

I. IDENTIFICATION DATA

Thesis title:	Generative models for high energy physics measurements
Author's name:	Lukáš Viceník
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Doc. Dr. André Sopczak (2 nd supervisor)
Reviewer's department:	IEAP, CTU in Prague

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>How demanding was the assigned project?</i>	
The task has been challenging as the project uses novel methods for the machine learning and requires getting familiar with the computing structure at the ATLAS experiment at CERN. The application has been posing a particular challenge as the statistical significance had to be determined.	

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 tasks have been achieved.	

Activity and independence when creating final thesis	A - excellent.
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
Lukáš has been very active and self-motivated. He regularly presented his progress in consultations with the supervisors. He presented his results at the ATLAS machine learning forum working group and he gave a presentation on his results at the 2024 German Physical Society spring meeting in Karlsruhe. He received very positive feedback.	

Technical level	B - very good.
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
Lukáš applied his knowledge and executed the suggestions efficiently. He also came up some ideas for presentations of the effect on the data analyses (signal separation from background) of his results. It would have been nice to expand further for alternative methods for the data augmentation.	

Formal level 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 thesis introduces the goal and challenges of the task clearly. The language was already in a very good shape in his draft version. The text fulfils scientific standards.	

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 citations are complete and make adequate reference to previous work. The format meets the standards.	

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.

The thesis addresses the main challenge in high energy particle physics to separate signal and background. In all of the many analyses, either searches for new particles, like a charged Higgs boson, or precision measurements, machine learning is applied. The machine learning training is limited by the available fully simulated data sets. The thesis results demonstrate as a proof of principle that data augmentation can increase the performance for many analyses. The related systematic uncertainties remain to be studied.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

The student very skilfully performed the analysis and demonstrated his knowledge to solve technical challenges. He is encouraged to continue academic studies.

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

Date: **4.6.2024**

Signature: