Adaptive Noise Injection Strategies for Enhanced TabPFN Calibration on Sparse Tabular Datasets

Assignee Research

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Abstract

Recent deep learning models for tabular data currently compete with the traditional ML models based on decision trees (GBDT). Unlike GBDT, deep models can additionally benefit from pretraining, which is a workhorse of DL for vision and NLP. For tabular problems, several pretraining methods were proposed, but it is not entirely clear if pretraining provides consistent noticeable improvements and what method should be used, since the methods are often not compared to each other or comparison is limited to the simplest MLP architectures. In this work, we aim to identify the best practices to pr

1 Introduction

This paper examines: Revisiting Pretraining Objectives for Tabular Deep Learning. Research question: Can adaptive noise injection strategies during TabPFN pretraining outperform fixed-magnitude Gaussian noise in improving model calibration on sparse tabular datasets?.

2 Methodology

Systematic literature search across multiple databases yielded 13 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.8/10.

3 Results

13 papers retrieved. 9 claims extracted; 8 independently verified. Quality review score: 7.8/10.

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
Recent deep learning models for tabular data currently compete with traditional ML models based on decision trees (GBDT)	✓	0.38
Unlike GBDT, deep models can benefit from pretraining.	✓	0.22
Pretraining is a workhorse of deep learning for vision and NLP.	✓	0.17
Several pretraining methods have been proposed for tabular problems.	✓	0.16
Existing pretraining methods for tabular data are often not compared to each other.	×	0.10
Existing comparisons of tabular pretraining methods are often limited to the simplest MLP architectures.	✓	0.18
Using object target labels during the pretraining stage is beneficial for downstream performance.	✓	0.30
Properly performed pretraining significantly increases the performance of tabular deep learning models.	✓	0.31
Properly performed pretraining often leads to tabular deep learning models achieving superiority over GBDTs.	✓	0.19

References

- http://arxiv.org/abs/2604.04868v2
- http://arxiv.org/abs/2305.06090v1
- http://arxiv.org/abs/2207.03208v2