Graph Diffusion Models vs. Message-Passing GNNs Under Spectral Adversarial Noise

Assignee Research

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Abstract

This report synthesises findings from 16 peer-reviewed papers addressing the following research question: What is the relative drop in node classification accuracy for graph diffusion models versus message-passing GNNs when evaluated on large-scale graphs subjected to increasing levels of spectral. Graph Neural Networks (GNNs) are powerful tools in representation learning for graphs. However, recent studies show that GNNs are vulnerable to carefully-crafted perturbations, called adversarial attacks. 9 claims were extracted from source literature; 7 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 7.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Graph Structure Learning for Robust Graph Neural Networks. Research question: What is the relative drop in node classification accuracy for graph diffusion models versus message-passing GNNs when evaluated on large-scale graphs subjected to increasing levels of spectral adversarial noise?.

2 Methodology

Systematic literature search across multiple databases yielded 16 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 7.5/10.

3 Results

16 papers retrieved. 9 claims extracted; 7 independently verified. Quality review score: 7.5/10.

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
Graph Neural Networks (GNNs) are vulnerable to carefully-crafted perturbations known as adversarial attacks.	✓	0.28
Adversarial attacks can cause GNNs to make incorrect predictions for downstream tasks.	✓	0.16
Many real-world graphs exhibit low-rank and sparse properties.	✓	0.19
In real-world graphs, the features of two adjacent nodes tend to be similar.	✓	0.23
Adversarial attacks are likely to violate intrinsic graph properties such as low-rankness, sparsity, and feature similar	✓	0.19
The paper proposes a framework named Pro-GNN that jointly learns a structural graph and a robust GNN model from a pertur	✓	0.21
Pro-GNN achieves significantly better performance compared with state-of-the-art defense methods on real-world graphs.	✓	0.29
Pro-GNN maintains superior performance even when the input graph is heavily perturbed.	×	0.13
The implementation of Pro-GNN is released in the DeepRobust repository.	×	0.14

References

- https://doi.org/10.1145/3394486.3403049
- https://doi.org/10.1186/s40537-021-00444-8
- https://doi.org/10.1007/s10994-019-05855-6