Abstract

We present the classification of about 6 million unresolved photometric detection from Sloan Digital Sky Survey Data Release 7, using an efficient Bayesian classifier. These objects are classified as stars, galaxies and quasars from a region of colour space that is selected for the study. Our algorithm recovers 99.96% of spectroscopically confirmed quasars and 99.51% of stars to SDSS i-band ~ 21.3 in the colour window that we study. This method has predicted about 2 times more quasar candidate stars to SDSS i-band ~ 21.3 in the colour window that we study. This method has predicted about 2 times more quasar candidate stars to SDSS i-band ~ 21.3 in the colour window that we study. This method has predicted about 2 times more quasar candidate stars to SDSS i-band ~ 21.3 in the colour window that we study. This method has predicted about 2 times more quasar candidate stars to SDSS i-band ~ 21.3 in the colour window that we study.

Data

The data used for the study are unresolved objects from SDSS DR7 photometric catalogue. A small set of spectroscopically confirmed objects are used to train the classifier. The colour window region shown as black box in Fig. 1 is used for this study. This region occupies all known quasars up to a limiting redshift of ~ 2.6 as shown in Fig. 2.

Comparison of our predictions with SDSS

<table>
<thead>
<tr>
<th>Object Type</th>
<th>Completeness</th>
<th>Contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Star</td>
<td>99.51%</td>
<td>0.47%</td>
</tr>
<tr>
<td>Galaxy</td>
<td>82.74%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Quasar</td>
<td>99.96%</td>
<td>0.28%</td>
</tr>
<tr>
<td>Star-Late</td>
<td>80.40%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Total</td>
<td>99.69%</td>
<td>0.31%</td>
</tr>
</tbody>
</table>

Motivation

With the advent of new detector technology and many large scale sky surveys, automated classification tools are required to analyse objects. This is more relevant at fainter magnitudes where noise is large and samples with confirmed nature are fewer. We use a Bayesian classifier that use the colour relation of each type of object to distinguish them. (Fig.1.)

Summary of the catalogue predictions with other spectroscopic surveys

Comparison of number density of quasars with 2fB-SDSS LRG and QSO (2SLAQ) survey

Results

- We have identified and provided a catalogue of about 2,430,625 probable quasars, 3,544,036 stars and 63,586 galaxies covering the SDSS i-band magnitude range 14 to 24.
- Our algorithm recovers 99.96% of spectroscopically confirmed quasars and 99.51% of stars to SDSS i-band ~ 21.3 in the colour window.
- Our catalogue covers most quasars with redshift < 2.6 and magnitude brighter than SDSS i ~ 24 in the SDSS footprint area.
- We compare our predictions with 24 other spectroscopic surveys (about 100 thousand) and find that the predictions closely agree with observations.
- We show that the number density of quasars in our predictions closely agree with the theoretical estimates.
- We identify specific redshift patches where the colours of quasars and some stars becomes indistinguishable.

Reference


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