

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>City traffic time series forecasting using RNN LSTM</b>
<b>Author's name:</b>	<b>Martin Křeček</b>
<b>Type of thesis :</b>	Master's thesis
<b>Faculty/Institute:</b>	Faculty of Mechanical Engineering
<b>Department:</b>	Department of Instrumentation and Control Engineering
<b>Thesis reviewer:</b>	Ing. Adam Pechl
<b>Reviewer's department:</b>	Department of Instrumentation and Control Engineering

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>A</b>
<i>How demanding was the assigned project?</i>	
Assignment was challenging.	

<b>Fulfilment of assignment</b>	<b>C</b>
<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>	
Primary goals were achieved. Based on the assignment, I would prefer more emphasis on predictive models in the practical part.	

<b>Methodology</b>	<b>A</b>
<i>Comment on the correctness of the approach and/or the solution methods.</i>	
In my opinion, student selected appropriate mathematical apparatus and state-of-the art technologies.	

<b>Technical level</b>	<b>C</b>
<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>	
Research part is deep and student obviously did a lot of work. Some parts were confusing for me as a reader and I had to re-read them several times. Practical part has a lot of code fragments, which I would prefer to move to the appendix.	

<b>Formal and language level, scope of thesis</b>	<b>B</b>
<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>	
Thesis meets the standards and is extensive. The amount of typing errors is relatively small.	

<b>Selection of sources, citation correctness</b>	<b>A</b>
<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 number of references of adequate quality is sufficient.	

<b>Additional commentary and evaluation (optional)</b>
<i>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.</i>
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.*

Starting with positives, I have to emphasize the amount of work done on this project. Student developed and implemented proof-of-concept of the whole software solution for traffic forecasting consisting of data acquisition, data persistence, modeling and also presentation.

The main problem I have is that based on the assignment, most of the work should have been focused on model predicting traffic. Student implemented three models ARIMA, CNN and LSTM. Figures 12 and 14 (the only results for first two models) do not have axis labels, what prediction I am looking at? Where is the comparison with target? Where is error (or some other metric like MSE) comparison of these models?

Questions:

1. What is the prediction horizon you aim at?
2. You have implemented grid search for hyperparameters of LSTM, what were the best parameters? What were the ranges allowed for hyperparameters?
3. From the prediction results it seems that there is a strong time-of-the-week and time-of-the-day effect, have you considered some models reflecting this phenomena?

The grade that I award for the thesis is **C**.

Date:

Signature: