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 the evolution of our own galaxy and others in the universe. By gaining insight into the processes of galactic evolution, it can provide us valuable information about the large-scale and long-term characteristics of both ordinary matter and dark matter. Thorough studies require both photometric and spectroscopic observations that complementarily support each other. In this study 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 well capable of learning the physical characteristics of a stellar spectrum, even in noisy and low S/N conditions. Moreover, they can be extremely valuable tools during the preprocessing stage of spectroscopic measurement, where otherwise finding the black body continuum of a noisy spectrum is computationally expensive.

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