Beyond the Star: A Data-Driven Approach to Exoplanet Classification

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Exoplanet detection improves the current understanding of planet formation and provides the possibility for the discovery of new habitable worlds. However, teams of astronomers and astrophysicists have traditionally been the only ones capable of identifying exoplanets. Using traditional techniques such as the Transit Method, Gravitational Microlensing, Direct Imaging, Polarimetry, Astrometry, and Radial Velocity, researchers have attempted to identify exoplanets in the past, but manual processing is difficult and time-consuming. An advanced approach to detecting exoplanets in space is by utilizing artificial intelligence to solve this problem. In this study, hybrid approaches with an optimized elastic-net-based driven model were developed to effectively detect exoplanets. The standard planet dataset was collected and pre-processed to eliminate unnecessary components that can affect the prediction accuracy. The quality of the dataset was enhanced by the suggested framework's use of two distinct pre-processing techniques, including mass imputation and median and median absolute deviation-based normalization. To forecast the exoplanet, the pre-data was further analyzed using a feature selection procedure. The optimized elastic net was used to carry out the feature selection. These features were then further processed for prediction using a hybrid Bidirectional Gated Recurrent Units and Support Vector Machine (BiGRU-SVM) classifier. For evaluating the proposed model, the performance metrics such as accuracy, error, TNR, and F1-score are evaluated.

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