

Prominence

A prominent actor occupies a distinctive location in the network that may lead to high visibility or importance relative to other actors. Prominence depends on an actor's direct ties to others and may also depend on the overall structure of ties among actors. Thus, prominence is not a characteristic of the individual, but of the individual's position in the network. However, measures of prominence have been shown to be empirically related to a number of individual characteristics and outcomes, including trust, power, and advancement within corporations.

Measures of network prominence fall into two major categories. For undirected relations (which are symmetric, such as collaboration or mutual friendship), prominence measures are typically called network *centrality*. For directed relations (which may be asymmetric across parties, such as supervision or dominance), prominence measures are typically called *prestige*.

Centrality measures of prominence

Prominence is frequently attributed to actors who have many ties in the network because such a position is associated with high visibility and ability to influence a large number of people. An actor's *degree centrality* (or 'degree') is simply the number of ties that the actor has to others in the network. Thus, in a network of mutual friendship, a person with many friends will have high degree centrality.

A more sophisticated alternative begins with the degree measure of prominence and then weights each actor's prominence by the prominence of each of its peers, which is in turn weighted by the prominence of each of those peers, and so on. This recursive measure represents an actor's connectedness to highly connected peers, and takes all direct and indirect network paths from the focal actor into account. Network analysis software computes this measure directly by finding the first eigenvector of the matrix representing ties among individuals, and so it is often called *eigenvector centrality*.

Two other measures are based on the set of geodesics, or the shortest paths connecting any two distinct actors i and j (where paths may be indirect, through other actors in the network). For example, *closeness centrality* is constructed by summing the geodesic path lengths between a focal actor i and each other member reachable from i through the network. (Typically, the inverse of this total is used for the final measure, to ensure that all centrality scores lie between 0 and 1 and that the most central actors receive the highest scores). Closeness centrality therefore captures the shortness of the network paths connecting an actor to all others, and may be interpreted as the ease and efficiency by which an actor can access information and other resources through the network.

An actor may also be prominent by being on paths that bridge different parts of the network, because many others may rely on the actor for relaying instructions or other information. *Betweenness centrality* is computed from the set of geodesics by finding the proportion of the shortest paths among all other actors that contain the focal actor.

Prestige measures of prominence

In a directed network, a tie is not a symmetric connection between two actors, but an asymmetric link, going *from* one actor *to* another. The simplest measure of prominence for directed networks simply breaks down the degree count for incoming ties (*in-degree*) and outgoing ties (*out-degree*). Either the in-degree or out-degree measure may be interpreted as prominence, depending on the meaning of the individual tie. For example, if a tie represents a supervisory relation, then an actor with a high out-degree is especially prestigious. If a tie represents seeking advice or support, then an actor with a high in-degree is especially prestigious.

Most other centrality measures can be similarly adapted to directed networks and used as prestige measures as well. This applies to closeness, betweenness, and recursive measures, although in each case, care must be taken to allow for the directionality of the network.

Methodological considerations

When examining particular measures of prominence, it is important to consider carefully whether a given measure is applicable to the network in question. Some measures are defined on a set of actors that are all reachable to one another by paths of finite length; for example, eigenvector and closeness centrality are defined for such a fully-connected component. The measures also differ in their robustness to missing data or imperfect measurement, as centrality measures based on geodesic path lengths may be particularly sensitive to even small changes in the sets of nodes or ties.

Prominence in empirical research

Measures of prominence are commonly used in empirical research on social networks and have been found to correlate with a number of important outcomes. Research has shown that patterns of trust and participation in collective activities are related to measures of network prominence. Prestige and status have also been found to affect organizational outcomes such as promotions and job satisfaction. Prestige measures have been applied most extensively in examining the relational structure of knowledge creation, as evidenced by patterns of collaboration and citation in scholarly works, patents, and judicial decisions.

See Also: Bibliometrics / Citation Networks, Directed Networks, Graph Theory, Paths/Walks/Cycles

Authored by: [Magnus Thor Torfason](#), Columbia University
[James A. Kitts](#), Columbia University

Cite As: Torfason, Magnus Thor and James A. Kitts. 2010. "Prominence." *Encyclopedia of Social Networks*, George Barnett, Editor. New York: Sage Publications.

Further reading

Bonacich, P. "Some Unique Properties of Eigenvector Centrality." *Social Networks*, 29, 555–564, 2007.

Friedkin, N. "Theoretical Foundations for Centrality Measures." *The American Journal of Sociology*. 96(6): 1478-1504, 1991.

Knoke, D. and R. Burt. "Prominence." In Burt, R.S. and M.J. Minor (eds.), *Applied Network Analysis*. 195-222. Sage, 1983.

Moody, J. "The Structure of a Social Science Collaboration Network: Disciplinary Cohesion from 1963 to 1999." *American Sociological Review*. 69(2): 213-238, 2004.

Wasserman, S. and K. Faust. "Centrality and Prestige." In *Social Network Analysis: Methods and Applications*, edited: 167-215, 1994.