

Assignment 1 - Smitesh Patil 22223696

2023-01-25

1. Basic measures

```
library(igraph)
```

```
## Warning: package 'igraph' was built under R version 4.1.3
```

```
##
```

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

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

```
##
```

```
##      decompose, spectrum
```

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

```
##
```

```
##      union
```

```
dib_graph<-read.graph("dib2.graphml",format="graphml")
```

1.1 Give the number of nodes and edges

```
cat("num vertices:", vcount(dib_graph), "\n")
```

```
## num vertices: 8969
```

```
cat("num edges :", ecount(dib_graph), "\n")
```

```
## num edges : 46750
```

1.2 Is the network strongly or weakly connected. If neither, what is the distribution of component sizes.

```
strong_component = as.data.frame(table(factor(components(dib_graph, mode="strong")$size)))
```

```
names(strong_component)[1] = "Component Size"
```

```
strong_component
```

```
##   Component Size Freq
```

```
## 1                1 3024
```

```
## 2                2  180
```

```
## 3                3   25
```

```
## 4                4    5
```

```
## 5                5    1
```

```
## 6                6    1
```

```
## 7             5479    1
```

The table above shows strongly connected components in the directed network. There is one component with 5479, 6 and 5 nodes and a distribution of component with sizes varying from 1 to 4.

```
weak_component = as.data.frame(table(factor(components(dib_graph, mode="weak")$csize)))
names(weak_component)[1] = "Component Size"
weak_component
```

```
##   Component Size Freq
## 1             2   30
## 2             3   11
## 3             4    1
## 4          8872    1
```

The table above shows weakly connected components in the directed network. There is one component with 8872 and 4 nodes with 30 weakly connected components of size 2 and 11 components with size 3.

1.3 What is the diameter of the network ?

```
cat("The diameter of the network is : ", diameter(dib_graph, directed = T, unconnected = TRUE, weights=
```

```
## The diameter of the network is : 18
```

1.4 What is the average path length of the network ?

```
cat("The average path length of the network :", mean_distance(dib_graph, directed = T), "\n")
```

```
## The average path length of the network : 6.017593
```

1.5 What is the clustering coefficient of the network ?

```
cat("clustering coeff of the graph is :", transitivity(dib_graph, type="localaverage"), "\n")
```

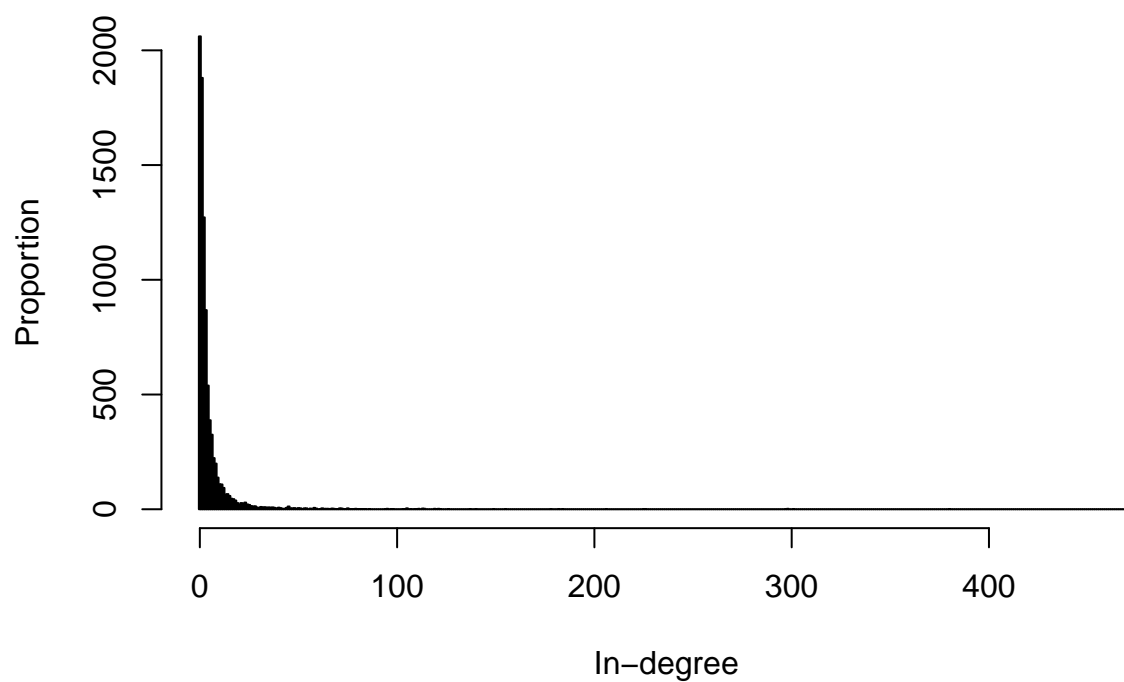
```
## clustering coeff of the graph is : 0.2300017
```

1.6 What is the in- and out-degree distribution ?

```
deg<-degree(dib_graph, mode = "in")

hist(deg,
      breaks=(min(deg)-1):(max(deg))+0.5,
      xlab = "In-degree",
      ylab = "Proportion",
      main = "Histogram of In-Degree Distribution",
      border="black",
      col="white",
      )
```

Histogram of In-Degree Distribution



```
deg<-degree(dib_graph, mode = "out")  
  
hist(deg,  
      breaks=(min(deg)-1):(max(deg))+0.5,  
      xlab = "Out-degree",  
      ylab = "Proportion",  
      main = "Histogram of Out-Degree Distribution",  
      border="black",  
      col="white")
```

Histogram of Out-Degree Distribution

