esade

Intermediate Python & a Glimpse into AI applications

Class 6

Pepe Bonet Giner

20th January 2023

Index Class 6

esade

Topic 1: Recap

Train & Test sets. Why are they necessary?

Training Set

Gender	Parent Education	Age	Grade
Male	College	21	8
Female	High School	22	9

To train the model. Can represent up to 90 % of the data

Test Set

Gender	Parent Education	Age	Grade
Male	None	20	6
Female	College	21	5

To test how the model generalizes to never seen data

Overfitting: The model is not good on never seen data

Underfitting: The model is bad everywhere

The reason to have a separate train and test set is to avoid overfitting of the model to the data

Objective: Find the best fit of a line to the data

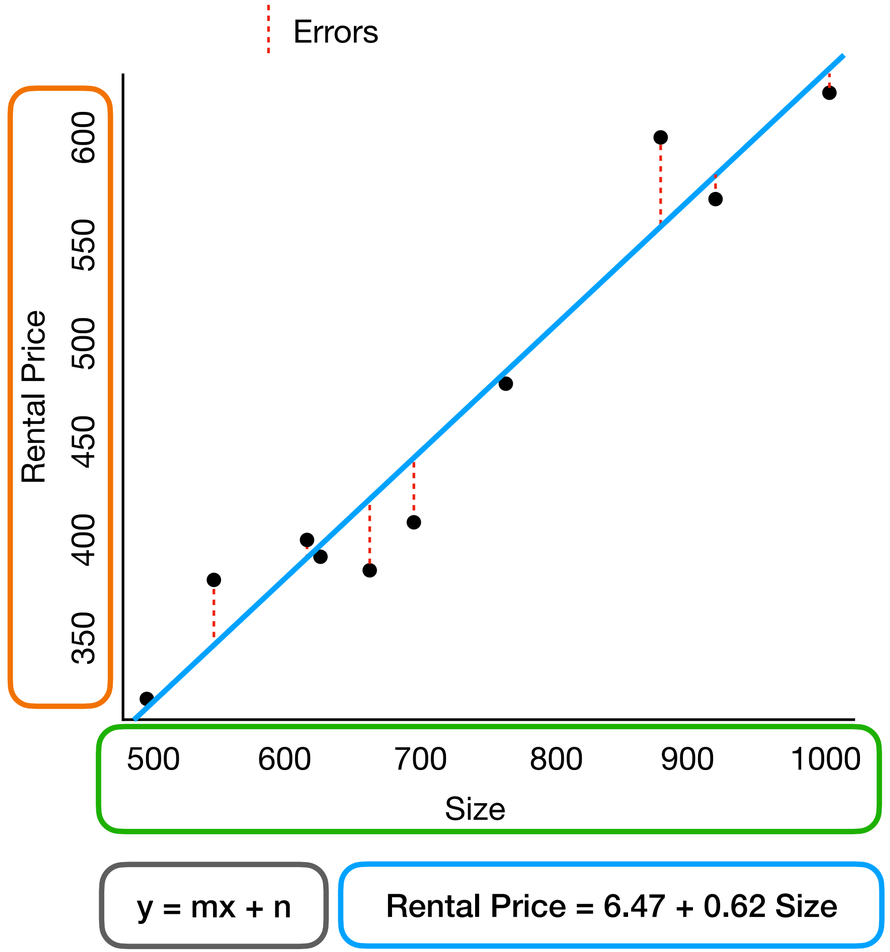
We want to obtain the line that minimizes the sum of squared errors.

$$min(L_2)$$

To find the best parameters for the line that we are searching for (m and n in this case)

This search can be done through something called **gradient descent**

This method is at the core of many machine learning models



Linear regression model in Python to predict math scores

The technical aspects explained and many more are already handled by sci-kit learn when building any model

Therefore, our work consists of having the data ready and selecting the model. After that we are done in some lines of code

Load packages

```
from sklearn import datasets, linear_model
from sklearn.metrics import mean_absolute_error
```

Start linear model

```
# Create linear regression object
regr = linear_model.LinearRegression()
```

Fit Model to data

```
# Train the model using the training sets
regr.fit(trainX, trainY)
```

Test your model

```
# Make predictions using the testing set
y_pred = regr.predict(testX)
```

Performance measurement

```
# The mean absolute error
print("MAE: %.2f" % mean_absolute_error(testY, y_pred))
```

```
MAE: 4.41
```

Exercise

- Does anybody see a problem with the time at which we did the normalization step?
- The train test split should come first and then normalize each group separately. Example of data leakage. Try fixing this in your code.

Not an Exercise

- Where else could we have a problem with the time at which we did the normalization step?

Not an Exercise

- Where else could we have a problem with the time at which we did the normalization step?
- Filling missing values with the mean for instance. Be careful with Data Leakage

esade

Topic 2: Final Project Explanation

How is it going to be graded?

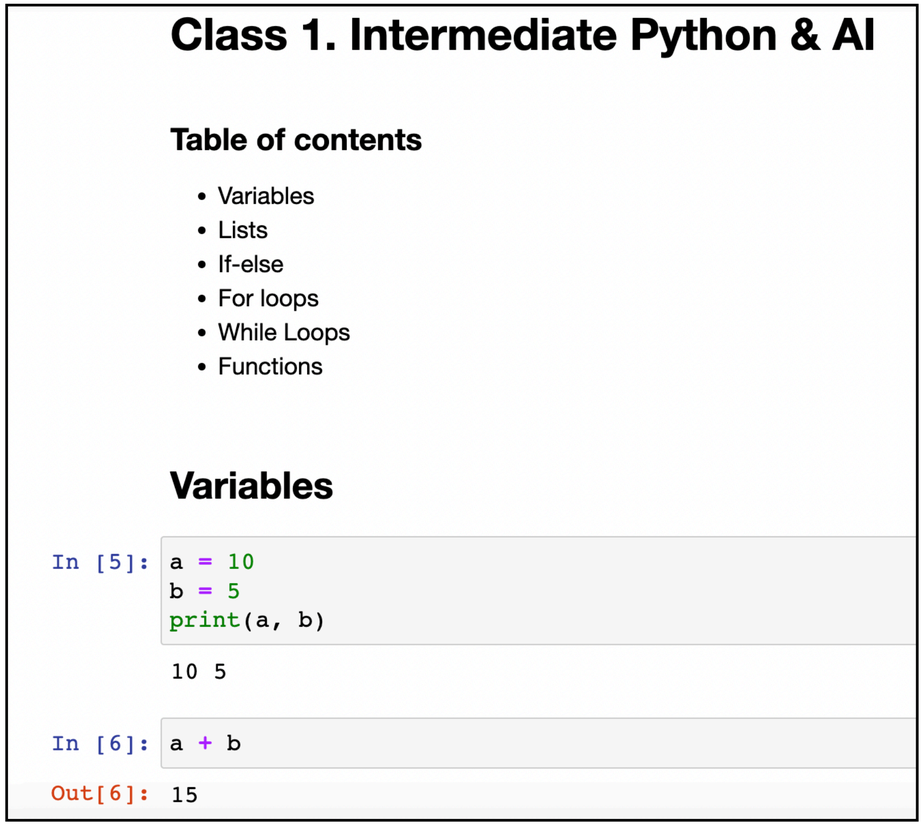
- **60% Active participation and class attendance**:
  - 15 % Attendance
  - 45 % coding exercises
  - Exercises will be uploaded to the Moodle after every session.

- **40% Final project**:
  - Python code on Jupyter Notebook, working and applying the concepts learned in class on a dataset, explaining the steps taken.
  - A 2-page report summarizing the results, the value extracted from data, and possible applications of AI.
  - Upload both to the Moodle max two weeks after the last lecture.

Final work

Code in Jupyter Notebooks

Report Explaining Results



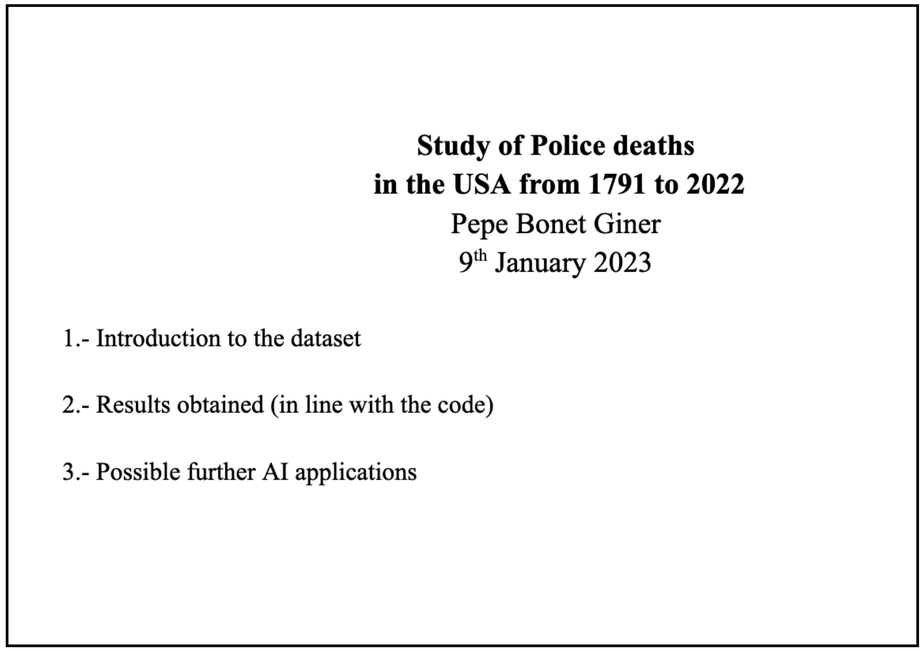
Class 1. Intermediate Python & AI

Table of contents

- Variables
- Lists
- If-else
- For loops
- While Loops
- Functions

Variables

```
In [5]: a = 10
        b = 5
        print(a, b)

        10 5

In [6]: a + b
Out[6]: 15
```



Study of Police deaths
in the USA from 1791 to 2022

Pepe Bonet Giner

9th January 2023

1.- Introduction to the dataset

2.- Results obtained (in line with the code)

3.- Possible further AI applications

Final work

There is a folder in the Moodle with several datasets extracted from Kaggle. You also have a file with the links to the Kaggle website that could give you some ideas

Final work

There is a folder in the Moodle with several datasets extracted from Kaggle. You also have a file with the links to the Kaggle website that could give you some ideas

You can either take one of them or search in Kaggle and use one from there. If you do so, you need to add the link to the dataset

Final work

There is a folder in the Moodle with several datasets extracted from Kaggle. You also have a file with the links to the Kaggle website that could give you some ideas

You can either take one of them or search in Kaggle and use one from there. If you do so, you need to add the link to the dataset

I also uploaded my code for the 5 previous lectures

esade

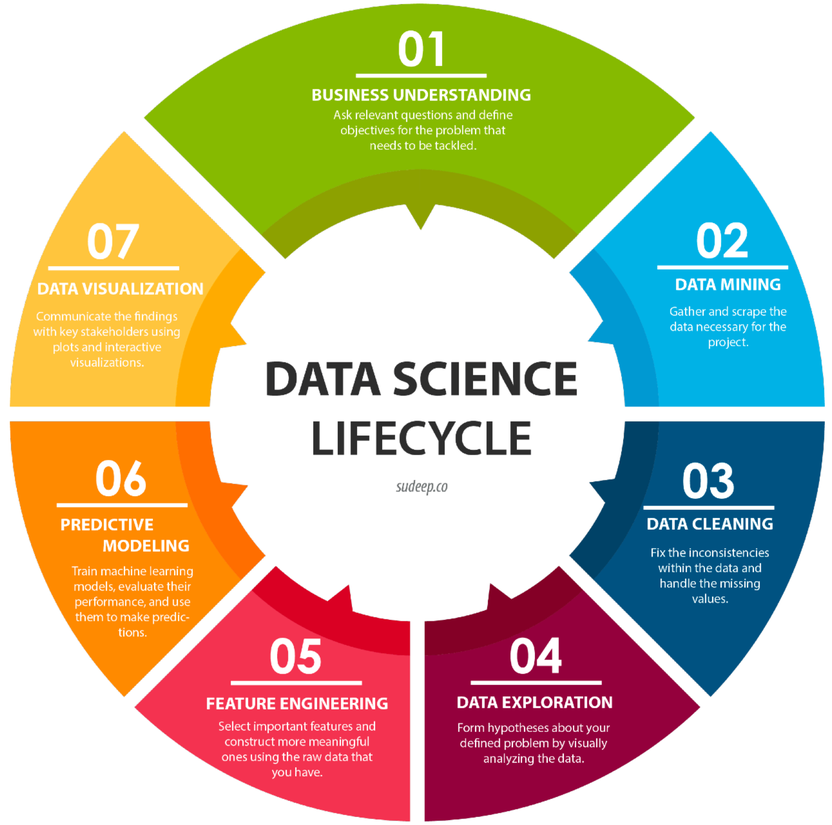
Topic 3: What do I want to see in the final project?

Review of important topics

- Lists, dictionaries, loops, if-elif-else, functions
- Pandas
    - Operations with rows and Columns
    - Groupby + apply + lambda

Review of important topics

- Lists, dictionaries, loops, if-elif-else, functions
- Pandas
    - Operations with rows and Columns
    - Groupby + apply + lambda



Review of important topics - Data Cleaning

- Step 1: Remove irrelevant data
- Step 2: Deduplicate your data
- Step 3: Fix structural errors
- Step 4: Deal with missing data
- Step 5: Deal with or Filter out data outliers
- Step 6: Validate your data

Review of important topics - EDA

- Categorical EDA
- Numerical EDA
    - Univariate analysis
    - Bivariate analysis (Categorical + Numerical)
    - Multivariate analysis

Review of important topics - Matplotlib & Seaborn

Load Libraries

```
import matplotlib.pyplot as plt
import seaborn as sns
```

Fully customizable

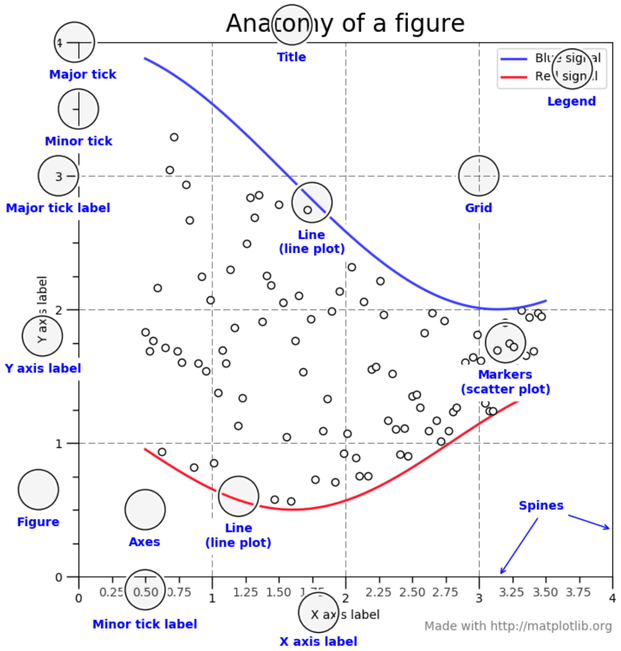
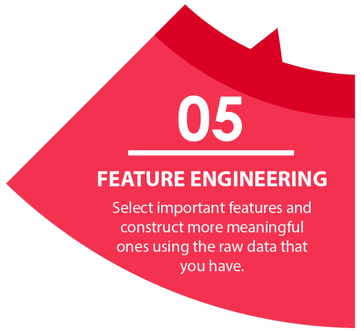
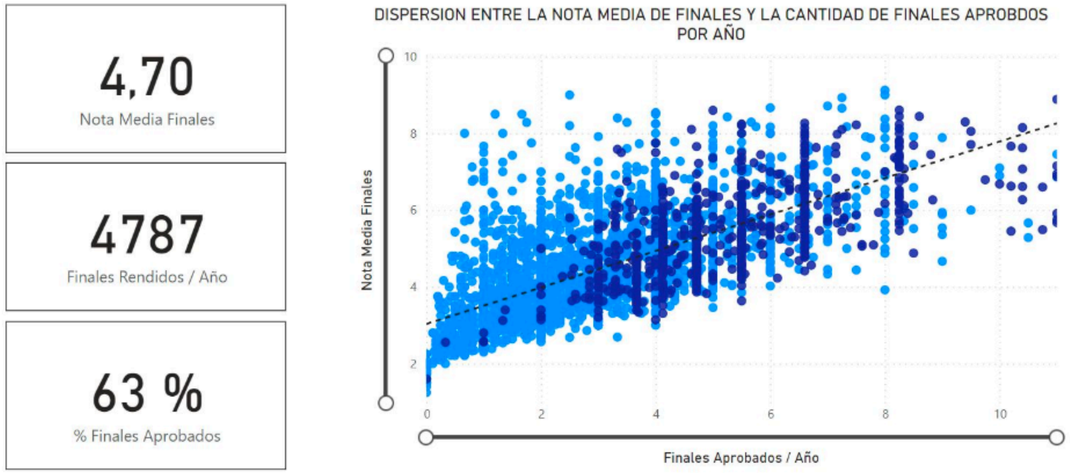


Figure structure

```
#Start Figure
fig, ax = plt.subplots(figsize=(5, 5))

#Body of the figure to build and the data to use
sns.barplot(x=to_plot['gender'], y=to_plot['index'],
            palette=['#08519c', '#f03b20'])

#Change Axes
ax.set_xlabel("Gender", fontsize=12)
ax.set_ylabel("", fontsize=12)
ax.set_yticklabels(['Male', 'Female'])
ax.spines['top'].set_visible(False)
ax.spines['right'].set_visible(False)

# Add Numbers to plot
for index, row in to_plot.iterrows():
    ax.text(row.gender + 25, index, row.gender,
             color='black', ha="center", fontsize=12)

## Add legend
custom_lines = []
for el in [('Male', '#08519c'), ('Female', '#f03b20')]:
    custom_lines.append(
        plt.plot([],[], marker="o", ms=8, ls="", mec='black',
        mew=0, color=el[1], label=el[0])[0]
    )
ax.legend(
    bbox_to_anchor=(0., 1.05, 1., .102),
    handles=custom_lines, loc='upper center',
    facecolor='white', ncol=1, fontsize=10, frameon=False
    )
#Save or show
plt.show()
```

Review of important topics - Feature engineering

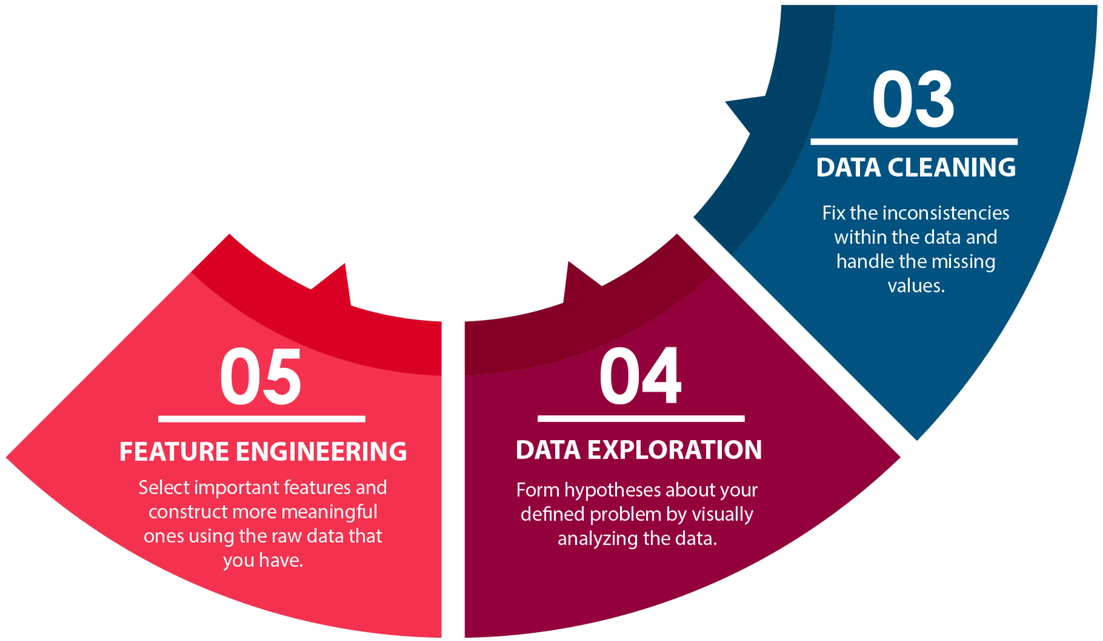




- Do you think maybe some columns could provide more information?
- Examples of current projects:
  - Chatbot: #TimesAsking4help, #Words
  - Universities: #PassedSubjects, GradeMean
- Obtain then figures with those new features

Review of important topics

- Until here you have done 90 % - 95 % of your coding work



Review of important topics - Data Preparation & Model

- Data Encoding
- Data Normalization
- Train Test Split
- Model Selection. Classification or Regression
- Code model, analyze model & get outputs

Remember

Final Project: Housing Dataset

Pepe Bonet Giner

Table of contents:


```
: # Load Packages that I will use
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

1. Load Data

Go up

- Clean & Organized code
- With different sections & comments in your code
- Ordered workflow (Minor exploration, Cleaning, EDA, etc…)
- Show me what you have learned

Let’s start working on it

First, are there any questions regarding what you guys have to do?

Let’s start working on it

First, are there any questions regarding what you guys have to do?

Mini-warning: to use the bank marketing response dataset you load it with:

pd.read_csv(‘bank_marketing_response.tsv’, **sep=‘\t’**)

esade

Topic 4: Advanced Python

Advanced Python main topics

- Scripting (VStudio)
- Classes
- Click
- Debugging
- GitHub 1 (Version Control)
- GitHub 2 (CD & CI)
- Project Structure
- Testing
- Multiprocessing
- Exceptions + assert
- Linting + Black + Cleaning Code

esade

Topic 5: Learning Python & Documentation

How do we learn it?

How do we learn it?

Practice

How do we learn it?

Job (Projects)

University Courses

Videos

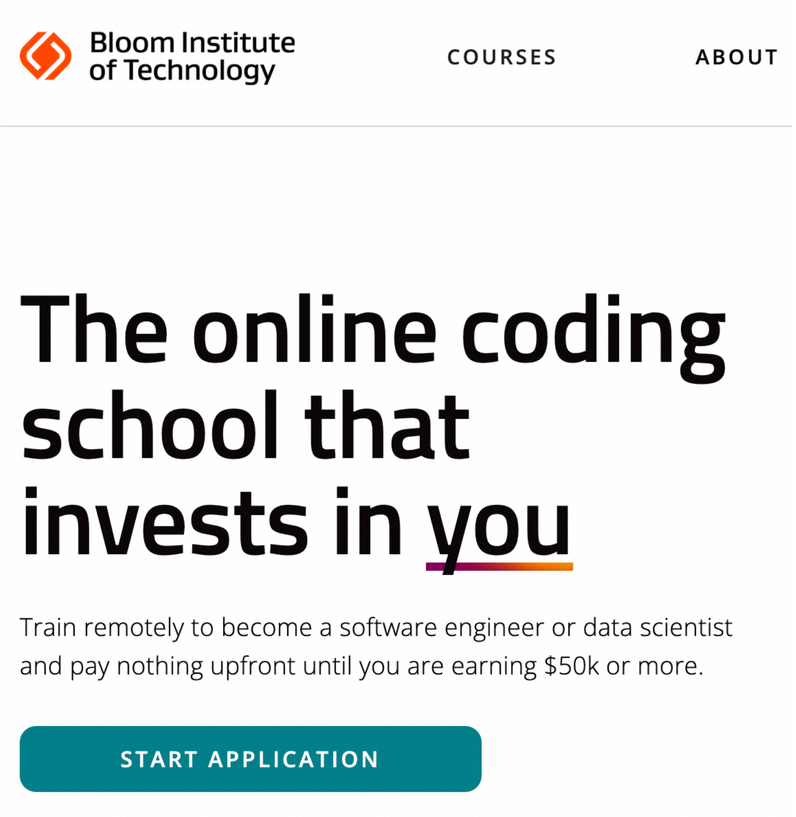
Practice

Own Projects

Online Courses

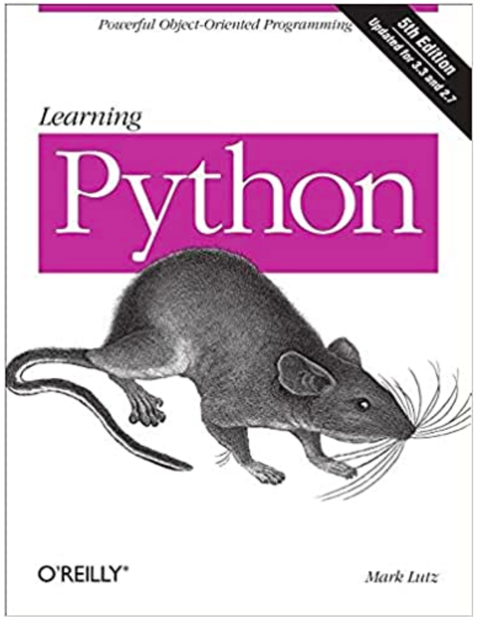
Books

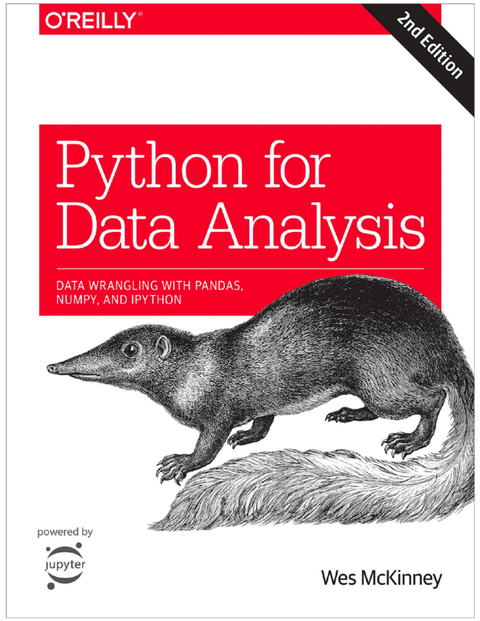
How do we learn it?

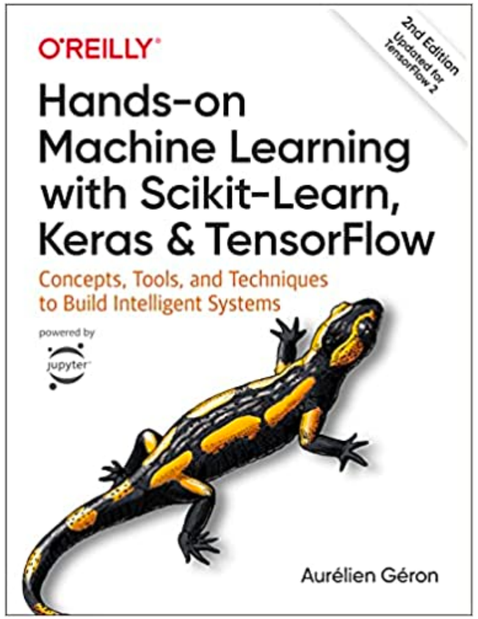


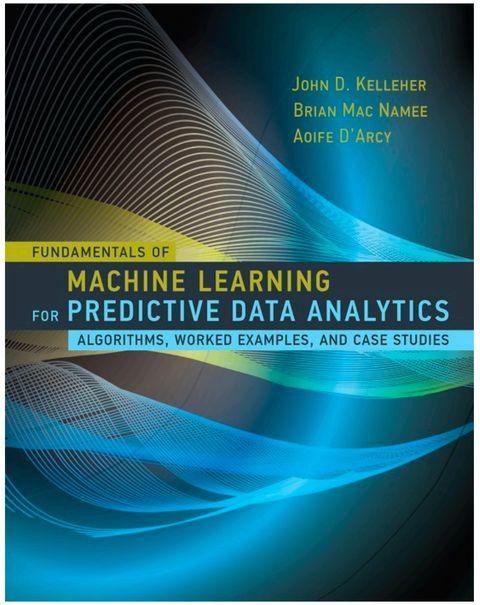
Datacamp Courses

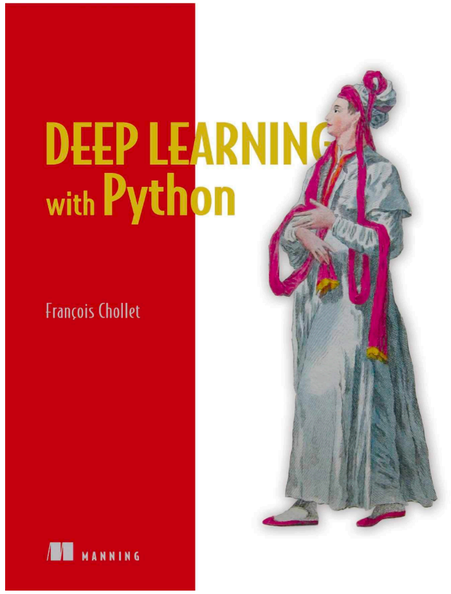
Free Books to learn Python & data analytics











esade

Topic 6: Final Words

You are already ahead

- I know writing code is frustrating
- Having somebody telling you how bad you are doing it every minute is not nice
- Especially if you spend hours stuck in a problem
- But you know a lot of Python already

You are already ahead

- I know writing code is frustrating
- Having somebody telling you how bad you are doing it every minute is not nice
- Especially if you spend hours stuck in a problem
- But you know a lot of Python already

Me

20-21

Coding?
What is that?

You are already ahead

- I know writing code is frustrating
- Having somebody telling you how bad you are doing it every minute is not nice
- Especially if you spend hours stuck in a problem
- But you know a lot of Python already

Me

20-21

Coding?
What is that?

Python: 22
Pandas & JN: 24
AI & ML: 24-25
DL: 25-26
Teaching & Workshops: 27-28

You are already ahead

- I know writing code is frustrating
- Having somebody telling you how bad you are doing it every minute is not nice
- Especially if you spend hours stuck in a problem
- But you know a lot of Python already

Me

20-21

Coding?
What is that?

Python: 22
Pandas & JN: 24
AI & ML: 24-25
DL: 25-26
Teaching & Workshops: 27-28

You

20-21

- Business & Economy knowledge
- Intermediate Python
- Pandas & JN
- Work with Datasets
- AI Intuition

You are already ahead

- I know writing code is frustrating
- Having somebody telling you how bad you are doing it every minute is not nice
- Especially if you spend hours stuck in a problem
- But you know a lot of Python already

Me

20-21

Coding?
What is that?

Python: 22
Pandas & JN: 24
AI & ML: 24-25
DL: 25-26
Teaching & Workshops: 27-28

You

20-21

- Business & Economy knowledge
- Intermediate Python
- Pandas & JN
- Work with Datasets
- AI Intuition

If you enjoy it, the only thing you need is to work on it

My Take reviewed

- I hope you are more aware after the course that AI is changing the world and you will have to live in it
- Chances are your work may be affected by it, but ideally, this course has prepared you a bit more for it. It can be programming, but it can also be possibilities to exploit AI and hire people to do it or related projects where you have to understand a bit of the technical/coding part as well
- I hope this course has taken you closer to a better understanding of python, how to use it to extract information for datasets, and the AI world and its possible applications
- Essentially, I hope you learned something and enjoyed it. It is been a pleasure!

Thank you!

Feel Free to contact me!

- Linkedin: Jose Bonet Giner
- Personal mail: pepebogi5@gmail.com
- Company website: hyntsanalytics.com
- Blog: pepesjourney.com

Thank you! / Last exercise ;)

Fill in the survey / Feedback form!