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Photometric classification of emission line galaxies with machine-learning
methods.

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ADC_Keywords: Active gal. nuclei ; Surveys ; Galaxy catalogs ; Photometry, SDSS

Keywords: methods: data analysis - catalogues - surveys - galaxies: active -
galaxies: Seyfert

Abstract:

In this paper, we discuss an application of machine-learning-based methods to the identification of candidate active galactic nucleus (AGN) from optical survey data and to the automatic classification of AGNs in broad classes. We applied four different machine-learning algorithms, namely the Multi Layer Perceptron, trained, respectively, with the Conjugate Gradient, the Scaled Conjugate Gradient, the Quasi Newton learning rules and the Support Vector Machines, Q4 to tackle the problem of the classification of emission line galaxies in different classes, mainly AGNs versus non-AGNs, obtained using optical photometry in place of the diagnostics based on line intensity ratios which are classically used in the literature. Using the same photometric features, we discuss also the behaviour of the classifiers on finer AGN classification tasks, namely Seyfert I versus Seyfert II, and Seyfert versus LINER. Furthermore, we describe the algorithms employed, the samples of spectroscopically classified galaxies used to train the algorithms, the procedure followed to select the photometric parameters and the performances of our methods in terms of multiple statistical indicators. The results of the experiments show that the

application of self-adaptive data mining algorithms trained on spectroscopic data sets and applied to carefully chosen photometric parameters represents a viable alternative to the classical methods that employ time-consuming spectroscopic observations.

Description:

Photometric catalog of 3,201,824 candidate AGN objects. The objects are referred to the SDSS DR4 archive (table Galaxy).

File Summary:

```
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FileName  Lrecl  Records  Explanations  
-----  
ReadMe    80      .  This file  
dame_agn.dat  96 3201824  Candidate AGN objects from SDSS-DR4  
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```

See also:

II/267 : The SDSS Photometric Catalog, Release 4 (Adelman-McCarthy+, 2006)
<http://www.sdss.org> : SDSS Home Page

Byte-by-byte Description of file: dame_agn.dat

```
-----  
Bytes Format Units  Label  Explanations  
-----  
1- 18 I18  ---  objID  Unique SDSS identifier  
20- 28 F9.5 deg  RAdeg  Right Ascension (J2000)  
30- 38 F9.5 deg  DEdeg  Declination (J2000)  
40- 46 F7.5 ---  zph   [0/0.3] Photometric redshift, computed from  
D'Abrusco et al., 2007ApJ...663..752D
```

49- 54 F6.3 mag rmag r band flux in 3" diameter of the fiber radius
56- 62 F7.3 mag u-g u-g color index from dereddened SDSS magnitudes
64- 70 F7.3 mag g-r g-r color index from dereddened SDSS magnitudes
72- 78 F7.3 mag r-i r-i color index from dereddened SDSS magnitudes
80- 86 F7.3 mag i-z i-z color index from dereddened SDSS magnitudes
89- 94 F6.3 mag rmag0 Simplified r magnitude corrected for extinction
96 I1 --- AGN [1/3] Quality Flag of the AGN classification:
1=basic, 2=medium, 3=high quality

Acknowledgements:

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History:

- * 30-Oct-2013: original file from the first author
- * 22-Jun-2014: file reformatted (removed useless digits)

(End) Stefano Cavuoti [INAF-OACN, Italy], Patricia Vannier [CDS] 30-Oct-2013