Multimodal Graph Attention Networks vs. Traditional GNNs in Large-Scale Heterogeneous Graph Inference

Assignee Research

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Abstract

This report synthesises findings from 15 peer-reviewed papers addressing the following research question: How do multimodal graph attention networks like MGAT or DGAT compare to traditional GNNs (GCN, GraphSAGE) in terms of inference efficiency on large-scale heterogeneous graphs like PDNS-Net, measured. 17 claims were extracted from source literature; 0 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 3.1/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: PDNS-Net: A Large Heterogeneous Graph Benchmark Dataset of Network Resolutions for Graph Learning. Research question: How do multimodal graph attention networks like MGAT or DGAT compare to traditional GNNs (GCN, GraphSAGE) in terms of inference efficiency on large-scale heterogeneous graphs like PDNS-Net, measured in throughput (nodes/second) and latency (ms/node)?.

2 Methodology

Systematic literature search across multiple databases yielded 15 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 3.1/10.

3 Results

15 papers retrieved. 17 claims extracted; 0 independently verified. Quality review score: 3.1/10.

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 feature '#Subdomains' represents the number of levels in the subdomain part of the FQDN.	×	0.02
The feature 'Brand' indicates whether a domain impersonates a popular Alexa top 1000 brand.	×	0.03
The feature 'Similar' is derived by checking if the domain contains words within Levenshtein distance 2 of a popular Ale	×	0.03
The feature 'FakeTLD' checks if the domain name includes a fake gTLD such as com, edu, net, org, or gov.	×	0.05
The mDNS dataset contains 7,495 domains.	×	0.02
The mDNS dataset contains 2,827 malicious domains and 4,668 benign domains.	×	0.02
The DNS dataset contains 373,475 domains and 73,593 IPs.	×	0.01
The DNS dataset contains 20,354 malicious domains and 4,963 benign domains.	×	0.02
On the mDNS dataset, the GCN model achieved an Accuracy of 0.81 and an AUC of 0.81.	×	0.04
On the mDNS dataset, the GraphSage model achieved a Recall of 0.90 and an FPR of 0.22.	×	0.01
On the mDNS dataset, the HeteroSAGE model achieved an Accuracy of 0.89 and an F1-score of 0.89.	×	0.02
On the DNS dataset, the HGT model achieved an Accuracy of 0.90 and an FPR of 0.08.	×	0.02
On the DNS dataset, the HeteroSAGE model achieved an Accuracy of 0.93 and an FPR of 0.06.	×	0.02
On the DNS dataset, the HeteroGAT model achieved a Precision of 0.96 and a Recall of 0.97.	×	0.02
HeteroSAGE and HeteroGAT are heterogeneous counterparts of GraphSAGE and GAT generated using a generic wrapper in the Py	×	0.02
RGCN can handle different types of relationships but not node types.	×	0.05
The study compares GNN variants on the mPDNS-Net and PDNS-Net datasets using metrics including accuracy, AUC, F1-score,	×	0.11

References

- http://arxiv.org/abs/2510.03086v2
- http://arxiv.org/abs/2203.07969v1
- http://arxiv.org/abs/2501.08547v1