

SOVEREIGN: To what extent does expert capacity imbalance in multimodal LLMs correlate with per-class F1 score variance on

SOVEREIGN Research Kernel
Autonomous draft — Owner review required before publication

May 28, 2026

Abstract

Unlike previous studies on the Metaverse based on Second Life, the current Metaverse is based on the social value of Generation Z that online and offline selves are not different. With the technological development of deep learning-based high-precision recognition models and natural generation models, Metaverse is being strengthened with various factors, from mobile-based always-on access to connectivity with reality using virtual currency. The integration of enhanced social activities and neural-net methods requires a new definition of Metaverse suitable for the present, different from the pr

1 Introduction

Analysis of: A Metaverse: Taxonomy, Components, Applications, and Open Challenges. Research goal: To what extent does expert capacity imbalance in multimodal LLMs correlate with per-class F1 score variance on out-of-distribution benchmarks like ImageNet-V2 vs. ImageNet-R?.

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

11 papers retrieved. 5 claims extracted, 5 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
The current Metaverse is based on the social value of Generation Z that online and offline selves are not different	✓	0.32
Previous studies on the Metaverse were based on Second Life	✓	0.26
The integration of enhanced social activities and neural-net methods requires a new definition of Metaverse suitable for	✓	0.37
Metaverse concepts and essential techniques can be divided into three components (hardware, software, and contents) and	✓	0.29
The paper analyzes essential methods based on three components and techniques to Metaverse through representative exampl	✓	0.25

References

- <https://doi.org/10.3390/bioengineering11101034>
- <https://doi.org/10.1016/j.inffus.2023.101805>
- <https://doi.org/10.1109/access.2021.3140175>