Tomas Bata University in Zlín
Faculty of Applied Informatics

OPPONENT´S EVALUATION OF THE MASTER´S THESIS

Student: **Syed Iftekharuddin**   **Opponent:** **prof. Ing. Ivan Zelinka, Ph.D.**

Study program: **Engineering Informatics**
Study course/Specialization: **Information Technologies**
Academic year: **2022/2023**

Master's Thesis topic: **Mutual Connection of Evolutionary Algorithms and Complex Networks**

Evaluation of the thesis:
Please enter your evaluation of the submitted work here. The report will focus on:

- The thoroughness of the elaboration, its validity and the difficulties resolved in the thesis: The diploma thesis deals with a difficult research task, which is particularly topical due to the concentration of intensive research in the analysis of complex (social networks).

- The method and level of the concepts resolved in the thesis: The thesis represents an interesting alternative (in methodological approach) to previous published articles and is also a follow-up to another thesis. The methodology is extended with the concept of automatic hyperparameter tuning and test function selection for a swarm algorithm generating a complex network. The overall workflow is well thought out, it is just a pity that the results of multiple experiments, including multiple datasets, are not included to underline the robustness of the approach. I also have some comments on the design of the eperiment: heuristics were used - so I would expect some statistical processing from repeated runs. Further, the prediction itself could have been handled better and on multiple instance sizes, although it is clear from the experiment itself that it was very time consuming - however, this should have been thought of in the design and implementation of the algorithms.

- The level of the student´s thesis topic and elaboration and its contribution(s): The thesis presents a proof of concept research and its contribution lies in the possible continuation and extension of the proposed methodology. The contribution compared to the thesis on which this one is based is also (but unfortunately brief) the comparison of prediction techniques.

- The formal aspects of the thesis: The thesis is written in English of acceptable quality and grammatical level. Unfortunately, there are a number of inaccuracies, grammatical errors and unclear statements (hard to understand without deeper context). The algorithm designs are supported by diagrams - for a hyper-heuristics design with local search (Figure 20), it might have been better to conceive of it in a more organized way. The quality of the graphics is acceptable. Representation of data is sometimes a bit confusing (but did not affect overall results), for example Table 9 (1 – output A1.log., 2 – output A3.log).

- Questions relating to the defence of the thesis.
    1. Why did you select PSO as algorithm "generating" complex network?
    2. And again, why did you selected PSO as algorithm for hyperparameters tuning? Maybe some other algorithms like DE, SOMA may work better. Did you test these algorithms?
    3. What would be possible to do to improve the prediction accuracy?

▪ Conclusion: The thesis presents an interesting research task in a topic that has been recently investigated by research groups within the framework of a basic research project. Although the thesis is complete and describes the theoretical foundations, the design of the experiment and the results obtained, it would certainly deserve in some passages a better explanation to the readers why a certain setup, procedure and algorithm was chosen. It is unfortunate that the complexity and scalability of the problem being solved has not been addressed. Despite the formal shortcomings, remarks and criticism mentioned above, and the interesting possibilities for extensions, which were not discussed, this is a solid thesis (in terms of the difficulty of the problem addressed, the research nature, and the computational complexity).

Overall evaluation of the thesis:
The Opponent shall grant a mark according to the ECTS classification scale:
A – Excellent, B – Very Good, C – Good, D – Satisfactory, E – Sufficient, F – Insufficient
An "F" grade also means "I do not recommend the thesis for defence."

I recommend this thesis to be defended and suggest the following evaluation:
D - Satisfactory
In the case of an evaluation grade of "F – Insufficient", please supply the main shortages and reasons for this assessment.

Date: 5. 6. 2023   Thesis Opponent's Signature: