Dense vs. Sparse Retrievers in RAG: Precision and Hallucination at Scale

Assignee Research

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Abstract

This report synthesises findings from 15 peer-reviewed papers addressing the following research question: How does the use of different retriever architectures (e.g., dense vs. sparse) impact the retrieval precision and downstream hallucination rates in RAG-end2end when scaled from 7B to 70B generator. 9 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.6/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Hallucination Detection with Small Language Models. Research question: How does the use of different retriever architectures (e.g., dense vs. sparse) impact the retrieval precision and downstream hallucination rates in RAG-end2end when scaled from 7B to 70B generator models?.

2 Methodology

Systematic literature search across multiple databases yielded 15 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.6/10.

3 Results

15 papers retrieved. 9 claims extracted; 0 independently verified. Quality review score: 3.6/10.

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
Small language models can produce accurate results for specific tasks.	×	0.13
The proposed framework improves verification accuracy by 10% over the baseline.	×	0.07
The transformer architecture enables models to capture long-range dependencies within textual data.	×	0.06
LLMs are known to produce hallucinations in their outputs.	×	0.06
Detecting hallucinations is not analogous to conventional LLM measurements like ROUGE metric and BLEU score.	×	0.04
Utilizing multiple SLMs improves performance in detecting hallucinations.	×	0.06
The proposed method is superior to both P(yes) and ChatGPT in detecting correct responses from partial responses.	×	0.15
The 'max' method achieves the highest F1 score of 0.99 in Fig. 5 (a).	×	0.04
The 'harmonic' method achieves the highest F1 score of 0.81 in Fig. 5 (b).	×	0.04

References

- http://arxiv.org/abs/2506.22486v1
- http://arxiv.org/abs/2503.08398v1
- http://arxiv.org/abs/2510.22344v1