

Review of Master's Thesis

Student: Rončka Martin, Bc.
Title: Material Artefact Generation (id 22154)
Reviewer: Španěl Michal, Ing., Ph.D., UPGM FIT VUT

- 1. Assignment complexity** **more demanding assignment**
The thesis deals with data augmentation for training classifiers based on synthetic image generation using CNNs. This assignment represents a difficult task that requires the student to become familiar with cutting edge methods published on scientific conferences, propose solution for slightly different tasks and make a large number of experiments.
- 2. Completeness of assignment requirements** **assignment fulfilled**
The student conducted lots of experiments with various CNN architectures, especially with GANs, and three different data sets.
- 3. Length of technical report** **within minimum requirements**
There is no unnecessary and long theory. Relevant methods are briefly described at the level necessary to understand the thesis. The author mainly describes the preparation, implementation and results of his experiments.
- 4. Presentation level of technical report** **65 p. (D)**
Some experiments, e.g. with NST or CycleGAN, do not seem to be well designed, but I could misunderstand the architecture and/or experiment design because these are not well described in the text.
 - What exactly are the inputs and outputs of individual blocks - discriminators, generators, etc.?It is difficult to finally interpret results of the experiments, because experiments performed on different data sets alternate in the report. I also miss exact definition of the 'detection' and 'segmentation' tasks for all the three data sets.
- 5. Formal aspects of technical report** **65 p. (D)**
The typography of the work is fine. I appreciate the technical report written in English. In the first half, the language is very good, mistakes and typos are rare. In the second half, the mistakes are more often. Some figures are very small - there is not much visible, and they are not sufficiently described.
- 6. Literature usage** **95 p. (A)**
The literature is very broad and covers the necessary topics. Many state-of-the-art scientific articles are cited in the text. The author obviously studied a lot.
- 7. Implementation results** **70 p. (C)**
The technical solution has the character of Jupyter notebooks with Python code that implement training and evaluation of the proposed CNNs for both synthetic image generation and final experiments.
- 8. Utilizability of results**
This is a research work that proposes new concepts of synthetic data generation for concrete data sets based on SotA methods. However, the experiments and results are not very convincing. E.g. the results lack comparison of training with data sets extended just by a simple augmentation via geometric transformations and just by the synthetic image generation.
For more difficult tasks represented by the BraTS data set, final benefit of the proposed image generation seems to be small when compared to the simple data augmentation. The image generation method works well for not so complex data (the Ceramics data set), however, a simple anomaly detection techniques might work quite well on this data set as well.
- 9. Questions for defence**
 - Please explain the problem with your Threads data set mentioned in the technical report - qualitative issues with annotations. Why did you choose this data set for the basic comparison of different image generation techniques?
 - What are the three channels in your 3 channel IoU metric?
 - Did you compare results when data sets extended with just augmentation and data sets extended with just synthetic images were used for training?
- 10. Total assessment** **78 p. good (C)**
The student has obviously gained very good knowledge of existing techniques for synthetic image generation

using CNNs and he understands network architectures derived from GANs. He proposed his own methods for image generation and carried out a lot of experiments. The student has proved that he is able to study difficult topic and apply the new knowledge in practice. From this perspective, I consider the work to be above average. Unfortunately, the quality of experiments, as described in the report, pushes my assessment down to good.

In Brno 7. June 2019

Španěl Michal, Ing., Ph.D.
reviewer