

0101-training-notebook

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1 0101 - First Session With Python - Solution Notebook

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1.1 About

1.1.1 Using Jupyter

You have 2 options: - Locally:

- ****Install Anaconda** <https://www.anaconda.com/> or Jupyter <https://jupyter.org/install> on your machine

- Use Anaconda or Jupyter installed on the Unilasalle PC (****Warning ****: some packages may be missing)

- Online:
 - Use Google Colab <https://colab.research.google.com/> (you have to be connected to your google account)
 - **Open this notebook on Google colab URL**
 - * Badge
 - Use Jupyter online <https://jupyter.org/try-jupyter> (**Warning** : External packages cannot be installed)

1.1.2 Material

All the material for this course could be found here. - <https://github.com/AlexandreGazagnes/Unilassalle-Public-Ressources/tree/main/4a-data-analysis>

1.1.3 Python / Jupyter ?

Few Questions : - Why Python - Python vs R ? - What is Data Analysis ? - What are we talking about ? - What is Jupyter ?

1.1.4 Context

You are a new employee of the NPO named “NPO”.

You are in charged of data analysis.

First project is about GHG emissions, more precisely regarding Bovine Meat.

1.1.5 Data

After a quick look on the internet, you find a very interesting dataset on the FAO website. It contains a list of various indicators. You decide to use this dataset to identify segments of countries.

- Find relevant data :
 - <https://www.kaggle.com/datasets/unitednations/global-food-agriculture-statistics>
 - <https://www.kaggle.com/datasets/dorbicycle/world-foodfeed-production>
 - <https://www.fao.org/faostat/en/>
 - <https://fr-en.openfoodfacts.org/>
 - <https://fr-en.openfoodfacts.org/data>

You can use a preprocessed version of the dataset [here](#). (Best option)

1.1.6 Mission

Our job is to : * Prepare notebook environment * Load data * Explore data * Clean data ==> Select relevant data * Clean data ==> Handle missing values * Clean data ==> Handle duplicates ? * Clean data ==> Handle outliers ? * Perform some basic analysis and data inspection * Perform some basic visualisation * Export our data

1.1.7 Usefull Ressources about Google Colab

- On Youtube :
 - <https://www.youtube.com/watch?v=8KeJZBZGtYo>
 - https://www.youtube.com/watch?v=JJYZ3OE_lGo
 - <https://www.youtube.com/watch?v=tCVXoTV12dE>

1.1.8 Usefull Ressources about Anaconda and Jupyter

- On Youtube :
 - <https://www.youtube.com/watch?v=ovlID7gefzE>
 - <https://www.youtube.com/watch?v=IMrxB8Mq5KU>
 - <https://www.youtube.com/watch?v=Ou-7G9VQugg>
 - https://www.youtube.com/watch?v=5pf0_bpNbkw

1.1.9 Teacher

- More info :
 - <https://www.linkedin.com/in/alexandregazagnes/>
 - <https://github.com/AlexandreGazagnes>

1.2 Preliminaries

1.2.1 System

These commands will display the system information:

Uncomment theses lines if needed.

```
[ ]: # pwd
```

```
[ ]: # cd ..
```

```
[ ]: # ls
```

```
[ ]: # cd ..
```

```
[ ]: # ls
```

These commands will install the required packages:

Please note that if you are using google colab, all you need is already installed

```
[ ]: # !pip install pandas matplotlib seaborn plotly scikit-learn
```

This command will download the dataset:

Please note that we will download the dataset later, in this notebook

```
[ ]: # !wget https://gist.githubusercontent.com/AlexandreGazagnes/  
↪2000e5c0e9149ffdb8c682a751ac448a/raw/  
↪35ad83320c26155415b7cccff8a4150ee80ee501/FAO_Unilassalle_raw.csv
```

1.2.2 Imports

Import data libraries:

```
[ ]: import pandas as pd # DataFrame  
import numpy as np # Matrix and advanced maths operations
```

Import Graphical libraries:

```
[ ]: import matplotlib.pyplot as plt # Visualisation  
import seaborn as sns # Visualisation  
import plotly.express as px # Visualisation (not used here)
```

:warning:These imports must be done, it is not possible to use this notebook without pandas, matplotlib etc.

1.2.3 Data

1st option : Download the dataset from the web

```
[ ]: # url  
url = "https://gist.githubusercontent.com/AlexandreGazagnes/  
↪2000e5c0e9149ffdb8c682a751ac448a/raw/  
↪35ad83320c26155415b7cccff8a4150ee80ee501/FAO_Unilassalle_raw.csv"  
url
```

Read the data :

```
[ ]: df = pd.read_csv(url, encoding="latin1")
df.head()
```

2nd Option : Read data from a file

```
[ ]: # # or

# fn = "my/awesome/respository/my_awesome_file.csv"
# fn = "./data/source/FAO.csv"
# df = pd.read_csv(fn, encoding='latin1')
```

1.3 Data Exploration

1.3.1 Display

Display the first rows of the dataset:

```
[ ]: # head

df.head()
```

Display the last rows of the dataset:

```
[ ]: # tail

df.tail(10)
```

Display a sample of the dataset:

```
[ ]: # sample 10

df.sample(10)
```

```
[ ]: # Sample with just 10% of the dataset

df.sample(frac=0.1)
```

1.3.2 Structure

What is the shape of the dataset?

```
[ ]: # shape
```

What data types are present in the dataset?

```
[ ]: # dtypes
```

:warning: **Please note that we have here main python dtypes** Data types : - int : *Integer* : 1,2,12332, 1_000_000 - float : *Float* : 1.243453, 198776.8789, 1.9776 - object : In this example object stands for *String* : “Paris”, “Rouen”, “Lea”

Count the number of columns with specific data types:

```
[ ]: # value_counts
```

Select only string columns:

```
[ ]: # select_dtypes
```

Counting unique values for string columns :

```
[ ]: # nunique
```

1.3.3 Select data

Display all the columns :

```
[ ]: # columns
```

Just use a small number of columns :

```
[ ]: columns = [  
    "Area Abbreviation",  
    "Area Code",  
    "Area",  
    "Item Code",  
    "Item",  
    "Element Code",  
    "Element",  
    "Unit",  
    "latitude",  
    "longitude",  
    "Y2010",  
    "Y2011",  
    "Y2012",  
    "Y2013",  
]  
columns
```

Make your column selection and display the output :

```
[ ]: # loc ? => JUST THE OUTPUT
```

If this Transformation is OK, you can re-write your `df` variable :

```
[ ]: # loc ? => REWRITE the DF
```

Use `iloc` to select the `nth` line and the `nth` column :

```
[ ]: # iloc
```

Use `iloc` to select data from 1st to the `nth` line and from first to the `nth` column :

```
[ ]: # iloc
```

Just keep in mind the global shape of our dataset :

```
[ ]:
```

And the names of our columns :

```
[ ]:
```

Columns with the *code* key word are not relevant :

```
[ ]: columns = ["Area Code", "Item Code", "Element Code"]
      columns
```

Suppose we have 1_000 columns ...

Let's find a more *pythonic* way to extract the *code* columns :

```
[ ]:
```

:clap: We have used : - a list : `columns = []` - a for loop - an if statement

What is the value of the `columns` variable ?

```
[ ]:
```

Let's drop these columns :

```
[ ]: # drop columns
```

Rewrite our dataframe

```
[ ]:
```

```
[ ]: # drop indexes
```

```
[ ]: # Drop with errors="ignore"
```

Another usage of `iloc` :

```
[ ]: # Implenting iloc
```

So far so good, we can rewrite our `df`

```
[ ]: # Saving our df
```

Selecting a specific column :

```
[ ]: # 1st implementation
```

```
[ ]: # 2nd implementation
```

Can we have a good representation of each unique value for the `Item` column ?

```
[ ]: # Item unique ?
```

Is `meat` in our `Item` column ?

```
[ ]: # Meat in Item unique ?
```

Use a list, a for loop and an if statement to be sure to have all items with `Meat` :

```
[ ]: # Select meat items
```

Build a boolean selector :

```
[ ]: # Creating a selector True / False
```

Select relevant data with the `loc` method :

```
[ ]: # .loc
```

Try a more advanced selection :

```
[ ]: # More advanced selection
```

What about `Area` ?

```
[ ]: # Area?
```

And area number of unique values ?

```
[ ]: # Area nunique ?
```

Same for `Item` :

```
[ ]: # Item nunique ?
```

Same for `Unit` :

```
[ ]: # Unit unique ?
```

Drop useless columns :

```
[ ]: # Drop other useless columns

columns = [
    "Item",
    "Element",
    "Unit",
    "latitude",
    "longitude",
]
```

1.3.4 NaN Values

Lets have a look to NaN (Not a Number) aka missing values :

```
[ ]: # Nan Values
```

Compute the sum of missing values for each line :

```
[ ]: # Sum of Nan Values
```

Try to focus on a specific column:

```
[ ]: # Select Nan Values
```

Try to focus on a specific Country :

```
[ ]: # Other selection
```

Drop Sudan from our DataFrame :

```
[ ]: # Drop a specific row
```

```
[ ]: # Drop a specific row
```

Are we done ?

```
[ ]:
```

Useless but fun :

```
[ ]:
```

Final output of df :

```
[ ]:
```

1.3.5 Data Inspection

```
[ ]: # Describe
```

```
[ ]: # Better describe ?
```

```
[ ]: # Recast as int
```

```
[ ]: # Sort by values
```

```
[ ]: # Select small values
```

```
[ ]: # Select small values and sort
```

```
[ ]: # select 'big' values ==> drop lower values
```

```
[ ]: # sort by values top :
```

```
[ ]: # Are we good ?
```

```
[ ]: # Just to be sure :
```



```
[ ]: # Creating tmp variable, just with numeric values
```

```
[ ]: # Correlation matrix is non sens here  
# (sorry for that )
```

```
[ ]: # Heatmap ?
```

```
[ ]: # Better heatmap ?
```

```
[ ]: # Best heatmap ever done ?
```

```
[ ]: # Build your first function
```

```
[ ]: # Use this function
```

1.4 Visualisation

1.4.1 Distplot

```
[ ]: # Just to be sure
```

```
[ ]: # Just to be sure
```

```
[ ]: # Distplot
```

```
[ ]: # Distplot normal
```

```
[ ]: # What about skewness ?
```

```
[ ]: # What about kurtosis ?
```

```
[ ]: # Log1p => log(x+1) ?
```

```
[ ]: # Top 5
```

1.4.2 Barplot

```
[ ]: # Bar plot
```

```
[ ]: # Same but better
```

1.4.3 Boxplot

```
[ ]: # My favorite plot EVER ;)
```

```
[ ]: # Ok, this one
```

```
[ ]: # Just another df output
```

1.4.4 Lineplot

```
[ ]: # Melt ?  
[ ]: # Boxplot  
[ ]: # Line plot  
[ ]: # Melt only top 5
```

1.5 Export

Export the csv file :

```
[ ]:
```