



# Supervisor's statement of a final thesis

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**Supervisor:** Ing. Jakub Bartel  
**Thesis title:** Interpolation and extrapolation of subsequent weather radar images  
**Branch of the study:** Knowledge Engineering

**Date:** 12. 6. 2019

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| <i>Evaluation criterion:</i>   | <i>The evaluation scale: 1 to 4.</i>   |
| <b>1. Fulfilment of the assignment</b>   | <b><u>1 = assignment fulfilled,</u><br/>2 = assignment fulfilled with minor objections,<br/>3 = assignment fulfilled with major objections,<br/>4 = assignment not fulfilled</b> |
| <i>Criteria description:</i><br>Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.   |  |
| <i>Comments:</i><br>All assignment's objectives were fulfilled. The theoretical part covers relevant theory and definitions for domain specific image processing and discusses selection of convolutional neural networks. The practical part of the thesis is well segmented to solve and evaluate all defined goals.   |  |
| <i>Evaluation criterion:</i>   | <i>The evaluation scale: 0 to 100 points (grade A to F).</i>   |
| <b>2. Main written part</b>  | <b>98 (A)</b>  |
| <i>Criteria description:</i><br>Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies? Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 26/2017, Art. 3. Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms. |  |
| <i>Comments:</i><br>I find the extent of the thesis adequate to its content and scope with no apparent errors or inaccuracies. Text is well structured and readable. I find all formal notations used and described correctly as well as the correct work with external sources. The student also covered licences for the dataset and used free open source software.<br><br>The evaluation parts and appendix contain just a few example outputs. There could be more results and examples included to show (dis)advantages of the invented solution. Also more different weather situations could be illustrated. (This work has practically been done but it's not included in the thesis content.)  |  |
| <i>Evaluation criterion:</i>   | <i>The evaluation scale: 0 to 100 points (grade A to F).</i>   |
| <b>3. Non-written part, attachments</b>  | <b>100 (A)</b>   |
| <i>Criteria description:</i><br>Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.  |  |
| <i>Comments:</i><br>All SW parts and the overall quality of the solution show great software engineering skills. Different ML frameworks were tested before the final framework selection and advanced computational optimizations were applied to reduce the duration of model's training. The thesis does not cover all these software engineering areas because it is mainly focused on Knowledge Engineering related outputs. All datasets are included to reproduce the results and whole thesis has been publicly versioned in a Github repository.  |  |
| <i>Evaluation criterion:</i>   | <i>The evaluation scale: 0 to 100 points (grade A to F).</i>   |
| <b>4. Evaluation of results, publication outputs and awards</b>  | <b>100 (A)</b>   |

*Criteria description:*  
Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

*Comments:*

To the best of my knowledge no other solution or research of weather radar nowcasting enhanced by machine learning exists for the area of Czech Republic or Slovakia. The thesis is both inovative and practical in terms of being ready for a production deployment. When compared to the actual nowcasting method used by National Met Office the results are qualitatively very promising, which is quite impressive for this early stage of research&development. This shows an exceptional effort and creativity invested into finalizing objectives of the thesis.

*Evaluation criterion:*

*The evaluation scale: 1 to 5.*

**5. Activity and self-reliance of the student**

*5a:*

**1 = excellent activity,**

*2 = very good activity,*

*3 = average activity,*

*4 = weaker, but still sufficient activity,*

*5 = insufficient activity*

*5b:*

**1 = excellent self-reliance,**

*2 = very good self-reliance,*

*3 = average self-reliance,*

*4 = weaker, but still sufficient self-reliance,*

*5 = insufficient self-reliance.*

*Criteria description:*

From your experience with the course of the work on the thesis and its outcome, review the student's activity while working on the thesis, his/her punctuality when meeting the deadlines and whether he/she consulted you as he/she went along and also, whether he/she was well prepared for these consultations (5a). Assess the student's ability to develop independent creative work (5b).

*Comments:*

The student was able to deal with all the feedback given on regular consultations, come with own solutions and develop all machine learning components including data preprocessing parts on his own. The activity and amount of regular work was excellent.

*Evaluation criterion:*

*The evaluation scale: 0 to 100 points (grade A to F).*

**6. The overall evaluation**

*100 (A)*

*Criteria description:*

Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.

*Comments:*

I appreciate the student's ability to solve the real world problem with a modern approach in a way nobody applied successfully before. The final solution is a great combination of image processing theory, data preprocessing techniques and software development. The student proved his ability to use knowledge engeneering skills with produced end-to-end machine learning solution.

Signature of the supervisor: