THESIS SUPERVISOR'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Simulative Selection of an Adaptive Real-Time Source Separation Algorithm for EIT**
Author's name:	**Bc. Lukáš Daněk**
Type of thesis:	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Diogo Silva, MSc.
Reviewer's department:	RWTH Aachen University

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **extraordinarily challenging**

How demanding was the assigned project?

The project involved the implementation, optimization and comparison of several advanced signal processing techniques, which, although several of these implementations were already provided to the student at an advanced stage, made for a considerably dense work load, making the project more challenging than ordinary.

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.

While all thesis topics were explored and lead to developments of some degree, the latter ones pertaining the source-separation algorithms were relatively lightly tackled, due to the time constraints associated with geographical challenges natural to the collaboration effort between universities from different counties (please refer to my note on Section "Additional commentary and evaluation"). Otherwise, other topics such as validation signal generation and multi-pitch detection algorithms were very extensively explored and very satisfactorily achieved.

Activity and independence when creating final thesis **B - very good.**

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.

In general, the student was able to learn and work the technical concepts easily and independently. However, significant intervention from the supervisor was necessary at the halfway mark of the project since the student was concentrating too heavily on the initial topics of the work, which was compromising the feasibility of the remaining ones inside the given time. This optimistic foresight seemed to be the only weakness of the otherwise mature organizational capabilities of the student.

Technical level **A - excellent.**

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?

The student showed a very solid understanding of technical concepts pertaining to his field, as well as the capability to assimilate and implement new processes and ideas. The documentation was adequately summarized considering the extent of the undertaken implementations, which further testifies to the technical understanding of the student.

Formal level and language level, scope of thesis **B - very 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 student complied with the scientific notation and formalism with little effort, and produced a document written at a high-level of technical English. The amount of work done by the student compared to the amount of time available for this submission caused the final sections in the thesis to slightly lack scientific detail in comparison to the earlier ones (please refer to my note on Section "Additional commentary and evaluation").

Selection of sources, citation correctness	**A - excellent.**
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 student delivered very extensive and pertinent literature research, which was a challenging aspect of the project considering its novelty. The distinction between related works and the student's own was also made clear.	

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 student was given a very challenging project, requiring solid scientific understanding and an above average learning rate. Still, the student delivered very strong implementations supported by extensive and scientifically sound validation. We expect the continuation of his work to significantly impact the state-of-the-art. It was a pleasure working with the student. NOTE: due to the constraints of writing the thesis under the dual studies program, the student is submitting this thesis after only four months of working on the project. Take into consideration the remaining two months for the submission of the thesis for the RWTH Aachen University during which the student will finish incomplete tasks and further optimize completed work.

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

The student was tasked with further developing different promising algorithms for simultaneous heart- and respiratory-rate estimation, and source-separation of cardiac- and ventilation-related sources in Electrical Impedance Tomography data. The project also required the simulation of extensive validation datasets to test different combinations of the individual algorithms to arrive at an optimal ensemble for data source-separation.

The student developed robust adaptive extensions to the provided multi-pitch estimation algorithms which allowed them to successfully handle the non-stationarities in the data. Moreover, the student validated these developments on extensively simulated realistic data. A comb filtering approach to the source-separation problem was also included in the workflow and produced very encouraging results, which are almost guaranteed to be successfully completed in the near future.

Based on the extensiveness of the project, the quality of the work and the time constraints to develop it, I recommend the grade below.

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

Date: **31.8.2023** Signature:

Diogo Silva, M. Sc.