# **Week 8 –** **Network Analysis**

# **Exercise: Centrality Analysis**

Given a undirected network as following:



* Calculate Degree centrality scores of each node in the network above, and complete the table below

|  |  |
| --- | --- |
| **Node** | **Score** |
| 1 | 1 |
| 2 | 1 |
| 3 | 3 |
| 4 | 2 |
| 5 | 3 |
| 6 | 2 |
| 7 | 2 |

* Calculate Betweenness centrality scores of each node in the network above, and complete the table below

|  |  |
| --- | --- |
| **Node** | **Score** |
| 1 | 0 |
| 2 | 0 |
| 3 | 9 S3 = {(1,2) (1,4) (1,5) (1,6) (1,7) (2,4) (2,5) (2,6) (2,7)} |
| 4 | 9 S4 = {(1,5) (1,6) (1,7) (2,5) (2,6) (2,7) (3,5) (3,6) (3,7)} |
| 5 | 8 S5 = {(6,4) (6,3) (6,2) (6,1) (7,4) (7,3) (7,2) (7,1)} |
| 6 | 0 |
| 7 | 0 |

* Calculate PageRank centrality scores of each node in the network above, and complete the table below

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| k | Node 1 | Node 2 | Node 3 | Node 4 | Node 5 | Node 6 | Node 7 |
| 1 | 0.1428 | 0.1428 | 0.1428 | 0.1428 | 0.1428 | 0.1428 | 0.1428 |
| 2 | 0.0476 | 0.0476 | 0.1666 | 0.0952 | 0.2142 | 0.119 | 0.119 |
| 3 | 0.055533 | 0.055533 | 0.158667 | 0.126933 | 0.1666 | 0.1309 | 0.1309 |
| 4 | 0.052889 | 0.052889 | 0.169244 | 0.108422 | 0.194367 | 0.120983 | 0.120983 |
| 5 | 0.056415 | 0.056415 | 0.167041 | 0.121204 | 0.175194 | 0.125281 | 0.125281 |
| 6 | 0.05568 | 0.05568 | 0.171962 | 0.114078 | 0.185882 | 0.121038 | 0.121038 |
| 7 | 0.057321 | 0.057321 | 0.171681 | 0.119282 | 0.178078 | 0.12248 | 0.12248 |
| 8 | 0.057227 | 0.057227 | 0.174095 | 0.116586 | 0.182121 | 0.120599 | 0.120599 |
| PageRank | 5 | 5 | 2 | 4 | 1 | 3 | 3 |

|  |  |
| --- | --- |
| **Node** | **Score** |
| 1 | 5 |
| 2 | 5 |
| 3 | 2 |
| 4 | 4 |
| 5 | 1 |
| 6 | 3 |
| 7 | 3 |

* Suppose the above network refers to friendship network.  Each node represents a person, and each edge represents friendship between the persons at ends.  If you are interested in finding the most popular person in the network, which centrality measure is the most appropriate?  Give the answer with reasons why it is the most appropriate.
* The most popular person is the one who has the highest number friends, that’s the reason why degree centrality is the most appropriate. (In this case Person num.3 and num. 5 has the most connections to others so they’re the most popular)
* Suppose the above network refers to information flow network of an organization. If you are interested in finding the section that can most frequently control information flow in the network, which centrality measure is the most appropriate?  Give the answer with reasons why it is the most appropriate.
* To control the flow in the network, we should have nodes between others to interupt the information flow in case we need, that’s the reason why betweeness centrality is the most appropriate.