Jupyter Notebook

By Giannis Papadopoulos, Lorenzo Gasparini, Anelia Dimitrova & Ajaya Adhikari

1.

What is Jupyter Notebook?

Jupyter Notebook

```
def add5(x):
    return x+5

def dotwrite(ast):
    nodename = getNodename()
    label=symbol.sym_name.get(int(ast[0]),ast[0])
    print ' %s [label="%s' % (nodename, label),
    if isinstance(ast[1], str):
        if ast[1].strip():
            print '= %s"];' % ast[1]
        else:
            print '"]'
    else:
        print '"];'
        children = []
        for n, child in enumerate(ast[1:]):
            children.append(dotwrite(child))
        print ' %s -> {' % nodename,
        for name in children:
            print '%s' % name,
```

Code

+

Lorem Ipsum Paragraph

Pellentesque habitant morbi tristique senectus et netus et malesuada fames
egestas. Vestibulum tortor quam, feugiat vitae, ultricies eget, tempor sit am
Donec eu libero sit amet quam egestas semper. Aenean ultricies mi vitae est
placerat eleifend leo. Quisque sit amet est et sapien ullamcorper pharetra. V
erat wisi, condimentum sed, commodo vitae, ornare sit amet, wisi. Aenean
fermentum, elit eget tincidunt condimentum, eros ipsum rutrum orci, sagittis
lacus enim ac dui. Donec non enim in turpis pulvinar facilisis. Ut felis. Praeser
dapibus, neque id cursus faucibus, tortor neque egestas augue, eu vulputate
eros eu erat. Aliquam erat volutpat. Nam dui mi, tincidunt quis, accumsan po
facilisis luctus, metus

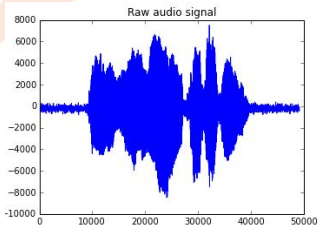
Natural text

+

$$\int \frac{d\theta}{1+\theta^2} = \tan^{-1}\theta + C$$

Equations

+



Code output and plots

All in one.. Notebook..

jupyter spectrogram (autosaved)

File Edit View Insert Cell Kernel Help | Python 3

Markdown CellToolbar

Simple spectral analysis

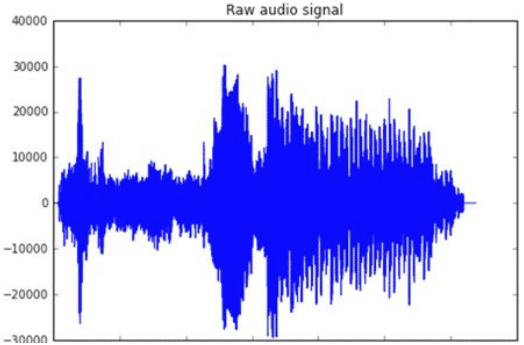
An illustration of the Discrete Fourier Transform

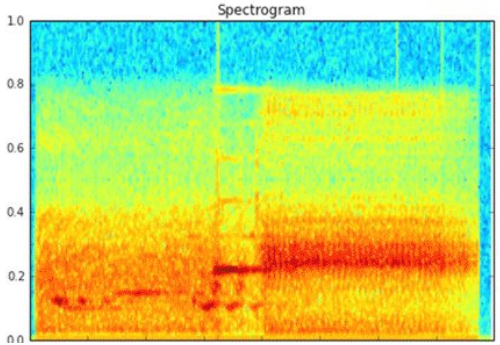
$$X_k = \sum_{n=0}^{N-1} x_n exp^{\frac{-2\pi i}{N} kn} \quad k = 0, \ldots, N-1$$

In [2]:
```
from scipy.io import wavfile
rate, x = wavfile.read('test_mono.wav')
```

And we can easily view it's spectral structure using matplotlib's builtin specgram routine:

In [5]:
```
fig, (ax1, ax2) = plt.subplots(1,2,figsize(16,5))
ax1.plot(x); ax1.set_title('Raw audio signal')
ax2.specgram(x); ax2.set_title('Spectrogram');
```





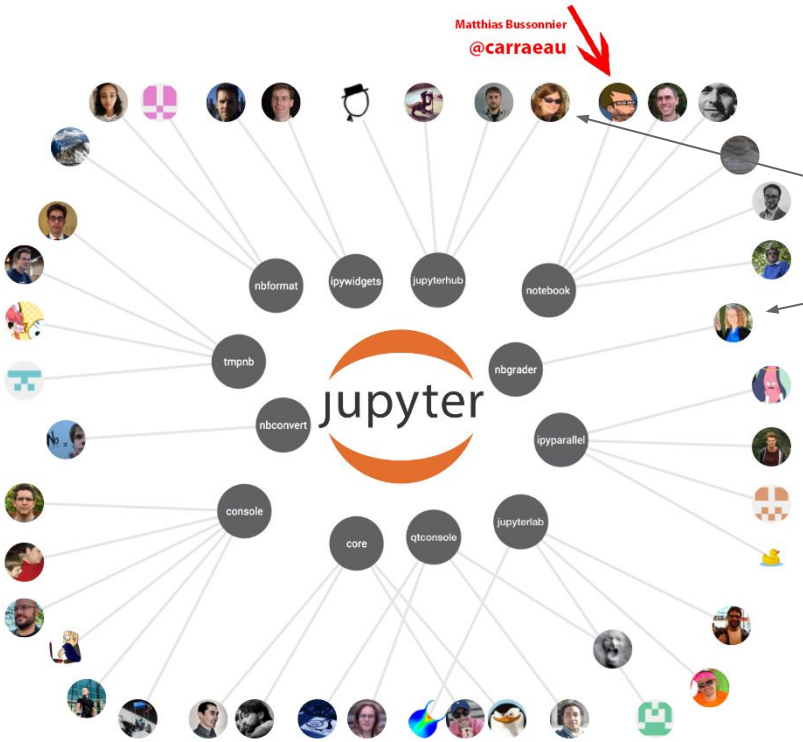
2.
Organization

267 contributors

41000 lines of code

500.000+ notebooks on Github

Jupyter Community



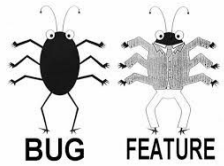
- Steering Council
  - 2 smart ladies!
- Developers
  - @Carreau ♥
- Contributors
- Sponsors

Stakeholders

Assessors

Communicators

Developers



Sponsors

Maintainers

Support Staff

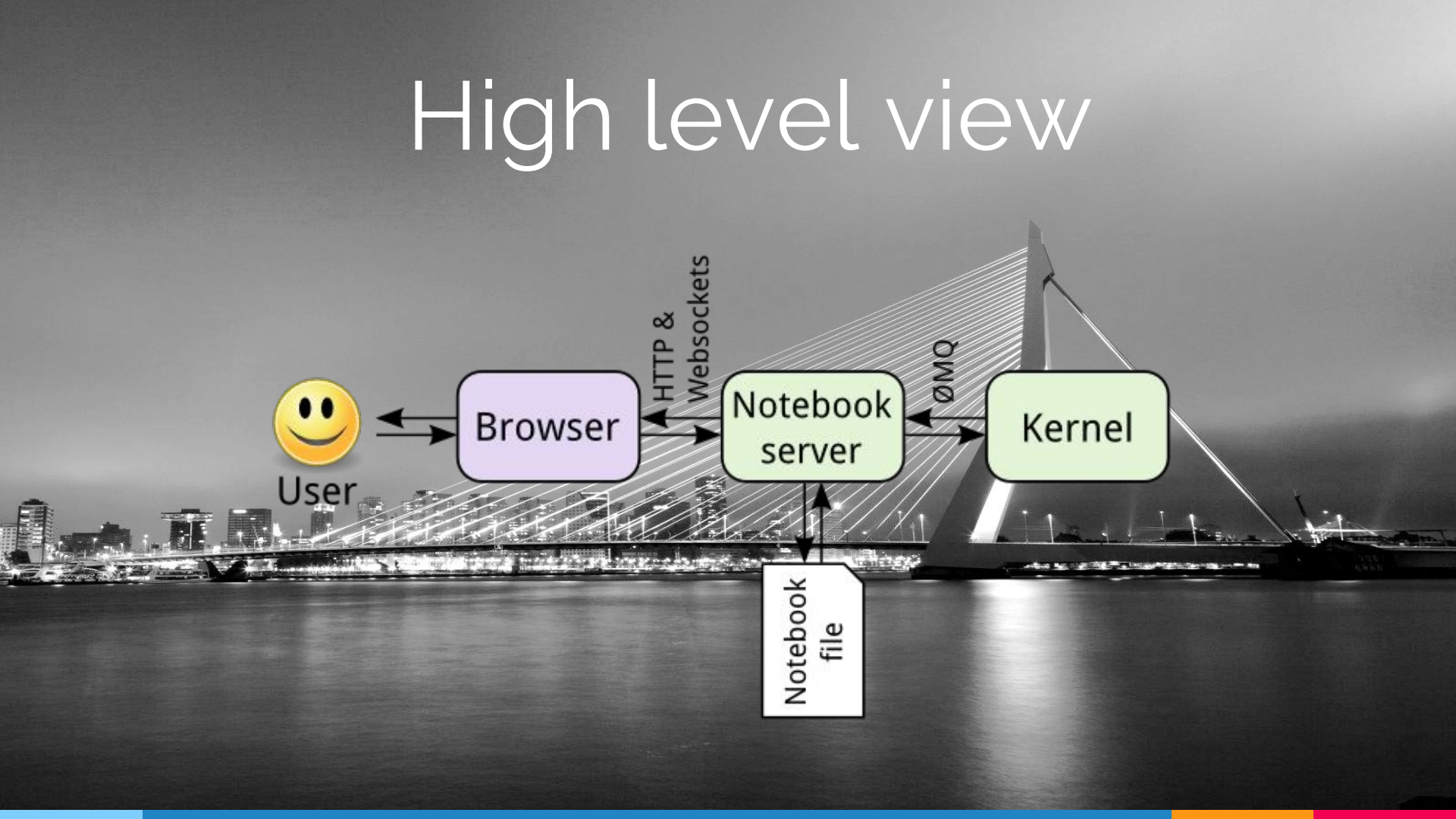
Testers

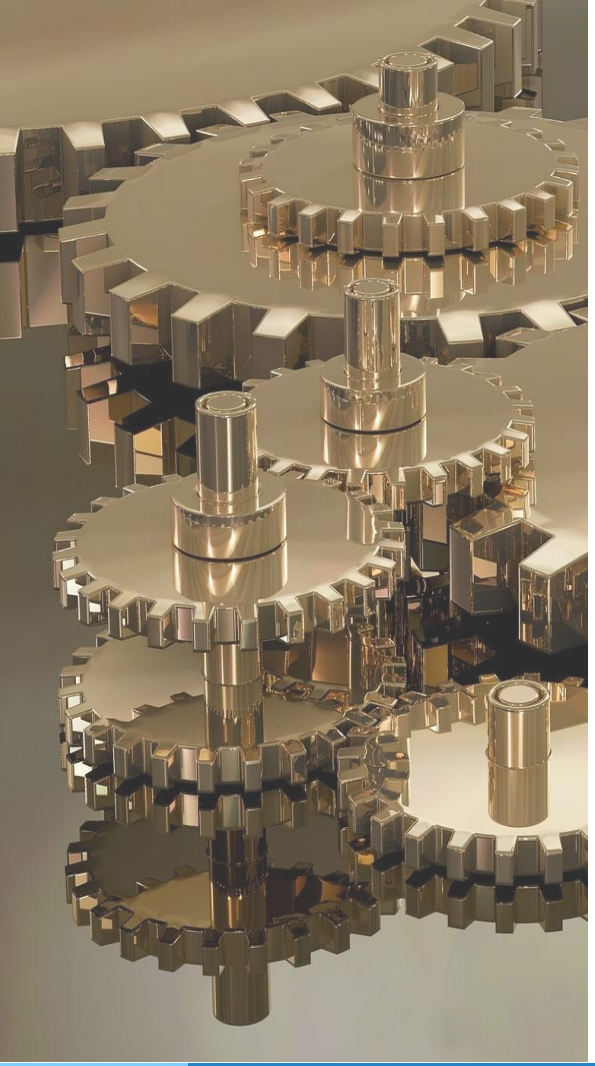
Users

Context Viewpoint

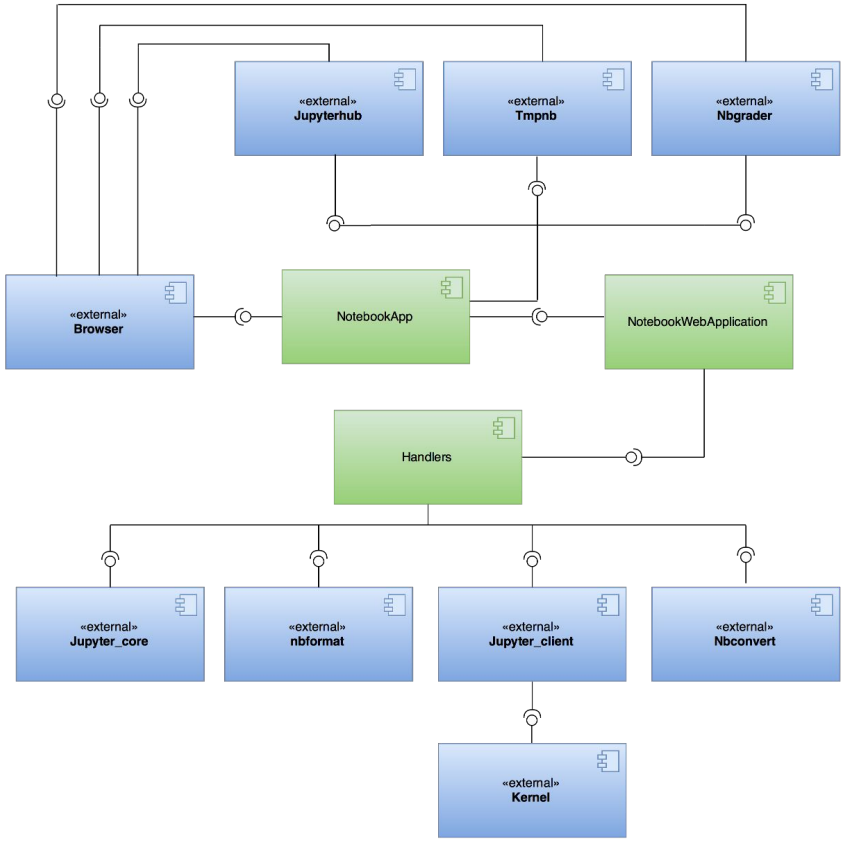
3.
Architecture

High level view

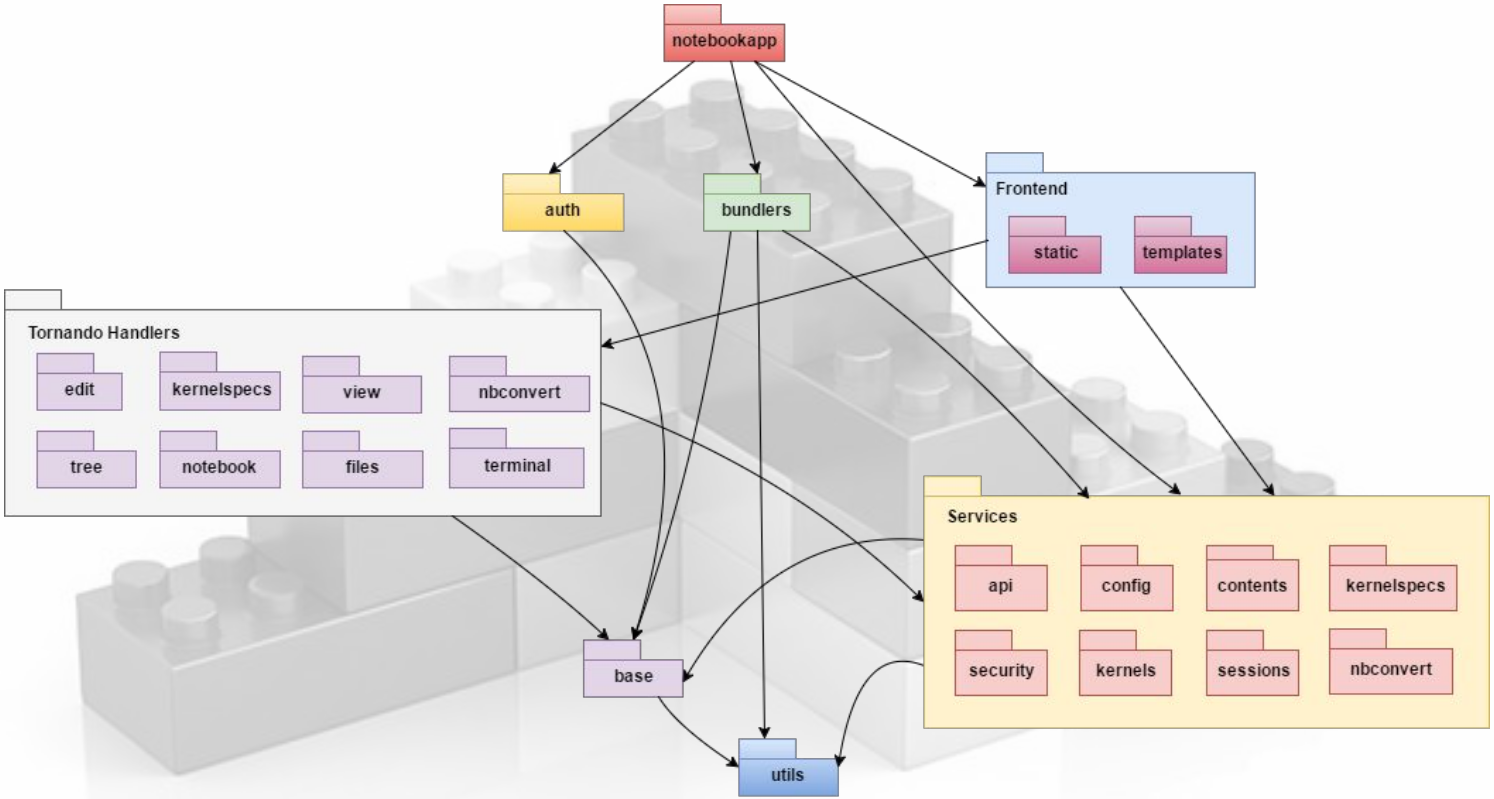




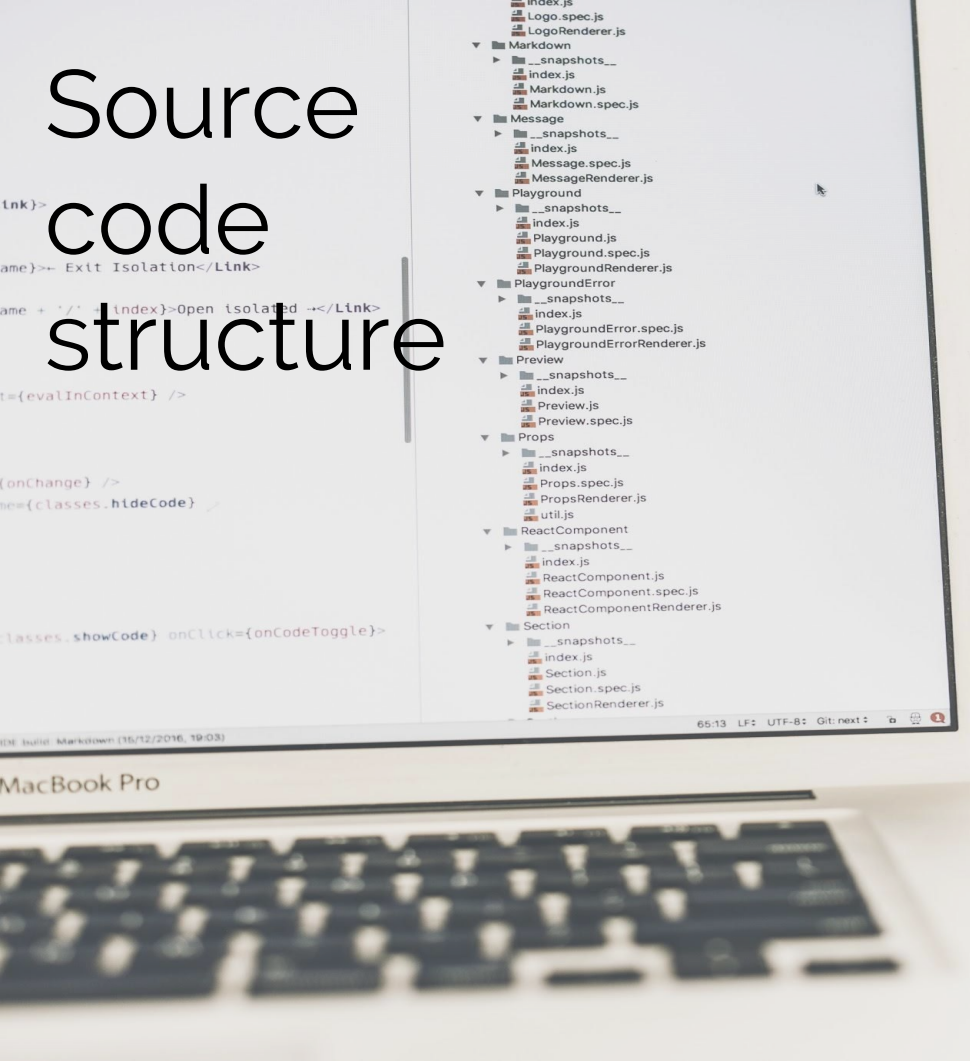
Functional view

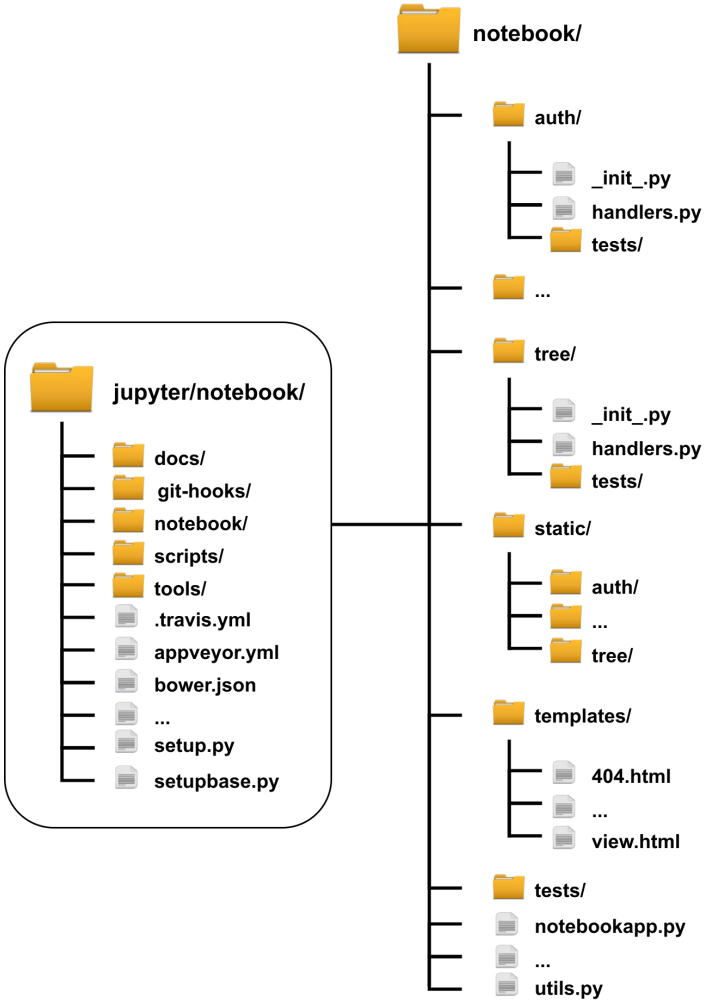


Module Structure



Source code structure





4.
Technical Debt

Just like any other software project...

Jupyter Notebook is also facing technical debt

Identified types of Technical Debt

- Code debt
- Testing debt
- Documentation debt

We tried to mitigate technical debt in some cases.

Code Debt

- Non-compliance to code convention
- Use of deprecated method
- Hard-coded strings
- Duplicate code

Testing Debt

- Back end
  - 77.24% covered
  - Low coverage in some packages
- Front end
  - Problematic Javascript testing suite
  - Pull requests accepted without tests

Documentation Debt

Attention

This is copied verbatim from the old IPython wiki and is currently under development. Much of the information in this part of the development guide is out of date.

5.
The Evolution

The Past

ipython-0.0.1.py

```
#!/usr/bin/env python
"""
Interactive execution with automatic history, tries to mimic Mathematica's
prompt system. This environment's main features are:

- Numbered prompts (In/Out) similar to Mathematica. Only actions that produce
  output (NOT assingments, for example) affect the counter and cache.

[...]

#*****************************************************************************
#       Copyright (C) 2001 Fernando Pérez. <fperez@pizero.colorado.edu>
#
#   Distributed under the terms of the GNU General Public License.
#
#   The full text of the GPL is available at:
#
#                  http://www.gnu.org/copyleft/gpl.html
#*****************************************************************************
__author__ = 'Fernando Pérez. <fperez@pizero.colorado.edu>'
__version__= '0.1'
```

The Past (2011)

IPython Notebook

Spectrogram | Save | Idle

Notebook

Actions: New | Open | Download | ipynb | Print

Cell

Actions: Delete

Format: Code | Markdown

Output: Toggle | ClearAll

Insert: Above | Below

Move: Up | Down

Run: Selected | All

Autoindent: ☑

Kernel

Actions: Interrupt | Restart

Kill kernel upon exit: ☐

Help

Links: Python | IPython | NumPy | SciPy | MPL | SymPy

Shift-Enter : run selected cell

Ctrl-Enter : run in terminal mode

Ctrl-m h : show keyboard shortcuts

Simple spectral analysis

An illustration of the Discrete Fourier Transform

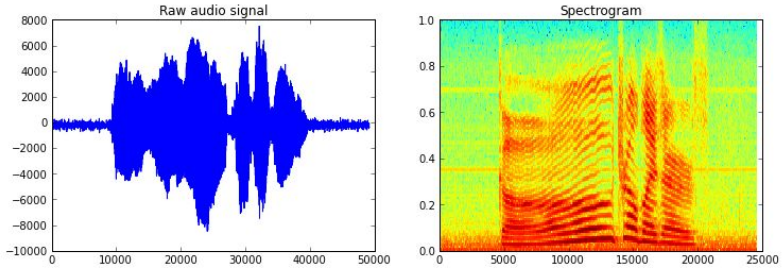
$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{2\pi i}{N} kn} \qquad k = 0, \ldots, N-1$$

using windowing, to reveal the frequency content of a sound signal.
We begin by loading a datafile using SciPy's audio file support:

```
In [1]: from scipy.io import wavfile
        rate, x = wavfile.read('/home/fperez/teach/py4science/book/examples/test_mono.wav')
```

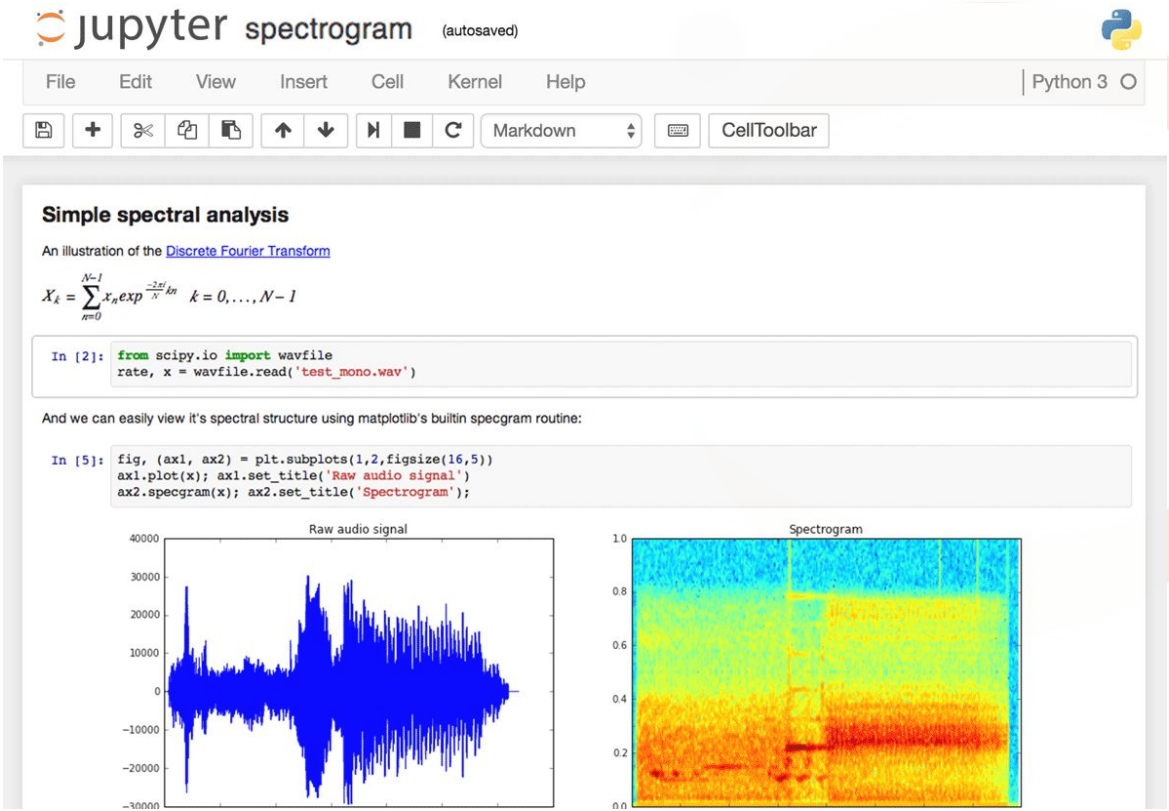
And we can easily view its spectral structure using matplotlib's builtin `specgram` routine:

```
In [3]: fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 4))
        ax1.plot(x); ax1.set_title('Raw audio signal')
        ax2.specgram(x); ax2.set_title('Spectrogram');
```



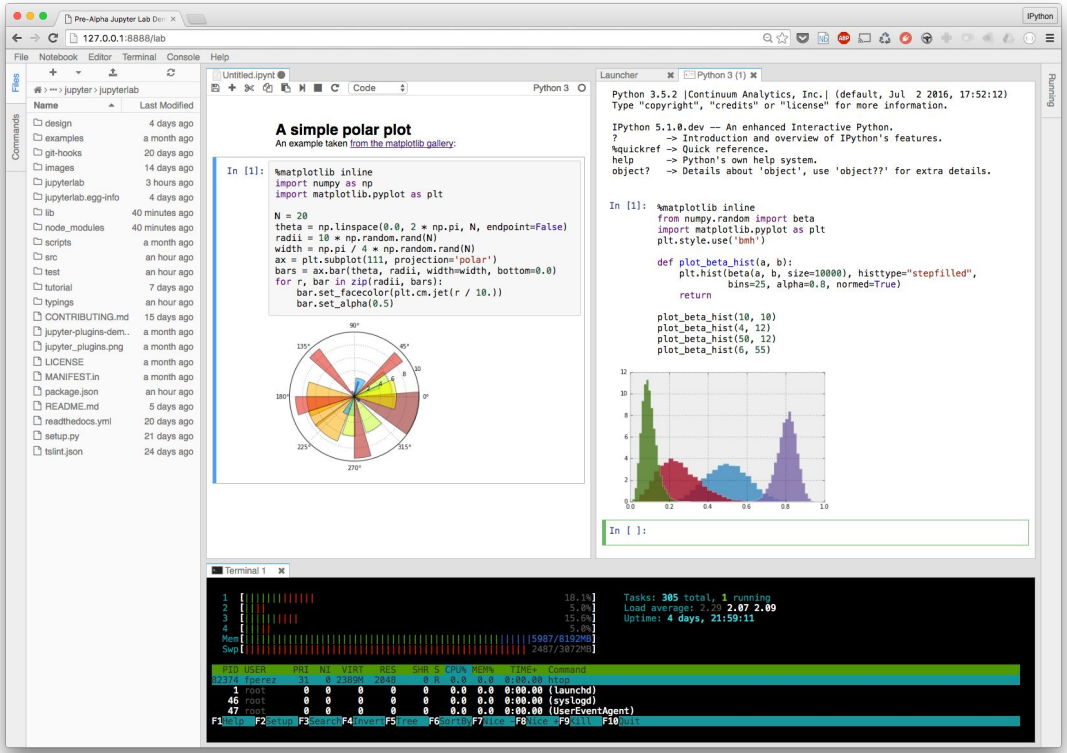
(2015-) The Present

- IPython.utils.traitlets ⇒ traitlets
- IPython.config ⇒ traitlets.config
- IPython.html ⇒ notebook
- IPython.nbconvert ⇒ nbconvert
- IPython.nbformat -> nbformat
- IPython.parallel ⇒ ipyparallel
- IPython.qt ⇒ qtconsole
- IPython.terminal.console ⇒ jupyter_console



JupyterLab

The Future



From Matthias Bussonnier <bussonniermatthias@gmail.com>

Subject **Re: Questions about Jupyter Notebook**

To Me <l.gasparini@student.tudelft.nl>

> 4. Is JupyterLab going to be a complete replacement for the notebook?

It should. That was the initial goal. I'm personally being doubtful now.

> If yes, will the Notebook continue to live?

Yes. It should. You can install notebook/lab as 2 plugins of the notebook server.
The classic notebook should become opt-in at some point.

> 5. What are the biggest improvements of JupyterLab over the Notebook?

This is contentious. Some will say multi-panel layout. Other think that multipanel is a mistake in browser as tab-in-tabs is confusing UI.
Some are fan of Typescript, other say that this is too complicated of a language for nights and week-end contributors.

The codebase is likely cleaner (and more recent), and better tested. I don't develop it enough to tell you whether it's simpler or have better design.

6.
Conclusion

The code is the truth, but it is not the whole truth

(Grady Booch)

Remove redundant sort from back-end #2281

Open **ajayaadhikari** wants to merge 1 commit into `jupyter:master` from `delftswa2017:remove-duplicate-sort`

Conversation 1 · Commits 1 · Files changed 1

ajayaadhikari commented 24 days ago — First-time contributor

While I was looking for fixme's in the code I found the following. In the file notebook/services/contents/handlers.py a fixme comment mentions that the sorting of the contents of a directory should be done in the front-end. I checked the code on the front-end where this is supposed to be done.

I found out that it is already done there. So the sorting is done redundantly on the front-end and the back-end. I removed the sorting from the back-end.

`Remove redundant sort from back-end` ✓ 7d4d7da

Carreau added this to the **5.1** milestone 24 days ago

Carreau commented 24 days ago — Member

I'm +1 I think we should wait post 5.0 though, just not to introduce a potential change so close to a release.

Fix markdown highlighting in latex #2244

Merged **minrk** merged 1 commit into `jupyter:master` from `delftswa2017:fix-issue-1911` on Mar 3

Conversation 1 · Commits 1 · Files changed 1

joined commented on Mar 2 — Contributor

I wrote a bugfix for issue #1911.

I'm not sure it's possible to write tests for this functionality.

`Swap $ and $$ delimiters order to avoid conflicts.` ✓ c782cb3

takluyver approved these changes on Mar 2 — View changes

Neat, thanks! I don't think there's an easy way to test this, either.

Add pandoc to travis #2283

Merged **minrk** merged 3 commits into `jupyter:master` from `delftswa2017:add-pandoc-travis` a day ago

Conversation 3 · Commits 3 · Files changed 1

John-Pap commented 24 days ago — Contributor

While inspecting the code coverage on Codecov, I saw that some packages had suspiciously low coverage. I checked the Travis build logs and I realized that some tests are skipped because pandoc is missing. I added it as an apt addon to the Travis configuration file.

`add pandoc to travis` ✗ 6c4efe8

blink1073 commented 24 days ago — Member

Great catch, **@John-Pap**!

🎉 1

blink1073 approved these changes 24 days ago — View changes

Fix deprecated decodestring warning #2280

Merged **Carreau** merged 3 commits into `jupyter:master` from `delftswa2017:fix-deprecation-warning` 23 days ago

Conversation 5 · Commits 3 · Files changed 2

adimitrova commented 24 days ago — Contributor

While running the nose tests a warning was thrown saying that

```
notebook/services/contents/largefilemanager.py:60: DeprecationWarning: decodestring() is a deprecated alias, use decodebytes() bcontent = base64.decodestring(b64_bytes)
```

As per the documentation of base64.decodestring this is deprecated since version 3.1 and the new function to use is decodebytes().

adimitrova added some commits 24 days ago

`updated decodestring` ✗ 47bbd07

Carreau added this to the **5.0** milestone 24 days ago

Carreau commented 24 days ago — Member

Sweet !

Jupyter Notebook 5.0

04 APRIL 2017

We are pleased to announce the release of Jupyter Notebook version 5.0. This is the first major release of the Jupyter Notebook since version 4.0 and the "Big Split" of IPython and Jupyter. This release adds some long-awaited features, such as cell tagging, customizing keyboard shortcuts, copying & pasting cells between notebooks, and a more attractive default style for tables. It also comes with many improvements and bug fixes. This release does not introduce any breaking API changes.

Credits

This release has been a team effort and we would like to thank the following 87 people who contributed:

- Lorenzo Gasparini (joined)

- Anelia Dimitrova (adimitrova)

Thank you!

Any questions?