Preferential Attachment

Large Scale Distributed Systems

Graphs formed by random preferential attachment will exhibit *hub nodes* that have significantly more connections that other nodes. In these graphs the degree distribution forms a power law. Such graphs can be formed by biasing the probability of choosing a given edge target by the degree of that target.

- Construct a graph that starts from a set of unconnected vertices and that (instead of the uniform random selection in the previous exercise) preferentially selects two vertices and connects them. Observe how the number of edges needed to form a connected component changes with respect to the previous exercise. Check the degree distribution of the resulting graph once a single connected component is established.

- Construct a graph that starts with a single node and that gradually adds vertices while connecting each new vertice to an existing vertice that is chosen under preferential attachment. Check the degree distribution of the resulting graph, to confirm the occurrence of a power law.

Recommended tools:

- Python

- NetworkX. `https://networkx.github.io`

- Gnuplot, mathplotlib, or similar graphing tools with PDF outputs

- NetLogo. `https://ccl.northwestern.edu/netlogo/`