Workshop Generative and Neurosymbolic AI in Software Engineering (GenSE'2024)

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Abstract: The main goal of the workshop GenSE'24 is to discuss the newest developments in the area of generative artificial intelligence in the context of software engineering and their practical applications. In order to successfully apply generative AI methods in software engineering, it is particularly important to analyze and critically reflect on issues about the trustworthiness and robustness of this technology. To overcome these issues, one of the main topics of the workshop was selected to be neurosymbolic methods, i.e. methods that combine subsymbolic (machine learning) with symbolic approaches (e.g. knowledge representation and inference based on symbolic logic) to improve the reliability of generative AI methods.

Keywords: Generative artificial intelligence; Neurosymbolic AI; Software engineering

Generative methods are playing a pivotal role in the latest developments in AI, including, but not limited to, the release of ChatGPT and GPT-4 and the first appearances of state-of-the-art open source models like Llama-2. Most of the latest developments can be traced back to improvements in the transformer architecture. When such transformer models are trained with large corpora of text resulting in a very large number of parameters, we speak of large language models (LLMs). Even though the initial motivation for the transformer architecture was mostly in the field of machine translation, currently chatbots represent one of the most pervasive applications of LLMs. Not only do properly trained LLMs show an unprecedented fluency and effectivity in language-related tasks, but are even capable of generating largely correct computer code in programming languages like Python, Java or C++. This can be seen as one of the first applications of generative AI in software engineering.

One of the main downsides of LLMs is related to their reliability and trustworthiness. The main problem is that in purely subsymbolic transformers there is no guarantee about the correctness of the generated output (i.e. the output corresponds to true facts or the generated code is syntactically and semantically correct). In high-stakes applications like healthcare or finance this can have catastrophic consequences. Specifically, in software engineering using generative models can result in software bugs or security flaws. Currently several approaches to prevent these problems are being investigated, including evaluation frameworks, tool integration and causality. In general, the combination of deep learning approaches with symbolic learning and inference systems is referred to as neurosymbolic AI. This kind

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of approaches are promising, since they offer explicit methods for combining structured domain knowledge with logic systems allowing for improved explainability and reliability.

For these reasons, the goals of the workshop can be defined as follows:

1. Identify and discuss the current challenges of using generative AI in software engineering.

2. Propose and validate solutions to the previously mentioned risks and challenges.

Contributions from all areas of software engineering are welcome, especially those where generative AI-based methods have not been sufficiently explored yet. Practical approaches for integrating neurosymbolic methods are one of the special topics of the workshop. The intended audience of this workshop includes researchers and practitioners from academia and industry.

Program committee

The program committee of the workshop is a balanced group of experts in generative AI from academia and industry, representing both the theory and practice of this technology in software engineering:

- Wolfgang Beer, Product Manager, Dynatrace

- Pedro Casas, Senior Scientist, AIT Austrian Institute of Technology GmbH

- Andreas Falkner, Senior Scientist, Siemens AG Österreich

- Alessio Gambi, Senior Lecturer, IMC Krems University of Applied Sciences

- Alois Haselböck, Senior Scientist, Siemens AG Österreich

- Josiane Xavier Parreira, Senior Scientist, Siemens AG Österreich

- Sarita Paudel, Senior Lecturer, IMC Krems University of Applied Sciences

- Rubén Ruiz-Torrubiano, Senior Lecturer, IMC Krems University of Applied Sciences

- Konstantin Schekotihin, Assoc. Professor, Universität Klagenfurt

- Danilo Valerio, Senior Scientist, Siemens AG Österreich