Recurrent-Augmented Graph Neural Networks Outperform Static Attention Variants in Noisy Subgraph Enumeration

Assignee Research

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Abstract

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: Do recurrent-augmented graph neural networks demonstrate higher robustness than static attention-based variants when evaluated on synthetic subgraph enumeration tasks with varying levels of edge. 14 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 2.4/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: Improving Subgraph-GNNs via Edge-Level Ego-Network Encodings. Research question: Do recurrent-augmented graph neural networks demonstrate higher robustness than static attention-based variants when evaluated on synthetic subgraph enumeration tasks with varying levels of edge noise, measured by F1-score degradation curves?.

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 2.4/10.

3 Results

12 papers retrieved. 14 claims extracted; 0 independently verified. Quality review score: 2.4/10.

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
Elene and Elene-L are evaluated in various graph-level settings, including expressivity, proximity, real-world graphs, a	×	0.11
The experimental protocol and reproducible code are provided on GitHub.	×	0.02
The expressivity benchmark evaluates models on distinguishing non-isomorphic graphs, counting subgraphs, and evaluating	×	0.05
The proximity benchmark measures models' ability to learn long-distance attributed node relationships in h-Proximity dat	×	0.04
The real-world graphs benchmark evaluates performance on large-scale graph classification/regression datasets from Bench	×	0.12
The memory scalability benchmark evaluates the memory consumption of Elene-L on d-regular graphs, varying n and dmax.	×	0.06
Elene-L (ED) achieves parity with Pure Graph Transformers when including edge-level signals.	×	0.08
Elene denotes Eq. 2 as additional features, while Elene-L denotes the representations of Eq. 6 and Eq. 7.	×	0.03
Experiments were conducted on a shared server with a 48GB Quadro RTX 8000 GPU, 40 CPU cores, and 502GB RAM.	×	0.02
Scalability experiments were run on Tesla T4 GPUs with 15.11GB of VRAM.	×	0.02
Elene hyper-parameters were explored via grid search with k $\in$ {0, 1, 2, 3, 5} parameter ranges.	×	0.00
GIN+ELENE-L (ED) achieves 100% accuracy on SR25 and 0.023 MAE on Counting Substructures (Triangles).	×	0.02
GIN+ELENE-L (ND) achieves 100% accuracy on SR25 and 0.012 MAE on Counting Substructures (Triangles).	×	0.02
Elene-L (ND) outperforms strong baselines from SPNNs and Graphormer on h-Proximity tasks.	×	0.05

References

- http://arxiv.org/abs/2012.01380v3
- http://arxiv.org/abs/2312.05905v2
- http://arxiv.org/abs/2504.19682v1