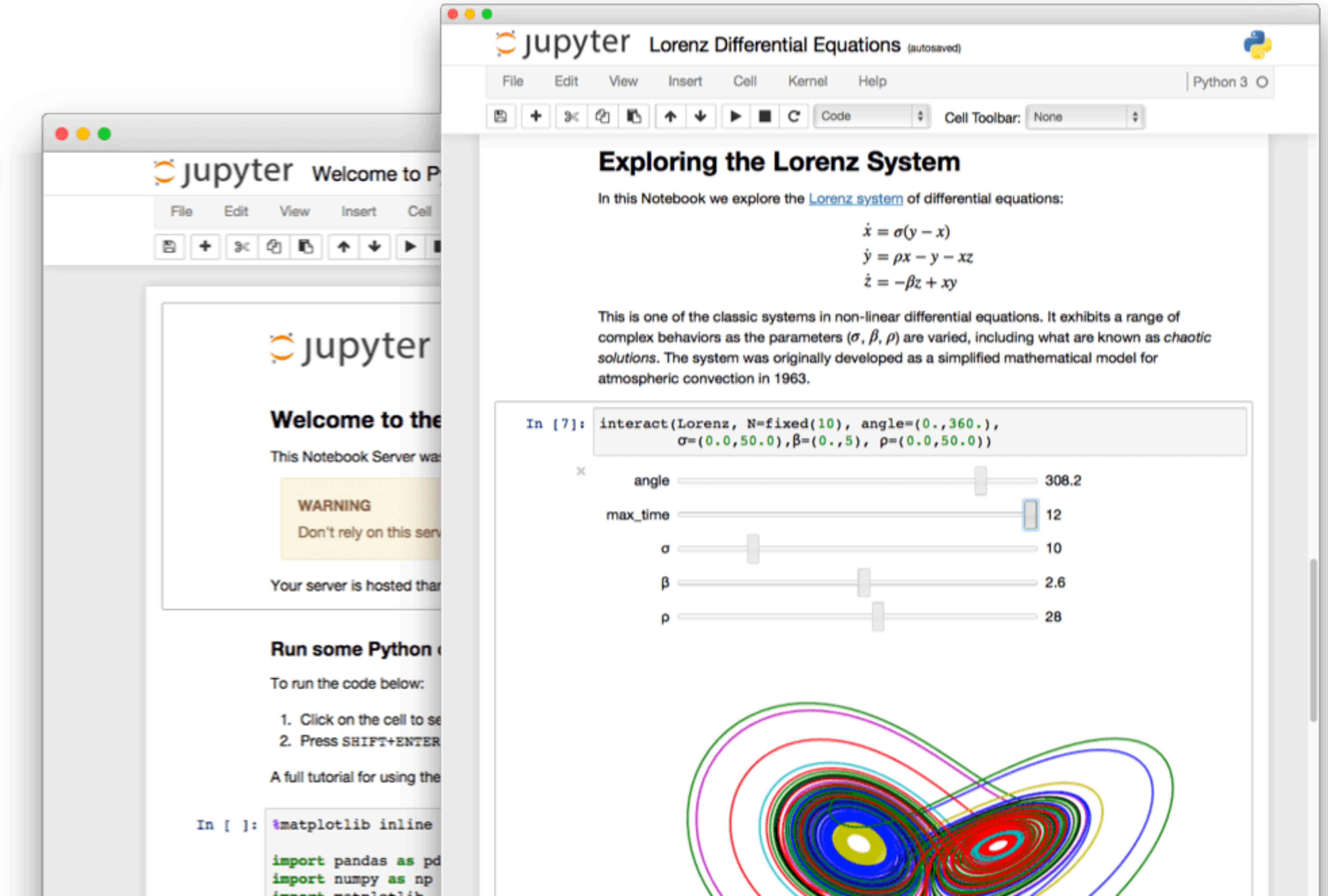
jupyter notebooks

pros, cons & examples with python

WHAT IS JUPYTER NOTEBOOK?

- An open-source web application
- Functions as a more easily interactive iPython terminal
- Compatible with over 40 programming languages



jupyter

Welcome to the

This Notebook Server wa

WARNING

Don't rely on this ser

Your server is hosted than

Run some Python

To run the code below:

1. Click on the cell to se
2. Press SHIFT+ENTER

A full tutorial for using the

```
In [ ]: %matplotlib inline

        import pandas as pd
        import numpy as np
```

Exploring the Lorenz System

In this Notebook we explore the Lorenz system of differential equations:

$$\dot{x} = \sigma(y - x)$$
$$\dot{y} = \rho x - y - xz$$
$$\dot{z} = -\beta z + xy$$

This is one of the classic systems in non-linear differential equations. It exhibits a range of complex behaviors as the parameters (σ, β, ρ) are varied, including what are known as *chaotic solutions*. The system was originally developed as a simplified mathematical model for atmospheric convection in 1963.

```
In [7]: interact(Lorenz, N=fixed(10), angle=(0.,360.),
                 σ=(0.0,50.0),β=(0.,5), ρ=(0.0,50.0))
```

angle 308.2

max_time 12

σ 10

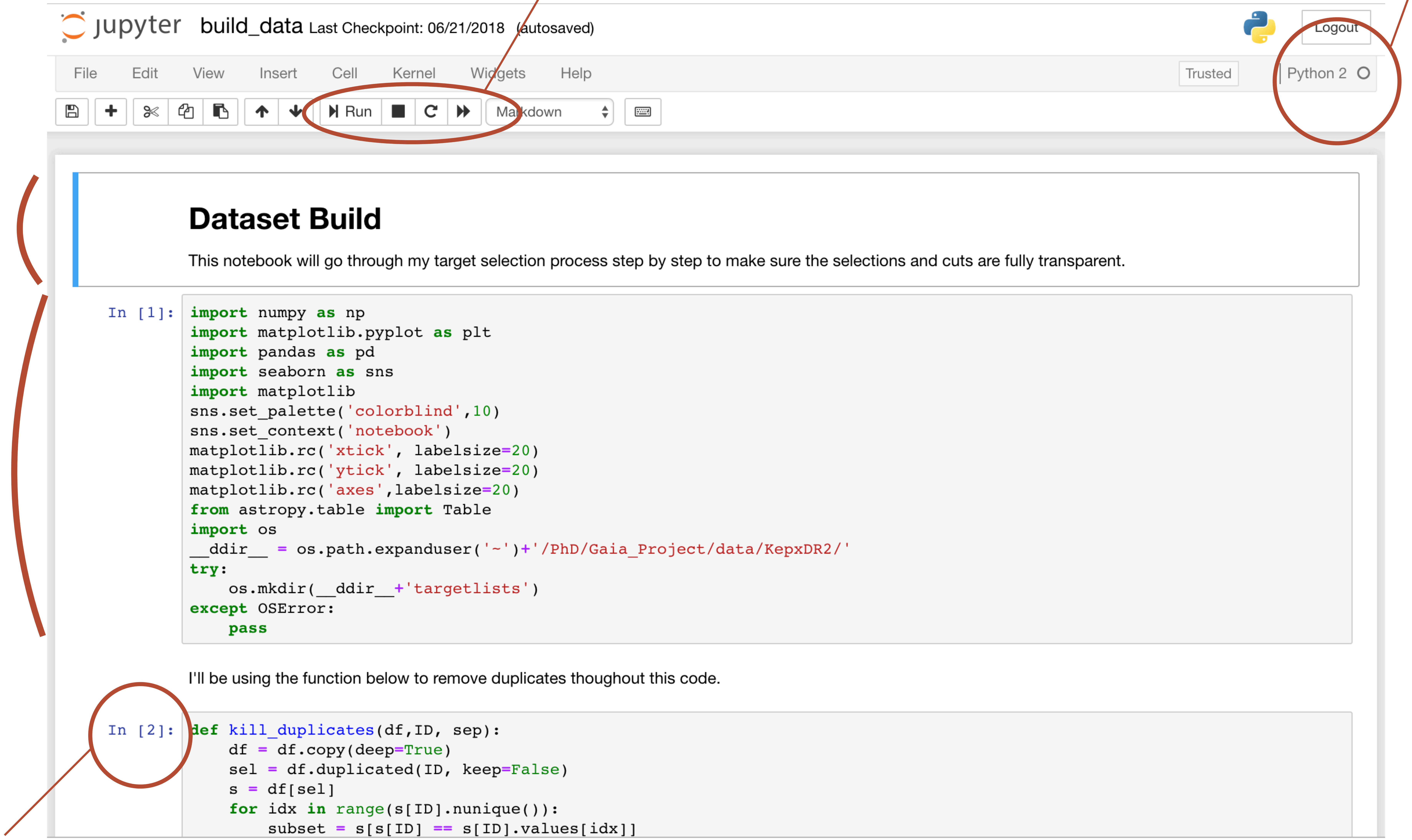
β 2.6

ρ 28

A QUICK RUNDOWN

run cell, stop, restart kernel, run all

used python kernel



Dataset Build

This notebook will go through my target selection process step by step to make sure the selections and cuts are fully transparent.

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
import matplotlib
sns.set_palette('colorblind',10)
sns.set_context('notebook')
matplotlib.rc('xtick', labelsize=20)
matplotlib.rc('ytick', labelsize=20)
matplotlib.rc('axes',labelsize=20)
from astropy.table import Table
import os
__ddir__ = os.path.expanduser('~')+'/PhD/Gaia_Project/data/KepxDR2/'
try:
    os.mkdir(__ddir__+'targetlists')
except OSError:
    pass
```

I'll be using the function below to remove duplicates thoughout this code.

```
def kill_duplicates(df,ID, sep):
    df = df.copy(deep=True)
    sel = df.duplicated(ID, keep=False)
    s = df[sel]
    for idx in range(s[ID].nunique()):
        subset = s[s[ID] == s[ID].values[idx]]
```

markdown cell

code cell

cell run history

WHEN IS JUPYTER NOTEBOOKS GREAT?

- Sharing a code is not an efficient way of sharing knowledge
  - Sharing a Jupyter Notebook is!

- When illustrating how to reproduce a result (i.e. tutorials and blog posts)
- When tweaking plots to get them just right
- When prototyping new code
- When showing your supervisor what you got up to this week
- Working with object-based code, like 'lightkurve'!

WHEN IS JUPYTER NOTEBOOKS TERRIBLE?

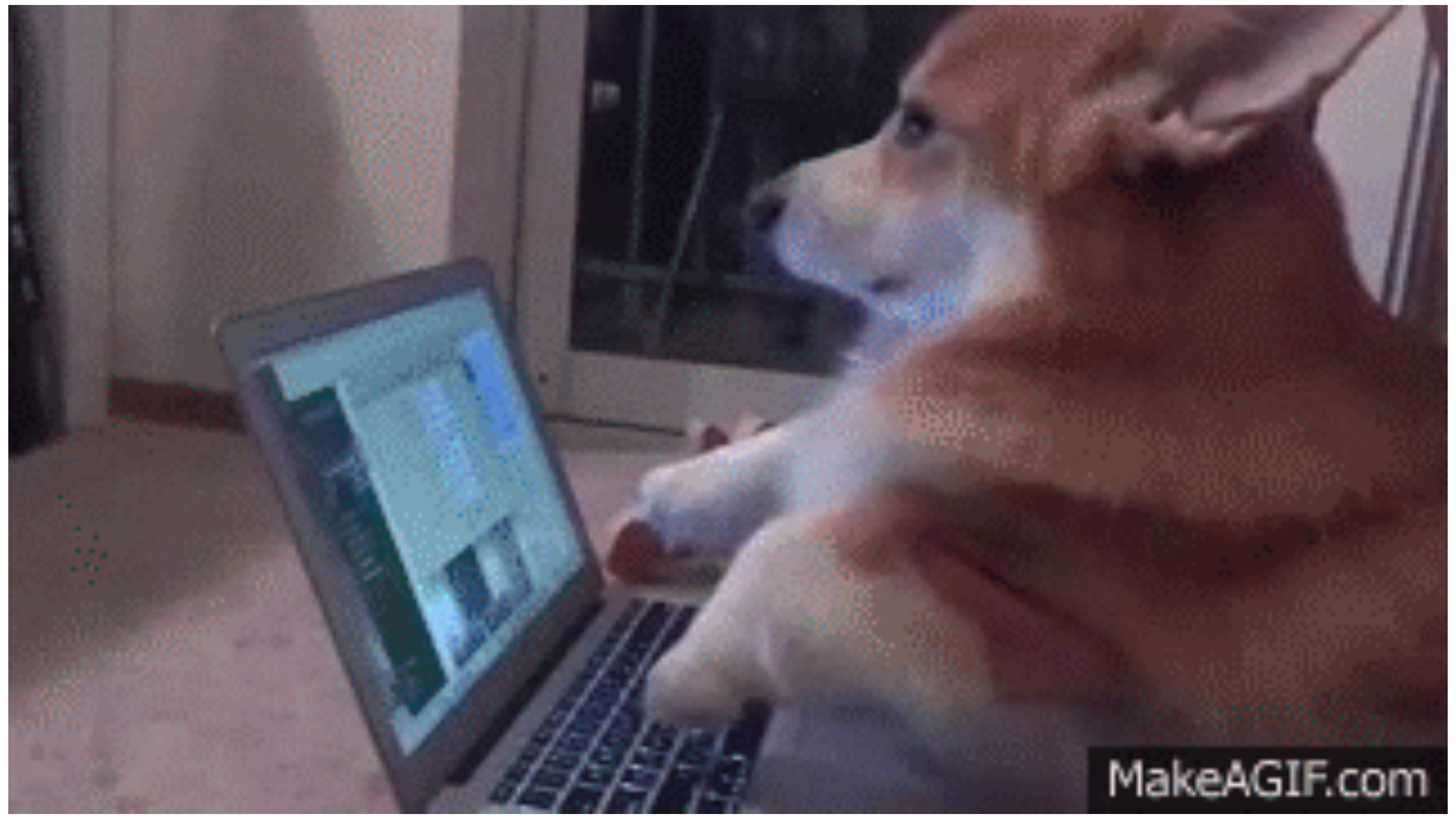
- When building a 'script' — cannot be run from commandline
- Performing delicate analysis — no edit history, cells could be ordered wrong
- Memory intensive work — all variables are stored in memory until closed
- When learning Python — notebooks discourage good habits, don't teach the basics

NOTEBOOKS ARE GREAT FOR ITERATIVE DEVELOPMENT
NOTEBOOKS ARE DANGEROUS UNLESS YOU RUN EACH CELL EXACTLY ONCE, IN ORDER

Credit: Why I Dont Like Jupyter Notebooks by Joel Grus

SOME USEFUL COMMANDS

- Shift + Enter : Run current cell
- ESC : enter ‘command mode’
- ESC -> b : create a new cell below
- ESC -> m : turn cell into `markdown`
- ESC -> y : turn cell into code
- ESC -> l : add line numbers to cell
- ESC -> d -> d : permanently deletes cell!

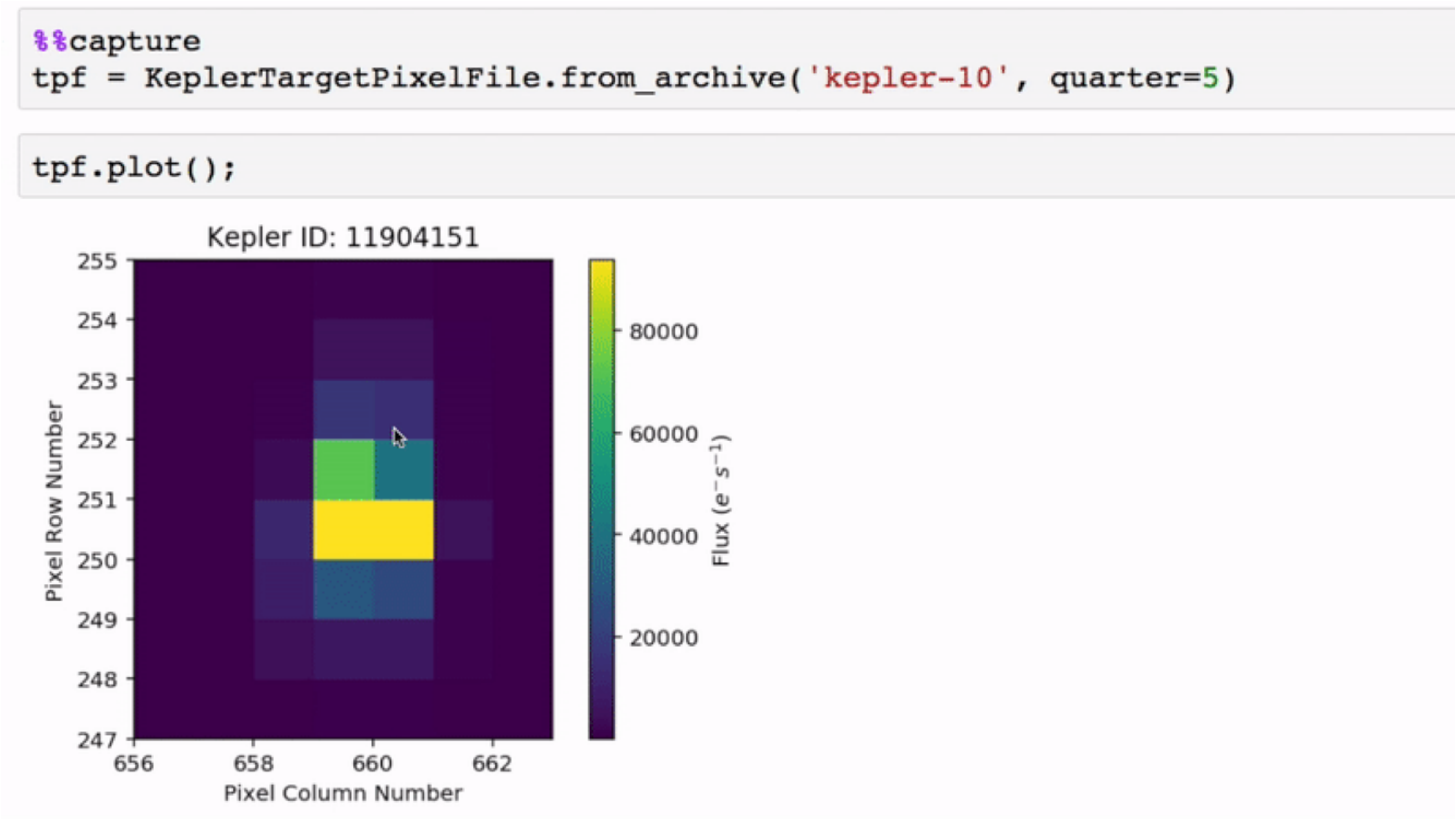


- Keyboard shortcuts compeltely customiseable!
- You can select, copy, cut, paste and move cells!

LIGHTKURVE

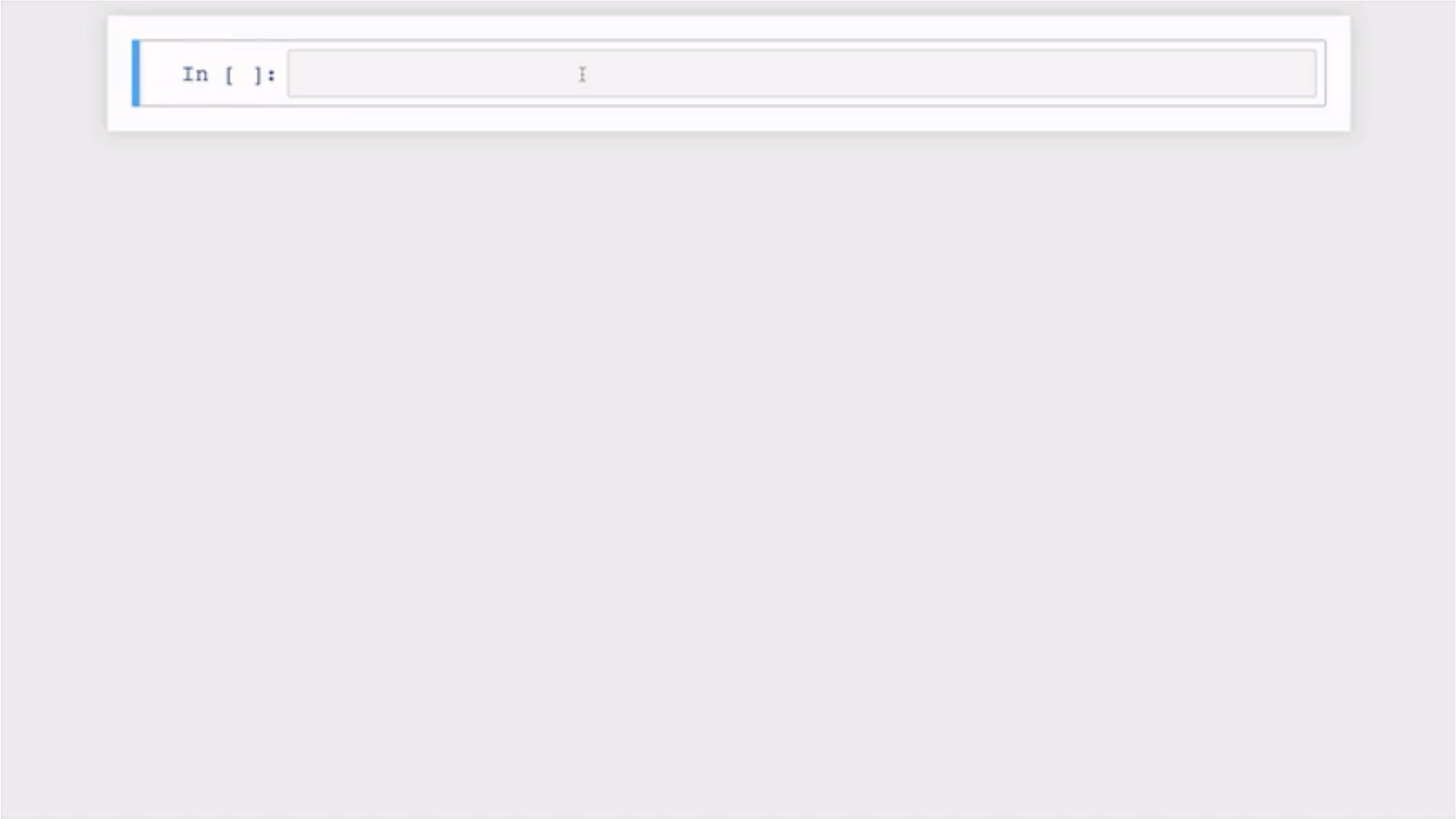
lowering the barrier for transit photometry

(& now also for asteroseismology)



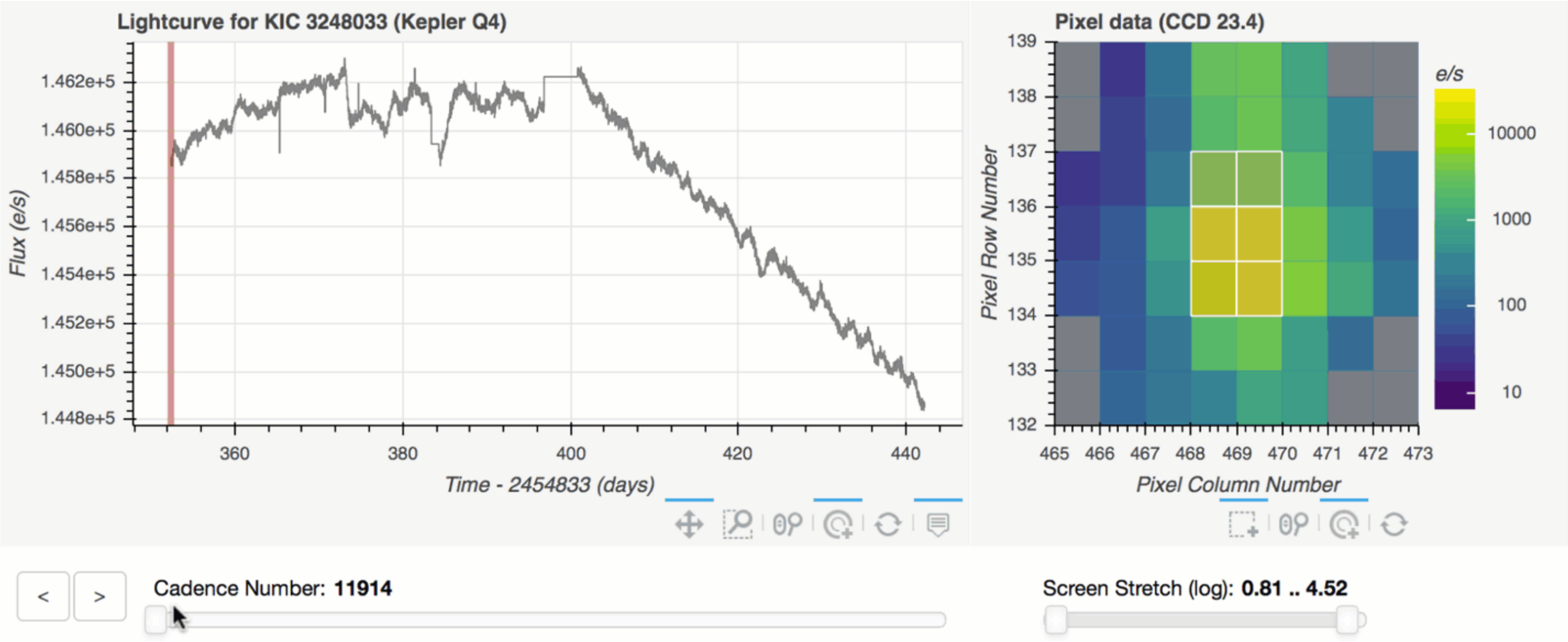
```
%%capture
tpf = KeplerTargetPixelFile.from_archive('kepler-10', quarter=5)
```

```
tpf.plot();
```



WHAT IS LIGHTKURVE?

- An ‘object-based’ Python package
- User-friendly analysis of flux time series data, especially ***Kepler*, K2**, and now **TESS!**
- Open source, so **you can contribute!**
- Constantly being upgraded



Cadence Number: **11914**

Screen Stretch (log): **0.81 .. 4.52**

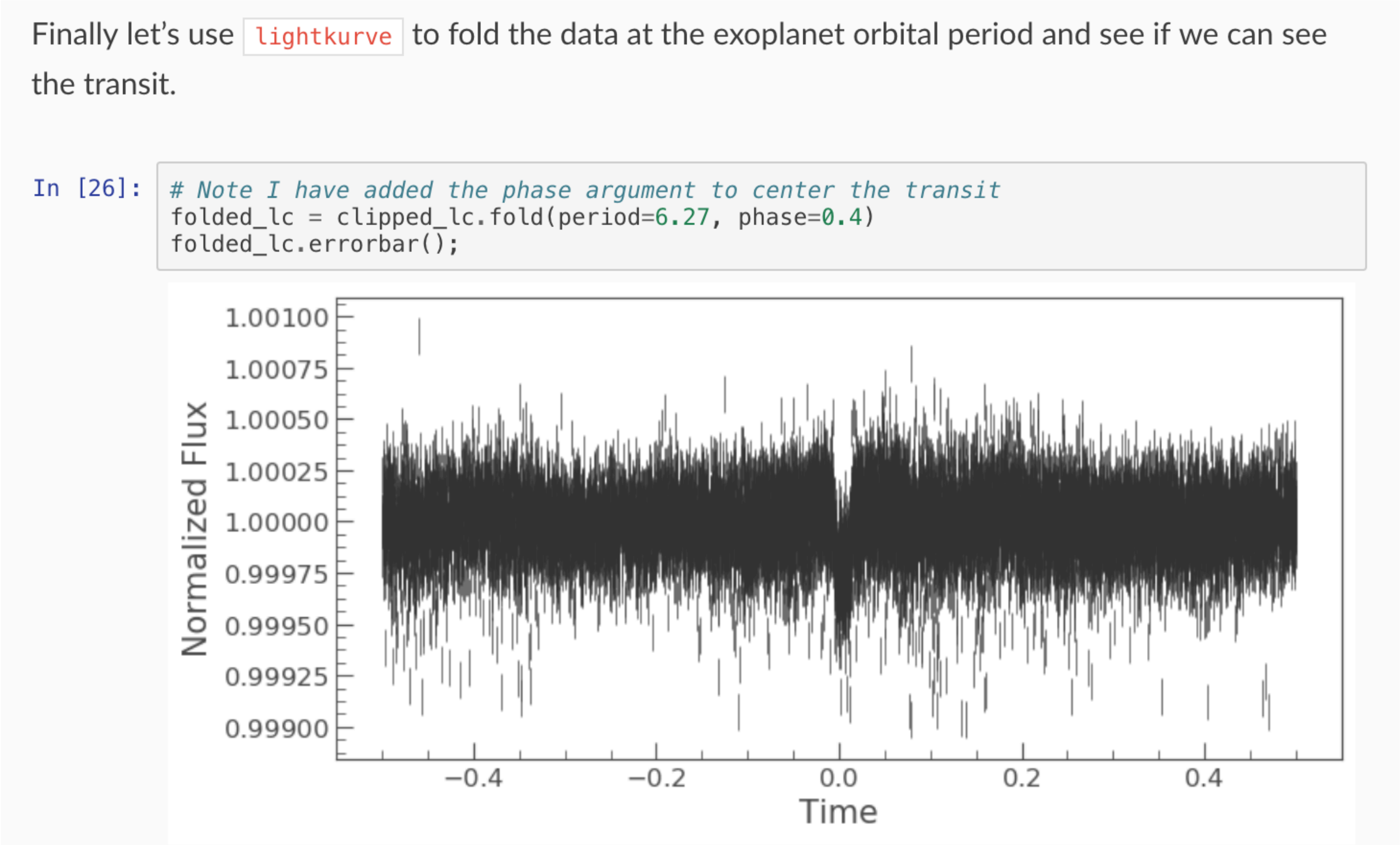
BETTER TO SHOW THAN TELL

we'll work through a tutorial and a live test

going from a target pixel file to a power spectrum

(i'll take suggestions from the audience)

finding the first TESS planet candidate



Finally let's use `lightkurve` to fold the data at the exoplanet orbital period and see if we can see the transit.

```
In [26]: # Note I have added the phase argument to center the transit
         folded_lc = clipped_lc.fold(period=6.27, phase=0.4)
         folded_lc.errorbar();
```

SOME USEFUL LINKS!

Install & learn about Jupyter

lightkurve

1.0b21

Install & learn about lightkurve

KeplerGO / lightkurve

Raise an issue on the repo, or fix an existing one!