Week8 Report

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In this week, we further study the ranking node effect on short average path. We focus on the extreme cases. In the first step, we check the feasibility of the new degree sequence model. Then we study the effect on average short path in graph.

1 Average short path

For this part, we study the marginal node effect upon average short path based upon page rank, betweenness centrality, total degree, in degree and out degree ranking. We test for the small graph (expected mean equals to 3), and medium graph (10).

1.1 Small graph

We first test the graph where in-degree and out-degree are correlated, perfectly correlated and independent.

1.1.1 General case

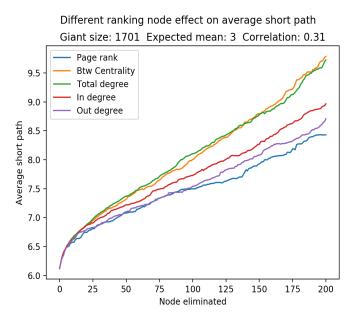


Figure 1.1: Node effect on average shortest path

1.1.2 Perfectly correlated

Different ranking node effect on average short path [Perfectly correlated]

Giant size: 1830 Expected mean: 3 Correlation: 1

8.0

Page rank
Btw Centrality
Total degree
In degree
Out degree
Out degree

Figure 1.2: Perfectly correlated node effect on average shortest path

100

Node eliminated

125

150

175

200

0

25

50

75

1.1.3 Independent

Different ranking node effect on average short path [Independent] Giant size: 1681 Expected mean: 3 Correlation: 0 10.0 Page rank **Btw Centrality** Total degree 9.5 In degree Out degree Average short path 9.0 8.5 8.0 7.5 7.0 100 175 200 0 25 50 75 125 150 Node eliminated

Figure 1.3: Independent degree sequence node effect on average shortest path

1.2 Mediuml graph

We test the graph where expected degree is 10.

1.2.1 General case

Different ranking node effect on average short path

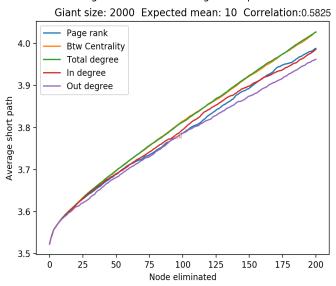


Figure 1.4: Node effect on average shortest path

1.2.2 Perfectly correlated

Different ranking node effect on average short path [Perfectly correlated]

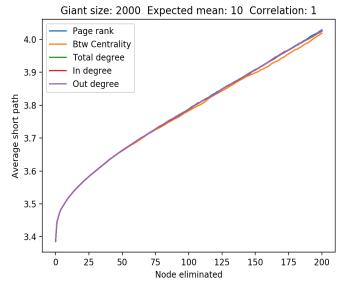


Figure 1.5: Perfectly correlated node effect on average shortest path

1.2.3 Independent

Different ranking node effect on average short path [Independent] Giant size: 2000 Expected mean: 10 Correlation: 0 4.05 Page rank **Btw Centrality** 4.00 Total degree In degree 3.95 Out degree Average short path 3.85 3.80 3.75 3.75 3.70 3.65 100 125 150 175 200 25 50 Node eliminated

Figure 1.6: Independent degree sequence node effect on average shortest path

1.3 Large graph

We test the graph where expected degree is 20.

1.3.1 General case

Different ranking node effect on average short path Giant size: 2000 Expected mean: 30 Correlation: 0.787 2.76 Page rank Btw Centrality 2.74 Total degree In degree 2.72 Out degree Average short path 2.70 89.2 89.2 2.64 2.62 2.60 50 150 200 25 100 125 175 Node eliminated

Figure 1.7: Node effect on average shortest path

1.3.2 Perfectly correlated

Different ranking node effect on average short path [Perfectly correlated]

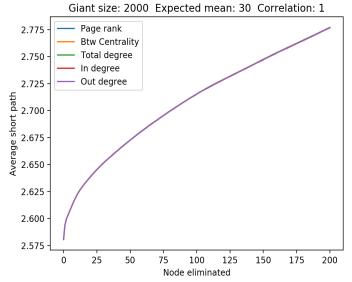


Figure 1.8: Perfectly correlated node effect on average shortest path

1.3.3 Independent

Different ranking node effect on average short path [Independent]

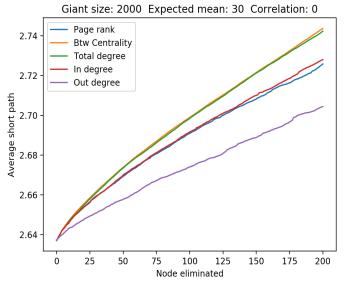


Figure 1.9: Independent degree sequence node effect on average shortest path

1.3.4 Conclusion

From the empirical result, the performance of page rank and betweenness centrality ranking on average short path depends on the correlation between in-degree and out-degree sequence. With highly correlated degree, the generated directed configuration graph's page rank and betweenness centrality's effect on average short path are much similar, whereas in independent case, the page rank is less effective as betweenness. The total degree always keep highly similar effect with betweenness centrality.