

## **OPPONENT'S EVALUATION OF THE MASTER'S THESIS**

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Julius

**Opponent:** Prof. RNDr. PaedDr. Eva  
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Study program: **Engineering Informatics**  
Study course/Specialization: **Information Technologies**  
Academic year: **2022/2023**

Master's Thesis topic: **Development of ensemble model for heart disease diagnosis**

### **The thoroughness of the elaboration, its validity and the difficulties resolved in the thesis.**

The main objective of this thesis was to develop an ensemble model for the detection of coronary heart disease. The proposed model utilizes different machine learning algorithms by combining features of each individual algorithm in order to achieve more accurate results.

The proposed models were tested on real data. Models were implemented in Python and their performances were evaluated using standard metrics. At the end of the thesis, the outputs from these models were analysed and compared with each other. The best model selected for predicting coronary heart disease achieved a classification accuracy of 97% and can be used as an auxiliary tool for cardiologists to improve their diagnosis of coronary heart disease.

### **The method and level of the concepts resolved in the thesis.**

Several machine learning algorithms, including KNN, logistic regression, multilayer perceptron, and support vector machines were used in this work to combine strengths of each algorithm to achieve more accurate results. Feature selection methods, such as chi-square and information gain, are employed, and the performance of the model is evaluated using standard metrics. Additionally, ensemble voting and stacked generalization models were developed using the three algorithms as base models, with the latter using Logistic Regression as the Meta classifier. The results demonstrate that the ensemble model outperforms individual traditional models and achieves higher accuracy in diagnosing heart diseases. All of these models were explained in the theoretical section. The main focus of this thesis is the practical component, which involved conducting a comparative experimental study and thoroughly analysing the results obtained from it.

### **The level of the student's thesis topic and elaboration and its contribution(s).**

The design, implementation and evaluation of the experiments is the student's own work. This thesis highlights the potential of machine learning techniques for predicting coronary heart disease and suggests that the resulting models are worth considering for clinical testing. These proposed models can be integrated into existing Health Information Systems.

In conclusion, the author presents ideas for future work. It is advisable to consider publishing certain sections of this piece.

### **The formal aspects of the thesis, errors and mistakes in the technical aspects.**

Regarding the formal aspect of the thesis, I don't have any major comments. However, the quality of the figures, particularly Fig. 6 - 9, is inadequate. The selection of literature is satisfactory and aligns with the thesis topic. The thesis exhibits a coherent structure, and the individual chapters are appropriately interconnected.

**Questions relating to the defence of the thesis.**

- The following problems in the data mining process are mentioned in your thesis: missing values, noisy data, inconsistencies and outliers. How did you solve these problems?
- Have you offered your study to any medical facilities to be tested in patients' diagnosis?

**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:**

**A – Excellent.**

**In the case of an evaluation grade of “F – Insufficient”, please supply the main shortages and reasons for this assessment.**

Date: 1. 6. 2023

Thesis Opponent's Signature: