



Python: Introduction to AI, Python and Colab

AAA-Python Edition



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Plan

- 1- What is AI ?
- 2- AI Branches
- 3- AI Applications
- 4- Introduction to Python
- 5- Jupyter NoteBook
- 6- Google Colab



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1- What is AI ?

- The definition of AI (Artificial Intelligence) depends on how it has been approached by the researchers through history.
- These approaches concern developing intelligent software taking into consideration **2** aspects: “**how do we think**” and “**how do we act**”.
- So in AI, we develop software that let machines be able to:
 - Think like a **human** intelligibly
 - Or Act like a **human** intelligibly
 - Or Think **Rationally**
 - Or Act **Rationally**



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1- What is AI ?

- If we want a more formal definition, we can select these 4 definitions :

| | Human | Rational |
|-------|--|--|
| Think | “[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning ...” (Bellman, 1978) | “The study of the computations that make it possible to perceive, reason, and act.” (Winston, 1992) |
| Act | “The art of creating machines that perform functions that require intelligence when performed by people.” (Kurzweil, 1990) | “Computational Intelligence is the study of the design of intelligent agents.” (Poole et al., 1998) |

Selected from (Stuart J Russell and Peter Norvig. Artificial intelligence: a modern approach. Pearson Education, Inc, 2010.).



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1- What is AI ?

- For example, we can find these involved techniques:

| | Human | Rational |
|-------|-----------------------------|-------------------|
| Think | Cognitive Science | Logic Programming |
| Act | Natural Language Processing | Rational Agents |

- It doesn't mean that each technique relate to only one category. For example, agents may need natural language processing skills.
- The categorization means, that the research will focus in a particular aspect related to the category it belongs to.



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2- AI Branches

- From the AI categories, many field emerged:

Machine Learning

Learn from data

Logic Based AI

Logic programming paradigm

Search

Select the optimal solution

Knowledge Representation

Efficient formal representation of Knowledge

Planning

Generate the most optimal plan to achieve a goal



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2- AI Branches

- From the AI categories, many field emerged:

Heuristics

Making estimations from the knowledge of a specific problem

Genetic Programming

Use biological processes in software to find answers to a large problem



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3- AI Applications

- We can use AI in:

Expert Systems

Speech recognition

Games

Robotics

Computer vision

Natural Language Processing



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4- Introduction To Python

- Python

Programming
language

(The syntax Rules)

Interpreter

(Perform source code
instructions)

The programming language

- Is easy to learn and powerful
- It has efficient high-level data structures
- It has a simple approach to object-oriented programming.
- It is ideal for scripting and rapid application development in many areas on most platforms.

The interpreter

- Is freely available in source or in binary form.
- It is available for all major platforms



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4- Introduction To Python

- Major versions
 - 2.* (many project compatibles only with python2)
 - 3.* (not backward compatible with python 2)
- In major of our code we will use **Python 3** (unless we specify an other version)
- Right now, the latest version is 3.7.0



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5- Jupyter Notebook

- It is :
 - An “Open-Source” web application
 - Allows you to create and share documents that contain :
 - Live code
 - Equations
 - Visualizations
 - Narrative Text
- It runs code in many programming languages
- For installation, it requires: python ≥ 3.3 , ≥ 2.7
- To run with additional languages, you have to install additional Kernels
- The list of all available Kernels can be found in Jupyter website (<https://github.com/jupyter/jupyter/wiki/Jupyter-kernels>)



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5- Jupyter Notebook



Logout

Files

Running

Clusters

Select items to perform actions on them.

Upload

New



/ Desktop



..

Notebook list empty.

Notebook:

Python 3

Other:

Text File

Folder

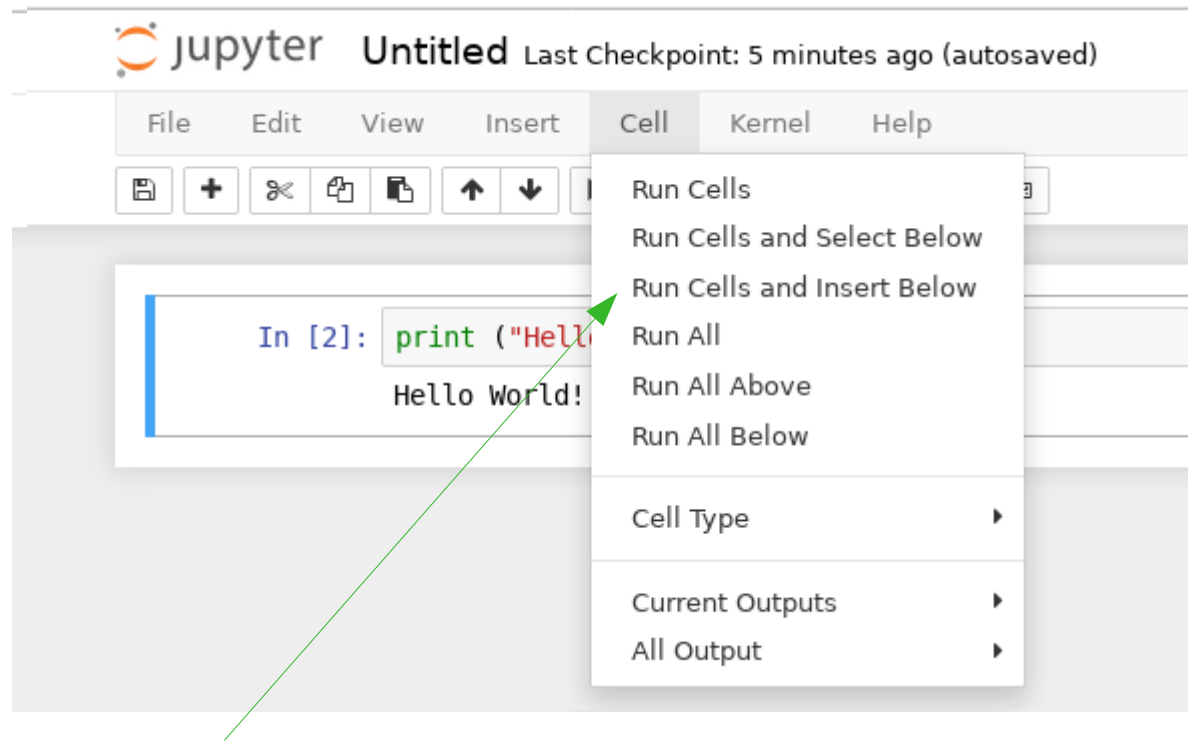
Terminal

To write code, you have to create a new Notebook



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5- Jupyter Notebook

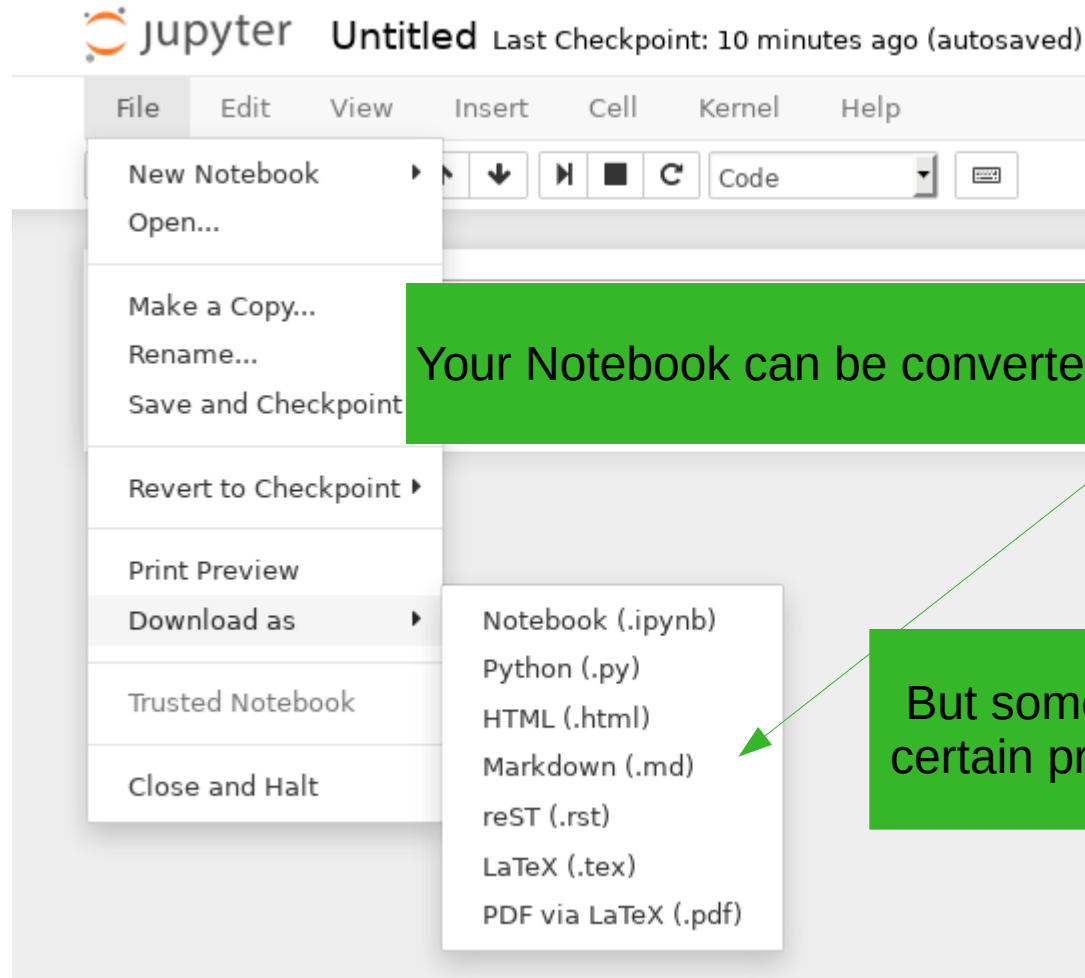


To run the code, you have to Run the Cells



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5- Jupyter Notebook





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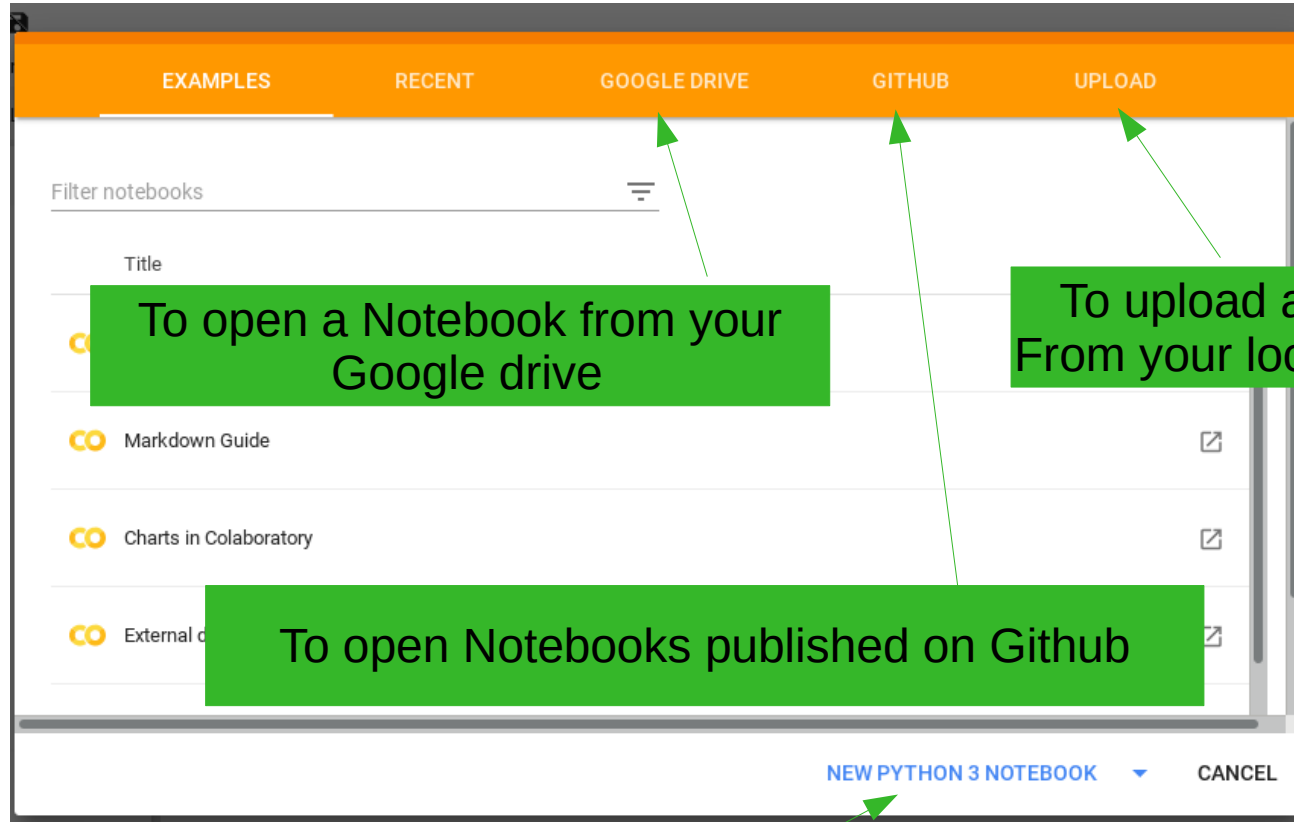
6- Google Colab

- Google Colaboratory is :
 - A **Jupyter notebook** environment that requires no setup to use.
 - It is a research **a free tool** for machine learning education and research
 - The Notebooks are stored in **Google Drive**
 - It supports **Python 2.7** and **Python 3.6**
 - It **doesn't support** other kernels (for now)
 - The code is executed in a **virtual machine** dedicated to a user account.
 - To use it, go to(<https://colab.research.google.com>)



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6- Google Colab



To open a Notebook from your Google drive

To upload a Notebook From your local file system

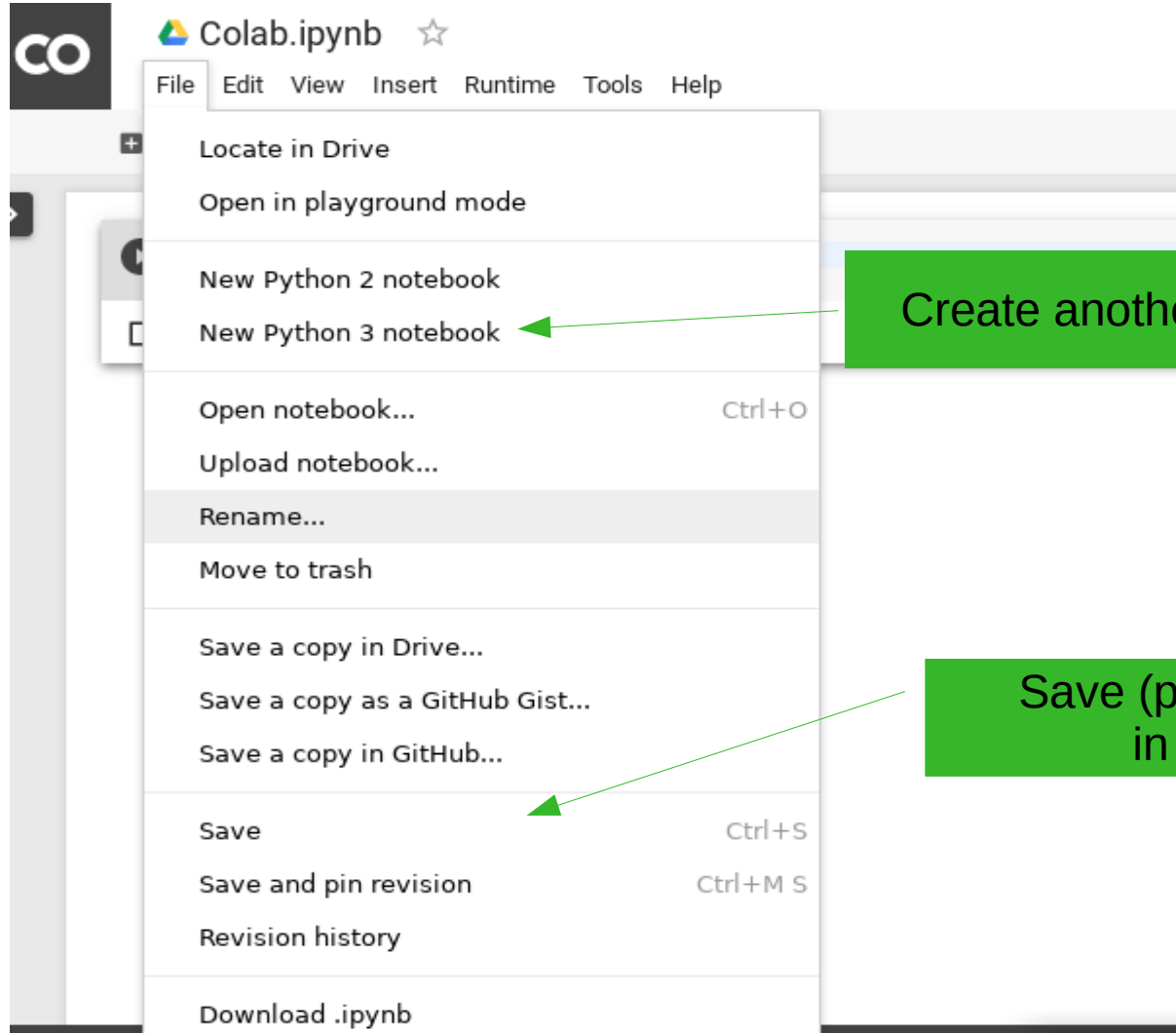
To open Notebooks published on Github

To create a new Notebook



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6- Google Colab





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6- Google Colab

The screenshot shows the Google Colab web interface. At the top, there's a 'CO' logo and the text 'Colab.ipynb' with a star icon. Below this is a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. A toolbar contains buttons for '+ CODE', '+ TEXT', '↑ CELL', and '↓ CELL'. A sidebar on the left has tabs for 'Table of contents', 'Code snippets', and 'Files'. The 'Code snippets' tab is active, displaying a list of pre-installed code snippets under the heading 'Filter code snippets'. The list includes: 'Altair: Bar Plot', 'Altair: Histogram', 'Altair: Interactive Brushing', 'Altair: Interactive Scatter Plot', 'Altair: Linked Brushing', 'Altair: Linked Scatter-Plot and Histogram', and 'Altair: Scatter Plot with Rolling Mean'. Each item has a right-pointing arrow. A green arrow points from a text box to the 'Code snippets' tab, and another green arrow points from a text box to one of the snippet arrows.

CO Colab.ipynb ☆

File Edit View Insert Runtime Tools Help

+ CODE + TEXT ↑ CELL ↓ CELL

Table of contents **Code snippets** Files X

Filter code snippets

- Altair: Bar Plot →
- Altair: Histogram →
- Altair: Interactive Brushing →
- Altair: Interactive Scatter Plot →
- Altair: Linked Brushing →
- Altair: Linked Scatter-Plot and Histogram →
- Altair: Scatter Plot with Rolling Mean →

A lot of sample codes
ready to use

Just Click in, and a new cell
will be created with the
corresponding code



Run the Cell

```
1 # load an example dataset
2 from vega_datasets import data
3 cars = data.cars()
4
5 # plot the dataset, referencing dataframe column names
6 import altair as alt
7 alt.Chart(cars).mark_bar().encode(
8     x='mean(Miles_per_Gallon)',
9     y='Origin',
10    color='Origin'
11 )
```

A horizontal bar chart titled 'Origin' on the y-axis and 'Mean of Miles_per_Gallon' on the x-axis. The y-axis lists three categories: Europe, Japan, and USA. The x-axis ranges from 0 to 35 with major ticks every 5 units. The bars are colored by origin: Europe is blue, Japan is orange, and USA is red. The bars show that Japan has the highest mean miles per gallon (approximately 30.5), followed by Europe (approximately 28), and the USA (approximately 20). A legend on the right side of the chart confirms the color coding for the origins.

| Origin | Mean of Miles_per_Gallon |
|--------|--------------------------|
| Europe | ~28 |
| Japan | ~30.5 |
| USA | ~20 |

Export as SVG Export as PNG View Source Open in Vega Editor

This is the results after running the Cell



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6- Google Colab

- Another interesting feature about Google Colab, is that we can install new **libraries** (we will talk about this later).

```
1 !pip install gym

Collecting gym
  Downloading https://files.pythonhosted.org/packages/9b/50/ed4a03d2be47ffd043b
    100% |████████████████████████████████████████| 1.5MB 7.0MB/s
Requirement already satisfied: numpy>=1.10.4 in /usr/local/lib/python3.6/dist-p
Requirement already satisfied: requests>=2.0 in /usr/local/lib/python3.6/dist-p
Requirement already satisfied: six in /usr/local/lib/python3.6/dist-packages (f
Collecting pygame>=1.2.0 (from gym)
  Downloading https://files.pythonhosted.org/packages/1c/fc/dad5eaaab68f0c21e2f
    100% |████████████████████████████████████████| 1.0MB 1.2MB/s
Requirement already satisfied: urllib3<1.23,>=1.21.1 in /usr/local/lib/python3.
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.6/d
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /usr/local/lib/python3.
Requirement already satisfied: idna<2.7,>=2.5 in /usr/local/lib/python3.6/dist-
Requirement alreadyv satisfied: future in /usr/local/lib/python3.6/dist-packages
```

- In this course, we will use Google Colab to run our Programs
- Since we program in Python 3, we will use **Python 3 Notebook**, unless we specify the other version



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References

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- Stuart J Russell and Peter Norvig. Artificial intelligence: a modern approach. Pearson Education, Inc, 2010.
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Thank you!

FOR ALL YOUR TIME