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# Where are the Planets? Mitigating Stellar Activity in Radial Velocity data using Machine Learning Techniques.

*Friday 4 October 2024 10:20 (10 minutes)*

Exoplanet studies have shown us that most stars host in average planetary systems. Very few of these exoplanets have been directly observed. We rely mostly on indirect methods such as the radial velocity (RV) technique. This technique relies on detecting exoplanets by analyzing the Doppler signals induced on the stellar spectra due to an orbiting planet. However, RVs are not only sensitive to planetary companions, but also to stellar phenomena such as spots, facula or granulation, which can mimic and hide planetary signals. The current generation of spectrographs have been designed to have precisions below 1 m/s, even 10 cm/s for ESPRESSO. Despite this extreme precision, stellar activity raises the noise floor of our observations to a few m/s, not allowing us to detect a true Earth twin, which would induce a Doppler signal as low as 9 cm/s. For two decades now, the community has struggled with this problem and Machine Learning (ML) can help to solve it. ML has been proven to be very good at building models based on a set of training examples. These methods are now seeing their first implementations across the exoplanet field, yielding remarkable success in various applications (Beurs et al., 2022; Perger et al., 2023; Liang et al., 2024, Zhao et al., 2024).

With this talk, I aim to introduce the RV technique and how it is limited by stellar activity. Then, I will present how we aim to solve this problem using ML techniques. The main focus of the talk is showing which inputs we have found to possess the most stellar activity content, so we can get the best correction on our RV observations. Additionally, I will showcase the application of this method to highly active stars observed with the HARPS-N and CARMENES spectrographs.

## Poster

No

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