

Identifying Binary Asteroids Using Machine Learning with Simulated Lightcurves and FOSSIL Survey Data

Binary asteroids provide crucial information of the solar system evolution. This study presents a machine learning (ML) approach, using Random Forest classifiers, to identify binary asteroids from lightcurves. We aim to study the population of binary asteroids in the main asteroid belt. To achieve this, we develop the asteroids model to simulate the lightcurves as the training set, which including shape, rotation, and orbit to simulate the photometric properties of asteroids and binary.

In the study, we generated the training set according to the parameter of binary groups which observed before, the noise level also considered. We apply feature engineering to transform lightcurves into descriptive properties, enhancing the model's predictive performance. Then, the trained ML model is then applied to observational lightcurves from the FOSSIL survey, a wide-field high-cadence observation for small solar system bodies (SSSBs), which has ~ 12000 lightcurves of main-belt asteroids (MBAs) and identify a couple of dozens of binary systems candidates from it.

Section

Solar System/Exoplanets

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