Introduction to JupyterLab

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Introduction

Project Jupyter

- a non-profit, open-source project
- interactive data science
- scientific computing across all programming languages

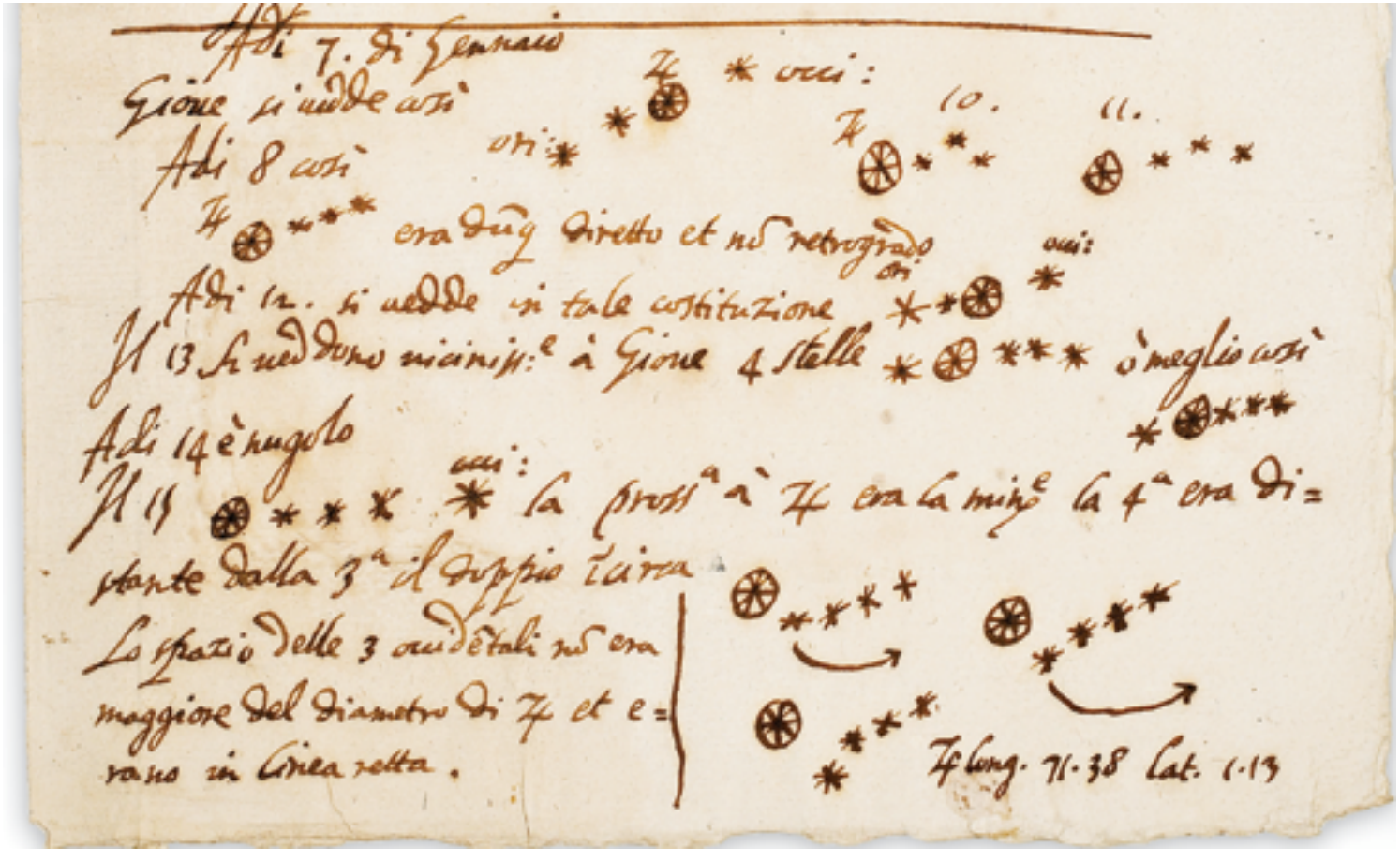
History

- 2014, Fernando Pérez announced a spin-off project from IPython called Project Jupyter.
- 2015, GitHub and the Jupyter Project announced native rendering of Jupyter notebooks file format (.ipynb files).

Philosophy

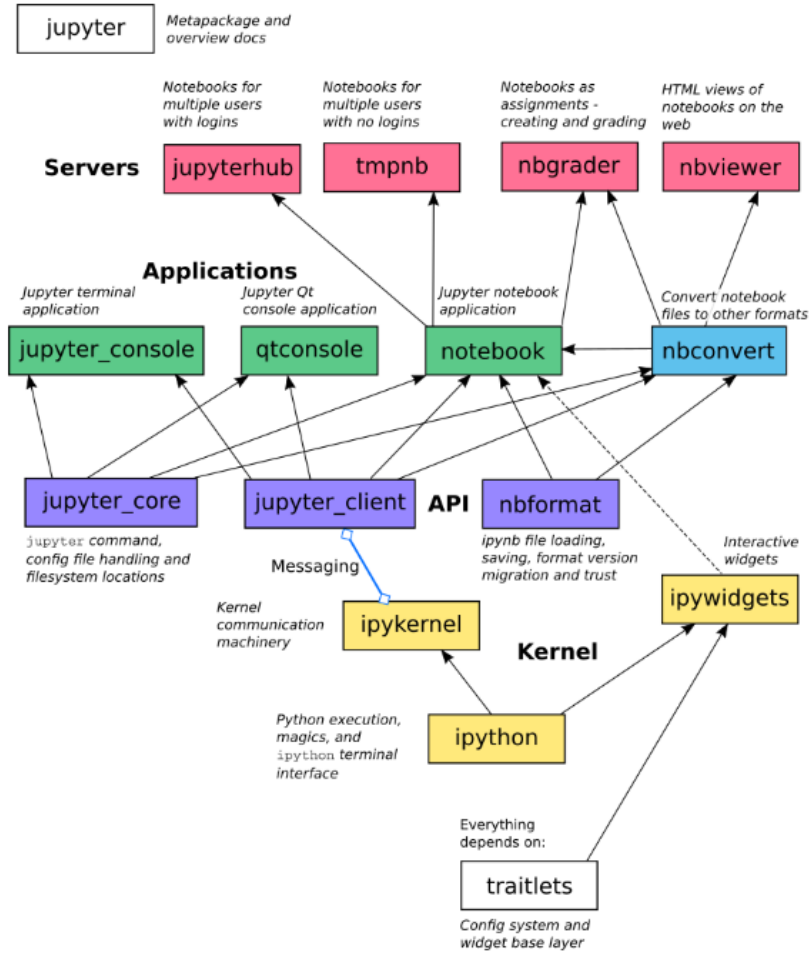
- support interactive data science and scientific computing across all programming languages
- open-source software : free for all to use and released under the liberal terms of the modified BSD license

Logo



- Inspiration from Galileo's manuscript about Jupyter (⊛) and its stars (✱)

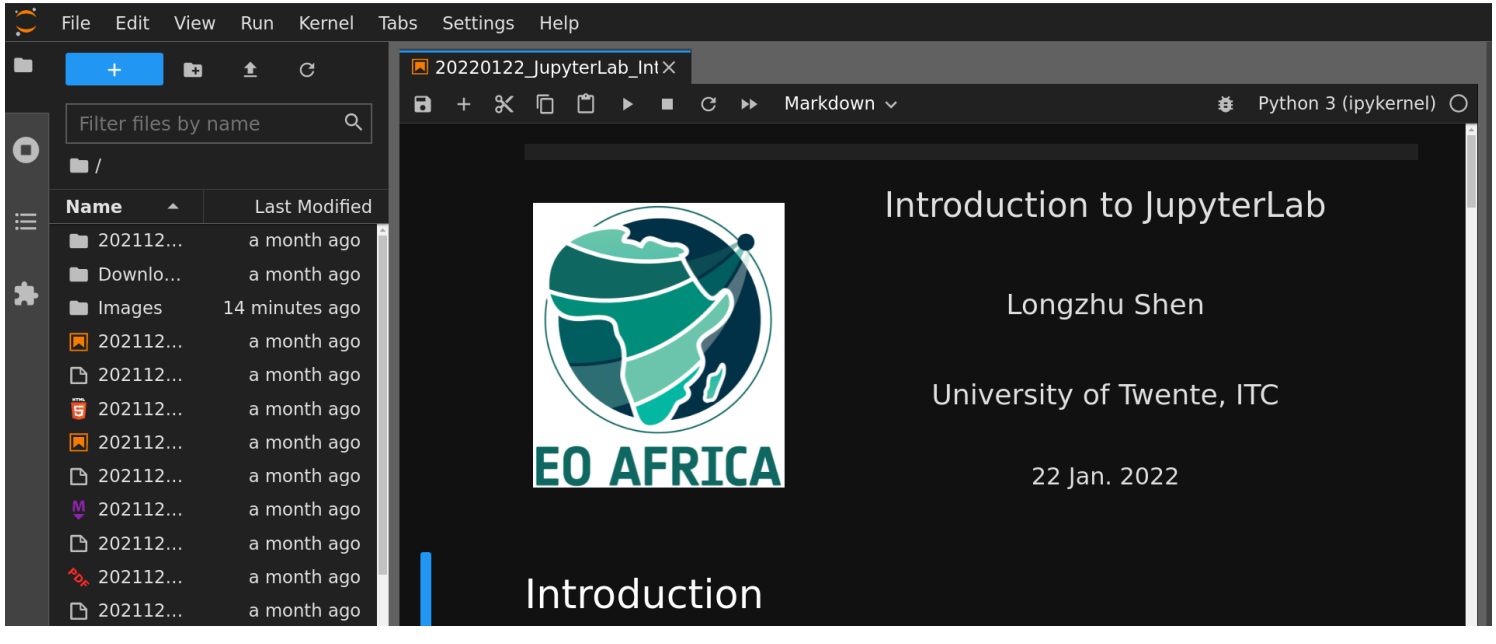
Project Overview



JupyterLab

- next-generation web-based user interface for Project Jupyter
- interactive development environment for notebooks, code, and data
- allowing onfigurationg and arrangement of workflows in data science, scientific computing, etc.
- a modular design with extensions to expand and enrich functionality

JupyterLab NoteBook Environment



Menu Bar

- File: actions related to files and directories
- Edit: actions related to editing documents and other activities
- View: actions that alter the appearance of JupyterLab
- Run: actions for running code
- Kernel: kernel management
- Tabs: tab related activities
- Settings: themes and configruations
- Help: jupyterlab help topics and references

Tool Bar


Markdown
Python 3 (ipykernel)
save
add new
cut
copy
paste
run a cell
stop
refresh
run the notebook
Markdown
cell type

File Manager

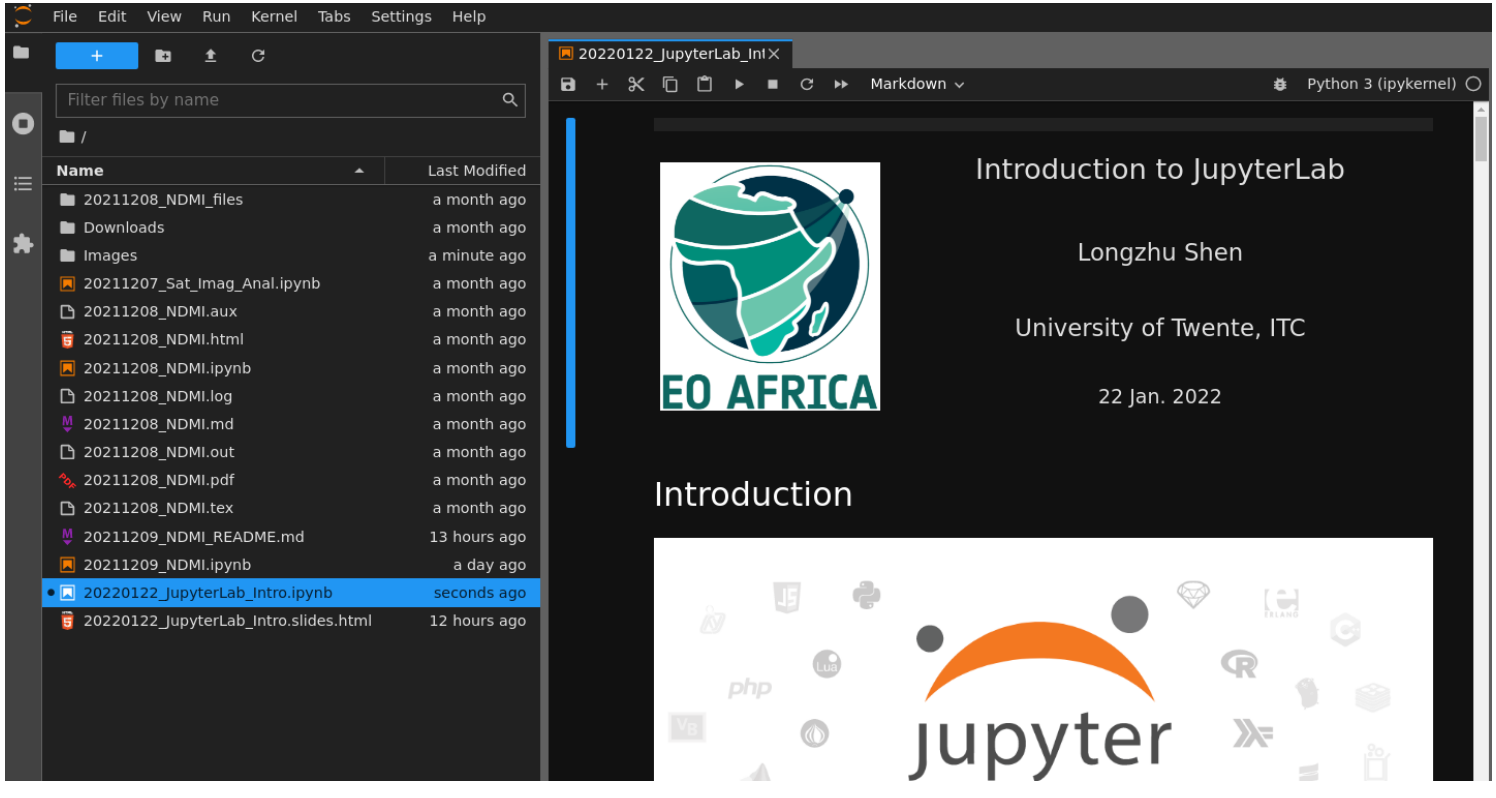
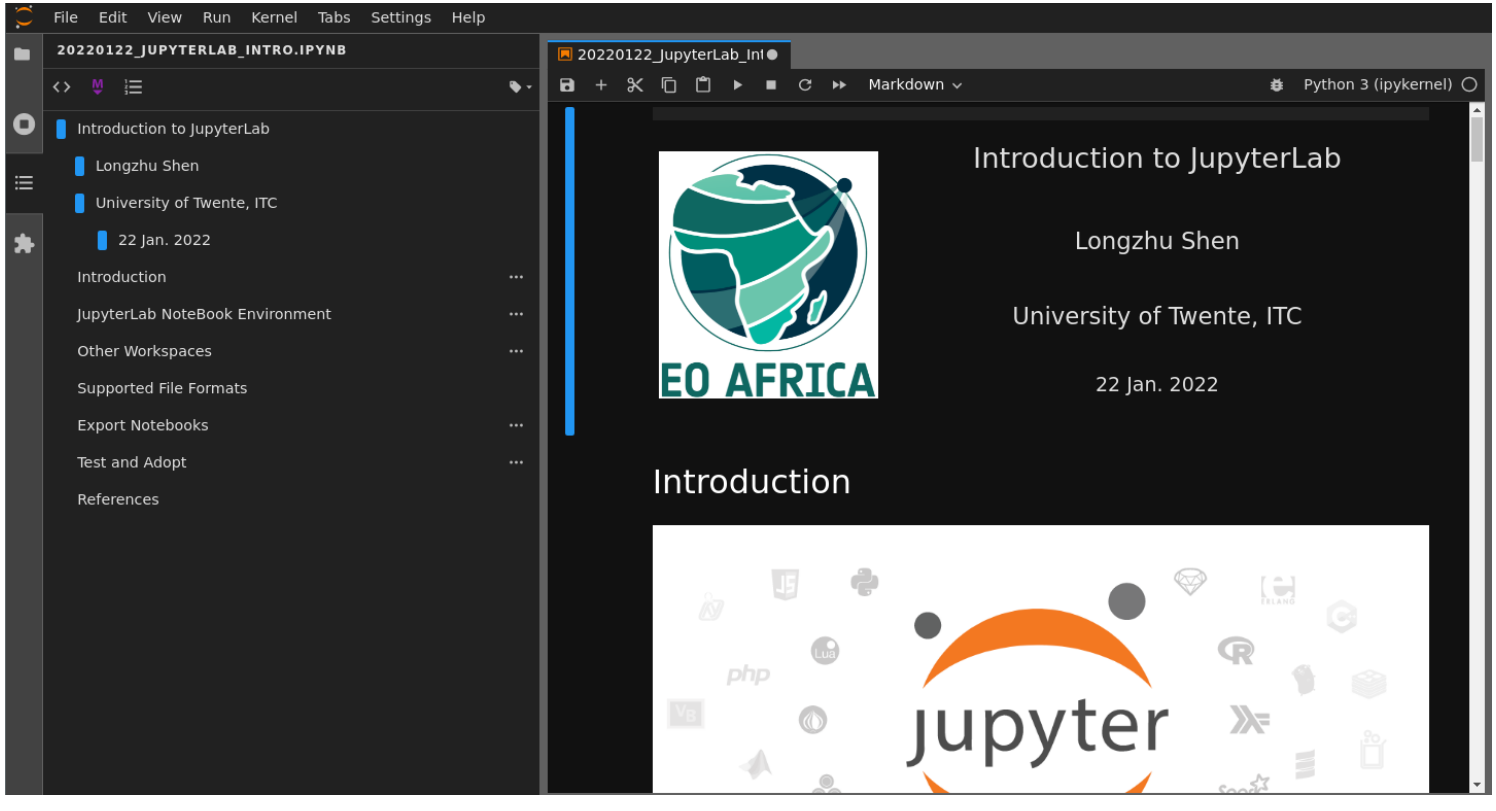


Table of Content



Cell Types

- Markdown
- Code
- Raw

Markdown

- popular markup language
- a superset of HTML
- more info

Markdown Basics

Bolded : **Bolded**

Italic : *Italic*

~Crossed off~ : ~Crossed off~

Markdown Basics

add headings by starting a line with one (or multiple) # followed by a space

```
# Heading 1
# Heading 2
## Heading 2.1
## Heading 2.2
```

Markdown Basics

- embedding code

  def f(x):

  ```
  """a docstring"""
  return x**2
  ```

Markdown Basics

- latex equation : $e^{i\pi} + 1 = 0\$

$$e^{i\pi} + 1 = 0$$

Code Cell

- running code in a wide range of languages
- each language associated with a kernel
- "Ctrl-Enter" run the current cell

Raw Cell

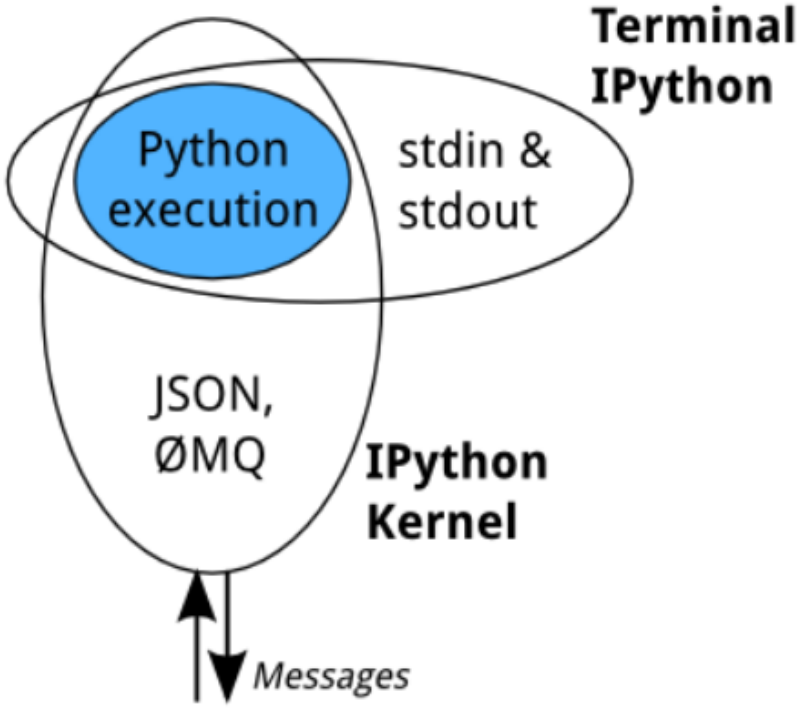
By default (if no cell format is selected), the cell content is included (without any conversion) in both the HTML and LaTeX output.

Raw cells in “reST” format are interpreted as reStructuredText and parsed by Sphinx.

Commonly Used Key Bindings

Change to Code Cell Type notebook:change-cell-to-code	Y
Change to Markdown Cell Type notebook:change-cell-to-markdown	M
Change to Raw Cell Type notebook:change-cell-to-raw	R
Copy Cell(s) notebook:copy-cell	C
Cut Cell(s) notebook:cut-cell	X
Delete Cell(s) notebook:delete-cell	D - D
Insert Cell Above notebook:insert-cell-above	A
Insert Cell Below notebook:insert-cell-below	B

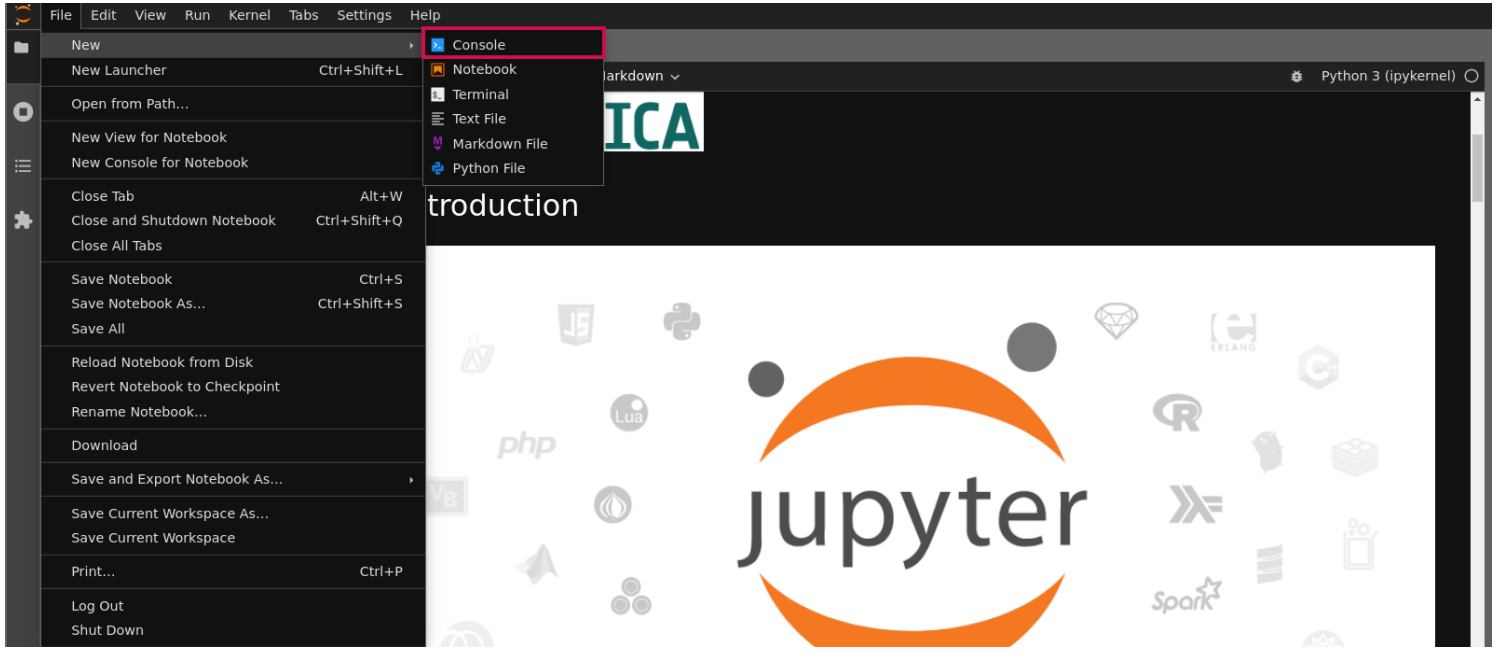
Ipython Kernel



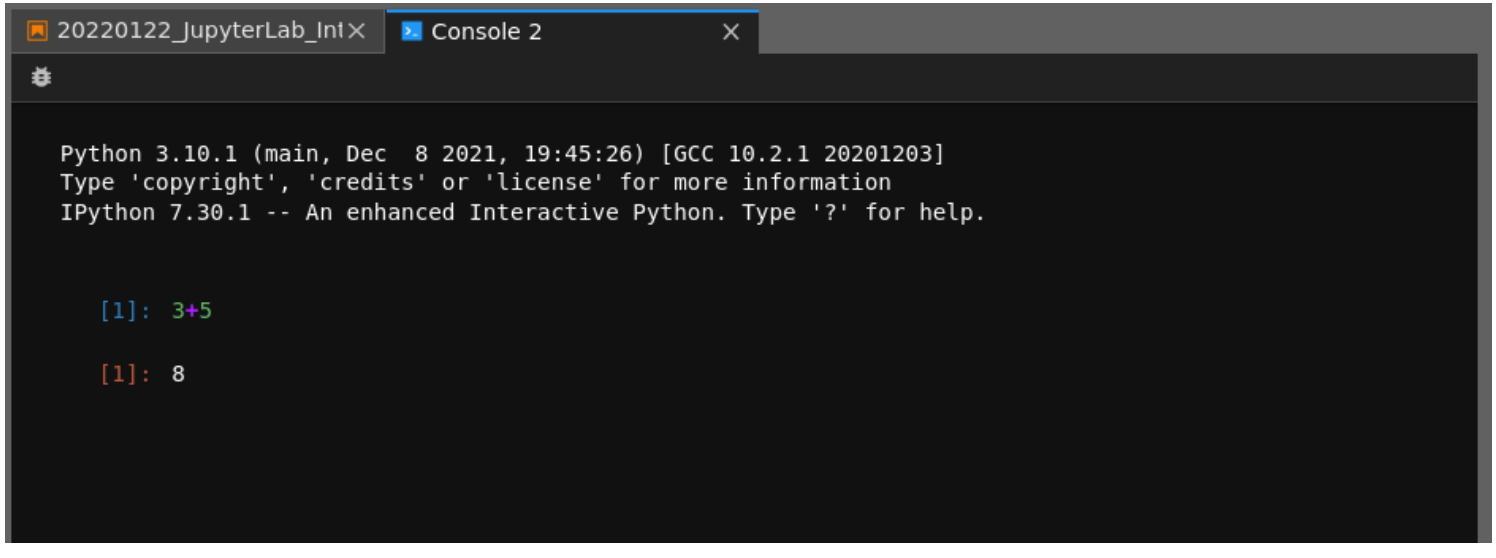
- a separate process responsible for running code, and things like computing possible completions
- can be connected to more than one frontend simultaneously

Other Workspaces

Consoles

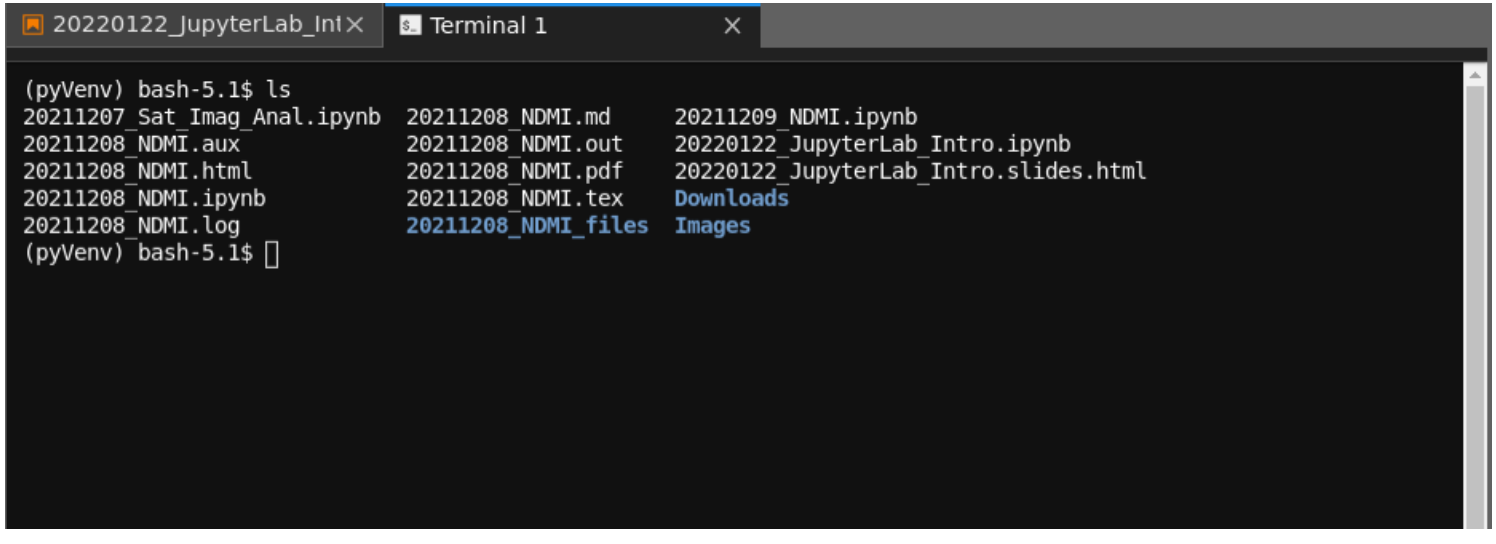

File
Edit
View
Run
Kernel
Tabs
Settings
Help
New
New Launcher
Ctrl+Shift+L
Open from Path...
New View for Notebook
New Console for Notebook
Close Tab
Alt+W
Close and Shutdown Notebook
Ctrl+Shift+Q
Close All Tabs
Save Notebook
Ctrl+S
Save Notebook As...
Ctrl+Shift+S
Save All
Reload Notebook from Disk
Revert Notebook to Checkpoint
Rename Notebook...
Download
Save and Export Notebook As...
Save Current Workspace As...
Save Current Workspace
Print...
Ctrl+P
Log Out
Shut Down
Console
Notebook
Terminal
Text File
Markdown File
Python File
Python 3 (ipykernel)
troduction
jupyter

Consoles



- Run code using "Shift Enter"
- Tab completion (Tab) and tooltips (Shift Tab)

Teminals


20220122_JupyterLab_Int
Terminal 1
(pyVenv) bash-5.1$ ls
20211207_Sat_Imag_Anal.ipynb
20211208_NDMI.aux
20211208_NDMI.html
20211208_NDMI.ipynb
20211208_NDMI.log
20211208_NDMI.md
20211208_NDMI.out
20211208_NDMI.pdf
20211208_NDMI.tex
20211208_NDMI_files
20211209_NDMI.ipynb
20220122_JupyterLab_Intro.ipynb
20220122_JupyterLab_Intro.slides.html
Downloads
Images
(pyVenv) bash-5.1$

Also

- Text File
- Markdown File

File and Formats

Supported formats

- markdown files : ".md"
- images : ".jpg", ".png", ".svg", ".gif", etc
- comma-separated file : ".csv"
- json : ".json"
- html : ".html"
- latex : ".tex"
- pdf : ".pdf"

Export Notebooks

- Asciidoc .asciidoc
- HTML .html
- Latex .tex
- Markdown .md
- PDF .pdf
- ReStructured Text .rst
- Executable Script .py
- Reveal.js Slides .html

Examples

- generate slides

  $ jupyter nbconvert --to slides 20220122_JupyterLab_Intro.ipynb

- generate pdf

  $ jupyter nbconvert --to pdf 20220122_JupyterLab_Intro.ipynb

- generate html

  $ jupyter nbconvert --to html 20220122_JupyterLab_Intro.ipynb

Test and Adopt

Test out online

Applications

The Jupyter team builds several end-user applications that facilitate interactive computing workflows. Click the boxes below to learn how they work and to learn more. If you like one, you can find installation instructions here.

JupyterLab

The latest web-based interactive development environment

Jupyter Notebook

The original web application for creating and sharing computational documents

Voilà

Share insights by converting notebooks into interactive dashboards

Install JupyterLab

- with pip

  $ pip install jupyterlab

- with conda

  $ conda install -c conda-forge jupyterlab

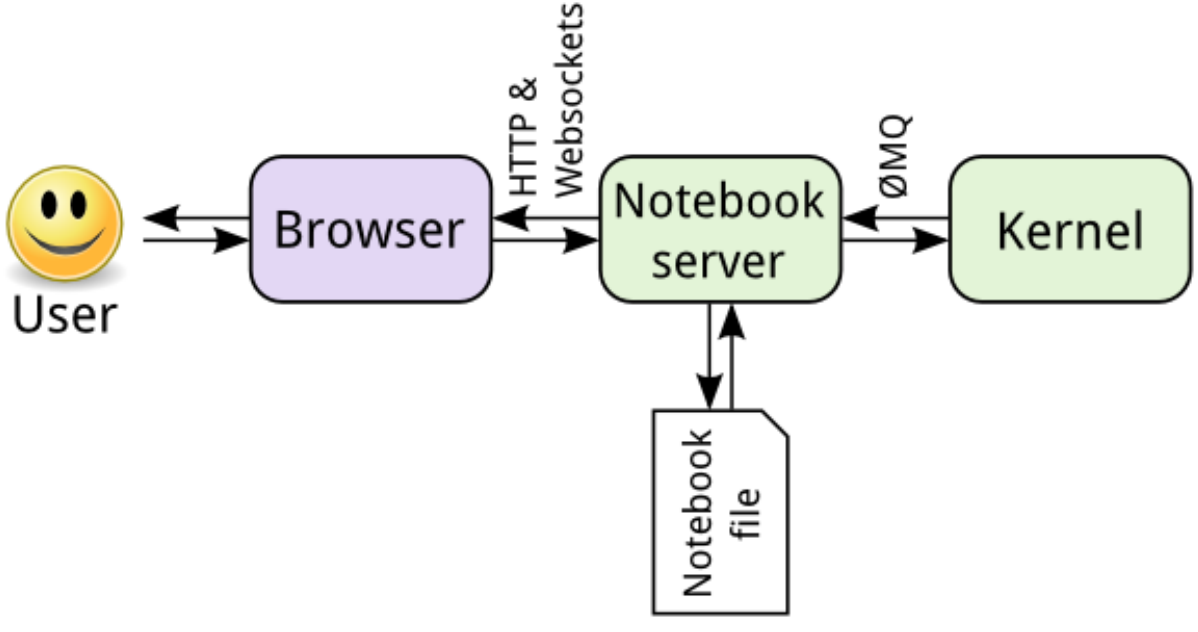
Start JupyterLab

Simply launch from a terminal

```
$ jupyter-lab
```

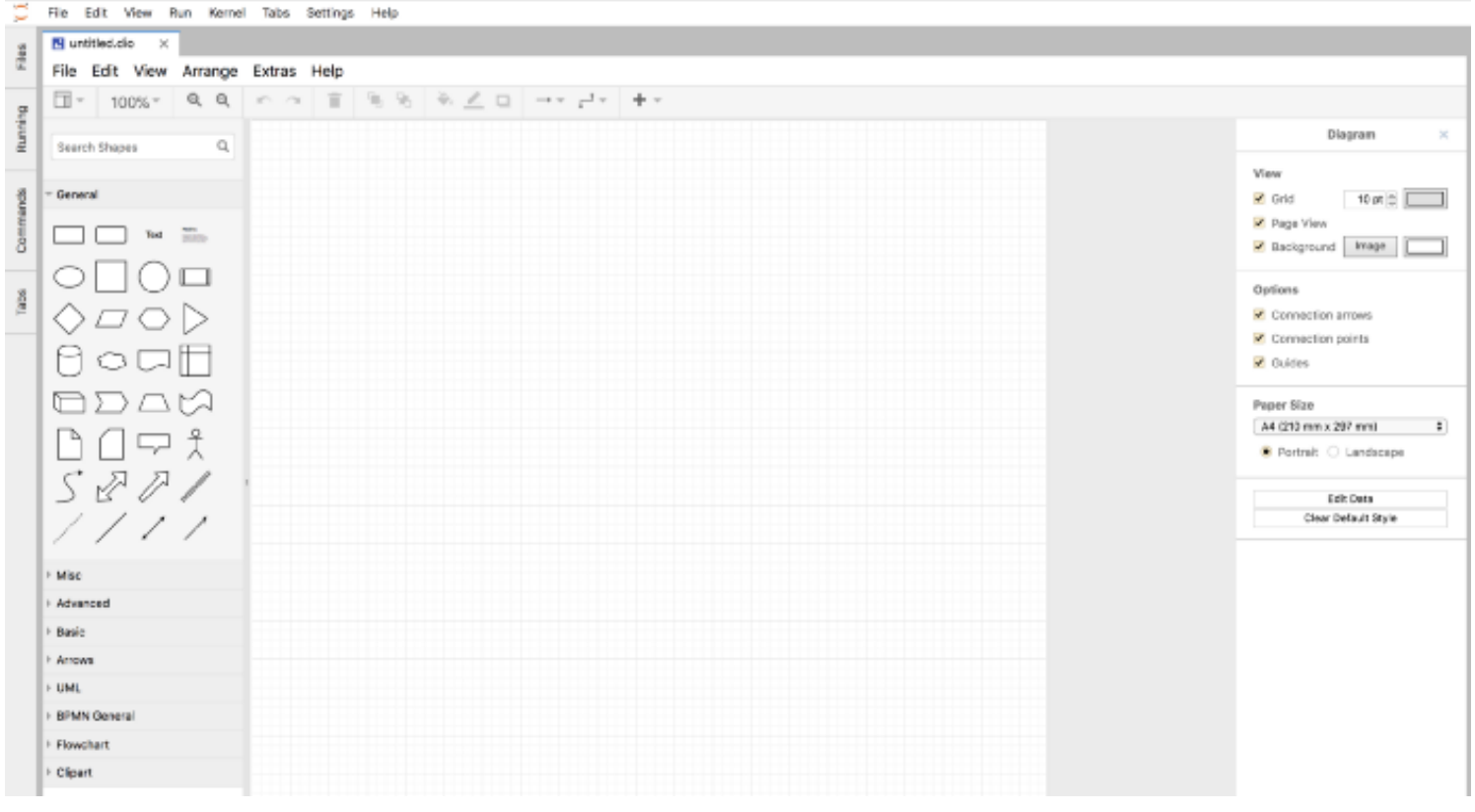
By default, a browser will open up to reveal the jupyterlab environment.

Interface

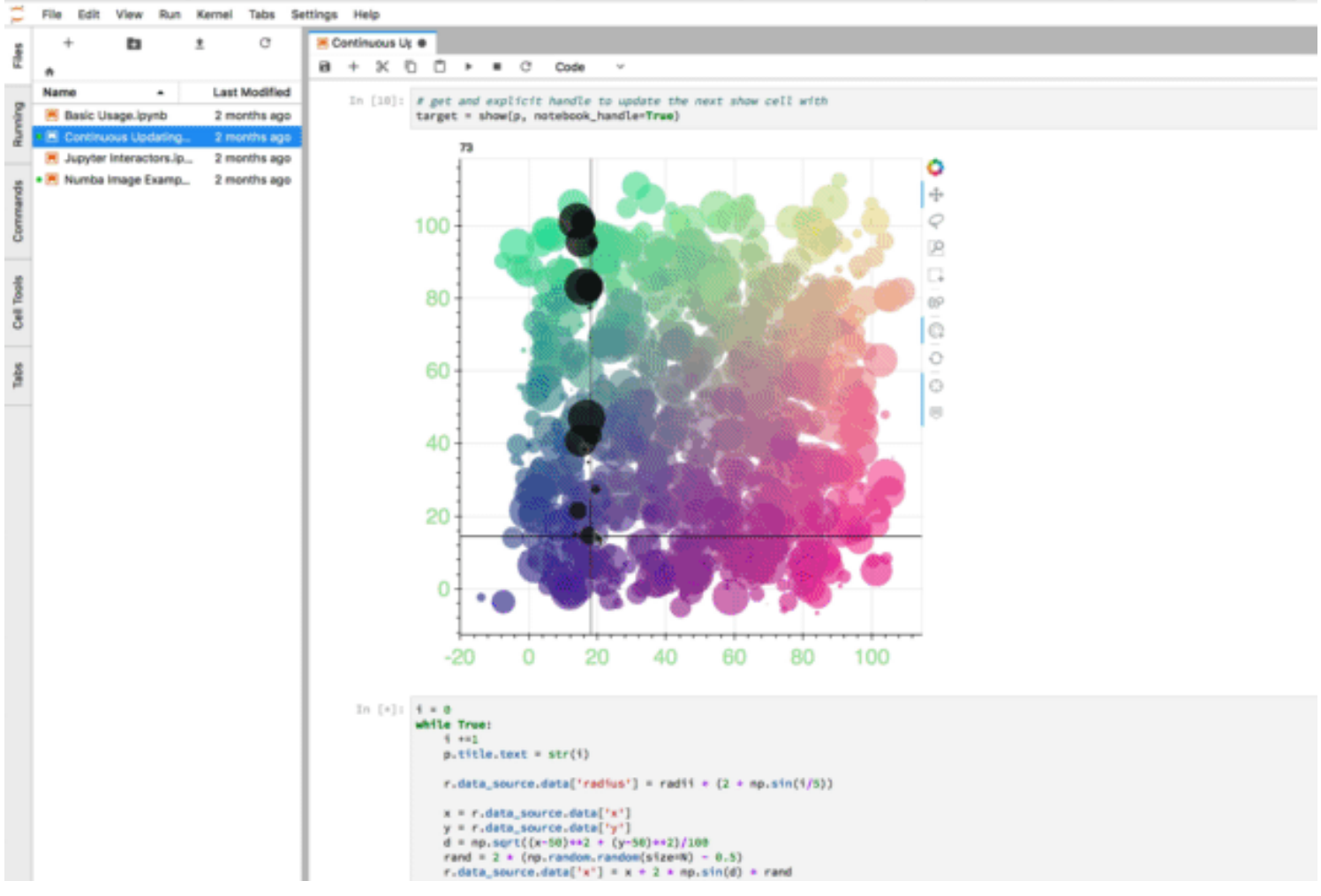

User
Browser
HTTP &
Websockets
Notebook
server
ØMQ
Kernel
Notebook
file

Extensions

Drawio : draw schemes



Bokeh : rendering Bokeh content within Jupyter



Thanks for your attention!

References

- https://jupyter.org/
- https://jupyterlab.readthedocs.io/en/stable/index.html
- https://en.wikipedia.org/wiki/Project_Jupyter
- https://github.com/mauhai/awesome-jupyterlab
- https://github.com/jupyterlab/jupyterlab-git
- https://realpython.com/jupyter-notebook-introduction
- https://github.com/jupyterlab/scipy2019-jupyterlab-tutorial