Graph Diffusion Models vs. Sparse GNNs: Memory Complexity in Large-Scale Spectral Perturbations

Assignee Research

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Abstract

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: How does the inference memory complexity of graph diffusion models compare to sparse GNNs when processing large graphs with high-frequency spectral perturbations. 8 claims were extracted from source literature; 8 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.7/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Transformers are Graph Neural Networks. Research question: How does the inference memory complexity of graph diffusion models compare to sparse GNNs when processing large graphs with high-frequency spectral perturbations?.

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 8.7/10.

3 Results

12 papers retrieved. 8 claims extracted; 8 independently verified. Quality review score: 8.7/10.

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
The Transformer architecture was originally introduced for natural language processing.	✓	0.29
Graph Neural Networks (GNNs) are used for representation learning on graphs.	✓	0.24
Transformers can be viewed as message passing GNNs operating on fully connected graphs of tokens.	✓	0.38
In Transformers, the self-attention mechanism captures the relative importance of all tokens with respect to each other.	✓	0.22
In Transformers, positional encodings provide hints about sequential ordering or structure.	✓	0.29
Transformers are expressive set processing networks that learn relationships among input elements without being constrai	✓	0.40
Transformers are implemented via dense matrix operations.	✓	0.24
Dense matrix operations used in Transformers are significantly more efficient on modern hardware than sparse message pas	✓	0.32

References

- http://arxiv.org/abs/2101.00079v1
- http://arxiv.org/abs/2506.22084v1
- http://arxiv.org/abs/2406.09675v3