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(Virtual Talk)

The rapid proliferation of commercial satellite-based detection systems represents a new frontier in remote sensing and environmental monitoring. At this frontier, MyRadar is developing the Hyperspectral Orbital Remote Imaging Spectrometer (HORIS) constellation. The first commercial pathfinders, two 1U CubeSats, are scheduled to launch in 2024. HORIS will provide capabilities for various use cases including civilian wildfire-related hazard monitoring as well as defense applications like cloud nowcasting and verification. HORIS integrates an onboard artificial intelligence (AI) capable of discerning a variety of scenes using a hierarchical methodology that combines a coarser low-power AI classification system with a more computationally intensive scene-specific model for more precise results. This approach facilitates intelligent power and thermal management for the miniaturized HORIS design to accomplish the data collection and alerting missions. In this study, we present the application of the HORIS AI system for lightweight deep learning detection of cloudy scenes on low-power hardware, followed by fine characterization and segmentation of high resolution multi-sensor data using state of the art models. This modular approach not only enhances the efficiency of the detection system itself but also improves the explainability of the system's alert-triggering processes. The preliminary results of the system's performance will be presented, offering insights into the potential benefits and challenges of employing hierarchical AI for onboard satellite detection systems. In addition, prospective developments, underscoring the future research directions and improvements, will be discussed.
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