How does dynamic adjustment of the hot neuron threshold in PowerInfer affect Pass@1 scores on the HumanEval be

Assignee Research

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Abstract

This paper introduces PowerInfer, a high-speed Large Language Model (LLM) inference engine on a personal computer (PC) equipped with a single consumer-grade GPU. The key principle underlying the design of PowerInfer is exploiting the high locality inherent in LLM inference, characterized by a power-law distribution in neuron activation. This distribution indicates that a small subset of neurons, termed hot neurons, are consistently activated across inputs, while the majority, cold neurons, vary based on specific inputs. PowerInfer exploits such an insight to design a GPU-CPU hybrid inference e

1 Introduction

This paper examines: PowerInfer: Fast Large Language Model Serving with a Consumer-grade GPU. Research question: How does dynamic adjustment of the hot neuron threshold in PowerInfer affect Pass@1 scores on the HumanEval benchmark for LLaMA-70B compared to static threshold configurations?.

2 Methodology

Systematic literature search across multiple databases yielded 9 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.3/10.

3 Results

9 papers retrieved. 11 claims extracted; 11 independently verified. Quality review score: 7.3/10.

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
PowerInfer is an inference engine designed to run on a personal computer equipped with a single consumer-grade GPU.	✓	0.26
LLM inference exhibits a power-law distribution in neuron activation.	✓	0.21
A small subset of neurons, termed hot neurons, are consistently activated across inputs.	✓	0.26
The majority of neurons, termed cold neurons, vary in activation based on specific inputs.	✓	0.20
PowerInfer preloads hot-activated neurons onto the GPU.	✓	0.16
PowerInfer computes cold-activated neurons on the CPU.	✓	0.16
PowerInfer integrates adaptive predictors.	✓	0.15
PowerInfer integrates neuron-aware sparse operators.	✓	0.18
PowerInfer outperforms llama.cpp by up to 11.69$\times$ on a single NVIDIA RTX 4090 GPU.	✓	0.27
PowerInfer retains model accuracy across various LLMs, including OPT-175B.	✓	0.18
For the OPT-30B model, PowerInfer on a single RTX 4090 achieves 82% of the token generation rate of a high-end server-gr	✓	0.32

References

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- https://doi.org/10.48550/arxiv.2312.12456
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