THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Segmentation of teeth restoration from X-ray bitewing images.**
Author's name:	**David Grundfest.**
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	MDDr. Antonin Tichy, Ph.D.
Reviewer's department:	Institute of Dental Medicine, Charles University

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**ordinarily challenging**

How demanding was the assigned project?

From the perspective of a dentist, it is difficult to properly estimate how demanding the project was. However, from the previous co-operation with Mr. Kunt, I would consider this project as ordinarily challenging for a bachelor thesis.

Fulfilment of assignment	**fulfilled with minor objections**

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.

The task was fulfilled, as the models were able to segment restorations satisfactorily. However, I have minor objections regarding the author's interpretation of the results:

1) While the results were better than those of Mr. Kunt, it should be taken into account that this study used a larger dataset and that the dataset was annotated by Dr. Nagyová, as opposed to the work of Mr. Kunt who had the dataset annotated by a 5th year dental student.
2) The author addressed the participating 2nd year and 3rd year as novice dentists in the conclusion. With all the respect to the students, this overestimated their skills as they barely received any clinical training at this point of their studies.
3) While the application of the model could potentially be used for dental charting, it would be necessary that the model was able to classify the teeth, which may be even more demanding than the segmentation of restorations.

Methodology	**correct**

Comment on the correctness of the approach and/or the solution methods.

As far as I can judge, the implemented solutions are reasonable. I only have minor comments:

1) The information regarding the dataset (section 5) is somewhat misleading – the dataset was annotated only by Dr. Nagyová, and the images came from a single clinic (but different machines were used to take them).
2) There is no information that the project received an approval by an ethical committee and how patient data were handled.
3) Why were the results compared with dental students in preclinical years? What is the relevance of such comparison? Furthermore, wouldn't it be better if the students rather annotated the testing data instead of the validation data?

Technical level	**A - excellent.**

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?

The explanation appears clear.

Formal and language level, scope of thesis	**C - good.**

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?

The organization of the thesis is logical, and its extent is appropriate. There are minor typing, spelling and English errors, but they don't affect the understanding of the thesis. The placement of tables and figures sometimes disrupts the flow of

the text, the organization could be improved. Captions are missing for Figure 5.3 and 5.4. The same applies for Table 6.2. There are also errors, such as a note in Figure 7.3 that the y axes of the histograms are not the same, while they appear to be identical.

If any part of the text could be improved significantly, it is the abstract which is mostly focused on the dental background. The explanation is not entirely correct, which is understandable, as the author is not an expert in dentistry. However, this could have been avoided by focusing on technical details and the results of the thesis that were not sufficiently presented.

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 author included several references to previous works on this topic in chapter 4. Unfortunately, the results were only compared with the thesis of Mr. Kunt. A more detailed comparison with other works could have been an interesting part of the discussion.

I noticed that very few references are presented in chapter 2, as well as in some other parts of the text.

As for the citation style, I am not sure which standards should have been followed, but the formatting is inconsistent. In addition, I have some other remarks regarding the citations:

1) Is it a sufficient citation of a website to include the URL? I would expect some further information.
2) A page range or article number is often missing.
3) Some citations present full journal names, some abbreviated with/without dots. This is just an example of the inconsistencies, indicating that the attention to bibliography was insufficient.

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 topic of this thesis is not entirely new, but the results are promising. More examples of segmented restorations would be appreciated, as they could highlight the strengths and weaknesses of the model.

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

Multiple approaches to the segmentation of dental restorations were tested in this thesis, leading to satisfactory results. However, their interpretation was not as good, and formal errors were found in the thesis, especially in referencing. As a result, the final grade was decreased to C – good.

The following questions should be answered:

1) *What is the relevance of comparing the results with dental students from preclinical years? Why were they asked to annotate the validation data?*
2) *Did you try to differentiate various types of dental restorations?*
3) *How large should the dataset be to obtain optimal results? Or do you consider the current dataset sufficient?*

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

Date: **5.6.2023**   Signature: