

Table A: Graph classification accuracy (%) under Auto-GCL backbone.

Loss	MUTAG	PTC-MR	PROTEINS	IMDB-B	IMDB-M	REDDIT-B	Avg.
Contrast	86.26 $\pm$ 1.14	61.67 $\pm$ 0.60	67.44 $\pm$ 1.16	72.50 $\pm$ 0.68	49.89 $\pm$ 0.45	81.43 $\pm$ 1.89	69.87
NO Training	85.80 $\pm$ 4.25	56.27 $\pm$ 3.86	53.98 $\pm$ 4.40	57.96 $\pm$ 0.76	34.61 $\pm$ 0.82	66.30 $\pm$ 0.05	59.15
NO Pos	87.23 $\pm$ 1.13	59.15 $\pm$ 0.76	66.57 $\pm$ 1.53	70.60 $\pm$ 1.13	49.31 $\pm$ 0.52	79.61 $\pm$ 1.05	68.75
NO Neg	87.12 $\pm$ 1.71	60.35 $\pm$ 1.14	70.51 $\pm$ 1.18	73.20 $\pm$ 9.32	50.08 $\pm$ 0.54	82.33 $\pm$ 0.90	70.60

Table B: Node classification accuracy (%) under BGRL backbone.

Cora	CiteSeer	PubMed	Photo	Computers	Avg.
82.94 $\pm$ 0.80	68.92 $\pm$ 1.11	87.13 $\pm$ 0.27	93.23 $\pm$ 0.62	90.83 $\pm$ 0.42	84.61

Table C: Node classification accuracy (%) under GRACE backbone with different augmentations.

Augmentation	Cora	CiteSeer	PubMed	Photo	Computers	Avg.
NO Training (baseline)	69.12 $\pm$ 4.18	60.60 $\pm$ 2.59	80.65 $\pm$ 0.80	68.37 $\pm$ 3.76	57.02 $\pm$ 1.93	67.15
GRACE augmentations	84.67 $\pm$ 1.39	73.47 $\pm$ 2.32	85.80 $\pm$ 0.16	91.42 $\pm$ 1.27	89.01 $\pm$ 0.60	84.87
Neighbor nodes (ours)	84.93 $\pm$ 2.63	71.92 $\pm$ 1.51	84.72 $\pm$ 0.32	90.54 $\pm$ 0.64	86.21 $\pm$ 0.58	83.66

Table D: Node classification accuracy (%) under GRACE backbone with different settings.

Loss	Augmentation	Encoder	Cora	CiteSeer	PubMed	Photo	Computers	Avg.
NO Pos	GRACE augmentations	GCN	82.65 $\pm$ 1.18	73.50 $\pm$ 2.41	85.28 $\pm$ 0.79	91.32 $\pm$ 1.10	84.40 $\pm$ 0.43	83.43
Contrast	Neighbor nodes (ours)	MLP	78.82 $\pm$ 3.28	68.80 $\pm$ 0.92	82.94 $\pm$ 0.99	91.87 $\pm$ 0.58	81.67 $\pm$ 1.43	80.82

Table E: Node classification accuracy (%) under GRACE backbone with MLP/MLP+ContraNorm encoder.

Loss	Encoder	Cora	CiteSeer	PubMed	Photo	Computers	Avg.
Contrast	MLP	67.72 $\pm$ 0.88	65.51 $\pm$ 2.63	83.29 $\pm$ 0.49	87.92 $\pm$ 0.59	80.89 $\pm$ 1.21	77.07
NO Training	MLP	40.66 $\pm$ 2.49	42.81 $\pm$ 4.82	78.53 $\pm$ 0.90	62.12 $\pm$ 0.97	57.97 $\pm$ 1.13	56.42
NO Neg	MLP	51.69 $\pm$ 3.04	50.36 $\pm$ 1.14	79.00 $\pm$ 0.63	61.33 $\pm$ 0.75	55.07 $\pm$ 0.99	59.49
NO Neg	MLP + CN	62.87 $\pm$ 0.84	62.16 $\pm$ 3.11	81.51 $\pm$ 0.60	83.03 $\pm$ 1.59	76.40 $\pm$ 1.09	73.19

Table F: Image classification accuracy (%) under SimCLR backbone on CIFAR10.

Loss & Encoder	SimCLR & ResNet	Uniform & ResNet	Align & ResNet	Align & ResNet + CN
Test Acc (%)	82.4	20.3	18.6	20.9

Table G: Node classification accuracy (%) under GRACE backbone with MLP using different augmentations.

Augmentation	Encoder	Cora	CiteSeer	PubMed	Photo	Computers	Avg.
NO Aug	MLP	58.09 $\pm$ 2.96	62.69 $\pm$ 1.21	80.62 $\pm$ 1.01	84.42 $\pm$ 0.64	73.30 $\pm$ 1.10	71.82
FeatureMask (FM) + EdgePerturb (EP)	MLP	67.72 $\pm$ 0.88	65.51 $\pm$ 2.63	83.29 $\pm$ 0.49	87.92 $\pm$ 0.59	80.89 $\pm$ 1.21	77.07
Gaussian noise	MLP	61.47 $\pm$ 3.36	63.23 $\pm$ 2.41	81.90 $\pm$ 0.57	84.03 $\pm$ 1.07	75.47 $\pm$ 0.70	73.22

Table H: Node classification accuracy (%) under GRACE backbone on new heterophily benchmarks.

Loss	Encoder	chameleon-filtered	squirrel-filtered	tolokers	minesweeper	amazon-ratings	roman-empire	Avg.
Contrast	GCN	41.91 $\pm$ 3.88	40.74 $\pm$ 1.40	80.35 $\pm$ 0.45	80.18 $\pm$ 1.31	43.57 $\pm$ 0.39	41.33 $\pm$ 0.32	54.68
NO Training	GCN	37.55 $\pm$ 3.14	34.72 $\pm$ 2.16	79.82 $\pm$ 0.27	80.10 $\pm$ 0.23	41.90 $\pm$ 0.55	41.41 $\pm$ 0.50	52.58
NO Pos	GCN	41.16 $\pm$ 2.79	39.30 $\pm$ 1.88	80.51 $\pm$ 0.47	80.22 $\pm$ 0.21	43.21 $\pm$ 0.48	41.19 $\pm$ 0.52	54.27
NO Neg	GCN	29.86 $\pm$ 4.58	39.79 $\pm$ 1.66	79.35 $\pm$ 0.53	80.06 $\pm$ 0.29	46.16 $\pm$ 1.11	38.78 $\pm$ 0.84	52.33
NO Neg	GCN + CN	43.04 $\pm$ 4.25	41.20 $\pm$ 2.27	79.51 $\pm$ 0.46	80.22 $\pm$ 0.19	49.08 $\pm$ 0.70	41.10 $\pm$ 0.58	55.69

Table I: Node classification accuracy (%) under GRACE backbone with no-training.

Loss	Encoder	Cora	CiteSeer	PubMed	Photo	Computers	Avg.
Contrast	GCN	84.67 $\pm$ 1.39	73.47 $\pm$ 2.32	85.80 $\pm$ 0.16	91.42 $\pm$ 1.27	89.01 $\pm$ 0.60	84.87
NO Training	GCN	69.12 $\pm$ 4.18	60.60 $\pm$ 2.59	80.65 $\pm$ 0.80	68.37 $\pm$ 3.76	57.02 $\pm$ 1.93	67.15
NO Training	GCN+CN	69.63 $\pm$ 4.08	59.82 $\pm$ 2.73	81.73 $\pm$ 0.97	91.37 $\pm$ 0.60	85.64 $\pm$ 0.70	77.64