AI as a Teacher's Assistant

Graduate

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Introduction: The digital transformation of higher education has led to a significant shift in teaching methods, with blended learning emerging as a favored approach. In this paradigm, traditional face-to-face teaching is combined with online learning, resulting in the well-known inverted classrooms. In this setting, students begin with self-study, supported by multimedia materials, followed by interactive face-to-face sessions.

However, experience shows that students may struggle with self-study, highlighting the need for AI-supported learning assistants. These assistants should provide students with personalized guidance, feedback, and assessment, adapting to their individual needs and learning styles. By leveraging AI, primarily large language models (LLMs), these assistants can help students progress towards competency in an efficient and effective manner.

Approach: Three state-of-the-art LLMs (GPT-3.5, GPT-4 and Mixtral-8x7B) are evaluated on three subtasks based on lecture notes about political rights in Switzerland:

- Generating questions
- Evaluating answers
- Providing feedback on the current study level

The models are fine-tuned and the quality of their outputs were compared to their non-fine-tuned equivalents.

A prototype application for a chat bot that supports multiple languages, model selection from a graphical user interface and an approach that combines chat history and RAG is built. Model access is wrapped under an abstracted class, allowing extensibility and enabling rapid integration of new models. Administrators assign documents and system prompts to individual chat bots, giving them granular control over their behavior and available information. The documents get embedded with a locally hosted Multilingual-E5-base instance.

Result: Our work has shown that while there is potential in using LLMs as assistants for pre-study. It was shown that existing chat models can work well on text-based lecture scripts out of the box. However, they could not interpret lecture scripts using images and text. The vast range of possible user inputs in this case makes finetuning challenging, as it would require an enormous amount of specific training data. Given that the non-finetuned versions already perform well, finetuning with few datapoints actually worsened the overall quality of the output.
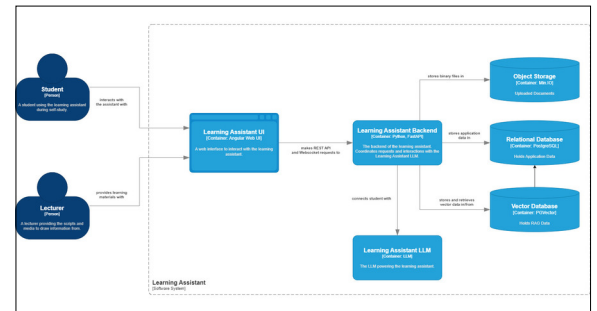
The prototype serves as a blueprint for history-aware and RAG-enabled chat bot applications. When provided with a locally hosted Mixtral-8x7B instance, the entire RAG process can be done locally. This gives its users control over the use of their data and ensures that classified information can be used to enhance the chat bots.

In its current form, the prototype is primarily limited by its resource consumption and therefore scalability concerns.
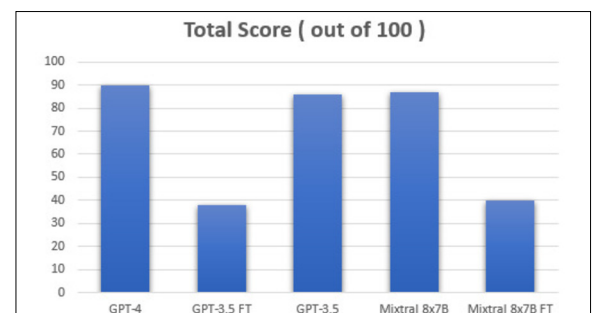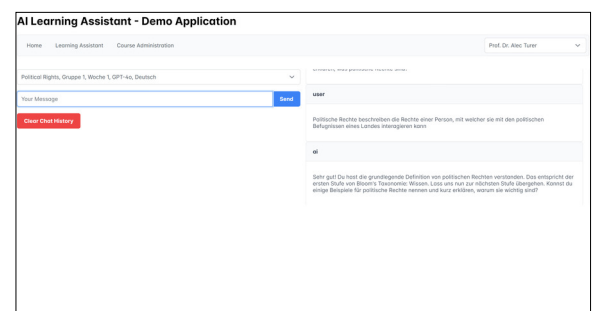
Container diagram of the prototype
Own presentment

Score of each model in our evaluation (FT = fine tuned)
Own presentment

The prototype application, showcasing a user-AI interaction
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Subject Area
Artificial Intelligence