I. IDENTIFICATION DATA

Thesis name:	**Behavioural classification of network devices**
Author's name:	**Bc. Vojtěch Outrata**
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Computer Science
Thesis reviewer:	Ing. Jan Brabec
Reviewer's department:	Department of Computer Science

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	**challenging**

Evaluation of thesis difficulty of assignment.

The assignment is challenging as it required student to study a broad prior art and combine domain knowledge in cybersecurity and networking with deep knowledge of Graph Neural Networks. Moreover, student was working with a sizable problem and needed to take also computation performance into account.

The assignment explicitly requires research and development of a novel method.

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 the points in the assignment are fulfilled.

Method of conception	**outstanding**

Assess that student has chosen correct approach or solution methods.

The Student started with a study of state of the art and tested several baseline methods. After identifying their short-comings he developed a novel method. The study includes multiple ablation studies and detailed experiments.

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 depth is excellent. Student describes intricacies of the domain and ML methods in depth. He thoroughly describes the process of data acquisition and feature engineering. Performs detailed experiments and ablation studies and makes valid conclusions.

The work is built upon a deep study of recent scientific literature and makes a novel contribution to the field of temporal graph neural networks that I hope will be submitted as a paper to a scientific conference.

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

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

The thesis is written in English and the language level is excellent. I didn't notice any typos. Mathematical text is well-formatted. Minor stylistic changes could be made from time to time but such cases are insignificant and exist in any text of this size.

- In the introduction I have minor issues with the sentence *"[…] number of interconnected devices of various types has started to grow exponentially."* Specifically with the terms "started to grow" and the figurative use of the word 'exponentially'. If the growth is truly exponential it should be supported by a citation.
- Similarly, in *"determining the type of a device is prohibitively difficult and time consuming to do manually"*. I think the word 'prohibitively' is unnecessary and technically inexact.

Interestingly, this vague style of writing is mostly limited to the first half of introduction that motivates the thesis but the actual technical content is written precisely.

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.

Sources are well selected and citations are used correctly. The citation style is consistent.

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 targets a very interesting and practical problem while being deep and scientifically valuable.

I appreciate the technical depth of the thesis and how well the text is written. The Student combined domain knowledge with internal knowledge of SoTA GNN algorithms to design a novel method that tackles several limitations of the prior art's shortcomings.

I have one concern that I raise as a question for the defense.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

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

Question for the defense: The novel positional features were designed using domain knowledge obtained from exploration of the customer's datasets. In the evaluation, you train/test split the datasets by devices but still operate on the same graphs you designed the features on. Do you think this can impact generalization to unseen customer networks? Do you plan to test on new customers whose data you didn't have available during the design?

Date: **9.6.2023**   Signature: