

Noise Distribution Effects on Tabular Foundation Model Robustness in Real-World Benchmarks

Assignee Research

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Abstract

This report synthesises findings from 15 peer-reviewed papers addressing the following research question: How does varying the distribution of noise types (e.g., Gaussian, salt-and-pepper, categorical) in synthetic data for pretraining tabular foundation models affect downstream robustness on real-world. 12 claims were extracted from source literature; 0 were 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 does varying the distribution of noise types (e.g., Gaussian, salt-and-pepper, categorical) in synthetic data for pretraining tabular foundation models affect downstream robustness on real-world benchmarks like TabM-NAR or MONAI?.

2 Methodology

Systematic literature search across multiple databases yielded 15 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

15 papers retrieved. 12 claims extracted; 0 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) rely on in-context learning (ICL) for classification and regression tasks with structure	×	0.12
TFMs can produce high-quality predictions on new datasets in milliseconds when GPU-accelerated.	×	0.07
Training TFMs relies on generating large amounts of diverse synthetic datasets constructed from structural causal models	×	0.07
All current publicly available, competitive TFMs have been pretrained on datasets generated from a fixed prior distribution	×	0.06
Fixed priors in TFM training underrepresent certain regions of the parameter space, potentially degrading performance on	×	0.07
State-of-the-art TFMs lag behind tree-based methods on some benchmarks.	×	0.05
The proposed RTFM method was applied to TabPFN V2 using only 90k additional training datasets.	×	0.12
Applying RTFM to TabPFN V2 significantly improved its ranking on several real-world tabular benchmarks.	×	0.11
In the maximization stage of the proposed algorithm, the model gW is frozen to maximize the optimality gap.	×	0.04
The proposed method uses a black-box optimization algorithm to search the SCM parameter space for parameters with large	×	0.05
The estimated optimality gap computation can be parallelized such that each baseline estimator is fit to each dataset in	×	0.05
With $nds=20$, $e=7$, and sufficient CPU cores, the estimated optimality gap could be computed in a matter of seconds.	×	0.03

References

- <http://arxiv.org/abs/2305.06090v1>

- <http://arxiv.org/abs/2004.06100v2>
- <http://arxiv.org/abs/2512.03307v1>