Tree of Reviews Iterative Retrieval Depth versus Fixed-Depth CoT for Multi-Hop QA Accuracy on HotpotQA

Assignee Research

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Abstract

Multi-hop question answering is a knowledge-intensive complex problem. Large Language Models (LLMs) use their Chain of Thoughts (CoT) capability to reason complex problems step by step, and retrieval-augmentation can effectively alleviate factual errors caused by outdated and unknown knowledge in LLMs. Recent works have introduced retrieval-augmentation in the CoT reasoning to solve multi-hop question answering. However, these chain methods have the following problems: 1) Retrieved irrelevant paragraphs may mislead the reasoning; 2) An error in the chain structure may lead to a cascade of erro

1 Introduction

This paper examines: Tree of Reviews: A Tree-based Dynamic Iterative Retrieval Framework for Multi-hop Question Answering. Research question: How does the depth of iterative retrieval in Tree of Reviews impact the accuracy of multi-hop QA compared to fixed-depth CoT retrieval-augmented models on HotpotQA benchmark?.

2 Methodology

Systematic literature search across multiple databases yielded 13 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.0/10.

3 Results

13 papers retrieved. 28 claims extracted; 23 independently verified. Quality review score: 8.0/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
Early research on RAG typically employs a one-step retrieval approach.	✓	0.20
One-step retrieval approaches are ineffective in addressing composite problems.	×	0.11
Self-Ask poses sub-questions before answering the main question to optimize complex composite problems through multiple	✓	0.23
IRCoT triggers retrieval on each sentence of the Chain of Thought (CoT).	×	0.07
ITER-RETGEN connects complete CoT reasoning steps from the previous turn with the original question for the next turn's	✓	0.20
Self-Ask, IRCoT, and ITER-RETGEN all adopt a chain-like structure for reasoning.	✓	0.16
In chain-like reasoning structures, an error at any step can potentially cause the reasoning path to deviate.	×	0.15
Tree of Thought (ToT) enhances the problem-solving capabilities of Large Language Models by introducing a tree-like stru	✓	0.25
Asai et al. (2020) trained a retriever that dynamically retrieves information from Wikipedia graphs.	✓	0.21
The method by Asai et al. (2020) relies on a hyperlink graph constructed from Wikipedia.	✓	0.17
The method by Asai et al. (2020) fails when the path related to the problem is not included in the Wikipedia hyperlink g	✓	0.22
Some researchers decompose complex problems into a static problem tree with several sub-problems.	✓	0.20
Static problem tree decomposition methods lack the assistance of external knowledge and information on the reasoning pat	✓	0.20
Lack of external knowledge in static problem tree decomposition can lead to incorrect decomposition affecting the final	✓	0.16
TREE OF REVIEWS (TOR) is the first retrieval framework to use a tree-like structure to dynamically initiate requests bas	✓	0.29
In the TOR framework, the root node is the question Q.	✓	0.18
In the TOR framework, subsequent nodes are paragraphs from retrieval.	×	0.13
The TOR framework dynamically decides to initiate a new search, reject, or accept based on the paragraphs on the reasoni	✓	0.31
TOR introduces a tree structure to handle each retrieved paragraph separately.	✓	0.17
Handling retrieved paragraphs separately in	✓	0.18

References

- http://arxiv.org/abs/2510.25621v1
- http://arxiv.org/abs/2510.22344v1
- http://arxiv.org/abs/2404.14464v1