

Class Conversation Network: Network Measures



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Introduction: Our world comprises of networks, be it social, technological or biological. Networks measures and analysis have become the basic foundation in every network study. The Class Conversation Network is a complex network formed from the data collected from each individual in a class. Each individual provided the names of 2 – 5 persons whom they had conversed with in the previous week. Analysis of the network using the software igraph reveals the interesting pattern of power law.

Different measures of a network:

Degree of a node	No. of edges linked to the node
Geodesic	Paths between two nodes of shortest length
Diameter	Length of the largest geodesic path in the graph
Global Clustering Coefficient	Probability that the adjacent vertices of a vertex are connected
Reciprocity	A node pair is reciprocal if there are links between them in both directions
Strong Components	Maximal set of nodes that have access to each other(directed paths between them)
Vertex(edge) betweenness centrality	No. of geodesics going through a vertex(edge)
Closeness Centrality	Inverse of the average length of the geodesics from a node to all other nodes

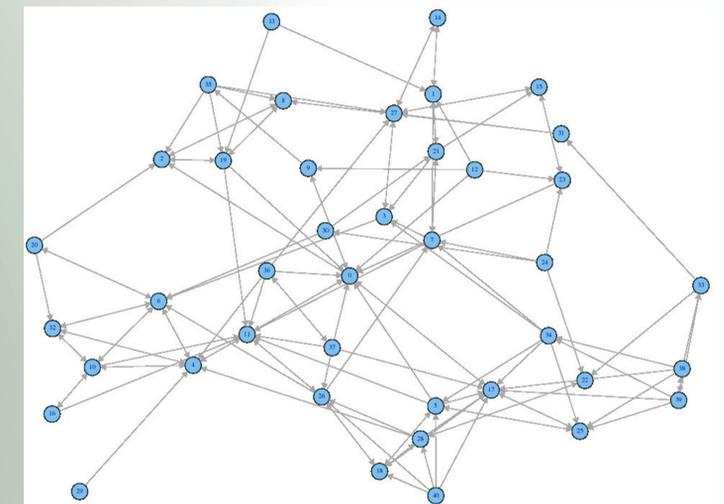
Power law is a behaviour exhibited by the degree distribution of most real world networks, the World Wide Web for instance.

$$P(k) \propto k^{-\alpha}$$

Where k is the degree, $P(k)$ is the degree distribution and α is a constant known as the exponent of power law.

This implies $\ln P(k) = -\alpha \ln k + C$

So the power law shows a straight line behaviour. As seen from the graphs obtained using igraph, class conversation network approximately follows the power law with values of α 3.994359 for the in-degree distribution and 3.665024 for the out-degree distribution.

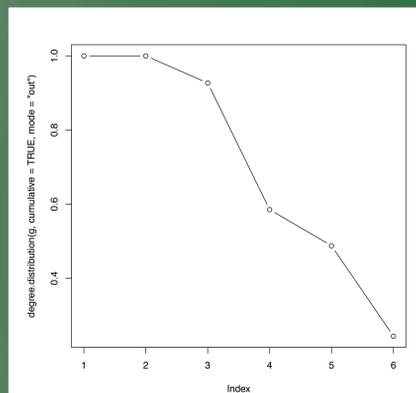


Conclusion: This is a simple illustration of network measurements using a software.

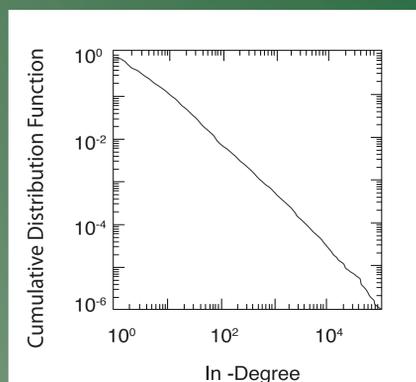
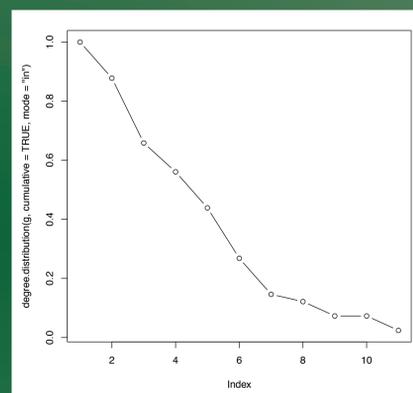
No. of nodes (individuals)	41
No. of edges	133
Average in-degree	3.243902
Average out-degree	3.243902
Diameter	8
Global Clustering Coefficient	0.299399
Reciprocity	0.3039216
No. of strong components	12
Highest betweenness centrality	305.667
Highest edge betweenness centrality	222.4166
Highest closeness centrality	0.095238

Reference: 1. Newman, MEJ. Networks: An Introduction. Oxford University Press: 2010.
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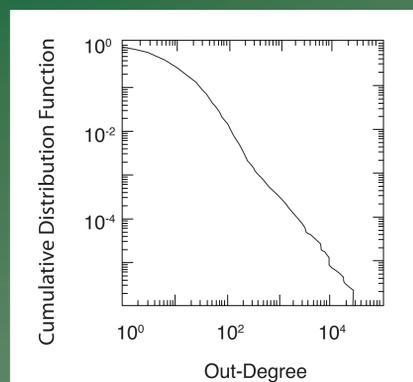
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Degree distribution of class-conversation network



(a) World Wide Web



(b) World Wide Web