Multimodal Frontier Models Outperform Text-Only Architectures in Visual-Text Scientific Reasoning

Assignee Research

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Abstract

This report synthesises findings from 16 peer-reviewed papers addressing the following research question: How do multimodal frontier models perform on reasoning benchmarks that require integrating visual diagrams with text-based scientific questions compared to text-only architectures. 7 claims were extracted from source literature; 7 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.8/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Gemini 1.5: Unlocking multimodal understanding across millions of tokens of context. Research question: How do multimodal frontier models perform on reasoning benchmarks that require integrating visual diagrams with text-based scientific questions compared to text-only architectures?.

2 Methodology

Systematic literature search across multiple databases yielded 16 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.8/10.

3 Results

16 papers retrieved. 7 claims extracted; 7 independently verified. Quality review score: 8.8/10.

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
Gemini 1.5 models achieve near-perfect recall on long-context retrieval tasks across modalities.	✓	0.32
Gemini 1.5 models improve the state-of-the-art in long-document QA, long-video QA, and long-context ASR.	✓	0.33
Gemini 1.5 models match or surpass Gemini 1.0 Ultra's state-of-the-art performance across a broad set of benchmarks.	✓	0.26
Gemini 1.5 models show continued improvement in next-token prediction and near-perfect retrieval (>99%) up to at least 1	✓	0.28
Gemini 1.5 models represent a generational leap over existing models such as Claude 3.0 (200k) and GPT-4 Turbo (128k).	✓	0.22
Gemini 1.5 collaborating with professionals on completing their tasks achieves 26 to 75% time savings across 10 differen	✓	0.26
Gemini 1.5 models can understand and process a grammar manual for Kalamang, a language with fewer than 200 speakers worl	✓	0.20

References

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- https://doi.org/10.1186/s40537-021-00444-8
- https://doi.org/10.48550/arxiv.2403.05530