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Machine-learning approaches to select Wolf-Rayet candidates

A. P. Marston[1], G. Morello[2,3], P. Morris[2], S. Van Dyk[2] and J. Mauerhan[4]

[1]ESA, STScI, 3700 San Martin Drive, Baltimore, MD 21218, USA
email: tmarston@sciops.esa.int
[2] IPAC, Caltech, 1200 E. California Blvd, Pasadena, CA 91125, USA
[3] Dept. of Physics and Astronomy, UCL, Gower Street, WC1E 6BT, UK
[4] Dept. of Astronomy, University of California, Berkeley, CA, USA

Abstract. The WR stellar population can be distinguished, at least partially, from other stellar populations by broad-band IR colour selection. We present the use of a machine learning classifier to quantitatively improve the selection of Galactic Wolf-Rayet (WR) candidates. These methods are used to separate the other stellar populations which have similar IR colours. We show the results of the classifications obtained by using the 2MASS J, H and K photometric bands, and the Spitzer/IRAC bands at 3.6, 4.5, 5.8 and 8.0μm. The k-Nearest Neighbour method has been used to select Galactic WR candidates for observational follow-up. A few candidates have been spectroscopically observed. Preliminary observations suggest that a detection rate of 50% can easily be achieved.

Keywords. Infrared surveys, Wolf-Rayet stars

We present a machine-learning method for refining our infrared broadband colour selection for determining Galactic Wolf-Rayet (WR) star candidates suitable for follow-up infrared spectroscopy (Mauerhan *et al.* 2011; Hadfield *et al.* 2007). The overall goal is to determine the total numbers of WR stars of different subtypes in our Galaxy.

Our technique uses the k-nearest neighbour machine-learning algorithm (Altman 1992) together with training sets of infrared colours from objects of known spectral type (Morello *et al.* 2017). In preliminary checks, the technique has enabled the discovery of four new WN4-5 stars using the SPEX IR spectrograph on the IRTF (see Fig. 1).

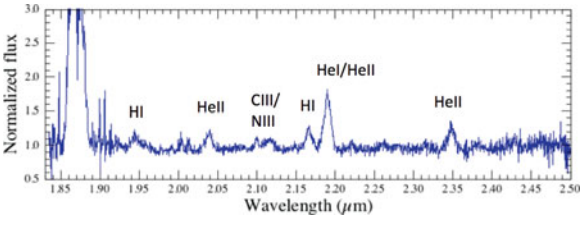

Figure 1. Continuum normalized K band spectrum of a newly found Galactic WR star (2MASSJ18442065-0236510) discovered via the list of machine learning candidates.

References

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