

Homework 4 - Basic Data Mining

Don't forget to `svn up` before you issue any other commands in SVN—this is to guard against you changing a document that someone else is working on in the same directory.

Don't forget to `svn ci` (with `-m` comments) frequently as you work. This allows others to see how your work progressed, and it automatically backs your work up as you produce it so that you're less likely to lose any of your work and/or so that you can revert to earlier versions of your work.

*Don't forget to log in using **your** personal username and password on the physics network. Remember to comment your code carefully with your initials beside every comment (as in `;ADM` an IDL comment). Remember to provide an informative header for **every** function and procedure that you write (see my IDL Primer linked from the syllabus for an example of such a header).*

Throughout ASTR5160, try to make your plots look professional. You may wish to write (or find) an IDL procedure that can be called to initiate a set of parameters to make professional-looking plots.

An astronomer wants to study the GALEX (UV) properties of SDSS optical point sources that are detected in the radio by the FIRST survey. As an initial test, she chooses to limit her study to a specific region of the sky—two overlapping circular regions of $\theta = 2^\circ$ in radius, centered at $(\alpha, \delta) = (163^\circ, 50^\circ)$ and $(\alpha, \delta) = (167^\circ, 50^\circ)$ ¹

1. Determine which FIRST sources lie in the astronomer's survey and write them out to a fits file.
2. Use `sdss_sweep_data_index` to determine the SDSS PSFFLUXES and GALEX NUV and FUV fluxes for *primary* point sources in the SDSS that are within $1''$ of the FIRST sources in the astronomer's survey. Note that *primary* SDSS sources in the sweep files can be specified as follows (if the structure containing your SDSS sweep information is called `objs`):

```
IDL> primaryflag = sdss_flagval('RESOLVE_STATUS', 'SURVEY_PRIMARY')
IDL> w = where((objs.resolve_status AND primaryflag) ne 0, nprim)
IDL> objs = objs[w]
```

Retain the SDSS RA and DEC for these sources to help answer question 4 of this homework. Note that only $\sim 5\%$ of the FIRST sources will match an SDSS primary point source.

3. Determine which of the FIRST sources in the astronomer's survey is brightest (has the largest flux) in GALEX FUV. Let us refer to this source as *FUV1*. Plot the 7 fluxes (5 SDSS and 2 GALEX) of *FUV1* as a function of wavelength².
4. Using the SDSS Navigator Tool linked from the syllabus, and the SDSS RA and DEC of *FUV1*, pull up the image of *FUV1* from the SDSS database. By clicking `Explore` you should be able to see the spectrum and identifying information of *FUV1*. As part of your code for question 3 of this homework, print out a few brief comments indicating why, given how it was selected in the astronomer's survey, the spectrum and identification of *FUV1* is as might be expected.

¹don't forget the code you wrote for last week's homework!

²PSFLUX represents SDSS *ugriz* bands at 3543Å, 4770Å, 6231Å, 7625Å and 9134Å, respectively. GALEX FUV and NUV are at about 1600Å and 2400Å, respectively