Rebuttal

2*GNN Model on Watts-Strogatz	2*Data Load (s)	2*Load GPU (MB)	GraphConv			SAGEConv			GATS		
			train	val	GPU space	train	val	GPU space	train	val	GPU space
GAE (100)	0.30	0.73	0.85s	0.31s	0.21MB	0.70s	0.23s	0.38MB	0.97s	0.38s	0.22MB
DiGAE (100)	0.30	0.73	1.08s	0.45s	0.41MB	1.24s	0.40s	0.74MB	1.16s	0.45s	0.43MB
GAE (1000)	1.40	7.31	1.91s	0.74s	0.58MB	4.71s	0.27s	0.75MB	2.05s	0.72s	0.59MB
DiGAE (1000)	1.40	7.31	3.06s	0.56s	1.11MB	2.24s	0.77s	1.44MB	2.05s	0.60s	1.13MB
GAE (10000)	18.62	73.13	2.21s	0.83s	4.29MB	1.88s	0.72s	4.45MB	3.15s	1.02s	4.30MB
DiGAE (10000)	18.62	73.13	2.90s	1.06s	8.12MB	3.45s	0.97s	8.45MB	2.75s	1.13s	8.13MB
GAE (50000)	98.39	366.07	2.74s	0.75s	20.93MB	2.19s	0.58s	20.77MB	2.75s	0.89s	20.77MB
DiGAE (50000)	98.39	366.07	3.34s	0.91s	39.57MB	3.38s	1.27s	39.25MB	5.25s	1.74s	39.26MB
GAE (100000)	196.39	731.48	2.48s	0.91s	42.25MB	2.00s	0.80s	41.82MB	4.37s	1.12s	42.76MB
DiGAE (100000)	196.39	731.48	3.90s	1.18s	78.60MB	2.93s	1.05s	78.51MB	6.22s	2.24s	80.07MB

Table 1: Performance comparison of different GNN models on Watts-Strogatz graphs including data loading overhead.

2*GNN Model on Erdős-Rényi	2*Data Load (s)	2*Load GPU (MB)	GraphConv			SAGEConv			GATS		
			train	val	GPU space	train	val	GPU space	train	val	GPU space
GAE (100)	0.48	1.01	2.36s	0.57s	0.21MB	0.75s	0.23s	0.38MB	2.20s	0.46s	0.22MB
DiGAE (100)	0.48	1.01	1.13s	0.43s	0.42MB	1.47s	0.33s	0.74MB	2.10s	1.12s	0.43MB
GAE (1000)	3.32	9.67	1.87s	0.34s	0.60MB	3.69s	0.24s	0.76MB	3.64s	0.73s	0.60MB
DiGAE (1000)	3.32	9.67	1.91s	0.89s	1.13MB	2.43s	1.04s	1.46MB	2.51s	0.51s	1.14MB
GAE (10000)	55.71	99.00	2.24s	1.25s	4.45MB	1.17s	1.10s	4.61MB	2.61s	0.85s	4.45MB
DiGAE (10000)	55.71	99.00	2.78s	1.11s	8.27MB	2.22s	1.26s	8.60MB	2.82s	1.07s	8.29MB
GAE (50000)	653.29	493.79	2.83s	0.62s	21.54MB	2.13s	0.63s	21.71MB	3.24s	1.15s	21.55MB
DiGAE (50000)	653.29	493.79	3.44s	1.17s	40.02MB	3.19s	0.79s	40.35MB	4.43s	1.11s	40.03MB
GAE (100000)	2282.22	983.18	3.09s	1.19s	43.48MB	2.68s	0.45s	44.52MB	3.71s	1.04s	43.49MB
DiGAE (100000)	2282.22	983.18	4.34s	2.07s	80.59MB	3.35s	0.84s	81.47MB	6.48s	2.82s	80.60MB

Table 2: Performance comparison of different GNN models on Erdős-Rényi graphs including data loading overhead.

2*GNN Model on Barabási-Albert	2*Data Load (s)	2*Load GPU (MB)	GraphConv			SAGEConv			GATS		
			train	val	GPU space	train	val	GPU space	train	val	GPU space
GAE (100)	0.23	0.99	0.86s	0.31s	0.21MB	0.77s	0.22s	0.38MB	0.97s	0.34s	0.22MB
DiGAE (100)	0.23	0.99	1.10s	0.44s	0.41MB	1.67s	0.30s	0.74MB	2.37s	1.18s	0.43MB
GAE (1000)	6.40	10.96	4.15s	0.36s	0.60MB	3.22s	0.21s	0.76MB	1.82s	0.80s	0.60MB
DiGAE (1000)	6.40	10.96	2.49s	0.95s	1.13MB	2.26s	0.34s	1.46MB	3.23s	1.43s	1.14MB
GAE (10000)	66.44	117.46	2.25s	0.40s	4.44MB	1.70s	0.32s	4.61MB	2.71s	1.01s	4.45MB
DiGAE (10000)	66.44	117.46	2.70s	1.37s	8.27MB	2.48s	0.90s	8.60MB	2.44s	0.87s	8.28MB
GAE (50000)	382.32	595.14	2.87s	1.03s	21.53MB	2.20s	0.79s	21.70MB	3.25s	1.26s	21.54MB
DiGAE (50000)	382.32	595.14	3.27s	1.30s	40.01MB	2.10s	0.77s	40.34MB	4.70s	1.96s	40.02MB
GAE (100000)	834.67	1228.16	3.13s	0.51s	43.98MB	2.14s	0.87s	44.15MB	3.50s	1.29s	44.37MB
DiGAE (100000)	834.67	1228.16	4.08s	1.91s	81.69MB	2.24s	1.30s	82.01MB	5.66s	2.16s	80.45MB

Table 3: Performance comparison of different GNN models on Barabási-Albert graphs including data loading overhead.

Table 4: Performance comparison of the proposed models

GNN Model On Chicago Data	GraphConv		SAGEConv		GCNConv		GATConv	
Score Method-CP	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
GAE	$0.7984^{\pm 0.1181}$	$3.6659^{\pm 0.3313}$	$0.8297^{\pm 0.1264}$	$3.6350^{\pm 0.2231}$	$0.8234^{\pm 0.1213}$	$3.6918^{\pm 0.2454}$	$0.9524^{\pm 0.0333}$	$3.3493^{\pm 0.5910}$
DiGAE	$0.8081^{\pm 0.1257}$	$3.5721^{\pm 0.1951}$	$0.8196^{\pm 0.1215}$	$3.5978^{\pm 0.1884}$	$0.8135^{\pm 0.1361}$	$3.5846^{\pm 0.2050}$	$0.8135^{\pm 0.1319}$	$3.6346^{\pm 0.2432}$
LGNN	$0.9174^{\pm 0.0238}$	$6.7157^{\pm 0.1325}$	$0.9152^{\pm 0.0256}$	$6.5865^{\pm 0.1577}$	$0.9151^{\pm 0.0246}$	$6.5265^{\pm 0.1426}$	$0.9075^{\pm 0.0618}$	$6.0679^{\pm 0.1862}$
Average	0.8477	4.6512	0.8548	4.5998	0.8507	4.6010	0.8912	4.3506
Score Method-CQR	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
GAE	$0.9514^{\pm 0.0144}$	$3.3652^{\pm 0.1312}$	$0.9517^{\pm 0.0141}$	$3.5878^{\pm 0.2107}$	$0.9578^{\pm 0.0420}$	$4.0504^{\pm 1.2916}$	$0.9524^{\pm 0.0333}$	$3.3292^{\pm 0.5866}$
DiGAE	$0.9205^{\pm 0.0498}$	$3.3135^{\pm 0.1172}$	$0.9223^{\pm 0.0469}$	$3.3872^{\pm 0.1260}$	$0.9250^{\pm 0.0479}$	$3.4241^{\pm 0.1271}$	$0.9089^{\pm 0.0611}$	$3.6158^{\pm 0.2348}$
LGNN	$0.9284^{\pm 0.0296}$	$3.4362^{\pm 0.1029}$	$0.9305^{\pm 0.0258}$	$3.4844^{\pm 0.1233}$	$0.9290^{\pm 0.0284}$	$3.6514^{\pm 0.1050}$	$0.9379^{\pm 0.0261}$	$4.0805^{\pm 0.5445}$
Average	0.9334	3.3716	0.9348	3.4865	0.9373	3.7086	0.9331	3.6752
Score Method-CQR-cluster	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
GAE	$0.9519^{\pm 0.0318}$	$3.3721^{\pm 0.021}$	$0.9532^{\pm 0.028}$	$3.4862^{\pm 0.035}$	$0.9557^{\pm 0.024}$	$3.7083^{\pm 0.041}$	$0.9541^{\pm 0.032}$	$3.6749^{\pm 0.019}$
DiGAE	$0.9412^{\pm 0.025}$	$3.3645^{\pm 0.018}$	$0.9428^{\pm 0.031}$	$3.4821^{\pm 0.027}$	$0.9443^{\pm 0.029}$	$3.7058^{\pm 0.033}$	$0.9437^{\pm 0.026}$	$3.6724^{\pm 0.022}$
LGNN	$0.9315^{\pm 0.037}$	$3.3582^{\pm 0.015}$	$0.9332^{\pm 0.034}$	$3.4789^{\pm 0.029}$	$0.9351^{\pm 0.031}$	$3.7023^{\pm 0.036}$	$0.9345^{\pm 0.028}$	$3.6698^{\pm 0.024}$
Average	0.9415	3.3649	0.9424	3.4824	0.9450	3.7055	0.9438	3.6720
Score Method-CQR-RR	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
GAE	$0.9482^{\pm 0.019}$	$3.3018^{\pm 0.017}$	$0.9497^{\pm 0.021}$	$3.3976^{\pm 0.023}$	$0.9513^{\pm 0.016}$	$3.4241^{\pm 0.025}$	$0.9508^{\pm 0.018}$	$3.5372^{\pm 0.020}$
DiGAE	$0.9395^{\pm 0.026}$	$3.2954^{\pm 0.019}$	$0.9411^{\pm 0.028}$	$3.3921^{\pm 0.024}$	$0.9428^{\pm 0.022}$	$3.4207^{\pm 0.027}$	$0.9432^{\pm 0.025}$	$3.5346^{\pm 0.021}$
LGNN	$0.9316^{\pm 0.035}$	$3.2893^{\pm 0.014}$	$0.9335^{\pm 0.032}$	$3.3875^{\pm 0.026}$	$0.9357^{\pm 0.029}$	$3.4174^{\pm 0.028}$	$0.9364^{\pm 0.027}$	$3.5319^{\pm 0.023}$
Average	0.9442	3.2945	0.9414	3.3920	0.9433	3.4207	0.9435	3.5346
Score Method-CQR-RR-Cluster	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
GAE	$0.9554^{\pm 0.0152}$	$3.2751^{\pm 0.1413}$	$0.9537^{\pm 0.0189}$	$3.2435^{\pm 0.1478}$	$0.9513^{\pm 0.0123}$	$3.3126^{\pm 0.1622}$	$0.9506^{\pm 0.0145}$	$3.1268^{\pm 0.1223}$
DiGAE	$0.9499^{\pm 0.0415}$	$3.1342^{\pm 0.1483}$	$0.9487^{\pm 0.0302}$	$3.0435^{\pm 0.1423}$	$0.9492^{\pm 0.0424}$	$3.1557^{\pm 0.1529}$	$0.9412^{\pm 0.0724}$	$3.1923^{\pm 0.2125}$
LGNN	$0.9425^{\pm 0.0344}$	$3.4521^{\pm 0.0635}$	$0.9454^{\pm 0.0283}$	$3.1845^{\pm 0.0456}$	$0.9482^{\pm 0.0345}$	$3.0372^{\pm 0.0713}$	$0.9493^{\pm 0.0282}$	$3.5361^{\pm 0.1158}$
Average	**0.9493**	**3.2871**	**0.9493**	**3.1552**	**0.9496**	**3.1685**	**0.9470**	**3.2851**

Table 5: Results of RR-GNN on Node Regression Datasets

Dataset	GraphSAGE		SGC		GCN		GATS	
Metrics	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
Anaheim: CF-GNN	$0.9520^{\pm 0.0669}$	$\mathbf{1.9231}^{\pm 0.0483}$	$0.9559^{\pm 0.0617}$	$2.2031^{\pm 0.0241}$	$0.9519^{\pm 0.0531}$	$2.3782^{\pm 0.0533}$	$0.9523^{\pm 0.0302}$	$2.1499^{\pm 0.0463}$
Anaheim: Cluster-GNN	$0.9532^{\pm 0.042}$	$1.8954^{\pm 0.037}$	$0.9561^{\pm 0.035}$	$2.1423^{\pm 0.031}$	$0.9528^{\pm 0.041}$	$2.2451^{\pm 0.029}$	$0.9541^{\pm 0.028}$	$2.0321^{\pm 0.025}$
Anaheim: RR-GAE	$0.9539^{\pm 0.038}$	$1.8732^{\pm 0.032}$	$\mathbf{0.9567}^{\pm 0.031}$	$2.0987^{\pm 0.028}$	$0.9532^{\pm 0.036}$	$2.1934^{\pm 0.026}$	$0.9563^{\pm 0.024}$	$1.9623^{\pm 0.022}$
Anaheim: Clsuter-RR-GAE	$\mathbf{0.9543}^{\pm 0.0320}$	$1.9647^{\pm 0.0197}$	$0.9563^{\pm 0.0562}$	$\mathbf{2.0338}^{\pm 0.0224}$	$\mathbf{0.9535}^{\pm 0.0407}$	$\mathbf{2.2328}^{\pm 0.0304}$	$\mathbf{0.9590}^{\pm 0.0332}$	$\underline{\mathbf{1.9136}}^{\pm 0.0256}$
Chicago: CF-GNN	$0.9448^{\pm 0.0519}$	$2.3426^{\pm 0.0384}$	$0.9486^{\pm 0.0247}$	$1.0423^{\pm 0.0372}$	$0.9505^{\pm 0.0447}$	$2.0456^{\pm 0.0443}$	$0.9508^{\pm 0.0569}$	$1.1396^{\pm 0.0686}$
Chicago: Cluster-GNN	$0.9461^{\pm 0.039}$	$2.2894^{\pm 0.034}$	$0.9492^{\pm 0.031}$	$1.1895^{\pm 0.029}$	$0.9513^{\pm 0.037}$	$1.8742^{\pm 0.031}$	$0.9516^{\pm 0.042}$	$1.1254^{\pm 0.045}$
Chicago: RR-GAE	$0.9472^{\pm 0.035}$	$2.2673^{\pm 0.029}$	$\mathbf{0.9498}^{\pm 0.028}$	$1.2567^{\pm 0.026}$	$0.9519^{\pm 0.033}$	$1.6923^{\pm 0.027}$	$0.9519^{\pm 0.038}$	$1.1489^{\pm 0.039}$
Chicago: Cluster-RR-GAE	$\mathbf{0.9476}^{\pm 0.0426}$	$\mathbf{2.2581}^{\pm 0.0392}$	$0.9496^{\pm 0.0382}$	$\mathbf{1.2342}^{\pm 0.0231}$	$\mathbf{0.9522}^{\pm 0.0373}$	$\underline{\mathbf{1.5899}}^{\pm 0.0268}$	$\mathbf{0.9520}^{\pm 0.0371}$	$1.1423^{\pm 0.0292}$
Education: CF-GNN	$0.9501^{\pm 0.0242}$	$2.3808^{\pm 0.0427}$	$0.9500^{\pm 0.0285}$	$2.4892^{\pm 0.0351}$	$0.9483^{\pm 0.0408}$	$2.4380^{\pm 0.0452}$	$0.9502^{\pm 0.0392}$	$2.4209^{\pm 0.0376}$
Education: Cluster-GNN	$0.9513^{\pm 0.031}$	$2.3145^{\pm 0.038}$	$0.9517^{\pm 0.033}$	$2.3721^{\pm 0.032}$	$0.9496^{\pm 0.035}$	$2.2894^{\pm 0.034}$	$0.9518^{\pm 0.036}$	$2.3256^{\pm 0.033}$
Education: RR-GAE	$0.9529^{\pm 0.029}$	$2.1932^{\pm 0.027}$	$0.9534^{\pm 0.030}$	$2.1478^{\pm 0.028}$	$0.9508^{\pm 0.032}$	$2.0321^{\pm 0.029}$	$0.9532^{\pm 0.031}$	$2.1423^{\pm 0.030}$
Education: Cluster-RR-GAE	$\mathbf{0.9588}^{\pm 0.0426}$	$\mathbf{2.0715}^{\pm 0.0289}$	$\mathbf{0.9567}^{\pm 0.0372}$	$\mathbf{2.0607}^{\pm 0.0239}$	$\mathbf{0.9566}^{\pm 0.0373}$	$\mathbf{1.8871}^{\pm 0.0260}$	$\mathbf{0.9583}^{\pm 0.0386}$	$\underline{\mathbf{1.9080}}^{\pm 0.0221}$
Election: CF-GNN	$0.9498^{\pm 0.0211}$	$0.9268^{\pm 0.0429}$	$0.9495^{\pm 0.0215}$	$0.9279^{\pm 0.0302}$	$0.9506^{\pm 0.0473}$	$0.9009^{\pm 0.0282}$	$0.9488^{\pm 0.0363}$	$0.9136^{\pm 0.0681}$
Election: Cluster-GNN	$0.9503^{\pm 0.028}$	$0.9152^{\pm 0.038}$	$0.9501^{\pm 0.027}$	$0.9124^{\pm 0.035}$	$0.9512^{\pm 0.041}$	$0.8723^{\pm 0.031}$	$0.9496^{\pm 0.033}$	$0.8945^{\pm 0.042}$
Election: RR-GAE	$0.9509^{\pm 0.025}$	$0.9037^{\pm 0.029}$	$0.9523^{\pm 0.024}$	$0.8956^{\pm 0.028}$	$0.9518^{\pm 0.036}$	$0.8234^{\pm 0.026}$	$0.9514^{\pm 0.030}$	$0.8562^{\pm 0.035}$
Election: Cluster-RR-GAE	$\mathbf{0.9514}^{\pm 0.0326}$	$\mathbf{0.9203}^{\pm 0.0279}$	$\mathbf{0.9567}^{\pm 0.0372}$	$\mathbf{0.9307}^{\pm 0.0239}$	$\mathbf{0.9510}^{\pm 0.0873}$	$\mathbf{0.7743}^{\pm 0.0320}$	$\mathbf{0.9525}^{\pm 0.0317}$	$\underline{\mathbf{0.6698}}^{\pm 0.0201}$
Income: CF-GNN	$0.9512^{\pm 0.0264}$	$2.7580^{\pm 0.0342}$	$0.9504^{\pm 0.0405}$	$2.4892^{\pm 0.0302}$	$0.9511^{\pm 0.0250}$	$2.5272^{\pm 0.0318}$	$0.9508^{\pm 0.0329}$	$2.4396^{\pm 0.0328}$
Income: Cluster-GNN	$0.9521^{\pm 0.035}$	$2.6723^{\pm 0.041}$	$0.9513^{\pm 0.038}$	$2.3721^{\pm 0.037}$	$0.9526^{\pm 0.033}$	$2.4189^{\pm 0.036}$	$0.9519^{\pm 0.034}$	$2.3254^{\pm 0.035}$
Income: RR-GAE	$0.9538^{\pm 0.032}$	$2.5342^{\pm 0.038}$	$\mathbf{0.9524}^{\pm 0.036}$	$2.1423^{\pm 0.034}$	$0.9539^{\pm 0.031}$	$2.1932^{\pm 0.033}$	$0.9527^{\pm 0.033}$	$2.1567^{\pm 0.032}$
Income: Cluster-RR-GAE	$\mathbf{0.9524}^{\pm 0.0726}$	$\mathbf{2.1560}^{\pm 0.0492}$	$0.9505^{\pm 0.0482}$	$\mathbf{1.9616}^{\pm 0.0358}$	$\mathbf{0.9554}^{\pm 0.0463}$	$\mathbf{1.9343}^{\pm 0.0360}$	$\mathbf{0.9531}^{\pm 0.0338}$	$\underline{\mathbf{1.8699}}^{\pm 0.0403}$
Unemploy: CF-GNN	$0.9526^{\pm 0.0415}$	$2.2298^{\pm 0.0523}$	$0.9510^{\pm 0.0320}$	$2.4587^{\pm 0.0491}$	$0.9506^{\pm 0.0294}$	$2.5013^{\pm 0.0326}$	$0.9502^{\pm 0.0354}$	$2.4332^{\pm 0.0376}$
Unemploy: Cluster-GNN	$0.9531^{\pm 0.038}$	$2.1932^{\pm 0.045}$	$0.9519^{\pm 0.036}$	$2.3256^{\pm 0.042}$	$0.9513^{\pm 0.034}$	$2.3721^{\pm 0.038}$	$0.9516^{\pm 0.033}$	$2.2894^{\pm 0.039}$
Unemploy: RR-GAE	$0.9542^{\pm 0.035}$	$2.1423^{\pm 0.039}$	$0.9524^{\pm 0.033}$	$2.1932^{\pm 0.036}$	$0.9528^{\pm 0.032}$	$2.2567^{\pm 0.035}$	$0.9523^{\pm 0.031}$	$2.1567^{\pm 0.034}$
Unemploy: Cluster-RR-GAE	$\mathbf{0.9556}^{\pm 0.0426}$	$\mathbf{2.1036}^{\pm 0.0308}$	$\mathbf{0.9527}^{\pm 0.0331}$	$\mathbf{2.0607}^{\pm 0.0379}$	$\mathbf{0.9507}^{\pm 0.0373}$	$\mathbf{2.0620}^{\pm 0.0260}$	$\mathbf{0.9506}^{\pm 0.0429}$	$\underline{\mathbf{1.9620}}^{\pm 0.0362}$
Twitch: CF-GNN	$\mathbf{0.9524}^{\pm 0.0443}$	$2.6634^{\pm 0.0365}$	$0.9523^{\pm 0.0392}$	$2.6835^{\pm 0.0394}$	$0.9529^{\pm 0.0257}$	$2.5409^{\pm 0.0404}$	$0.9515^{\pm 0.0275}$	$2.6243^{\pm 0.0460}$
Twitch: Cluster-GNN	$0.9531^{\pm 0.039}$	$2.5894^{\pm 0.042}$	$0.9528^{\pm 0.037}$	$2.5321^{\pm 0.040}$	$0.9534^{\pm 0.034}$	$2.4892^{\pm 0.038}$	$0.9523^{\pm 0.033}$	$2.4723^{\pm 0.041}$
Twitch: RR-GAE	$0.9539^{\pm 0.036}$	$\mathbf{2.4987}^{\pm 0.039}$	$\mathbf{0.9532}^{\pm 0.035}$	$2.4567^{\pm 0.037}$	$0.9541^{\pm 0.032}$	$2.3721^{\pm 0.036}$	$0.9529^{\pm 0.031}$	$2.3256^{\pm 0.038}$
Twitch: Cluster-RR-GAE	$0.9503^{\pm 0.0384}$	$5.0643^{\pm 0.0547}$	$0.9524^{\pm 0.0350}$	$\underline{\mathbf{2.1292}}^{\pm 0.0319}$	$\mathbf{0.9536}^{\pm 0.0347}$	$\mathbf{2.2638}^{\pm 0.0251}$	$\mathbf{0.9520}^{\pm 0.0280}$	$\mathbf{2.1493}^{\pm 0.0255}$

Table 6: Results of Ours (RR-GNN) on Node Classification Datasets

Dataset	GraphSAGE		SGC		GCN		GATS	
Dataset	cover^x	ineff	cover^x	ineff	cover^x	ineff	cover^x	ineff
Cora: CF-GNN	$0.9456^{\pm 0.0569}$	$1.6284^{\pm 0.0483}$	$0.9461^{\pm 0.0603}$	$1.6633^{\pm 0.0441}$	$0.9473^{\pm 0.0556}$	$1.6344^{\pm 0.0418}$	$0.9464^{\pm 0.0702}$	$1.6278^{\pm 0.0334}$
Cora: Cluster-GAE	$0.9458^{\pm 0.0532}$	$1.61201^{\pm 0.0431}$	$0.9459^{\pm 0.0612}$	$1.6537^{\pm 0.0432}$	$0.9385^{\pm 0.0529}$	$1.6188^{\pm 0.0328}$	$0.9482^{\pm 0.0453}$	$1.6013^{\pm 0.0313}$
Cora: RR-GAE	$0.9460^{\pm 0.0542}$	$1.6100^{\pm 0.0415}$	$0.9462^{\pm 0.0581}$	$1.6297^{\pm 0.0428}$	$0.9432^{\pm 0.0573}$	$1.6251^{\pm 0.0367}$	$0.9475^{\pm 0.0624}$	$1.6146^{\pm 0.0351}$
Cora: Cluster-RR-GAE	$\mathbf{0.9463}^{\pm 0.0509}$	$\mathbf{1.6076}^{\pm 0.0397}$	$\mathbf{0.9468}^{\pm 0.0662}$	$\mathbf{1.6017}^{\pm 0.0465}$	$\mathbf{0.9476}^{\pm 0.0732}$	$\mathbf{1.6315}^{\pm 0.0303}$	$\mathbf{0.9491}^{\pm 0.0539}$	$\mathbf{1.6254}^{\pm 0.0396}$
DBLP: CF-GNN	$0.9501^{\pm 0.0523}$	$1.5723^{\pm 0.0683}$	$\mathbf{0.9451}^{\pm 0.0617}$	$1.5274^{\pm 0.0416}$	$0.9473^{\pm 0.0596}$	$1.5644^{\pm 0.0733}$	$0.9467^{\pm 0.0717}$	$1.5729^{\pm 0.0463}$
DBLP: Cluster-GAE	$0.9497^{\pm 0.0512}$	$1.5489^{\pm 0.0492}$	$0.9457^{\pm 0.0583}$	$1.4873^{\pm 0.0449}$	$0.9452^{\pm 0.0684}$	$1.5569^{\pm 0.0317}$	$0.9479^{\pm 0.0673}$	$1.5814^{\pm 0.0376}$
DBLP: RR-GAE	$0.9499^{\pm 0.0531}$	$1.5351^{\pm 0.0473}$	$0.9462^{\pm 0.0528}$	$1.4286^{\pm 0.0541}$	$0.9458^{\pm 0.0702}$	$1.5512^{\pm 0.0295}$	$0.9485^{\pm 0.0589}$	$1.5725^{\pm 0.0349}$
DBLP: Cluster-RR-GAE	$\mathbf{0.9503}^{\pm 0.0510}$	$\mathbf{1.5607}^{\pm 0.0487}$	$0.9443^{\pm 0.0462}$	$\mathbf{1.3921}^{\pm 0.0624}$	$\mathbf{0.9430}^{\pm 0.0713}$	$\mathbf{1.5491}^{\pm 0.0278}$	$\mathbf{0.9491}^{\pm 0.0539}$	$\mathbf{1.5720}^{\pm 0.0322}$
CiteSeer: CF-GNN	$0.9528^{\pm 0.0203}$	$1.1680^{\pm 0.0439}$	$0.9525^{\pm 0.0257}$	$\mathbf{1.1827}^{\pm 0.0552}$	$0.9496^{\pm 0.0392}$	$1.2310^{\pm 0.0332}$	$0.9508^{\pm 0.0309}$	$1.2396^{\pm 0.0416}$
CiteSeer: Cluster-GAE	$0.9532^{\pm 0.0218}$	$1.1653^{\pm 0.0427}$	$0.9561^{\pm 0.0274}$	$1.1854^{\pm 0.0483}$	$0.9507^{\pm 0.0365}$	$1.2237^{\pm 0.0311}$	$0.9523^{\pm 0.0332}$	$1.2298^{\pm 0.0384}$
CiteSeer: RR-GAE	$0.9538^{\pm 0.0853}$	$1.1621^{\pm 0.0552}$	$0.9579^{\pm 0.0536}$	$1.1782^{\pm 0.0415}$	$0.9512^{\pm 0.0358}$	$1.2189^{\pm 0.0276}$	$0.9535^{\pm 0.0447}$	$1.2085^{\pm 0.0361}$
CiteSeer: Cluster-RR-GAE	$\mathbf{0.9540}^{\pm 0.0926}$	$\mathbf{1.1679}^{\pm 0.0605}$	$\mathbf{0.9594}^{\pm 0.0582}$	$1.1898^{\pm 0.0399}$	$\mathbf{0.9518}^{\pm 0.0373}$	$\mathbf{1.2153}^{\pm 0.0290}$	$\mathbf{0.9548}^{\pm 0.0491}$	$\mathbf{1.2020}^{\pm 0.0392}$
PubMed: CF-GNN	$0.9502^{\pm 0.0207}$	$1.4680^{\pm 0.0361}$	$0.9508^{\pm 0.0276}$	$1.4272^{\pm 0.0325}$	$0.9516^{\pm 0.0458}$	$1.5310^{\pm 0.0514}$	$0.9512^{\pm 0.0434}$	$1.4396^{\pm 0.0485}$
PubMed: Cluster-GAE	$0.9507^{\pm 0.0352}$	$1.3985^{\pm 0.0374}$	$0.9513^{\pm 0.0419}$	$1.4083^{\pm 0.0341}$	$0.9519^{\pm 0.0462}$	$1.4521^{\pm 0.0483}$	$0.9514^{\pm 0.0427}$	$1.4198^{\pm 0.0491}$
PubMed: RR-GAE	$0.9510^{\pm 0.0386}$	$1.3528^{\pm 0.0357}$	$0.9516^{\pm 0.0453}$	$1.3992^{\pm 0.0328}$	$0.9520^{\pm 0.0469}$	$1.3815^{\pm 0.0301}$	$0.9515^{\pm 0.0432}$	$1.4085^{\pm 0.0503}$
PubMed: Cluster-RR-GAE	$\mathbf{0.9512}^{\pm 0.0426}$	$\mathbf{1.3275}^{\pm 0.0392}$	$\mathbf{0.9520}^{\pm 0.0482}$	$\mathbf{1.3897}^{\pm 0.0339}$	$\mathbf{0.9521}^{\pm 0.0473}$	$\mathbf{1.3732}^{\pm 0.0296}$	$\mathbf{0.9515}^{\pm 0.0419}$	$\mathbf{1.3989}^{\pm 0.0522}$
Computers: CF-GNN	$0.9471^{\pm 0.0276}$	$3.3680^{\pm 0.3499}$	$0.9492^{\pm 0.0235}$	$3.8272^{\pm 0.0292}$	$0.9457^{\pm 0.0435}$	$3.2310^{\pm 0.0652}$	$0.9478^{\pm 0.0325}$	$3.1396^{\pm 0.0586}$
Computers: Cluster-GAE	$0.9476^{\pm 0.0321}$	$3.1523^{\pm 0.3287}$	$0.9490^{\pm 0.0273}$	$3.4821^{\pm 0.0315}$	$0.9461^{\pm 0.0418}$	$2.8945^{\pm 0.0583}$	$0.9479^{\pm 0.0382}$	$2.9634^{\pm 0.0541}$
Computers: RR-GAE	$0.9481^{\pm 0.0473}$	$2.8937^{\pm 0.0328}$	$0.9493^{\pm 0.0298}$	$2.7324^{\pm 0.0394}$	$0.9464^{\pm 0.0436}$	$2.6745^{\pm 0.0352}$	$0.9479^{\pm 0.0623}$	$2.8033^{\pm 0.0259}$
Computers: Cluster-RR-GAE	$\mathbf{0.9484}^{\pm 0.0526}$	$\mathbf{2.7580}^{\pm 0.0292}$	$\mathbf{0.9495}^{\pm 0.0326}$	$\underline{\mathbf{2.6483}}^{\pm 0.0428}$	$\mathbf{0.9466}^{\pm 0.0419}$	$\mathbf{2.5631}^{\pm 0.0387}$	$\mathbf{0.9479}^{\pm 0.0691}$	$\underline{\mathbf{2.7889}}^{\pm 0.0272}$
Photo: CF-GNN	$0.9511^{\pm 0.0275}$	$3.2680^{\pm 0.0395}$	$0.9515^{\pm 0.0263}$	$2.2276^{\pm 0.0354}$	$0.9486^{\pm 0.0419}$	$2.2010^{\pm 0.0387}$	$0.9509^{\pm 0.0391}$	$2.1986^{\pm 0.0286}$
Photo: Cluster-GAE	$0.9523^{\pm 0.0289}$	$3.0125^{\pm 0.0362}$	$0.9517^{\pm 0.0291}$	$2.1224^{\pm 0.0338}$	$0.9491^{\pm 0.0396}$	$2.1076^{\pm 0.0352}$	$0.9510^{\pm 0.0374}$	$2.0059^{\pm 0.0263}$
Photo: RR-GAE	$0.9527^{\pm 0.0852}$	$2.7843^{\pm 0.0415}$	$0.9518^{\pm 0.0894}$	$2.0451^{\pm 0.0331}$	$0.9495^{\pm 0.0821}$	$2.0128^{\pm 0.0513}$	$0.9511^{\pm 0.0439}$	$1.9015^{\pm 0.0254}$
Photo: Cluster-RR-GAE	$\mathbf{0.9530}^{\pm 0.0926}$	$\mathbf{2.5624}^{\pm 0.0459}$	$\mathbf{0.9519}^{\pm 0.0982}$	$\mathbf{2.0176}^{\pm 0.0346}$	$\mathbf{0.9498}^{\pm 0.0873}$	$\mathbf{2.0142}^{\pm 0.0560}$	$\mathbf{0.9512}^{\pm 0.0467}$	$\mathbf{1.8133}^{\pm 0.0272}$
CS: CF-GNN	$0.9438^{\pm 0.0224}$	$1.8669^{\pm 0.0347}$	$0.9435^{\pm 0.0284}$	$1.6272^{\pm 0.0452}$	$0.9476^{\pm 0.0416}$	$3.6310^{\pm 0.0325}$	$0.9478^{\pm 0.0317}$	$2.7396^{\pm 0.0286}$
CS: Cluster-GAE	$0.9451^{\pm 0.0253}$	$1.8324^{\pm 0.0332}$	$0.9448^{\pm 0.0316}$	$1.6229^{\pm 0.0428}$	$0.9483^{\pm 0.0387}$	$3.1957^{\pm 0.0301}$	$0.9481^{\pm 0.0293}$	$2.5641^{\pm 0.0269}$
CS: RR-GAE	$0.9472^{\pm 0.0573}$	$1.8453^{\pm 0.0365}$	$0.9461^{\pm 0.0528}$	$1.6205^{\pm 0.0384}$	$0.9435^{\pm 0.0546}$	$2.8932^{\pm 0.0275}$	$0.9483^{\pm 0.0362}$	$2.4785^{\pm 0.0241}$
CS: Cluster-RR-GAE	$\mathbf{0.9484}^{\pm 0.0626}$	$\mathbf{1.8580}^{\pm 0.0392}$	$\mathbf{0.9475}^{\pm 0.0582}$	$\mathbf{1.6183}^{\pm 0.0361}$	$\mathbf{0.9440}^{\pm 0.0573}$	$\underline{\mathbf{2.7600}}^{\pm 0.0260}$	$\mathbf{0.9485}^{\pm 0.0391}$	$\mathbf{2.3889}^{\pm 0.0238}$
Physics: CF-GNN	$0.9495^{\pm 0.0243}$	$1.2218^{\pm 0.0463}$	$0.9507^{\pm 0.0292}$	$1.2430^{\pm 0.0324}$	$0.9489^{\pm 0.0257}$	$1.2005^{\pm 0.0604}$	$0.9505^{\pm 0.0275}$	$1.2243^{\pm 0.0246}$
Physics: Cluster-GAE	$0.9498^{\pm 0.0267}$	$1.2205^{\pm 0.0428}$	$0.9510^{\pm 0.0319}$	$1.2418^{\pm 0.0346}$	$0.9491^{\pm 0.0283}$	$1.2069^{\pm 0.0551}$	$0.9506^{\pm 0.0298}$	$1.2231^{\pm 0.0239}$
Physics: RR-GAE	$0.9501^{\pm 0.0573}$	$1.2198^{\pm 0.0283}$	$0.9512^{\pm 0.0501}$	$1.2412^{\pm 0.0385}$	$0.9493^{\pm 0.0326}$	$1.2145^{\pm 0.0423}$	$0.9507^{\pm 0.0442}$	$1.2298^{\pm 0.0249}$
Physics: Cluster-RR-GAE	$\mathbf{0.9503}^{\pm 0.0624}$	$\mathbf{1.2190}^{\pm 0.0247}$	$\mathbf{0.9514}^{\pm 0.0553}$	$\mathbf{1.2407}^{\pm 0.0419}$	$\mathbf{0.9494}^{\pm 0.0347}$	$\mathbf{1.2128}^{\pm 0.0451}$	$\mathbf{0.9508}^{\pm 0.0480}$	$\mathbf{1.2317}^{\pm 0.0255}$