

Part II: Python

Python is one of the most popular general-purpose programming languages

Rank	Language	Ratings
1	Java	20.5%
2	C	14.6%
3	C++	6.7%
4	C#	4.3%
5	Python	4.3%
6	PHP	2.8%
7	Visual Basic.Net	2.6%
8	JavaScript	2.3%
9	Perl	2.3%
10	Ruby	2.2%

Python has many applications

- Web development
- Application development
- Computer graphics
- Scientific computing
 - Bioinformatics
 - Machine learning
 - Simulations

<https://www.python.org/about/quotes/>

We use the Anaconda Python distribution

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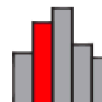
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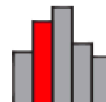
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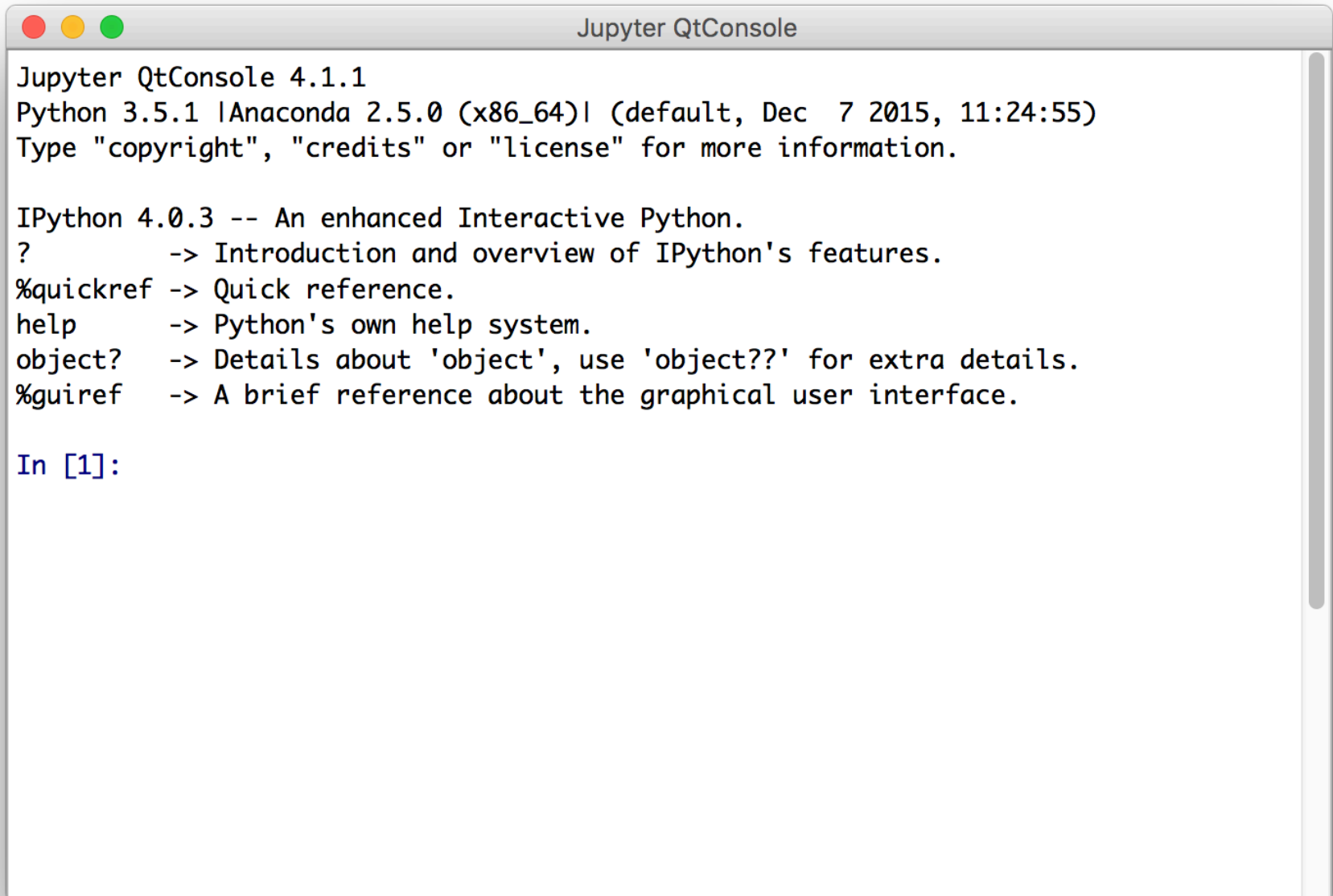
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Simple python console
for small problems

IPython QtConsole



```
Jupyter QtConsole 4.1.1
Python 3.5.1 |Anaconda 2.5.0 (x86_64)| (default, Dec 7 2015, 11:24:55)
Type "copyright", "credits" or "license" for more information.

IPython 4.0.3 -- An enhanced Interactive Python.
?                -> Introduction and overview of IPython's features.
%quickref        -> Quick reference.
help             -> Python's own help system.
object?          -> Details about 'object', use 'object??' for extra details.
%gui?            -> A brief reference about the graphical user interface.

In [1]:
```

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Similar to R Studio, but not
as full featured.



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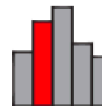
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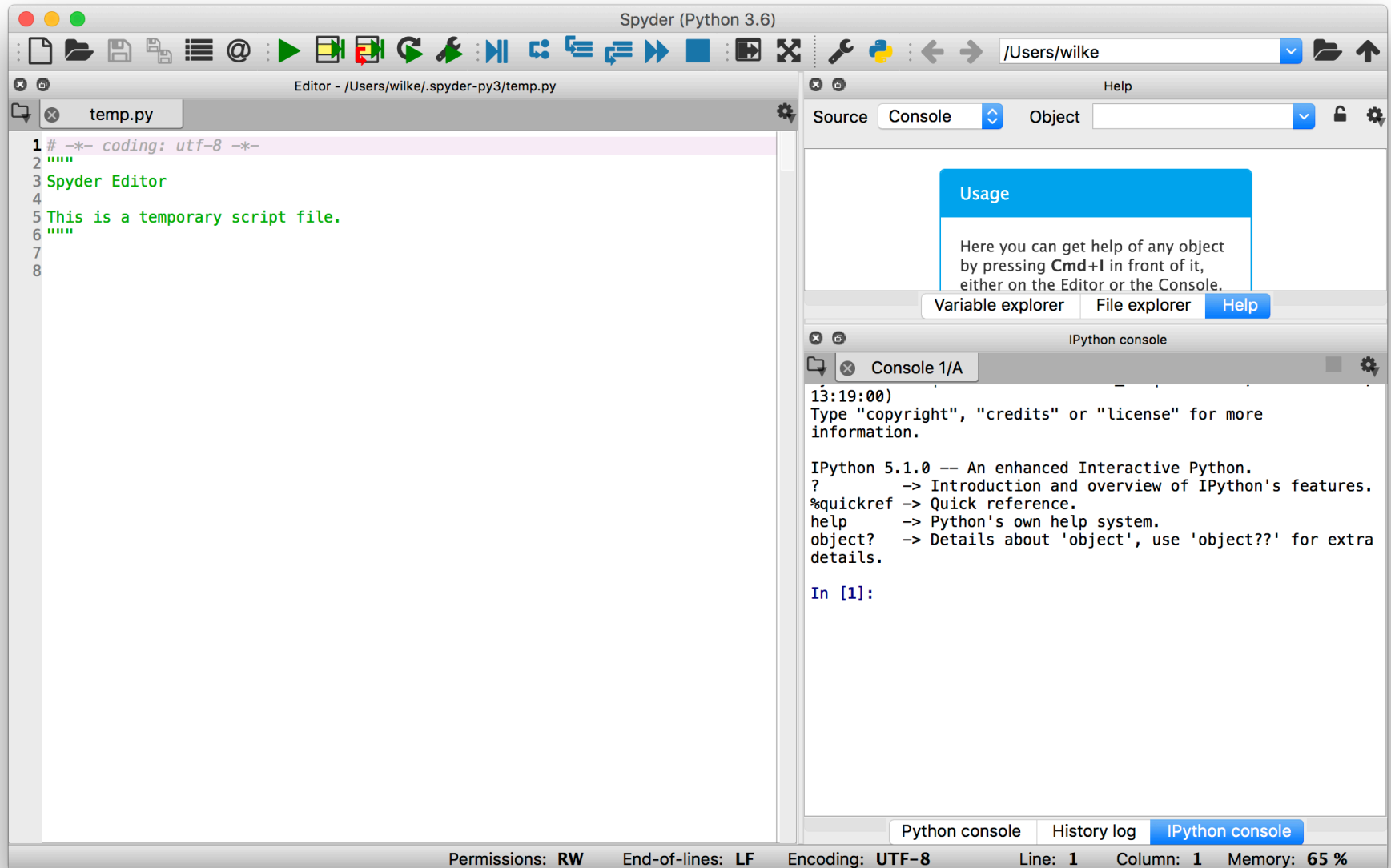
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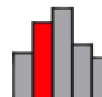


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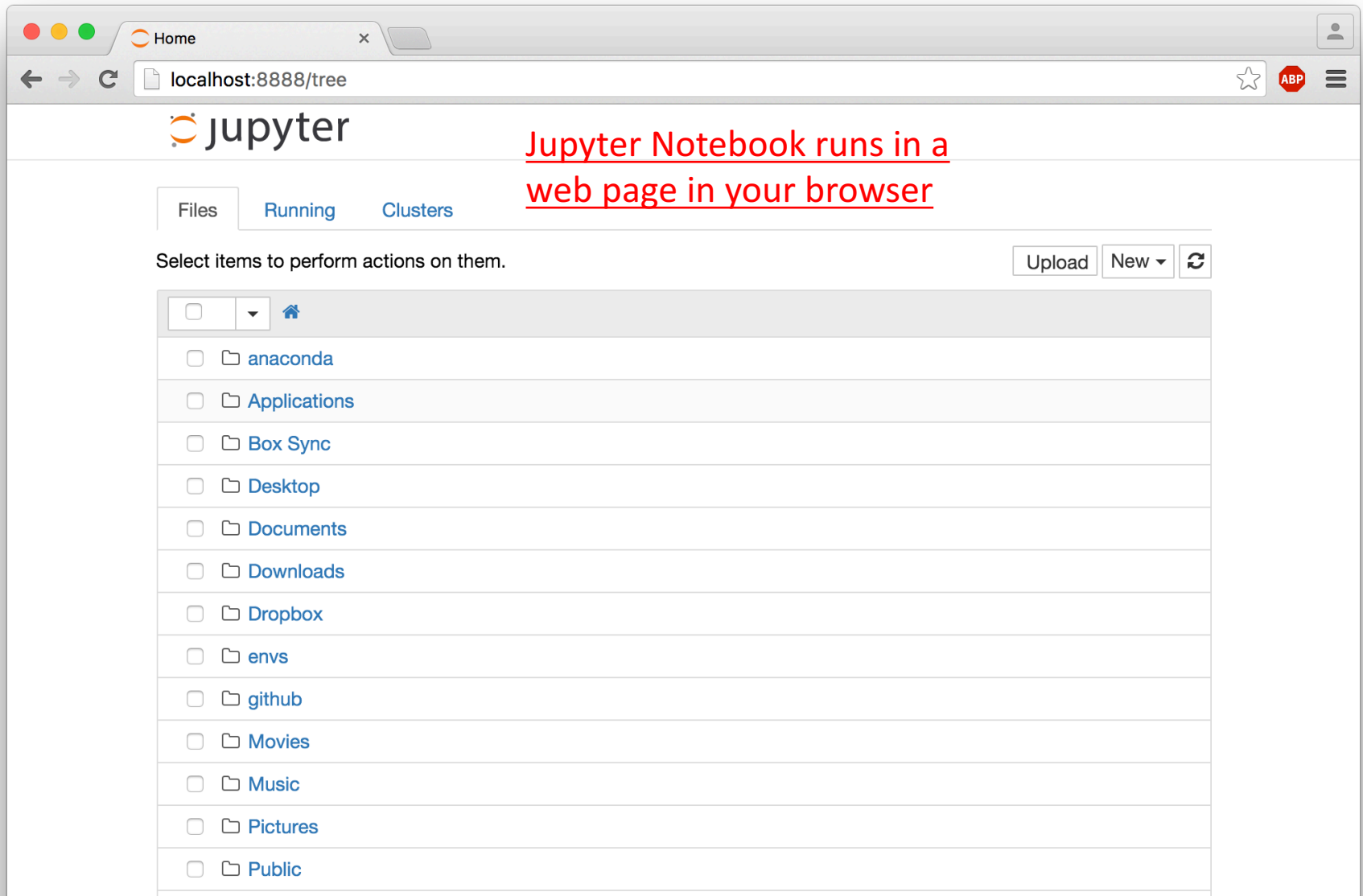
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Mix text and python code,
similar to R Markdown

Jupyter Notebook



Jupyter Notebook

The image shows a web browser window displaying the Jupyter Notebook interface at `localhost:8888/tree`. The interface includes a sidebar with a file tree and tabs for 'Files', 'Running', and 'Clusters'. The file tree lists various system folders like 'anaconda', 'Applications', 'Box Sync', 'Desktop', 'Documents', 'Downloads', 'Dropbox', 'envs', 'github', 'Movies', 'Music', 'Pictures', and 'Public'. A terminal window is overlaid on the right side of the browser, showing the command `python -bash` and the output of the Jupyter Notebook startup process. The terminal output includes the last login time, the command used to start the notebook, and the URL to access the notebook in a browser. The URL is `http://localhost:8888/?token=5a5ebba23d3434ed9db9adf16d3b2d90874f6d62db95a407`. The terminal also shows the message 'The Jupyter Notebook is running at: http://localhost:8888/?token=5a5ebba23d3434ed9db9adf16d3b2d90874f6d62db95a407' and instructions to use Control-C to stop the server.

IPython Notebook (Jupyter)
runs in a web page in your browser

```
Last login: Sun Feb 26 22:32:04 on ttys003
Claus-2016-MBP:~ wilke$ /Users/wilke/anaconda/bin/jupyter_mac.command ; exit;
[I 22:51:07.997 NotebookApp] Serving notebooks from local directory: /Users/wilke
[I 22:51:07.997 NotebookApp] 0 active kernels
[I 22:51:07.997 NotebookApp] The Jupyter Notebook is running at: http://localhost:8888/?token=5a5ebba23d3434ed9db9adf16d3b2d90874f6d62db95a407
[I 22:51:07.997 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 22:51:07.998 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time, to login with a token:
http://localhost:8888/?token=5a5ebba23d3434ed9db9adf16d3b2d90874f6d62db95a407
[I 22:51:08.423 NotebookApp] Accepting one-time-token-authenticated connection from ::1
```

It also opens another window that you need to close when you are done!

Counting like a computer scientist

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, ...

Indexing in Python

P	y	t	h	o	n
0	1	2	3	4	5

Indexing in Python

P	y	t	h	o	n
0	1	2	3	4	5

```
In [1]: x="Python"
```

```
In [2]: x[0]
```

```
Out[2]: 'P'
```

Indexing in Python

P	y	t	h	o	n
0	1	2	3	4	5

```
In [1]: x="Python"
```

```
In [2]: x[1:4] ← We index from the first element to  
Out[2]: 'yth'    one past the last element
```


Indexing in Python

P	y	t	h	o	n
0	1	2	3	4	5

```
In [1]: x="Python"
```

```
In [2]: x[3:] ← Missing number means "to the end"
```

```
Out[2]: 'hon'
```

We can also index in reverse

P	y	t	h	o	n
-6	-5	-4	-3	-2	-1

We can also index in reverse

P	y	t	h	o	n
-6	-5	-4	-3	-2	-1

```
In [1]: x="Python"
```

```
In [2]: x[-6]
```

```
Out[2]: 'P'
```

We can also index in reverse

P	y	t	h	o	n
-6	-5	-4	-3	-2	-1

```
In [1]: x="Python"
```

```
In [2]: x[-5:-2] ← Again, we index one  
Out[2]: 'yth'      past the last element
```

We can also index in reverse

P	y	t	h	o	n
-6	-5	-4	-3	-2	-1

```
In [1]: x="Python"
```

```
In [2]: x[-3:] ← This captures the last 3 characters
```

```
Out[2]: 'hon'
```