ASTR 119 Final Project Option #3
Astronomical Source Detection

(NB: Do not contact anyone from astropy or sep about any part of this assignment. You must work through this project only relying on your team.)

Final Project #3 Requirements

1) Get astropy and install it on your system (pip install astropy).

2) Get sep and install it on your system (pip install sep).

3) Follow the tutorial found at https://sep.readthedocs.io/en/v1.0.x/tutorial.html, but use the astropy fits routines instead of fitsio. Create a notebook that performs the tutorial and comment it using Markdown to explain what it's doing. Note that the fits image used in the tutorial can be acquired via the sep GitHub account.

4) Augment the tutorial to save each of the four figures to PNG files.

5) Get the f105w band image of the Hubble Ultra Deep Field, which is called hlsp_hudf12_hst_wfc3ir_udfmain_f105w_v1.0_drz.fits. You can down load it from https://archive.stsci.edu/pub/hlsp/hudf12/.

6) Redo the tutorial steps in a second notebook, but on the UDF f105w image. How many sources do you find? Histogram their fluxes (for extra fun, covert to AB magnitude first, check the FITS header and the STSCI website).

7) Extra Credit:

Download the f125w and f160w images of the HUDF at the same website, and make a 3-color false image of the UDF using RGB -> f160w, f125w, f105w. Save the image as a PNG.

$$\frac{dx_{i+1}}{dx_i} = f'(x_i) = 4r(1 - 2x_i)$$

$$\lambda = \frac{1}{n}\sum_{i=0}^{n-1} \ln\left|f'(x_i)\right| = \frac{1}{n}\sum_{i=0}^{n-1} \ln[4r(1 - 2x_i)]$$