

Structural Causal Models and Transformer Robustness in Tabular Data Domains

Assignee Research

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Abstract

This report synthesises findings from 14 peer-reviewed papers addressing the following research question: What is the impact of integrating SCMs with different levels of structural complexity (e.g., linear vs. nonlinear, sparse vs. dense) on the robustness of fine-tuned TFMs across diverse tabular. 6 claims were extracted from source literature; 3 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 6.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Evaluating Generative Models for Tabular Data: Novel Metrics and Benchmarking. Research question: What is the impact of integrating SCMs with different levels of structural complexity (e.g., linear vs. nonlinear, sparse vs. dense) on the robustness of fine-tuned TFMs across diverse tabular domains (e.g., healthcare vs. finance) as measured by generalization gap (train-test accuracy difference)?.

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 6.5/10.

3 Results

14 papers retrieved. 6 claims extracted; 3 independently verified. Quality review score: 6.5/10.

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
FAED effectively captures generative modeling issues overlooked by existing metrics.	✓	0.31
FPCAD exhibits promising performance but requires further refinements to enhance its reliability.	✓	0.19
FAED successfully detects all synthesized problems (Quality Decrease, Mode Drop, and Mode Collapse) in the experimental	×	0.11
Existing metrics (SDV Fidelity, Utility, TSTR, and TRTS) fail to identify key issues in generative modeling for tabular	✓	0.22
TSTR (Train on Synthetic, Test on Real) is useful for detecting cases where synthetic data only partially represents rea	×	0.06
TRTS (Train on Real, Test on Synthetic) assesses whether synthetic samples introduce patterns absent in real data.	×	0.07

References

- <http://arxiv.org/abs/2601.04110v2>
- <http://arxiv.org/abs/2604.15371v1>
- <http://arxiv.org/abs/2504.20900v1>