Stellar characterization using Hierarchical Bayesian Neural Networks

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In this study, we present a machine learning model, particularly a Hierarchical Bayesian Neural Network (HBNN), designed to predict stellar parameters such as mass, radius, and age, with a particular focus on the last one. Our goal is to emphasize the advantages of transitioning from classical machine learning predictors to probabilistic models, which usually provide a more realistic representation of the data and showcase their robustness in handling uncertainties. Leveraging statistically hierarchical architectures, our Bayesian NN automatizes the learning process, eliminating the need for manual exploration of parameter relationships. The application of our model to Chemical Clocks, a method for dating main sequence stars, demonstrates its ability to handle observational uncertainties and propagate errors effectively. The results demonstrate the model's capability to predict stellar ages with a mean absolute error of less than 1 Gyr in the testing set, showing its effectiveness in addressing the challenges posed by some stellar dating methods.

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Clasificación de la sesión : Afternoon Session