

## I. IDENTIFICATION DATA

<b>Thesis name:</b>	<b>Finding a leptoquark using machine learning in data from the CERN ATLAS experiment</b>
<b>Author's name:</b>	Lukáš Viceník
<b>Type of thesis:</b>	bachelor
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Cybernetics
<b>Thesis reviewer:</b>	Vlasios Petousis
<b>Reviewer's department:</b>	Institute of Experimental and Applied Physics

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>challenging</b>
<i>Evaluation of thesis difficulty of assignment.</i>	
Challenging research using machine learning method. The thesis is providing a new and alternative way of investigation finding leptoquarks using CERN ATLAS data.	
<b>Satisfaction of assignment</b>	<b>fulfilled</b>
<i>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.</i>	
The assignment is fulfilled in all aspects.	
<b>Method of conception</b>	<b>correct</b>
<i>Assess that student has chosen correct approach or solution methods.</i>	
A correct machine learning approach that serves as an improvement of the cross-section limit, for pair production of third generation scalar leptoquark, decaying into a top quark and a $\tau$ -lepton.	
<b>Technical level</b>	<b>B - very good.</b>
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
A good use of algorithms from two machine learning categories implemented and used for tabular data classification, gradient boosting decision trees and deep neural networks, were well deployed to analyze the simulated data for leptoquark masses from 300 to 2000 GeV. A very good use of the data for all available masses which they have combined in order to show that one universal classifier can be used for all leptoquark mass cases.	
<b>Formal and language level, scope of thesis</b>	<b>B - very good.</b>
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
The thesis is concise and well written. I have no objections about the structure if the individual chapters. Citations are used properly.	
<b>Selection of sources, citation correctness</b>	<b>B - very good.</b>
<i>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.</i>	
The citations are used properly throughout the thesis.	

**III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION**

Overall, I positively evaluate all aspects of this thesis.

I consider the work done is of good quality and could be very useful for the leptiquark research group within ATLAS.

I evaluate handed thesis with classification grade **B - very good**.

Date: **26.5.2022**

Signature: