Impact of Multi-head Latent Attention on Perplexity and Retrieval Accuracy in LongBench

Assignee Research

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Abstract

We present DeepSeek-V3, a strong Mixture-of-Experts (MoE) language model with 671B total parameters with 37B activated for each token. To achieve efficient inference and cost-effective training, DeepSeek-V3 adopts Multi-head Latent Attention (MLA) and DeepSeekMoE architectures, which were thoroughly validated in DeepSeek-V2. Furthermore, DeepSeek-V3 pioneers an auxiliary-loss-free strategy for load balancing and sets a multi-token prediction training objective for stronger performance. We pre-train DeepSeek-V3 on 14.8 trillion diverse and high-quality tokens, followed by Supervised Fine-Tuning

1 Introduction

This paper examines: DeepSeek-V3 Technical Report. Research question: How does the Multi-head Latent Attention (MLA) mechanism in DeepSeek-V3 impact perplexity and retrieval accuracy on the LongBench dataset compared to standard dense attention for contexts exceeding 32k tokens?.

2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.2/10.

3 Results

12 papers retrieved. 15 claims extracted; 10 independently verified. Quality review score: 7.2/10.

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
DeepSeek-V3 is a Mixture-of-Experts (MoE) language model.	✓	0.19
DeepSeek-V3 has 671 billion total parameters.	×	0.10
DeepSeek-V3 activates 37 billion parameters for each token.	×	0.07
DeepSeek-V3 adopts Multi-head Latent Attention (MLA) architecture.	✓	0.23
DeepSeek-V3 adopts DeepSeekMoE architecture.	×	0.12
DeepSeek-V3 uses an auxiliary-loss-free strategy for load balancing.	✓	0.21
DeepSeek-V3 sets a multi-token prediction training objective.	✓	0.25
DeepSeek-V3 was pre-trained on 14.8 trillion tokens.	×	0.12
DeepSeek-V3 underwent Supervised Fine-Tuning and Reinforcement Learning stages after pre-training.	✓	0.22
DeepSeek-V3 outperforms other open-source models in comprehensive evaluations.	✓	0.24
DeepSeek-V3 achieves performance comparable to leading closed-source models.	✓	0.26
DeepSeek-V3 required 2.788 million H800 GPU hours for its full training.	×	0.15
The DeepSeek-V3 training process experienced no irrecoverable loss spikes.	✓	0.20
The DeepSeek-V3 training process required no rollbacks.	✓	0.16
DeepSeek-V3 model checkpoints are available at https://github.com/deepseek-ai/DeepSeek-V3.	✓	0.27

References

- https://doi.org/10.48550/arxiv.2412.19437
- https://doi.org/10.48550/arxiv.2412.19442
- https://doi.org/10.48550/arxiv.2409.05591