

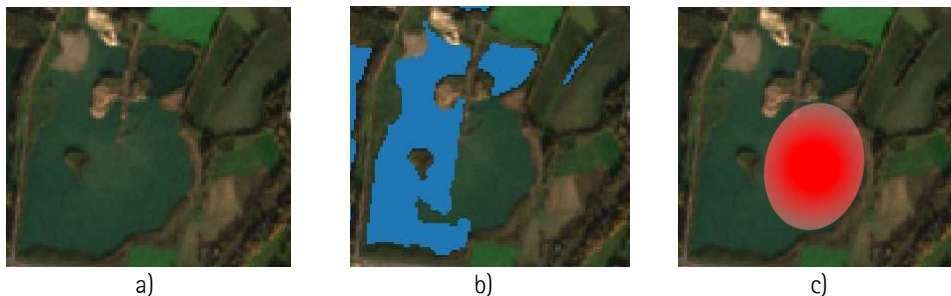
## Automatic detection of land cover changes from remote sensing images

### 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.

Based on the pixel-wise classification with CNNs, the automatic detection of changes is of great interest, e.g. for national surveying authorities like the German Land Survey Office of Lower Saxony (LGLN). As these authorities already have existing databases for land cover, that need to be kept up to date, the detection of changes is based on the comparison of the outdated database and the land cover classification of a new satellite image. The main challenge for such a comparison is the small amount of changes in comparison to the noise of the classifier, e.g. at edges of objects.

*Figure 1: Example of: a) New satellite image, b) Satellite image with water mask of outdated database, and c)*



*Visualization of the detected region of change*

The main goal of this thesis is to develop a method to detect real changes and to separate them from the noise of the classifier. This can include post-processing steps, e.g. the smoothing of the classifier's prediction based on assumptions that can be used to describe the changes that shall be detected. For the actual detection of changes between the database and the new segmentation map different methods can be tested and compared, e.g. a simple pixel-wise comparison compared to an object-based analysis. In the end, the results shall be visualized for instance in a heat map that indicates the probability of a change in a region, as shown in figure 1 for example. The resulting methods are to be evaluated in terms of stability, effectiveness, and generalization. The student will be provided with datasets as well as initial classification architectures.

Previous knowledge in the field of image analysis is mandatory. A further requirement is good programming knowledge. The thesis can be written in English or German.

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