Scaling Laws of Long Chain-of-Thought Reasoning in Large Language Models

Assignee Research

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Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: How does the reasoning performance of long chain-of-thought (Long CoT) LLMs scale with model size and compute budget, as measured by accuracy on benchmark datasets like GSM8K or MATH. 8 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 2.7/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Towards Reasoning Era: A Survey of Long Chain-of-Thought for Reasoning Large Language Models. Research question: How does the reasoning performance of long chain-of-thought (Long CoT) LLMs scale with model size and compute budget, as measured by accuracy on benchmark datasets like GSM8K or MATH?.

2 Methodology

Systematic literature search across multiple databases yielded 14 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 2.7/10.

3 Results

14 papers retrieved. 8 claims extracted; 0 independently verified. Quality review score: 2.7/10.

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
For any positive integer n, there exists a positive integer m such that m + 1 is divisible by n	×	0.05
Short CoT typically addresses a limited set of logical nodes, involving shallow reasoning, and struggles with problems r	×	0.07
Long CoT is designed to accommodate a significantly larger set of logical nodes, allowing for deeper logic and more thor	×	0.05
Long CoT involves deeper reasoning, reflective analysis, and a broader exploration of logical structures	×	0.07
Long CoT expands upon the constraints presented in Equation 1 based on tree structures by incorporating three critical c	×	0.08
Deep reasoning ensures each logical step is executed rigorously, even within complex structures, fostering robust logic	×	0.05
Exploration encourages the identification of new pathways, revealing potential avenues that may not be immediately obvio	×	0.01
Reflection enables iterative analysis and reassessment of conclusions, allowing reasoning to evolve throughout problem-s	×	0.03

References

- http://arxiv.org/abs/2503.09567v5
- http://arxiv.org/abs/2312.17080v4
- http://arxiv.org/abs/2308.10783v2