Bachelor/Master Project

Large Language Model-based Intelligent Modeling Assistant for Conceptual Modeling

Term: Winter Term 2023/204

Language: English

Motivation

Large Language Models (LLMs) have recently received much attention. Language models provide a statistical representation of a particular language. LLMs are typically pre-trained on existing languages. The interaction with these models is typically unrestricted, i.e., it can receive any input string that may lead to a generation of any output string as a response. Chat-based systems, like ChatGPT, are therefore common to interact with LLMs. The generality of these language-model-based systems comes at a cost. It is often unclear why a particular response is given and the language models typically lack domain-specific linguistic information. For this purpose, LLMs are often enhanced either via prompting techniques or fine-tuning of the underlying model.

The generality of language, and therefore LLMs, also suggests a wide range potential application scenarios. One of these is to support the construction of conceptual models. That may concern various areas of concern, e.g., model repair, initial model creation, or model validation. Recently, many researchers have discussed the potentials of LLMs in the various areas of conceptual modeling.

Description

The aim of this project to develop an assistant for conceptual modeling that is based on LLMs. For this purpose, it is necessary to choose a particular focus on conceptual modeling activities that appears especially promising (e.g., model creation). It must be argued which LLMs is used for this purpose and how it can be applied to extract domain-specific and language-specific (with respect to the used modeling language) information. The scope of functionalities and covered modeling languages depends on the course of study and number of participants.

In summary, the range of tasks can include the following:

- Clarification of the concept LLM and options to add domain-specific information
- Selection or development of LLM to support conceptual modeling activities
- Prototypical development and evaluation of a conceptual modeling assistant that is based on LLMs

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Expected Outcomes

The scope of the expected outcome varies according to the number of students. In any case, the students are expected to produce a project report that discusses the various design choices and presents an evaluation of the final artifact. All source code that is being produced must be made available.

Introductory Literature

- Cámara J, Troya J, Burgueño L, Vallecillo A (2023) On the Assessment of Generative AI in Modeling Tasks: An Experience Report with ChatGPT and UML. *Software and Systems Modeling* 22(3):781–793
- Fill H-G, Fettke P, Köpke J (2023) Conceptual Modeling and Large Language Models: Impressions From First Experiments With ChatGPT. *Enterprise Modelling and Information Systems Architectures* 18(3):1–15
- Liu P, Yuan W, Fu J, Jiang Z, Hayashi H, Neubig G (2023) Pre-train, Prompt, and Predict: A Systematic Survey of Prompting Methods in Natural Language Processing. *ACM Computing Surveys* 55(9)
- Manning CD (2022) Human Language Understanding & Reasoning. *Daedalus* 151(2):127–138
- Montemayor C (2021) Language and Intelligence. *Minds and Machines* 31:471–486
- Wolfram S (2023) What Is ChatGPT Doing … and Why Does It Work? Wolfram Media. Also available at https://writings.stephenwolfram.com/2023/02/what-is-chatgpt-doing-and-why-does-it-work/

Application Procedure:

Please apply via email to the supervisor. Please attach a short letter of motivation (approximately 1/2 A4 page) and a recent performance record ('Leistungsnachweis'). You can apply individually or in a group of **2-6 participants** (in this case each person should still send a separate e-mail, however point to the other members of the group). The minimum and maximum number of group members depends on the pursued degree.

Application deadline: 31 October 2023, 23:59 h