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))
```

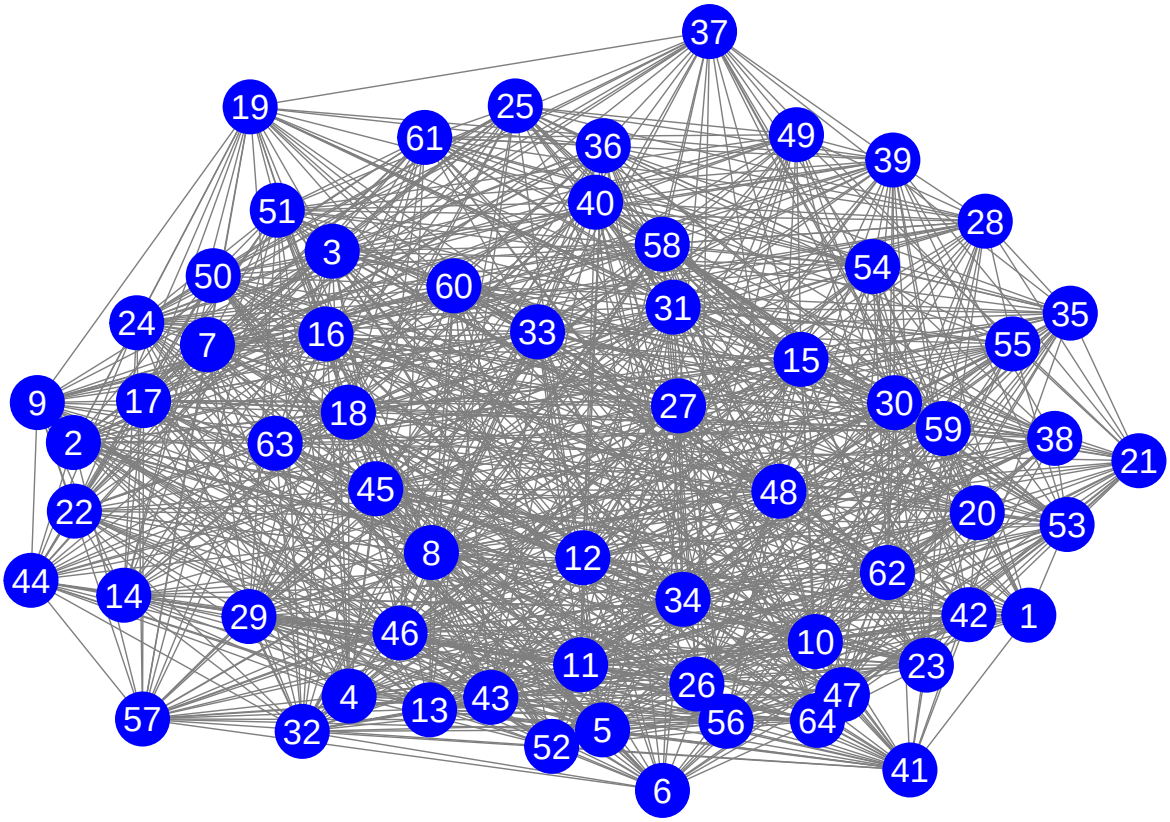
Creating Network Data

The nodes are numbered by one to number of nodes.

```
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")
```



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] 56 64 66 68 66 60 72 84 60 66 76 74 58 56 72 64 68 70 56 60 50 60 66
## [24] 70 60 60 78 58 72 70 68 68 76 70 62 64 54 56 66 70 58 60 72 56 70 74
## [47] 58 70 52 60 70 62 64 60 52 68 58 68 70 64 60 60 66 66
```

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] 28 32 33 34 33 30 36 42 30 33 38 37 29 28 36 32 34 35 28 30 25 30 33
## [24] 35 30 30 39 29 36 35 34 34 38 35 31 32 27 28 33 35 29 30 36 28 35 37
## [47] 29 35 26 30 35 31 32 30 26 34 29 34 35 32 30 30 33 33
```

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] 28 32 33 34 33 30 36 42 30 33 38 37 29 28 36 32 34 35 28 30 25 30 33
## [24] 35 30 30 39 29 36 35 34 34 38 35 31 32 27 28 33 35 29 30 36 28 35 37
## [47] 29 35 26 30 35 31 32 30 26 34 29 34 35 32 30 30 33 33
```

The centrol point of the map is:

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

```
## [1] 0.1567145
```

REFERENCES

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