

# Supplementary Information for the Paper “Network Robustness Prediction: Influence of Training Data Distributions”

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Table S1: The average number of nodes ( $\bar{N}$ ) and standard deviation ( $\sigma$ ) for each of the seven distributions.

Distribution	Uniform	Gaussian	Extra	Bimodal	Trimodal	Decrease	Increase
$N \pm \sigma$	$496.05 \pm 229.30$	$499.67 \pm 176.77$	$506.83 \pm 206.65$	$498.31 \pm 216.19$	$501.69 \pm 171.46$	$423.60 \pm 212.69$	$579.69 \pm 215.92$

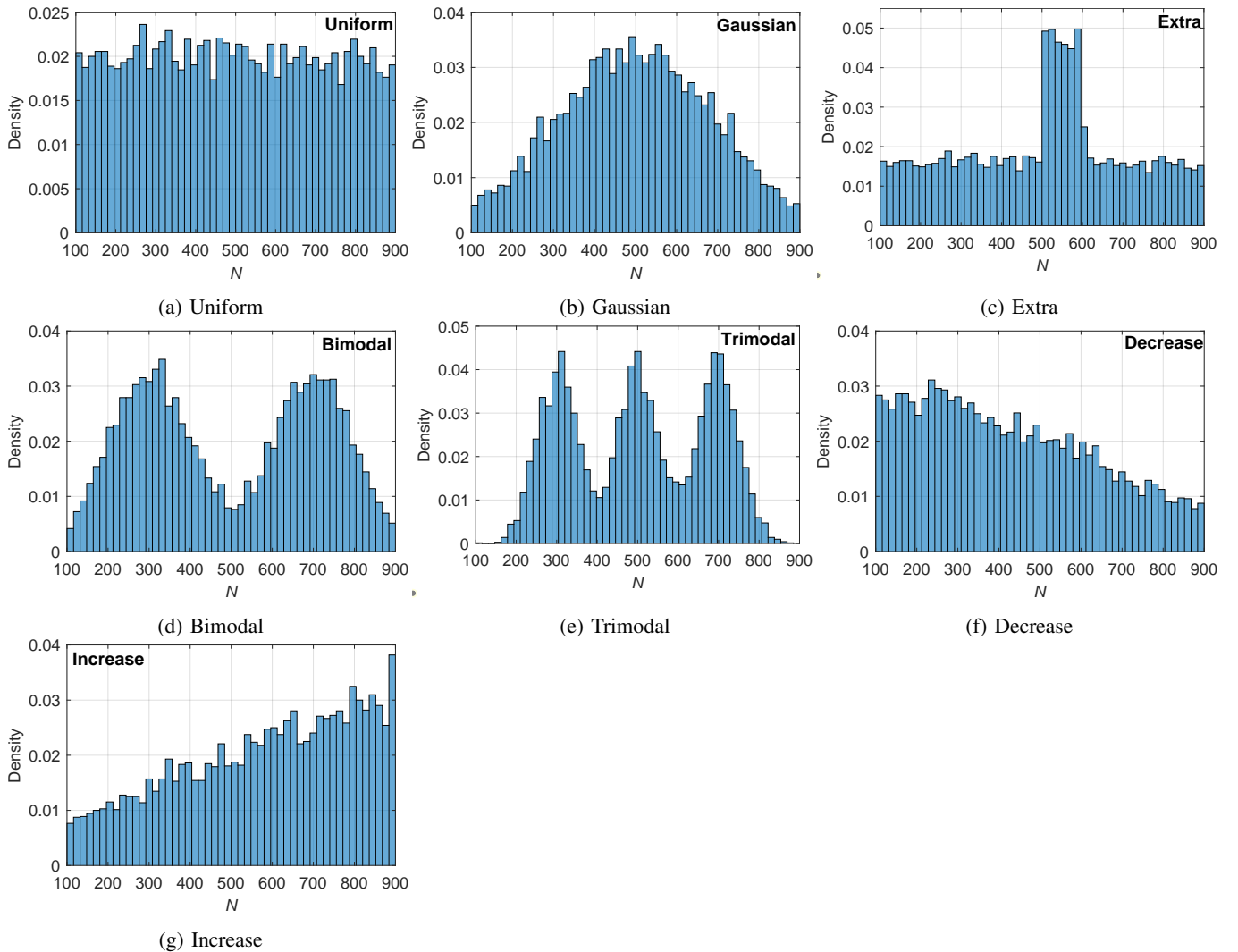


Figure S1: Histograms for different node distributions: (a) Uniform, (b) Gaussian, (c) Extra, (d) Bi-modal, (e) Trimodal, (f) Decrease, and (g) Increase. The total number of samples is 9000 for (c) Extra, and 7200 for other distributions.

Table S2: Comparison of the average prediction error with standard deviation, using the seven different distributions of training data. The simulated scenario is using LFR-CNN to predict the connectivity robustness.

LFR-CNN	Uniform	Gaussian	Extra	Bimodal	Trimodal	Decrease	Increase
BA	0.047±0.003 (3)	0.05±0.003 (4.5)	0.042±0.003 (2)	0.06±0.004 (6)	0.081±0.004 (7)	0.05±0.004 (4.5)	0.041±0.003 (1)
EH	0.031±0.002 (3)	0.024±0.001 (1)	0.028±0.002 (2)	0.108±0.003 (6)	0.127±0.004 (7)	0.069±0.001 (4)	0.093±0.004 (5)
ER	0.028±0.001 (2.5)	0.028±0.002 (2.5)	0.027±0.001 (1)	0.09±0.003 (6)	0.104±0.004 (7)	0.064±0.002 (4)	0.067±0.003 (5)
QS	0.034±0.002 (3)	0.028±0.002 (1)	0.032±0.002 (2)	0.105±0.003 (6)	0.128±0.005 (7)	0.071±0.002 (4)	0.089±0.004 (5)
RH	0.024±0.001 (1)	0.028±0.002 (3)	0.025±0.001 (2)	0.076±0.002 (6)	0.091±0.003 (7)	0.055±0.003 (5)	0.051±0.003 (4)
RT	0.034±0.003 (2)	0.038±0.002 (3)	0.032±0.002 (1)	0.068±0.003 (6)	0.088±0.004 (7)	0.052±0.004 (5)	0.046±0.003 (4)
SF	0.028±0.002 (2)	0.035±0.002 (7)	0.029±0.002 (3)	0.032±0.002 (5)	0.034±0.002 (6)	0.031±0.002 (4)	0.027±0.002 (1)
SWNW	0.026±0.001 (1.5)	0.027±0.002 (3)	0.026±0.001 (1.5)	0.08±0.003 (6)	0.099±0.004 (7)	0.057±0.003 (5)	0.056±0.003 (4)
SWWS	0.025±0.001 (1.5)	0.027±0.002 (3)	0.025±0.001 (1.5)	0.079±0.003 (6)	0.098±0.003 (7)	0.056±0.003 (5)	0.055±0.003 (4)
Overall	0.031±0.002 (2.2)	0.032±0.002 (3.1)	0.03±0.002 (1.8)	0.077±0.003 (5.9)	0.095±0.004 (6.9)	0.056±0.003 (4.5)	0.059±0.003 (3.7)

Table S3: Comparison of the average prediction error with standard deviation, using the seven different distributions of training data. The simulated scenario is using PATCHY-SAN to predict the connectivity robustness.

PATCHY-SAN	Uniform	Gaussian	Extra	Bimodal	Trimodal	Decrease	Increase
BA	0.063±0.005 (2)	0.065±0.005 (4.5)	0.059±0.004 (1)	0.064±0.005 (3)	0.066±0.005 (6.5)	0.065±0.005 (4.5)	0.066±0.005 (6.5)
EH	0.043±0.002 (2.5)	0.042±0.002 (1)	0.046±0.002 (4.5)	0.046±0.002 (4.5)	0.056±0.002 (7)	0.043±0.002 (2.5)	0.048±0.002 (6)
ER	0.038±0.002 (1.5)	0.039±0.002 (3.5)	0.04±0.002 (5)	0.039±0.002 (3.5)	0.05±0.003 (7)	0.038±0.002 (1.5)	0.042±0.002 (6)
QS	0.043±0.002 (2)	0.041±0.002 (1)	0.048±0.002 (6)	0.047±0.003 (5)	0.057±0.003 (7)	0.044±0.003 (3.5)	0.044±0.002 (3.5)
RH	0.037±0.002 (1)	0.041±0.002 (4.5)	0.041±0.002 (4.5)	0.04±0.002 (3)	0.051±0.003 (7)	0.039±0.002 (2)	0.045±0.002 (6)
RT	0.05±0.004 (1)	0.052±0.004 (2)	0.053±0.004 (3.5)	0.054±0.003 (5)	0.061±0.005 (7)	0.053±0.004 (3.5)	0.055±0.004 (6)
SF	0.043±0.003 (2)	0.046±0.003 (6)	0.042±0.003 (1)	0.045±0.003 (4)	0.049±0.003 (7)	0.045±0.003 (4)	0.045±0.003 (4)
SWNW	0.04±0.002 (2.5)	0.037±0.002 (1)	0.043±0.002 (6)	0.042±0.002 (5)	0.05±0.003 (7)	0.041±0.002 (4)	0.04±0.002 (2.5)
SWWS	0.037±0.002 (2)	0.036±0.002 (1)	0.042±0.002 (6)	0.039±0.002 (4.5)	0.049±0.003 (7)	0.038±0.002 (3)	0.039±0.001 (4.5)
Overall	0.044±0.003 (1.8)	0.044±0.003 (2.7)	0.046±0.003 (4.2)	0.046±0.003 (4.2)	0.054±0.003 (6.9)	0.045±0.003 (3.2)	0.047±0.003 (5)

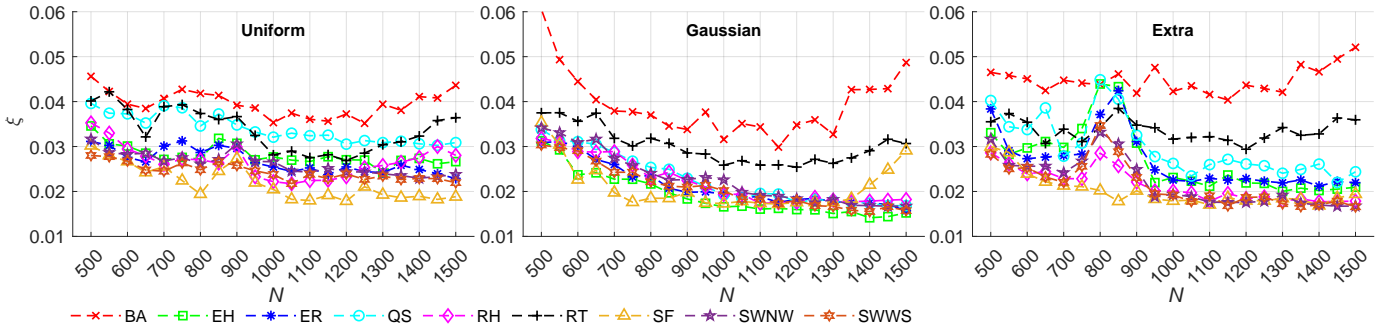


Figure S2: Prediction error  $\xi$  obtained by LFR-CNN against the change of the network size  $N$ , where  $N \in [500, 1500]$  follows uniform, Gaussian, or extra distribution. The input size of CNN is  $W = 1000$ . Network robustness is measured by the connectivity robustness under targeted attacks.

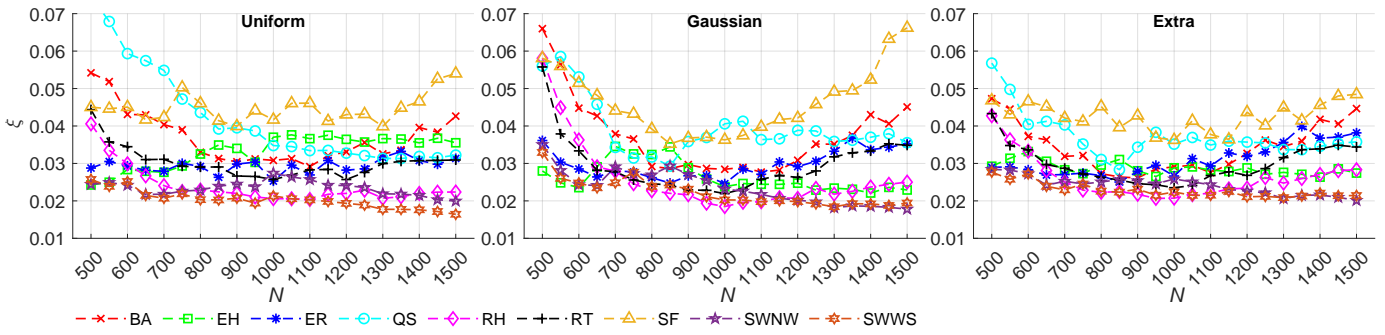


Figure S3: Prediction error  $\xi$  obtained by PATCHY-SAN against the change of the network size  $N$ , where  $N \in [500, 1500]$  follows uniform, Gaussian, or extra distribution. The input size of CNN is  $W = 1000$ . Network robustness is measured by the connectivity robustness under targeted attacks.

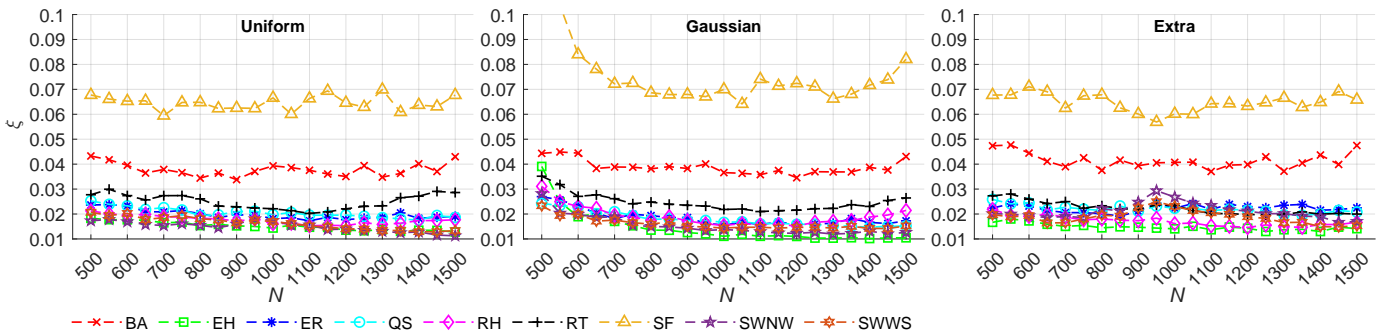


Figure S4: Prediction error  $\xi$  obtained by LFR-CNN against the change of the network size  $N$ , where  $N \in [500, 1500]$  follows uniform, Gaussian, or extra distribution. The input size of CNN is  $W = 1000$ . Network robustness is measured by controllability robustness under random attacks.

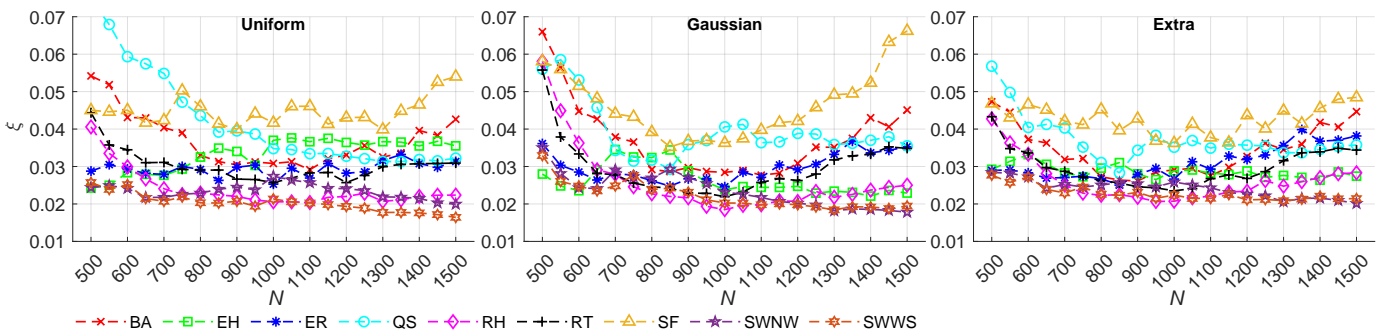


Figure S5: Prediction error  $\xi$  obtained by PATCHY-SAN against the change of the network size  $N$ , where  $N \in [500, 1500]$  follows uniform, Gaussian, or extra distribution. The input size of CNN is  $W = 1000$ . Network robustness is measured by controllability robustness under random attacks.

Table S4: Prediction ranks of LFR-CNN using uniform (U), Gaussian (G), and extra (E) distributed training data set. The input size of CNN is  $W = 500$ , with the measure of connectivity robustness under degree-based node-removal attacks.

N	BA			EH			ER			QS			RH			RT			SF			SWNW			SWWS			
	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	
100	1	3(-)	2	2	3(-)	1	1	3(-)	2	2	3	1(+)	1	3(-)	2	2	3(-)	1	1	3(-)	2(-)	1	3(-)	2	1	3(-)	2	
125	1	3(-)	2	1	3(-)	2	1	3(-)	2(-)	2	3(-)	1	1	3(-)	2(-)	2	3(-)	1	1	3(-)	2(-)	1	3(-)	2(-)	1	3(-)	2(-)	
150	1	2	3(-)	3	2	1(+)	1	3	2	2	3	2	1	1	3(-)	2(-)	1	3	2(-)	1	2	3(-)	1	2	3(-)	2		
175	2	1	3(-)	3	2	1(+)	2	3	1	3	2	1(+)	1	2(-)	3(-)	1	2	3(-)	2	3(-)	1	2	1	3	1	3	2	
200	1	3	2	2	3(-)	1(+)	1	3(-)	2	3	2	1(+)	1	2(-)	3(-)	1	3	2	1	3(-)	2(-)	1	3(-)	2	1	3(-)	2	
225	2	1	3	1	3(-)	2	1	2	3(-)	3	1(+)	2	1	2(-)	3(-)	1	2	3	1	3(-)	2	1	2	3(-)	1	2	3(-)	
250	3	1(+)	2	3	2	1(+)	2	1	3	3	1(+)	2	3	1	2	3	2(+)	1(+)	1	3(-)	2(-)	2	1	3	1	3(-)	2	
275	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	
300	3	1(+)	2	3	1(+)	2	3	1(+)	2	3	1(+)	2(+)	2	1(+)	3(-)	1	2	3	1	3	3	1(+)	2	3	1(+)	2	1(+)	3
325	3	2	1	3	1(+)	2	2	1(+)	3	3	1(+)	2(+)	2	1(+)	3(-)	3	1(+)	2	2	3	1	2	1(+)	3	3	1(+)	2	
350	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	2	3	1	3	1(+)	2(+)	3	1(+)	2(+)	
375	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3(-)	1	2	1(+)	3	3	1(+)	2	
400	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	2	1	3	3	1(+)	2(+)	3	1(+)	2	
425	3	1	2	2	1(+)	3	3	1(+)	2	2	3	1(+)	2	2	1(+)	3	3	1(+)	2	2	1	3	2	1(+)	3	2	1(+)	3
450	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	1	2	3	2	1(+)	3	3	1(+)	2	
475	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	1	2	3	2	1(+)	3	3	1(+)	2	
500	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	1	2	3	2	1(+)	3	3	1(+)	2	
525	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	2	3	1	3	1(+)	2(+)	3	1(+)	2(+)	
550	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3	1	3	1(+)	2	3	1(+)	2(+)	
575	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3	1	3	1(+)	2	3	1(+)	2(+)	
600	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3	1	3	1(+)	2	3	2(+)	1(+)	
625	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3(-)	1	3	1(+)	2(+)	3	2(+)	1(+)	
650	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2	1(+)	3	2	1(+)	3	1(+)	2	3	1(+)	2(+)	
675	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1	3	1	3	1	3	1(+)	2(+)	3	1(+)	2(+)	
700	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	3	2	1(+)	3	1(+)	2	3	1(+)	2(+)	
725	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2	1(+)	3	1(+)	2	3	1(+)	2(+)	
750	3	1	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	3	2	1(+)	3	1(+)	2	3	1(+)	2(+)	
775	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3	1	3	1(+)	2	3	1(+)	2	
800	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	3	1	3	1(+)	2	3	1(+)	2	
825	3	2	1	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1	3	1(+)	2(+)	3	1(+)	2	2(+)	
850	3	1	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2	1(+)	3	2(+)	1(+)	2	3(-)	1(+)	3	1(+)	2	3	1(+)	2(+)	
875	3	2	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	3	2(+)	1(+)	2	3(-)	1(+)	3	1(+)	2	3	2(+)	1(+)	
900	3	2(+)	1(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	3	2(+)	1(+)	2	3(-)	1(+)	3	1(+)	2	3	1	2	
Average Rank	2.70	1.55	1.76	2.79	1.33	1.88	2.61	1.33	2.06	2.94	1.21	1.85	2.55	1.64	1.82	1.67	1.79	1.67	2.64	1.58	2.52	1.27	2.21	2.52	1.61	1.88		
sum(+)	21	15	15	27	26	27	26	26	21	28	28	28	28	25	21	27	24	27	0	11	9	25	9	25	25	15	15	
sum(-)	2	2	2	4	3	0	3	3	2	1	1	0	7	6	7	2	3	2	12	5	3	3	3	3	5	2	2	

Table S5: Prediction ranks of LFR-CNN using uniform (U), Gaussian (G), and extra (E) distributed training data set. The input size of CNN is  $W = 500$ , with the measure of controllability robustness under random node attacks.

N	BA			EH			ER			QS			RH			RT			SF			SWNW			SWWS			
	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	
100	3	2(+)	1(+)	1	2	3(-)	3	1(+)	2	3	1(+)	2(+)	2	3	1	3	1(+)	2(+)	3	2(+)	1(+)	1	3(-)	2	2	3	1	
125	3	2	1(+)	1	3(-)	2	3	1(+)	2	3	1(+)	2	3	1	3	2	1	3	2(+)	1(+)	2	3(-)	1	2	3	1	1	
150	3	2(+)	1(+)	3	2	1(+)	3	1(+)	2	3	1(+)	3	3	2	1	3	1(+)	2	3	2(+)	1(+)	3	1	2	3	2	1	
175	3	2(+)	1(+)	3	2	1	3	1(+)	2	3	1(+)	2	3	2	1	3	2	1	3	2(+)	1(+)	3	2	1	1	3	2	1
200	3	2(+)	1(+)	2	3	1	3	1(+)	2	3	1(+)	2(+)	2	3	1	3	2	1(+)	3	2(+)	1(+)	3	2	1	3	2	1	1
225	3	2(+)	1(+)	3	2	1	3	1	2	3	2(+)	1(+)	3	2	1(+)	3	2(+)	1(+)	3	2(+)	1(+)	2	3	1	2	3	1	1
250	3	2(+)	1(+)	3	1	2	3	1(+)	2(+)	3	2(+)	1(+)	2	3	1	3	2	1(+)	3	2(+)	1(+)	2	3	1	2	3	1	1
275	3	2(+)	1(+)	2	3	1	3	1(+)	2	3	2(+)	1(+)	2	3	1	3	2	1	3	2(+)	1(+)	2	3	1	2	3	1	1
300	3	2(+)	1(+)	3	1	2	3	2	1	3	2(+)	1(+)	3	1	2	3	1	2(+)	3	2(+)	1(+)	2	3	1	3	2	1	1
325	3	2(+)	1(+)	3	2	1	3	1(+)	2(+)	3	2(+)	1(+)	1	3	2	3	1(+)	2	3	2(+)	1(+)	2	3	1	3	2	1	1
350	3	1(+)	2(+)	2	1	3	3	1(+)	2	3	2(+)	1(+)	2	1	3	3	1(+)	2	3	2(+)	1(+)	1	2	3	3	1	2	1
375	3	1(+)	2(+)	2	1	3	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2	3	2(+)	1(+)	3	1	2	3	3	1(+)	2
400	3	1(+)	2(+)	2	1	3(-)	3	1(+)	2	3	1(+)	2(+)	2	1(+)	3	2	1	3	3	2(+)	1(+)	2	1	3(-)	2	1	3	1
425	3	2(+)	1(+)	2	1(+)	3	3	1(+)	2(+)	3	1(+)	2(+)	2	1(+)	3	2	1(+)	3	3	2(+)	1(+)	3	1(+)	2	3	1(+)	2	1
450	3	2(+)	1(+)	2	1	3(-)	3	1(+)	2	3	1(+)	2(+)	2	1	3(-)	3	1(+)	2	3	2(+)	1(+)	2	1	3(-)	2	1	3	1
475	3	2(+)	1(+)	1	2	3(-)	3	1(+)	2(+)	2	1	3	2(+)	2	1	3	3	1(+)	2	3	2(+)	1(+)	2	1(+)	3	1	2	1
500	3	2(+)	1(+)	1	2	3(-)	3	1(+)	2	3	1(+)	2(+)	2	1	3(-)	3	1(+)	2	3	2(+)	1(+)	3	2(+)	2	3	1(+)	2	1
525	3	2(+)	1(+)	1	2	3(-)	2	1(+)	3	3	1(+)	2(+)	2	1	3(-)	3	1	2	3	2(+)	1(+)	2	1(+)	3	3	1(+)	2	1
550	3	2(+)	1(+)	1	2	3(-)	3	1(+)	2	3	1(+)	2(+)	2	1	3(-)	3	1(+)	2	3	2(+)	1(+)	2	1(+)	3	3	1(+)	2	1
575	3	2(+)	1(+)	1	2	3(-)	2	1(+)	3	3	2(+)	1(+)	2	1	3(-)	3	1	2	3	2(+)	1(+)	2	1(+)	3	2	1	3	1
600	3	2	1(+)	1	2	3(-)	2	1(+)	3	3	1(+)	2(+)	2	1	3	2	1	3	3	2(+)	1(+)	2	1	3	2	1(+)	3	1
625	3	2	1(+)	1	2	3(-)	2	1(+)	3	3	1(+)	2(+)	2	1	3	3	2	1	3	2(+)	1(+)	2	1	3	3	1(+)	2	1
650	3	2(+)	1(+)	1	2	3(-)	2	1(+)	3	3	1(+)	2(+)	2	1	3(-)	3	2	1	3	2(+)	1(+)	2	1(+)	3	2	1	3	1
675	3	2(+)	1(+)	1	2	3(-)	2	1(+)	3	3	1(+)	2(+)	2	1	3(-)	2	1	3	3	2(+)	1(+)	2	1(+)	3	2	1	3	1
700	3	2	1(+)	1	2	3(-)	2	1(+)	3(-)	3	1(+)	2(+)	1	2	3(-)	1	3	2	3	2(+)	1(+)	2	1(+)	3	3	1(+)	2	1
725	3	2(+)	1(+)	1	2	3(-)	2	1(+)	3(-)	3	2(+)	1(+)	1	2	3	1	2	3	3	2(+)	1(+)	2	1	3	3	1	2	1
750	3	2	1	1	2	3(-)	2	1(+)	3(-)	3	1(+)	2(+)	1	2	3	1	3	2	3	2(+)	1(+)	2	1	3	2	1	3	1
775	2	3	1	1	2	3(-)	2	1(+)	3	3	2(+)	1(+)	1	2	3	2	3	1	3	2(+)	1(+)	2	1	3	3	1	2	1
800	3	2	1(+)	1	2	3(-)	2	1(+)	3(-)	3	1(+)	2(+)	1	3	2	2	3	1	3	2(+)	1(+)	2	1	3	2	1	3	1
825	3	2	1(+)	1	2	3(-)	2	1(+)	3(-)	3	1(+)	2(+)	1	3	2	1	3	2	3	2(+)	1(+)	2	1	3	2	1	3	1
850	3	2	1(+)	1	2	3(-)	2	1(+)	3(-)	3	2(+)	1(+)	1	3	2	1	3	2	3	2(+)	1(+)	2	1	3	2	1	3	1
875	3	2(+)	1(+)	2	1	3(-)	2	1(+)	3(-)	3	1(+)	2(+)	1	3	2	2	3	1	3	2(+)	1(+)	2	1	3	2	1	3	1
900	2	3	1	1	2	3(-)	2	1(+)	3(-)	3	1(+)	2(+)	1	3	2	2	3	1	3	2(+)	1(+)	2	1	3	2	1	3	1
Average Rank	2.94	1.97	1.09	1.61	1.85	2.55	2.55	2.55	1.03	2.42	1.30	1.73	1.85	1.88	2.27	2.45	1.73	1.82	3.00	2.00	1.00	2.12	1.52	2.36	2.42	1.48	2.09	
sum(+)	23	30	30	1	1	1	1	1	31	5	33	30	3	3	1	5	11	5	5	33	33	33	9	0	8	0	0	
sum(-)	0	0	0	0	0	21	0	0	0	8	0	0	0	0	8	0	0	0	0	0	0	0	2	2	2	0	0	

Table S6: Prediction ranks of LFR-CNN using uniform (U), Gaussian (G), and extra (E) distributed training data set. The input size of CNN is  $W = 1000$ , with the measure of connectivity robustness under degree-based node-removal attacks.

$N$	BA			EH			ER			QS			RH			RT			SF			SWNW			SWWS			
	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	
500	1	3(-)	2	3	1	2	2	1	3(-)	3	2	1	2	3	2	1	2	3(-)	1	2	3	1	2	3	1	2	3	
550	1	3(-)	2	3	2	1(+)	2	3	1(+)	2	3	2	1	3	1(+)	2	3	1(+)	2	1	3	2	3	1(+)	2	3	1(+)	
600	1	2	3	3	1(+)	2	2	3	1	3	1(+)	2	3	2	1(+)	3	2	1(+)	2	3	1(+)	2	3	1(+)	2	3	1	
650	1	2	3	2	1(+)	3	1	2	3	2	1(+)	3	2	3	1(+)	2	3	1(+)	2	3	1	2	3	1(+)	2	3	1	
700	2	1	3	2	1(+)	3	3	1(+)	2	3	2(+)	1(+)	2	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2	3	1(+)	
750	2	1	3	2	1(+)	3	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1	2	3	1	2	3	1	2	
800	2	1	3	2	1(+)	3(-)	2	1(+)	3(-)	2	1(+)	3(-)	2	1(+)	3	2	1(+)	2	2	1	3	2	1	3(-)	2	1(+)	3(-)	
850	2	1(+)	3	2	1(+)	3(-)	2	1(+)	3(-)	2	1(+)	3	3	2	1(+)	3	3	2(+)	1(+)	3	2(+)	1(+)	2	1(+)	3	2	1(+)	
900	2	1	3	2	1(+)	3	2	1(+)	3	3	1(+)	2	3	3	1(+)	2	3	1(+)	2	3	1(+)	2	3	1(+)	2	3	1(+)	
950	2	1	3(-)	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	3	1(+)	2	3	2(+)	1(+)	3	2(+)	1(+)	
1000	2	1	3	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	1	3	3	1	2	3	2(+)	1(+)	3	2(+)	1(+)	
1050	2	1	3	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	2	1	3	3	1	3	3	1	2	3	2(+)	1(+)	3	2(+)	1(+)	
1100	2	1	3	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	2	1	3	3	2	1	3	3	2	1	3	2(+)	1(+)	3	1(+)	
1150	2	1(+)	3	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	2	1	3	3	1	2	3	3	1	2	3	2(+)	1(+)	3	2(+)	
1200	2	1	3	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	2	1	3	2	1	3	2	1	3	2	1	3	2(+)	1(+)	2(+)	
1250	1	2	3(-)	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	2	1	3	3	1	3	3	1	2	3	1(+)	2	3	1(+)	2(+)	
1300	2	1(+)	3	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2(+)	1(+)	3	1	2	3	1(+)	2	3	1(+)	2(+)	
1350	1	2	3(-)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1	2	3	1(+)	2	3	1(+)	2(+)	
1400	1	2	3	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2(+)	3	2	1	3	1(+)	2	3	1(+)	2(+)	
1450	1	2	3	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2	3	1	2	3	1(+)	2	3	1(+)	2(+)	
1500	1	2	3	3	1(+)	2(+)	3	1(+)	2	3	1(+)	2(+)	3	1(+)	2(+)	3	1(+)	2	3	1	2	3	1(+)	2	3	1(+)	2(+)	
Average Rank	1.57	1.52	2.90	2.71	1.05	2.24	2.14	1.24	1.24	2.86	1.67	1.48	2.38	1.24	2.38	1.71	2.48	1.81	2.67	1.81	1.71	2.48	1.81	2.67	1.81	1.52	1.62	1.71
sum(+)	3	0	0	0	19	13	6	17	17	0	15	19	0	11	2	7	0	7	2	7	3	0	7	2	7	14	15	
sum(-)	2	4	2	0	0	2	3	0	1	0	0	0	1	1	1	0	1	0	1	2	3	0	1	2	1	2	0	

Table S7: Prediction ranks of LFR-CNN using uniform (U), Gaussian (G), and extra (E) distributed training data set. The input size of CNN is  $W = 1000$ , with the measure of controllability robustness under random node attacks.

N	BA			EH			ER			QS			RH			RT			SF			SWNW			SWWS				
	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E		
500	1	2	3	2	3(-)	1	2	3	1	2	3	1	2	3(-)	2	2	3(-)	1	2	3(-)	1	2	3(-)	1	3(-)	2(-)	2	3(-)	1
550	1	2	3	1	3(-)	2	1	3	2	2	1	3	2	1	3(-)	1	2	3	1	1	3(-)	2	1	3(-)	2(-)	2	3	1	
600	1	2(-)	3	2	3	1	3	2	1	2	1	3	2	1	3(-)	1	3	2	1	1	3(-)	2	1	3(-)	2(-)	3	2	1	
650	1	2	3	2	3(-)	1	2	1	3	3	1	2	1	3	2	2	3	1	1	3	2	2	1	3(-)	2(-)	3	2	1	
700	1	2	3	2	3	1	3	1(+)	2	2	1	3	2	1	3	2	1	1	3(-)	2	1	1	2(-)	3(-)	2	2	1(+)		
750	1	2	3	3	1	2	3	1	2	2	1(+)	3	2	1	3	2	3	1	1	3	2	2	1	3(-)	3	1(+)	2		
800	1	3	2	3	1	2	3	1	2	2	1	3(-)	3	1	2	3	2	1	1	3	2	2	1	3(-)	2	1	3		
850	1	2	3	3	1(+)	2	2	1	3	2	1(+)	3(-)	2	3	1	2	3	1	1	3	2	2	1	2	3(-)	2	1	3	
900	1	2	3	3	1(+)	2	2	1	3	2	1(+)	3	1	2	3	2	3	1	2	3	1	2	1	3(-)	2	1	3(-)		
950	1	2	3	3	1(+)	2	2	1(+)	3(-)	2	1(+)	3	2	1	3	1	2	3	2	3	1	2	1	1(+)	3(-)	2	1(+)	3(-)	
1000	2	1	3	3	1(+)	2	2	1(+)	3(-)	2	1(+)	3(-)	2	1	3	2	1	3	2	3	1	2	2	1	3(-)	2	1(+)	3(-)	
1050	2	1	3	3	1(+)	2	2	1	3(-)	2	1	3(-)	2	1	3	1	3	2	2	3	1	2	2	1	3(-)	2	1	3(-)	
1100	3	1	2	3	1(+)	2	2	1	3(-)	2	1(+)	3	2	3	1	1	3	2	2	3	1	2	2	1	3(-)	2	1	3(-)	
1150	1	2	3	2	1(+)	3	2	1	3(-)	2	1(+)	3(-)	2	3	1	2	3	1	2	3	1	2	2	1	3(-)	2	1	3(-)	
1200	2	1	3	2	1(+)	3	2	1	3(-)	2	1(+)	3	3	2	1	3	2	1	2	3	1	2	2	1	3(-)	1	2	3(-)	
1250	2	1	3	3	1(+)	2	2	1	3(-)	2	1(+)	3	2	3	1	3	2	1	1	3	2	2	1	3(-)	1	2	3(-)		
1300	1	2	3	2	1(+)	3	2	1	3(-)	2	1(+)	3	2	3	1	3	2	1	2	3	1	2	2	1	3(-)	1	2	3(-)	
1350	1	2	3	2	1(+)	3	2	1	3	2	1(+)	3	2	3	1	3	2	1	1	3	2	2	2	1	3(-)	1	2	3(-)	
1400	2	1	3	3	1(+)	2	2	1	3	2	1(+)	3(-)	2	3	1	3	2	1	1	3(-)	2	1	2	3(-)	1	2	3(-)		
1450	1	2	3	2	1(+)	3	2	1(+)	3	2	1(+)	3	2	3	1	3	2	3	1	3	2	2	1	2	3(-)	1	2	3(-)	
1500	1	2	3	2	1(+)	3	2	1	3	2	1(+)	3	2	3(-)	1	3	2	1	2	3(-)	1	1	2	3(-)	1	2	3(-)		
Average Rank	1.33	1.76	2.90	2.43	1.48	2.10	2.14	1.24	2.62	2.05	1.00	2.95	1.95	2.52	1.52	2.38	1.29	1.57	2.90	1.52	1.57	1.57	1.86	2.81	1.62	1.67	2.48		
sum(+)	0	0	0	0	14	0	0	4	0	0	15	0	0	0	0	0	1	7	0	0	0	0	4	0	4	3	1		
sum(-)	1	0	0	0	3	0	0	0	8	0	0	5	0	4	0	0	1	0	6	0	0	0	5	21	5	3	13		

Table S8: Prediction ranks of PATCHY-SAN using uniform (U), Gaussian (G), and extra (E) distributed training data set. The input size of CNN is  $W = 500$ , with the measure of connectivity robustness under degree-based node-removal attacks.

N	BA			EH			ER			QS			RH			RT			SF			SWNW			SWWS			
	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	U	G	E	
100	1	3(-)	2	2	3(-)	1	2	3(-)	1	2	3(-)	1	2	3	1(+)	2	3	1(+)	2	1	3	2	2	3(-)	1	2	3(-)	1
125	1	3(-)	2	2	3(-)	1	3	2	1(+)	2	3(-)	1	3	2	1(+)	1	3	2	1(+)	1	2	3(-)	2	3(-)	1(+)	2	3(-)	1
150	1	3	2	2	3(-)	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	3(-)	1	2	3(-)	1
175	2	3	1	2	3(-)	1	3	1	2	1	3	2	2	3	1	2	3	1	2	3	1	2	3	1	2	3(-)	1	2
200	1	3	2	2	3(-)	1	3	2	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3(-)	1	2
225	2	3	1	3	2	1(+)	3	2	1(+)	3	2	1(+)	3	2	1(+)	3	2	1(+)	3	2	3	1(+)	2	3	1(+)	2	3	1
250	2	3	1	3	2	1(+)	3	1(+)	2(+)	2	3	1	3	1(+)	2(+)	1	2	3	1	2	3	1(+)	2	3	1(+)	2	3	1(+)
275	2	3	1	3	2(+)	1(+)	3	2(+)	1(+)	2	3	1	3	2(+)	1(+)	1	3	2	3	2	3	1(+)	3	2	1(+)	2	3	1(+)
300	1	3	2	3	2	1(+)	3	1	2	1	3	2	2	3	1	2	3	1	2	3	1	3	1(+)	2	3	1(+)	2	3
325	2	3	1	3	1(+)	2	2	1	3	1	2	3	1	3	1(+)	2	3	1(+)	2	3	1(+)	2	3	1(+)	2	3	1(+)	1
350	2	3	1	3	1(+)	2	1	2	3(-)	1	2	3(-)	1	3	2	2	3	1	3	1	3	1(+)	2	3	1(+)	2	3	1
375	3	2	1	3	1(+)	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	1	1	3	2	2
400	1	3	2	2	1(+)	3	1	2	3(-)	2	1	3	2	3	1	2	3	2	3	2	1	3	2	1	1	3	2	2
425	3	2	1	2	1(+)	3	2	1	3(-)	2	1	3	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
450	2	3	1	2	1(+)	3	1	2	3(-)	2	1	3	2	3	1	3	2	1	3	2	1	3	2	1(+)	3	1	2	2
475	1	2	3	1	3	1(+)	2	1	2	3	2	1	3	2	3	1	2	3	1	3	2	1	3	2	1(+)	3	2	1
500	3	2	1	3	1(+)	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
525	3	2	1(+)	3	1(+)	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
550	3	1(+)	2	2	1(+)	3	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
575	3	2	1(+)	3	1(+)	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
600	3	2	1	3	1(+)	2	2	3	1	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
625	2	3	1	2	1(+)	3	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
650	2	3	1	3	1(+)	2	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
675	3	2	1	2	1(+)	3	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
700	2	3	1	2	1(+)	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
725	2	3	1	2	1(+)	3	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
750	1	3	2	2	1(+)	3	3	1(+)	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
775	2	3	1	2	1(+)	3	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
800	1	3	2	3	1(+)	2	2	1(+)	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
825	1	3(-)	2	2	1(+)	3	2	1(+)	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
850	2	3	1	2	1(+)	3	2	1	3	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2
875	2	3	1	2	1(+)	3	3	1(+)	2	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
900	2	3	1	2	1(+)	3	3	1(+)	2(+)	2	1	3	2	1	3	2	1	3	2	1	3	2	1(+)	3	2	1	2	1
Average Rank	1.94	2.70	1.36	2.42	1.42	2.15	2.03	1.67	2.30	1.88	1.58	2.55	2.39	1.97	1.64	2.24	2.61	1.15	1.94	2.52	1.55	2.73	1.94	1.33	2.55	2.00	1.45	
sum(+)	1	2	0		25	4		8	5		18	1		11	15		6	13		3	10		18	27		11	17	
sum(-)	3	0			5	0		1	5		7	19		3	0		3	0		9	3		6	0		7	0	







Table S11: Prediction ranks of PATCHY-SAN using uniform (U), Gaussian (G), and extra (E) distributed training data set. The input size of CNN is  $W = 1000$ , with the measure of controllability robustness under random node attacks.

N	BA		EH		ER		QS		RH		RT		SF		SWNW		SWWS							
	U	G	E	G	U	G	E	G	U	G	E	G	U	G	E	G	U	G						
500	2	3(-)	1	2(-)	1	3(-)	2	3	1(+)	2(+)	1	3(-)	1	1	3(-)	2	1	3(-)	2(-)	1	3(-)	2		
550	2	3	1(+)	2	1	3(-)	3	2	1	3	2(+)	1(+)	1	2	3(-)	1	1	2	3(-)	1	1	2	3	
600	2	3	1(+)	2	1	3(-)	3	2	1	3	2(+)	1(+)	1	3	2(-)	2(-)	1	2	3(-)	2	1	2	3	
650	3	2	1(+)	1	2	3	1	2	3	2(+)	1(+)	1	2	1	3	2	1	2	3(-)	1	2	3(-)	2	
700	3	2	1(+)	1	3(-)	2	3	1	3	1(+)	2(+)	1	3	1	2	3	1	1	3(-)	2(-)	1	3(-)	2	
750	3	2	1(+)	2	3	1	3	2	1	3	1(+)	2(+)	1	3	2	1	1	3(-)	2	1	3(-)	2(-)	2	
800	3	2(+)	1(+)	3	2	1	3	1	2	3	2(+)	1(+)	3	2	1	3	1	2	1	3(-)	2(-)	1	3(-)	2(-)
850	3	2	1(+)	3	2	1(+)	3	1	2	3	2(+)	1(+)	2	1	3	1	2	1	3(-)	2	1	3(-)	2(-)	
900	3	2	1(+)	3	2(+)	1(+)	3	1	2	3	2(+)	1(+)	3	1	3	1	3	1	3	2	1	3	2(-)	
950	3	2	1	3	1(+)	2(+)	3	1	2	3	1	2	3	1	2	3	2(+)	1(+)	1	3	2	1	2	3(-)
1000	3	1	2	3	1(+)	2(+)	2	1	3	1	3(-)	2	2	1	3	2	1	3	1(+)	2	2	1	3	3
1050	3	1	2	3	1(+)	2(+)	2	1	3	1	3(-)	2	2	1	3	3	1	2	3	1(+)	2	2	1	3
1100	3	2	1	3	1(+)	2(+)	1	2	3	1	3	1	2	3	2	1	3	1(+)	2	2	1	3	3	
1150	3	1	2	3	1(+)	2(+)	2	1	3	1	3	1	2	3	1	3	1(+)	2	1	3	1(+)	2	1	3
1200	3	1	2	3	1(+)	2(+)	1	2	3	1	3(-)	2	2	1	3	2	1	3	1(+)	2	1	2	3(-)	3(-)
1250	2	1	3	3	1(+)	2(+)	1	2	3	1	3(-)	2	1	2	3	2	3	1	3	1(+)	2	1	2	3(-)
1300	1	3	2	3	1(+)	2(+)	1	2	3	1	3(-)	1	3	2	1	3	2	1	3	1(+)	2	1	2	3(-)
1350	1	3	2	3	1(+)	2(+)	1	2	3	1	3(-)	1	2	3	2	1	3	1	3	1(+)	2	1	2	3(-)
1400	1	3	2	3	1(+)	2(+)	1	2	3	1	3(-)	1	2	3	2	1	2	1	3	1(+)	2	1	2	3(-)
1450	1	3	2	3	1(+)	2(+)	1	2	3	1	3(-)	1	3	2	2	2	1	2	1	3	1	2	1	3(-)
1500	1	3	2	3	1(+)	2(+)	1	2	3	1	3(-)	1	3	2	3	1	2	1	3	1	2	1	2	3(-)
Average Rank	2.33	2.14	1.52	1.43	2.00	1.95	1.71	1.95	1.76	1.57	1.90	2.52	2.24	1.67	2.10	1.52	1.90	1.81	2.29	1.19	2.14	2.33	1.52	2.67
sum(+)	1	8	14	14	2	3	0	8	9	9	0	0	5	0	0	3	1	11	0	0	0	2	0	0
sum(-)	1	0	2	3	2	3	2	8	6	1	4	7	1	0	0	0	5	5	6	6	7	7	0	14

Table S12: Summary of Tables S1–S8: The numbers of significance test results, where ‘(-)’ indicates the number of comparisons that using uniform training data obtains significantly lower errors than using other distributions (uniform training data are better); ‘sum(+)’ indicates the numbers of comparisons that using Gaussian or extra training data obtains significantly lower errors than using uniform data (non-uniform training data are better). Table IV of the paper is a summary of this table.

Measure	Input Size	Gaussian												Extra											
		BA	EH	ER	QS	RH	RT	SF	SW NW	SW WS	BA	EH	ER	QS	RH	RT	SF	SW NW	SW WS						
Connectivity robustness under TAR	W = 500	(-)	2	4	3	1	6	2	12	3	5	2	0	2	0	7	3	5	3	2					
		(+)	21	26	26	28	25	27	0	25	25	15	27	21	28	21	24	11	9	15					
	(-)	3	5	1	7	3	3	9	6	7	0	0	5	19	0	0	3	0	0						
	(+)	1	25	8	18	11	6	3	18	11	2	4	5	1	15	13	10	27	17						
Controllability robustness under RND	W = 1000	(-)	2	0	0	0	0	1	3	2	0	4	2	3	1	0	1	0	1	1					
		(+)	3	19	17	21	15	11	7	14	15	0	13	6	17	19	2	7	17	15					
	(-)	6	1	4	0	10	2	4	2	3	4	1	1	0	2	0	7	0	0						
	(+)	0	10	10	7	4	8	4	1	0	3	3	3	0	3	10	7	4	5						
Controllability robustness under RND	W = 500	(-)	0	1	0	0	0	0	0	2	0	0	21	8	0	0	0	2	0	0					
		(+)	23	1	31	33	3	11	33	9	8	30	1	5	30	1	5	33	0	0					
	(-)	7	6	2	0	4	5	5	2	2	3	0	0	0	0	3	0	0	1						
	(+)	3	2	0	9	0	1	0	4	0	2	29	0	28	0	2	1	0	0						
Controllability robustness under RND	W = 1000	(-)	1	3	0	0	4	1	6	5	3	0	0	8	5	0	0	21	13						
		(+)	0	14	4	15	0	1	0	4	3	0	0	0	0	7	0	0	1						
Controllability robustness under RND	W = 1000	(-)	1	2	2	6	4	1	2	5	7	0	3	8	1	7	0	6	14						
		(+)	1	14	0	9	0	5	3	11	0	8	14	0	9	0	1	0	0						

Table S13: Detailed ranks of the comparison of  $W = 500$  and  $W = 1000$  input sizes in terms of the number of superiors. Here, a ‘L’ means the  $W = 1000$  predictor outperforms the  $W = 500$  predictor; a ‘S’ means the  $W = 500$  predictor outperforms the  $W = 1000$  predictor; while a ‘≈’ means no significant difference between the  $W = 500$  and  $W = 1000$  predictors.

Uniform	LFR-CNN										PATCHY-SAN									
	500	550	600	650	700	750	800	850	900	500	550	600	650	700	750	800	850	900		
Connectivity robustness under TAR	BA	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L		
	EH	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L		
	ER	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L		
	QS	≈	≈	≈	≈	S	≈	≈	≈	≈	≈	≈	≈	≈	L	L	L	L		
	RH	S	≈	L	≈	L	L	L	≈	≈	≈	≈	≈	L	L	L	L	L		
	RT	L	≈	≈	L	L	L	L	L	L	L	L	L	L	L	L	L	L		
	SF	S	≈	S	≈	L	L	L	L	L	L	L	L	L	L	L	L	L		
	SWNW	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈		
	SWWS	≈	≈	≈	L	≈	≈	≈	≈	≈	L	L	L	L	L	L	L	L		
	sum(L)	4	3	4	5	4	4	4	2	4	34	5	6	6	7	7	8	9	8	
sum(S)	2	≈	1	≈	1	1	≈	≈	1	6	1	1	≈	≈	≈	≈	≈	≈		
Controllability robustness under RND	BA	L	L	L	L	L	L	L	L	L	S	L	L	L	L	L	L	L		
	EH	≈	≈	≈	S	≈	≈	≈	≈	≈	L	L	L	L	L	L	L	L		
	ER	L	L	≈	≈	≈	≈	≈	≈	≈	L	L	L	L	L	L	L	L		
	QS	≈	≈	≈	≈	≈	≈	≈	≈	≈	L	L	L	L	L	L	L	L		
	RH	≈	≈	≈	≈	≈	≈	≈	≈	≈	L	L	L	L	L	L	L	L		
	RT	≈	≈	≈	≈	≈	≈	≈	≈	≈	L	L	L	L	L	L	L	L		
	SF	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L		
	SWNW	L	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈		
	SWWS	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈	≈		
	sum(L)	4	3	2	2	2	3	3	4	4	27	3	2	2	3	3	6	5	6	
sum(S)	≈	≈	≈	1	2	2	≈	1	1	7	5	4	1	1	2	3	2	2		

Table S14: Detailed significance comparisons of LFR-CNN and PATCHY-SAN on predicting the robustness of unseen data with unseen network sizes (UNS), where the training data follow uniform distribution.

Uniform		LFR-CNN: Connectivity robustness under TAR										PATCHY-SAN: Connectivity robustness under TAR										
CNN Input Size	Network Size	BA	EH	ER	QS	RH	RT	SF	SW NW	SW WS	BA	EH	ER	QS	RH	RT	SF	SW NW	SW WS			
W = 500	N <sub>e</sub> < W	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)		
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
	N <sub>e</sub> > W	(-)	(+)	(+)	(+)	(+)	(+)	≈	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	
		(-)	(+)	(+)	(+)	(+)	(+)	≈	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	
		(-)	(+)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	
		(-)	(+)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	
W = 1000	N <sub>e</sub> < W	BA	EH	ER	QS	RH	RT	SF	SW NW	SW WS	BA	EH	ER	QS	RH	RT	SF	SW NW	SW WS			
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
		(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	N <sub>e</sub> > W	(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	≈	(+)	(+)	(+)	
		(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	≈	(+)	(+)	(+)	
		(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	≈	(+)	(+)	(+)	
		(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	≈	(+)	(+)	(+)	
		(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	≈	(+)	(+)	(+)	
		(-)	(+)	(+)	≈	(-)	(-)	(+)	(+)	(+)	(+)	(-)	(+)	(+)	≈	(-)	(-)	≈	(+)	(+)	(+)	





Table S17: Details of the real-world datasets. COLLAB is a dataset of scientific collaborations. REDDIT-BINARY consists of graphs corresponding to online discussions on Reddit. REDDIT-MULTI-5K is similar to REDDIT-BINARY, but divided into 5 categories. Only the real-world networks with network size  $N \in [100, 900]$  are tested.

Dataset	Number of Networks	Average Degree				Number of Nodes per Network				Number of Edges per Network			
		Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std
COLLAB	70	26.7	112.0	62.5	22.6	100.0	419.0	139.3	52.4	3056.0	39436.0	9104.9	6075.6
REDDIT-BINARY	119	4.2	5.5	4.7	0.3	107.0	898.0	418.7	195.8	464.0	4608.0	1983.9	971.4
REDDIT-MULTI-5K	337	4.2	6.1	4.9	0.3	138.0	900.0	543.2	194.0	600.0	4984.0	2684.1	1010.4