

I. IDENTIFICATION DATA

Thesis title:	Automatic Determination of Knosp Score Based on Segmentation of Anatomical Structures
Author's name:	Bc. Filip Opl
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Dept. of Cybernetics
Thesis reviewer:	Ing. Eduard Bakštein, Ph.D.
Reviewer's department:	Analysis and Interpretation of Biomedical Data

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The assignment required an end-to-end solution to a complex biomedical task, including design of own suitable architecture.	

Fulfilment of assignment	fulfilled
<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>	
The assignment was fulfilled completely at a high qualitative level.	

Methodology	outstanding
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The methodology is sound, implements one geometrical solution along with a set of deep-learning solutions using an established ResNet architecture. Both seem suitable for the task and the author evaluates several application variants, some of which achieve state-of-art results.	

Technical level	A - excellent.
<i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	
The thesis uses established terms and methods and applies them in an appropriate way, clearly disclosing the limitations, alternatives and comparison to existing approaches.	

Formal and language level, scope of thesis	A - excellent.
<i>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?</i>	
This is a very well-structured thesis with balanced emphasis on different aspects of the problem. The problem is clearly described in a technical and sound language.	

Selection of sources, citation correctness	A - excellent.
<i>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?</i>	
The standard of used sources and way they are used in the text is high and on par with quality scientific journals.	

Additional commentary and evaluation (optional)
<i>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.</i>

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. Pose questions that should be answered during the presentation and defense of the student's work.

The candidate did a very thorough job on a complex research topic. The quality seems sufficient for a scientific publication – both in terms of the technical work done, as well as quality of the reporting. I would like to point out the thoroughness of discussing the strengths and pitfalls of the proposed models, including examples.

Questions:

1. The inclusion of the neighboring slices in a 3-channel image always lead to performance decrease. Can you think of a modification to your CNN architecture which could process the neighboring slices in a more appropriate manner? Or is the inclusion of neighboring slices just not a good idea?
2. The drop between per-slice and per-patient score is very significant, the reason being sensitivity to misclassification in a single slice, as correctly discussed. Could a different method of aggregation of the per-patient score from the slice score improve the results? (maybe by evaluating certainty/quality of per-slice scores, adding sanity checks to the individual slice results etc...)

The grade that I award for the thesis is **A - excellent**.

Date: **22.1.2024**

Signature: