

Improving land cover classification of remote sensing images with convolutional neural networks

Proposal for a Bachelor or Master thesis topic (DE/EN)

Classification of land cover is a standard task in remote sensing, in which each image pixel is assigned a class label indicating the physical material of the object surface (e.g. grass, building). This task is highly relevant for applications such as the detection of changes or rapid mapping. Recent work has focused on Convolutional Neural Networks (CNNs), delivering considerably better results than traditional classifiers. This is mainly due to the fact that, unlike traditional classifiers using hand-crafted features, CNNs provide a framework in which these features can be learned from training data. An example of a training and classification procedure can be seen in figure 1.

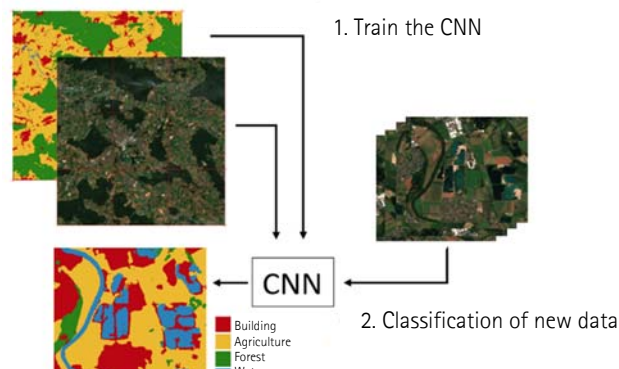


Figure 1: Training and classification process with CNNs

Based on the pixel wise classification with CNNs, there are various possibilities to further improve and extend this approach. One disadvantage of the used optical satellite data is the weather dependence. For days with a high cloud coverage the obtained images can not be used for the land cover classification. The additional usage of radar data can fill these gaps and further improve the classification as additional information. Another idea is to focus on the detection of inland waters. In this context the differentiation between standing and flowing waters is very interesting, but also the detection of flooded areas. For the latter, the modeling of water masks as time series is required in order to be able to detect deviations from it afterwards. Other possible topics would be the analysis of existing incorrect training data (label noise) or the implementation of a recurrent neural network to better model the temporal variation of land cover.

The specific task for a bachelor or master thesis is dependent on the students interests and knowledge. The topic can be one of the described ones, a fusion or also an extension with own ideas. The starting point for all of them is the existing implementation of different CNNs for pixel wise classification of land cover. Previous knowledge in the field of image analysis and deep learning is of great advantage. A further requirement is good programming knowledge and

experience with the usage of deep learning packages like tensorflow or pytorch. The thesis can be written in English or German.

This thesis will be supervised by Mirjana Voelsen M.Sc.