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HYPERSCOUT; STATE OF THE ART HYPERSPECTRAL IMAGER DEMONSTRATING IMAGE PROCESSING IN SPACE, AND ITS FUTURE IN ADDRESSING CLIMATE AND ENVIRONMENTAL CHANGES

Abstract

For the first time in history an image was processed in space using artificial intelligence. The image was processed by the tailored artificial intelligence hardware of HyperScout 2, a miniaturized Earth observation instrument that is developed under the leadership of cosine Remote Sensing. The deep neural network algorithm identified the clouds in an image of part of the Earth's surface. What is HyperScout? It is cosine Remote Sensing's flagship product with numerous launches now in its heritage. It provides hyperspectral imaging in the visible and near infrared to analyse the composition of the Earth, along with three thermal infrared bands to retrieve the temperature distribution, boosting and improving the number of Earth Observation applications cosine's customers can benefit from. It allows them to develop and update software for their own applications from space. Applications such as monitoring of; vegetation,

fire hazards, volcanos, water quality, soil moisture as well as detection of; flooding, oil spills, clouds and environmental changes. Integrated into the HyperScout 2 instrument is a Myriad 2 Vision Processing Unit (VPU) from Intel. This allows the instrument to process the images with machine learning algorithms, without requiring more power than available on a nanosatellite. The AI algorithm is trained on ground using machine learning on synthetic as well as HyperScout data. The resulting algorithms are implemented on the dedicated AI hardware to analyse the images extremely efficiently on board. Being a state-of-the-art miniaturized instrument, HyperScout 2 can be flown on a small satellite, which can be launched in larger numbers. By using a constellation consisting of multiple HyperScout instruments, observations can be made several times per week or even per day, so that alerts can be sent and action can be taken in time. This can also be of great benefit for environmental monitoring, water quality, air quality, deforestation and change detection. This paper will discuss past missions, present and future missions of HyperScout, its capabilities and plans for the future.