AMRITA VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY

19CSE337 Social Networking Security

Lecture 9

Topics to Discuss

- Closeness Centrality

Closeness Centrality

- This is based on the assumption that important nodes are close to other nodes.
- Closeness centrality scores each node based on their ‘closeness’ to all other nodes in the network.
- This measure calculates the shortest paths between all nodes, then assigns each node a score based on its sum of shortest paths.
- Useful for finding the individuals who are best placed to influence the entire network most quickly.

Closeness Centrality

- Closeness centrality can help find good ‘broadcasters’, but in a highly-connected network, you will often find all nodes have a similar score.
- What may be more useful is using Closeness to find influencers in a single cluster.
- Nodes with a high closeness value have a lower distance to all other nodes.

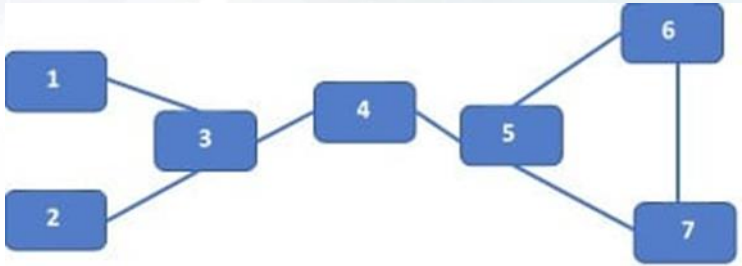
Closeness Centrality

- The closeness centrality of a node gives us a measure of how quickly one can get from this node to all other nodes (remember the example of the distribution center).
- The closeness centrality is defined as the inverse of the sum of the number of shortest paths from this node to all others, normalized by the number of total nodes in the network minus one.

$$c_C(s) = \frac{n-1}{\sum_{t \in V} p(s,t)}$$

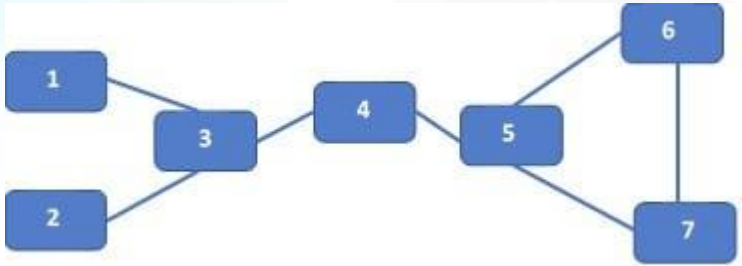
- with p(s,t) being the shortest path between nodes s and t, V being the nodes of the network and n the number of nodes in the network.
- The shorter the shortest paths to all nodes are, the larger is the closeness centrality.

Closeness Centrality



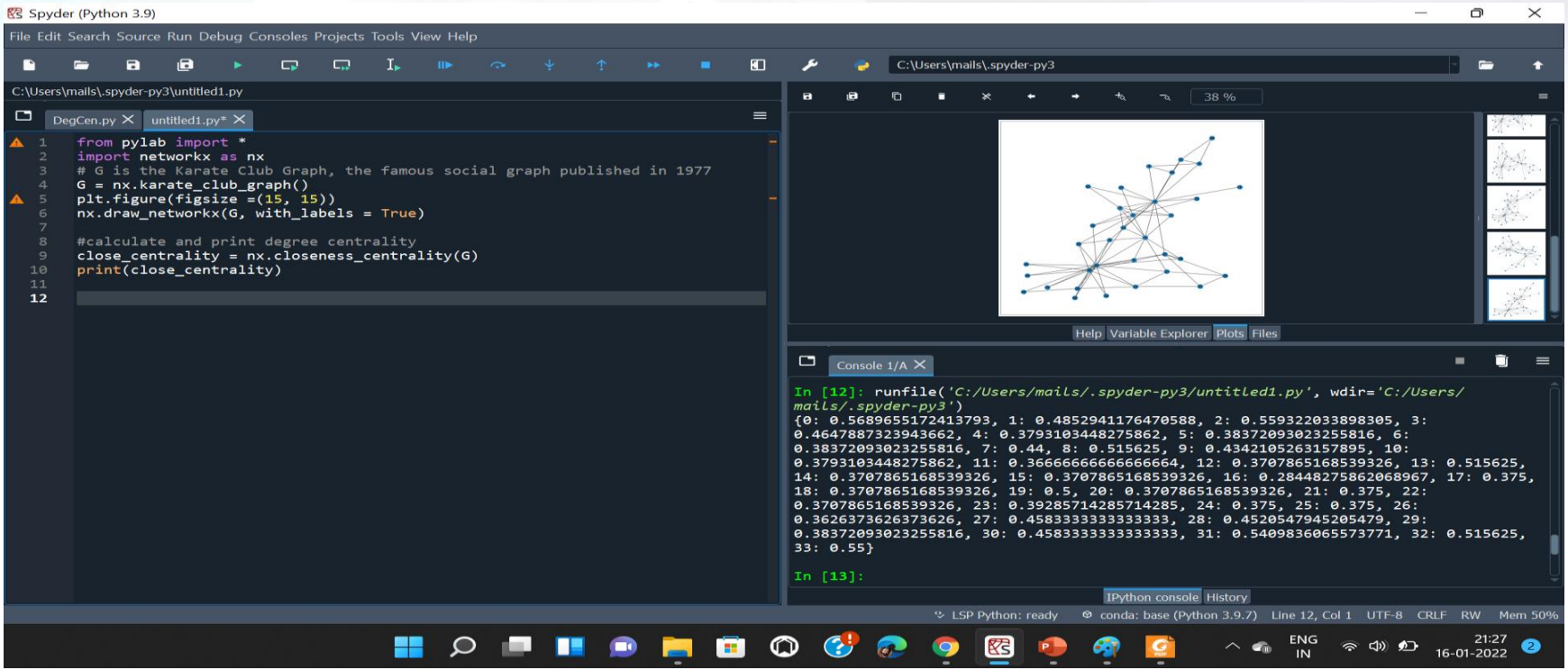
Distance from s to t	1	2	3	4	5	6	7	Total Distance
1	0	2	1	2	3	4	4	16
2	2	0	1	2	3	4	4	16
3	1	1	0	1	2	3	3	11
4	2	2	1	0	1	2	2	10
5	3	3	2	1	0	1	1	11
6	4	4	3	2	1	0	1	15
7	4	4	3	2	1	1	0	15

Closeness Centrality



Node	Score	Standardized Score
1	1/16	6/16 = 3/8
2	1/16	6/16 = 3/8
3	1/11	6/11
4	1/10	6/10 = 3/5
5	1/11	6/11
6	1/15	6/15 = 2/5
7	1/15	6/15 = 2/5

Closeness Centrality



Thanks……