THESIS SUPERVISOR'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Applications of Graph Neural Networks in Classical Planning**
Author's name:	**Bohdan Nazarenko**
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Rostislav Horčík
Reviewer's department:	Department of Computer Science, AIC

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**extraordinarily challenging**

How demanding was the assigned project?

The project's goal was to replicate the experimental results of a recent paper by Stahlberg et al. on applications of graph neural networks (GNNs) in classical planning. To fulfil the goal, Mr Nazarenko had to get familiar with a large portion of several topics. In particular, the architecture of GNNs, their modification for relational structures, and relevant parts of classical planning. This includes Planning Domain Definition Language (PDDL) and the Fast Downward planning system. Therefore, I consider the task a very challenging one for a bachelor project.

Fulfilment of assignment	**fulfilled**

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 project's objectives were fulfilled completely. Both parts of a GNN-based planner were implemented, i.e., the part training a GNN for a given planning domain and the part employing the trained GNN to solve actual planning instances. The experimental results from Stahlberg's paper were successfully replicated. Moreover, the thesis further improves them by combining the GNN-based planner with pruning techniques from the Fast Downward system.

Activity and independence when creating final thesis	**A - excellent.**

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.

Mr Nazarenko was very active, working on the project quite independently. We discussed together mainly theoretical concepts from classical planning and GNNs. The design of the GNN-based planner was done entirely by Mr Nazarenko. The same holds for running all the experiments on the RCI cluster.

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 technical level of the implemented GNN-based planner is excellent. The implementation code is well structured and well documented. The obtained experimental results correspond precisely to Stahlberg's results in all but one planning domain.

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 thesis is written in English. The language quality is good. The text itself is quite extensive, providing a theoretical background, describing the structure of the implemented planner, and presenting the experimental results. On the other hand, the presentation of the applied algorithms in Chapter 4 could be further improved so that it clearly describes the crucial ideas in a more accessible way.

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 thesis cites relevant sources of literature and employed software packages. The bibliographic references were generated by BibTeX so that the references meet the usual standards.	

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.
Please insert your comments here.

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

Summarize your opinion on the thesis and explain your final grading.

Although the assignment was quite extensive, the thesis fulfilled all the objectives and further explored the possibility of improving the results with the standard pruning techniques. The implemented GNN-based planner forms a reasonable basis for further research on applications of GNNs in classical planning. The grade that I award for the thesis is **A - excellent.**

Date: **5.6.2023**   Signature: