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Earth-like planet predictor: using AI to predict planet detection

Jeanne Davoult[1,2], Romain Eltschinger[2], and Yann Alibert[3]
[1]Institute of Space Research, German Aerospace Center (DLR), Berlin, Germany
[2]Space research & Planetary Sciences (WP), University of Bern, Bern, Switzerland
[3]Center for Space and Habitability (CSH), University of Bern, Bern, Switzerland

Searching for planets analogous to Earth in terms of mass and equilibrium temperature is currently the first step in the quest for habitable conditions outside our Solar System and, ultimately, the search for life in the universe. Future missions such as PLATO or LIFE will begin to detect and characterise these small, cold planets, dedicating significant observation time to them. The aim of this work is to predict which stars are most likely to host an Earth-like planet (ELP) to avoid blind searches, minimises detection times, and thus maximises the number of detections.
Using a previous study on correlations between the presence of an ELP and the properties of its system, we trained a Random Forest to recognise and classify systems as 'hosting an ELP' or 'not hosting an ELP'. The Random Forest was trained and tested on populations of synthetic planetary systems derived from the Bern model, and then applied to real observed systems. The tests conducted on the machine learning (ML) model yield precision scores of up to 0.99, indicating that 99% of the systems identified by the model as having ELPs possess at least one. Among the few real observed systems that have been tested, 44 have been selected as having a high probability of hosting an ELP, and a quick study of the stability of these systems confirms that the presence of an Earth-like planet within them would leave them stable.
If we assume that such a global model of planetary formation adequately describes the architecture of real systems, then such a tool can prove indispensable in the search for Earth-like planets.