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# Estimation of Soil Moisture Content Using Deep Learning and High-Resolution Satellite Imagery (Sentinel-1 and 2)

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Soil moisture is an important factor affecting global circulation (climate, carbon, and water), disasters (drought, floods, and forest fires), and crop growth, so the production of soil moisture data is important. Currently, satellite-based soil moisture data is available from NASA' SMAP (Soil Moisture Active Passive) and ESA' SMOS (Soil Moisture and Ocean Salinity) data. Since these data are based on passive microwave sensor, they have low spatial resolution. Therefore, it is difficult to observe the distribution of soil moisture on a local scale. The purpose of this study is to produce high resolution soil moisture for monitoring on a local scale. For this purpose, we performed soil moisture modeling using high resolution satellite data (Sentinel-1 SAR (synthetic-aperture radar), Sentinel-2 MSI (multispectral instrument)) and deep learning. Deep learning is a method improving the problems of traditional neural networks such as overfitting, gradient vanishing, and local optimal solution through development of learning methods such as dropout, ReLU (Rectified Linear Unit), and so on. Recently, it has been used for estimation of surface hydrologic factors (soil moisture, evapotranspiration, etc.). The study area is an agricultural area located in Manitoba and Saskatoon, Canada. In-situ soil moisture data was constructed from RISMA (Real-Time In-Situ Soil Monitoring for Agriculture). In order to develop an optimal soil moisture model, various condition experiments on hyper-parameters affecting the performance of model were carried out and their performance was evaluated.