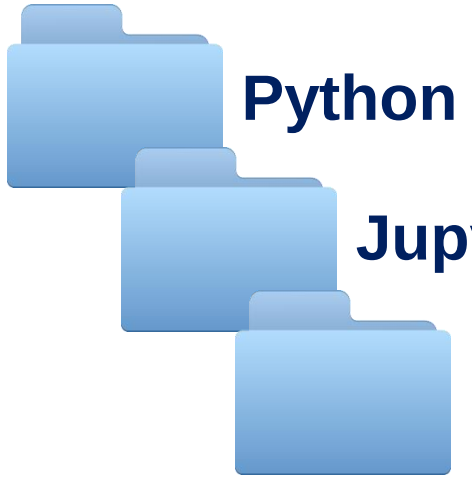
Virtual Environment & Jupyter Notebook

Lesson Objectives

At the end of this lesson, you should be able to:

- Understand the concept of Python Virtual Environment
- Setup Virtual Environment
- Install Jupyter Notebook on Local Machine
- Explore Jupyter Notebook
- Familiarized Markdown Language on Jupyter Notebook

Topic Outline



Python Virtual Environment

Jupyter Notebook Overview

Installing and Using Jupyter Notebook

Why do we need Python Virtual Environment

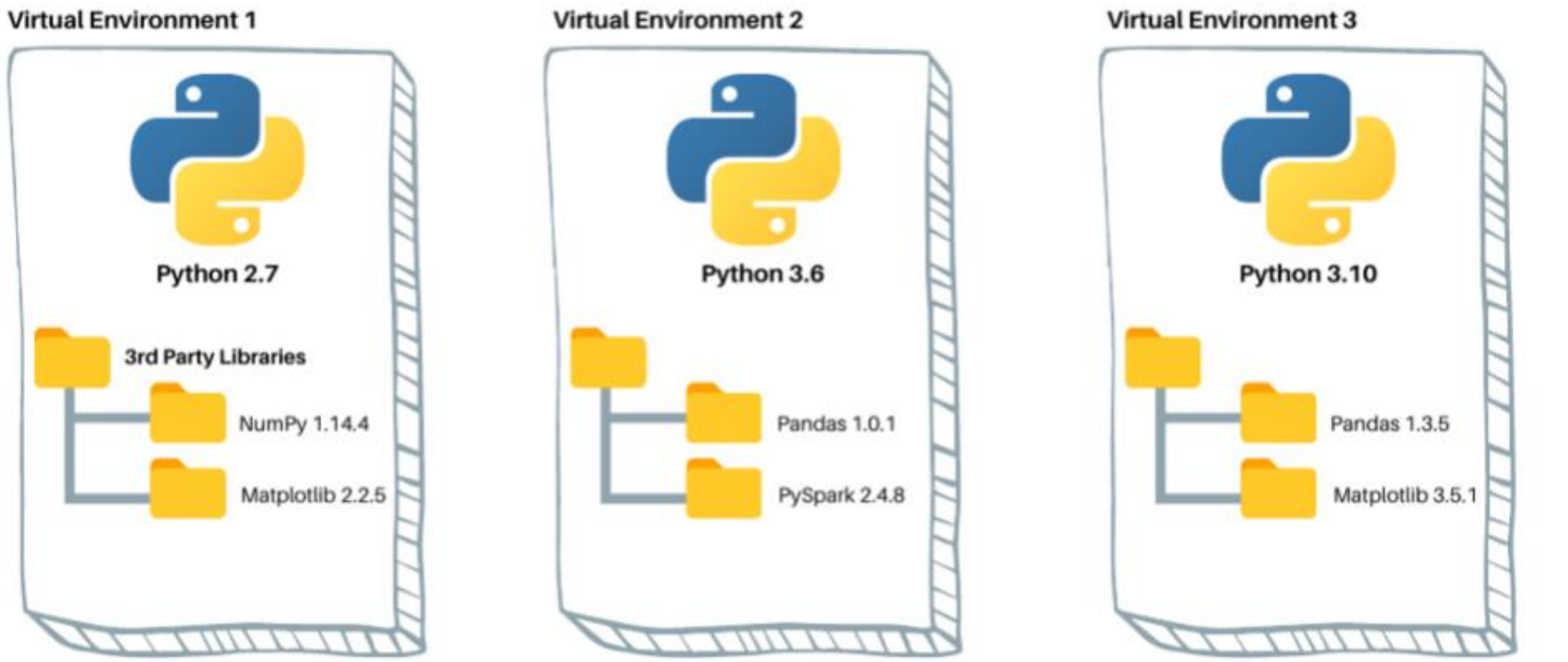
- Python applications will often use various packages and modules that don't come as part of the standard library.
- Applications will sometimes need a specific version of a library, because the application may require that a particular bug has been fixed or the application may be written using an obsolete version of the library's interface.
- Therefore, it may not be possible for one Python installation to meet the requirements of every single application.

What is Python Virtual Environment

- The solution for this problem is to create a **virtual environment** for each project.
- Virtual environment is a self-contained directory tree that contains a Python installation for a particular version of Python, plus a number of additional packages.
- Gives you everything you need to run a lightweight yet isolated Python environment.
- Example projects:
  - Data Science
  - Machine Learning
  - Web Development
  - Game Development
  - Chatbot Development
  - IoT & etc…

```
venv\
|
├── Include\
|
├── Lib\
|   |
|   └── site-packages\
|       |
|       ├── pip\
|       |
|       └── pip-24.2.dist-info\
|
|
├── Scripts\
|   ├── Activate.ps1
|   ├── activate
|   ├── activate.bat
|   ├── deactivate.bat
|   ├── pip.exe
|   ├── pip3.12.exe
|   ├── pip3.exe
|   ├── python.exe
|   └── pythonw.exe
|
└── pyvenv.cfg
```

What is Python Virtual Environment



Source: https://www.dataquest.io/blog/a-complete-guide-to-python-virtual-environments/

What is Python Virtual Environment

- Virtual Environment Folder Structure:

Folder	Description
Include\	initially empty folder that Python uses to include C header files for packages you might install that depend on C extensions.
Lib\	contains the site-packages\ folder, which is one of the main reasons for creating your virtual environment. This folder is where you'll install external packages that you want to use within your virtual environment.
Scripts\	contains the executable files of your virtual environment. Most notable are the Python interpreter (python.exe), the pip executable (pip.exe), and the activation script for your virtual environment, which comes in a couple of different flavors to allow you to work with different shells.
pyvenv.cfg	a crucial file for your virtual environment. It contains only a couple of key-value pairs that Python uses to set variables in the sys module that determine which Python interpreter and site-packages directory the current Python session will use.

```
venv\
|
├── Include\
|
├── Lib\
|   |
|   └── site-packages\
|       |
|       ├── pip\
|       |
|       └── pip-24.2.dist-info\
|
|
├── Scripts\
|   ├── Activate.ps1
|   ├── activate
|   ├── activate.bat
|   ├── deactivate.bat
|   ├── pip.exe
|   ├── pip3.12.exe
|   ├── pip3.exe
|   ├── python.exe
|   └── pythonw.exe
|
└── pyvenv.cfg
```

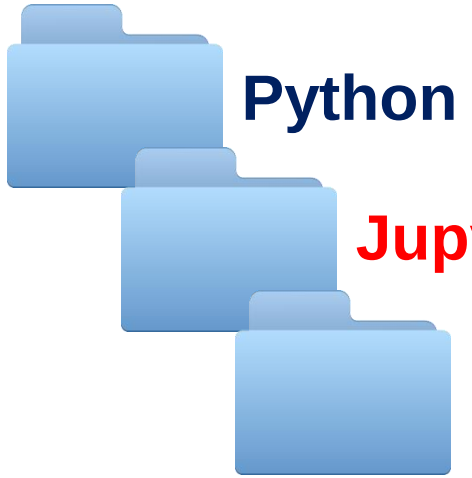
How to setup virtual environment and use it?

The following steps will be shown in the demo:

1. Install Python (pre-requisite)
2. Setup virtual environment
3. Activate virtual environment
4. Install required package
5. Develop a simple application
6. Deactivate the environment

Source: https://realpython.com/python-virtual-environments-a-primer/#how-can-you-work-with-a-python-virtual-environment

Topic Outline



Python Virtual Environment

Jupyter Notebook Overview

Installing Using Jupyter Notebook

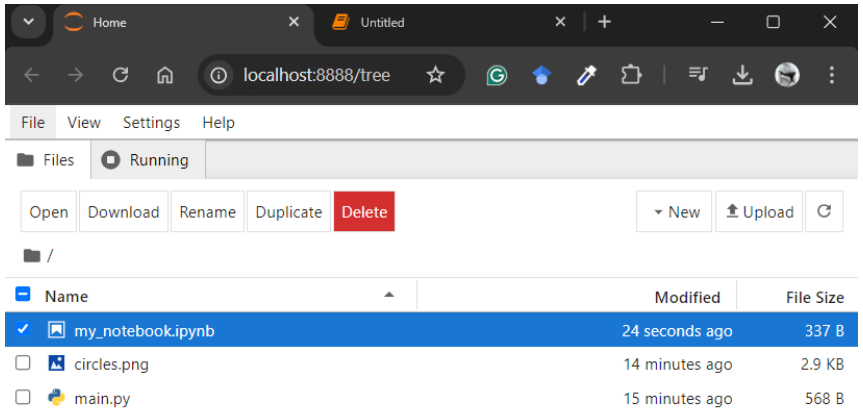
What is Jupyter Notebook

- Free software, open standards, and web services for interactive computing across all programming languages.
- **Notebook** is a document produced by the **Jupyter Notebook App**, which contain both computer **code** (e.g. python) and rich text elements (paragraph, equations, figures, links, etc…), using **Markdown** language.
- Notebook documents are both human-readable documents containing the analysis description and the results (figures, tables, etc..) as well as executable code which can be run to perform some data analysis or simulation.

Source: https://jupyter.org/
https://jupyter-notebook-beginner-guide.readthedocs.io/en/latest/what_is_jupyter.html

What is Jupyter Notebook App

- **Jupyter Notebook App** is a server-client application that allows editing and running notebook documents via a web browser.
- The Jupyter Notebook App can run on a local machine/host requiring no internet access or can be installed on a remote server and accessed through the internet (e.g. Google Colab).
- A **notebook kernel** is a “computational engine” that executes the code contained in a Notebook document.
- For python, we are using the **ipython kernel** to executes python code. The .ipynb is the file extension for Python notebook.
- Kernels for many other languages exist (official kernels).

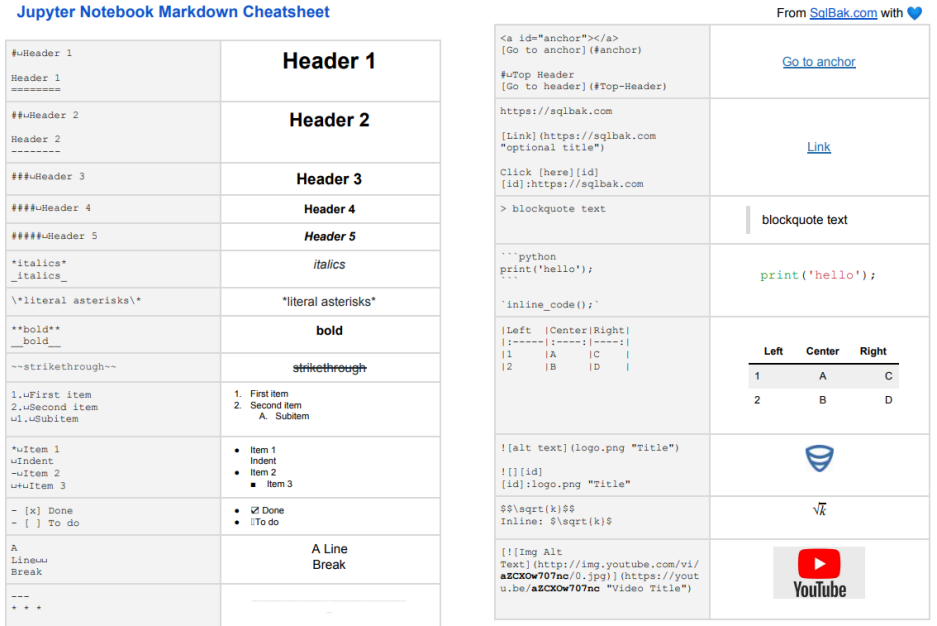


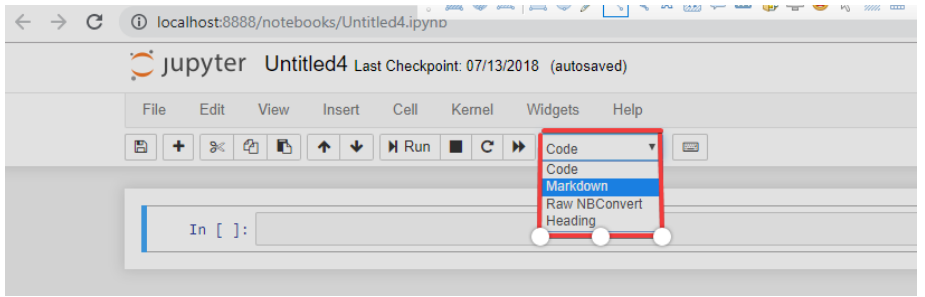
Source: https://jupyter.org/
https://jupyter-notebook-beginner-guide.readthedocs.io/en/latest/what_is_jupyter.html

What is Markdown

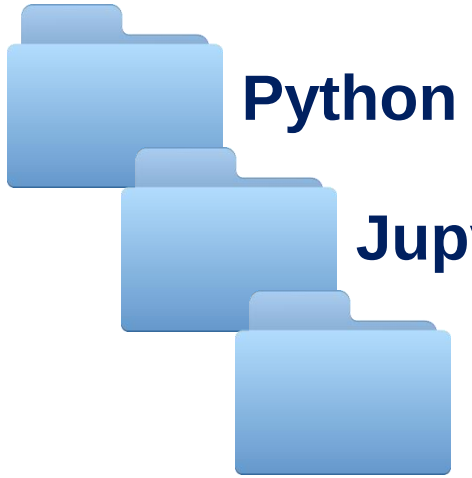
- **Markdown** is a lightweight language with plain text formatting syntax. It is used to create **formatted text** using a plain text editor.
- In Jupyter Notebooks, Markdown is used to add narrative, explanations, and documentation alongside code. This helps in creating well-documented and readable notebooks. (sample syntax)
- To use Markdown in a Jupyter Notebook, you need to create a new cell and set its type to "Markdown" by selecting "Markdown" from the dropdown menu in the toolbar or by pressing M while the cell is selected. (shortcut)

More about Jupyter Notebook:
https://medium.com/edureka/jupyter-notebook-cheat-sheet-88f60d1aca7





Topic Outline



Python Virtual Environment

Jupyter Notebook Overview

Installing and Using Jupyter Notebook

How to install Jupyter Notebook and use it?

The following steps will be shown in the demo:

1. Install Jupyter Notebook
2. Start Jupyter Notebook
3. Exploring Jupyter Notebook
    a. Interactive coding
    b. Markdown syntax (documentation / reporting)

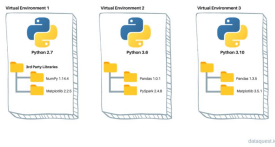
Source: https://jupyter-notebook.readthedocs.io/en/stable/examples/Notebook/What%20is%20the%20Jupyter%20Notebook.html

Summary

In this lesson, we have learned:

- What is Python Virtual Environment and how to create a virtual environment
- What is Jupyter Notebook
- How to install and start a Jupyter notebook
- Markdown language & syntax

References for Images

No.	Slide No.	Image	Reference
1			A Hands-On Introduction to Essential Python Libraries and Frameworks Book Cover [Online Image] https://www.amazon.sg/Introduction-Essential-Libraries-Frameworks-Samples/dp/B0BW2MGYG4
2			Virtual Environment File Structure [Online Image] https://realpython.com/python-virtual-environments-a-primer/#how-can-you-work-with-a-python-virtual-environment
3			Virtual Environments [Online Image] https://www.dataquest.io/blog/a-complete-guide-to-python-virtual-environments/
4			Jupyter Notebook Markdown [Online Image] https://sqlbak.com/blog/jupyter-notebook-markdown-cheatsheet/