

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

**Student:** Ujjwal Bhusal

**Opponent:** Assoc. Prof. Martin  
Kotyrba, Ph.D.

Study program: **Information Technologies**  
Study course/Specialization: **Software Engineering**  
Academic year: **2023/2024**

Master's Thesis topic: **Predictive modeling of patient health condition using machine learning**

Evaluation of the thesis:

This thesis explores the application of machine learning models in predicting medical conditions and treatment outcomes based on two distinct datasets. The first dataset focuses on the classification of Transurethral Resection of Bladder Tumor (TURBT) cases, while the second deals with post-surgical leak predictions in patients with rectourethral fistulas (RUF). The study evaluates several machine learning models to identify the most effective approaches for each classification task. The whole thesis has 77 pages.

The formal side of the work is of a good standard, the work contains 92 links to recommended literature and all of them are correctly cited in the work. Tables are poorly described and some figures are completely unreadable due to their resolution and size.

The motivation of this thesis is increasing significance of machine learning models in healthcare. The author's aim to explore the practical applications of these models in medical and surgical data analysis, addressing the growing interest in leveraging artificial intelligence for improving healthcare outcomes.

The results highlight the evaluation of multiple machine learning models on medical and surgical datasets. The models demonstrated varying performance, with notable improvements observed after multiple training iterations. Eight models were applied to the first dataset with varying training settings, showing fluctuating results initially, with rapid improvements observed after 20 training iterations. The second dataset saw improvements with all three models with more training data, although generalization remained challenging due to limited dataset size. The results underscore the potential of predictive modeling in healthcare despite data size limitations. The student has made significant contributions by developing and evaluating various machine learning models to address medical classification problems. Nevertheless, I would like to recommend one point to the student: validating the models on external datasets from multiple medical facilities to ensure wider applicability and reliability.

Questions for the defense:

1. Why were logistic regression, KNN, and SVM chosen as the initial models for TURBT classification, and what specific characteristics made them better for your choice?
2. Can you explain the overfitting issues observed in your models and how you plan to solve them for possible future applicant?

3. Can you provide examples of new features that could be derived from the current data to enhance model predictions?

The thesis of **Ujjwal Bhusal** is very interesting and emphasizes the significance of machine learning in healthcare while acknowledging ethical implications and limitations. The author underscores the need for further research to address these challenges and recommends considering the impact of AI on patient care. This comprehensive study establishes a solid foundation for future research in medical classification using machine learning, with clear pathways for enhancing model performance and expanding the scope of application and therefore I recommend this thesis for defense with evaluation

**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:**

**B - Very Good**

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

Date: 24.5.2024

Thesis Opponent's Signature: