A neural network-based algorithm for fast classification and analysis of large samples of white dwarf stars

Olivier Vincent, Pierre Bergeron, Patrick Dufour

Département de Physique, Université de Montréal, Montreal, QC H3C 3J7, Canada

The next generation of spectroscopic surveys will provide spectra for hundreds of thousands of white dwarf candidates. Such unprecedented volumes of data will require fast, automated tools to quickly sort through typical objects and to identify interesting cases. Up until now, spectroscopic classification of white dwarfs has mostly been done by eye. While feasible for modest numbers of stars, such method does not scale well and is prone to many human biases. We train an ensemble of convolutional neural networks on SDSS DR16 objects and show that this method offers a promising alternative, providing consistent and quantifiable classification for thousands of stellar objects in just a few minutes. We also investigate the use of sequential neural posterior estimation methods to determine stellar parameters of DA and DB white dwarfs. The networks are trained on synthetic SDSS-quality spectra. We first verify the quality of the estimated posteriors via simulation-based calibration and predictive checks. We then apply our networks on SDSS DR16 spectra and compare our results with those published in the literature.