Interpretable Machine Learning and Remote Sensing for Cloud Detection and Classification

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The detection and classification of atmospheric clouds, in both ground-based and satellite-based domains, is crucial to the understanding of Earth's energy balance, climate, and weather. Utilizing the latest deep learning methodologies, we train a convolutional neural network, of the ResNet50 architecture, on cloud imagery data from the ground. Building off of previous work, we explore the interpretability of models, i.e. how and why the models are coming to their decisions. This requires ablation studies concerning different input modalities and the fine-tuning of particular features like the learning rate and loss functions. We also propose the generation of gradient class-activation maps for the visual representation of the inner workings of our machine learning models. These figures, which act as saliency maps, allow us to break open any black box models and understand why they are making their decisions. Interpretability is key to be aware of biases within the models.