given by a "teacher", and the goal is to learn a general rule that maps inputs to outputs.
- **Reinforcement learning**: A computer program interacts with a dynamic environment in which it must perform a certain goal (such as driving a vehicle or playing a game against an opponent). The program is provided feedback in terms of rewards and punishments as it navigates its problem space.

Mathematical Approach

- Data Model: $(X, Y) \sim P$ joint probability distribution
- Training set: $T = \{(x_i, y_i)\}_{i \leq I}$ and the data is iid.
- Parametric model set: $\hat{y}(x) = \Phi(x; \lambda), \;\; \lambda \in \mathbb{R}^M$

Empirical loss

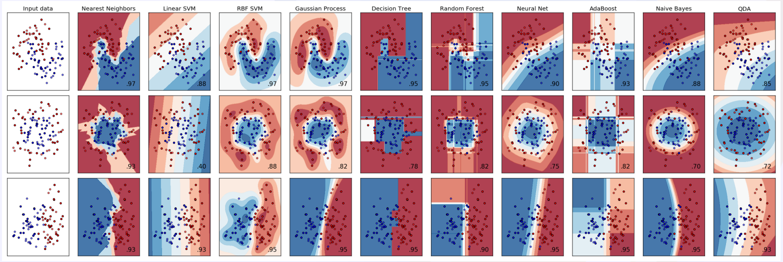
$$\hat{E}(\lambda) = \frac{1}{I} \sum_{i \leq I} d(\Phi(x_i; \lambda), y_i)$$

Machine learning are the tools to compute λ that follows:

$$\min_{\lambda}(\hat{E}(\lambda))$$

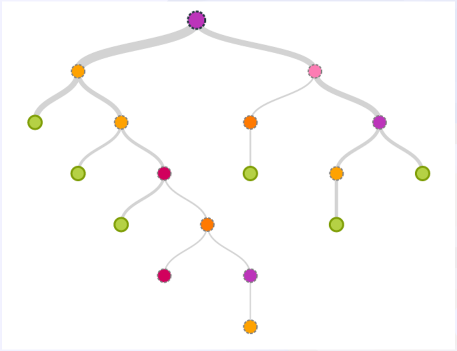
Scikit-learn

- Simple and efficient tools for data mining and data analysis
- Accessible to everybody, and reusable in various contexts
- Built on NumPy, SciPy, and matplotlib
- Open source, commercially usable - BSD license



Decision Trees

A decision tree is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm that only contains conditional control statements.



What really does?

Given training vectors $x_i \in \mathbb{R}^n, i = 1, .., l$ and the labels vector $y \in \mathbb{R}^l$, a decision tree recursively partitions the space such that the samples with the same labels are grouped together. Let the data at node m be represented by Q. For each candidate split $\theta = (j, t_m)$ consisting of a feature j and threshold t_m, partition the data into $Q_{left}(\theta)$ and $Q_{right}(\theta)$ subsets:

$$Q_{left}(\theta) = (x, y)|x_j <= t_m$$

$$Q_{right}(\theta) = Q \setminus Q_{left}(\theta)$$

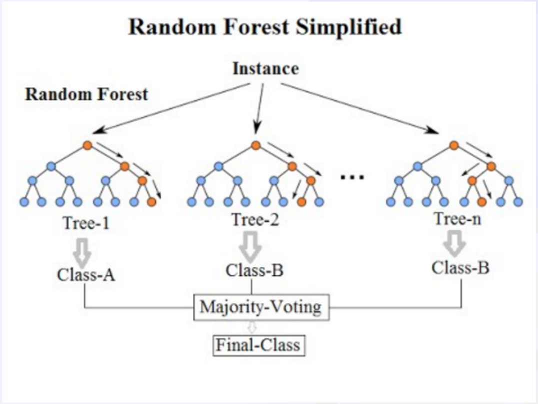
Also, trees have an impurity function, which changes if the tree is a classifying tree or a regression tree. The proportion p_{mk} of the points of node m in class k:

$$p_{mk} = 1/N_m \sum_{x_i \in R_m} I(y_i = k)$$

And we use Gini index as an impurity function in terms of proportion.

Random Forest

What is a random forest and why to use them? (reduce overfitting)



What is boosting?

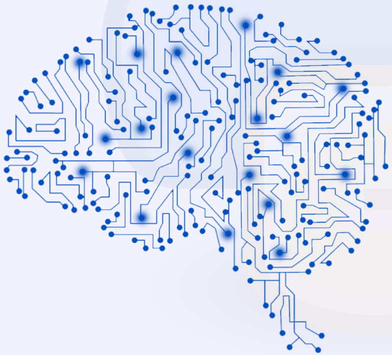
Neural Networks and Deep Learning

Neural Network

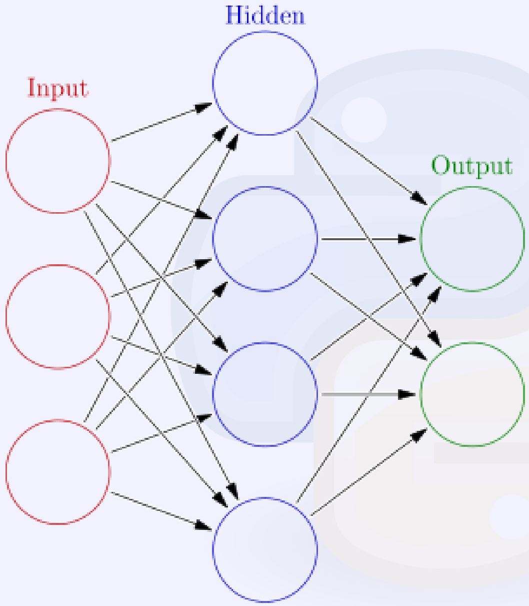
Neural networks, a beautiful biologically-inspired programming paradigm which enables a computer to learn from observational data

Deep Learning

Deep learning, a powerful set of techniques for learning in neural networks



Neural Network



How it works

- Neurons: is an entity that receives many inputs and computes a number and it sends as an output.
- Layer: set of neurons in the same phase (means step).
- Synapses: Set of arrows that have weights from a layer to another.
- Input: a set of neurons that sends the input information.
- Output: the last layer of neurons.

More mathematically

let l be the layer, and the output of the neuron i in the layer l is:

$$a_i^l = \sigma\left(b_i^l + \sum_j w_{ij}^l a_j^{(l-1)}\right)$$

- z_i^l is the information received $b_i^l + \sum_j w_{ij}^l a_j^{(l-1)}$
- σ is the activation function, the more usuals are sigmoid, $tanh(z_i^l)$ and $max(0, z_i^l)$.
- b_i^l is the bias, and measures the amount of sensibility of our neuron, because acts as a threshold for the activation function.

Back-Propagation 1

What is back-propagation?

Is the action where the coefficients of the synapses and the biases of the neurons are corrected by a process of identifying the error in the last layer, correcting this error and going backwards till the beginning.
Is the main reason of why the NN converges to a solution.

Let δ^l be the vector of errors in the layer l so:

$$\delta^l = (\delta^l_1, ..., \delta^l_n)$$

Then how we propagate the error, knowing that the error in the last layer l is:

$$\delta^L = \nabla_a C \odot \sigma'(z^L)$$

Where also a, z^L are vectors, $\odot$ denotes the Hadamard product, and C is the cost function, and usually is $\frac{1}{2}\sum_i (y_i - a^L_i)^2$

Back-Propagation 2

The answer is:

$$\delta^l = ((w^{l+1})^T \delta^{l+1}) \odot \sigma'(z^l)$$

And to compute the corresponding corrections of the biases and the coefficients of the synapses, we have this equations:

$$\delta_j^l = \frac{\partial C}{\partial b_j^l}$$

$$a_k^{l-1}\delta_j^l = \frac{\partial C}{\partial w_{jk}^l}$$

And to compute this numbers, we use an optimization method(i.e. the gradient descent method).

How works all the process

1. Input a set of training examples
2. For each training example x:
    - Set the corresponding activation input (the output of the input layer).
    - Feedforward: for each layer, compute the information that each neuron recieves.
    - Output error: compute the output errors δ^l.
    - Back-propagate the error to the beginning.
3. Gradient descend method.

Then iterate 2 and 3 to purify the coefficients till some tolerance parameter or a previously convergence.

So what is deep learning?

Answer

Networks with this kind of many-layer structure (two or more hidden layers) are called deep neural networks.
After the years the people start saying that deep starts at 4, then 5 , 9 and 21 actually.

Perceptrons

Answer

A perceptron is a neuron that receives an amount of binary inputs, and returns a binary output.
Were the first defined neurons in the 50's, and still useful.
Nowadays we use more sigmoid neurons that perceptron ones.

How a perceptron neuron works?

The neuron receives many inputs, and then does:

```
def perceptron(x,w,threshold):
    if np.sum(x*w) < threshold:## star acts as Hadamard
     ↪  product
        return 0
    else:
        return 1
```

Finally we are ready to work with neural networks somehow, more specifically with the **Multi Layer Perceptron** of scikit-learn.

DL environments
Pytorch

There are many DL environments nowadays...

- TensorFlow
- Keras
- Caffe2
- Pytorch
- MXnet

and many others...
I prefer Pytorch, because is fast, and is simple compared to those that use **Static Computational Graphs**.

Models on titanic processed data

We are going to see now, how "easy" is to apply previously stated models: **decision tree**, **xgboost** and **MLP**.

Warning

On most didactic Kaggle datasets (not in competitions), all models perform quite well, and dataset structure is near perfect.

Open `titanic_decision_tree.py`, `titanic_xgboost.py` and `titanic_scikit_MLP.py`