

Identifying mean-motion and secular resonances with large language models and classical machine learning

Evgeny Smirnov

Abstract. The usage of the machine learning techniques in astronomy is experiencing significant growth, including various challenges such as predicting orbital stability, classifying celestial objects, and analyzing images. A new approach in this field is the use of large language models (LLMs), which rely on natural language processing and explicit task definitions instead of traditional statistical algorithms or probabilistic models. This talk will demonstrate the capabilities of LLMs, particularly GPT-4o and other proprietary and open-source alternatives, in analyzing visual patterns and accurately classifying asteroids. Remarkably, this is achieved without any training, fine-tuning, or coding beyond writing an appropriate natural language prompt. The overall accuracy can reach even 100 per cent. This new approach signifies a new paradigm in astronomical data analysis. The implications extend beyond the tasks discussed, as the methodology can be applied to various astronomical problems.

Evgeny Smirnov
Belgrade Astronomical Observatory
Volgina 7, Belgrade, Serbia
e-mail: smirik@gmail.com