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IMBIBITION OF MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE TOOLS FOR INFERRING EXOPLANETARY HABITABILITY

Abstract

The aim of this project is to build a habitability platform which assesses different Artificial Intelligence (AI) methods and to ultimately deduce the Machine Learning (ML) techniques which are best suited for building the envisaged platform in both supervised and unsupervised learning environments. The concept of habitable planets is evolving and so should be the tools used in habitability assessments. A thorough comparison of transit method and radial velocity has been settled in this discussion. An experiment with planetary orbital periods to find their effect on habitability was also carried out. The researcher has also worked on habitability score concept by considering various factors such as star metallicity, star mass, star temperature, planetary mass and its diameter. The total habitability score was obtained for the purpose of differentiating exoplanets into habitable classes. Skymaps were deduced to show the audience the concentrate of habitable, non-habitable and conservatively habitable catalogues. The impact of molecules such as water, methane, hydrogen, oxygen and nitrogen on habitability has been observed as well in the modelling of exoplanetary atmospheres section. The experimenter has also entertained an evaluation of the effect of ML oversampling technique in this habitability topic. The effect of Earth Similarity Index (ESI) on habitability has been explored thoroughly in this paper. Stellar constellation influence on habitability was also covered. The researcher also took time to validate literature on habitability by modelling exoplanets with supervised learning in: Stochastic Gradient Descent with Lasso Penalty; Multinomial Naive Bayes; Passive Aggressive Classifier with Hinge Loss; Perceptron and Gradient Boosting Classifier. Traditional Kolmogorov Sminov algorithm assessment tool was also invited when the writer experimented with random forest classifiers to distinctively put classifying identifiers on exoplanets. Experimentation with big data handling techniques on this habitability platform was also performed to enhance the product's robustness and efficiency.