

Jupyter Notebook Foundations

About Me...

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Testing in Scala (Book)

Beginning Scala Programming (Video)

Scala Beyond the Basics (Video)

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Introduction



What is it?
(In case you've never heard)

Jupyter Notebooks

- Open Source Web Based Application
- Editable, Document based Notebook
- Extensible through plugins
- Based on Python through interactive project called IPython
- Trial Website: <https://jupyter.org/try>
- Basis for data exploration, and machine learning

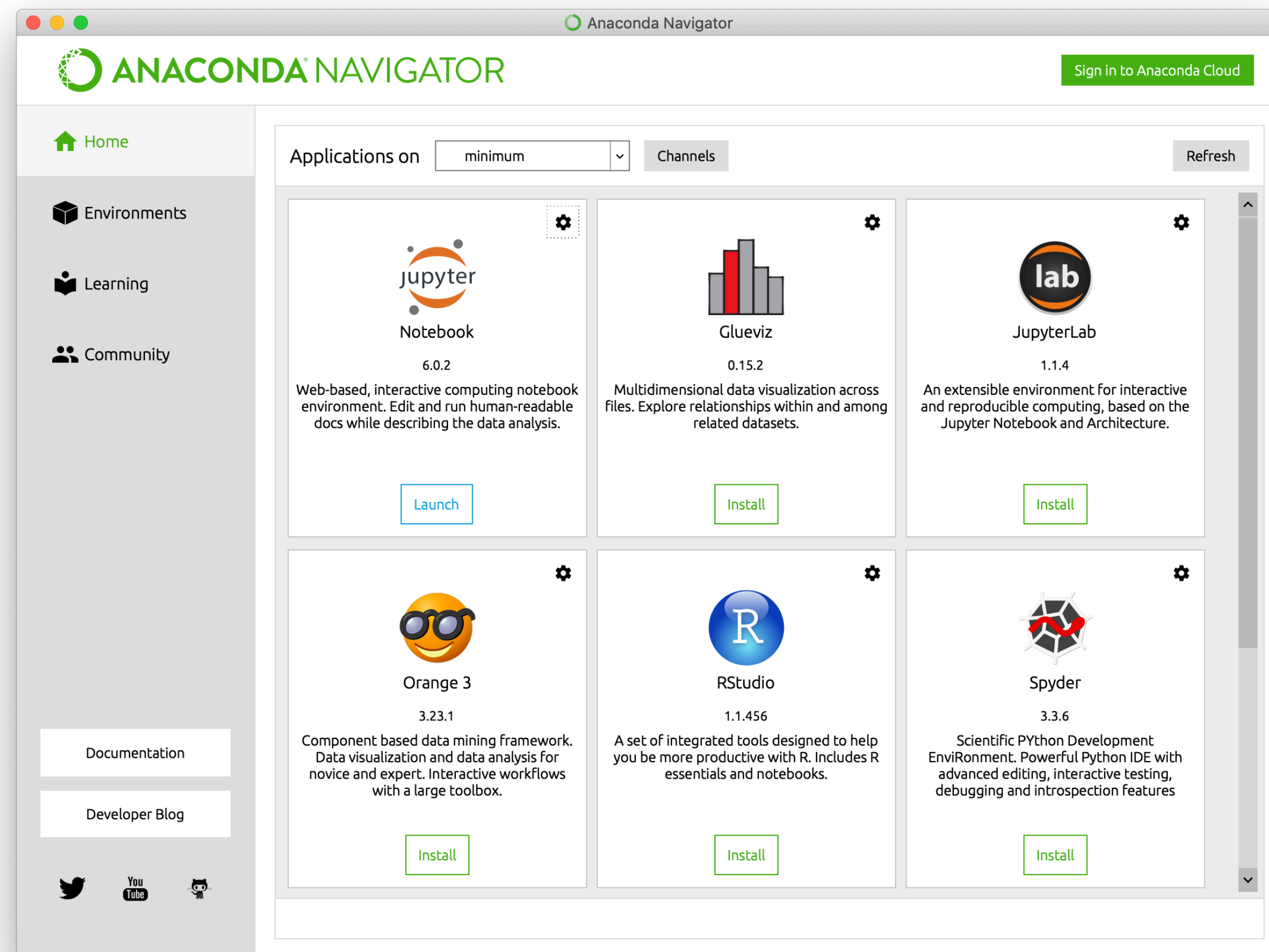


Where to get Jupyter
Notebooks?

Starting Notebooks

The following are just general instructions. This class we will use a web service called Binder.

Anaconda



Pip

```
python3 -m pip install --upgrade pip
```

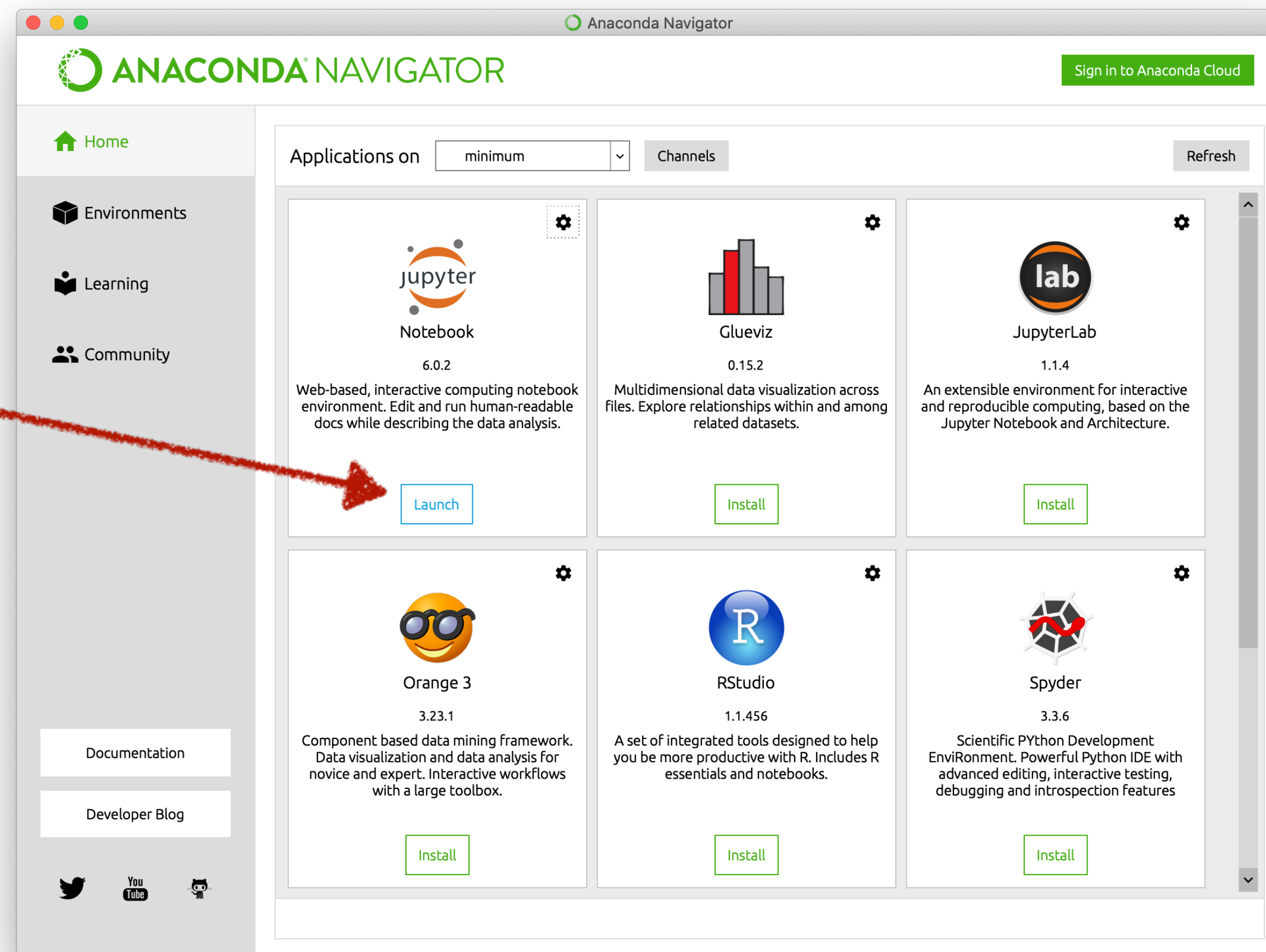
```
python3 -m pip install jupyter
```



Starting Your Notebook

Anaconda

Start Here



Command Line

```
% jupyter notebook
```

After Starting Jupyter

To access the notebook, open this file in a browser:

`file:///Users/myname/Library/Jupyter/runtime/nbserver-5973-open.html`

Or copy and paste one of these URLs:

`http://localhost:8888/?token=8c5f90bee1ff33fb8602f97485e3a7fdc849d9d0d269c245`

or `http://127.0.0.1:8888/?token=8c5f90bee1ff33fb8602f97485e3a7fdc849d9d0d269c245`



Token



Markdown

Markdown Basic Syntax

Element	Markdown Syntax
Heading	<code># H1</code> <code>## H2</code> <code>### H3</code>
Bold	<code>**bold text**</code>
Italic	<code>*italicized text*</code>
Blockquote	<code>> blockquote</code>
Ordered List	<code>1. First item</code> <code>2. Second item</code> <code>3. Third item</code>
Unordered List	<code>- First item</code> <code>- Second item</code> <code>- Third item</code>
Code	<code>`code`</code>
Horizontal Rule	<code>---</code>
Link	<code>[title](https://www.example.com)</code>
Image	<code>![alt text](image.jpg)</code>

Markdown Extended Syntax

Element	Markdown Syntax
Table	<pre> Syntax Description ----- ----- Header Title Paragraph Text </pre>
Fenced Code Block	<pre>```\n{\n "firstName": "John",\n "lastName": "Smith",\n "age": 25\n}\n```\n</pre>
Footnote	<pre>Here's a sentence with a footnote. [^1]\n\n[^1]: This is the footnote.</pre>
Heading ID	<pre>### My Great Heading {#custom-id}</pre>
Definition List	<pre>term\n: definition</pre>
Strikethrough	<pre>~~The world is flat.~~</pre>
Task List	<pre>- [x] Write the press release\n- [] Update the website\n- [] Contact the media</pre>

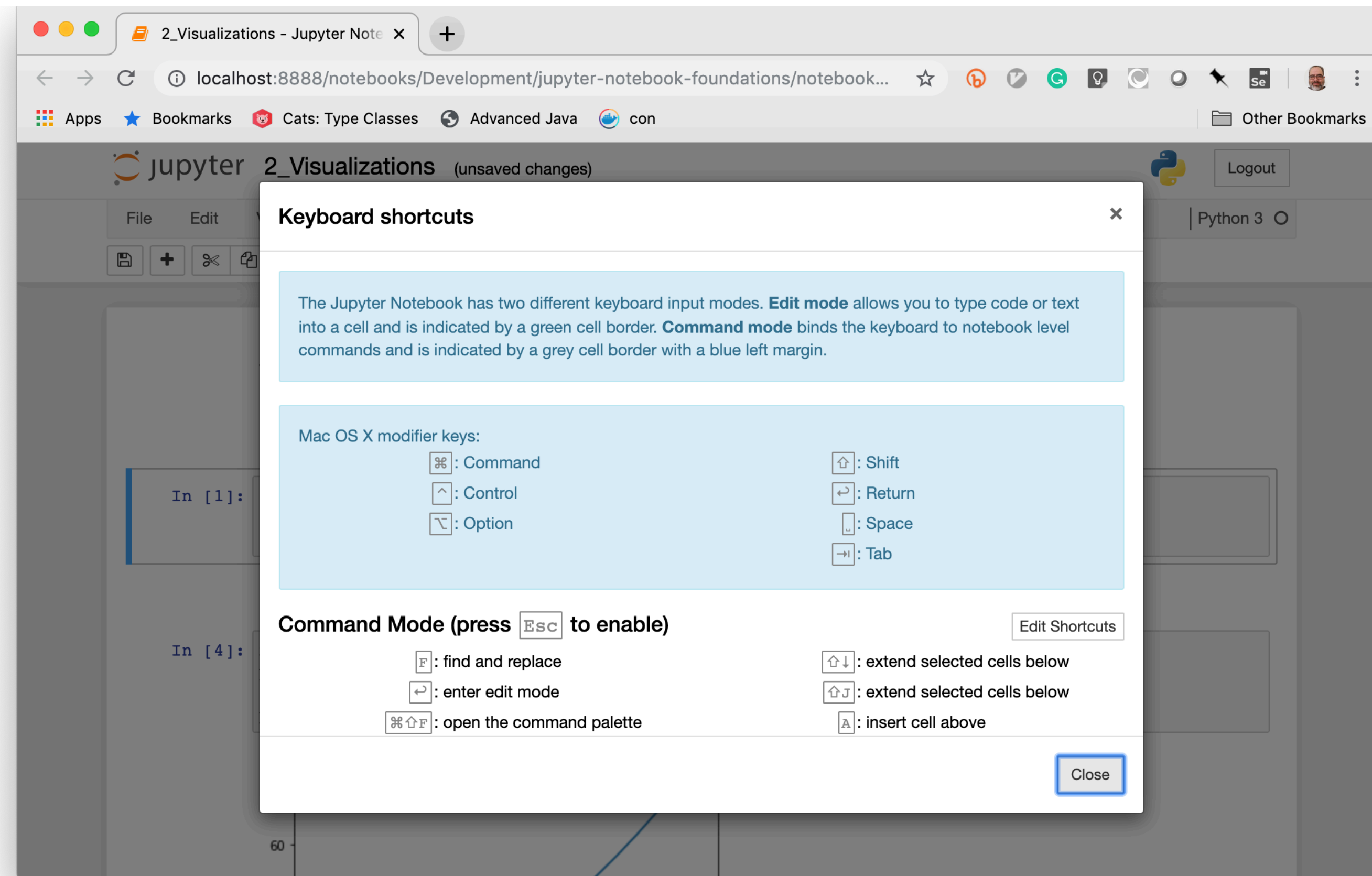


Rapid Creation

Rapid Manipulation Without a Mouse

- It is essential to speed up development with shortcut keys
- Jupyter notebook is rapid prototyping
 - Get your elements and your ideas on the sheet as fast as possible
- Using a mouse can work against you

H is for Help



Command Mode

Command	Mac	Windows/Linux
Create a call above	A	A
Create a cell below	B	B
Code	Y	Y
Markdown	M	M
Raw	R	R
Line Numbers	L	L

Edit Mode

Command	Key
Code Completion or Indent	<TAB>
Tooltip	<SHIFT+TAB> (x1, x2, x3, x4)
Split Cell	<CTRL+SHIFT+MINUS>
Command Mode	ESC



Demo: Edit a Notebook without using a mouse

Open the notebook `/notebooks/1_Introduction.ipynb`



Lab: Edit a Notebook without using a mouse

Open the notebook `/labs/1_Introduction.ipynb`



Questions?



Advanced Manipulation




What to do when
things go wrong?

Too Many Pages Open

- Depending on installation you will reach a limit on the number of pages that you can have open
- You can shut down pages that you no longer require by click on the running tab




[Files](#) [Running](#) [Clusters](#) [Nbextensions](#)

Currently running Jupyter processes 

Terminals ▼

There are no terminals running.

Notebooks ▼

 Development/jupyter-notebook-foundations/notebooks/2_Visualizations.ipynb	Python 3	Shutdown	seconds ago
 Development/jupyter-notebook-foundations/notebooks/4_Extensions.ipynb	Python 3	Shutdown	seconds ago
 Development/jupyter-notebook-foundations/notebooks/1_Introduction.ipynb	Python 3	Shutdown	seconds ago

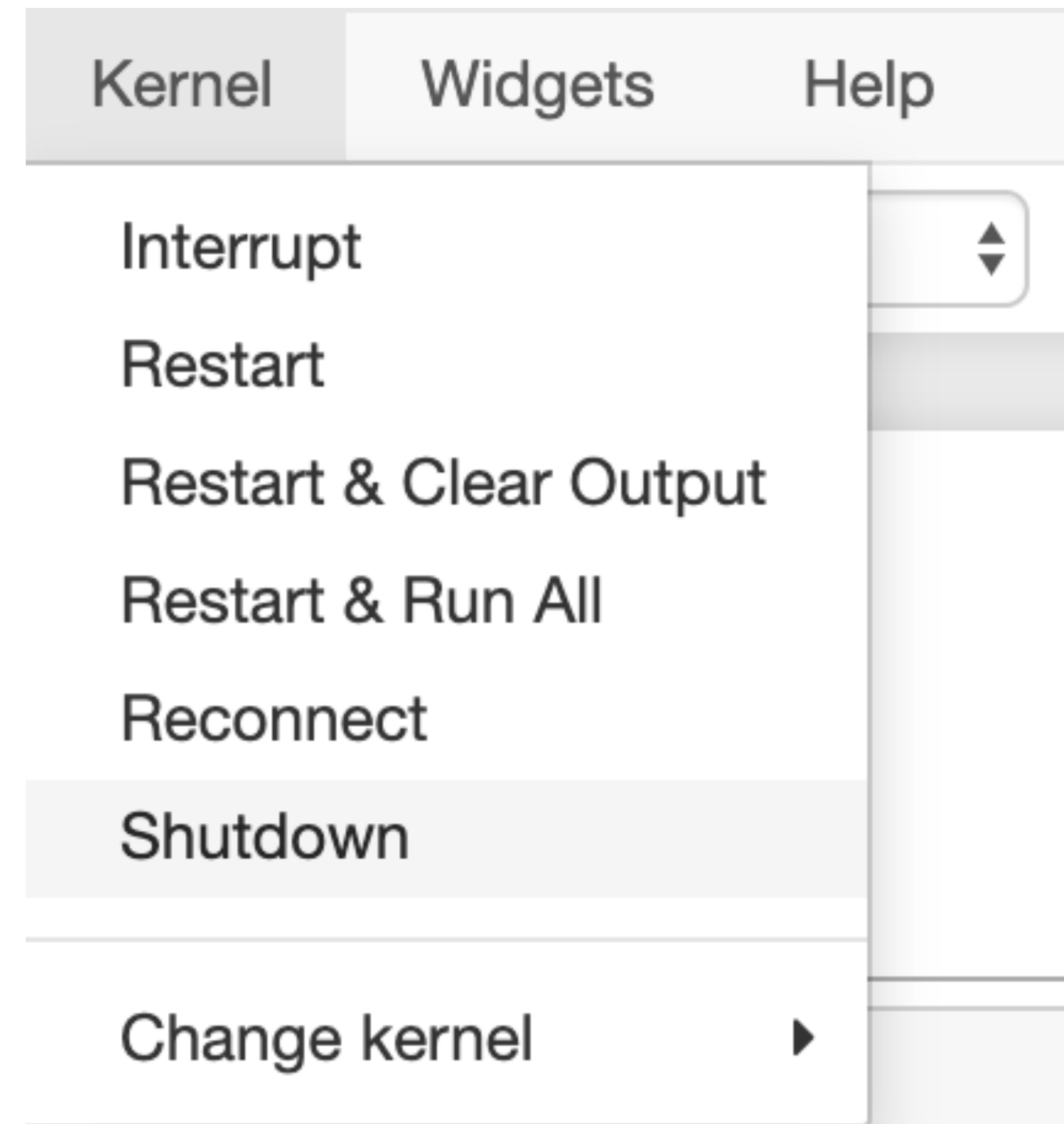
Cannot use Hotkeys

- At times there are various plugins that can interfere with Jupyter Notebooks.
- Do an audit of your browser plugins and determine which ones are affecting your experience
- Good quality plugins will often allow you to turn off its plugin for certain sites.

Patterns	Keys
<input type="text" value="https?://localhost:8888/*"/>	<input type="text" value="Exclude keys"/> ✕

I'm stuck!

- You have varying ways to bail out when things go wrong
- Try some of these less intrusive means first:
 - Interrupt - Stop the process that is taking a long time
 - Restart & Clear Output - Restart the page and make all the cells blank
 - Restart & Run All - Restart the page and make all the cells blank

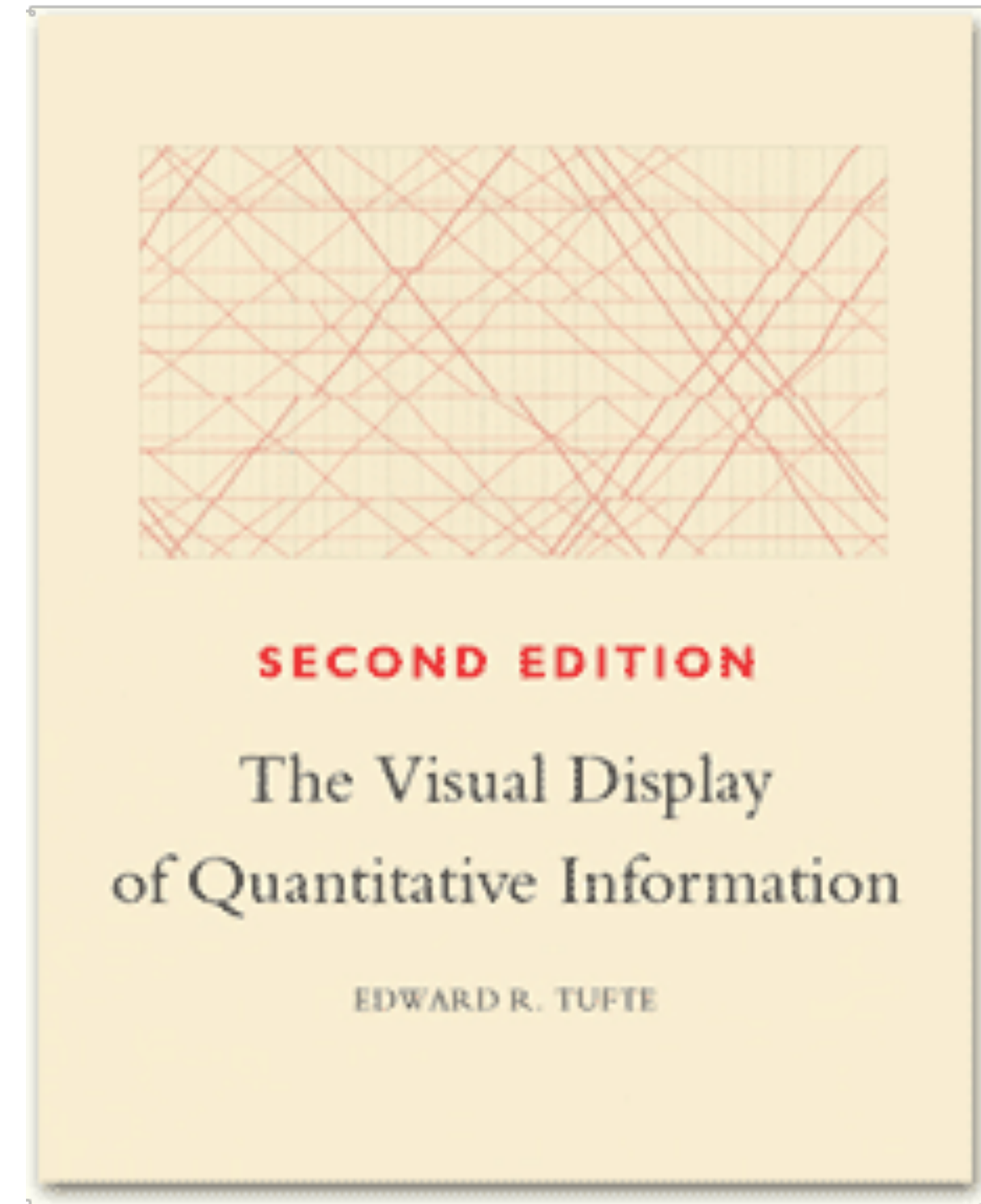




Visualizations

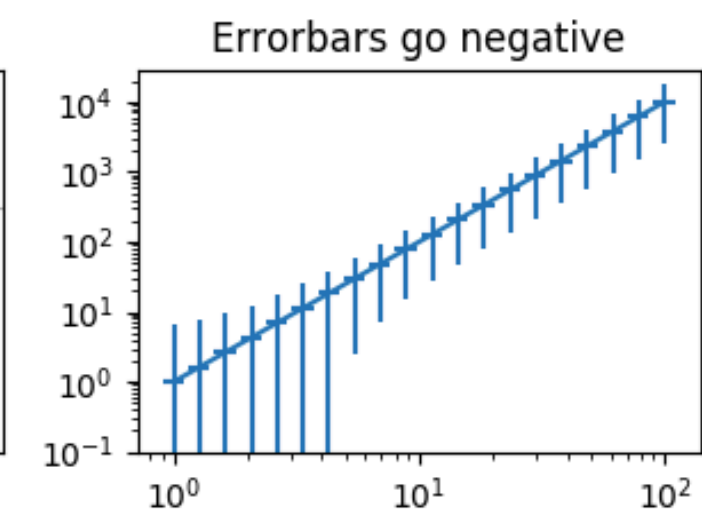
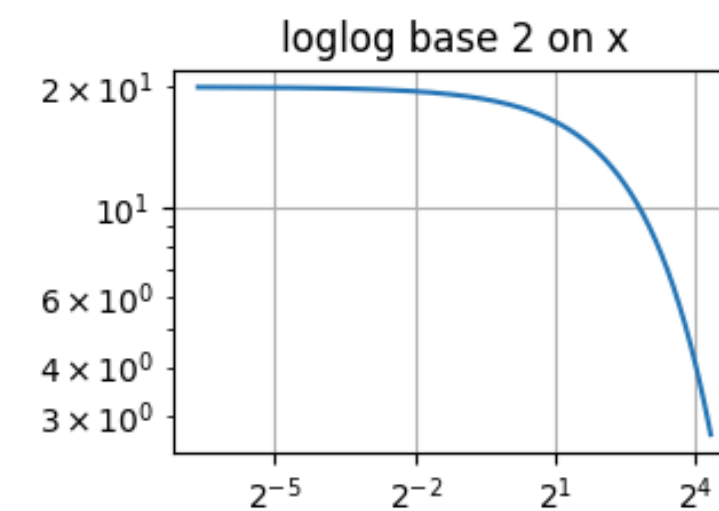
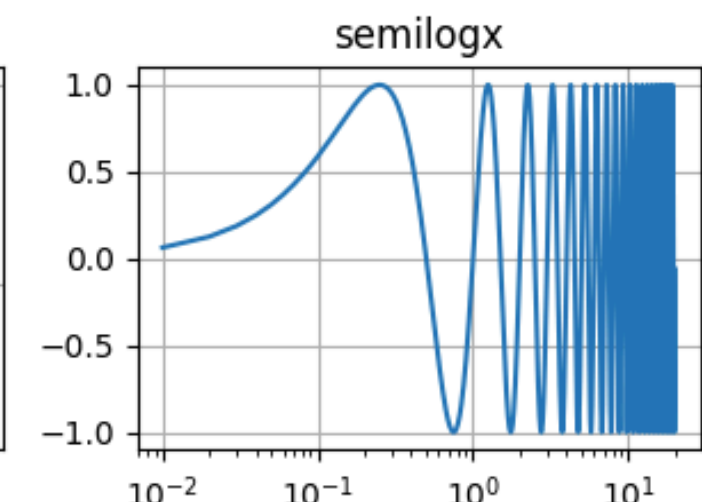
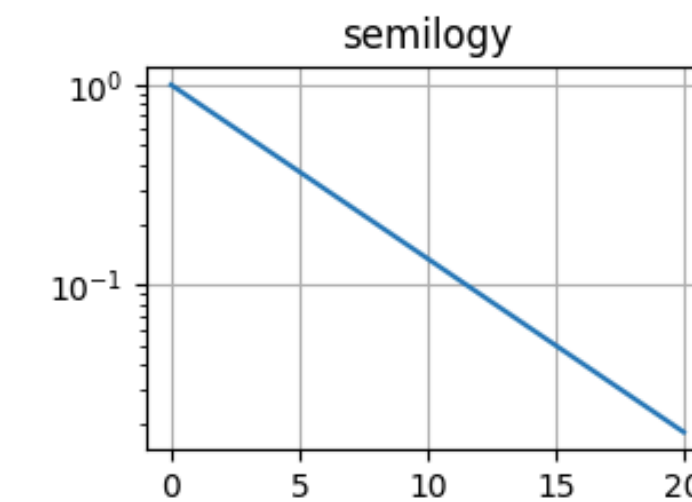
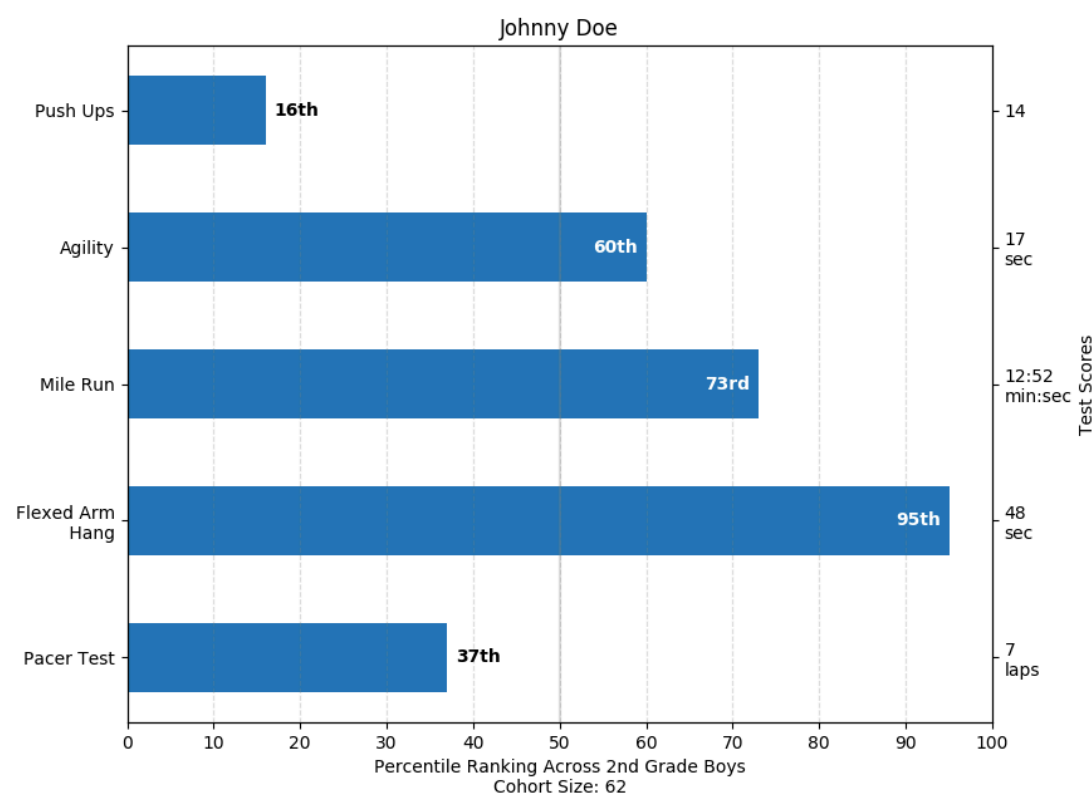
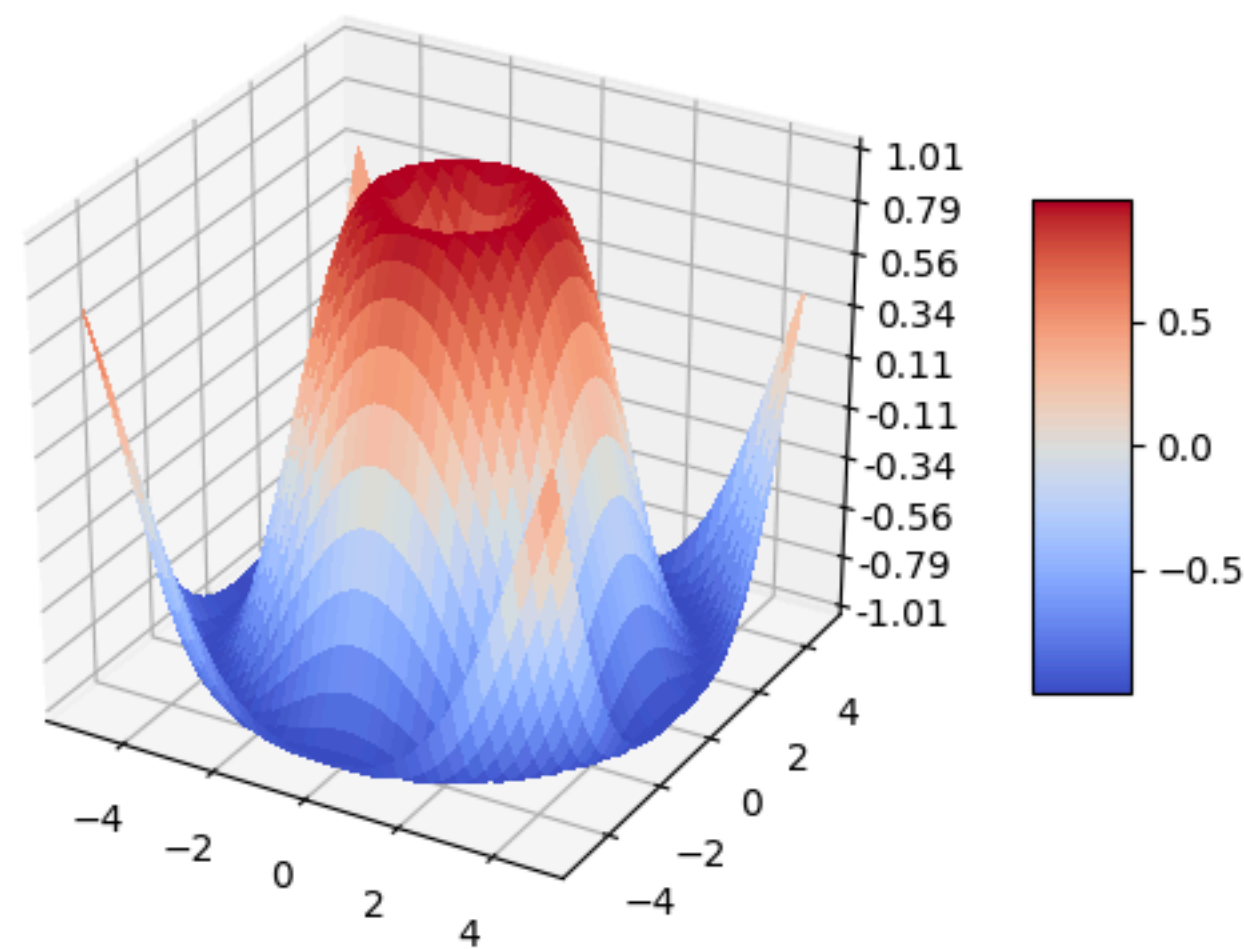
Graphical Excellence

- "Excellence in statistical graphics consists of complex ideas communicated for clarity precision and efficiency"
- "A large share of ink on a graphic should present data-information, the ink changing as the data change. Data-ink is the non-erasable core of a graphic, the non-redundant ink arranged in response to variation in the numbers represented."
- "Above all else, show the data"



Matplotlib

Python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms

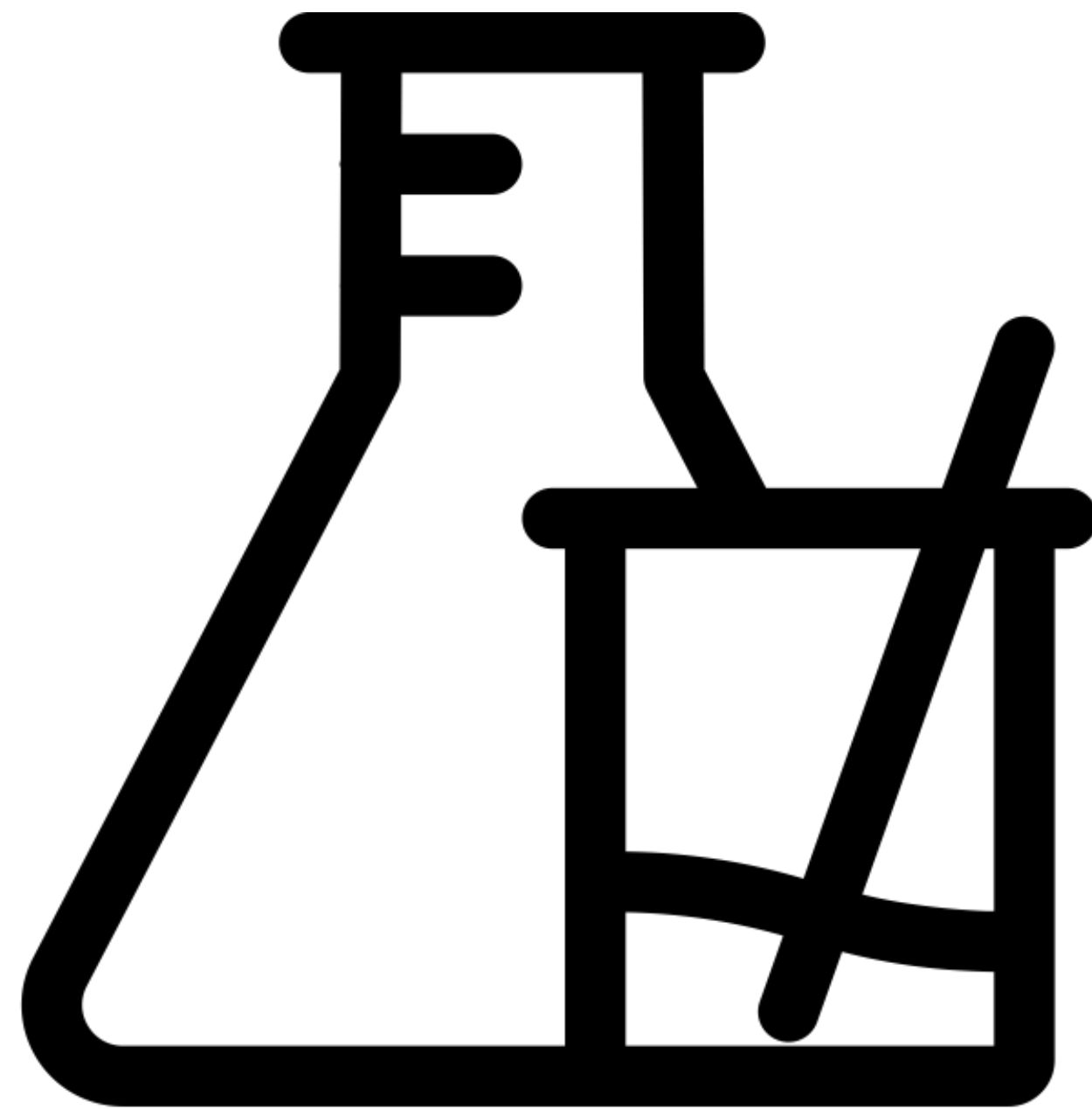


Source: https://matplotlib.org/tutorials/introductory/sample_plots.html



Demo: Visualizations, how to bring graphing into Jupyter

Open the notebook `/notebooks/2_Visualizations.ipynb`



Lab: Create a graph with some data

Open the notebook `/labs/2_Visualizations.ipynb`



Widgets



Demo: Widgets to Change Results

Open the notebook /notebooks/3_Widgets.ipynb



Lab: Using a Widgets

Open the notebook `/labs/3_Widgets.ipynb`



Extensions

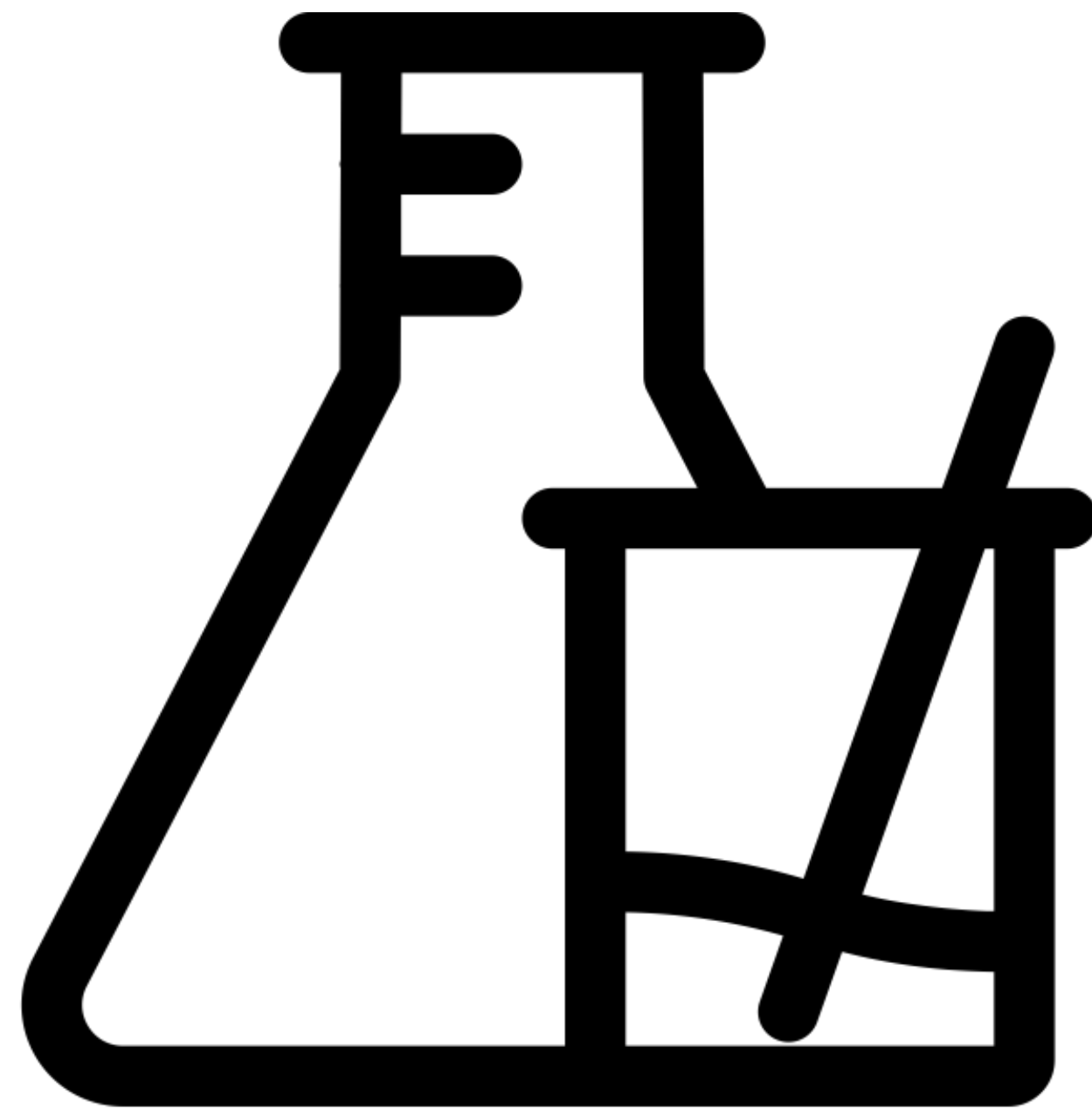


Configurable nbextensions

☐ disable configuration for nbextensions without explicit compatibility (they may break your notebook environment, but can be useful to show for nbextension development)

filter: by description, section, or tags

- | | | | |
|--|--|--|---|
| <input type="checkbox"/> (some) LaTeX environments for Jupyter | <input type="checkbox"/> 2to3 Converter | <input type="checkbox"/> AddBefore | <input type="checkbox"/> Autopep8 |
| <input type="checkbox"/> AutoSaveTime | <input type="checkbox"/> Autoscroll | <input type="checkbox"/> Cell Filter | <input type="checkbox"/> Code Font Size |
| <input type="checkbox"/> Code prettify | <input type="checkbox"/> Codefolding | <input type="checkbox"/> Codefolding in Editor | <input type="checkbox"/> CodeMirror mode extensions |
| <input type="checkbox"/> Collapsible Headings | <input type="checkbox"/> Comment/Uncomment Hotkey | <input checked="" type="checkbox"/> contrib_nbextensions_help_item | <input type="checkbox"/> datestamper |
| <input type="checkbox"/> Equation Auto Numbering | <input type="checkbox"/> ExecuteTime | <input type="checkbox"/> Execution Dependencies | <input type="checkbox"/> Exercise |
| <input type="checkbox"/> Exercise2 | <input type="checkbox"/> Export Embedded HTML | <input type="checkbox"/> Freeze | <input type="checkbox"/> Gist-it |
| <input type="checkbox"/> Help panel | <input type="checkbox"/> Hide Header | <input type="checkbox"/> Hide input | <input type="checkbox"/> Hide input all |
| <input type="checkbox"/> Highlight selected word | <input type="checkbox"/> highlighter | <input type="checkbox"/> Hinterland | <input type="checkbox"/> Initialization cells |
| <input type="checkbox"/> isort formatter | <input checked="" type="checkbox"/> jupyter-js-widgets/extension | <input type="checkbox"/> Keyboard shortcut editor | <input type="checkbox"/> Launch QTConsole |
| <input type="checkbox"/> Limit Output | <input type="checkbox"/> Live Markdown Preview | <input type="checkbox"/> Load TeX macros | <input type="checkbox"/> Move selected cells |
| <input type="checkbox"/> Navigation-Hotkeys | <input checked="" type="checkbox"/> Nbextensions dashboard tab | <input checked="" type="checkbox"/> Nbextensions edit menu item | <input type="checkbox"/> nbTranslate |
| <input type="checkbox"/> Notify | <input type="checkbox"/> Printview | <input type="checkbox"/> Python Markdown | <input type="checkbox"/> Rubberband |
| <input type="checkbox"/> Ruler | <input type="checkbox"/> Ruler in Editor | <input type="checkbox"/> Runtools | <input type="checkbox"/> Scratchpad |
| <input type="checkbox"/> ScrollDown | <input type="checkbox"/> Select CodeMirror Keymap | <input type="checkbox"/> SKILL Syntax | <input type="checkbox"/> Skip-Traceback |
| <input type="checkbox"/> Snippets | <input type="checkbox"/> Snippets Menu | <input type="checkbox"/> spellchecker | <input type="checkbox"/> Split Cells Notebook |
| <input type="checkbox"/> Table of Contents (2) | <input type="checkbox"/> table_beautifier | <input type="checkbox"/> Toggle all line numbers | <input type="checkbox"/> Tree Filter |
| <input type="checkbox"/> Variable Inspector | <input checked="" type="checkbox"/> voila/extension | <input type="checkbox"/> zenmode | |



Lab: Select Your Favorite Extensions

Open the notebook `/labs/4_Extension.ipynb`



Questions?



More Advanced Manipulation



Layouts with Voilá

The Idea for Dashboards

- Dashboards are meant to drag and arrange cells on your page
- Currently to do so is somewhat in limbo
- We first started with Jupyter-Dashboards, which has since been....

Deprecated

jupyter-attic / **dashboards**

Watch ▾

82

★ Star

973

🔗 Fork

196

↔ Code

🔔 Issues 28

🔗 Pull requests 4

▶ Actions

📁 Projects 0

📖 Wiki

🛡 Security

📊 Insights

[RETIRED] See Voilà as a supported replacement <https://github.com/voila-dashboards>

dashboard

jupyter

jupyter-notebook

🔄 441 commits

🔗 10 branches

📦 0 packages

🏷 15 releases

👤 17 contributors

📄 View license

Branch: master ▾

New pull request

Create new file

Upload files

Find file

Clone or download ▾

The word "voilà" is written in a teal, cursive script. A small yellow curved line is positioned above the final 'à'.

Now, there is a new project

<https://github.com/voila-dashboards>



Choosing a Different Language Kernel

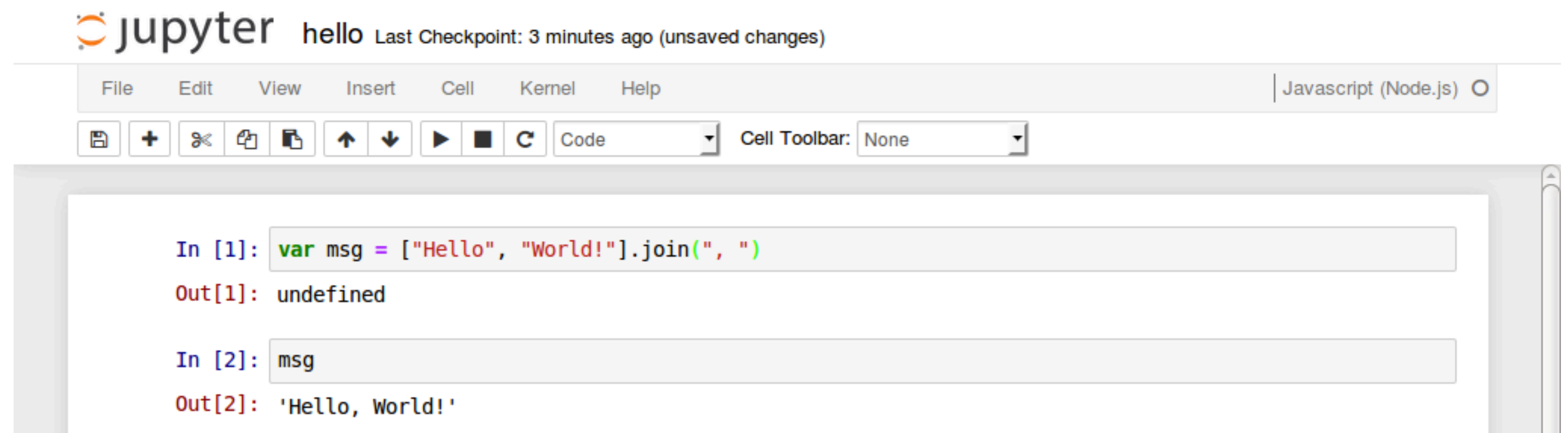
Different Languages

- Jupyter Notebooks offer more than just one language
- Python 3 is the the most common
- <https://github.com/jupyter/jupyter/wiki/Jupyter-kernels>
- Each Language has their own installation process

Example: JavaScript

- Requirements
 - Node JS
 - npm
 - brew
 - pyzmq
 - zeromq

```
npm install -g ijavascript  
ijsinstall
```



The image shows a Jupyter Notebook interface. At the top, the Jupyter logo is followed by the text "hello" and "Last Checkpoint: 3 minutes ago (unsaved changes)". Below this is a menu bar with "File", "Edit", "View", "Insert", "Cell", "Kernel", and "Help". To the right of the menu bar is a dropdown menu showing "Javascript (Node.js)". Below the menu bar is a toolbar with icons for saving, adding a new cell, undo, redo, and other actions. The main area of the notebook contains two code cells. The first cell has the input "In [1]: var msg = ['Hello', 'World!'].join(', ')" and the output "Out[1]: undefined". The second cell has the input "In [2]: msg" and the output "Out[2]: 'Hello, World!'".

```
Jupyter hello Last Checkpoint: 3 minutes ago (unsaved changes)  
File Edit View Insert Cell Kernel Help Javascript (Node.js)  
[Icons] Code Cell Toolbar: None  
  
In [1]: var msg = ["Hello", "World!"].join(", ")  
Out[1]: undefined  
  
In [2]: msg  
Out[2]: 'Hello, World!'
```



Show the World your
Work

nbconvert

- Enables:
 - Presentation: of information in familiar formats, such as PDF.
 - Publishing of research using LaTeX and opens the door for embedding notebooks in papers
 - Collaboration with others who may not use the notebook in their work.
 - Sharing contents with many people via the web using HTML.



Lab: Creating Your Delivery



Questions?

Thank You



- Email: dhinojosa@evolutionnext.com
- Github: <https://www.github.com/dhinojosa>
- Twitter: <http://twitter.com/dhinojosa>
- Linked In: <http://www.linkedin.com/in/dhevolutionnext>

Credits

Graph Background Public Domain: <https://www.maxpixel.net/Graph-Statistics-Visualisation-Data-Line-Graph-3186082>
Rocket Logo, Noun Project, Orin Zuu - <https://thenounproject.com/search/?q=rocket&i=1078870>
Mouse by Braja Omar Justico from the Noun Project - <https://thenounproject.com/search/?q=mouse&i=2554259>
lab by Vadim Solomakhin from the Noun Project - <https://thenounproject.com/search/?q=lab&i=3020051>
tutorial by Adrien Coquet from the Noun Project - <https://thenounproject.com/search/?q=demonstrate&i=2366975>
notes by Delwar Hossain from the Noun Project - <https://thenounproject.com/search/?q=note&i=585396>