Spyder

&

iPython Notebooks

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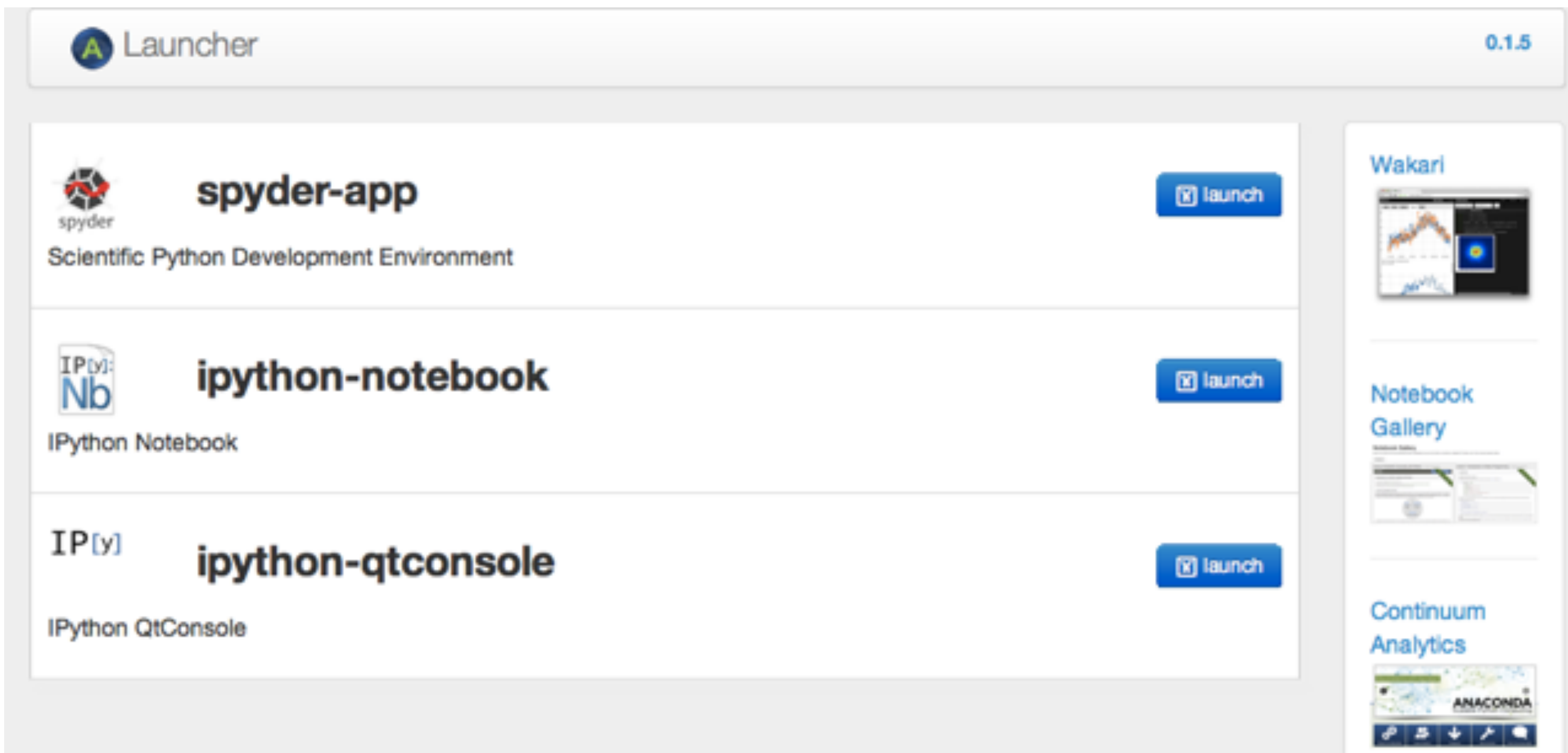
14 Aug 2014

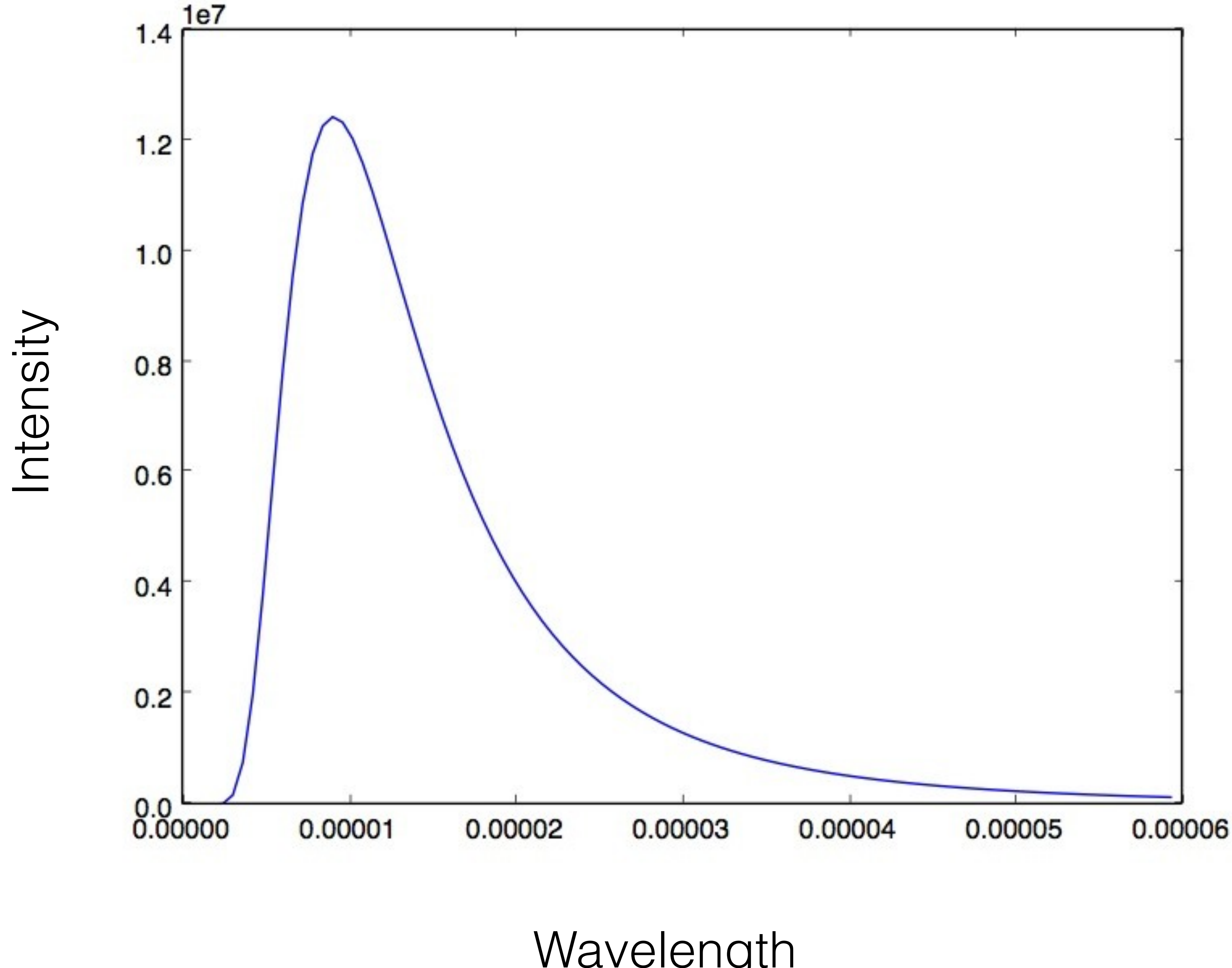
First : Let's see if things are running on your computer

- [ ] Download Anaconda Python
- [ ] Go to Launcher
- [ ] Launch Spyder and Launch ipython Notebook



- [ ] Open a terminal
- [ ] $ spyder
- [ ] $ ipython notebook

Recap on yesterday's assignment : Planck Spectrum



Recap on yesterday's assignment : Planck Spectrum

How did we get there?

Using Emacs

Using ipython terminal

Created a plot

Recap on yesterday’s assignment : Planck Spectrum

Let’s try it with Spyder!

1 - Open Spyder

2 - Open your python script

3 - Compile it within Spyder

4 - Show us the plot (or errors that you get!)

Spyder

&

iPython Notebooks

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Conducting Research

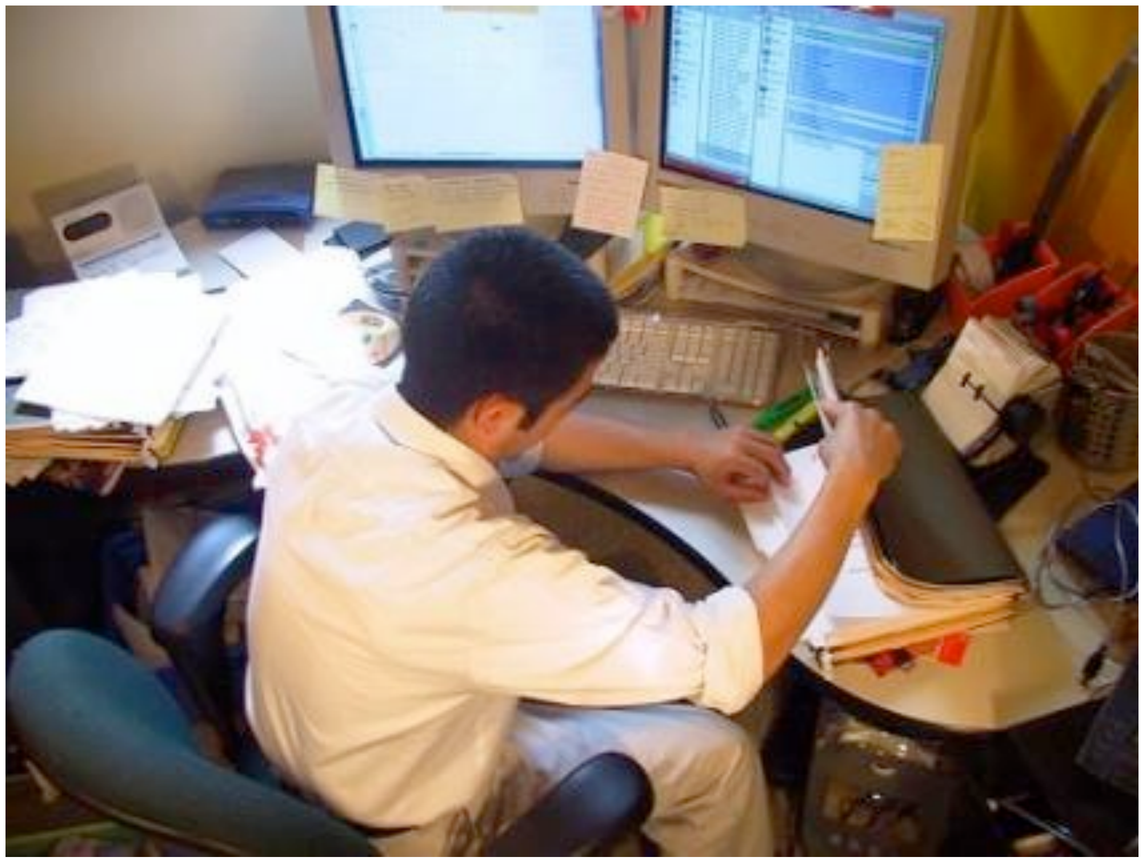
Idealized Version

Individuals conducting research

Collaborating on ideas

Conducting Research

Real World



Individuals conducting research

Collaborating on ideas

Conducting Research

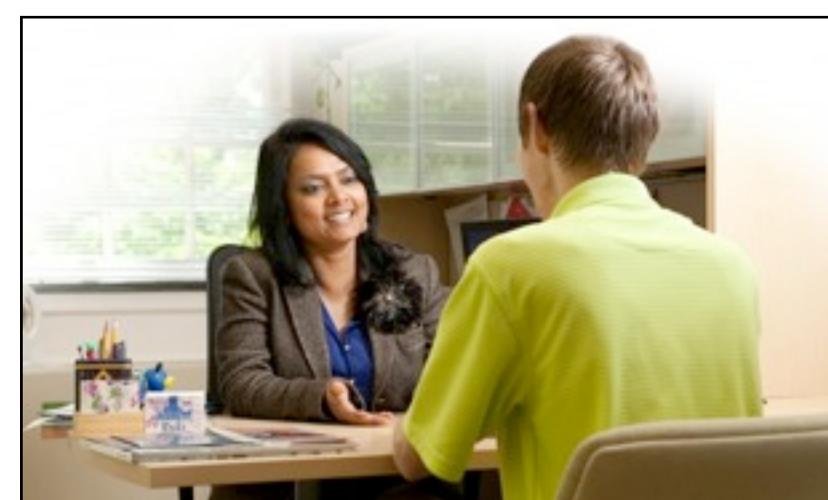
Look things up

Talk to your peers

Ask Questions

Do an experiment

Talk to your advisor



Mini Research Project Activity

1 - Ask a question about anything in science

Some examples...

How do solar cells convert sunlight into useable energy?

What is black hole?

Why are leaves green?

Why do we use fruit flies to study the immune system?

Mini Research Project Activity

1 - Ask a question about anything in science

2 - Find 3 resources that relate to answering your question

Mini Research Project Activity

1 - Ask a question about anything in science

2 - Find 3 resources that relate to answering your question

3 - Take 3 screenshots of things that you find interesting in your articles

Some examples...

A plot

An equation

A block of text you want to remember

Mini Research Project Activity

1 - Ask a question about anything in science

2 - Find 3 resources that relate to answering your question

3 - Take 3 screenshots of things that you find interesting in your articles

4 - Think of a way to answer your question via an tiny experiment

What is black hole?

--> How would I know a black hole is out in the universe?
---> Maybe I can make a computer simulation with the orbits of stars around a black hole

Mini Research Project Activity

1 - Ask a c

2 - Find 3 resourc

3 - Take 3 screenshots s

4 - Think of a way to

5 - Copy up this little code into python

6 - Save this plot

```
import numpy as np
import matplotlib.pyplot as plt

plt.plot(np.random.normal(size=1000),
np.random.normal(size=100), 'ro')

np.random.seed(1234)
fig, ax = plt.subplots(1)
x = 30*np.random.randn(10000)
mu = x.mean()
median = np.median(x)
sigma = x.std()
textstr = '$\mu=%.2f$\n$\mathrm{median}=%.2f$\n$
\sigma=%.2f$'%(mu, median, sigma)

ax.hist(x, 50)
# these are matplotlib.patch.Patch properties
props = dict(boxstyle='round', facecolor='wheat',
alpha=0.5)

# place a text box in upper left in axes coords
ax.text(0.05, 0.95, textstr,
transform=ax.transAxes,
fontsize=14,verticalalignment='top', bbox=props)
```

Collaborating

1 - Compile everything together from what you just did research on

2 - Write up a paragraph how everything hangs together
(your question, your articles, the screenshots, the plot)

3 - Share this with your neighbor

4 - Read what your neighbor shared with you

Discussion

What program did you use to bring together these thoughts?

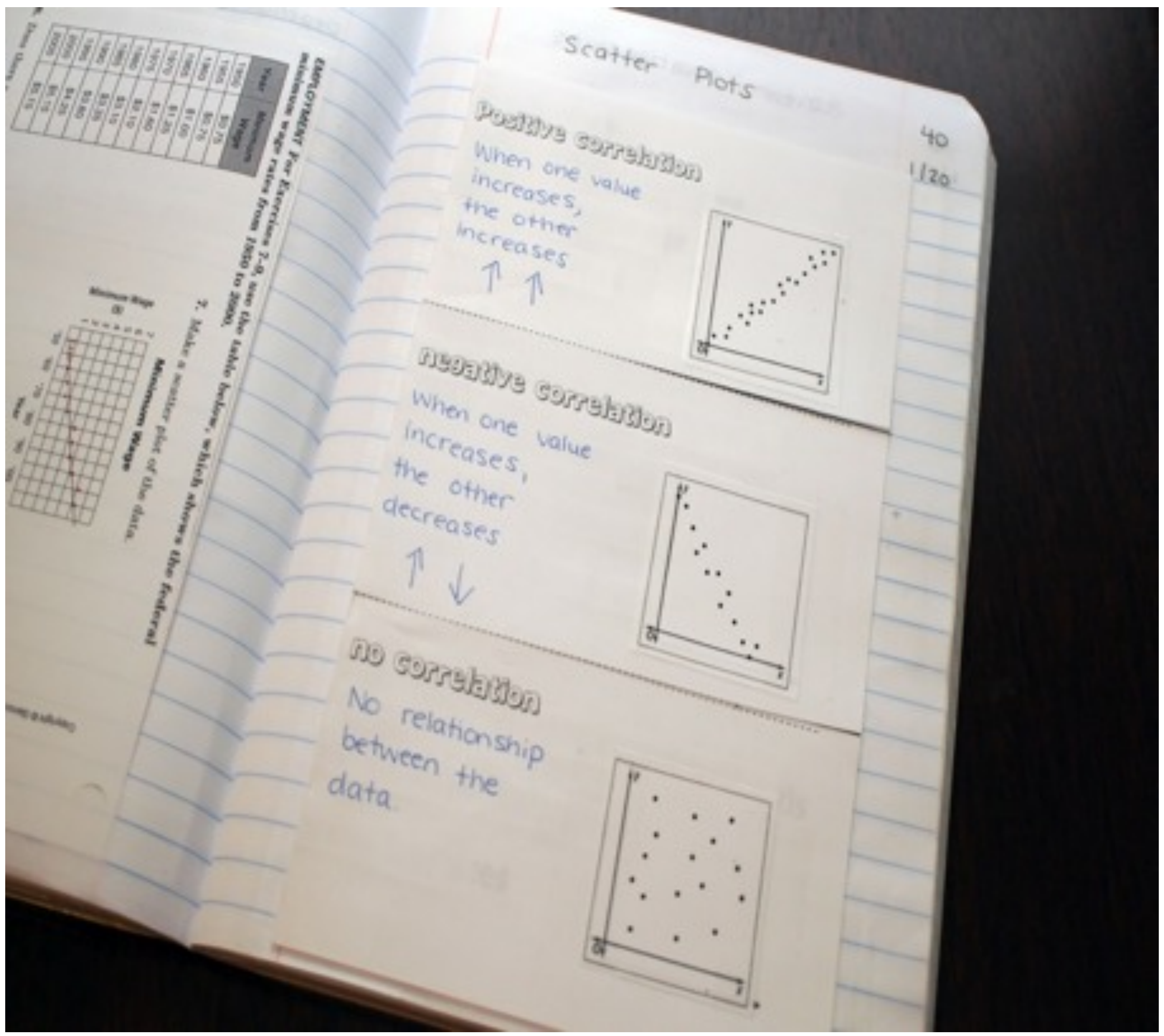
What issues did you have compiling your research?

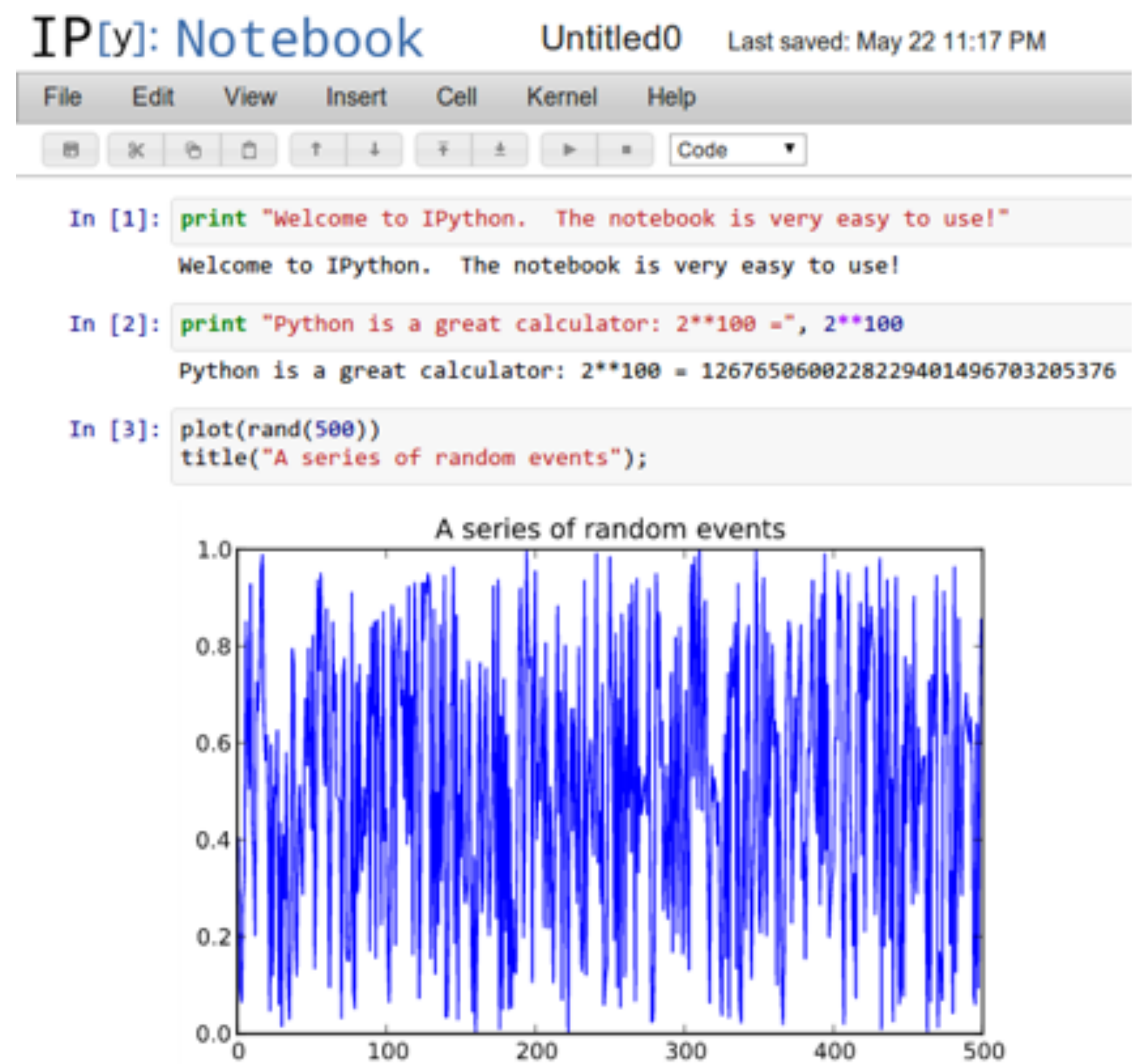
Did you have a clear sense of what your neighbor was thinking?

Did all of the attachments make sense with their thought process?

Introducing : iPython Notebooks

Digital equivalent of a real notebook





Example 1 : Conducting an experiment

Context

- I work on an experiment hunting for a new source of correlated noise from a new concept in physics
- My thesis work is dedicated to proving that there is no additional correlated noise

Notebook

- I wanted to test a new set-up for testing the detectors with independent light sources
- This notebook highlights what I did during a day

Example 1 : Conducting an experiment

Show notebook example 1

Example 2 : Understanding what I was reading

Context

- I wanted to understand how signals are processed through our control system for the interferometers
- I was working on designing a circuit for a wind speed and direction monitor

Notebook

- I started reading a book on digital signal processing
- This notebook highlights how we can use keep track of changes throughout a code as we work to an understanding

Example 2 : Understanding what I was reading

Show notebook example 2

Let's make our own notebooks!

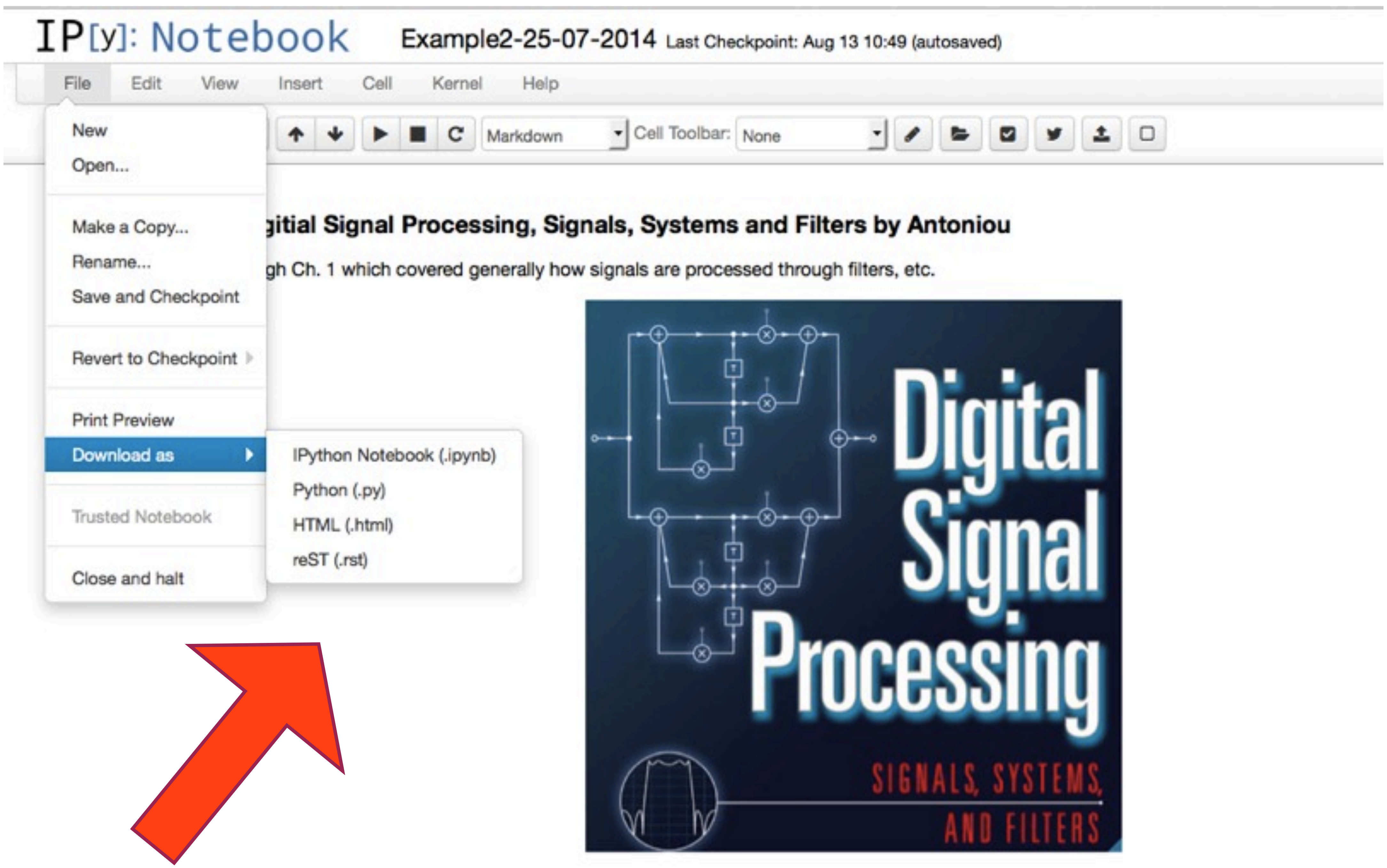
1 - Open up an ipython notebook

2 - Rename your notebook

3 - Make a markdown cell

4 - Make a python cell

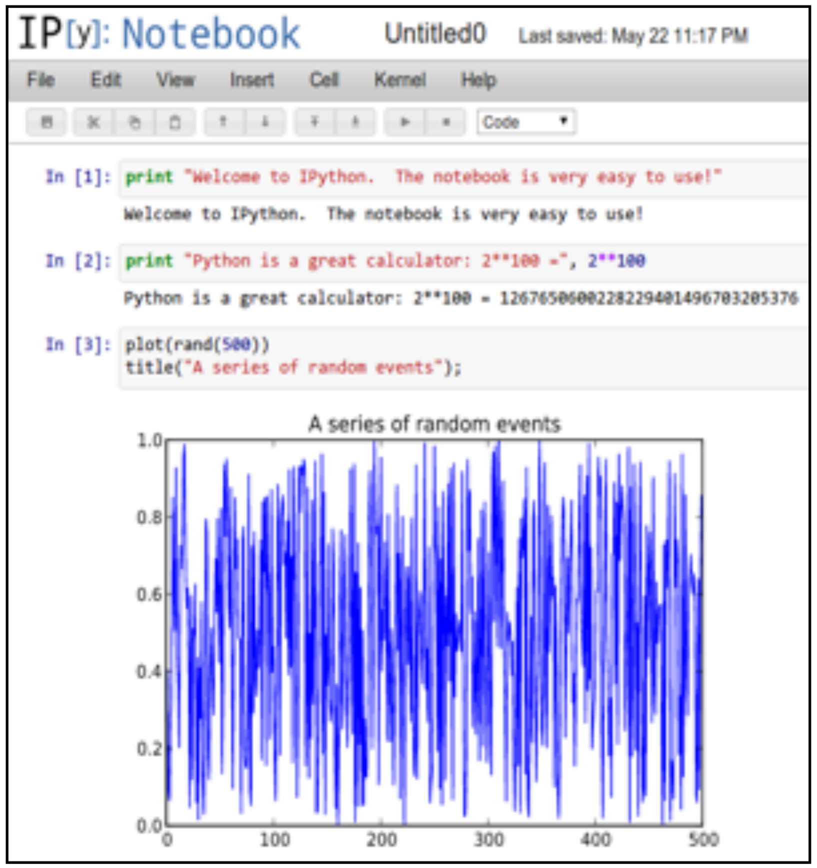
Exporting my notebook



Can export to different formats for sharing

Exporting my notebook

Ipython Notebook



Latex file

PDF

$ ipython nbconvert notebook.ipynb --to latex

$ pdf2latex notebook.tex

nbconvert allows you to convert to a bunch of other things too!

pdf2latex may be a different command depending on which tex distribution you use

Notebook Activity

1 - Compile everything together from what you just did research on using ipython notebooks

2 - Embed screenshots and links into the notebook

3 - Write short (1-2 sentence) descriptions about each thing you looked up

4 - Create your plot in an python cell
Have your plot embedded inline to your notebook

5 - Export your notebook to html

6 - Share your notebook with a different neighbor

7 - Read your neighbor’s notebook

Discussion

How does this compare to what you did before?

What issues did you have compiling your research?

Did you have a clear sense of what your neighbor was thinking?

Did all of the attachments make sense with their thought process?

Have fun science-ing!