Thesis topic: LLM-powered Requirements Engineering: from use case specifications to development tasks and test cases

In modern software engineering, ensuring that user requirements are efficiently translated into clear use cases, robust test cases and actionable development tasks is crucial for a successful project. However, this process often involves repetitive manual effort, which can lead to inconsistencies and errors. This thesis involves the design and development of a custom LLM-based tool to assist in generating and aligning these key Software Engineering artifacts.

Objectives and Deliverables:

This project aims to develop a custom LLM-based tool that automates a core part of the requirements engineering process. Specifically, the tool will:

- Generate detailed **use case specifications** based on a published use-case grammar.
- Automatically generate **test cases** from the use case specifications, ensuring coverage for main, alternate, and exception flows.
- Translate the use case specifications into actionable development **tasks** for integration with project management tools, such as Jira.

Potential Extensions

For a more advanced project (e.g., a master's thesis), the scope could be expanded to include one of the following challenges:

- **UML Diagram Generation:** Investigate the generation of text-based UML code (e.g., for PlantUML) to create visual models like use case or sequence diagrams from the specifications.
- **Dynamic Synchronization:** Explore mechanisms for dynamically updating development tasks (e.g., Jira tasks) and other artifacts when the source use case specifications are modified.

Note on Scope

The project's scope is flexible and can be scaled according to the level of studies (bachelor's or master's).

References

[1] Georgiades, M. (2025). An EBNF-Based Grammar for Use Case Specification. In: Marcinkowski, B., *et al.* Advances in Information Systems Development. Lecture Notes in Information Systems and Organisation, vol 77. Springer, Cham. https://doi.org/10.1007/978-3-031-87880-0_13

[2] Georgiades, M. (2024). A Use Case Grammar for Requirements Specification. In B. Marcinkowski, A. Przybylek, A. Jarzębowicz, N. Iivari, E. Insfran, M. Lang, H. Linger, & C. Schneider (Eds.), Harnessing Opportunities: Reshaping ISD in the post-COVID-19 and Generative AI Era (ISD2024 Proceedings). Gdańsk, Poland: University of Gdańsk. ISBN: 978-83-972632-0-8. https://doi.org/10.62036/ISD.2024.7

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