مقدمه‌ای بر Jupyter Notebook

Introduction to Jupyter Notebook

نشست ۲۱۷

شیرازلاگ

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Project Jupyter

Project Jupyter - History

- a non-profit, open-source project
- IPython was released in 2011
- born out of the IPython Project in 2014
- IPython continues to exist as a Python shell and a kernel for Jupyter
- support interactive computing, research and education
- with an emphasis in data science workflows
- will always be 100% open-source software, free for all
- released under the liberal terms of the modified BSD license
- Its name and logo are an homage to Galileo's discovery of the moons of Jupiter
- three core programming languages supported by Jupyter are Julia, Python and R
- Jupyter supports over 40 programming languages
- Project Jupyter has developed and supported the interactive computing products Jupyter Notebook, JupyterHub, and JupyterLab
- A $ 6 million dollars grant in 2015, donations, sponsors, awards, …
- about 200,000 Jupyter notebooks on GitHub in 2015
- about 2.5 million Jupyter notebooks on GitHub in 2018
- nearly 10 million Jupyter notebooks on GitHub in 2021
- Major cloud computing providers have adopted the Jupyter Notebook or derivative tools as a frontend interface for cloud users
  Amazon SageMaker Notebooks, Google's Colaboratory, and Microsoft's Azure Notebook
- As of July 2022, the Jupyter extension for VS Code has been downloaded over 40 million times, making it the second-most popular extension in the VS Code Marketplace
- In 2021, Nature named Jupyter as one of ten computing projects that transformed science

^Jupyter*

What’s the Difference Between Jupyter Notebook, JupyterLab, and JupyterHub?

- ✔ **Jupyter Notebooks provides a document specification and a graphical user interface for editing documents. Here are several aspects to know about Jupyter Notebooks:**

A Jupyter Notebook is a .ipynb specification document file—composed of narrative text, code cells, and outputs.

A Jupyter Notebook comes with a graphical user interface—which enables you to edit .ipynb documents.

Document editing is not exclusive to the Jupyter Notebook interface. You can also use alternatives like JupyterLab, Google Colab, nteract, and Kaggle.

- ✔ **JupyterLab provides a user interface designed for interactive computing. Here are several aspects to know about JupyterLab:**

JupyterLab is a user interface—designed to provide extensible and flexible interactive computing.

JupyterLab provides extensions—some of which are designed for Jupyter Notebooks. There are also extensions designed for specific parts of the data science pipeline.

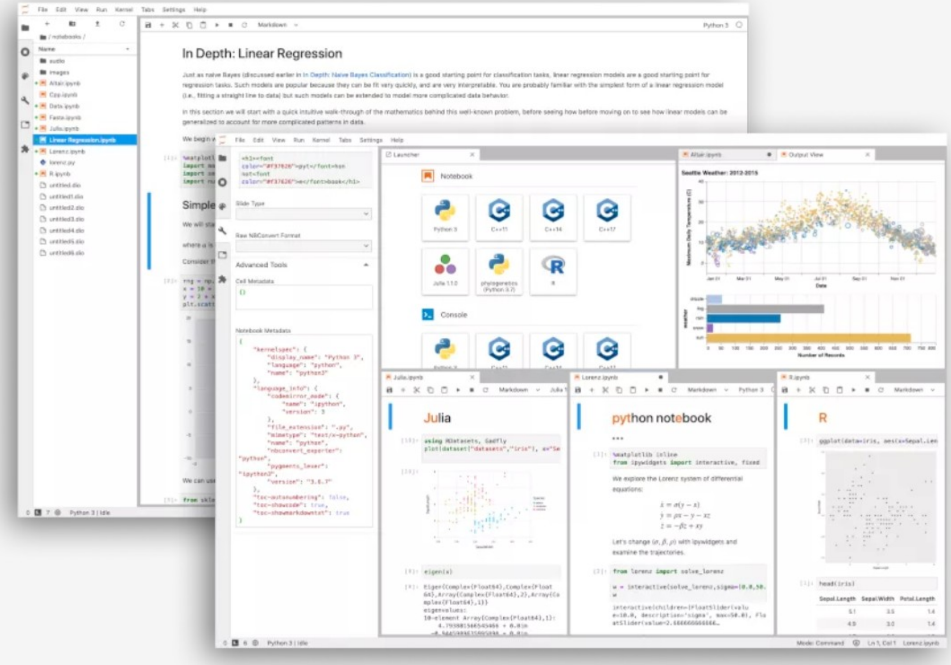
- ✔ **JupyterHub provides an application designed for the management of Jupyter Notebooks. Here are several aspects to know about JupyterHub:**

JupyterHub is an application—designed to help you manage multiple-users sessions of interactive computing.

JupyterHub provides connectivity—that enables you to connect users with the infrastructure required for their sessions.

JupyterHub enables remote access—to JupyterLab as well as Jupyter Notebooks. You can use this option to let multiple users gain remote access to Jupyter resources.

JupyterLab



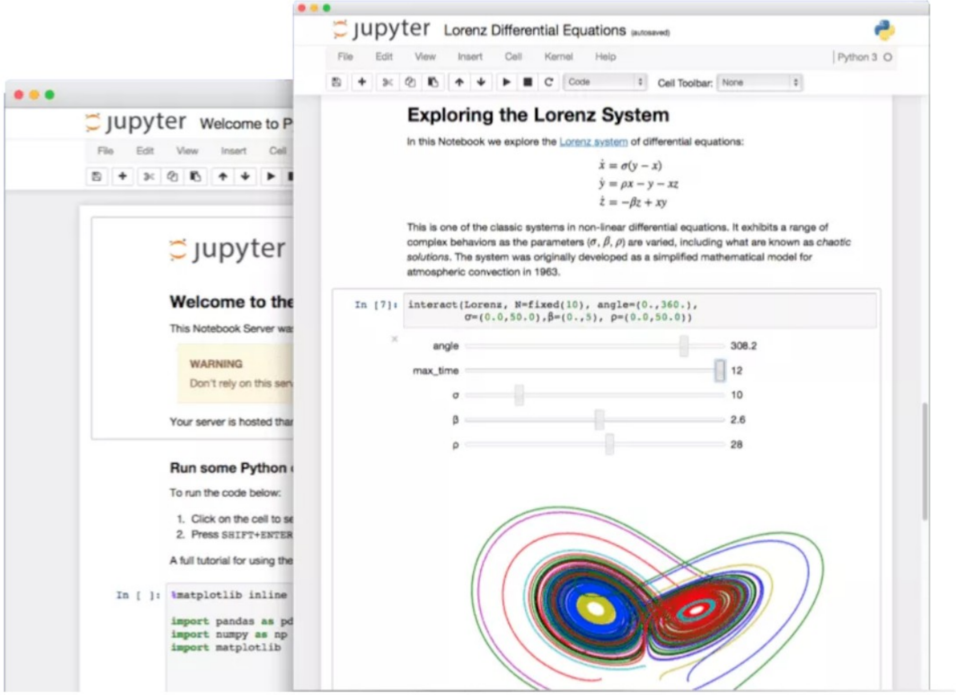
JupyterLab: A Next-Generation Notebook Interface

JupyterLab is the latest web-based interactive development environment for notebooks, code, and data. Its flexible interface allows users to configure and arrange workflows in data science, scientific computing, computational journalism, and machine learning. A modular design invites extensions to expand and enrich functionality.

Try it in your browser

Install JupyterLab

Jupyter Notebook


jupyter Welcome to P
File Edit View Insert Cell
jupyter
jupyter Lorenz Differential Equations (autosaved)
File Edit View Insert Cell Kernel Help
Python 3
Code
Cell Toolbar: None

Welcome to the

This Notebook Server wa

WARNING

Don't rely on this ser

Your server is hosted tha

Run some Python

To run the code below:

1. Click on the cell to se
2. Press SHIFT+ENTER

A full tutorial for using the

```
In [ ]: %matplotlib inline

        import pandas as pd
        import numpy as np
        import matplotlib
```

Exploring the Lorenz System

In this Notebook we explore the Lorenz system of differential equations:

$$\dot{x} = \sigma(y - x)$$
$$\dot{y} = \rho x - y - xz$$
$$\dot{z} = -\beta z + xy$$

This is one of the classic systems in non-linear differential equations. It exhibits a range of complex behaviors as the parameters (σ, β, ρ) are varied, including what are known as *chaotic solutions*. The system was originally developed as a simplified mathematical model for atmospheric convection in 1963.

```
In [7]: interact(Lorenz, N=fixed(10), angle=(0.,360.),
                 σ=(0.0,50.0),β=(0.,5), ρ=(0.0,50.0))
```

angle 308.2

max_time 12

σ 10

β 2.6

ρ 28

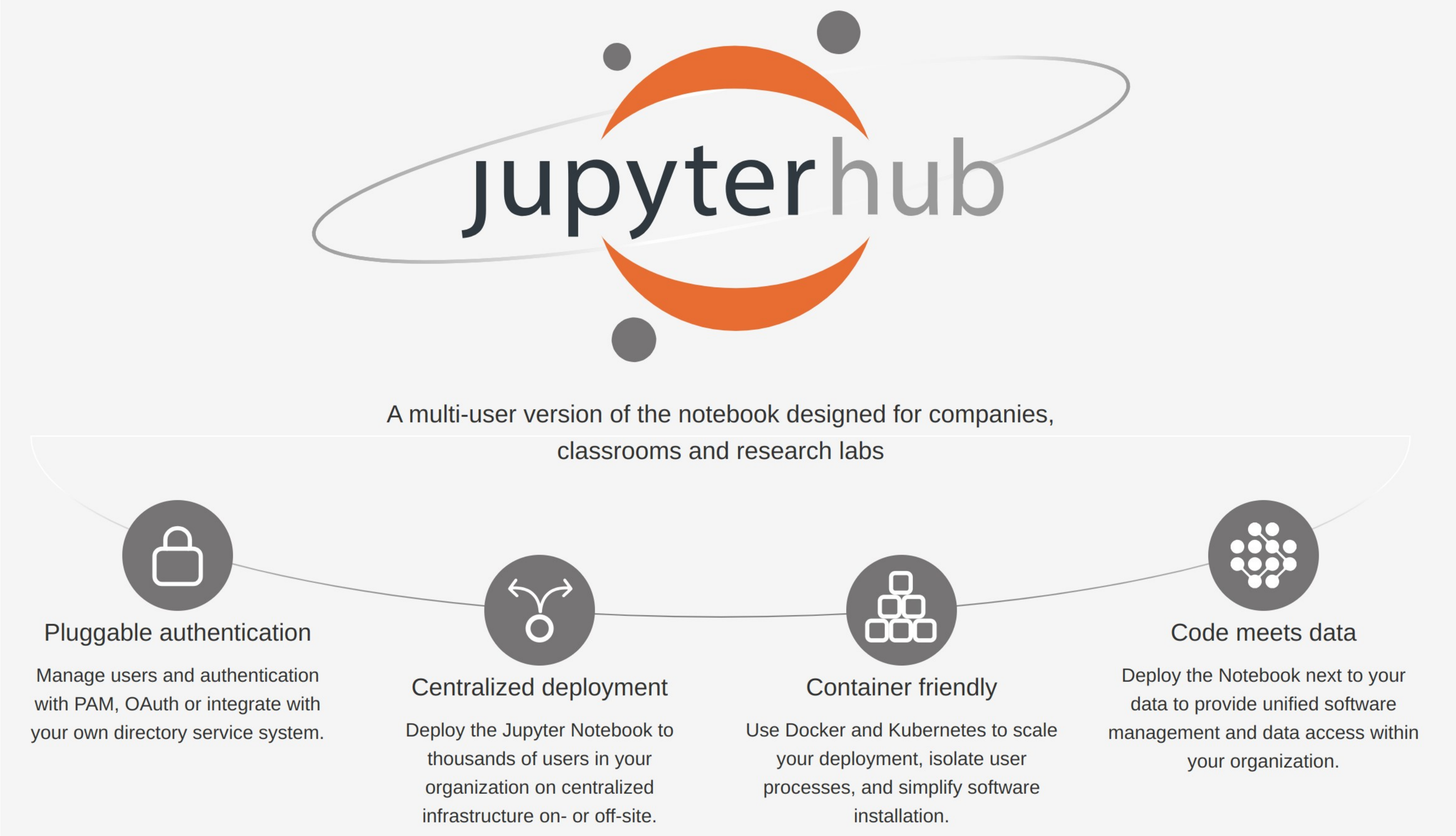
Jupyter Notebook: The Classic Notebook Interface

The Jupyter Notebook is the original web application for creating and sharing computational documents. It offers a simple, streamlined, document-centric experience.

Try it in your browser

Install the Notebook

JupyterHub



A multi-user version of the notebook designed for companies, classrooms and research labs

Pluggable authentication

Manage users and authentication with PAM, OAuth or integrate with your own directory service system.

Centralized deployment

Deploy the Jupyter Notebook to thousands of users in your organization on centralized infrastructure on- or off-site.

Container friendly

Use Docker and Kubernetes to scale your deployment, isolate user processes, and simplify software installation.

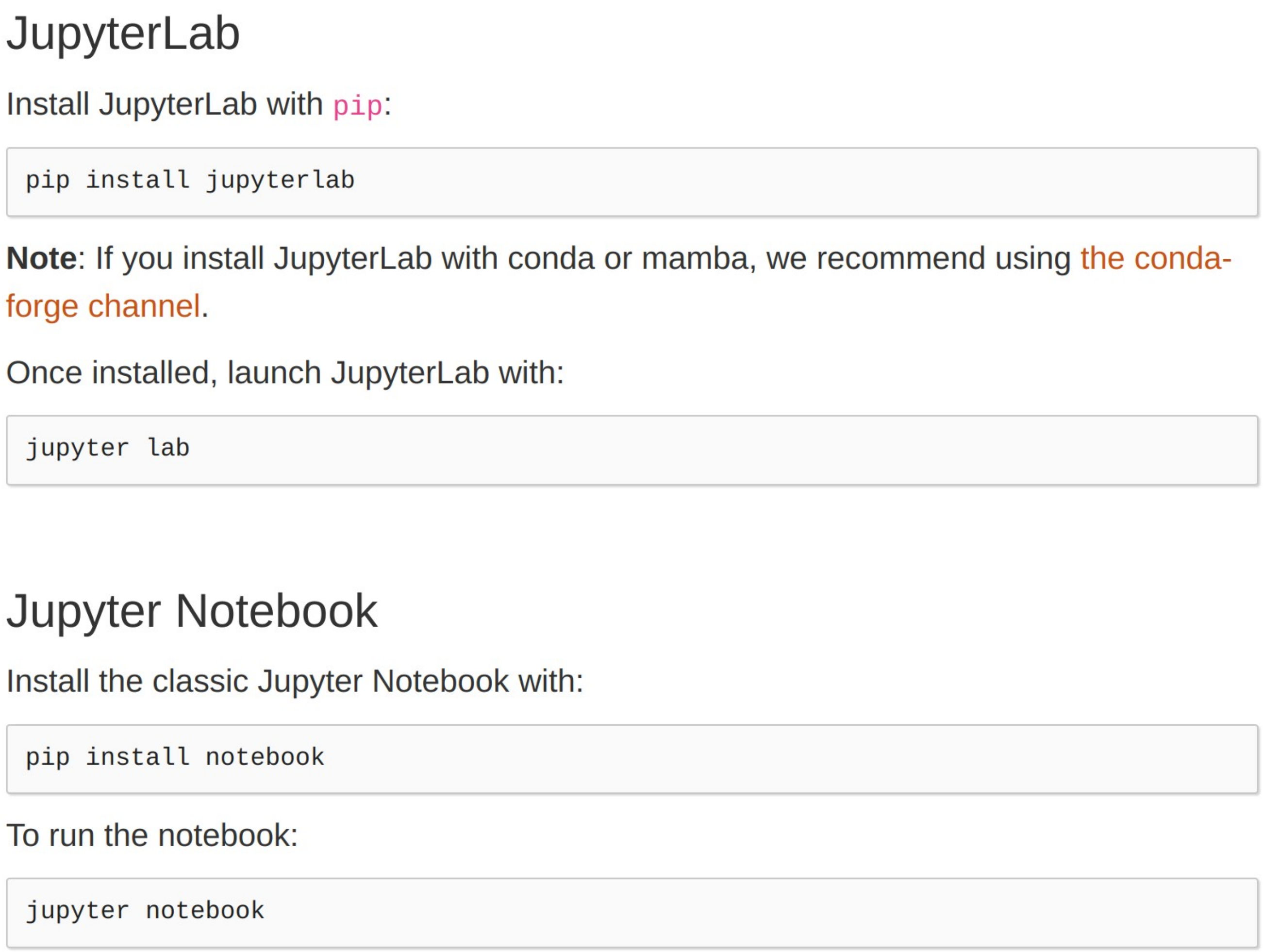
Code meets data

Deploy the Notebook next to your data to provide unified software management and data access within your organization.

How to Install Jupyter Notebook?

Installation

The simplest way



JupyterLab

Install JupyterLab with `pip`:

```
pip install jupyterlab
```

Note: If you install JupyterLab with conda or mamba, we recommend using the conda-forge channel.

Once installed, launch JupyterLab with:

```
jupyter lab
```

Jupyter Notebook

Install the classic Jupyter Notebook with:

```
pip install notebook
```

To run the notebook:

```
jupyter notebook
```

How to work with Jupyter Notebook?

Terminology

- ✔ **Kernel:**

A kernel is a “computational engine” that executes the code contained in a notebook document.
Behind every notebook runs a kernel.
When you run a code cell, that code is executed within the kernel.
Any output is returned back to the cell to be displayed.

- ✔ **Cell:**

A cell is a container for text to be displayed in the notebook or code to be executed by the notebook’s kernel

A **code cell** contains code to be executed in the kernel. When the code is run, the notebook displays the output below the code cell that generated it.

A **Markdown cell** contains text formatted using Markdown and displays its output in-place when the Markdown cell is run.

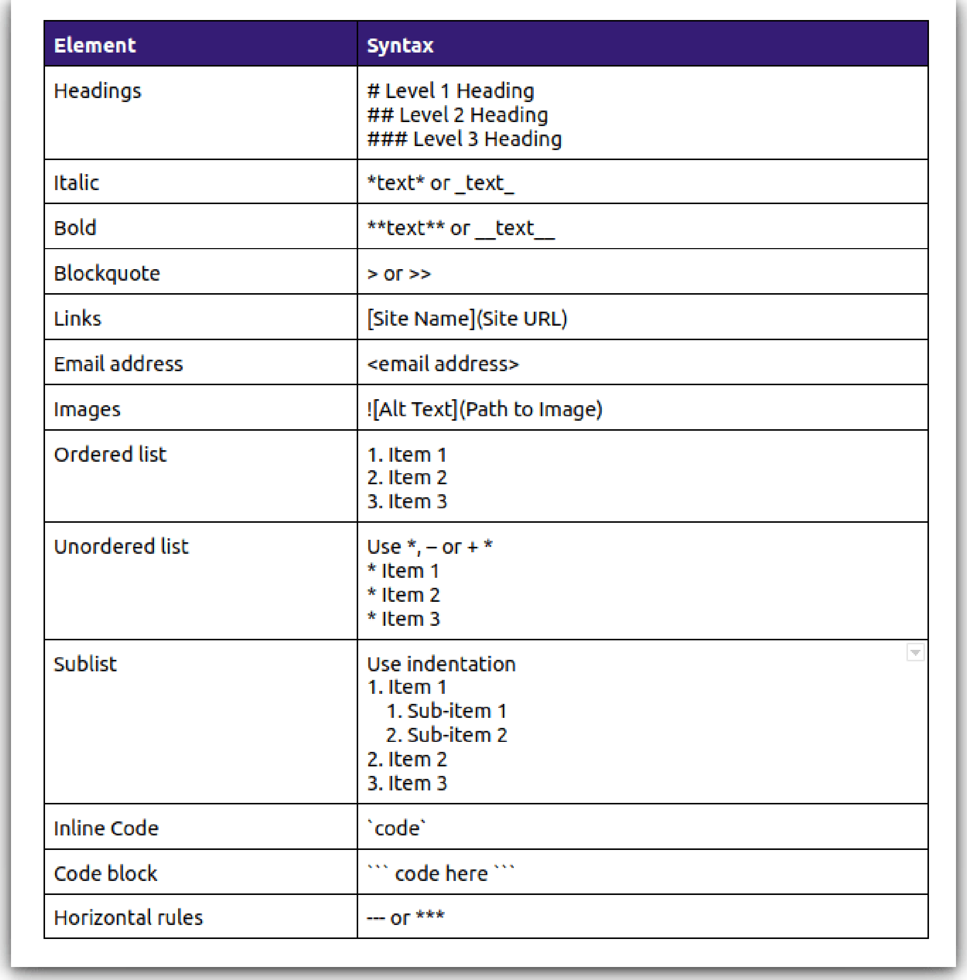
Keyboard Shortcuts

- ✔ **Esc:** command mode
- ✔ **Enter:** edit mode
- ✔ **Up and Down:** Scroll up and down
- ✔ **A:** insert a new cell **above**
- ✔ **B:** insert a new cell **below**
- ✔ **M:** transform the active cell to a Markdown cell
- ✔ **Y:** set the active cell to a code cell
- ✔ **D + D (D twice):** delete the active cell
- ✔ **Z:** undo cell deletion
- ✔ Hold **Shift** and press **Up** or **Down** to select multiple cells at once
- ✔ With multiple cells selected, **Shift + M** will merge your selection
- ✔ **Ctrl + Shift + -** in edit mode, will split the active cell at the cursor

Markdown

Markdown

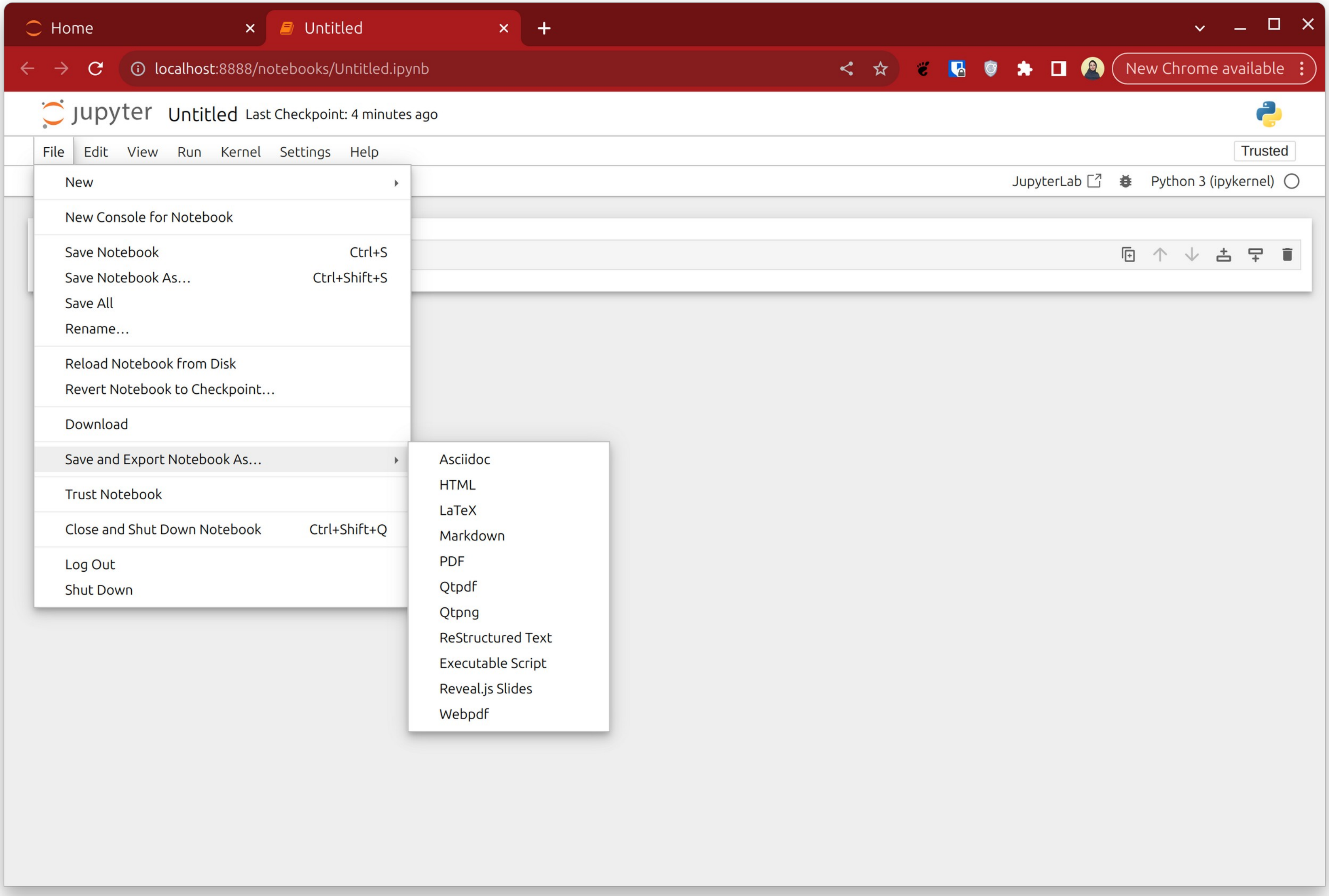
- John Gruber created Markdown in 2004
- It is a lightweight, easy to learn markup language for formatting plain text without the use of a formal text editor or the use of HTML tags
- Its syntax has a one-to-one correspondence with HTML tags.
- Markdown is easier to write than HTML, and it's easier for most humans to read Markdown source than HTML source. However, HTML is more expressive.
- Markdown is widely used for blogging and instant messaging, and also used elsewhere in online forums, collaborative software, documentation pages, and Readme files.
- What is the difference between markup and markdown?



Element	Syntax
Headings	# Level 1 Heading ## Level 2 Heading ### Level 3 Heading
Italic	*text* or _text_
Bold	**text** or __text__
Blockquote	> or >>
Links	[Site Name](Site URL)
Email address	<email address>
Images	![Alt Text](Path to Image)
Ordered list	1. Item 1 2. Item 2 3. Item 3
Unordered list	Use *, – or + * * Item 1 * Item 2 * Item 3
Sublist	Use indentation 1. Item 1 1. Sub-item 1 2. Sub-item 2 2. Item 2 3. Item 3
Inline Code	`code`
Code block	``` code here ```
Horizontal rules	--- or ***

Save, Export, Share

Save it as you wish!



Let’s see some examples! :)

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