CoRe: Cognitive Reasoning Framework for Zero-Shot Table Understanding and Reasoning

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Abstract

While Large Language Models (LLMs) have demonstrated remarkable capabilities in natural language understanding, they still struggle with reasoning over table-based structured data, particularly in zero-shot settings. Tasks like question answering (QA), SQL generation, and numerical reasoning often fail due to insufficient task-specific training. To address these challenges, we propose CoRe (Cognitive Reasoning Framework for Structured Data), inspired by cognitive science principles of hierarchical and iterative reasoning. CoRe structures reasoning into multiple stages, allowing LLMs to better navigate the intricacies of table-based data. Evaluations using advanced LLMs, including Qwen-Plus, GPT-4o mini, and GLM-4-Plus, on datasets like HybridQA, BIRD, and DocMath-Eval show consistent performance improvements. CoRe outperforms zero-shot state-of-the-art (SOTA) on HybridQA and BIRD by 11.4% and 1.8% in Exact Match (EM) respectively, and achieves the best accuracy on DocMath-Eval's complong subset with 37.0%, approaching RAG-based SOTA. These results highlight CoRe's effectiveness as a robust framework for zero-shot reasoning over structured data.

In D. Barner, N.R. Bramley, A. Ruggeri and C.M. Walker (Eds.), *Proceedings of the 47th Annual Conference of the Cognitive Science Society*