Contrastive Loss Formulations and Scaling Laws in Noisy Multimodal Foundation Models

Assignee Research

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Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: How do different contrastive loss formulations affect the scaling laws and sample efficiency of foundation models when pretrained on noisy, unlabeled multimodal datasets. 11 claims were extracted from source literature; 1 was independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.7/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Robust Tabular Foundation Models. Research question: How do different contrastive loss formulations affect the scaling laws and sample efficiency of foundation models when pretrained on noisy, unlabeled multimodal datasets?.

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 3.7/10.

3 Results

14 papers retrieved. 11 claims extracted; 1 independently verified. Quality review score: 3.7/10.

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
Tabular foundation models (TFMs) have emerged as a promising direction for classification and regression tasks with stru	✓	0.15
TFMs rely on in-context learning (ICL).	×	0.03
TFMs can provide high-quality predictions on new datasets in milliseconds when GPU-accelerated.	×	0.07
TFMs are pretrained using synthetic data generated from structural causal models (SCMs).	×	0.11
Current publicly available, competitive TFMs have been pretrained on datasets generated from a fixed prior distribution	×	0.05
Fixed priors underrepresent certain regions of the parameter space, potentially degrading performance on real-world data	×	0.03
State-of-the-art TFMs still lag behind tree-based methods on some benchmarks.	×	0.06
The work introduces an optimality gap concept to target regions where the TFM underperforms relative to the best achieva	×	0.10
The proposed RTFM algorithm can significantly improve the ranking of TabPFN on several real-world tabular benchmarks wit	×	0.09
The black-box optimization algorithm is used to efficiently search the parameter space for parameters with large optimal	×	0.05
For nds = 20 and e = 7, the estimated optimality gap b$\delta$$\theta$i can be computed in a matter of seconds when parallelized, give	×	0.04

References

- http://arxiv.org/abs/2502.06733v1
- http://arxiv.org/abs/2512.03307v1
- http://arxiv.org/abs/2411.15127v3