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Machine Learning for Cloud Masking

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As the importance of satellite readings grows in fields as varied as meteorology, urban planning and climate change science so has the importance of satellite reading accuracy. This has in turn lead to an increased need for accurate cloud masking algorithms given the large impact that clouds have on the accuracy of these readings. At the moment there are some automatic cloud masking algorithms, including one based on Bayesian statistics. However, they all suffer from precision issues as well as issues with misclassifying normal natural phenomena such as ocean sun glint, sea ice and dust plumes as clouds. Given that these natural phenomena tend to be concentrated in certain regions, this also implies that the precision of most algorithms tends to vary from region to region.

This has led to eyes increasingly turning to machine learning and image segmentation techniques to perform cloud masking. In this presentation it will be described how and with what result these techniques can be applied to Sentinel-3 SLSTR data with the main focus being techniques that are variations of the so called fully convolutional networks (FCNs) originally proposed by Long and Shelhamer in 2015. Given that FCNs have performed well in areas such as medical imaging, facial detection, navigation systems for self-driving cars etc., there should be a large potential for them within cloud detection.

The presentation will also look into the regional variability of these machine learning techniques and whether one can improve the overall cloud masking accuracy by developing models specifically for a region. Furthermore, it will aim to demonstrate how one can, by performing simple perturbation techniques, increase the interpretability of the model predictions something that is a salient issue given the somewhat black box-like nature of many machine learning models.