

Assignment 1

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```
nodes <- read.csv("Names.csv", header=TRUE)
edges <- read.csv("Edges.csv", header=TRUE)

library(igraph)
```

```
## Warning: package 'igraph' was built under R version 4.3.3
```

```
##
## Attaching package: 'igraph'
```

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

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

```
airports <- graph_from_data_frame(edges, nodes, directed=FALSE)
vertex_attr(airports) <- list(name = nodes$Code)
```

```
#1
cat("Number of nodes:", vcount(airports), "\n")
```

```
## Number of nodes: 30
```

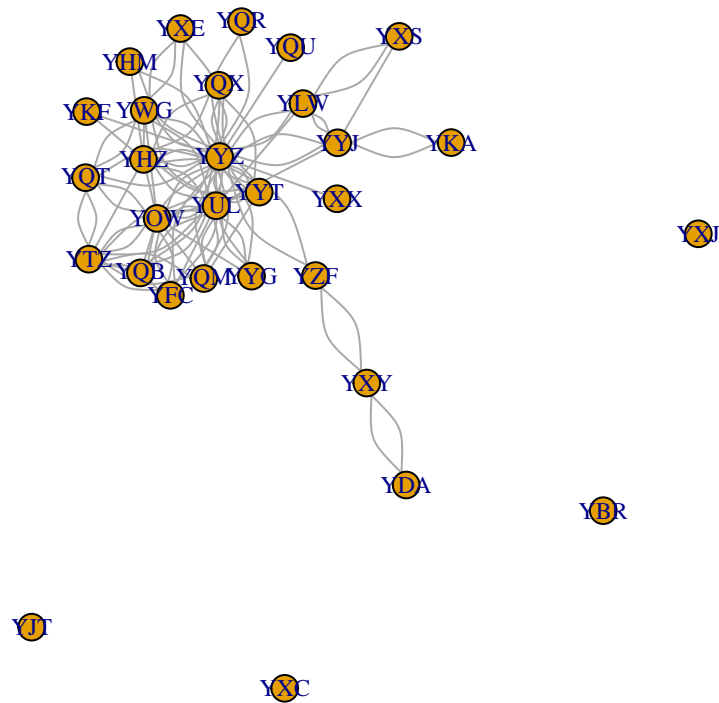
```
cat("Number of edges:", ecoun(airports), "\n")
```

```
## Number of edges: 101
```

```
#2
par(mar=c(1,1,1,1), oma=c(0,0,0,0), cex=1.5)
```

```
plot(airports, vertex.label=V(airports)$Code, vertex.size=8, edge.arrow.size=1, layout=layout_with_kk, m
```

Airport Network



```
#3
deg <- degree(airports)
mean_degree <- mean(deg)

most_connected <- names(sort(deg, decreasing=TRUE)[0:2])
least_connected <- names(sort(deg, decreasing=FALSE)[0:2])

cat("Mean degree:", mean_degree, "\n")
```

```
## Mean degree: 6.733333
```

```
cat("Most connected airports:", most_connected, "\n")
```

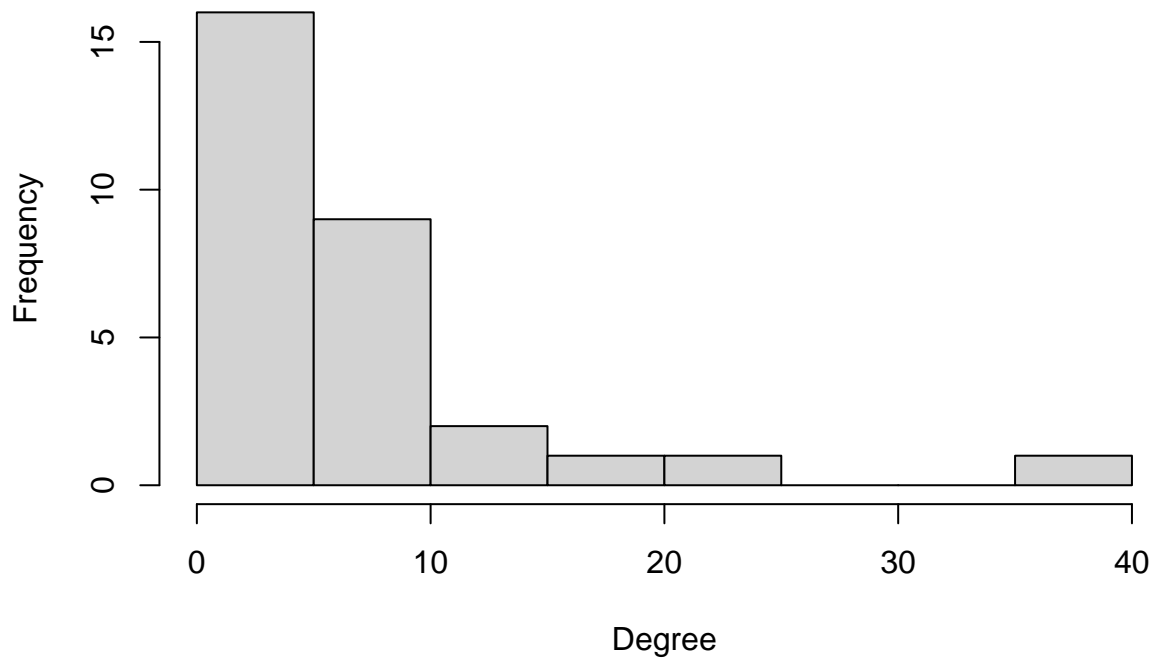
```
## Most connected airports: YYZ YUL
```

```
cat("Least connected airports:", least_connected, "\n")
```

```
## Least connected airports: YXJ YXC
```

```
#4
hist(deg, main="Degree Distribution", xlab="Degree", ylab="Frequency")
```

Degree Distribution



```
#5
adj_matrix <- as_adjacency_matrix(airports)
is_symmetric <- isSymmetric(as.matrix(adj_matrix))

cat("Adjacency Matrix:\n")
```

Adjacency Matrix:

```
print(as.matrix(adj_matrix))
```

```
##      YYJ YXJ YXX YKA YLW YXS YXC YQX YQU YQR YXE YBR YWG YHM YYZ YKF YOW YQT YUL
## YYJ   0   0   0   2   2   1   0   0   0   0   0   0   0   0   2   0   0   0   1
## YXJ   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## YXX   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
## YKA   2   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## YLW   2   0   0   0   0   2   0   0   0   0   0   0   0   0   2   0   0   0   1
## YXS   1   0   0   0   2   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## YXC   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## YQX   0   0   0   0   0   0   0   0   0   0   0   0   0   0   2   0   0   0   0
## YQU   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
## YQR   0   0   0   0   0   0   0   0   0   0   0   0   0   0   2   0   0   0   0
## YXE   0   0   0   0   0   0   0   0   0   0   0   0   2   0   2   0   0   0   0
## YBR   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
## YWG   0   0   0   0   0   0   0   0   0   0   2   0   0   0   2   0   1   2   2
## YHM   0   0   0   0   0   0   0   0   0   0   0   0   0   0   2   0   0   0   0
```

```

## YYZ 2 0 1 0 2 0 0 2 1 2 2 0 2 2 0 1 2 2 2
## YKF 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
## YOW 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 0 0 2
## YQT 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0 2 0
## YUL 1 0 0 0 1 0 0 0 0 0 0 0 2 0 2 0 2 0
## YQB 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 0
## YFC 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0
## YQM 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 0
## YHZ 0 0 0 0 0 0 0 2 0 0 0 0 1 1 2 1 1 0
## YYG 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 0
## YYT 0 0 0 0 0 0 0 2 0 0 0 0 0 0 2 0 1 0
## YJT 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## YDA 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## YXY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## YZF 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0
## YTZ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2
##      YQB YFC YQM YHZ YYG YYT YJT YDA YXY YZF YTZ
## YYJ 0 0 0 0 0 0 0 0 0 0 0
## YXJ 0 0 0 0 0 0 0 0 0 0 0
## YXX 0 0 0 0 0 0 0 0 0 0 0
## YKA 0 0 0 0 0 0 0 0 0 0 0
## YLW 0 0 0 0 0 0 0 0 0 0 0
## YXS 0 0 0 0 0 0 0 0 0 0 0
## YXC 0 0 0 0 0 0 0 0 0 0 0
## YQX 0 0 0 2 0 2 0 0 0 0 0
## YQU 0 0 0 0 0 0 0 0 0 0 0
## YQR 0 0 0 0 0 0 0 0 0 0 0
## YXE 0 0 0 0 0 0 0 0 0 0 0
## YBR 0 0 0 0 0 0 0 0 0 0 0
## YWG 0 0 0 1 0 0 0 0 0 0 0
## YHM 0 0 0 1 0 0 0 0 0 0 0
## YYZ 2 2 2 2 2 2 0 0 0 2 0
## YKF 0 0 0 1 0 0 0 0 0 0 0
## YOW 1 2 1 1 1 1 0 0 0 0 2
## YQT 0 0 0 0 0 0 0 0 0 0 2
## YUL 2 1 2 2 2 2 0 0 0 0 2
## YQB 0 0 0 0 0 0 0 0 0 0 1
## YFC 0 0 0 0 0 0 0 0 0 0 2
## YQM 0 0 0 0 0 1 0 0 0 0 2
## YHZ 0 0 0 0 0 2 0 0 0 0 1
## YYG 0 0 0 0 0 0 0 0 0 0 0
## YYT 0 0 1 2 0 0 0 0 0 0 0
## YJT 0 0 0 0 0 0 0 0 0 0 0
## YDA 0 0 0 0 0 0 0 0 2 0 0
## YXY 0 0 0 0 0 0 0 2 0 2 0
## YZF 0 0 0 0 0 0 0 0 2 0 0
## YTZ 1 2 2 1 0 0 0 0 0 0 0

```

```
cat("Is the matrix symmetric?", is_symmetric, "\n")
```

```
## Is the matrix symmetric? TRUE
```