Assessing crop classification from Sentinel-2A MSI data

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Crop classification maps are useful for managing agricultural fields, which are developed and managed through a variety of social actions or policies. Furthermore, they can hugely impact biogeochemical and hydrologic cycles, climate, ecosystem functions, the economy and human health.
The Sentinel-2A satellite was launched on 23 June 2015 and provides the opportunity for crop type identifications. It carries the MultiSpectral Instrument (MSI), which has 13 spectral bands ranging from 433 nm to 2190 nm including three visible bands, three red edge, two near-infrared (NIR) and two short wave infrared (SWIR) bands except for the three atmospheric bands (i.e. Band 1, Band 9 and Band 10). Especially, the SWIR bands have a great potential for evaluating photosynthetic capacity (e.g. maximal carboxylation rate, Vcmax) and that may lead to an improvement in crop type identification.
In this study, six clop types (i.e. beans, beet, grass, maize, potato and winter wheat) were identifies using MSI data acquired on August 11, 2016, except the atmospheric bands. Accurate classification may be possible with currently existing supervised learning models. A comparison among the kernel-based extreme learning machine (KELM), the multi-layer perceptron and the random forests was performed and the hyperparameters of them were tuned using Bayesian optimization, which is a framework used to optimize hyperparameters of noisy, expansive black-box functions and it defines a principled approach to modelling uncertainty.
As the results, it was found that KELM performed better, achieving an overall accuracy of 90.3 %.

Keywords: Kernel-based extreme learning machine, hyperparameters

