

## **Describing networks**

**Network Diameter:** It shows the shortest path between the two most distant nodes in the networks. It provides inference about the path it needs to travel to get to all sides of the network. Jackson's study shows us that the diameter and the average distance do not change as the homophily increases in random networks.

**Graph Density:** It is the ratio of the number of edges divided by the number of possible edges. The density of the complete graph is 1. The density of null graphs in which their edges are isolated is 0. In other words, there are no edges between any nodes.

**HITS (Hyperlink-induced topic search):** HITS discovers the relationship between websites by computing authority and hubs. Authority measures the quality of the node while hubs measure the quality of the node's links. For search engine applications, it gives an opportunity to analyze relevant web pages for a particular search.

**Modularity:** Networks aggregate into subgroups according to the strength of the connections. These subgroups are called modules or communities. Modularity measures the strength of the connections. High modularity indicates dense connection inside the module and sparse connection outside the module.

**PageRank:** It shows the importance of nodes (pages) by counting the number and quality of links. The algorithm output is a probability distribution that represents the likelihood of reach at any page by clicking on links randomly.

**Connected Components:** Connected components are a subgroup in which each pair of nodes is connected by a path. If the graph has more than one connected component, the union of them gives the set of all edges of the graph. There are 2 different properties in connected components. The first one is the set of the connected component is always non-empty. Another property is that connected component sets are pairwise disjoint which means the intersection of two separate sets of connected components gives an empty or null set.