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BIOSIGNATURE DETECTION IN EXOPLANETS BY USING DEEP LEARNING MODELS ON ABSORPTION LINE SPECTRAL DATA

Abstract

Exoplanet discoveries have been exponentially rising during the past decade, with almost over 4000 exoplanets being discovered till date. However the analysis on search for intelligent life on these exoplanets is a difficult process as the spectrum obtained from the planet is often shrouded by the spectra of other neighbouring star/s. However by eliminating the eclipse spectrum (spectrum from only the star) from the combined spectrum of the planet and the star, the spectral data of the planet can be obtained. The spectral dataset for the model is obtained from the NASA exoplanet archives.

Biosignatures are the indicators or signs of life on a planet. These include Oxygen, Methane and Sulphur compounds. The exoplanet's absorption line spectrum is compared with the absorption line spectra of these biosignature gases. The dips in the exoplanet's absorption line spectrum correspond to the elements that might be present on the planet.

In this paper, the accuracy of this task is increased by using Neural networks which are trained to classify the absorption spectral data into corresponding biosignatures. The paper also makes use of supervised logistic regression model which, according to the hierarchical order of biosignatures, calculates the probability of the existence of life forms on the exoplanet.

This model can further be used for accurate results in the search for extraterrestrial life and to also provide a faster approach to process thousands of terabytes of exoplanet data.