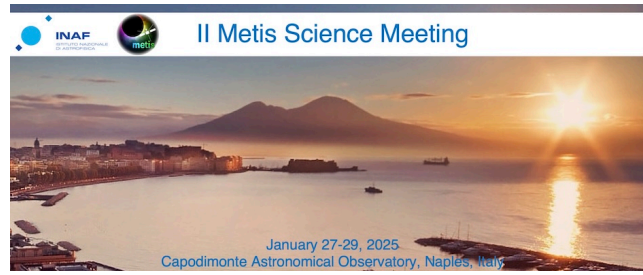


2nd Metis Science Meeting



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Detection and classification of comet-like objects in Metis coronagraph images using deep learning

The detection of small objects, such as sungrazing comets or asteroids, passing in the field of view of solar coronagraphs, remains an underexplored field of research. This gap presents an opportunity to leverage advanced deep learning methodologies for detecting these objects in the images of Metis, the multi-wavelength coronagraph aboard the Solar Orbiter mission. Metis offers imaging capabilities in both UV and visible light spectra. Our proposed methodology to detect and classify the objects begins with the analysis of Level 0 (L0) non-calibrated images. In cases where L0 images present challenges, we propose an alternative approach using Level 2 (L2) calibrated images to enhance detection reliability. To improve detection and classification, the methodology will incorporate temporal analysis of sequential images, leveraging motion patterns to identify and track objects like comets or asteroids. Additionally, advanced machine learning architectures, including Convolutional Neural Networks and transformer-based models, will be employed for efficient and accurate object detection. Finally, an automated and scalable framework will be developed to process vast datasets, in view of the feasibility of real-time analysis. This comprehensive approach aims to facilitate the discovery of previously undetected astronomical objects, like sungrazing comets or asteroids, transiting in coronagraph images.

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