GC114-0003 - A cloud computing approach for crop classification using high-resolution satellite imagery

Wednesday, 16 December 2020

15:30 - 08:29

Abstract

Agriculture is known as a core of a dynamic economy that determines the food security. However, inefficient crop pattern and excessive development can adversely result in an overexploitation of water resources endangering their security. The conventional methods of crop monitoring mainly include field observations and estimation of cultivation area based on limited regional samplings that lead to biased and unrealistic results. Alternatively, remotely sensed imagery has facilitated less expensive and a broader extent coverage to estimate crop pattern and detailed land cover map over a wide range of spatiotemporal resolutions. This study introduces a remote sensing-based framework, developed in the cloud computing system of Google Earth Engine, that leverages both optical and physical properties of crops, together with classification algorithms to extract the annual crop pattern maps. We demonstrate the applicability of the framework in the Urmia Basin (located in the northwestern, Iran, with focus on wheat, barley, alfalfa, sugar beet, and orchard from 2013 to 2019. To this end, we utilize Sentinel-1 imagery SAR data and Landsat-8 optical channels to consider the physical and optical properties of crops, respectively. The results showed that the Random Forests model (RF) yields the most accurate results (overall accuracy=0.89) as compared to CART (overall accuracy=0.86) and SVM (overall accuracy =0.83). The higher accuracy of RF mainly indicates the superiority of collective decision making of several decision trees against a single decision tree's performance in CART, as well as against the support vectors determined by SVM for the classification purpose. The adopted cloud computing approach also proves a breakthrough in satellite remote sensing realm by facilitating high-resolution, in-minutes image processing in large scales domains.

Keywords: Crop mapping, Phenology, Remote Sensing, Urmia Basin

Authors

Majid Bayati
Sharif University of Technology

Mohammad Danesh-Yazdi
Sharif University of Technology

Massoud Tajrishy
Remote Sensing Research Center (RSRC), Sharif University of Technology
Sharif University of Technology