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- 1st year of PhD
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## Introduction

Doctoral dissertation is in the field of computer science in the branch of artificial intelligence (AI). The research area is related to the field of human interaction with systems based on artificial intelligence.

## Research Question

"How can different forms of interaction affect the behavior of AI based systems?"

## Methodology

The research will investigate various methods of interaction, including direct and indirect interaction, feedback loop mechanisms, assistive interactions, collaborative methods, etc. Furthermore, the research will explore diverse large language model (LLM) prompting techniques such as Zero-Shot prompting, Chain-of-Thought (CoT), Retrieval Augmented Generation (RAG), Multimodal CoT, etc.

These approaches will be systematically tested and analyzed to assess their impact on AI system performance, efficiency, and user satisfaction. Experimental designs will include controlled environments where different interaction forms and prompting techniques are applied to identical tasks, allowing for a comparative analysis of their effects.

## Related work

M. McTear, M. Ashurkina, Transforming Conversational AI: Exploring the Power of Large Language Models in Interactive Conversational Agents, Apress Berkeley, CA, 2024

F. Fui-Hoon Nah, R. Zheng, J. Cai, K. Siau i L. Chen, Generative AI and ChatGPT: Applications, challenges, and AI-human collaboration, Journal of Information Technology Case and Application, 2023.

Interaction Design Foundation - IxDF. "What is Human-AI Interaction (HAX)?" Interaction Design Foundation - IxDF. https://www.interaction-design.org/literature/topics/human-ai-interaction (accessed May. 30, 2024).

F. D. Davis, A. Granić, The Technology Acceptance Model: 30 Years of TAM (Human-computer interaction series), Springer Nature, 2024

A. Granić, Educational Technology Adoption: A systematic review. Education and Information Technologies 27, 9725–9744 (2022).

## Results So Far

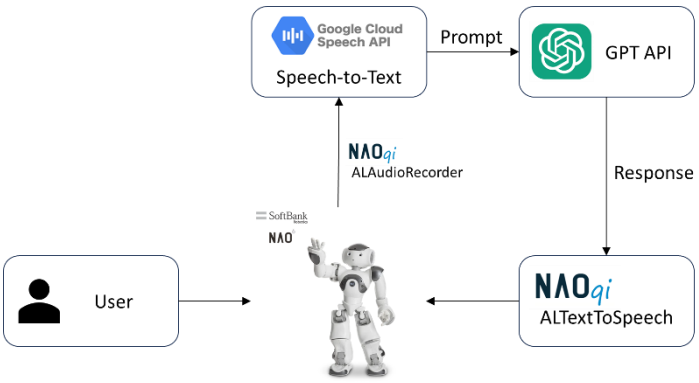
Publications:

D. Nejašmić, D. Sokol, S. Mladenović, A. Granić (2023) CHATGPT BASED TOOLS IN TEACHING AND LEARNING, ICERI2023 Proceedings, pp. 4288-4293.

Work in progress:

LLM Prompting Case Study: Interaction with the NAO Robot

This example represents an advanced form of interaction between humans and robots, where human speech is converted into text format to enable communication with AI. The text is used to create a prompt for GPT model which processes the prompt and returns an answer to robot which verbally responds to the user.

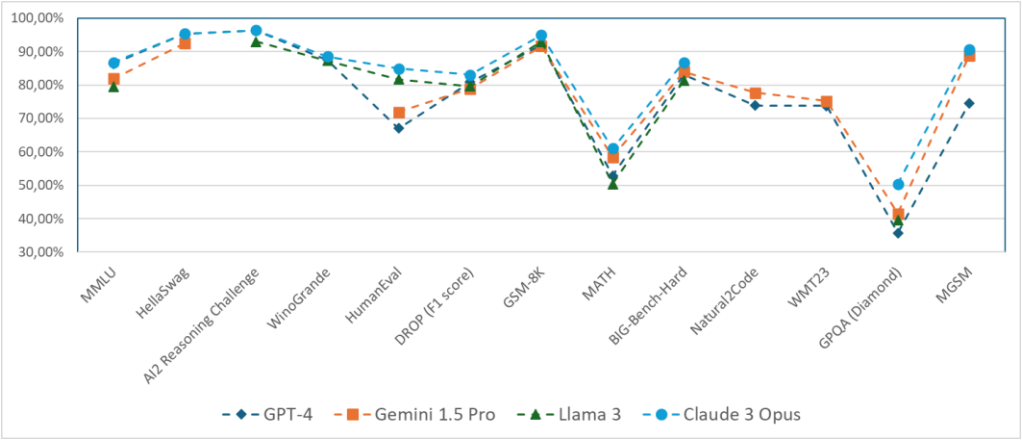



For successful interaction it is crucial to define contextual information that allows the model to understand the situation. This included providing basic information about the robot itself and its capabilities, as well as specific details related to the dialogue. To achieve more natural and relevant interaction, prompting techniques were used. That included using key words and phrases to get meaningful and contextually appropriate responses from model. Also, to ensure conversation efficiency, the response length of the model was limited.

After implementing the initial settings, a series of tests were conducted to assess the quality of the dialogue and identify areas for improvement. Based on these results, the context and prompt techniques were continuously adjusted to enhance the interaction. NAO robots were used in several workshops where students were taught about artificial intelligence.

Comparison of LLM performance

A meta-analysis has been conducted by synthesizing data from multiple sources, consolidating the performance metrics of LLMs into one table. The plot below shows the results for several most commonly used LLMs against the standard benchmarks. These tests are used to measure performance of LLM in solving different types of tasks from basic mathematics to complex reasoning.




## Open Questions

What are the implications of rapid advancements and the continuous emergence of new LLMs for someone currently writing a doctoral dissertation, especially considering the landscape might significantly evolve in the next couple of years?