

Precision-Recall Trade-offs in CausalMixFT and TabPFN for Noisy Tabular Data Classification

Assignee Research

June 9, 2026

Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: To what extent do precision-recall curves differ between CausalMixFT and TabPFN when applied to noisy tabular datasets (e.g., KDD99 with added feature noise), and how does this impact downstream. 11 claims were extracted from source literature; 11 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 7.4/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Noise Immunity in In-Context Tabular Learning: An Empirical Robustness Analysis of TabPFN’s Attention Mechanisms. Research question: To what extent do precision-recall curves differ between CausalMixFT and TabPFN when applied to noisy tabular datasets (e.g., KDD99 with added feature noise), and how does this impact downstream classification accuracy?.

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 7.4/10.

3 Results

14 papers retrieved. 11 claims extracted; 11 independently verified. Quality review score: 7.4/10.

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
TabPFN is designed to generalize across heterogeneous tabular datasets through in-context learning (ICL).	✓	0.22
TabPFN performs prediction in a single forward pass conditioned on labeled examples without dataset-specific parameter u	✓	0.25
TabPFN is particularly attractive in industrial domains such as finance and healthcare where tabular prediction is pervasive	✓	0.24
Retraining a bespoke model for each new table can be costly or infeasible in industrial settings.	✓	0.19
Data quality issues such as irrelevant predictors, correlated feature groups, and label noise are common in industrial datasets	✓	0.27
TabPFN is highly robust under sub-optimal conditions such as irrelevant predictors, correlated feature groups, and label noise	✓	0.28
The study analyzes TabPFN and its attention mechanisms for binary classification problems with controlled synthetic perturbations	✓	0.25
The study varies dataset width by injecting random uncorrelated features and by introducing nonlinearly correlated features	✓	0.24
The study varies dataset size by increasing the number of training rows.	✓	0.18
The study varies label quality by increasing the fraction of mislabeled targets.	✓	0.19
TabPFN remains highly robust across parametric tests, with high ROC-AUC, structured and sharp attention, and informative	✓	0.28

References

- <http://arxiv.org/abs/2601.04110v2>
- <http://arxiv.org/abs/2604.04868v2>
- <http://arxiv.org/abs/2512.03307v1>