Assessment of the master thesis by Matěj Bartoš

Cloud and Shadow Detection in Satellite Imagery

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The goal of the thesis was to investigate how recent advances in Convolution Neural Networks could contribute to detecting clouds and shadows in satellite images. Cloud and shadow detection is an important recognition problem that suffers from lack of reliable and sufficiently large ground truth data allowing direct application of supervised learning.

The thesis consists of three main parts. First, features of Landsat satellite data are described and the state of the art in cloud classification and modeling for classification is reviewed. Next, cloud modeling and synthesis are studied to provide ground truth labels for a supervised training of a CNN network. Existing "Meta-balls" algorithm is evaluated and modified to produce better results on Landsat images. The approach is convincing and it is demonstrated that it fits the reality. Next, the CNN architecture is chosen. Since training a network from scratch in general requires large number data sets, an alternative approach of modifying a network already trained on another classification task in satellite images is chosen. Large space in the thesis is devoted to analyzing the network and choosing a right engineering approach to finding good learning strategies. The performance is evaluated in several interesting experiments.

I believe that the thesis addressed important problems and demonstrated how to approach them by using very diverse set of approaches. Matěj Bartoš was able to use many different methods and to combine them into a working engineering solution. On the negative side, the final performance of his method may still not be sufficient for a fully automatic technology. Also, the text of the thesis is sometimes a bit too verbose. Language is understandable but the overall quality of the text could still be improved.

Matěj Bartoš was a motivated student who was working systematically on the topic. He has chosen the problem and was eager to approach it by using CNN. He was inventive and was suggesting new approaches and techniques. I was happy with the way he worked on the problem.

Matěj Bartoš presented an interesting and useful work that extends our understanding of the problem and demonstrates that simulation can be in principle used to provide ground truth in large-scale supervised learning from satellite data. He fulfilled the goals set in the assignment and presented a very solid work. Therefore, I recommend grade the thesis by B – very good.

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