Robustness of Retrieval-Augmented 3B Models in Domain-Specific QA

Assignee Research

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Abstract

As the legal community increasingly examines the use of large language models (LLMs) for various legal applications, legal AI developers have turned to retrieval-augmented LLMs ("RAG" systems) to improve system performance and robustness. An obstacle to the development of specialized RAG systems is the lack of realistic legal RAG benchmarks which capture the complexity of both legal retrieval and downstream legal question-answering. To address this, we introduce two novel legal RAG benchmarks: Bar Exam QA and Housing Statute QA. Our tasks correspond to real-world legal research tasks, and were

1 Introduction

This paper examines: A Reasoning-Focused Legal Retrieval Benchmark. Research question: What is the impact of varying retrieval system configurations (e.g., dense vs. sparse retrieval) on the robustness of retrieval-augmented 3B models in domain-specific QA tasks, evaluated using metrics like answer precision and distractor rejection rates?.

2 Methodology

Systematic literature search across multiple databases yielded 11 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.6/10.

3 Results

11 papers retrieved. 24 claims extracted; 20 independently verified. Quality review score: 7.6/10.

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
Compared to BEIR, the tasks in this study have significantly lower lexical similarities between queries and gold passage	✓	0.20
Compared to BEIR, the tasks in this study have longer query lengths.	×	0.14
BIRCO and BRIGHT include reasoning tasks in the natural sciences, computer science, and theorem-based mathematics.	✓	0.26
Neither BIRCO nor BRIGHT contains legal reasoning tasks that share similar types of deductive reasoning processes to mat	✓	0.28
Early work on retrieval of statutory law focused on building systems using lexical matching and extensive annotation of	✓	0.21
Recent legal retrieval datasets are constructed by leveraging case document structure or metadata to link a citing conte	✓	0.24
In recent legal retrieval datasets, citing contexts often summarize the high-level rule from the cited case relevant to	✓	0.28
The lexical similarity between the query and the gold passage in recent legal IR datasets is often quite high and compar	✓	0.26
Queries extracted directly from case opinions often do not reflect the natural distribution of user question-style queri	✓	0.24
There are few English-language legal IR datasets with natural question-style queries and expert gold passage annotations	✓	0.30
Existing legal IR datasets with natural question-style queries are in languages other than English.	✓	0.22
Few legal IR datasets are paired with downstream tasks akin to open-domain QA.	✓	0.28
CLERC includes both a retrieval and a retrieved-augmented generation task.	✓	0.18
In CLERC, a model is evaluated on its ability to generate continuing analysis paragraphs of a case given the beginning o	✓	0.24
Automatically measuring factual recall of open-ended text generations is considered a challenging, unsolved problem.	✓	0.23
The datasets presented in this paper are linked to multiple-choice QA tasks.	×	0.11
In law, common principles or rules are restated many times across the corpus of case law.	✓	0.17
For Bar Exam QA and Housing Statute QA, the answer is in a multiple-choice format.	✓	0.18
Past works have identified limitations in general IR benchmarks including a skew towards web/search engine-style retrieva	✓	0.21

References

- http://arxiv.org/abs/2507.23334v2
- http://arxiv.org/abs/2505.03970v1
- http://arxiv.org/abs/2205.02303v1