How to Find a Quasar?

Tutorial #4

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25 de abril de 2023

The goal of this tutorial was to ...

1. Part I

1.1. Getting the Data

First of all, I downloaded the data from SDSS DR18 [?] using the following SQL query:

Code 1: SQL Query

```sql
SELECT s.specobjid, s.plate, s.mjd, s.fiberID, s.subclass, s.z,
g.oiii_5007_flux, g.oiii_5007_flux_err,
g.h_alpha_flux, g.h_alpha_flux_err,
g.h_beta_flux, g.h_beta_flux_err,
g.nii_6584_flux, g.nii_6584_flux_err,
W.w1mpro as w1, W.w2mpro as w2, W.w3mpro as w3

FROM GalSpecLine AS g
JOIN SpecObj AS s ON g.specobjid = s.specobjid
JOIN wise_xmatch AS x ON s.bestobjid = x.sdss_objid
JOIN wise_allsky AS w ON w.cntr = x.wise_cntr

WHERE
(s.class = 'QSO' or s.class = 'GALAXY')
AND 2.355 * g.sigma_balmer < 500
AND 2.355 * g.sigma_forbidden < 500
AND s.snmedian_g > 40
AND g.oiii_5007_flux > 5
AND (g.oiii_5007_flux / g.oiii_5007_flux_err) > 5
AND g.h_alpha_flux > 5
AND (g.h_alpha_flux / g.h_alpha_flux_err) > 5
AND g.h_beta_flux > 5
AND (g.h_beta_flux / g.h_beta_flux_err) > 5
AND g.nii_6584_flux > 5
AND (g.nii_6584_flux / g.nii_6584_flux_err) > 5
```

This query defines the sample, gets the spectroscopic information on the needed lines and gets the colours from the WISE catalogue [?]. This query resulted in 960 objects. I checked their spectroscopic

subclasses and saw that 163 objects are classified as starburst galaxies, 319 as broadline, 71 as AGN broadline, 214 as starforming, 29 as starforming broadline, 84 as AGN, one as starburst broadline, and the rest had no sub-classification. I plotted a BPT diagram (see Section 1.2) with the spectroscopic subclasses from SDSS as the style of the data points in Figure **??**. The trends of the different classes are already visible.

Figure 1: BPT Diagram with SDSS subclasses.

I also plotted the distributions of the relevant spectral line fluxes (see Figure **??**).
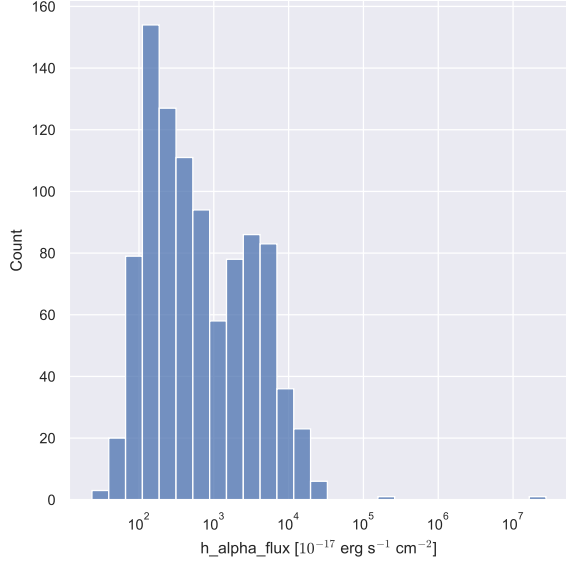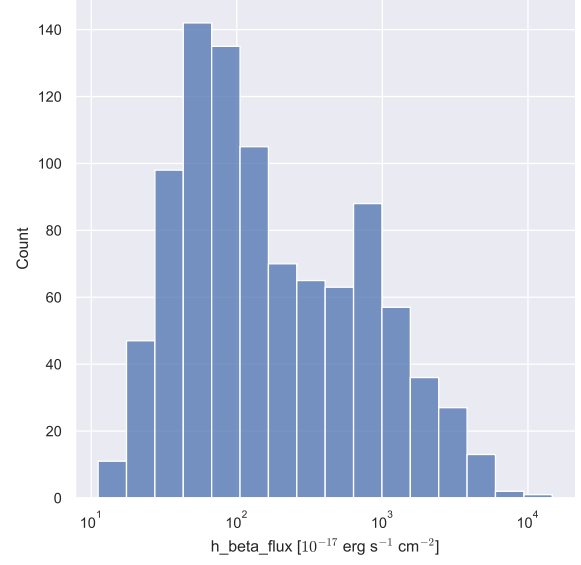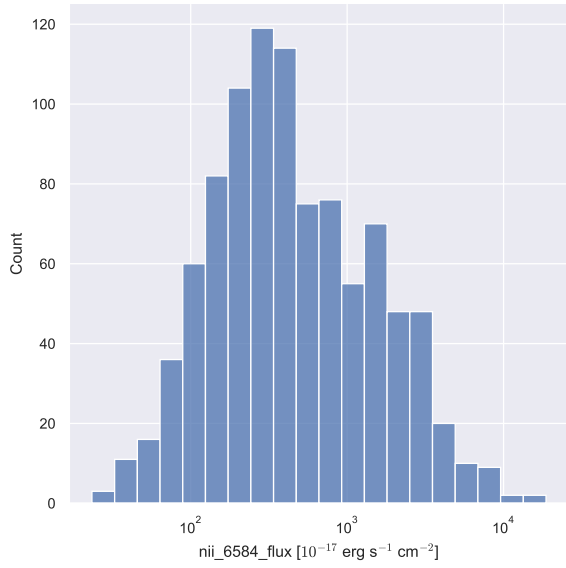
1.2. BPT Diagram
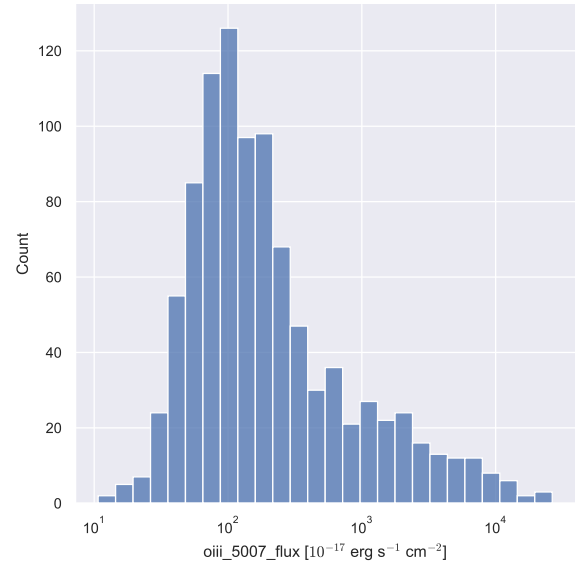
2. Part II

2.1. Colours from WISE

I downloaded the WISE colours using the same SQL as the first part 1.

2.2. Classification with WISE Colour-Colour Diagram

2.3. Analysing a Particular Object

(a) Distribution of Hα fluxes.

alphDistribution of Hβ fluxes.

alphDistribution of [NII] fluxes.

alphDistribution of [OIII] fluxes.

Figure 2: Distribution of the fluxes of the relevant spectral lines.