

Table 1: Ablation study on homophilous graphs (%). - indicates that the corresponding hyperparameter is not used in GNN*, as it empirically leads to inferior performance.

	Cora	CiteSeer	PubMed	Computer	Photo	CS	Physics	WikiCS
Metric	Accuracy↑	Accuracy↑	Accuracy↑	Accuracy↑	Accuracy↑	Accuracy↑	Accuracy↑	Accuracy↑
GCN*	85.08 ± 0.52	72.98 ± 0.84	81.32 ± 0.72	93.80 ± 0.29	96.51 ± 0.20	95.80 ± 0.28	97.43 ± 0.05	80.27 ± 0.71
(-) Normalization	-	-	-	93.09 ± 0.13	96.38 ± 0.14	94.47 ± 0.25	97.18 ± 0.15	-
(-) Dropout	82.70 ± 0.87	70.96 ± 1.00	79.50 ± 1.29	93.34 ± 0.11	-	95.59 ± 0.16	97.32 ± 0.06	78.34 ± 0.42
(-) Residual Connections	83.40 ± 1.58	71.60 ± 1.26	80.86 ± 0.58	-	94.68 ± 0.29	94.45 ± 0.12	96.89 ± 0.20	79.38 ± 0.57
(-) Jumping Knowledge	-	-	-	92.97 ± 0.08	95.93 ± 0.32	93.73 ± 0.53	97.00 ± 0.10	79.13 ± 0.91
GraphSAGE*	84.18 ± 0.81	71.93 ± 0.85	79.41 ± 0.53	93.59 ± 0.22	96.41 ± 0.17	96.12 ± 0.24	97.21 ± 0.05	80.51 ± 0.48
(-) Normalization	-	71.80 ± 0.19	-	93.07 ± 0.12	-	94.53 ± 0.14	96.73 ± 0.05	80.41 ± 0.70
(-) Dropout	81.54 ± 1.55	70.36 ± 0.47	75.70 ± 1.69	92.71 ± 0.47	96.23 ± 0.10	-	97.14 ± 0.04	-
(-) Residual Connections	80.46 ± 1.19	71.80 ± 0.19	-	93.23 ± 0.26	95.95 ± 0.13	95.87 ± 0.08	97.16 ± 0.04	80.00 ± 0.76
(-) Jumping Knowledge	-	70.00 ± 1.26	-	93.16 ± 0.18	95.82 ± 0.10	94.67 ± 0.26	96.91 ± 0.04	79.89 ± 0.79
GAT*	84.64 ± 1.27	72.10 ± 1.10	79.70 ± 0.70	93.93 ± 0.16	96.67 ± 0.13	96.08 ± 0.10	97.30 ± 0.06	80.75 ± 0.74
(-) Normalization	-	-	-	93.86 ± 0.10	96.21 ± 0.17	94.50 ± 0.33	96.99 ± 0.15	-
(-) Dropout	83.18 ± 1.16	70.82 ± 0.76	79.04 ± 0.44	93.35 ± 0.33	-	95.85 ± 0.04	-	80.19 ± 0.16
(-) Residual Connections	83.34 ± 0.24	71.88 ± 0.40	-	93.29 ± 0.31	95.29 ± 0.13	94.47 ± 0.25	96.51 ± 0.05	79.30 ± 0.92
(-) Jumping Knowledge	82.78 ± 0.96	70.36 ± 0.44	-	93.44 ± 0.22	96.43 ± 0.20	94.41 ± 0.28	97.03 ± 0.04	79.56 ± 1.31

Table 2: Ablation study on heterophilous graphs (%).

	Squirrel	Chameleon	Amazon-Ratings	Roman-Empire	Minesweeper	Questions
Metric	Accuracy↑	Accuracy↑	Accuracy↑	Accuracy↑	ROC-AUC↑	ROC-AUC↑
GCN*	44.50 ± 1.92	46.11 ± 3.16	53.57 ± 0.32	91.35 ± 0.37	97.77 ± 0.38	77.40 ± 1.07
(-) Normalization	43.92 ± 1.59	-	-	-	-	-
(-) Dropout	41.96 ± 1.89	-	50.99 ± 0.21	86.88 ± 0.34	94.33 ± 0.21	76.92 ± 1.55
(-) Residual Connections	-	43.22 ± 3.91	50.31 ± 0.25	75.63 ± 0.48	89.16 ± 0.24	74.49 ± 0.39
(-) Jumping Knowledge	43.10 ± 1.47	43.81 ± 3.96	51.63 ± 0.27	90.73 ± 0.25	95.29 ± 0.62	77.30 ± 0.57
GraphSAGE*	39.93 ± 1.58	43.44 ± 3.19	54.72 ± 0.38	92.19 ± 0.58	96.95 ± 0.41	77.96 ± 0.72
(-) Normalization	-	-	54.50 ± 0.38	-	-	76.07 ± 1.56
(-) Dropout	-	40.98 ± 4.65	52.58 ± 0.17	86.50 ± 0.13	93.92 ± 0.73	-
(-) Residual Connections	39.37 ± 2.30	41.24 ± 3.85	53.94 ± 0.40	88.65 ± 0.96	94.41 ± 0.43	76.70 ± 0.87
(-) Jumping Knowledge	38.70 ± 1.95	-	54.27 ± 0.69	90.12 ± 0.54	93.80 ± 0.30	76.80 ± 0.72
GAT*	38.72 ± 1.46	43.44 ± 3.00	54.99 ± 0.71	91.60 ± 0.21	97.76 ± 0.37	79.04 ± 1.27
(-) Normalization	-	42.24 ± 3.26	-	90.96 ± 0.20	-	79.02 ± 1.13
(-) Dropout	-	41.08 ± 2.96	53.84 ± 0.87	87.06 ± 0.21	94.10 ± 0.09	78.51 ± 0.36
(-) Residual Connections	-	41.74 ± 2.08	51.24 ± 0.28	79.11 ± 0.88	90.83 ± 0.45	77.07 ± 0.84
(-) Jumping Knowledge	-	41.12 ± 3.94	54.38 ± 0.29	-	93.92 ± 0.73	-

Table 3: Ablation study on large-scale graphs (%).

	ogbn-proteins	ogbn-arxiv	ogbn-products	pokec
Metric	ROC-AUC↑	Accuracy↑	Accuracy↑	Accuracy↑
GCN*	77.29 ± 0.46	73.60 ± 0.18	82.33 ± 0.19	86.33 ± 0.17
(-) Normalization	74.48 ± 1.13	71.97 ± 0.18	80.01 ± 0.48	85.21 ± 0.23
(-) Dropout	74.85 ± 0.87	72.59 ± 0.23	79.30 ± 0.37	84.47 ± 0.38
(-) Residual Connections	73.19 ± 1.46	73.01 ± 0.09	-	79.59 ± 0.97
(-) Jumping Knowledge	-	72.98 ± 0.24	-	-
GraphSAGE*	82.21 ± 0.32	72.95 ± 0.31	83.89 ± 0.36	85.97 ± 0.21
(-) Normalization	77.42 ± 0.98	71.52 ± 0.17	82.12 ± 0.31	84.95 ± 0.33
(-) Dropout	80.52 ± 0.49	71.51 ± 0.04	80.36 ± 0.43	83.06 ± 0.28
(-) Residual Connections	81.75 ± 0.53	72.84 ± 0.09	-	85.81 ± 0.45
(-) Jumping Knowledge	-	72.76 ± 0.17	-	-
GAT*	85.01 ± 0.46	73.30 ± 0.16	80.99 ± 0.16	86.19 ± 0.23
(-) Normalization	80.32 ± 0.83	71.68 ± 0.36	78.62 ± 0.33	84.63 ± 0.64
(-) Dropout	82.48 ± 0.34	71.83 ± 0.42	77.68 ± 0.21	85.12 ± 0.49
(-) Residual Connections	82.43 ± 0.75	72.76 ± 0.45	-	81.37 ± 0.87
(-) Jumping Knowledge	-	72.94 ± 0.30	-	-