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Abstract: Large Language Models (LLMs) are making a big impact in Artificial Intelligence due to their ability to perform tasks as humans. However, using LLMs in many domain-specific tasks is a relatively unexplored area, specifically in disease diagnosis. This is due to challenges such as multiple modalities in patient clinical information and LLM's high memory and computational power requirements. This study proposes a framework, XLR-KGDD, that overcomes these challenges and performs an LLM-based disease diagnosis. Additionally, XLR-KGDD generates explanations to establish the trust of clinicians and support the diagnosis. These explanations are precise and unambiguous as they adhere to the standard medical guidelines and are presented in natural language. The proposed framework maps multimodal patient clinical information to a patient Knowledge Graph (KG) using the N2K mapper and CheXzero. Prompt Engineering is then applied to create an LLM-compatible input prompt from the patient KG. The framework employs a Parameter Efficient Fine-tuning technique to fine-tune LLM efficiently by optimizing numerical computations and memory requirements. The framework uses Retrieval Augmented Generation to provide standard medical guidelines as context to the LLM, addressing the issue of hallucinations in LLMs and generating coherent explanations. A system based on the XLR-KGDD framework was developed and tested on the multimodal MIMIC-Eye dataset. The LLaMA-3 LLM shows an AUC value of 0.88 and 0.91 in ROC and PR curves, respectively, in diagnosing patients with CHF disease. Furthermore, the system-generated explanations support the diagnosis with evidence from medical guidelines.
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