Beyond Interpolation: Enhancing Large Language Models (LLMs) with Mental Models

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Abstract

Large Language Models (LLMs) demonstrate high performance across various tasks, yet they struggle with those requiring complex comprehension and reasoning. LLMs are not solely reliant on memorization: responses can be generated to novel prompts by interpolating between learned data points in a continuous vector space. However, they exhibit limitations in their inherent reasoning capabilities. Despite efforts to enhance their reasoning abilities, such as Chain-of-Thought prompting and test-time inference techniques, LLMs still face challenges in this domain. In contrast, humans utilize mental models—internal representations of situations and concepts—to adapt and solve novel situations. Integrating external modules that emulate the construction and utilization of mental models could offer a promising avenue for enhancing the reasoning abilities of LLMs. This approach could bridge the gap between current LLM capabilities and human-like reasoning, potentially leading to more robust and reliable LLMs.

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