

Spyder



&

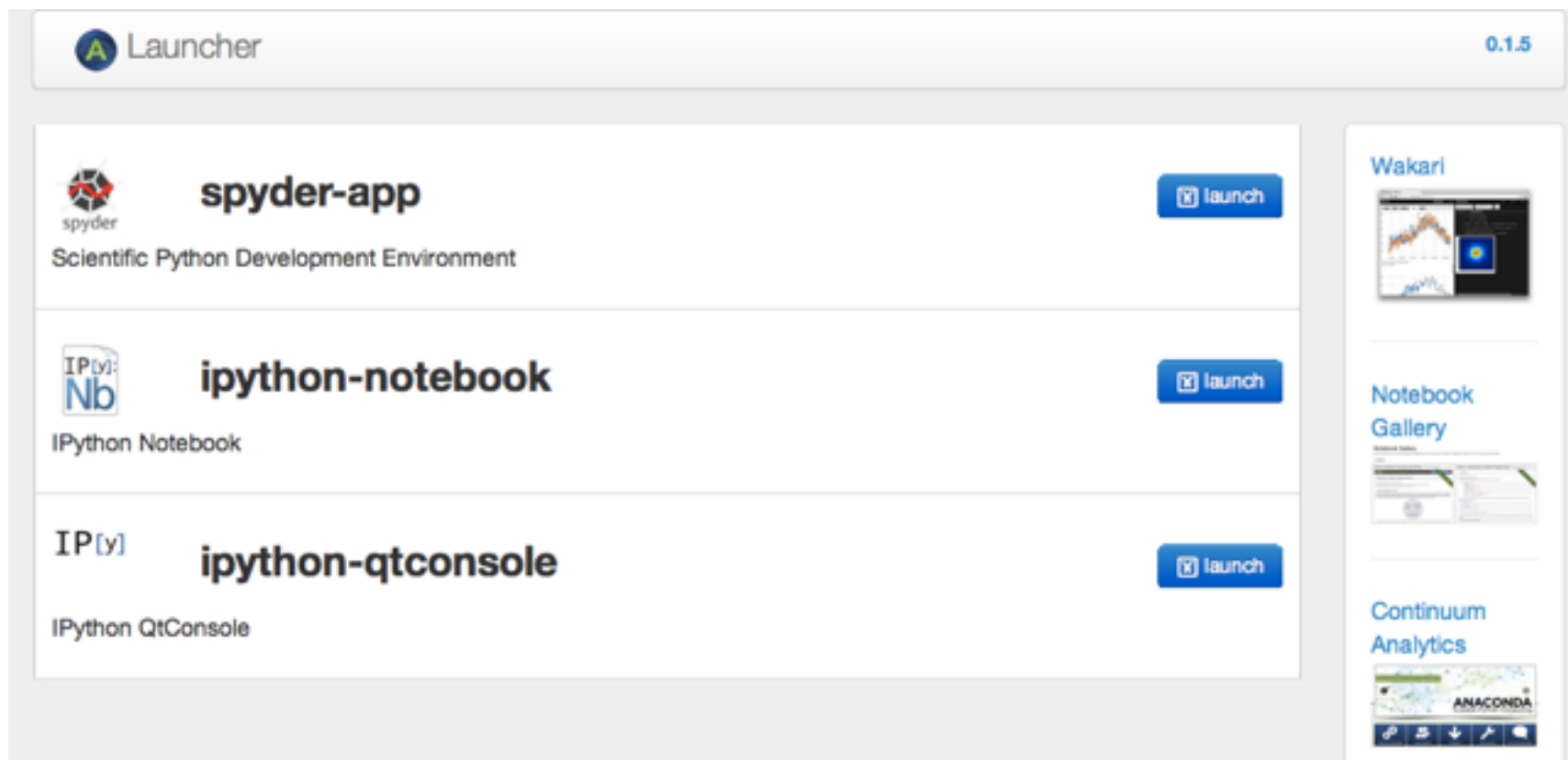
iPython Notebooks



Brittany Kamai
14 Aug 2014

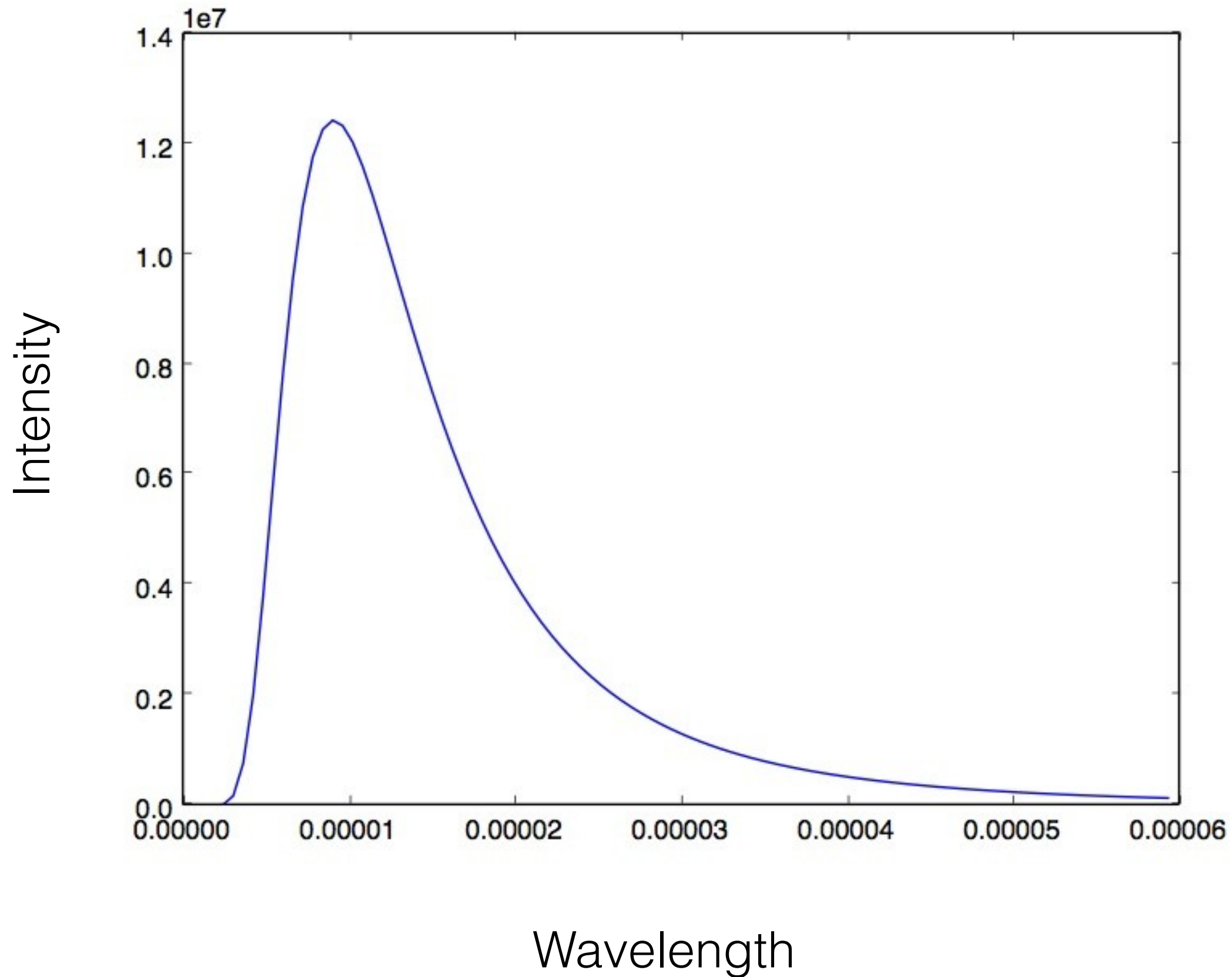
First : Let's see if things are running on your computer

- ☐ 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



Brittany Kamai
14 Aug 2014

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

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

2 - Find 3 resourc

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

3 - Take 3 screenshots

```
np.random.seed(1234)
fig, ax = plt.subplots(1)
x = 30*np.random.randn(10000)
mu = x.mean()
```

4 - Think of a way to

```
median = np.median(x)
sigma = x.std()
textstr = '$\mu=%.2f$\n$\mathrm{median}=%.2f$\n$
\sigma=%.2f$'%(mu, median, sigma)
```

5 - Copy up this little
code into python

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

6 - Save this plot

```
# 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?

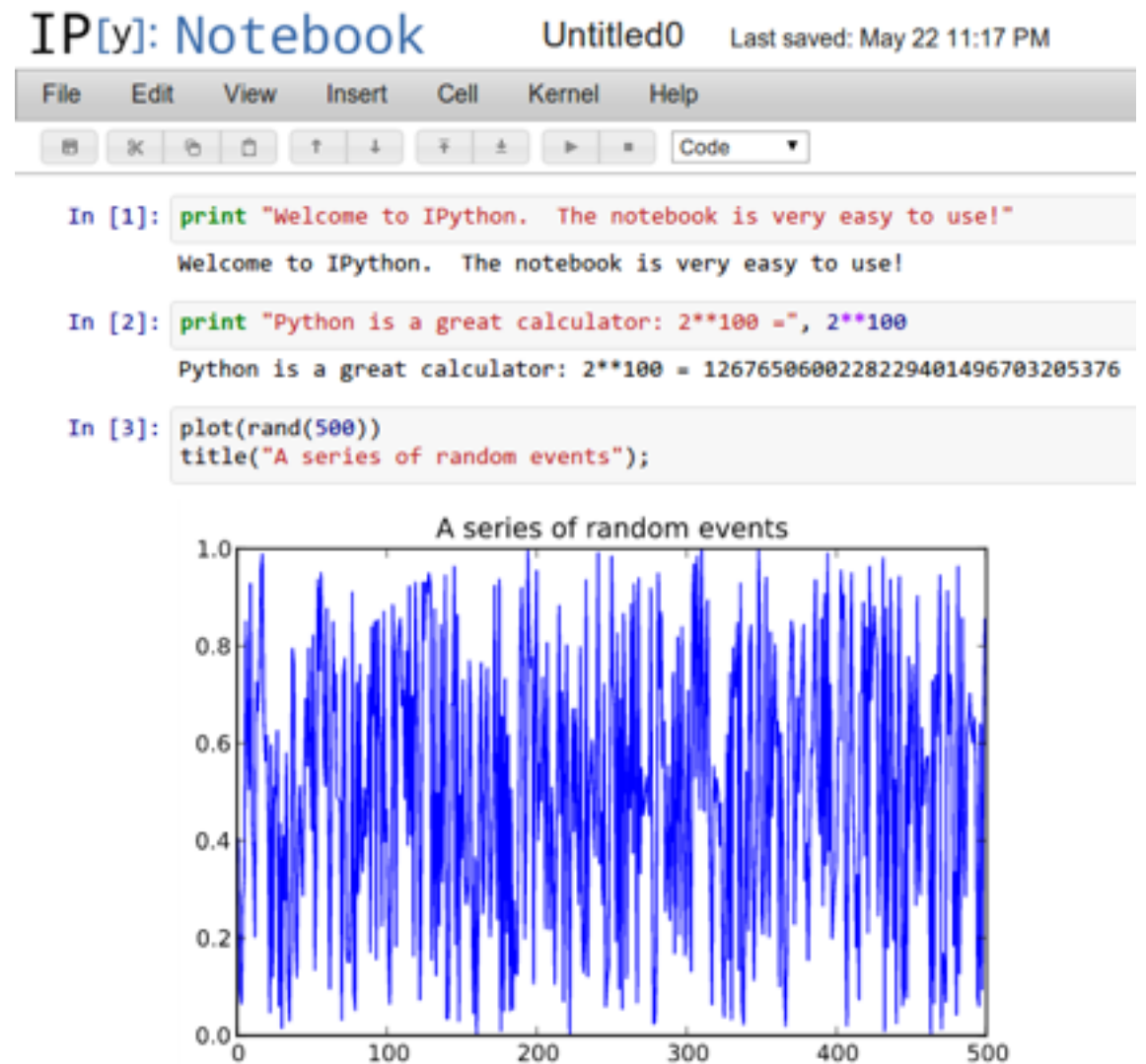
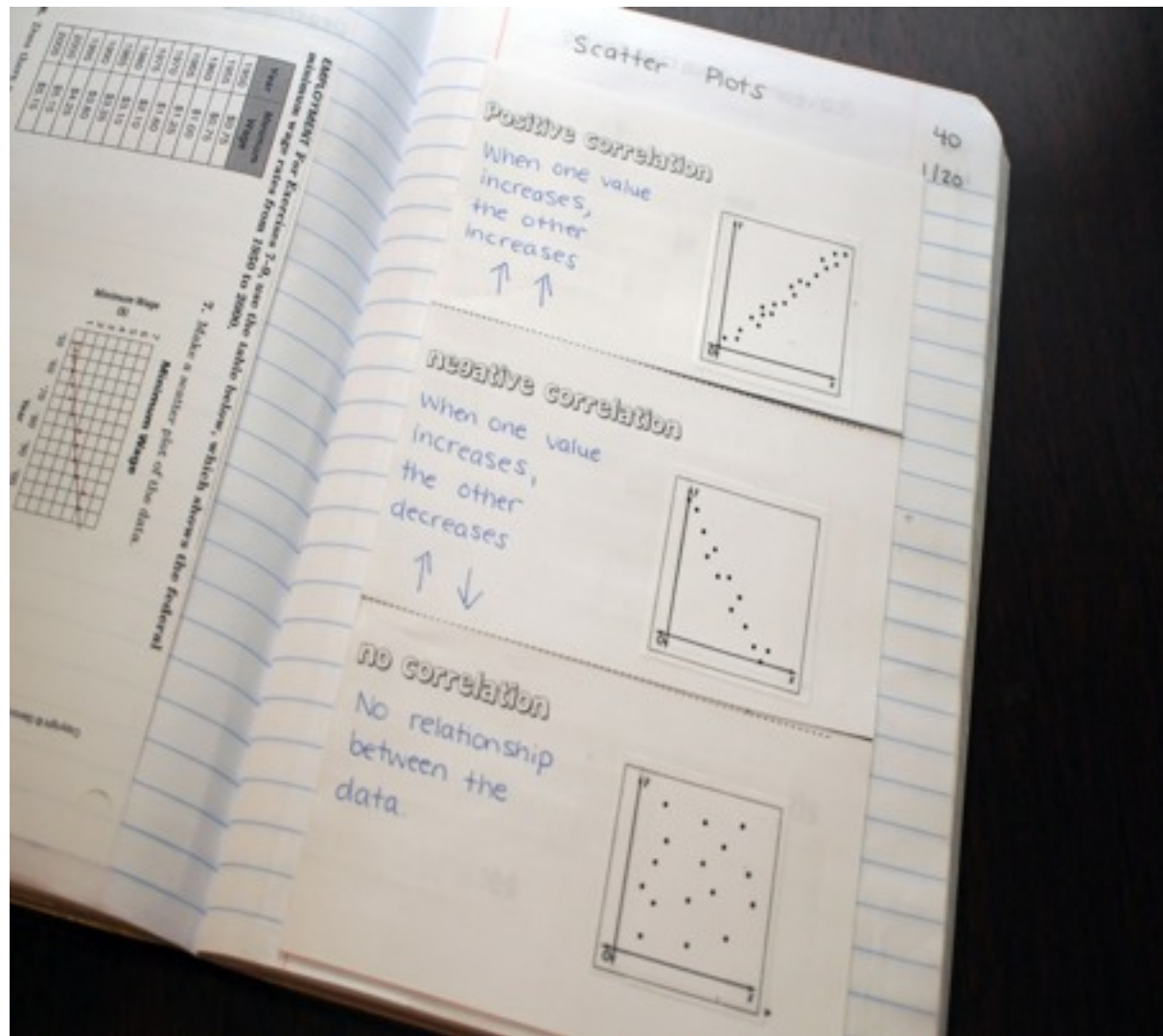
Did you have a clear sense of what your neighbor was thinking?

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

The screenshot shows the IP[y]: Notebook web interface. The title bar reads 'IP[y]: Notebook Example2-25-07-2014 Last Checkpoint: Aug 13 10:49 (autosaved)'. The 'File' menu is open, displaying options: 'New', 'Open...', 'Make a Copy...', 'Rename...', 'Save and Checkpoint', 'Revert to Checkpoint', 'Print Preview', 'Download as', 'Trusted Notebook', and 'Close and halt'. The 'Download as' option is highlighted, and a sub-menu is open showing export formats: 'IPython Notebook (.ipynb)', 'Python (.py)', 'HTML (.html)', and 'reST (.rst)'. A large red arrow points from the 'Download as' menu towards the book cover on the right. The book cover is for 'Digital Signal Processing' by Antoniou, featuring a circuit diagram and the subtitle 'SIGNALS, SYSTEMS, AND FILTERS'.

Can export to different formats for sharing

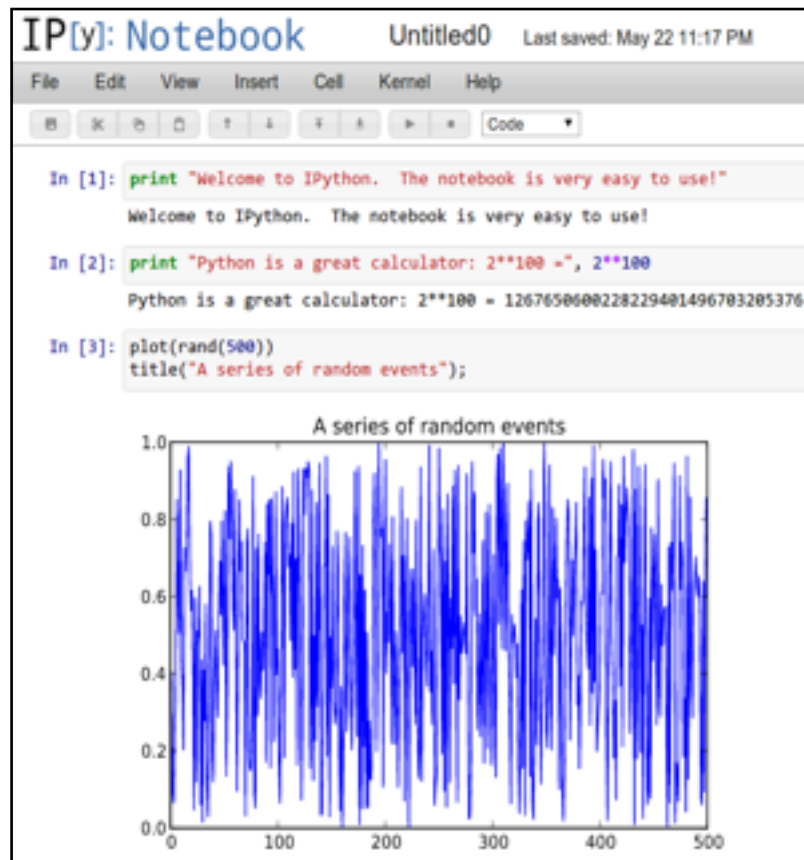


Exporting my notebook

Ipython Notebook

Latex file

PDF



title (New **bvt**) Photometry of Low-Mass Pleiades Stars: Exploring the Effects of Rotation on Broadband Colors

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begin/abstract

We present new **BVI_r** photometry for **lrvba** Pleiades proper-motion members with $9 < V < 17$. Importantly, our new catalog includes a large number of K and early-M type stars, roughly doubling the number of low-mass stars with well-calibrated Johnson/Cousins photometry in this benchmark cluster. We combine our new photometry with existing photometry from the literature to define a purely empirical isochrone at Pleiades age (≈ 100 Myr) extending from $V=9.5$ to 17. We use the empirical isochrone to identify 48 new probable binaries and 14 likely non-members. The photometrically identified single stars are compared against their expected positions in the color-magnitude diagram (CMD). At 100 Myr, the mid K and early M stars are predicted to lie above the zero-age main sequence (ZAMS) having not yet reached the ZAMS. We find in the **lrvba** vs. **SVS** CMD that mid K and early M dwarfs are instead displaced below (or blueward of) the ZAMS. Using the stars' previously reported rotation periods, we find a highly statistically significant correlation between rotation period and CMD displacement, in the sense that the more rapidly rotating stars have the largest displacements in the **B - V** CMD.

end/abstract

section/introduction

The Pleiades is one of the quintessential open clusters that defines the empirical isochrone of solar-metallicity stars at ~ 100 Myr. Empirical isochrones are derived from the single star locus of different aged clusters. They serve to both utilize evolutionary model predictions and to point the way to needed improvements in those models. The Pleiades serves as an ideal testing ground by virtue of its proximity and richness (Itier 1933; Soderblom 2005). membership

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doi:10.1088/0004-6266/279/2/30

NEW BVI_r PHOTOMETRY OF LOW-MASS PLEIADES STARS: EXPLORING THE EFFECTS OF ROTATION ON BROADBAND COLORS

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ABSTRACT

We present new **BVI_r** photometry for 350 Pleiades proper motion members with $9 < V < 17$. Importantly, our new catalog includes a large number of K- and early M-type stars, roughly doubling the number of low-mass stars with well-calibrated Johnson/Cousins photometry in this benchmark cluster. We combine our new photometry with existing photometry from the literature to define a purely empirical isochrone at Pleiades age (≈ 100 Myr) extending from $V = 9.5$ to 17. We use the empirical isochrone to identify 48 new probable binaries and 14 likely nonmembers. The photometrically identified single stars are compared against their expected positions in the color-magnitude diagram (CMD). At 100 Myr, the mid K and early M stars are predicted to lie above the zero-age main sequence (ZAMS) having not yet reached the ZAMS. We find in the **B - V** versus **V** CMD that mid K and early M dwarfs are instead displaced below (or blueward of) the ZAMS. Using the stars' previously reported rotation periods, we find a highly statistically significant correlation between rotation period and CMD displacement, in the sense that the more rapidly rotating stars have the largest displacements in the **B - V** CMD.

Key words: catalogs – Hertzsprung-Russell and C-M diagrams – open clusters and associations: individual (Pleiades) – stars: low-mass – stars: rotation – stars: spots

Online-only material: color figures, machine-readable and VO table

1. INTRODUCTION

The Pleiades cluster is one of the quintessential open clusters that defines the empirical isochrone of solar metallicity stars at ~ 100 Myr. Empirical isochrones are derived from the single star locus of different age clusters. They serve to both utilize evolutionary model predictions and to point the way

highlights the differences between the theoretical predictions and empirical observations.

A striking feature is that the empirical 100 Myr isochrone (derived from the Pleiades) exhibits a systematic shift below (or blueward of) the nominal ZAMS in the **B - V** versus **V** CMD only. Observations of this blueward departure in the Pleiades dates back almost 50 yr. Explanations of this peculiar behavior



\$ 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!

