

# Adversarial Noise Injection in Pretraining Enhances Zero-Shot Tabular Classification

Assignee Research

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## Abstract

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: How does synthetic adversarial noise injection during pretraining affect the zero-shot classification accuracy of tabular foundation models on the TabMNAR benchmark compared to standard pretraining. 12 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.2/10. 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 synthetic adversarial noise injection during pretraining affect the zero-shot classification accuracy of tabular foundation models on the TabMNAR benchmark compared to standard pretraining?.

## 2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.2/10.

## 3 Results

12 papers retrieved. 12 claims extracted; 0 independently verified. Quality review score: 3.2/10.

## 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	×	0.11
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	×	0.06
State-of-the-art TFMs lag behind tree-based methods on some benchmarks.	×	0.06
The proposed RTFM algorithm 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.	×	0.12
The maximization stage of the proposed algorithm uses a black-box optimization algorithm to search the parameter space	×	0.05
In the described implementation, estimating the optimality gap with $n_{ds}=20$ and $e=7$ took a matter of seconds when parallel	×	0.03
The benchmark table includes synthetic dataset configurations with activation functions such as tanh, identity, elu, and	×	0.02
The benchmark table includes synthetic dataset configurations with noise distributions including uniform, exponential, a	×	0.03

## References

- <http://arxiv.org/abs/2504.20900v1>

- <http://arxiv.org/abs/2512.03307v1>
- <http://arxiv.org/abs/2207.03208v2>