The Application of Machine Learning Algorithms to Estimate Forest Canopy Cover

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Abstract: LiDAR data are very useful to estimate forest canopy cover for a small coverage area. It is able to determine a forest based on a quantitative term established by national government. In order to identify the forest over 133.7 million ha nationally, it was suggested to extrapolate the estimation by using satellite optical imageries with larger coverage area such as Landsat and Sentinel. With this method, the problem of scale emerges because of the spectral responses on different forests confuscate the percentage canopy cover scale. In this paper we investigate the relationship patterns of spectral response of Landsat 8 correspond to canopy cover index generated from LiDAR data for several forest types and their separability in South Sumatra province. We examine and compare two popular machine learning algorithms, particularly Random Forest and Deep Learning, in recognizing the patterns without previously labelled the samples. In the end, we compare the performance of both models performance on their predictability with the actual samples and prediction uncertainty maps.

Keywords: LiDAR, forest canopy cover, Landsat 8, random forest, deep learning