

**I. IDENTIFICATION DATA**

<b>Thesis title:</b>	<b>Monitorování průmyslového HMI pomocí strojového vidění</b>
<b>Author's name:</b>	<b>Bc. Horák Jakub</b>
<b>Type of thesis :</b>	<input type="text"/>
<b>Faculty/Institute:</b>	<input type="text"/>
<b>Department:</b>	12110
<b>Thesis reviewer:</b>	Ing. Mgr. Boris Fačkovec, PhD.
<b>Reviewer's department:</b>	Inovec Technology s.r.o.

**II. EVALUATION OF INDIVIDUAL CRITERIA**

<b>Assignment</b>	<input type="text"/>
<i>How demanding was the assigned project?</i>	
The human-machine interface is an important topic for implementation of industry 4.0, mainly digitization of data from older machines. Computer vision is perfect for this problem, as it can be used universally and easily verified by machine operators and experts	

<b>Fulfilment of assignment</b>	<input type="text"/>
<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>	
The assignment was fulfilled without any objections	

<b>Methodology</b>	<input type="text"/>
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
The student first classifies the visual signal elements and pragmatically selects one of the classes for a deep dive. For the deep-dive, the student solves each sub-problem, creating a practically usable end-to-end solution.	

<b>Technical level</b>	<input type="text"/>
<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 problem is an engineering challenge that requires a combination of knowledge across various fields of computer vision (detection, classification, localisation etc.) combining both conventional computer vision and CNNs, selection of a suitable solution scheme and refinement of the parameters. The student uses wide range of methods pragmatically and correctly, leading to a compelling solution. The used technology (python / opencv) will make it easy to integrate, deploy and maintain the solution.	

<b>Formal and language level, scope of thesis</b>	<input type="text"/>
<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>	
Straightforward, brief, and clear language. Written in EN, which widens the readership, although there are a few objectionable terms (maybe literal translations from CZ language)	

## Selection of sources, citation correctness

*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?*

Right references, I would maybe expect more citations of the original works in CV, e.g. CNN, YOLOv8, COCO dataset, use of the Hough transformation to detect lines and curves in pictures etc.

## 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.*

A very practical and an important problem for the industry, commercial institutions will be interested in the code developed and hiring the student into teams solving related problems.

## 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.*

The grade that I award for the thesis is

### Questions for viva:

1. How would you suggest continuing the work improving the accuracy? What cost function or optimization algorithm could be used to improve the parameters (9.2.3)?
2. How would the usage of your system work? How can the user add simple inputs (e.g. bounding box, confirmation of the class etc.) in order to maximise the accuracy? How much time per new image of panel / situation would it take the annotator? How much time for the case of a minor shift of the camera in an already annotated image of panel / situation?
3. Have you considered synthetic data for enriching the training dataset using generative AI or rendering 3D models? How would you expect the reliability of the system improve with the synthetic data?

Date: **19.6.2023**

Signature: