

## 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

1

```
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 ◀ ▶  Info

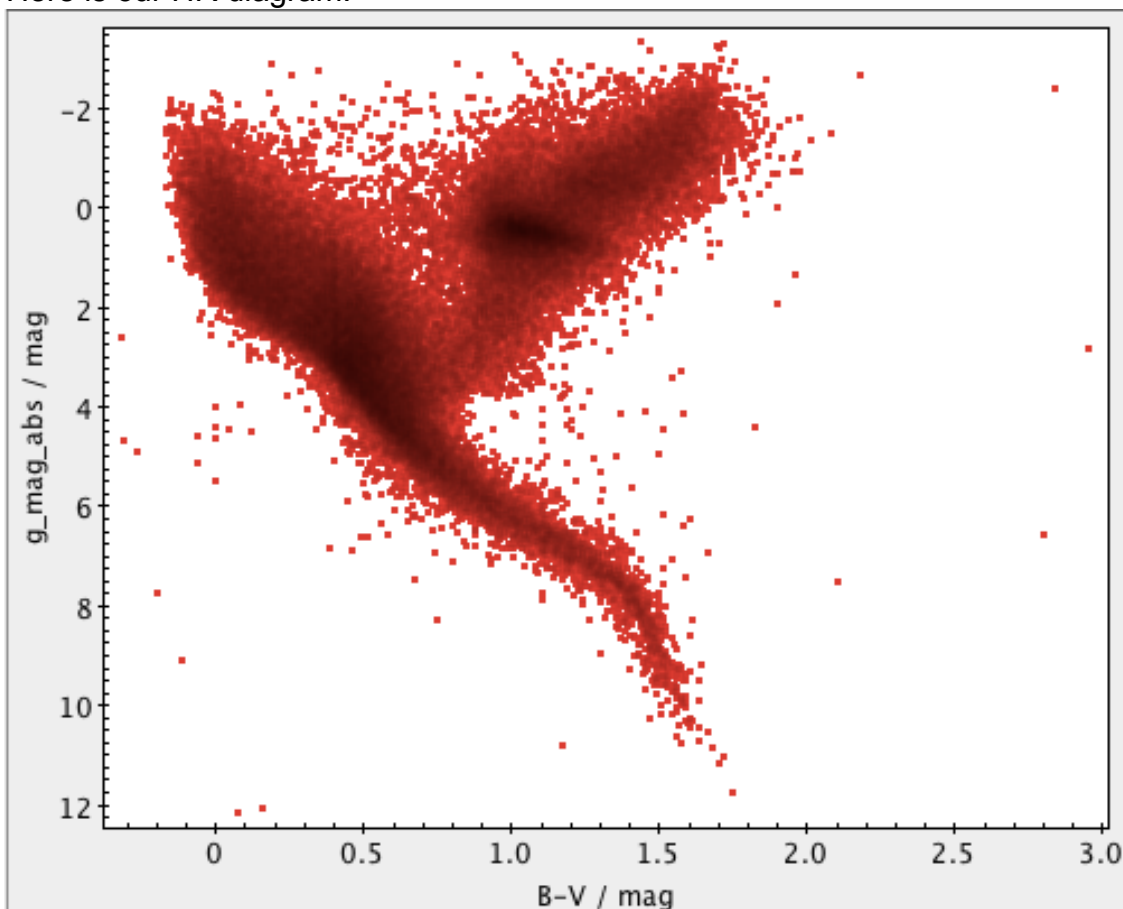
Run Query

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  **Axes** 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.




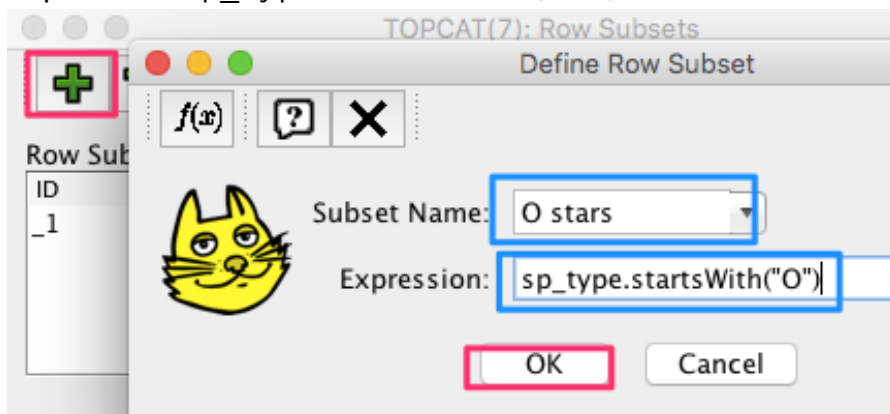
Click on , select *simbad* in remote table list.

Select *TAP\_1\_I\_337\_tgas,I\_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.



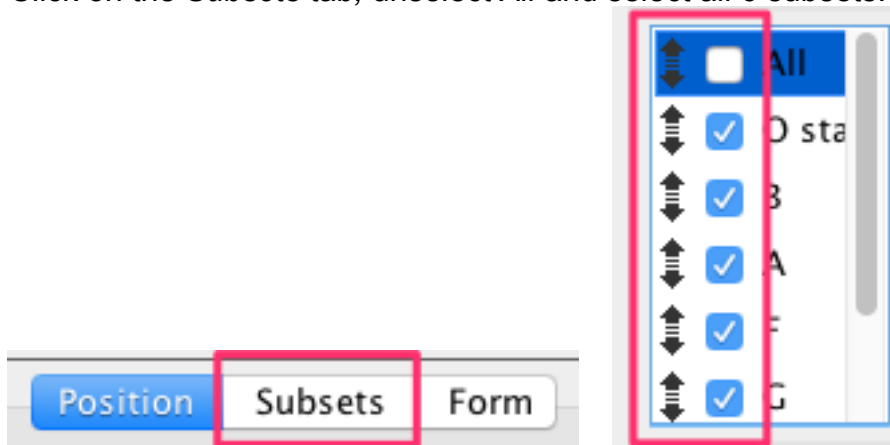
Click on  and define a new subset named *O stars* matching the following expression: `sp_type.startsWith("O")`



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:

