Copernicus Master in Digital Earth
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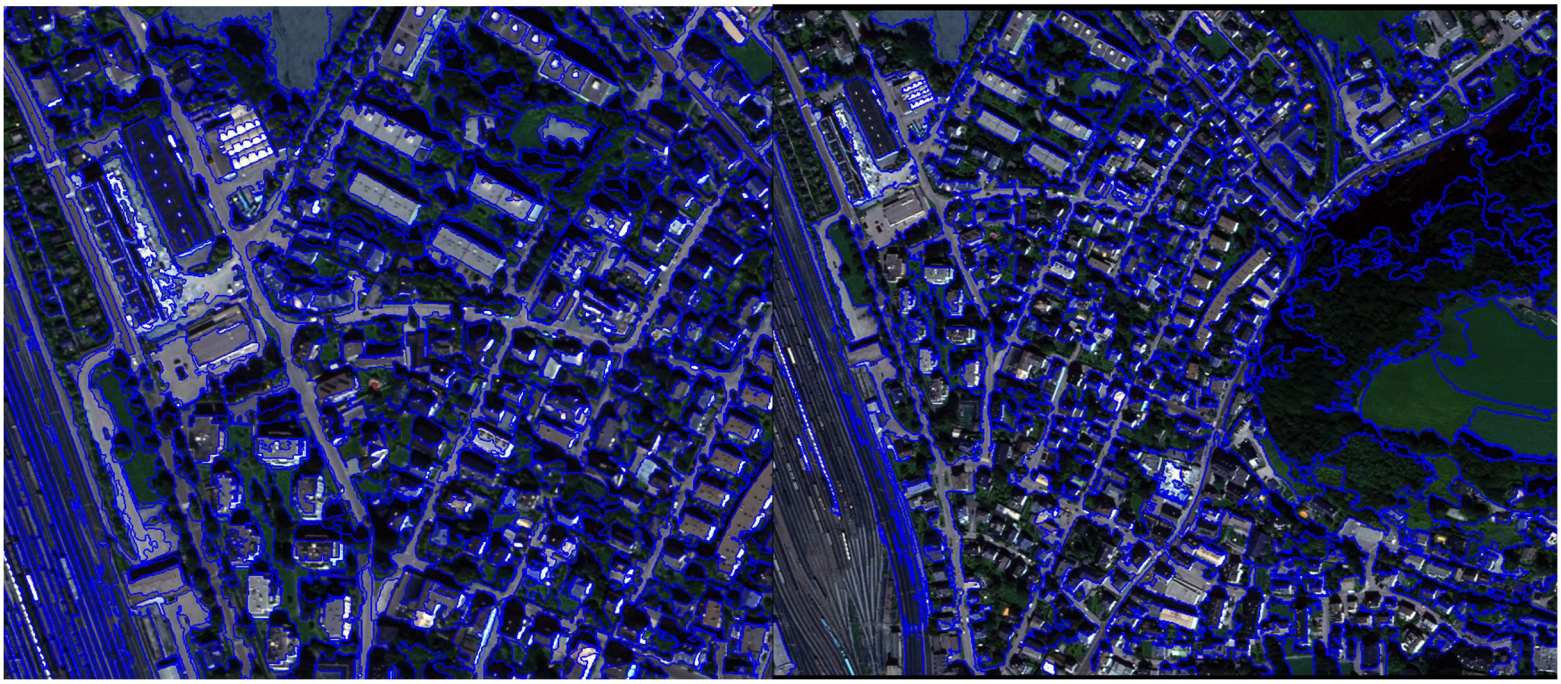
Advanced Remote Sensing
Assignment 1 : Image Segmentation

Ecognition – Trimble

At the first step, I applied the multi-resolution algorithm to segment the image WV2-ortho-UTM33. To segment the image, I initially used a trial-and-error approach until I achieved some results that looked acceptable. Reading the documentation of the algorithm, I understood that the seeds look for their best-fitting neighbor for a potential merger. The shape of the objects is the main parameter to be tuned to achieve better results. The scale parameter considers the homogeneity criteria of spectral and shape, where high values of the scale parameter result in larger objects and smaller values result in smaller objects. The shape value influences the balance between color and shape, meaning that a higher shape value increases the influence of the shape while decreasing the influence of color, and vice versa. The compactness value, when increased, will automatically lower the smoothness value.

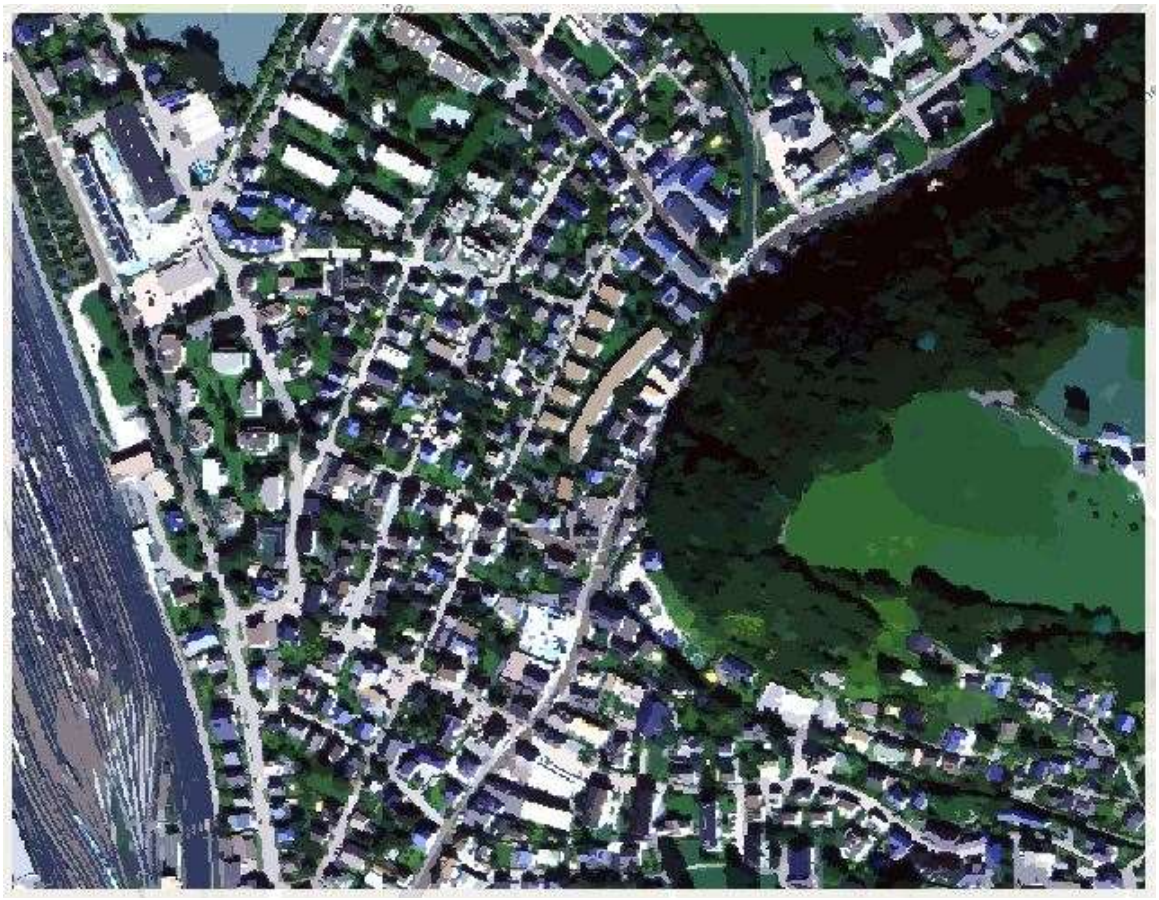
For my image, when I picked a scale parameter value of less than 150, I obtained 1,364 objects. For example, the roofs of venues were well recognized, but all the heterogeneity in reflectance on the side of roofs caused by trees and different types of pavement was classified into many objects, creating an over-segmentation in the scene. As my image depicts a city, it is essentially composed of fairly heterogeneous reflectance. When I increased the scale to 500 and kept the shape values the same, I obtained 103 objects, as shown in Figure 2. These objects were larger in the hyperspectral domain, and I quite enjoyed the results for the forest, obtaining different objects for probably different canopies and tree species. However, these large objects were not representative of the train railways. Additionally, at a scale of 500, I was more prone to segment whole squares in the neighborhood instead of small portions of roofs, gardens, and roads.

Left side image: Scale of 150. Shape of 1. Zoom in image.
Right side image: Scale of 500. Shape of 1



Arcgis – **Mean Shift toolbox**.

The Mean Shift toolbox contains the parameters of Spectral Detail, Spatial Detail, and Minimum Segment Size. These parameters are quite similar to the eCognition Multi-resolution Segmentation algorithm. I tried the trial-and-error approach again and, with the parameters of Spectral Detail 19, Minimum Segment 25, and Spatial Detail 10, I got the results shown below:



- WV2-ortho-UTM33 image segmentation using Mean Shift toolbox

The forest on the right of the scene was well classified, obtaining different objects based on the varying spectral responses of the greenery. The roads were quite difficult to segment. I understood that the high heterogeneity in the road leads to diverse classes rather than a single well-constrained object. By increasing the minimum segment size, I was able to better capture the roads. My best results were achieved with a high Spectral Detail of 19 and a lower Spatial Detail of 10, which means I was more focused on the spectral response rather than the spatial detail of the scene.

In general, the train lines are clustered together, but the results are not optimal for railways. I tried setting a maximum segment size but could not find suitable values, so it did not work as expected. For the classification task, however, I am quite satisfied with my segmentation results.