Miguel G. Castro Gómez

Joint use of Sentinel-1 and Sentinel-2 for land cover classification. A machine learning approach

Reliable information on land cover is required to assist and help in the decision-making process needed to face the environmental challenges society has to deal with due to climate change and other driving forces. Different methods can be used to gather this information but satellite earth observation techniques offer a suitable approach based on the coverage and type of data that are provided. Few years ago, the European Union (EU) started an ambitious program, Copernicus, that includes the launch of a new family of earth observation satellites known as Sentinel. Each Sentinel mission is based on a constellation of two satellites to fulfill specific requirements of coverage and revisit time. Among them are the Sentinel-1 and Sentinel-2 satellites. Sentinel-1 offers data day-and-night and in all-weather conditions. Sentinel-2 is a multispectral high-resolution imaging mission. The main objective of this study has been to investigate the classification accuracies of specific land covers obtained after a classification of multi-temporal Sentinel data over an agricultural area. Four scenarios have been tested for the classification: i) Sentinel-1, ii) Sentinel-2, iii) Sentinel-2 and vegetation indices, iv) Sentinel-1, Sentinel-2, and vegetation indices. The classifications have been performed using a pixel and polygon based approach. The results have shown that the best accuracies (0.98) are obtained when using and polygon based approach independently of the scenario that is selected. For the pixel based approach, the highest accuracy (0.84) is obtained when using Sentinel-1, Sentinel-2, and vegetation indices.

Keywords: Physical Geography and Ecosystem analysis, optical, SAR, land cover classification, Random Forest, temporal series.

Advisor: **Hongxiao Jin, Karlis Zalite, Lars Eklundh**

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