Boosting Cross-Domain and Cross-Task Generalization for Text-Attributed Graphs from Structural Perspective

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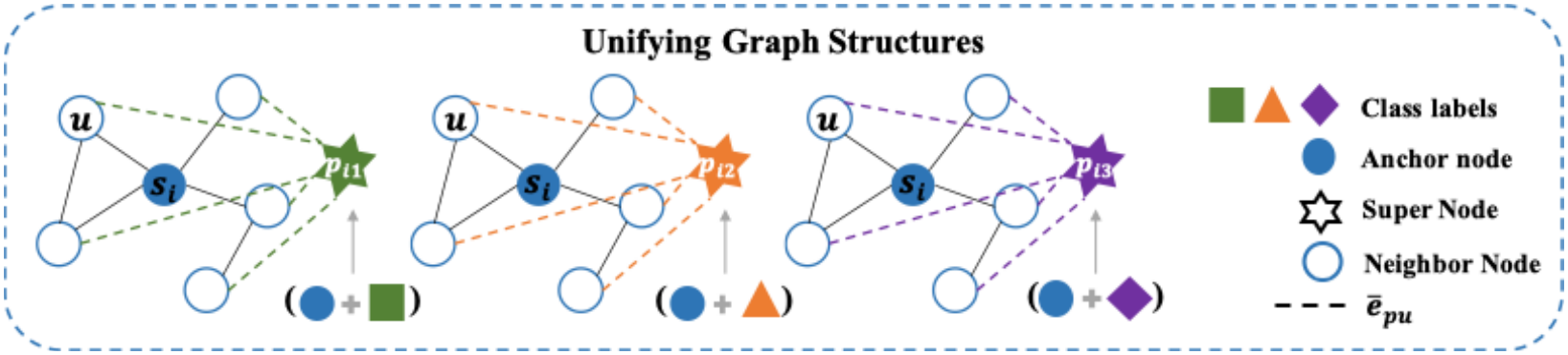
Problems & Ideas

- Problems:

  - Existing methods disregard the unique structural characteristics of graphs from different domains.

- Ideas: The model constructs virtual super nodes to unify structural characteristics of graph data from different domains.



Unifying graph structures by super nodes.

Main Contributions

- **Conclusions:**

  - A novel graph model, BooG, is developed from a structural perspective to address the limitations of existing methods in cross-domain and cross-task generalization;

  - The model introduces virtual super nodes that unify structural characteristics of graphs from different domains, enabling a standardized aggregation mechanism that integrates both semantic and structural information;

  - Extensive experiments on multiple datasets and tasks demonstrate its superior performance.

Table 3 Experiment results in supervised learning. We report accuracy (%) for node/edge tasks and ROC-AUC score (%) for graph tasks. We highlight the best score on each dataset in bold and the runner-up score with underline.

Datasets and tasks		MLP	GAT	GIN	OFA	GraphCL	DGI	GraphMAE	UniGraph	BooG
Node level	Cora	80.68	83.57	80.41	77.45	65.79	63.26	78.31	83.02	**83.70**$_{\pm 0.47}$
	Pubmed	78.62	80.46	79.26	75.16	72.30	70.81	78.24	81.57	**88.51**$_{\pm 0.31}$
	ogbn-arxiv	68.31	70.24	70.55	**77.64**	60.94	65.77	70.80	73.10	74.57$_{\pm 0.61}$
	Wiki-CS	65.24	73.61	68.20	**78.12**	58.44	60.55	64.35	72.85	75.84$_{\pm 0.60}$
	Ele-Fashion	58.23	62.12	65.24	68.56	55.20	60.17	64.05	70.11	**72.34**$_{\pm 0.65}$
Edge level	Cora-link	88.64	90.27	88.85	90.32	81.53	80.86	80.28	90.20	**93.11**$_{\pm 1.24}$
Graph level	PCBA	52.31	50.83	**60.03**	20.89	54.30	55.17	55.67	55.18	58.26$_{\pm 1.27}$
	HIV	60.15	62.37	70.46	71.47	65.86	62.14	67.04	71.02	**74.50**$_{\pm 1.42}$

BooG shows strong generalization ability in all scenarios, achieving results comparable to or even better than baseline methods, which proves its effectiveness.