Homework 04 - Network Science

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October 23, 2020

1 Exercise

For this exercise, the generated graph, which is directed, was based on an external file named 'net.txt'. After building it, the following questions was possible to answer.

1.1 Plot the outgoing degree distribution of this network in a log-log scale. Does it look like a pure power-law?

Visualizing the chart bellow, it is possible to conclude that it doesn't follow fully a straight line, so it isn't a pure power law. At the begining it looks like a exponential function, but at certain point near to degree equals 10, it started to follow a power law, which seems like a straight line in log-log scale, and then ended with some irregularities.
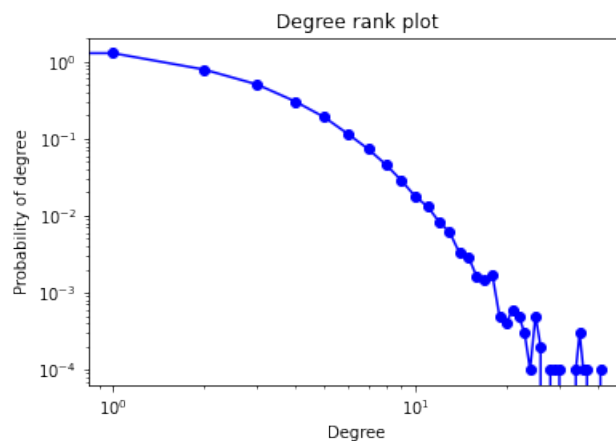

Figure 1: Outgoing Degree Distribution

1.2 The chapter on the scale-free property talks about low degree saturation and high degree cutoffs. Do you think any of these effects comes into play here? If yes, which of the two is more pronounced?

Both of the presented effects come into play in the graph. Therefore, the high degree cutoff is very pronounced at this chart. It means that the graph has fewer high-degree nodes than expected in a pure power low, which can be clearly observed. At the end of the chart, the probability of having nodes with degree greater than 10^1 suddenly drops and then rises a bit. It shows the behaviour of high degree cutoff.
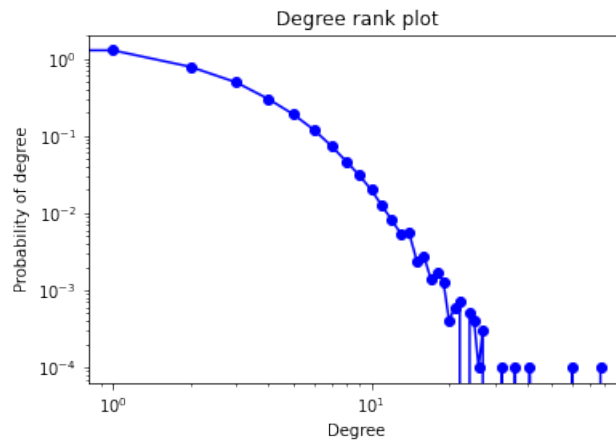
1.3 Plot the incoming degree distribution

Figure 2: Incoming Degree Distribution

1.4 Can low degree saturation or high degree cutoff be perceived in the incoming degree distribution?

Yes, both of them again are very present. But in this case, the saturation is visually more pronounced. As the number of the nodes with low degree is fewer than expected. This behaviour can be observed whitin the number of nodes with degree equals 0 and 1. 2794 nodes has degree 0, while 12818 nodes has degree 1. So the low-degree saturation comes into play here.