Generating Safety Concepts with Large-Language-Models (Bachelor/Master)

In this project, we want to investigate the application of large-language models for generating whole safety concepts in industrial contexts. Nowadays, smart factories and Industry 4.0 and adaptive manufacturing sites are rapidly changing. However, this involves re-evaluation of the safety concepts every time something changes. To ease this expensive process, the possibilities of applying large-language-models (LLMs) should be explored as assistance in the design process. The research will be part of the project carried out between Pro2Future GmbH, TU Graz, and Siemens AG Österreich, giving students the opportunity to extend their knowledge by closely working with Siemens experts and being employed by Siemens as working students (Not Obligatory).

Image generated with AI (Copilot Designer)

Goal and Tasks:
- Getting familiar with Siemens hardware and software portfolio and simulation models (e.g., Fischer Lernfabrik)
- Getting familiar with fine-tuning and transfer learning of LLMs to the context of safety
- Developing safety concepts for using different simulation models of smart factories
- Specifying inputs and outputs for the methodologies.

Recommended Prior Knowledge:
- Experience or a high interest in learning Safety Concept development and Functional Safety, including HARA and FMEA analysis
- Experience or interest in working with automation technology e.g. PLCs and modules.
- Interest in working with simulation models of smart factories such as Fischer Lernfabrik
- Ideally, familiarity with Siemens equipment, PLC programming and the Siemens TIA portal.
- Basic programming skills, such as Python, C, or C++.
- Basic skill with AI/ML models and frameworks, e.g., Keras, PyTorch, TensorFlow, Scitkit-learn, XGBoost.
- Interest in language models, like GPT, and their applications.

Start: a.s.a.p.

Duration: 6-12 months

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