

I. IDENTIFICATION DATA

Thesis title:	Deep neural network for city mapping using Google Street View data
Author's name:	Varun Burde
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Ing. Michal Reinštein, Ph.D.
Reviewer's department:	Department of Cybernetics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
<p>The aim of the thesis was to design, implement and experimentally evaluate a deep neural network based solution for city mapping using Google Street View images. The proposed software solution should allow the user to request Google Street View imagery for any location, perform analysis and feature extraction using deep neural network(s) (DNN) and output vectorized description projected and visualized over an underlying map. This thesis aimed for the integration of Google APIs and cloud services with state-of-the-art DNN based technology to create an application allowing user to extract insights from Google Street View imagery. The topic was demaning since it expected gaining knowledge in different fields as well as to understand deep learning.</p>	

Fulfilment of assignment	fulfilled with major objections
<i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	
<p>The thesis assignement defined 5 milestones to be met, 3 were fulfilled as requested, 2 were fulfilled with major objections. First objection: the comparison of the achieved results with the state-of-the-art is not sufficient. Second objection: the user interface based on Google Colab is badly designed – current solution lacks any ability to configure the proposed pipeline since it consists only of hardcoded calls to predefined scripts. The interface also lacks any documentation or comments to guide the user – the user cannot use it without proper knowledge of the code repository. The visualisation of the results as demonstrated in the thesis were sufficient, however, they were not included into the user interface as requested. On the other hand, the user interface is not the essential part of the thesis. The proposed pipeline connecting the Google APIs and the DNN based model is the important part and it was demonstrated by the student successflly.</p>	

Activity and independence when creating final thesis	D - satisfactory.
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
<p>The student attended regular consultations that were happening weekly or bi-weekly mostly prepared. Detailed guidenace was necessary otherwise the progress was very slow. The student was not meeting internal deadlines repeatedly and in the final he heavily underestimated the effort necessary to write the master thesis. This was the reason the thesis was not submitted by the original deadline and required one semester extension. Even during the extension, the majority of the work on the document was done at last minute, leaving several issues unresolved. The student adhered to rather simple solutions without any inclination to dive deeper into the problem and to seek innovative ways how to approach the topic.</p>	

Technical level	C - good.
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
<p>The given task required a combination of various software realted technical skills: working with APIs, handling deep neural network based models in TensorFlow, understanding evaluation of machine leanring algorithms, understanding geospatial data, and intergating geospatial analytics with a computer vision solution. Starting without any apriori knowledge of the topic, the student was able to tackle all of these skills up to a good level that was sufficient to desing and implement basic</p>	

solution to the given problem. The topic was open for innovation in many different ways, however, only the most straightforward solution was explored and implemented. The proposed solution does not scale to larger data volumes. The implementation is not sufficiently robust and does not meet common standards of writing a clean code. On the other hand, the student invested a lot of effort to learn and improve in many different fields of research that were new to him and this is something I highly appreciate. The student studied large amount of scientific papers and related literature, however, the text of the thesis does not fully demonstrate this understanding.

Formal level and language level, scope of thesis

E - sufficient.

Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?

Although the student proposed, implemented and evaluated a good solution to the problem, more effort should have been invested into the text of master thesis. The structure of the thesis is good, but the chapters 5 and 6 should be restructured due to overlapping content. The extent of the thesis meets the requirements; the thesis contains sufficient amount of figures that help the reader understand the proposed solution, however, the figure descriptions are lacking. However, the language of the thesis is the weakest part. Some parts of the thesis contain incomplete or confusing sentences that do not make sense. The narrative of the thesis is weak, majority of the explanations lack technical details and the thesis suffers from a numerous grammar issues. The thesis advisor strongly and repeatedly highlighted these issues and although the thesis improved a lot during the iterations between different versions, the result is unfortunately only satisfactory.

Selection of sources, citation correctness

D - satisfactory.

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The master thesis contains a large number of references (81) to public sources, white papers and scientific literature. All the listed sources are well chosen and related to the work presented. Unfortunately, correctness of citations and correctness of paraphrasing was one of the issues that repeatedly came up during the process of creation of this document. Previous versions of the thesis repeatedly contained portions of text copied from other sources without a reference to the original. We discussed this serious issue during regular meetings and all the identified cases were corrected, however, I cannot claim that all cases were actually identified due to last minute submission. The student worked hard and invested a lot of effort into learning how to work with scientific literature and made a great progress in this regard.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

The final grade reflects the final state of the thesis as well as the quality of the technical solution with respect to the original assignment and given milestones. Although the grade is low, I appreciate very much the amount of effort the student invested into the thesis and all the knowledge he gained while he worked on the thesis.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading.

Based on the above criteria and considering the above named issues I consider the thesis to be satisfactory.

The grade that I award for the thesis is **D - satisfactory**.

Date: **26.1.2020**

Signature: