Learning stellar spectra with AI

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Abstract

Examining the dynamics and spatial properties of individual stars and stellar populations in satellite galaxies surrounding the Milky Way through the lenses of galactic archeology is crucial to understand galactic evolution. By gaining insight into this process, it can provide us valuable information about the large-scale and long-term characteristics of both ordinary matter and dark matter. Thorough studies can utilize both photometric and spectroscopic observations that complementarily support each other. Here we focused on the spectroscopic aspect of this problem, by investigating how well autoencoder-based neural networks (AEs) perform in the processing and analysis of stellar spectra. We show that AEs are capable of learning the characteristics of a stellar spectrum to a considerable extent, even in noisy and low S/N conditions. Moreover, they can be extremely valuable tools during the preprocessing stage of spectroscopic data analysis, where otherwise finding the black body continuum of a noisy spectrum is challenging.

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