Network Measures

Generally speaking, you can measure network properties at the level of nodes (aka, ‘centrality measures’) or at the level of the network (aka, ‘global measures’). That is, if you are interested in the position of nodes within a system, then you are measuring something at the node-level. Conversely, if you want to understand the structure of the system as a whole, you are measuring something at the network-level. Network analysis often combines both.

CENTRALITY MEASURES:

Centrality measures are a vital tool for understanding connected data structures – often known as graphs, or networks.They use graph theory to calculate the importance of any given node in a network, cutting through noise and highlighting nodes or clusters that might need more attention. There are many different centrality measures, each with its own definition of ‘importance’, so you need to understand how they work to find the best one for your social network analysis application.

Social network centrality measures

- Degree centrality
- Betweenness centrality
- Closeness centrality
- Eigen Centrality
- PageRank

Degree Centrality:

Degree centrality example: A network of terrorists, repeatedly filtered by degree (also known as a k-degenerate graph) revealing clusters of tightly-connected nodes. It defined as Degree centrality assigns an importance score based simply on the number of links held by each node. Even it tells us How many direct, ‘one hop’ connections each node has to other nodes in the network.

Uses : For finding very connected individuals, popular individuals, individuals who are likely to hold most information or individuals who can quickly connect with the wider network.

In Detail : Degree centrality is the simplest measure of node connectivity. Sometimes it’s useful to look at in-degree (number of inbound links) and out-degree (number of outbound links) as distinct measures, for example when looking at transactional data or account activity.

Betweenness centrality: Betweenness centrality example: visualizing an email network, with nodes resized by betweenness score. It defines as to measures the number of times a node lies on the shortest path between other nodes. Also This tell us about the measure shows which nodes are ‘bridges’ between nodes in a network. It does this by identifying all the shortest paths and then counting how many times each node falls on one.

Uses : For finding the individuals who influence the flow around a system.

In detail : Betweenness is useful for analyzing communication dynamics, but should be used with care. A high betweenness count could indicate someone holds authority over disparate clusters in a network, or just that they are on the periphery of both clusters.

Closeness centrality: Closeness centrality example: a corporate email network; nodes with a high closeness degree are enlarged. It defines as the closeness centrality calculation scores each node based on their 'closeness' to all other nodes in the network. It also tell about the measure calculates the shortest paths between all nodes, then assigns each node a score based on its sum of shortest paths.

Uses: For finding the individuals who are best placed to influence the entire network most quickly.

In Detail : The Closeness centrality can help find good 'broadcasters'. It should be used with caution: in a highly-connected network, you will often find all nodes have a similar score. The Closeness centrality calculation is more effective at finding influencers in a single cluster of a wider network.

Eigen Centrality:

Eigen Centrality example: an email network, with nodes sized by their Eigen Centrality. It Define as like the degree centrality, Eigen Centrality measures a node's influence based on the number of links it has to other nodes in the network. Eigen Centrality then goes a step further by also taking into account how well connected a node is, and how many links their connections have, and so on through the network.

It Tells us about by calculating the extended connections of a node, Eigen Centrality can identify nodes with influence over the whole network, not just those directly connected to it.

Uses : Eigen Centrality is a good 'all-round' centrality score, handy for understanding human social networks, but also for understanding networks like malware propagation.

In Detail: Our tools calculate each node's Eigen Centrality by converging on an eigenvector using the power iteration method.

PageRank: An email network, with nodes sized by PageRank score. It defined as the PageRank is a variant of Eigen Centrality, also assigning nodes a score based on their connections, and their connections' connections. The difference is that PageRank also takes link direction and weight into account – so links can only pass influence in one direction, and pass different amounts of influence. It also tell us about the measure uncovers nodes whose influence extends beyond their direct connections into the wider network.

Uses : Because it takes into account direction and connection weight, PageRank can be helpful for understanding citations and authority.

In Detail : PageRank is famously one of the ranking algorithms behind the original Google search engine (the 'Page' part of its name comes from creator and Google founder, Larry Page).