

## A2

2024-03-26

```
# Create a data frame to represent edges based on seat adjacency
edges <- data.frame(
  from = c('1', '2', '2', '3', '3', '3', '3', '3', '4', '4', '5', '5', '5', '6', '6', '6', 'A', 'A', 'A',
  to = c('2', '1', 'A', '2', '4', 'B', 'C', '5', '3', '5', '4', '6', 'D', '5', 'B', 'D', '2', 'B', 'C',
)
```

```
# Print the dataset
print(edges)
```

```
##      from to
## 1      1  2
## 2      2  1
## 3      2  A
## 4      3  2
## 5      3  4
## 6      3  B
## 7      3  C
## 8      3  5
## 9      4  3
## 10     4  5
## 11     5  4
## 12     5  6
## 13     5  D
## 14     6  5
## 15     6  B
## 16     6  D
## 17     A  2
## 18     A  B
## 19     A  C
## 20     B  A
## 21     B  3
## 22     B  C
## 23     B  D
## 24     B  6
## 25     C  B
## 26     C  4
## 27     C  D
## 28     C  3
## 29     C  5
## 30     D  C
## 31     D  B
## 32     D  6
## 33     D  5
## 34     D  3
```

```

library(igraph)

## Warning: package 'igraph' was built under R version 4.3.2
##
## Attaching package: 'igraph'
##
## The following objects are masked from 'package:stats':
##
##     decompose, spectrum
##
## The following object is masked from 'package:base':
##
##     union
# Create the graph from the edge data frame
bus_network <- graph_from_data_frame(edges, directed = FALSE)

# Calculate the centrality measures
degree centrality <- degree(bus_network, v = V(bus_network), normalized = TRUE)
closeness centrality <- closeness(bus_network, v = V(bus_network), normalized = TRUE)
betweenness centrality <- betweenness(bus_network, v = V(bus_network), normalized = TRUE)

# Print the centrality measures for seats A-D
seats <- c('A', 'B', 'C', 'D')
centrality_measures <- data.frame(
  seat = seats,
  degree = degree centrality[seats],
  closeness = closeness centrality[seats],
  betweenness = betweenness centrality[seats]
)

print(centrality_measures)

```

```

##   seat   degree closeness betweenness
## A    A 0.5555556 0.6000000 0.09259259
## B    B 1.1111111 0.6428571 0.12685185
## C    C 1.0000000 0.6923077 0.09259259
## D    D 1.0000000 0.6428571 0.03425926

```

Seat B has the highest degree centrality, suggesting it has the most direct connections. Seat B might be beneficial if you want to be a key connector or bridge within the network since it has the highest betweenness centrality. Being in a seat that is central to many interactions can lead to frequent interruptions, making it difficult to read, think, or relax.

```

# Create a layout
layout <- layout_nicely(bus_network)

# Plot the network
plot(bus_network, layout = layout,
      vertex.label = V(bus_network)$name, # Label nodes with their names
      vertex.size = degree centrality * 50, # Adjust vertex size based on degree centrality for visualization
      main = "Bus Network Graph with Centrality Measures")

# Adding centrality values as labels next to the nodes
text(layout, labels = paste("D:", round(degree centrality, 2), "\nC:", round(closeness centrality, 2),

```

## Bus Network Graph with Centrality Measures

