

Data Science Challenge

Centrality metrics

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Fist Challenge

In this challenge, suppose we are looking to do social network analysis for prospective customers. We want to extract from their social network a metric called “closeness centrality”.

Centrality metrics try to approximate a measure of influence of an individual within a social network. The distance between any two vertices is their shortest path. The *farness* of a given vertex v is the sum of all distances from each vertex to v . Finally, the *closeness* of a vertex v is the inverse of the *farness*.

The first part of the challenge is to rank the vertices in a given graph by their *closeness*. The graph is provided in the attached file; each line of the file consists of two vertex names separated by a single space, representing an edge between those two nodes.

Load Libraries

```
library(GGally)
library(network)
library(sna)
library(ggplot2)
```

Loadding Dataset

```
myData <- as.matrix(read.table("D:/Data Science/Semantix/edges.dat", quote="\"",
                             comment.char="", stringsAsFactors=FALSE))
```

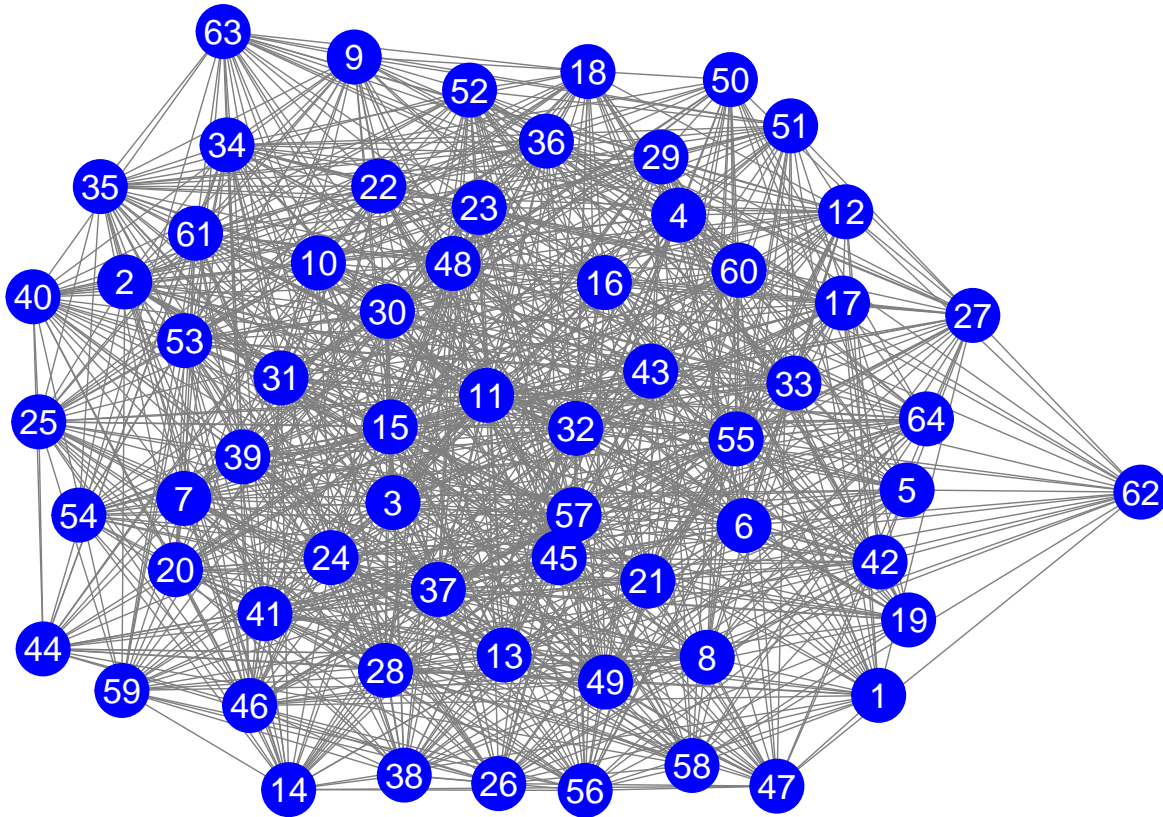
Creating Network Data F=Graph

```
net = rgraph(myData, mode = "graph")
net = network(net, directed = FALSE)
network.vertex.names(net) = 1:dim(myData)[1]
```

Plotting

```
ggnet2(net,color = "blue", label = TRUE, label.color = "white")
```

```
## Loading required package: scales
```



Second Challenge

The second part of the challenge is to create a RESTful web server with endpoints to register edges and display the centrality of the graph.

Degree

The node degree is the number of relations (edges) of the nodes.

```
degree(net)
```

```
## [1] 54 62 74 58 56 74 66 62 58 70 70 66 72 56 84 60 64 60 48 64 66 58 66
## [24] 72 64 64 60 70 66 64 68 84 60 72 64 66 72 62 66 58 66 60 66 46 72 70
## [47] 54 74 62 52 56 70 72 52 72 68 76 60 50 70 66 38 54 62
```

Betweenness centrality is even more important statistical property of a network. This is applied in a lot of real-world problems, such as finding influential people in a social network, finding crucial hubs in a computer network, finding border crossing points which have a largest traffic or trade flow.

```
degree(net, cmode="indegree")
```

```
## [1] 27 31 37 29 28 37 33 31 29 35 35 33 36 28 42 30 32 30 24 32 33 29 33
## [24] 36 32 32 30 35 33 32 34 42 30 36 32 33 36 31 33 29 33 30 33 23 36 35
## [47] 27 37 31 26 28 35 36 26 36 34 38 30 25 35 33 19 27 31
```

Closeness (farness) centrality indicates how long it will take for information from a given node to reach other nodes in the network. The smaller the value, the more central role the node plays in the network.

```
degree(net, cmode="outdegree")
```

```
## [1] 27 31 37 29 28 37 33 31 29 35 35 33 36 28 42 30 32 30 24 32 33 29 33
## [24] 36 32 32 30 35 33 32 34 42 30 36 32 33 36 31 33 29 33 30 33 23 36 35
## [47] 27 37 31 26 28 35 36 26 36 34 38 30 25 35 33 19 27 31
```

The control point of the map is:

```
centralization(net, degree, cmode="indegree")
```

```
## [1] 0.1622575
```

REFERENCES

Alex, B. 1950. Communication patterns in task-oriented groups. J. Acoust. Soc. Am. 22 (6): 725-730.
Sabadussi, G. 1966. The centrality index of a graph. Psychometrika. 31: 581-603.