

I. IDENTIFICATION DATA

Thesis title:	Improving atherosclerotic plaque segmentation and estimating their clinically relevant parameters
Author's name:	Ondřej Stejskal
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Boris Flach
Reviewer's department:	Department of Cybernetics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The thesis considers the analysis of plaques in ultrasound images of carotid arteries. Its main goals are the following. 1) Improving the segmentation of plaques by using advanced deep learning models that allow to incorporate shape priors. 2) Train a ResNet model which allows to characterize the clinically relevant parameters of the plaque segments.	

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 author has considered three advanced deep learning models for segmentation, which incorporate shape priors by combining UNet models with autoencoders or GANs. All three methods were adapted to the task, trained and validated on a dataset of ultrasound images of carotid arteries. Furthermore, he trained a ResNet classifier for characterising the clinical parameters of the plaque segments obtained from the previous step. This provides a validation of the considered segmentation models in terms of clinically relevant parameters.	

Methodology	correct
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The proposed methods are technically correct.	

Technical level	B - very good.
<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 is technically sound. It applies and analyses advanced deep learning methods. The explanation of the methods is however somewhat lacking details (see below).	

Formal and language level, scope of thesis	C - good.
<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>	
The structure of the thesis and clarity of language are not perfect. My main objections are the following. 1) Chapter 3. is in my view superficial. It discusses basic concepts and methods but on a superficial level only. It does not allow to judge the students level of understanding and provides no insights for a beginner. 2) Chapter 4 introduces the advanced segmentation models used in the thesis. I would have appreciated a higher level of detail in this part. 3) The English gets poorer toward the end of the thesis, sometimes to a level that starts to hinder understanding.	

Selection of sources, citation correctness	B - very good.
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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?

References to previous work are adequate. The students contributions are clearly distinguished from previous work.

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 overall quality of the thesis is good. It applies advanced deep learning methods to a clinically relevant task and validates them in terms of medical parameters that may directly support clinical decisions.

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.

Overall, the work of the student is solid and fulfils all criteria of a master thesis. I recommend to accept it for the defence. In view of the good fulfilment of a challenging task, I rate the work with "very good" despite its weaknesses mentioned above.

Question for the defence: *Which of the segmentation models/methods considered in the thesis can be combined with the subsequent classifier network and trained end-to-end?*

The grade that I award for the thesis is **B - very good**.

Date: 24.1.2024

Signature: