Graph Theory Basics

Pawan Singh Faujdar (03CS3006)

09/01/2007

1 Planar Graphs:

The graphs for which there exists a planar representation of the graph is called planar graphs.

Advantage: They can be drawn using straight lines

1.1 Test for planarity: n - e + f = 2

where:

n = No. of Nodes.
e = No. of edges.
f = No. of faces.

2 Social Network Concepts:

2.1 Centrality:

Centrality is an important measrure that is used within complex network analysis to determine the relative importance of a vertex within the graph (for example, how important a person is within a social network, or how well-used a road is within an urban network). In other words, the centrality of a node in a network is a measure of the structural importance of the node. These measures attempt to quantify the prominence of an individual actor embedded in a network. A central actor, presumably, has a stronger influence on other network members.

There are different measures of centrality for vertices, which accordingly give us different insights.

2.2 Degree Centrality -

This is a measure of the immediate neighbours of a vertex. A star network would have very high degree centrality, whereas a line network would be much lesser degree centrality.

2.3 Betweeness Centrality -

It is defined as the number of shortest path (u,v) passing through the node.

This centrality tries to measure the importance of a node in the network, in terms of the number of paths in the network that depend on it. Here, unlike degree centrality, a vertex with very low degree could also be deemed very important (e.g if it is the sole node which connects two components in the network).

2.4 Closeness Centrality -

This is a measure which gives high weight to nodes which are closer to the rest of the nodes in the network. That is, those nodes which have short geodesic distances to other vertices in the graph.

The closeness C(v) for a vertex v is the reciprocal of the sum of geodesic distances to all other vertices in the graph.

C (v) =1/Sum of all D(v,t)

where D(v,t) is the weight of the shortest path between v and t.

2.5 Degree Centrality (For Groups):

Group Degree Centrality = | N(c) | = Measure of immmediate neighbours a group.

where C = Set, N = Neighbours.

2.6 Normalized Degree Centrality:

- Normalized Degree Centrality = |N(C)| / (|V|-|C|);
- Efficiency = K / |C|
- Redundancy = (|C|-k) / |C|

where |V| = No. of Vertices.

K = Least no. of nodes needed to acheive the maximum |N(C)|.