

# Assignment 2

2024-03-22

First, we attach the excel dataset I made called “fakebook” that shows the adjacency of the seats. I renamed seats A, B, C, and D to 7, 8, 9, and 10 respectively to make it easier for me to locate each seat.

```
library(readxl)
fakebook <- read_excel("fakebook.xlsx")
attach(fakebook)
```

We load igraph and create the adjacency matrix based on the dataset given.

```
library(igraph)

##
## Attaching package: 'igraph'

## The following objects are masked from 'package:stats':
##
##     decompose, spectrum

## The following object is masked from 'package:base':
##
##     union

# Create the adjacency matrix based on my dataset
adjacency_matrix <- matrix(
  c(
    0, 1, 0, 0, 0, 0, 0, 0, 0, 0, # Seat 1
    1, 0, 0, 0, 0, 0, 1, 0, 0, 0, # Seat 2
    0, 0, 0, 1, 1, 0, 0, 1, 1, 1, # Seat 3
    0, 0, 1, 0, 0, 0, 0, 0, 1, 0, # Seat 4
    0, 0, 1, 0, 0, 1, 0, 0, 0, 1, # Seat 5
    0, 0, 0, 0, 1, 0, 0, 1, 0, 1, # Seat 6
    0, 1, 0, 0, 0, 0, 0, 1, 1, 0, # Seat 7 (A)
    0, 0, 1, 0, 0, 1, 1, 0, 1, 1, # Seat 8 (B)
    0, 0, 1, 1, 0, 0, 1, 1, 0, 1, # Seat 9 (C)
    0, 0, 1, 0, 1, 1, 0, 1, 1, 0 # Seat 10 (D)
  ), nrow = 10, byrow = TRUE
)
```

We create a network graph based on the adjacency matrix that is non-directional, since everyone can speak with anyone sitting in an adjacent seat.

```
# Create the graph from the adjacency matrix
g <- graph_from_adjacency_matrix(adjacency_matrix, mode = "undirected", diag = FALSE)
```

We calculate the centrality values: degree, closeness, and betweenness.

```
# Calculate degree centrality
degree_centrality <- degree(g, v=7:10, mode="all", normalized=FALSE)

# Calculate closeness centrality
```

```

closeness centrality <- closeness(g, vids=7:10, mode="all", normalized=TRUE)

# Calculate betweenness centrality
betweenness centrality <- betweenness(g, v=7:10, directed=FALSE, normalized=TRUE)

```

We put the results together and print them.

```

# Combine results
centrality_measures <- data.frame(
  Seat = 7:10,
  Degree = degree centrality,
  Closeness = closeness centrality,
  Betweenness = betweenness centrality
)

print(centrality_measures)

```

```

##   Seat Degree Closeness Betweenness
## 1    7      3 0.5625000 0.38888889
## 2    8      5 0.6428571 0.25092593
## 3    9      5 0.6428571 0.23888889
## 4   10      5 0.5625000 0.09074074

```

## Degree Centrality

- Beneficial: High degree centrality indicates that a seat has direct connections to many other seats. Choosing a seat with high degree centrality would mean I'm in a position to easily communicate with a larger number of people directly surrounding me. This can be advantageous for networking, sharing information quickly, and integrating into the social fabric of Fakebook more seamlessly.
- Not so beneficial: While being in a central position allows for greater visibility and access to information, it might also lead to stretching myself thin. If I want to develop deeper, more focused relationships, a seat with too many direct connections might spread my attention too thin, juggling conversations with so many people.

## Closeness Centrality

- Beneficial: High closeness centrality suggests that a seat is, on average, close to all other seats in terms of the shortest paths. This could be advantageous for becoming a hub of information exchange, since I can quickly disseminate or gather information from across the bus. It allows me to foster rapid engagement with various individuals.
- Not so beneficial: Similarly to the issue with high degree centrality, being too close to the majority of seats in the bus may make me spread myself too thin trying to network with everyone.

## Betweenness Centrality

- Beneficial: High betweenness centrality indicates that a seat acts as a bridge within the network, controlling the flow of information between different groups of seats. This could allow me to get diverse viewpoints and information, while also boosting my reputation as a team player.
- Not so beneficial: The drawback of being a bridge is that it might place me in a position where I'm facilitating others' interactions, which can be potentially stressful, especially as an intern who is new to Fakebook. There's also the risk of becoming a bottleneck in communication flows, where too much reliance on me can hinder direct interactions between others.

## Conclusion

In the context of developing informal connections at work, the choice of seat would significantly influence the nature and quality of my interactions. Based on the centrality values calculated, the best seat to choose would be Seat 8 or Seat C. This is because it has the highest degree, closeness, and betweenness centrality overall. Seat C offers the best balance of being directly connected to others (degree centrality) and being centrally located within the network (closeness centrality), ensuring I'm well-positioned to meet a broad range of people and access information efficiently (betweenness centrality).

To plot we have to add our measures as graph attributes. We plot the graph with labels and centrality values.

```
# Sizing & labels
degree_centrality_norm <- degree_centrality / max(degree_centrality)
node_sizes <- degree_centrality_norm * 50
node_labels <- paste(V(g)$name, "\nCentrality:", round(degree_centrality), ",",
                    round(closeness_centrality, 3), ",", round(betweenness_centrality, 3), sep=" ")
par(mar=c(1, 1, 1, 1))

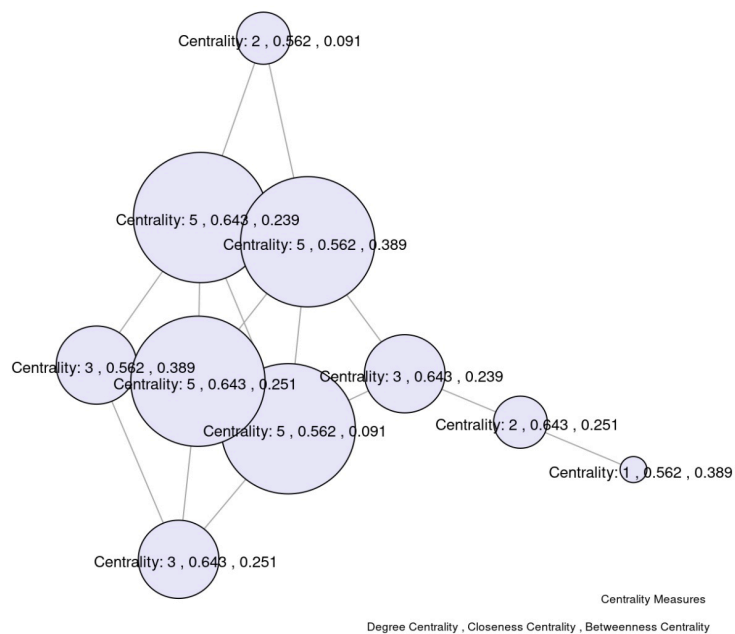
# Plot the graph
plot(g,
     layout = layout_with_kk(g),
     vertex.size=node_sizes,
     vertex.label=node_labels,
     vertex.label.cex=0.8,
     edge.arrow.size=0.3,
     vertex.label.dist = 0.5,
     main="Fakebook Bus Seats Network Graph",
     vertex.color="lavender",
     vertex.label.color = "black",
     vertex.label.family = "sans")

## Warning in layout[, 1] + label.dist * cos(-label.degree) * (vertex.size + :
## longer object length is not a multiple of shorter object length

## Warning in layout[, 2] + label.dist * sin(-label.degree) * (vertex.size + :
## longer object length is not a multiple of shorter object length

legend("bottomright",
     title="Centrality Measures",
     cex=0.6,
     bty="n",
     legend=c("Degree Centrality , Closeness Centrality , Betweenness Centrality"),
     )
```

## Fakebook Bus Seats Network Graph



# Fakebook Bus Seats Network Graph

