ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

SUPERVISOR'S OPINION OF FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Learning Segmentation from Multiple Datasets with Different Label Sets**
Author's name:	**Elnaz Babayeva**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Dept. of Computer Science
Thesis supervisor:	Milan Šulc
Supervisor's department:	Dept. of Cybernetics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment — challenging

Evaluation of thesis difficulty of assignment.

The topic of the thesis lies on the intersection of two areas of active research in the computer vision and machine learning community: Object instance segmentation and semi-supervised learning. The goal was to propose and implement a procedure that allows training state-of-the-art instance segmentation methods using several datasets with different label sets. The assignment of the thesis required to get a good understanding of the state-of-the-art in the area of deep learning, as well as getting familiar with implementation details.

Satisfaction of assignment — fulfilled

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.

All parts of the assignment were fulfilled: The thesis reviewed the state-of-the-art methods and datasets for instance segmentation, as well as the problems of learning from different datasets - the work focuses on the problem of missing labels. Two novel methods were proposed for dealing with the problem of missing labels when training state-of-the-art instance segmentation models using a combination of datasets. The methods were implemented and evaluated against baselines. Moreover, the proposed methods also enable weakly-supervised training - with some datasets annotated only with bounding boxes. Future work and possible improvements of the proposed methods are discussed as well.

Activity and independence when creating final thesis — B - very good

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.

Elnaz Babayeva was actively searching and studying relevant literature and proposing possible ways to design the solution. The methodology was consulted regularly. A significant effort has been put into the implementation of the proposed methods. The submission of the thesis was delayed by 1 year. The presented experiments were finished shortly before submission, making additional experiments (such as more detail segmentation-specific evaluation or a combination of real datasets – not only artificial splits of COCO) impossible before the submission deadline.

Technical level — A - excellent

Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.

The thesis works with very recent research publications, code repositories and datasets. While preparing the thesis, Elnaz Babayeva gained a good of knowledge of deep learning and especially state-of-the-art methods for object instance segmentation and detection. The proposed methods were implemented with attention to efficiency – allowing multi-GPU training; the KNN-based method was implemented with fast GPU parallelization of the NN-search, making use the the state-of-the-art FAISS library. The implementation is publicly available as a github repository.

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Formal and language level, scope of thesis	B - very good
Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.	
The thesis is written in English, The structure of the thesis is clear and the text is appropriately completed by equations, tables, plots, illustrations, and pseudo-code of the algorithms. The thesis has 49 pages (without Bibliography and Appendix) and adequately describes related work, methods, performed experiments and results. Although a general introduction to semi- and weakly-supervised learning is not included, the methods related to combining multiple datasets are discussed well. The proposed methods and implementations are described in a detailed and replicable way. The English level is intermediate.	

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 thesis works with 35 references, often recent research papers from prestigious journals (IJCV, PAMI) conferences (CVPR, ICCV): half of the cited publications are less than 3 years old. The thesis is citing all sources (publications and software). Some references in the text could be cited in a more polite way (not skipping author names).	

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 underlying problems of using several datasets and the proposed methods are well formalized and explained. I appreciate the efficient implementation of the proposed methods. The work would benefit from further experimentation. Although the current experimental results are not groundbreaking (improvement against the baselines are achieved only on one of the two experimented artificial scenarios), a derived work with more experiments (including application to different existing datasets, and adding more segmentation-specific experiments) may have a good publication potential.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

The thesis fulfilled all parts of the assignment and proposed two novel methods dealing with the problem of missing labels when training instance segmentation models from datasets with different labels sets. The proposed methods were implemented in an efficient way into the state-of-the-art instance segmentation model (Mask-RCNN). The work would benefit from further experiments (such as more segmentation-specific evaluation or a combination of real datasets – not only artificial splits of COCO), but in total I consider the thesis very good.

I evaluate handed thesis with classification grade B - very good

Date: 06/05/19 Signature: