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SUPERVISOR'S OPINION OF
FINAL THESIS

I. IDENTIFICATION DATA

Thesis name:	**Inference on a Graph Representing a Computer Network**
Author's name:	**Mandlík Šimon**
Type of thesis :	Bachelor
Faculty/Institute:	Faculty of Electrical Engineering
Department:	Department of Cybernetics
Thesis supervisor:	Ing. Tomás Pevný
Supervisor's department:	Department of Computer Science

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**Very difficult**

Evaluation of thesis difficulty of assignment.

The goal of the thesis was to use neural networks to learn a function calculating messages in message passing algorithm used for inference on graphs. To meet the goal, the student has to get background from two fields - theory of graphs and theory of multi-instance learning with neural networks, where the latter is a niche. Besides this, the implementation was everything but trivial, because working with graphs requires processing of large corpuses of data and therefore custom solutions and adaptations of mainstream algorithms, which further complicates the work.

Satisfaction of assignment	**Completed**

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.

The student has fully fulfilled the assignment.

Activity and independence when creating final thesis	**Excellent**

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.

The student was very active and independent. He has always came to meetings with a list of questions and open problems.

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 technical level of the thesis is very high.

Formal and language level, scope of thesis	**A - excellent**

Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.

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The language and formal level is good.

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.

Citations are satisfactory.

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 has challenged a problem, where a few prior art exist so far. As such, the student has to master two different topics of machine learning — the graph theory and the multiple-instance learning with neural networks. Since the approach was evaluated on a real problem from computer security, it has required to work on very large graphs with millions of nodes and edges. This required adaptations and approximations of existing algorithms and careful programming such that the memory would not be wasted.

The student mastered all the above very well. He was passionate to find the best and importantly mathematically correct solution. He has came prepared for consultations and thanks to this, he has solved the problem.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

As was already mentioned above, the student has managed to solve a difficult problem from scientific and engineering point of view. The quality of his presentation was very good and his approach improves more than five times the prior art. Therefore I would like to recommend this thesis for Dean's award for an exceptional work.

I evaluate handed thesis with classification grade **A**

Date: **4th June 2018**   Signature: Tomáš Pevný