Exercises 3 The Free-Scale Property

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Contents

```
library(igraph)
```

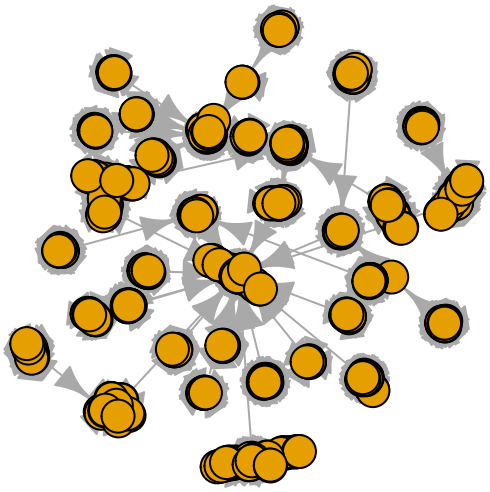
```
##
## Attaching package: 'igraph'
```

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

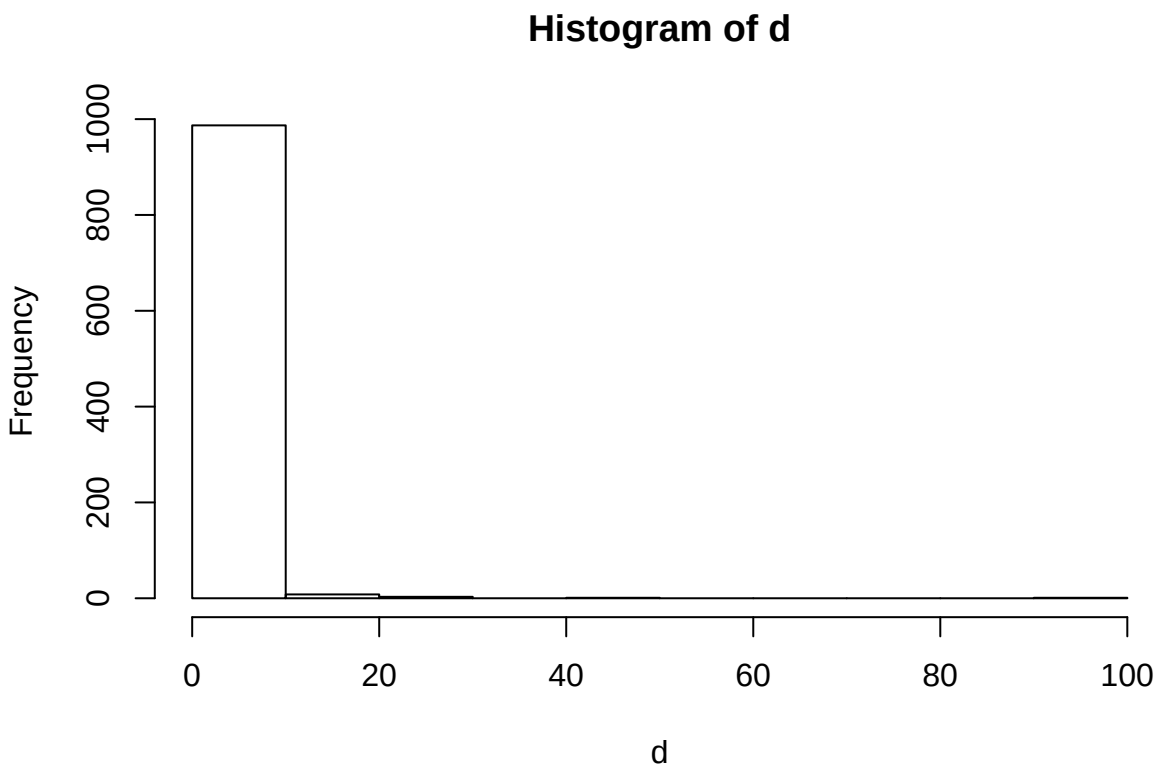
```
## The following object is masked from 'package:base':
##
##     union
```

The commando for generating a free-sacel network is `barabasi.game()`

```
# This should approximately yield the correct exponent 3
g <- barabasi.game(1000) # increase this number to have a better estimate
plot(g,vertex.label=NA)
```



```
d <- degree(g, mode="in")
hist(d)
```




```
fit1 <- fit_power_law(d+1, 10)
fit2 <- fit_power_law(d+1, 10, implementation="R.mle")

fit1$alpha
```

```
## [1] 3.088576
```

```
stats4::coef(fit2)
```

```
##    alpha
## 3.088855
```

```
fit1$logLik
```

```
## [1] -62.95297
```

```
stats4::logLik(fit2)
```

```
## 'log Lik.' -62.95296 (df=1)
```

Exercises

1. From the next networks, plot the degree distribution

```
g10<-barabasi.game(10,directed = FALSE)
g100<-barabasi.game(100,directed = FALSE)
g1K<-barabasi.game(1000,directed = FALSE)
g2<-random.graph.game(1000,0.20)
g3<-sample_smallworld(1,1000,p=0.2,nei=3)
g4<-make_graph("Zachary")
```

2. Find the median, mean and boxplots of these distributions.

3. Fit a power law to these distributions. Discuss your results.
4. Fit a power law distribution to the classroom network.