Using_astroquery

January 4, 2021

1 K Using astroquery

- Astroquery: part of astropy : https://astroquery.readthedocs.io/en/latest/index.html

astroquery: An Astronomical Web-querying Package in Python Ginsburg, A., Sipocz, B. M., Brasseur, C. E., Cowperthwaite, P. S., Craig, M. W., Deil, C., Guillochon, J., Guzman, G., Liedtke, S., Lian Lim, P., Lockhart, K. E., Mommert, M., Morris, B. M., Norman, H., Parikh, M., Persson, M. V., Robitaille, T. P., Segovia, J.-C., Singer, L. P., Tollerud, E. J., de Val-Borro, M., Valtchanov, I., Woillez, J., Astroquery Collaboration, & a subset of astropy Collaboration 2019, Astronomical Journal, 157, 98

ABSTRACT: astroquery is a collection of tools for requesting data from databases hosted on remote servers with interfaces exposed on the internet, including those with web pages but without formal application program interfaces. These tools are built on the Python requests package, which is used to make HTTP requests, and astropy, which provides most of the data parsing functionality. astroquery modules generally attempt to replicate the web page interface provided by a given service as closely as possible, making the transition from browser-based to command-line interaction easy. astroquery has received significant contributions from throughout the astronomical community, including several from telescope archives. astroquery enables the creation of fully reproducible workflows from data acquisition through publication. This paper describes the philosophy, basic structure, and development model of the astroquery package. The complete documentation for astroquery can be found at http://astroquery.readthedocs.io/. ADS URL : https://ui.adsabs.harvard.edu/abs/2019AJ….157…98G

- Some examples of Astroquery uses:
- part of astroquery: TAP/TAP+: https://astroquery.readthedocs.io/en/latest/utils/tap.html
- Gaia TAP+: https://astroquery.readthedocs.io/en/latest/gaia/gaia.html
- Atomic line list: https://astroquery.readthedocs.io/en/latest/atomic/atomic.html
- Simbad: https://astroquery.readthedocs.io/en/latest/simbad/simbad.html
- Vizier: https://astroquery.readthedocs.io/en/latest/vizier/vizier.html
- This lecture explains step by step how to extract information from the Gaia database: https://allendowney.github.io/AstronomicalData/

[1]:
```
import matplotlib.pyplot as plt
```

1.0.1 Querying Vizier

[2]:
```
from astroquery.vizier import Vizier
```

```
[3]: catalog_list = Vizier.find_catalogs('Kang W51')
```

```
[4]: catalog_list
```

```
[4]: OrderedDict([('J/ApJ/684/1143', </>),
                  ('J/ApJ/736/87', </>),
                  ('J/ApJ/738/79', </>),
                  ('J/ApJ/760/12', </>),
                  ('J/ApJ/785/119', </>),
                  ('J/ApJ/813/39', </>),
                  ('J/ApJ/839/12', </>),
                  ('J/ApJ/859/4', </>),
                  ('J/ApJS/165/360', </>),
                  ('J/ApJS/191/232', </>),
                  ('J/ApJS/238/29', </>),
                  ('J/A+A/454/717', </>),
                  ('J/A+A/548/A29', </>),
                  ('J/A+A/563/A120', </>),
                  ('J/A+A/578/A51', </>),
                  ('J/A+A/622/A81', </>),
                  ('J/A+A/642/A85', </>),
                  ('J/AJ/127/539', </>),
                  ('J/AJ/128/846', </>),
                  ('J/AJ/144/35', </>),
                  ('J/AJ/144/150', </>),
                  ('J/AJ/145/167', </>),
                  ('J/AJ/149/59', </>),
                  ('J/AJ/150/1', </>),
                  ('J/MNRAS/310/982', </>),
                  ('J/MNRAS/359/865', </>),
                  ('J/MNRAS/385/2225', </>),
                  ('J/MNRAS/401/160', </>),
                  ('J/MNRAS/439/611', </>)])
```

```
[5]: catalogs = Vizier.get_catalogs('J/ApJ/706/83/ysos')
     print(catalogs)
```

```
TableList with 1 tables:
        '0:J/ApJ/706/83/ysos' with 22 column(s) and 50 row(s)
```

```
[6]: Vizier.ROW_LIMIT = -1
     catalogs = Vizier.get_catalogs('J/ApJ/706/83/ysos')
     print(catalogs)
```

```
TableList with 1 tables:
        '0:J/ApJ/706/83/ysos' with 22 column(s) and 737 row(s)
```

[7]:

```python
Table = catalogs['J/ApJ/706/83/ysos']
```

[8]:

```python
print(Table)
```

```
Seq f_Seq      SSTGLMC       AV  Mstar Ltot …  A  _2M Simbad  _Glon    _Glat
                            mag   Msun Lsun …                  deg      deg
--- ----- ----------------- ---- ----- ---- … --- --- ------ -------- --------
  1       G048.7567-00.6341  4.0   3.0   74 …   F  2M Simbad  48.7567  -0.6341
  2       G048.7579-00.2797  1.6   2.7   33 …   F  2M Simbad  48.7579  -0.2797
  3       G048.7605-00.0388 33.3   4.1  269 …   W  2M Simbad  48.7605  -0.0388
  4       G048.7618+00.0627 51.8   4.0  274 …   W  2M Simbad  48.7618   0.0627
  5       G048.7637+00.2022 25.7   3.5  155 …   W  2M Simbad  48.7637   0.2022
  6       G048.7655+00.1017  3.0   3.2   66 …   F  2M Simbad  48.7655   0.1017
  7       G048.7667+00.0766  7.5   4.0  229 …   F  2M Simbad  48.7667   0.0766
  8       G048.7702-00.1505 18.8   3.9  106 …   W  2M Simbad  48.7702  -0.1505
  9       G048.7703+00.0786 52.7   6.6 1788 …   W  2M Simbad  48.7703   0.0786
 10       G048.7720-00.4792  9.3   4.6  349 …   F  2M Simbad  48.7720  -0.4792
…   …               …  …   …  … … … …    …      …      …
728       G049.9895-00.0079 20.0   4.9  602 …   W  2M Simbad  49.9895  -0.0079
729       G049.9899-00.1413 21.5  10.1 7855 …   W  2M Simbad  49.9899  -0.1413
730       G049.9914-00.1333 23.5   9.1 4871 …   W  2M Simbad  49.9914  -0.1333
731       G049.9937+00.0231  6.4   3.2   81 …   F  2M Simbad  49.9937   0.0231
732       G049.9952-00.0063 12.5   4.9  554 …   W  2M Simbad  49.9952  -0.0063
733       G049.9972+00.2599 33.6   5.6 1089 …   W  2M Simbad  49.9972   0.2599
734       G049.9973+00.2605 17.3  10.1 5162 …   W  2M Simbad  49.9973   0.2605
735       G049.9973+00.2630  8.4   5.2  353 …   F  2M Simbad  49.9973   0.2630
736       G049.9977-00.1261 11.3   8.3 1886 …   W  2M Simbad  49.9977  -0.1261
737       G049.9982-00.1303 25.9   8.1 2819 …   W  2M Simbad  49.9982  -0.1303
Length = 737 rows
```

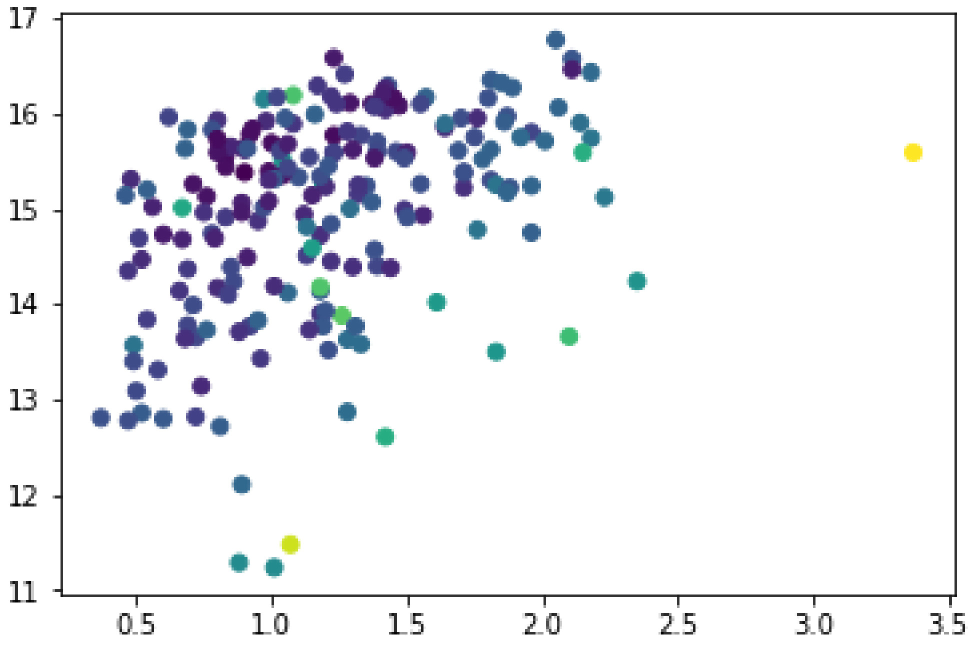
[9]:

```python
print(Table.keys())
```

```
['Seq', 'f_Seq', 'SSTGLMC', 'AV', 'Mstar', 'Ltot', 'Stg', 'Cl1', 'Cl2', 'Jmag',
'Hmag', 'Ksmag', '__3.6_', '__4.5_', '__5.8_', '__8.0_', '__24_', 'A', '_2M',
'Simbad', '_Glon', '_Glat']
```

[10]:

```python
f, ax = plt.subplots()
ax.scatter(Table['Jmag'] - Table['Hmag'], Table['Jmag'], c=Table['Mstar']);
```



1.0.2 Querying MAST

https://archive.stsci.edu/access-mast-data

[11]:
```
from astroquery.mast import Catalogs, Observations
```

[12]:
```
obs_table = Observations.query_object("IC 418",radius=".02 deg")
```

[13]:
```
obs_table.show_in_browser(jsviewer=True)
```

[14]:
```
mask_spectrum = obs_table['dataproduct_type'] == 'spectrum'
```

[15]:
```
print(len(obs_table), mask_spectrum.sum())
```

```
186 82
```

[16]:
```
data_products_by_obs = Observations.get_product_list(obs_table[mask_spectrum][0:
↪2])
```

[17]:
```
data_products_by_obs.show_in_browser(jsviewer=True)
```

[18]:
```
obs1 = Observations.download_products('3000021002', productType="SCIENCE")
```

```
INFO: Found cached file ./mastDownload/IUE/lwr02253/lwr02253.mxhi.gz with
expected size 695134. [astroquery.query]
INFO: Found cached file ./mastDownload/IUE/lwr02253/lwr02253.mxlo.gz with
```

```
expected size 17513. [astroquery.query]
INFO: Found cached file ./mastDownload/IUE/lwr02253/lwr02253mxlo_vo.fits with
expected size 48960. [astroquery.query]
```

```
[19]: obs1
```

```
[19]: <Table length=3>
                          Local Path                          Status  Message  URL
                            str48                              str8    object object
      ------------------------------------------------ -------- ------- ------
          ./mastDownload/IUE/lwr02253/lwr02253.mxhi.gz COMPLETE    None   None
          ./mastDownload/IUE/lwr02253/lwr02253.mxlo.gz COMPLETE    None   None
      ./mastDownload/IUE/lwr02253/lwr02253mxlo_vo.fits COMPLETE    None   None
```

1.0.3 Catalogs

```
[20]: catalog_data = Catalogs.query_object("IC 418")
```

```
[21]: catalog_data.show_in_browser(jsviewer=True)
```