
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

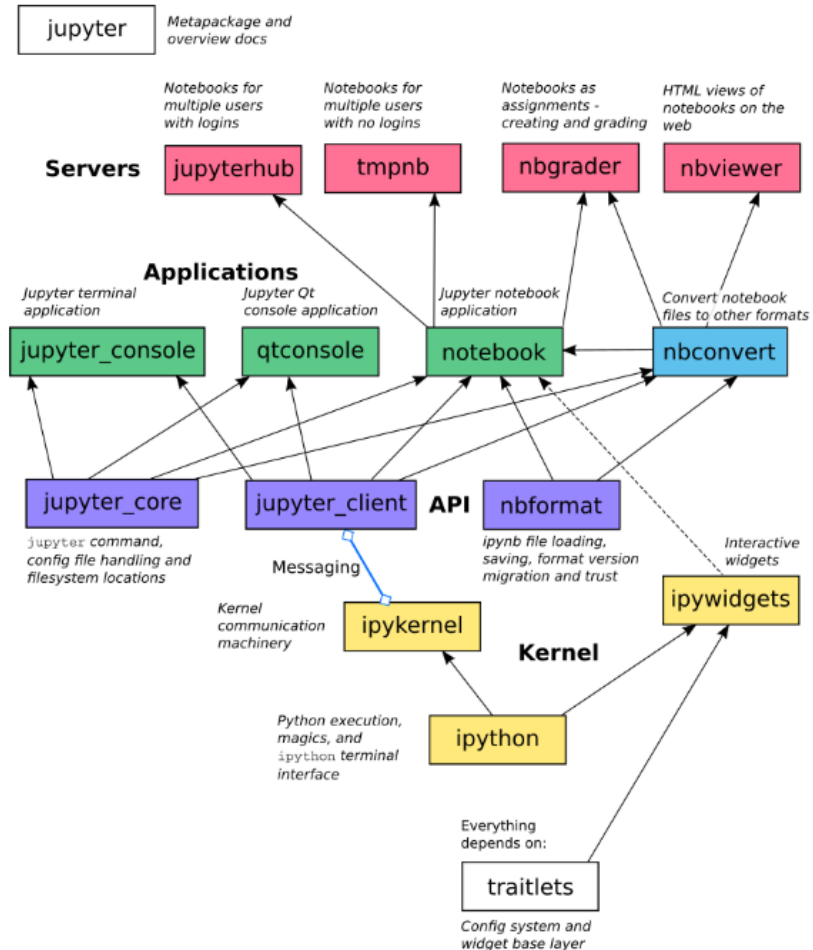
- support interactive data science and scientific computing across all programming languages
- open-source software : free for all to use and released under the liberal terms of the modified BSD license

Logo



- Inspiration from Galileo's manuscript about Jupyter (⊗) and its stars (★)

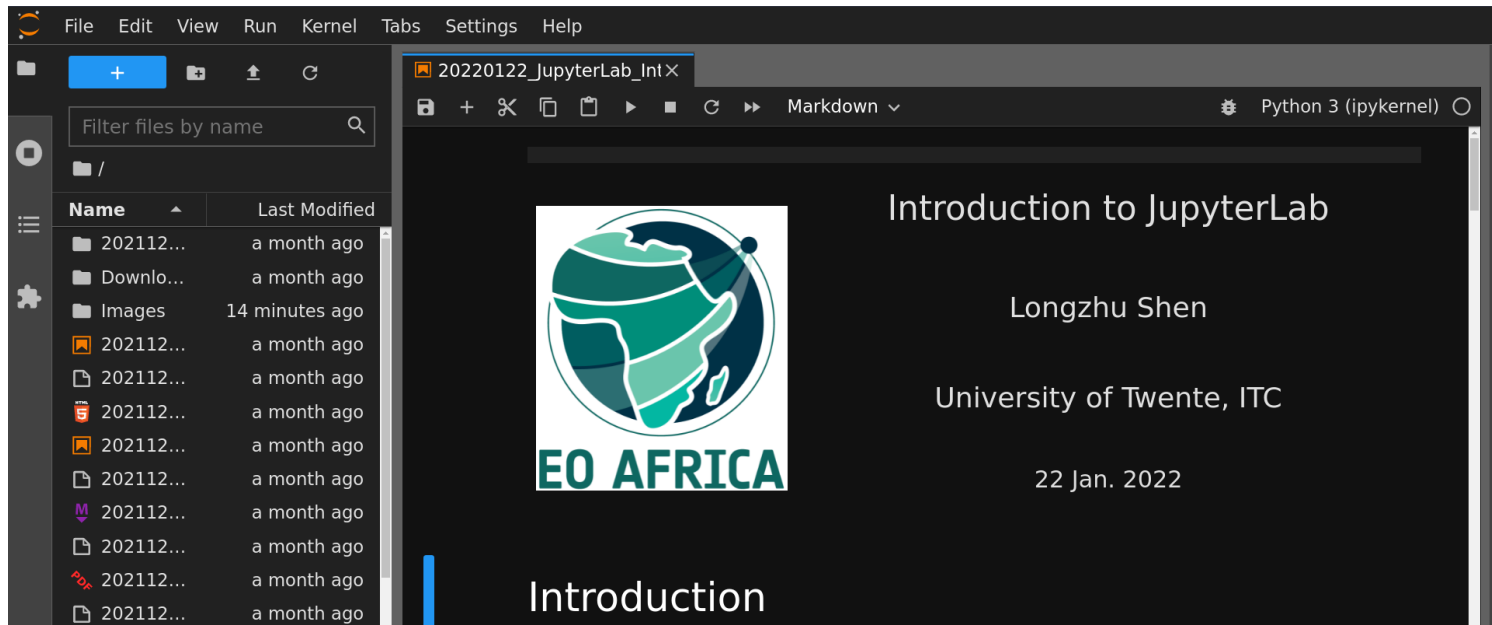
Project Overview



JupyterLab

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

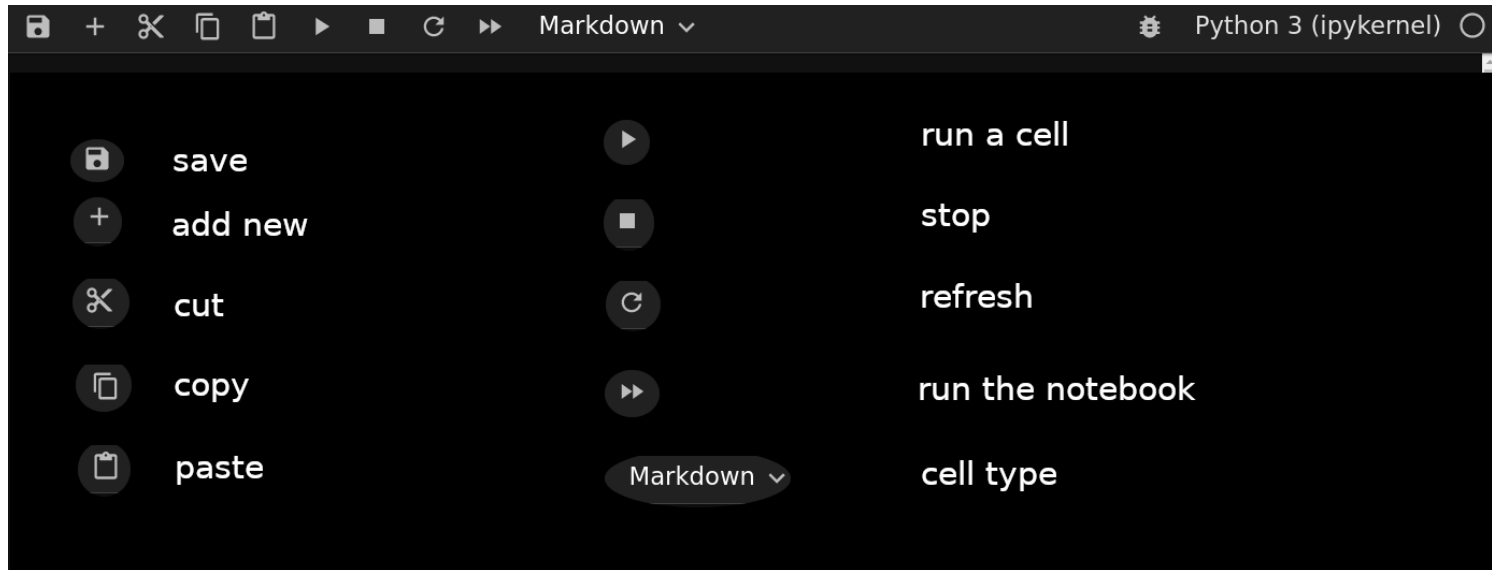
JupyterLab Notebook Environment



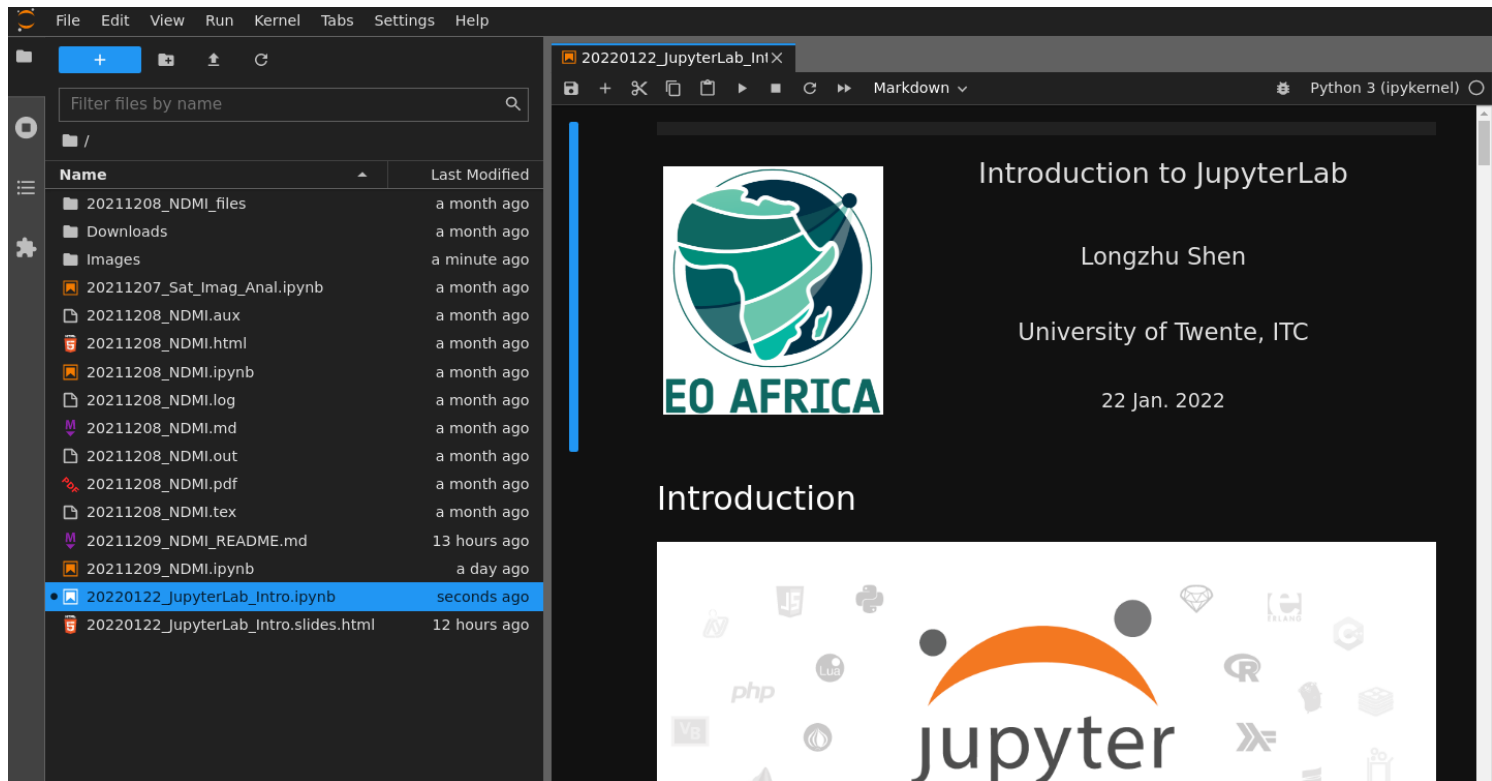
Menu Bar

- 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 configurations
- Help: jupyterlab help topics and references

Tool Bar



File Manager



The screenshot displays the JupyterLab interface. On the left, a file manager sidebar shows a list of files and folders. The selected file is `20220122_jupyterLab_Intro.ipynb`. The main area on the right shows a presentation slide titled "Introduction to JupyterLab" by Longzhu Shen, dated 22 Jan. 2022. The slide features the "EO AFRICA" logo and the Jupyter logo.

File Manager Sidebar:

Name	Last Modified
20211208_NDMI_files	a month ago
Downloads	a month ago
Images	a minute ago
20211207_Sat_Imag_Anal.ipynb	a month ago
20211208_NDMI.aux	a month ago
20211208_NDMI.html	a month ago
20211208_NDMI.ipynb	a month ago
20211208_NDMI.log	a month ago
20211208_NDMI.md	a month ago
20211208_NDMI.out	a month ago
20211208_NDMI.pdf	a month ago
20211208_NDMI.tex	a month ago
20211209_NDMI_README.md	13 hours ago
20211209_NDMI.ipynb	a day ago
20220122_jupyterLab_Intro.ipynb	seconds ago
20220122_jupyterLab_Intro.slides.html	12 hours ago

Slide Content:

Introduction to JupyterLab

Longzhu Shen

University of Twente, ITC

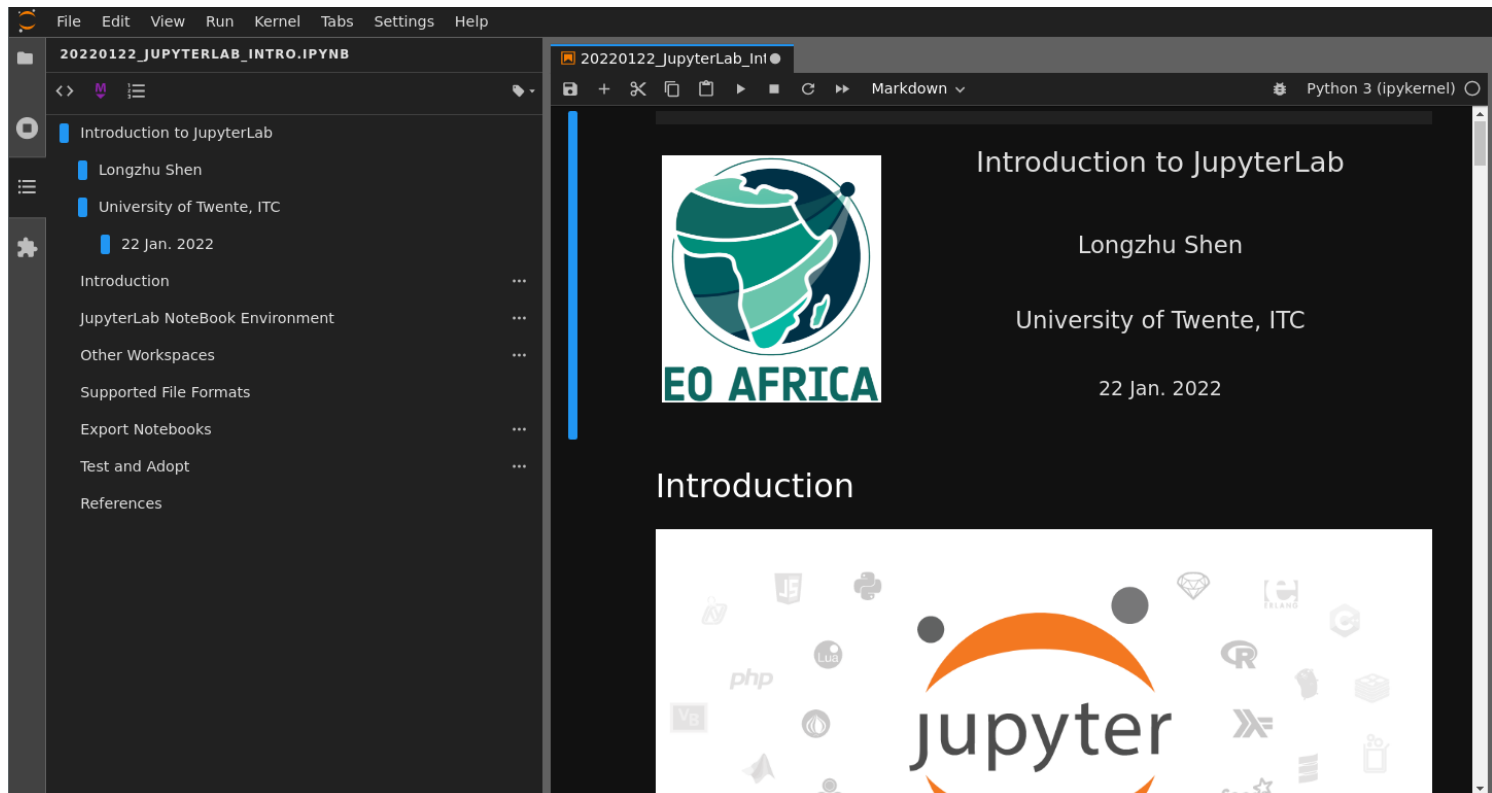
22 Jan. 2022

Introduction

EO AFRICA

jupyter

Table of Content



The screenshot displays the JupyterLab application interface. On the left, a sidebar shows the file explorer for the notebook '20220122_JUPYTERLAB_INTRO.IPYNB'. The table of contents lists the following sections:

- Introduction to JupyterLab
 - Longzhu Shen
 - University of Twente, ITC
 - 22 Jan. 2022
- Introduction
- JupyterLab Notebook Environment
- Other Workspaces
- Supported File Formats
- Export Notebooks
- Test and Adopt
- References

The main area shows the first page of the notebook, titled '20220122_JupyterLab_Int'. It features a logo for 'EO AFRICA' (a globe with a satellite dish) and the text 'Introduction to JupyterLab', 'Longzhu Shen', 'University of Twente, ITC', and '22 Jan. 2022'. Below this, the word 'Introduction' is displayed above a large image of the Jupyter logo, which is surrounded by various programming language icons (e.g., Python, R, Julia, PHP, Lua, C++, etc.).

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

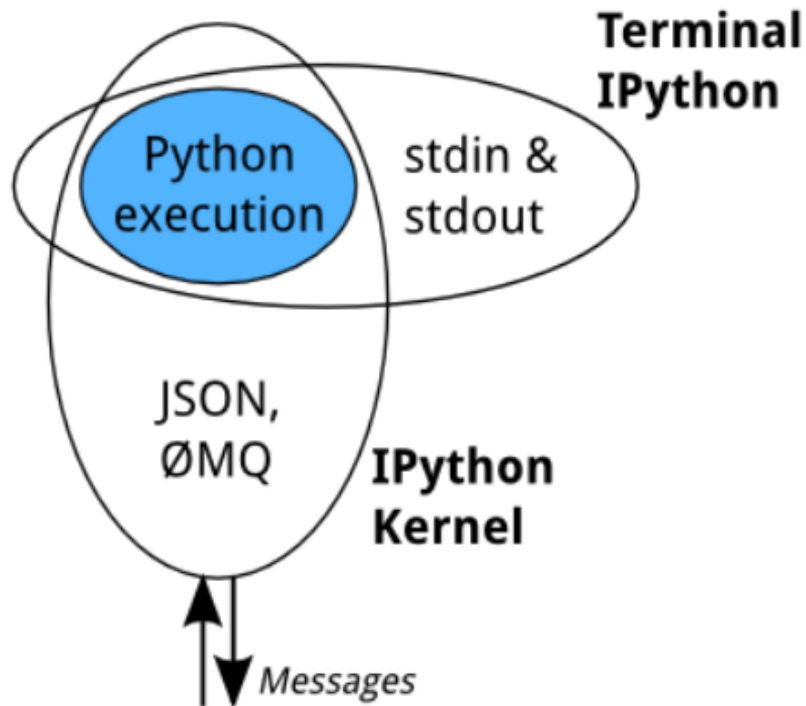
By default (if no cell format is selected), the cell content is included (without any conversion) in both the HTML and LaTeX output.

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	
Change to Markdown Cell Type notebook:change-cell-to-markdown	
Change to Raw Cell Type notebook:change-cell-to-raw	
Copy Cell(s) notebook:copy-cell	
Cut Cell(s) notebook:cut-cell	
Delete Cell(s) notebook:delete-cell	 - 
Insert Cell Above notebook:insert-cell-above	
Insert Cell Below notebook:insert-cell-below	

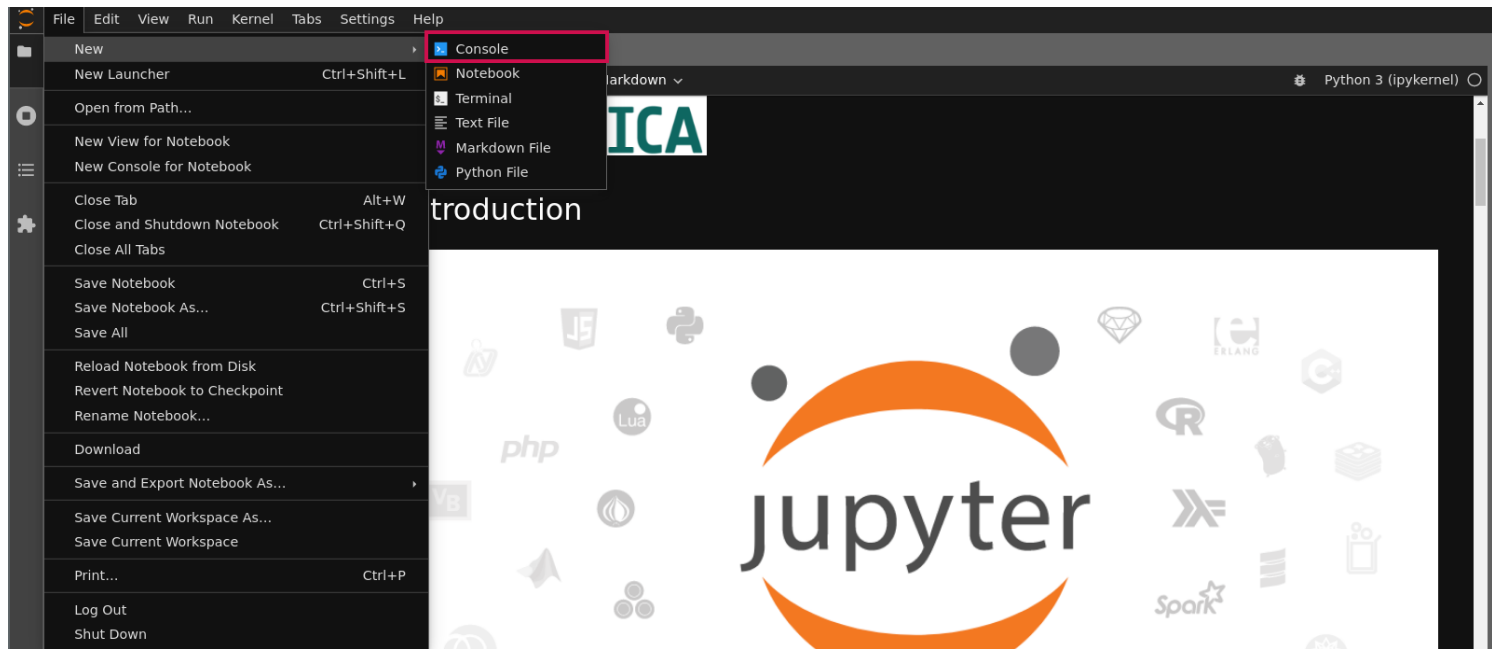
IPython Kernel



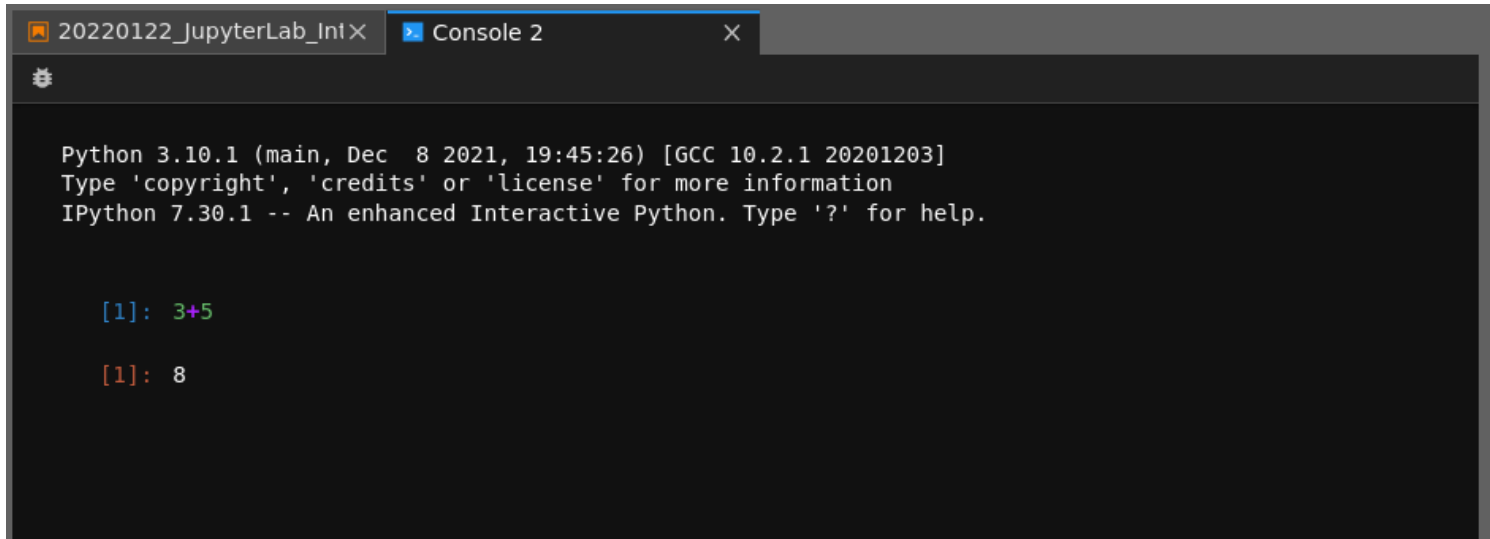
- a separate process responsible for running code, and things like computing possible completions
- can be connected to more than one frontend simultaneously

Other Workspaces

Consoles



Consoles

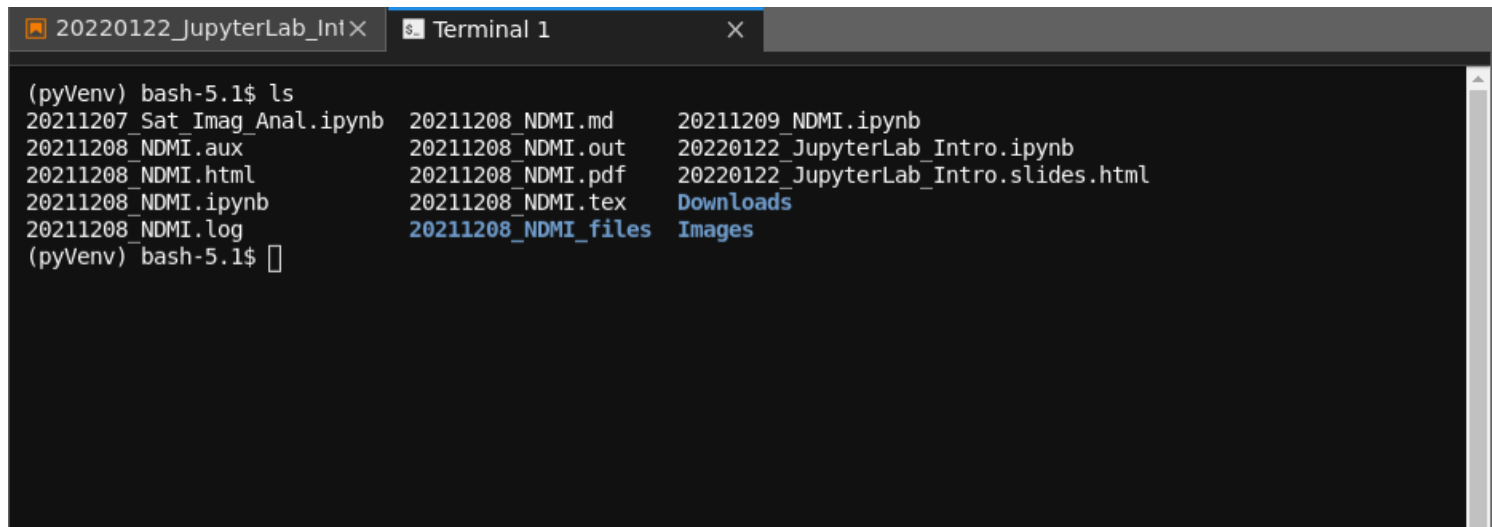


The screenshot shows a JupyterLab interface with two tabs: "20220122_JupyterLab_Intro" and "Console 2". The "Console 2" tab is active, displaying a dark-themed terminal window. The terminal output includes the Python 3.10.1 startup message, the IPython 7.30.1 version, and the execution of the code `3+5`, which results in the output `8`.

```
Python 3.10.1 (main, Dec 8 2021, 19:45:26) [GCC 10.2.1 20201203]  
Type 'copyright', 'credits' or 'license' for more information  
IPython 7.30.1 -- An enhanced Interactive Python. Type '?' for help.  
  
[1]: 3+5  
  
[1]: 8
```

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

Terminals



The image shows a terminal window titled "Terminal 1" within a JupyterLab interface. The terminal displays the output of a `ls` command executed in a `bash-5.1` shell. The output lists files and directories organized in three columns. The first column contains files from 20211207 and 20211208. The second and third columns contain files from 20211208 and 20211209, respectively. The third column also includes two blue-colored links: `Downloads` and `Images`.

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

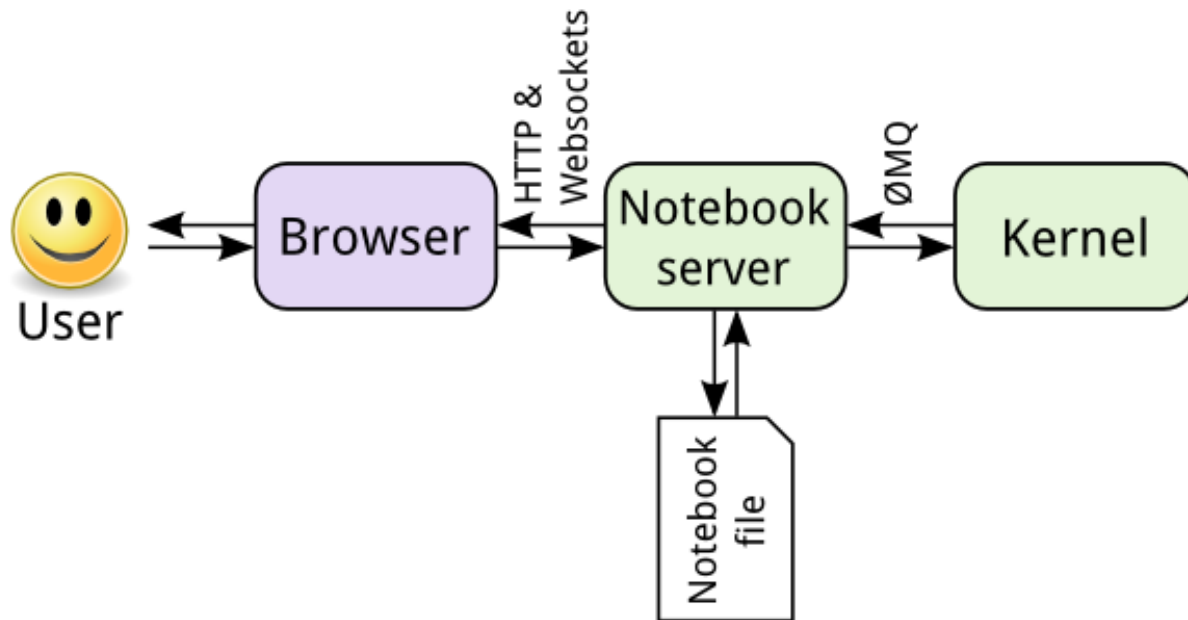
Start JupyterLab

Simply launch from a terminal

```
$ jupyter-lab
```

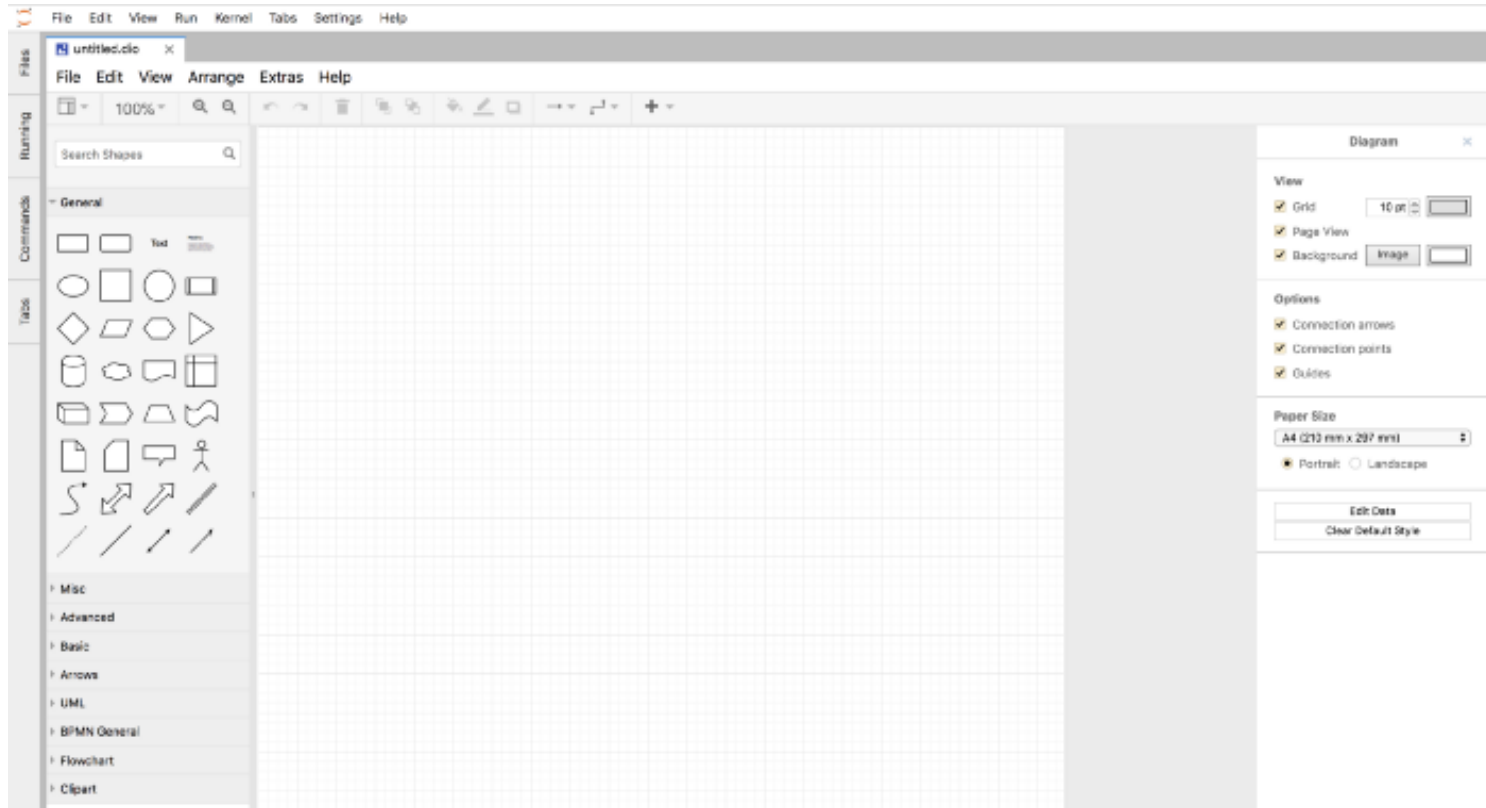
By default, a browser will open up to reveal the jupyterlab environment.

Interface

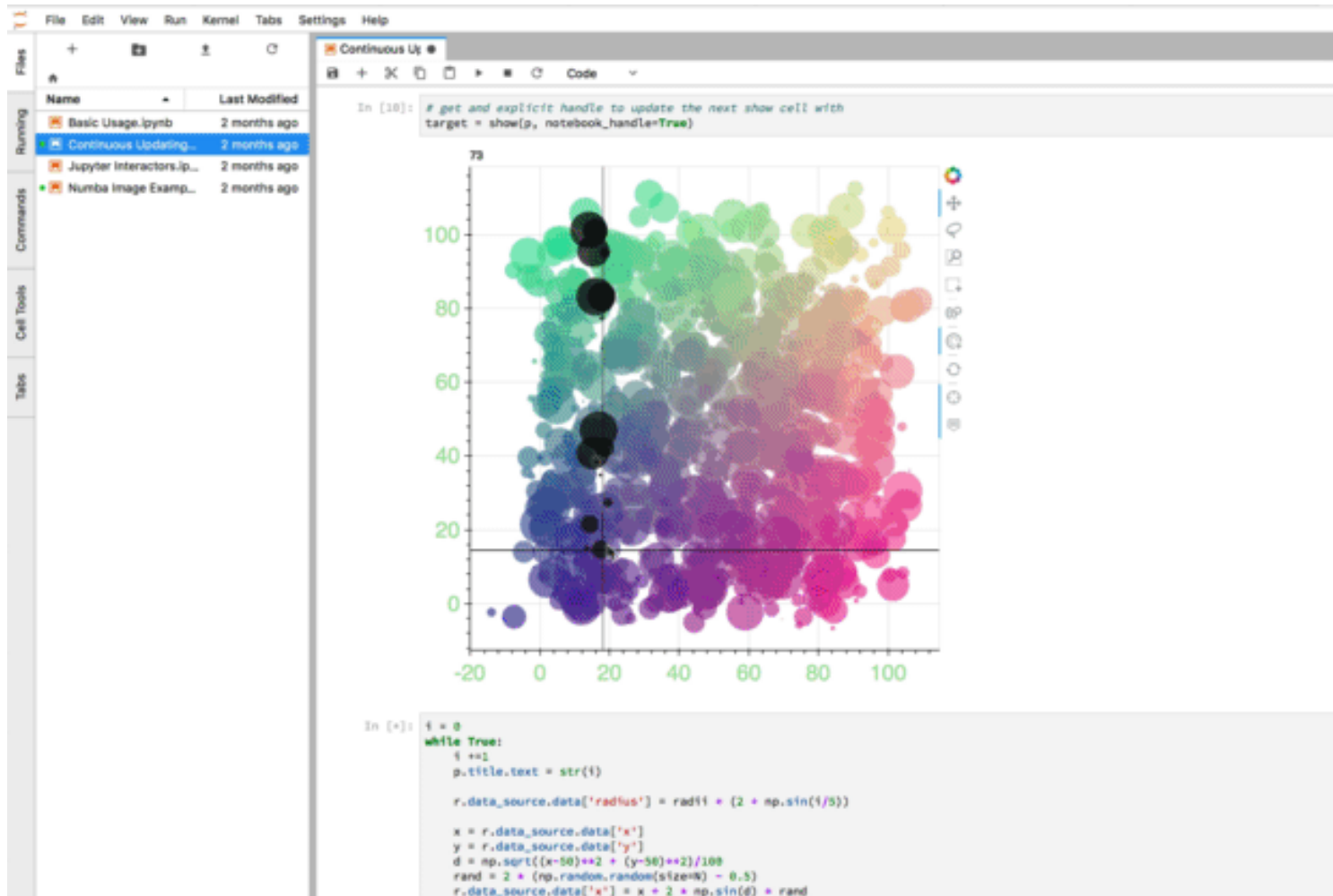


Extensions

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>