

## I. IDENTIFICATION DATA

<b>Thesis title:</b>	<b>Integrating Text and Image Models for Question Answering</b>
<b>Author's name:</b>	<b>Jan Čuhel</b>
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Electrical Engineering (FEE)
<b>Department:</b>	Department of Cybernetics
<b>Thesis reviewer:</b>	Ing. Jan Šedivý, CSc.
<b>Reviewer's department:</b>	CIIRC

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>extraordinarily challenging</b>
<i>How demanding was the assigned project?</i>	
This thesis focused on developing novel algorithms for question answering systems specifically designed to handle complex technical user manuals. These manuals, typically in PDF format, often combine textual explanations with images to enhance understanding. The task involved utilizing Retrieval-Augmented Generation (RAG) for answer retrieval and a new algorithm for the selection and integration of relevant images to complement the generated responses. The research included a comprehensive review of existing methods and the implementation of models best suited for this specific use case.	

<b>Fulfilment of assignment</b>	<b>fulfilled</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>	
The student conducted a thorough investigation of the problem, evidenced by a comprehensive review of relevant literature summarized in the initial chapters of the thesis. Based on the theoretical foundation he has selected several known algorithms for experimentation and testing on a curated domain specific dataset of car manuals. Subsequently, the student implemented and fine-tuned a chosen algorithm, transforming it into a fully functional RAG system. His contribution extends to the creation of a task-specific training and testing set, allowing for the evaluation of the system's accuracy and demonstration of its functionality on car manuals.	

<b>Activity and independence when creating final thesis</b>	<b>A - excellent.</b>
<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>	
Jan had a very positive and enthusiastic approach. We met weekly to discuss further steps and potential problems. Our discussions were always fast-paced and on topic, as Jan consistently came well-prepared with numerous new suggestions. During the preparation of the thesis, he worked very independently.	

<b>Technical level</b>	<b>A - excellent.</b>
<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>	
Jan's work on developing a Retrieval-Augmented Generation (RAG) system with relevant image retrieval is at the forefront of question-answering systems powered by large language models. This project involved designing an algorithm to select images that best complement the generated answers. To achieve this, Jan independently acquired expertise in novel technologies beyond the standard curriculum. The thesis is clearly explaining the development and implementation and summarizes the final results.	

<b>Formal level and language level, scope of thesis</b>	<b>A - excellent.</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>	

The thesis is written with attention to every important detail. It is aesthetically pleasing and uses the recommended LaTeX template. It is written in clear and understandable English, conforming to standard notations and other formal requirements

### **Selection of sources, citation correctness**

**A - excellent.**

*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?*

Jan skillfully collected and studied a vast array of internet and literature resources. Through this ongoing process, he was steadily discovering the field's newest and most sophisticated papers. Notably, he maintained deep attention to detail, ensuring all statements were properly referenced in accordance with ethical citation practices. His citations adhere to the standard format.

### **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.*

Jan has been a valuable member of our department team for over three years. During his tenure, he has contributed to several projects. Notably, Jan was part of the highly successful team that competed in the Alexa Prize. Additionally, he is a co-author of scientific papers describing the social bot Alquist developed by our department.

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

Jan's thesis is one of the first of its kind in this new attractive field combining the text and image processing. It is a significant contribution to the field. It provides a comprehensive overview of the current state of the art of the text-image AI and presents selected implementation along with accuracy tests. Congratulations!!

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

Date: **7.6.2024**

Signature: