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im Rahmen des **Astrophysikalischen Kolloquiums** ein:

# "Automated Detection of Solar Prominences: A Machine Learning Approach Using YOLOv5"


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Solar prominences are tenuous clouds of plasma suspended in the solar atmosphere, observed as bright structures on or above the solar limb. They exhibit a broad morphological variety and dynamical behaviour, and are intimately linked to other solar phenomena including flares and coronal mass ejections. Consequently, detecting and classifying such structures is an important task, but not trivial. Missions such as the Atmospheric Imaging Assembly (AIA) onboard the Solar Dynamics Observatory (SDO) have provided an enormous wealth of observational data on prominences during its over 15-year lifetime. Whilst existing databases of prominences have used and benefited from these data, accurate automated detection of prominences remains challenging, more so than other solar features. Machine learning offers a promising solution to deal with the large amounts of data, aiding the construction of a more robust detection and classification system for prominences.

This talk showcases my work tuning the YOLOv5 object detection model for prominence detection, using the labelled SDO/AIA 304 Å prominence dataset of Baek et al. (2021, SoPh, 296, 160). In particular, I focus on the steps taken to improve and optimise the model performance, including transfer learning (using pre-training weights from a different model), dataset augmentation, and hyperparameter tuning. The aim is to combine this method with the process developed by Birch and Regnier (2025, submitted) using the Rolling Hough Transform (RHT) to compute the spatial orientation of prominences in SDO/AIA 304 observations. Finally, I will also cover my current work at the Met Office and collaboration with GeoSphere Austria on forecasting CME arrival times using machine learning, highlighting its implications for space weather prediction.


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