

Some more complex TAP VizieR queries

1. Select high proper motions stars near Galactic center

Goal: retrieve 10 TGAS stars with higher proper motion near the galactic center

Go to TAP VizieR web interface: <http://tapvizier.u-strasbg.fr/adql/>

Search tables for the *Gaia* keyword.

Select *I/337/tgas* and click on Construct your query at the top right

Click on *Sky area* and enter *Galactic center* as cone center

Update radius to *5 deg*, *max records* to *10* and click on *Update query*

Click on *Quickview* to get a preview of the result

Edit the query to keep only *source_id*, *ra*, *dec* and compute total proper motion:

```
SELECT TOP 10 source_id, ra, dec, sqrt(pmra*pmra+pmdec*pmdec) as  
pm  
FROM "I/337/tgas"  
WHERE 1=CONTAINS(POINT('ICRS',"I/337/tgas".ra,"I/337/tgas".dec),  
CIRCLE('ICRS', 266.416833, -29.007806, 5.))
```

Click on *Quickview* to get a preview

We still need to sort the result according to the proper motion value, using the *ORDER BY* clause.

The final query should look like this:

```
SELECT TOP 10 ra, dec, sqrt(pmra*pmra+pmdec*pmdec) as pm  
FROM "I/337/tgas"  
WHERE 1=CONTAINS(POINT('ICRS',"I/337/tgas".ra,"I/337/tgas".dec),  
CIRCLE('ICRS', 266.416833, -29.007806, 5.))  
ORDER BY pm DESC
```

Click on *Run* to launch the query and retrieve the result in the requested format.

6.2 Recreate HR diagram from Gaia DR1 paper

Goal: we will recreate figure 3c of the Gaia Data release 1 paper (<https://arxiv.org/pdf/1609.04172v1.pdf>)

Launch Topcat: `java -Xmx1024M -jar topcat-full.jar`

Open the TAP query window (menu VO → *Table Access Protocol (TAP) Query*)

Select  TAPVizieR (31971) - ivo://cds.vizier/tap and click  on

In the appendix of <https://arxiv.org/pdf/1609.04172v1.pdf>, table B.1 provides with the ADQL query used to create the HR diagram:

```
SELECT gaia.source_id, gaia.hip, gaia.phot_g_mean_mag
+5*log10(gaia.parallax)-10 as g_mag_abs, hip.b_v
FROM gaiadr1.tgas_source as gaia
inner join public.hipparcos_newreduction as hip
on gaia.hip = hip.hip
WHERE gaia.parallax/gaia.parallax_error >= 5 and
hip.e_b_v > 0.0 and hip.e_b_v <= 0.05 and 2.5/
log(10)*gaia.phot_g_mean_flux_error/gaia.phot_g_mean_flux
<= 0.05
```

This query is meant to be executed on GACS archive at ESA. A few changes must be made in order to make it work with TAP VizieR:

- In TAP VizieR, gaiadr1.tgas_source is named ...
and public.hipparcos_newreduction is named ...
- columns b_v and e_b_v respectively are named B-V and e_B-V
As the dash is a special character in ADQL, the column name must be put between double quotes: "B-V" and "e_B-V"
- column hip is named HIP

We will also add position fields ra and dec from TGAS

The updated ADQL query to be typed in Topcat is:

```
SELECT gaia.ra, gaia.dec, gaia.source_id,
gaia.hip, gaia.phot_g_mean_mag+5*log10(gaia.parallax)-10 as
g_mag_abs,
hip."B-V"
FROM "I/337/tgas" as gaia
inner join "I/311/hip2" as hip
on gaia.hip= hip.HIP
where gaia.parallax/gaia.parallax_error >= 5 and hip."e_B-V" > 0.0
and hip."e_B-V" <= 0.05 and
2.5/log(10)*gaia.phot_g_mean_flux_error/gaia.phot_g_mean_flux <=
0.05
```

Copy/paste this query in the ADQL text panel, at the bottom of the window and *Run Query*:

ADQL Text

Mode: Synchronous

```

SELECT gaia.source_id, gaia.hip, gaia.phot_g_mean_mag+5*log10(gaia.parallax)-10 as g_mag_abs,
hip."B-V"
FROM "I/337/tgas" as gaia
inner join "I/311/hip2" as hip
on gaia.hip= hip.HIP
where gaia.parallax/gaia.parallax_error >= 5 and hip."e_B-V" > 0.0 and hip."e_B-V" <= 0.05 and
2.5/log(10)*gaia.phot_g_mean_flux_error/gaia.phot_g_mean_flux <= 0.05

```

Examples

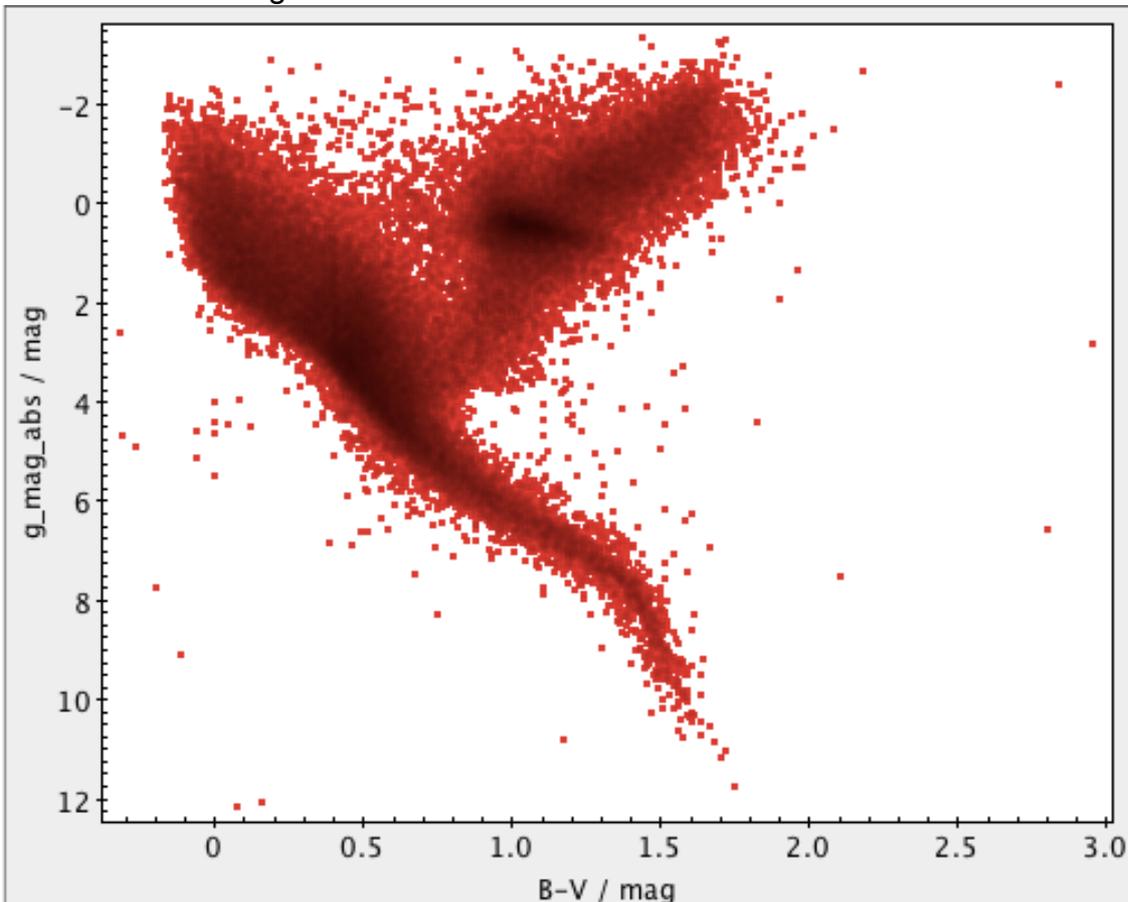
Run Query

We should retrieve 74,817 sources.

Create a scatter plot (*Graphics* → *Plane Plot*) and select *B-V* for **X** axis and *g_mag_abs* for **Y** axis.

Click on  and flip Y axis Y Flip.

Here is our HR diagram!



3. Retrieve spectral types from Simbad

We will now try to retrieve the spectral types of our sources, by querying Simbad through the CDS cross-match service.

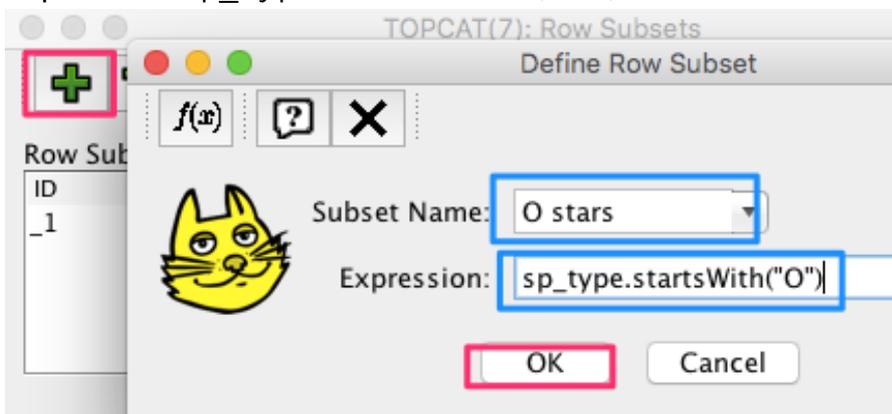


Click on , select *simbad* in remote table list. Select *TAP_1_l_337_tgas,l_311_hip2* as input table and launch cross-match at 1 arcsec.

On the result table, we will create some subsets according to the spectral type of the star.



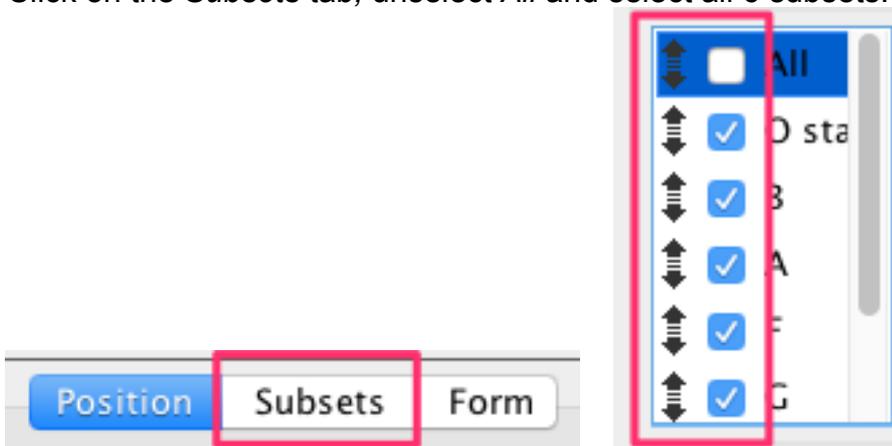
Click on  and define a new subset named *O stars* matching the following expression: `sp_type.startsWith("O")`



Repeat the same steps to create subsets for spectral types **B**, **A**, **F**, **G**, **K** and **M**.

Once the 6 spectral types have been created, plot the HR diagram following steps of section 6.2

Click on the *Subsets* tab, unselect *All* and select all 6 subsets:



You should end up with the following plot:

