

I. IDENTIFICATION DATA

Thesis name:	Partial volume effect correction in positron emission tomography images for hypometabolism detection
Author's name:	Bc. Kateřina Macková
Type of thesis:	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	K13131 Department of Circuit Theory
Thesis supervisor:	Ing. Radek Janča, Ph.D.
Supervisor's department:	K13131 Department of Circuit Theory

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	extraordinarily challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
The thesis tasks cover four partially overlapped fields, each requiring specific knowledge and an approach to a solution. First task targets on measurement of the PET scanner's effective resolution (PSF) of specific protocols using NEMA standard and capillary phantom. The second requires developing a novel approach for PSF estimation of real PET data (patient brain) combining structural MRI measured at the edges of the cortex. The result of PSF estimation on complex data is compared with the simple phantom. The third part analyses patient movements in a PET scanner using PET dynamic protocol, quantifies them in three-dimensional space, and obtained parameters are compared with estimated resolutions. And finally, the fourth part tested the effect of obtained PSF value on the partial volume effect correction of PET and its effect on hypometabolism detection.	

Satisfaction of assignment	fulfilled
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
Tasks were met beyond expectations.	

Activity and independence when creating final thesis	A - excellent.
<i>Assess that student had positive approach, time limits were met, conception was regularly consulted and was well prepared for consultations. Assess student's ability to work independently.</i>	
The student worked fully independently. She searched all relevant sources resulting in an excellent review, which was ground for new and original implemented methods. She consulted periodically, however, her progress did not require corrections.	

Technical level	A - excellent.
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
The level of speciality is high, which is comparable with scientific practice. All steps were supported by actual state-of-the-art.	

Formal and language level, scope of thesis	B - very good.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
The thesis is written in English, well organized and structured. All chapters are understandable, results are well reported. Although the English are at a good level, some sentences or paragraphs should be reformulated in proofreading.	

Selection of sources, citation correctness**A - excellent.**

Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.

The student uses 40 references mainly to journal papers. Understanding and application of obtained knowledge is at a high level resulting in original work. References are used correctly.

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

The thesis represents comprehensive work which brings new results to the estimation of PSF of individual patient examinations. The very valuable results confirm the minimal effect of unprecise PSF estimation on partial volume effect correction of PET and the measurable but minimal effect of patient's movement on PET reconstruction.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation.

The thesis is a complex scientific study which solves or quantifies the effect of effective resolution of PET scanners to partial volume effect correction. The results of the work will be extended in a PhD program and published, as well as, intercorporate into a pipeline of clinical data processing.

I evaluate handed thesis with classification grade **A - excellent**.

Date: **5.6.2023**

Signature: