



Diversity Track: MathMentor: A System for Navigating Concepts and Strategies in Math Problem Solving and Learning with Large Language Models

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Abstract: Tutoring has been found effective in helping students struggling academically or otherwise, and new technological innovations have been used to address various challenges in tutoring (e.g., matching, scheduling). Recent breakthroughs in Large Language Models (LLMs) offer new ways to support tutoring services. While LLM-based tools like ChatGPT and Bing Chat have emerged as powerful tools in language understanding, coding, reasoning, etc., the potential of LLMs in educational contexts, especially in STEM education, are yet to be fully realized. There is a gap in understanding how these models can be effectively integrated into learning tools to provide meaningful and tailored support to students, helping them navigate the complexities of problem-solving in STEM. As a pilot study, this research proposes MathMentor, an AI-based math tutoring system empowered by large language models. Drawing insights from cognitive theories on problem-solving and theories on STEM education, MathMentor aims to leverage the language and reasoning capabilities of LLMs to provide step-by-step guidance in problem-solving, identify and address common misconceptions (blind points), and offer personalized explanations of mathematical concepts in real-time. Through this, the system intends to enhance the problem-solving skills and conceptual understanding of college students, making mathematics more accessible and less daunting. We will also conduct a thorough evaluation of the system to gain deeper insights into the efficacy of LLMs in aiding students with math concept learning and problem-solving.