CS5664

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HW1.

Facebook Network Analysis

To begin the analysis on the given facebook network, it would be a good idea to examine what shape of this network is. With the provided condition, the given dataset of Facebook network is an undirected network. Therefore, by knowing the number of connected components, the overall shape of network can be estimated. In result, the number of connected network is 1 which means all nodes in the network are connected. Next, the plot for degree rank to verify the graph’s connectivity.

A close up of a map

Description generated with high confidence

The loglog plot for the degree distribution only convinces that there are no nodes having 0 edge connected. However, it would not be enough to verify that the data is composed of just one graph. Thus, the comparison between the entire network’s diameter and the largest subgraph’s diameter was performed. In fact, both diameters are 8. Therefore, it can be concluded that the given dataset is one giant network without any subgraphs.

Next analysis to understand the characteristics of given data is to find the density of the graph. The density of the graph is 0.011 which means that only 0.011 percent out of all possible edges are present in the graph. This density is used as connection possibility to create Edos-Renyi graph to identify that this given dataset is a small-world network.

The centralization is a great factor to understand how key nodes are more important than other nodes. To compute the centralization, Freeman’s general formula for centralization is used. The result of centralization is 0.24 which basically means that this network is somewhat evenly distributed among each node. By computing and plotting betweenness centrality one can grasp how many nodes in the network plays bridge role in the network.

A screenshot of a cell phone

Description generated with high confidence

This is histogram of betweenness centrality for all nodes in the network. Note that the nodes on the outer parameter of the network have 0 betweenness. There are nodes that have more betweenness than others but there is no noticeable outlier.

Next analysis is clustering property of the network. The average clustering coefficient of the network is 0.61 which means that two nodes that connected to the one node is likely to be connected with 0.61 percent of chance.

Finally, two random graphs were created with 4039 nodes Erdos-Renyi model with the density (0.011) of given network as connection possibility and Barabasi-Albert model with average node degree (43) of the given network. Both random generated graphs are evidence of the fact that the given dataset is not a small-world network. Both random graphs had very small average clustering coefficients with 0.06 for BA model and 0.01 for ER model. However, both average shortest path as much larger than that of real network.