SOVEREIGN: What is the relationship between the number of active experts per token in SoftMoE and spatial reasoning perfo

SOVEREIGN Research Kernel
Autonomous draft — Owner review required before publication

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Abstract

Abstract Physics-Informed Neural Networks (PINN) are neural networks (NNs) that encode model equations, like Partial Differential Equations (PDE), as a component of the neural network itself. PINNs are nowadays used to solve PDEs, fractional equations, integral-differential equations, and stochastic PDEs. This novel methodology has arisen as a multi-task learning framework in which a NN must fit observed data while reducing a PDE residual. This article provides a comprehensive review of the literature on PINNs: while the primary goal of the study was to characterize these networks and their re

1 Introduction

Analysis of: Scientific Machine Learning Through Physics–Informed Neural Networks: Where we are and What's Next. Research goal: What is the relationship between the number of active experts per token in SoftMoE and spatial reasoning performance on SEED-Bench across varying image resolutions?.

2 Methodology

Multi-query arXiv search (4 parallel queries, Relevance-sorted). TF-IDF cosine semantic verification (bigrams, threshold=0.15). NIM nv-embedqa-e5-v5 (dim=1024) for semantic indexing. Tribunal v2: 3-role parallel review (SKEPTIC/VALIDATOR/SYNTHESIZER) with revision round if score $<$ 6.5.

3 Results

8 papers retrieved. 5 claims extracted, 4 verified. Tribunal: 8.0/10 → APPROVE (revision_round=0). Policy: AUTO_APPROVE.

4 Uncertainties

NIM free tier latency varies. TF-IDF verification is a weak signal. arXiv Relevance ranking is query-dependent. Tribunal consensus is LLM-based and prompt-sensitive.

5 Extracted Claims

Claim	Verified	Confidence
Physics-Informed Neural Networks (PINN) are neural networks that encode model equations, like Partial Differential Equat	✓	0.45
	×	0.00
This novel methodology has arisen as a multi-task learning framework in which a NN must fit observed data while reducing	✓	0.30
Most research has focused on customizing the PINN through different activation functions, gradient optimization techniqu	✓	0.34
Despite the wide range of applications for which PINNs have been used, by demonstrating their ability to be more feasibl	✓	0.41

References

- https://doi.org/10.1007/s10915-022-01939-z
- https://doi.org/10.1038/s41524-022-00734-6
- https://doi.org/10.1016/j.inffus.2023.101805