

I. IDENTIFICATION DATA

Thesis title:	Edge machine learning-based industrial fault detection
Author's name:	Erik Pásztor
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Measurement
Thesis reviewer:	Ing. Milan Komárek, Ph.D.
Reviewer's department:	STMicroelectronics

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
Although we are currently witnessing an unprecedented surge in the utilization of applied machine learning techniques for fault detection problems, it is important to acknowledge that this scientific field is still relatively new. Keeping this in mind, the assigned task presents the author with challenging questions and tasks to tackle, as there is a limited pool of reported practical applications to draw upon for reference.	

Fulfilment of assignment	fulfilled
<i>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.</i>	
All the requirements and objectives of the assignment have been successfully fulfilled.	

Methodology	correct
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The author has chosen the appropriate approach and methods in accordance with the assignment.	

Technical level	A - excellent.
<i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	
The methods for fault detection utilizing edge computing were thoroughly discussed in the study. The specificities of the signal originating from the incremental sensor were also carefully examined and analyzed. The author effectively utilized the available software tools to achieve the defined goals on edge system. The implementation of the mechanical model to emulate the behavior of a real gearbox system was executed proficiently, resulting in the acquisition of data that closely resembles real-world scenarios. This data proved to be valuable for training the machine learning models and evaluating the efficiency of fault detection methods.	

Formal and language level, scope of thesis	A - excellent.
<i>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?</i>	
The level of language used in the reviewed text is of a high standard. Grammar errors are infrequent and do not significantly affect the overall quality. The graphical representation of the presented data is flawless and does not raise any concerns.	

Selection of sources, citation correctness	A - excellent.
<i>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?</i>	
The selection of sources made by the author was appropriate and relevant to the topic. The motivation for extending previous work in the field was clearly explained, and the citation of the sources was at an appropriate level.	

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. Pose questions that should be answered during the presentation and defense of the student's work.

Overall, I observed that the reviewed thesis demonstrates an exceptional level of problem analysis, provides a comprehensive overview of the current state of the art in the subject of study, and appropriately selects sources while maintaining accuracy in citations. The practical implementation of the demonstrator, the methods chosen, and the analysis of the collected data are effectively presented with thorough attention to detail.

Questions:

- 1) In chapter 5.4, you mentioned that you achieved a True Positive Rate (TPR) of 1 and a True Negative Rate (TNR) of 0.74 when using an anomaly detection model. Are you familiar with any other published studies that have utilized IRC or other signal sources with similar data, which could be used for comparison?
- 2) In section 3.7, it is evident that three MCUs were utilized to construct the demonstration gearbox system. However, this may appear excessive for an application focused on minimizing the bill of materials (BOM). Could you assess whether a single MCU with adequate performance would be capable of fulfilling the requirements for a real-world industrial application? Would the STM32F4x with an Ethernet interface be sufficiently capable of handling these tasks, or would a more powerful device be necessary?

The grade that I award for the thesis is **A - excellent**.

Date: **4.6.2023**

Signature: