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Applications of autoencoders to exoplanetary transit light curves

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Identifying transits in light curves has become a major method of detecting exoplanets, and many deep learning classification models have been applied to exoplanetary transit data. We have chosen to explore the potential of deep learning generative models. We consider the ability of a simple autoencoder and convolutional autoencoder to generate light curves of transiting exoplanets, with the aim to help balance the current data received from the recent NASA missions such as Kepler and TESS, as due to the rarity of transiting planets there is a severe data imbalance in observed data (too many non-transits vs transits). We show that a simple convolutional autoencoder can be used to augment transit light curves, which can then be added to the total data set and aid in the classification of exoplanets and non-exoplanets. Finally, we explore a further application by examining the possibility of using a simple autoencoder to classify transits and non-transits by looking at the difference in reconstruction error. The results confirm that an autoencoder has the potential to be used as an aid in classifying exoplanet and non-exoplanet light curves.

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