

X55a Exploring Galaxy Spectra by Deep Learning

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The spectral energy distribution (SED) - i.e. the distribution of radiation intensity over wavelengths - is a reflection of the overall flux of stars, gas, and dust, which are crucial markers of the composition of galaxies. Hence, it contains important information for understanding a galaxy. To better understand it, we propose a method that uses unsupervised neural networks, or 'autoencoders', to compress high dimensional data to extract only the important latent features without assumptions. Unlike the principal component analysis, it captures the relationship between SED and latent representation. By keeping only a small number of important features, we can reduce the dimensions of our data, and making it easier to analyze and give an interpretation. We anticipate more observational data from instruments of the next generation such as JWST, which will usher in the era of big data. The Big data with high dimensions make it challenging for physics inference. Therefore, dimension reduction is a powerful method for understanding the universe. This time, we introduce a special type of autoencoder to discovering the disentangled representation and the reconstructed spectra closer to observation data. We then check for correlations between these latent features and a galaxy's properties. Latent features can predict galaxy physical properties. We compared these predictions to ones measured with SED fitting.