

Jupyter, Markdown, Python



KHOA CÔNG NGHỆ THÔNG TIN
TRƯỜNG ĐẠI HỌC KHOA HỌC TỰ NHIÊN

fit@hcmus

**WHY SHOULD A DATA SCIENTIST HAVE
JUPYTER
NOTEBOOK IN HIS/HER TOOLBOX?**

Why Jupyter notebook

- ☐ A data science process is a process of finding an answer for a question through data; this is a long process ...
- ☐ During this process, we want to **write text, code, write text, code, ...**
- ☐ Documenting the process not only helps us to review and continue our work next day but also helps stakeholders to verify our results at the end
- ☐ The coding style in data science is also quite special: **exploratory** — code some lines, observe results, code some lines, observe results, ...

Why Jupyter notebook

- ☐ Jupyter Notebook is a good tool for our need
- ☐ Jupyter Notebook is a “notebook” allowing us to:
 - ☐ Write text (using Markdown)
 - ☐ Write code and run code (using Python, but other programming languages are also supported)
- ☐ Jupyter Notebook also allow us to code in exploratory style

Offers a single document that contains

- ☐ Visualizations
- ☐ Mathematical equations
- ☐ Statistical modeling
- ☐ Narrative text
- ☐ Any other rich media

This single document approach enables users to develop, visualize the results and add information, charts, and formulas that make work more **understandable, repeatable, and shareable.**

Two variants of the Jupyter notebook

- **Jupyter Classic Notebook**, with all the capabilities mentioned above.
- **JupyterLab**, a new next-generation notebook interface designed to be much more extensible and modular, with support for a wide variety of workflows from data science, machine learning, and scientific computing.

What is Jupyter Notebook

- ☐ "notebook" or "notebook documents" denote documents that contain **both code and rich text elements**, such as figures, links, equations, ...
- ☐ Because of the mix of code and text elements, these documents are the ideal place to bring together an **analysis description**, and its results, as well as, they can be executed perform the data analysis in real time.
- ☐ The Jupyter Notebook App produces these documents.

Jupyter Notebook App

- ☐ As a **server-client application**, the Jupyter Notebook App allows you to edit and run your notebooks via a web browser.
- ☐ The application can be executed on a PC without Internet access, or it can be installed on a remote server, where you can access it through the Internet.

Jupyter Notebook App

- Its two main components are the kernels and a dashboard.
- A **kernel** is a program that runs and introspects the user's code. The Jupyter Notebook App has a kernel for Python code, but there are also kernels available for [other programming languages](#).
- The **dashboard** of the application not only shows you the notebook documents that you have made and can reopen but can also be used to manage the kernels: you can which ones are running and shut them down if necessary.

Use your Jupyter Notebooks

- ☐ Try to provide **comments** and **documentation** to your code. They might be a great help to others!
- ☐ Also consider a consistent naming scheme, code grouping, limit your line length, ...
- ☐ Don't be afraid to **refactor** when or if necessary.

Use your Jupyter Notebooks

- ☐ Don't forget to name your notebook documents!
- ☐ Try to keep the cells of your notebook simple: don't exceed the width of your cell and make sure that you don't put too many related functions in one cell.
- ☐ If possible, import your packages in the first code cell of your notebook
- ☐ Display the graphics inline.
- ☐ Sometimes, your notebook can become quite code-heavy, or maybe you just want to have a cleaner report. In those cases, you could consider hiding some of this code. You can already hide some of the code by using magic commands such as `%run` to execute a whole Python script as if it was in a notebook cell.
 - ☐ How to [hide code](#)

Share your Jupyter Notebooks

- ☐ Share .ipynb?
- ☐ File>Download as
- ☐ `jupyter nbconvert --to html Untitled4.ipynb`

AsciiDoc (.asciidoc)

HTML (.html)

LaTeX (.tex)

Markdown (.md)

Notebook (.ipynb)

PDF via LaTeX (.pdf)

PDF via HTML (.html)

PNG via HTML (.html)

reST (.rst)

Python (.py)

Reveal.js slides (.slides.html)

Use your Jupyter Notebooks

jupyter

Lab

gallagher_notebooks

notebook_unpolished.ipynb

JUPYTER

FAQ

An Unpolished Notebook

This notebook contains visible code blocks and other Jupyter elements. It's fine for some situations, but may not be appropriate for a polished presentation to a non-technical audience. To see how to make this look more polished, see my [blog post](#).

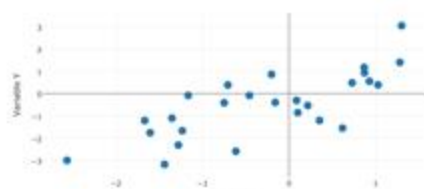
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```
In [2]: import plotly
import plotly.plotly as py
import plotly.graph_objs as go
from plotly import tools
import string
import numpy as np
plotly.offline.init_notebook_mode()

n = np.random.randn(10)
y = n * np.random.randn(10)
labels = {}
for i in range(10):
    labels[i] = {}
    labels[i]['x'] = n[i]
    labels[i]['y'] = y[i]

trace = go.Scatter(
    x=n,
    y=y,
    mode='markers',
    marker=dict(size=10),
    text=labels,
    hoverinfo='text',
    name='Sample Data',
)

fig = Figure(data=[trace], layout={})
fig['layout']['xaxis'] = dict(title='Variable X')
fig['layout']['yaxis'] = dict(title='Variable Y')
plotly.offline.plot(fig, show_link=False)
```



Conclusion

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Firefox version: 45.0

Internet Explorer: 11.0

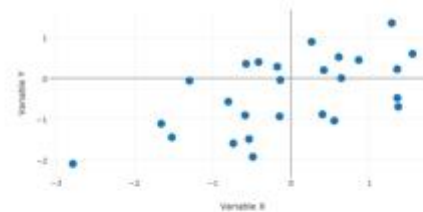
Powered (Sat, 12 Feb 2016 03:08:07 UTC)

Show Code

A Polished Notebook

This Jupyter presentation looks nice. Because it hides many of the Jupyter elements and makes code visibility optional (see button on left), it is appropriate for non-technical audiences or for those who just want a quick summary of your results. For instructions on how to do this, see my [blog post](#).

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Conclusion

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi architecto beatae vitae dicta sunt explicabo. Nemo enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem. Ut enim ad minima veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat? Quis autem vel eum iure reprehenderit qui in ea voluptate velit esse quam nihil molestiae consequatur, vel illum qui dolorem eum fugiat qui voluptas nulla pariatur?

Created with Jupyter, delivered by Fastly, rendered by Rackspace.

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Jupyter Notebooks for Data Science Teams: Best Practices

- ☐ Use two types of notebooks for a data science project, namely, a **lab notebook** and a **deliverable notebook**. The difference between the two is the fact that individuals control the lab notebook, while the deliverable notebook is controlled by the whole data science team,
- ☐ Use some type of versioning control (Git, Github, ...). Don't forget to commit also the HTML file if your version control system lacks rendering capabilities, and
- ☐ Use explicit rules on the naming of your documents.
- ☐ [For more information](#)

Learn From the Best Notebooks

- Notebooks are also used to complement books, such as the Python Data Science Handbook. You can find the notebooks [here](#).
- This [matplotlib tutorial](#) is an excellent example of how well a notebook can serve as a means of teaching other people topics such as scientific Python.

Markdown

- ☐ Markdown allow us to write plain text with marks to specify simple and widely used formats such as heading, bullet, italic, bold, ...
- ☐ It's **easy to read and write**
- ☐ Restricting users to a small set of formats also helps users to **focus more on content** when writing

Markdown

- ☐ If you just need to write text and don't need to run code, you can simply write to a Markdown file (*.md)
- ☐ From a Markdown file, you can convert to other formats using **Pandoc**
- ☐ In Jupyter Notebook, Pandoc is used behind the scene to convert a Notebook file to other formats

Python

- ☐ Why did Guido van Rossum create Python programming language, although C had already existed at that time?
- ☐ Guido van Rossum: “I realized that the development of system administration utilities in C was taking too long”

Why Python write faster

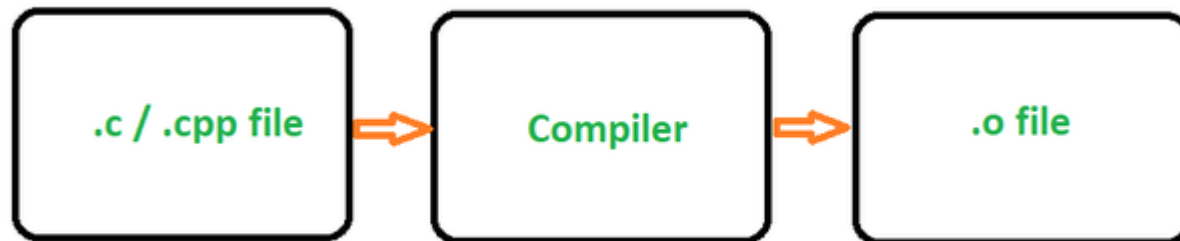
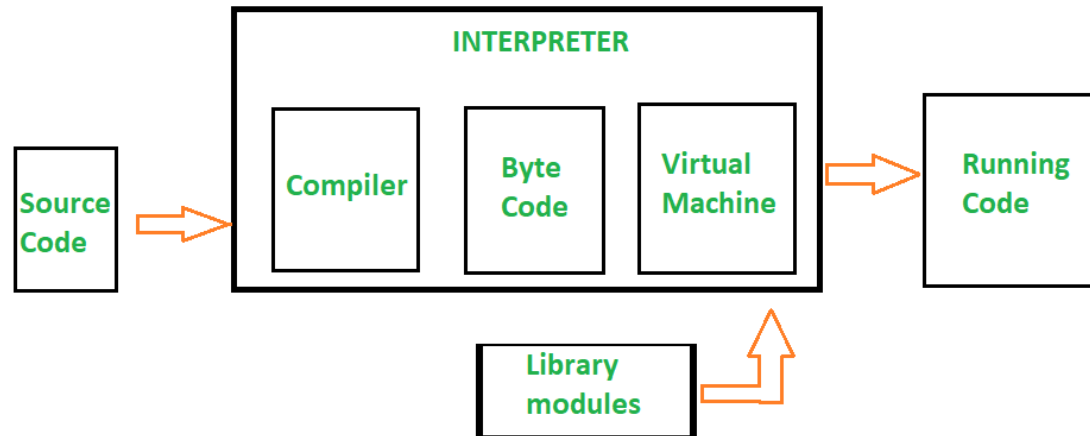
- ❑ **Interpreted language:** no need to compile all code before running; instead, programmers can code some lines of code and run immediately, and can continue to code and run from previous running state
- ❑ **Dynamic typing**

```
a = 1
...
a = 'hello'

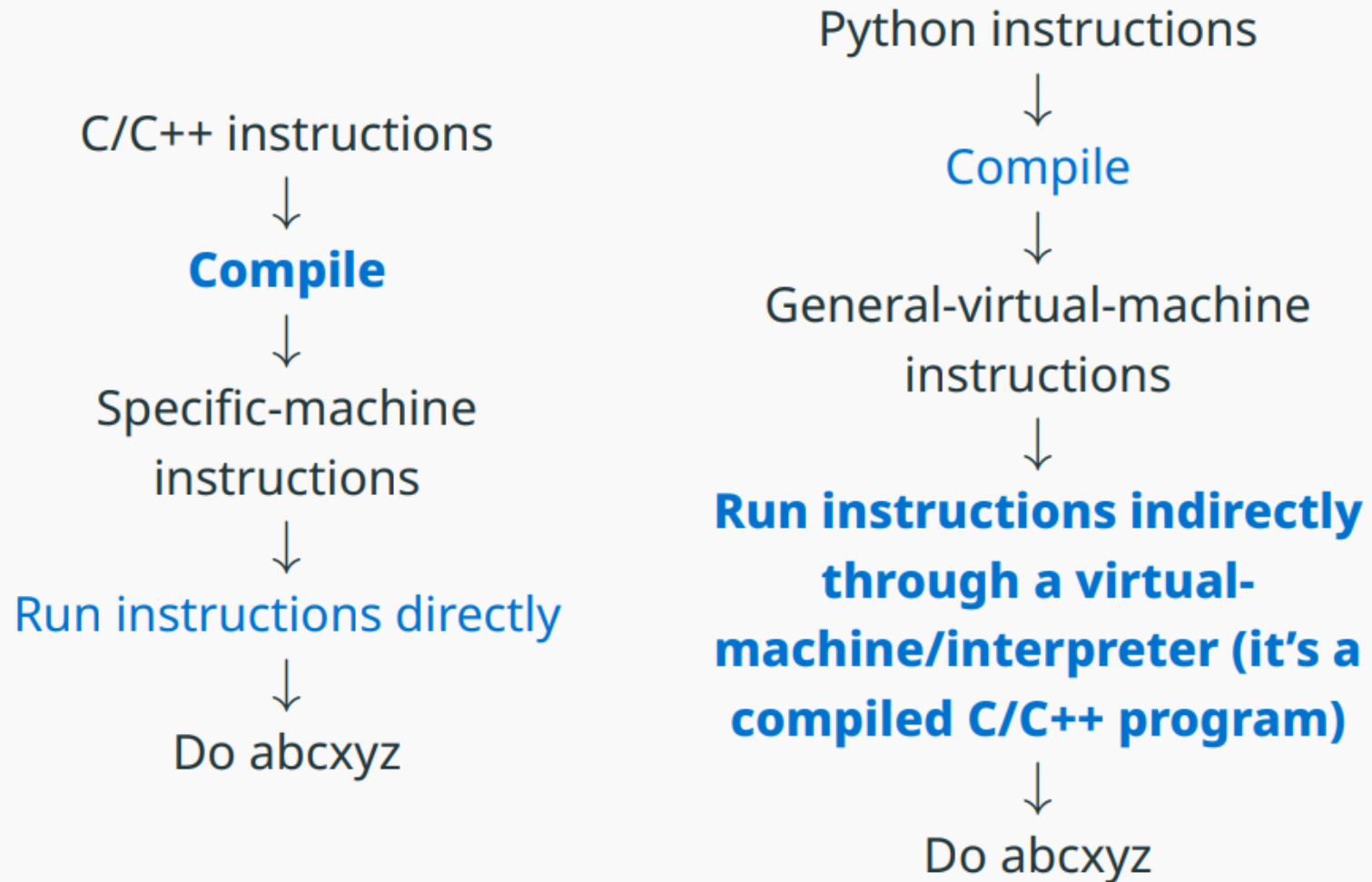
def add_two_things(a, b):
    return a + b

# Can call add_two_things
# with 2 arbitrary objects
# having + operation
```
- ❑ **Automatic memory management:** programmers don't have to spend time doing malloc and free memories manually as in C/C++

Why Python write faster



Why Python write faster

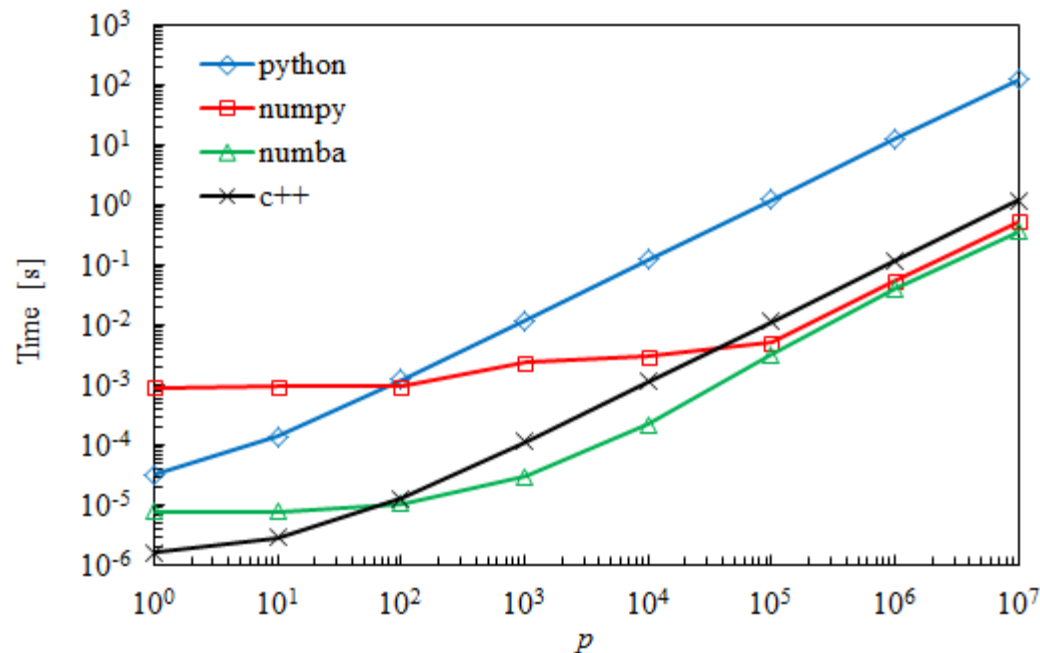


Why Python run slower

- **Interpreted language:** interpreted languages *often run slower* than compiled languages, because in compiled languages, before running, compiler will look at all source code and do optimizations
- **Dynamic typing:** to achieve this, a variable in Python is just a pointer pointing to an object, and this object contains not only value but also meta info such as data type, ...; when do an operation with 2 objects, Python interpreter first have to *spend time* opening these objects to identify data type
- **Automatic memory management:** it also costs *extra work and time* to know when to free allocated memories

Homework

- ☐ Compare runtime of matrix multiplication program with: **C, Python, numpy.**
- ☐ Test with several different size of matrix.
- ☐ Write report with Jupyter notebook with code and explain.



Reference

- ☐ <https://www.datacamp.com/tutorial/tutorial-jupyter-notebook>
- ☐ <https://www.markdowntutorial.com/>