

# HCD Simulations Write Up

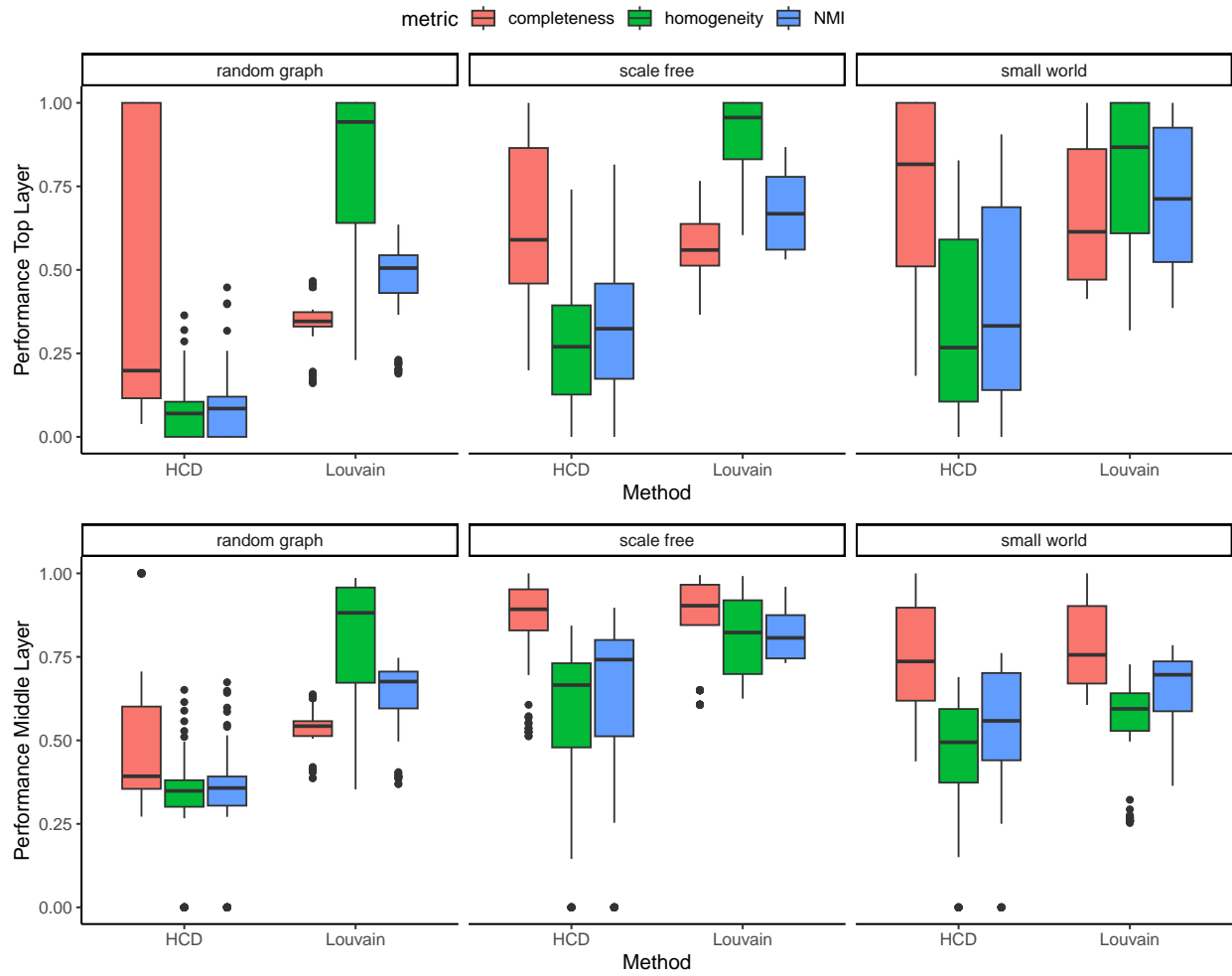
Audrey Fu Lab

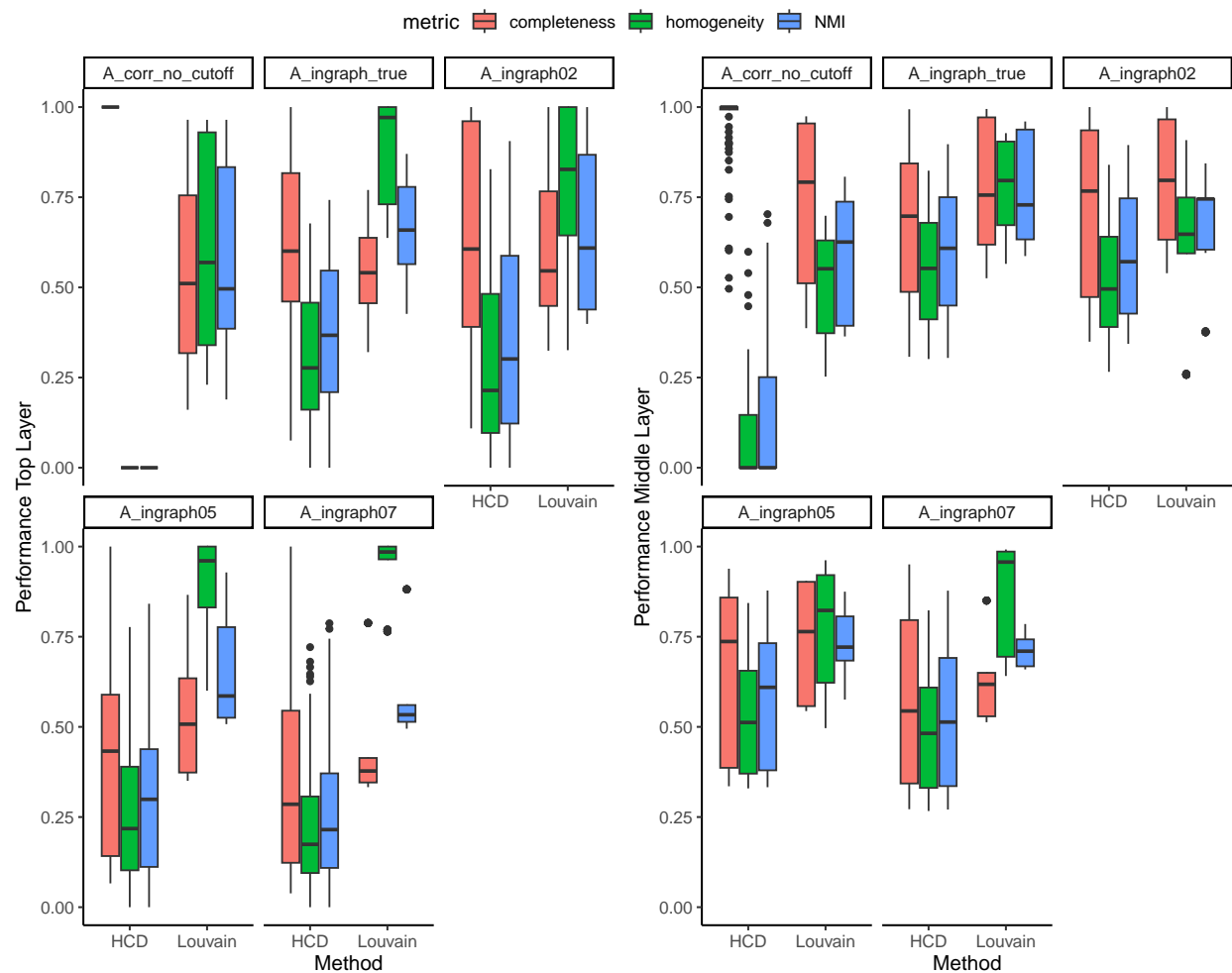
2024-03-07

**Simulation Description**

**Preliminary Findings**

## Figures





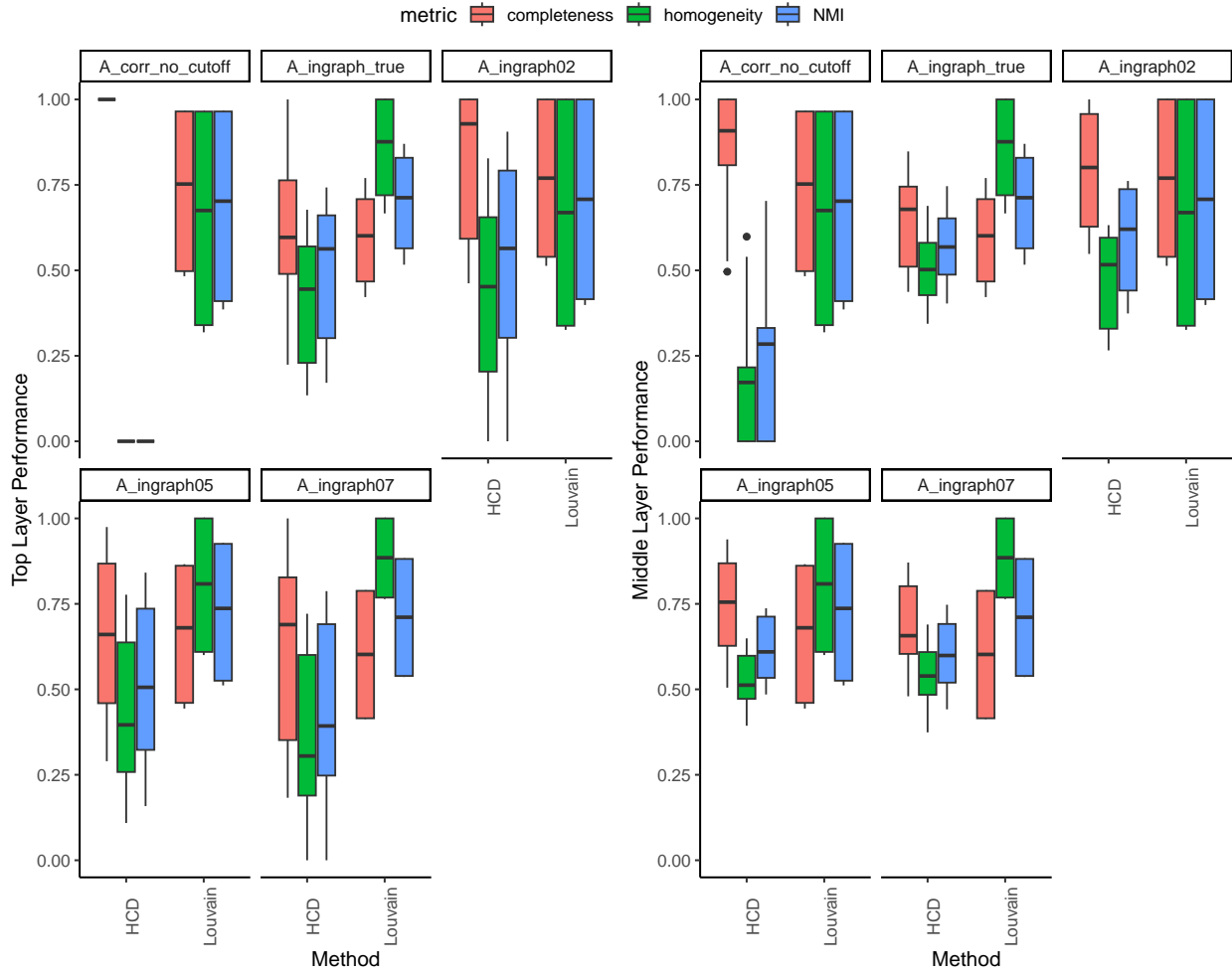


Figure 1: Small world graphs

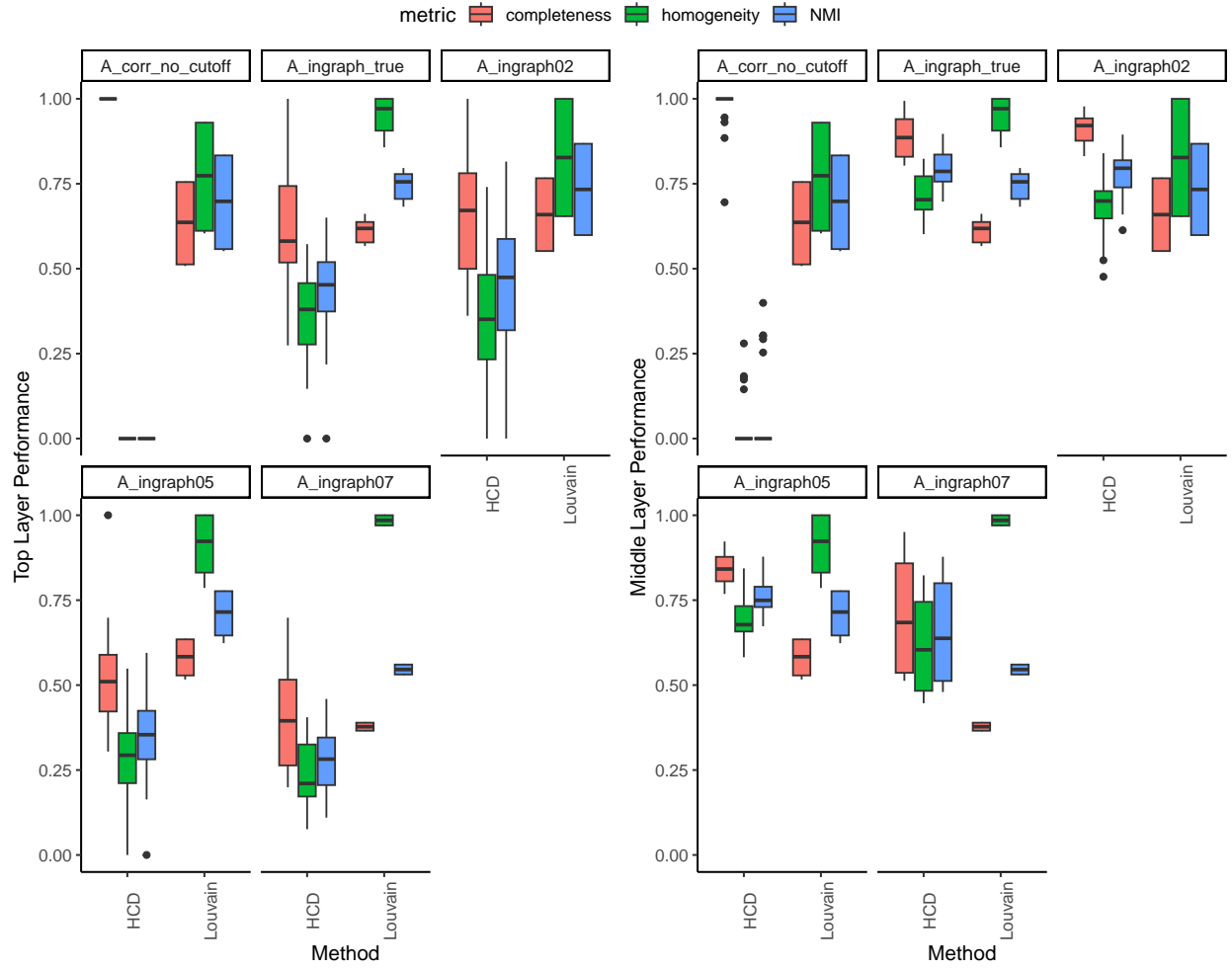


Figure 2: Scale free graphs

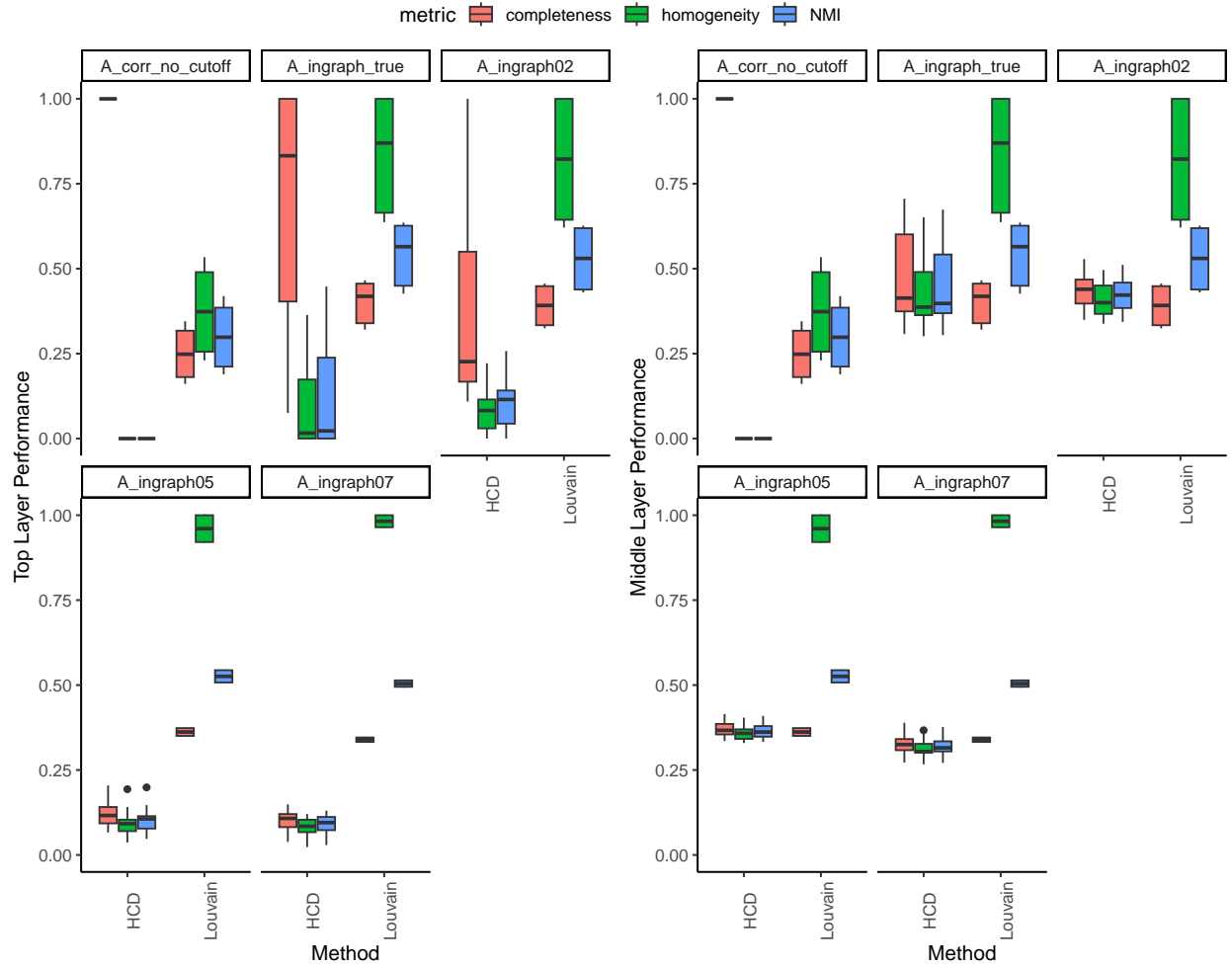


Figure 3: random graphs

Table 1: Summary statistics for intermediate difficulty simulated networks.

Value	Network1	Network2	Network3	Network4	Network5	Network6
Subgraph type	small world	small world	scale free	scale free	random graph	random graph
Connection type	disc	full	disc	full	disc	full
Layers	3	3	3	3	3	3
Standard deviation	0.1	0.1	0.1	0.1	0.1	0.1
Nodes per layer	(5, 15, 300)	(5, 15, 300)	(5, 15, 300)	(5, 15, 300)	(5, 12, 167)	(5, 12, 167)
Edges per layer	(0, 15, 358)	(10, 25, 300)	(0, 10, 965)	(10, 20, 300)	(0, 7, 129)	(10, 17, 167)
Subgraph probability	0.05	0.05	0.05	0.05	0.05	0.05
Sample size	500	500	500	500	500	500
Modularity (top)	0.8	0.686	0.781	0.739	0.789	0.663
Average node degree top	1.193	1.38	3.217	3.337	0.772	0.886
Avg connections within top communities	71.6	73.4	193	191.6	25.8	25.8
Avg. connections between top communities	0	2.35	0	2.15	0	0.95
Modularity (middle)	0.771	0.658	0.875	0.841	0.813	0.697
Average node degree middle	1.193	1.38	3.217	3.337	0.772	0.886
Avg connections within middle communities	20	20	61.333	61.333	9.667	9.667
Avg connections between middle communities	0.276	0.543	0.214	0.386	0.098	0.242

## Tables

Table 2: Simulation settings for intermediate difficulty networks.  
Each row represents a single simulation scenario applied to all 6  
simulated networks given in Table 1

Scenario	Input Graph	Graph Recon. Loss	Attr. Recon. Loss	Modularity Weighth	Clust. Weight
1	A_ingraph_true	1 = on	False (on)	1 = on	1 (middle), 1 (top)
2	A_corr_no_cutoff	= on	False (on)	1 = on	1 (middle), 1 (top)
3	A_ingraph02	1 = on	False (on)	1 = on	1 (middle), 1 (top)
4	A_ingraph05	1 = on	False (on)	1 = on	1 (middle), 1 (top)
5	A_ingraph07	1 = on	False (on)	1 = on	1 (middle), 1 (top)
6	A_ingraph_true	0 = off	False (on)	1 = on	1 (middle), 1 (top)
7	A_corr_no_cutoff	= off	False (on)	1 = on	1 (middle), 1 (top)
8	A_ingraph02	0 = off	False (on)	1 = on	1 (middle), 1 (top)
9	A_ingraph05	0 = off	False (on)	1 = on	1 (middle), 1 (top)
10	A_ingraph07	0 = off	False (on)	1 = on	1 (middle), 1 (top)
11	A_ingraph_true	1 = on	True (off)	1 = on	1 (middle), 1 (top)
12	A_corr_no_cutoff	= on	True (off)	1 = on	1 (middle), 1 (top)
13	A_ingraph02	1 = on	True (off)	1 = on	1 (middle), 1 (top)
14	A_ingraph05	1 = on	True (off)	1 = on	1 (middle), 1 (top)
15	A_ingraph07	1 = on	True (off)	1 = on	1 (middle), 1 (top)
16	A_ingraph_true	0 = off	True (off)	1 = on	1 (middle), 1 (top)
17	A_corr_no_cutoff	= off	True (off)	1 = on	1 (middle), 1 (top)
18	A_ingraph02	0 = off	True (off)	1 = on	1 (middle), 1 (top)
19	A_ingraph05	0 = off	True (off)	1 = on	1 (middle), 1 (top)
20	A_ingraph07	0 = off	True (off)	1 = on	1 (middle), 1 (top)
21	A_ingraph_true	1 = on	False (on)	0 = off	1 (middle), 1 (top)
22	A_corr_no_cutoff	= on	False (on)	0 = off	1 (middle), 1 (top)
23	A_ingraph02	1 = on	False (on)	0 = off	1 (middle), 1 (top)
24	A_ingraph05	1 = on	False (on)	0 = off	1 (middle), 1 (top)
25	A_ingraph07	1 = on	False (on)	0 = off	1 (middle), 1 (top)
26	A_ingraph_true	0 = off	False (on)	0 = off	1 (middle), 1 (top)
27	A_corr_no_cutoff	= off	False (on)	0 = off	1 (middle), 1 (top)
28	A_ingraph02	0 = off	False (on)	0 = off	1 (middle), 1 (top)
29	A_ingraph05	0 = off	False (on)	0 = off	1 (middle), 1 (top)
30	A_ingraph07	0 = off	False (on)	0 = off	1 (middle), 1 (top)
31	A_ingraph_true	1 = on	True (off)	0 = off	1 (middle), 1 (top)
32	A_corr_no_cutoff	= on	True (off)	0 = off	1 (middle), 1 (top)
33	A_ingraph02	1 = on	True (off)	0 = off	1 (middle), 1 (top)
34	A_ingraph05	1 = on	True (off)	0 = off	1 (middle), 1 (top)
35	A_ingraph07	1 = on	True (off)	0 = off	1 (middle), 1 (top)
36	A_ingraph_true	0 = off	True (off)	0 = off	1 (middle), 1 (top)
37	A_corr_no_cutoff	= off	True (off)	0 = off	1 (middle), 1 (top)
38	A_ingraph02	0 = off	True (off)	0 = off	1 (middle), 1 (top)
39	A_ingraph05	0 = off	True (off)	0 = off	1 (middle), 1 (top)
40	A_ingraph07	0 = off	True (off)	0 = off	1 (middle), 1 (top)
41	A_ingraph_true	1 = on	False (on)	1 = on	0.1 (middle), 1e-4 (top)
42	A_corr_no_cutoff	= on	False (on)	1 = on	0.1 (middle), 1e-4 (top)
43	A_ingraph02	1 = on	False (on)	1 = on	0.1 (middle), 1e-4 (top)
44	A_ingraph05	1 = on	False (on)	1 = on	0.1 (middle), 1e-4 (top)



Scenario	Input Graph	Graph Recon. Loss	Attr. Recon. Loss	Modularity Weigth	Clust. Weight
45	A_ingraph07	1 = on	False (on)	1 = on	0.1 (middle), 1e-4 (top)
46	A_ingraph_true	0 = off	False (on)	1 = on	0.1 (middle), 1e-4 (top)
47	A_corr_no_cutoff	0 = off	False (on)	1 = on	0.1 (middle), 1e-4 (top)
48	A_ingraph02	0 = off	False (on)	1 = on	0.1 (middle), 1e-4 (top)
49	A_ingraph05	0 = off	False (on)	1 = on	0.1 (middle), 1e-4 (top)
50	A_ingraph07	0 = off	False (on)	1 = on	0.1 (middle), 1e-4 (top)
51	A_ingraph_true	1 = on	True (off)	1 = on	0.1 (middle), 1e-4 (top)
52	A_corr_no_cutoff	1 = on	True (off)	1 = on	0.1 (middle), 1e-4 (top)
53	A_ingraph02	1 = on	True (off)	1 = on	0.1 (middle), 1e-4 (top)
54	A_ingraph05	1 = on	True (off)	1 = on	0.1 (middle), 1e-4 (top)
55	A_ingraph07	1 = on	True (off)	1 = on	0.1 (middle), 1e-4 (top)
56	A_ingraph_true	0 = off	True (off)	1 = on	0.1 (middle), 1e-4 (top)
57	A_corr_no_cutoff	0 = off	True (off)	1 = on	0.1 (middle), 1e-4 (top)
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61	A_ingraph_true	1 = on	False (on)	0 = off	0.1 (middle), 1e-4 (top)
62	A_corr_no_cutoff	1 = on	False (on)	0 = off	0.1 (middle), 1e-4 (top)
63	A_ingraph02	1 = on	False (on)	0 = off	0.1 (middle), 1e-4 (top)
64	A_ingraph05	1 = on	False (on)	0 = off	0.1 (middle), 1e-4 (top)
65	A_ingraph07	1 = on	False (on)	0 = off	0.1 (middle), 1e-4 (top)
66	A_ingraph_true	0 = off	False (on)	0 = off	0.1 (middle), 1e-4 (top)
67	A_corr_no_cutoff	0 = off	False (on)	0 = off	0.1 (middle), 1e-4 (top)
68	A_ingraph02	0 = off	False (on)	0 = off	0.1 (middle), 1e-4 (top)
69	A_ingraph05	0 = off	False (on)	0 = off	0.1 (middle), 1e-4 (top)
70	A_ingraph07	0 = off	False (on)	0 = off	0.1 (middle), 1e-4 (top)

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71	A_ingraph_true	1 = on	True (off)	0 = off	0.1 (middle), 1e-4 (top)
72	A_corr_no_cutoff	= on	True (off)	0 = off	0.1 (middle), 1e-4 (top)
73	A_ingraph02	1 = on	True (off)	0 = off	0.1 (middle), 1e-4 (top)
74	A_ingraph05	1 = on	True (off)	0 = off	0.1 (middle), 1e-4 (top)
75	A_ingraph07	1 = on	True (off)	0 = off	0.1 (middle), 1e-4 (top)
76	A_ingraph_true	0 = off	True (off)	0 = off	0.1 (middle), 1e-4 (top)
77	A_corr_no_cutoff	= off	True (off)	0 = off	0.1 (middle), 1e-4 (top)
78	A_ingraph02	0 = off	True (off)	0 = off	0.1 (middle), 1e-4 (top)
79	A_ingraph05	0 = off	True (off)	0 = off	0.1 (middle), 1e-4 (top)
80	A_ingraph07	0 = off	True (off)	0 = off	0.1 (middle), 1e-4 (top)

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