Social Network Analysis Home Assignment 3

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Network communities

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Use this file as a template for your report.
Support your computations with figures and comments. Send ONLY .Rmd versions of your report.

```
## Warning: package 'igraph' was built under R version 3.5.3

##
## Attaching package: 'igraph'

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

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

Yahoo Music Network

For this assignment, you have to load the part of Yahoo Music Network. Archive contains network in GML format and corresponding list of artists.

```
## Put your code here
z = read.graph("music2K.gml", format = "gml")
```

Edges in this network appear if enough number of users have given ratings to both music bands. Note, that edges are weighted with similarity of the ratings.

1. Preprocessing

This network needs to be preprocessed. Do the steps, described on seminar, to make it look properly. How many vertices and edges were deleted?

```
## Put your code here

# Preprocess the graph
g = delete.vertices(z, degree(z) == 0)
simplify(g)
```

```
## IGRAPH 4e3041e U-W- 1996 6668 --
## + attr: id (v/n), label (v/c), weight (e/n)
## + edges from 4e3041e:
##  [1]  1-- 639  1--1741  2-- 365  2-- 871  2--1403  2--1516  2--1837
##  [8]  2--1881  3-- 324  3-- 827  3--1425  3--1593  4-- 427  4-- 697
## [15]  4-- 755  4-- 837  4--1629  5-- 102  5-- 272  5-- 358  5-- 723
## [22]  5-- 759  5--1118  5--1217  5--1386  5--1513  5--1558  5--1892
## [29]  6-- 760  6-- 870  6--1246  6--1704  7-- 614  7-- 820  7--1010
## [36]  7--1097  7--1110  7--1408  7--1544  7--1607  7--1877  7--1928
## [43]  8--  56  8-- 190  8-- 487  8-- 512  8-- 841  9-- 271  9-- 526
## [50]  9-- 935  9-- 997 10-- 216 10-- 291 10-- 384 10--1003 10--1292
## + ... omitted several edges
```

```
#plot(g)

# Check the result of preprocessing
deltaV = length(V(z))-length(V(g))
deltaE = length(E(z))-length(E(g))

paste("After preprocessing the size of vertices decreased by",deltaV)
```

```
## [1] "After preprocessing the size of vertices decreased by 4"
```

```
paste("After preprocessing the size of edges decreased by",deltaE)
```

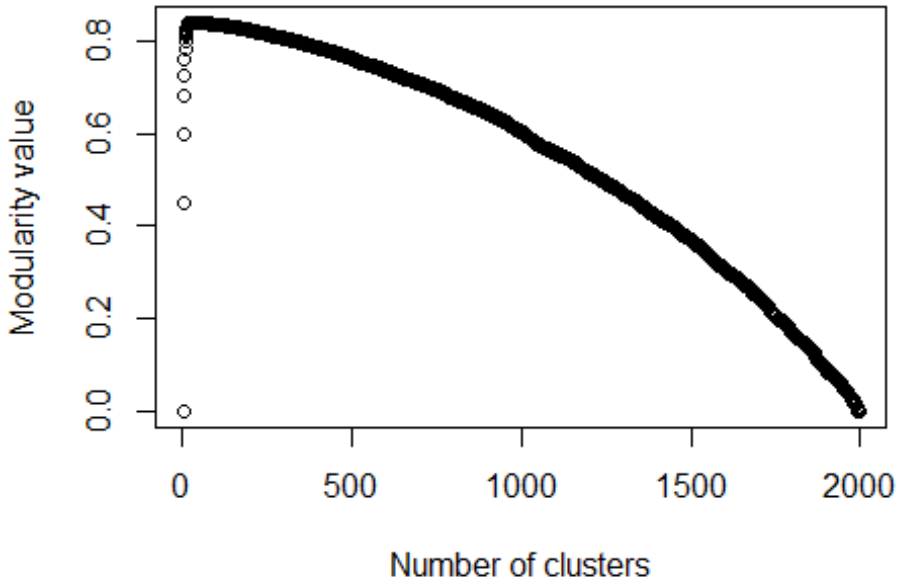
```
## [1] "After preprocessing the size of edges decreased by 0"
```

2. Clustering

Define clusters for this networks using one of the algorithms described on lectures and seminars:

```
## Put your code here
mm <- fastgreedy.community(g)
```

```
plot(rev(mm$modularity), xlab = 'Number of clusters', ylab = 'Modularity
value')
```




```
#plot(mm, g)

typeof(mm)

## [1] "list"
```

Compute density of obtained clusters:

```
## Put your code here
#groups(mm)
#
density.list = list()
for (i in seq(length(groups(mm)))){
    sg = induced_subgraph(g, mm$membership==i)
    density.sg = graph.density(sg)
    density.list[i] = density.sg
    print(sprintf("Community %d has density = %.4f", i, density.sg))}

## [1] "Community 1 has density = 0.0500"
## [1] "Community 2 has density = 0.0602"
## [1] "Community 3 has density = 0.0396"
## [1] "Community 4 has density = 0.0808"
## [1] "Community 5 has density = 0.1074"
## [1] "Community 6 has density = 0.0190"
## [1] "Community 7 has density = 0.0393"
```

```
## [1] "Community 8 has density = 0.0475"
## [1] "Community 9 has density = 0.0878"
## [1] "Community 10 has density = 0.0613"
## [1] "Community 11 has density = 0.0521"
## [1] "Community 12 has density = 0.2308"
## [1] "Community 13 has density = 0.0684"
## [1] "Community 14 has density = 0.1010"
## [1] "Community 15 has density = 0.1703"
## [1] "Community 16 has density = 0.0375"
## [1] "Community 17 has density = 0.2286"
## [1] "Community 18 has density = 0.0981"
## [1] "Community 19 has density = 0.3399"
## [1] "Community 20 has density = 0.1355"
## [1] "Community 21 has density = 0.1277"
## [1] "Community 22 has density = 0.1345"
## [1] "Community 23 has density = 0.5385"
## [1] "Community 24 has density = 0.2536"
## [1] "Community 25 has density = 0.5238"
## [1] "Community 26 has density = 0.5769"
## [1] "Community 27 has density = 0.6429"

density.list[[27]]

## [1] 0.6428571
```

Compute the ratio of inner clusters connections to outer ones:

```
## Put your code here
for (i in seq(length(groups(mm)))){
    sg = induced_subgraph(g, mm$membership==i)
    ratio = ecount(sg)/(ecount(g)-ecount(sg))
    print(sprintf("Community %d has ratio = %.4f", i, ratio))}

## [1] "Community 1 has ratio = 0.0362"
## [1] "Community 2 has ratio = 0.0393"
## [1] "Community 3 has ratio = 0.0710"
## [1] "Community 4 has ratio = 0.0157"
## [1] "Community 5 has ratio = 0.0227"
## [1] "Community 6 has ratio = 0.1682"
## [1] "Community 7 has ratio = 0.0901"
## [1] "Community 8 has ratio = 0.0507"
## [1] "Community 9 has ratio = 0.0401"
## [1] "Community 10 has ratio = 0.0539"
## [1] "Community 11 has ratio = 0.0623"
## [1] "Community 12 has ratio = 0.0123"
## [1] "Community 13 has ratio = 0.0262"
## [1] "Community 14 has ratio = 0.0230"
## [1] "Community 15 has ratio = 0.0071"
## [1] "Community 16 has ratio = 0.0985"
## [1] "Community 17 has ratio = 0.0073"
## [1] "Community 18 has ratio = 0.0369"
```

```
## [1] "Community 19 has ratio = 0.0079"
## [1] "Community 20 has ratio = 0.0115"
## [1] "Community 21 has ratio = 0.0211"
## [1] "Community 22 has ratio = 0.0108"
## [1] "Community 23 has ratio = 0.0063"
## [1] "Community 24 has ratio = 0.0106"
## [1] "Community 25 has ratio = 0.0017"
## [1] "Community 26 has ratio = 0.0068"
## [1] "Community 27 has ratio = 0.0027"
```

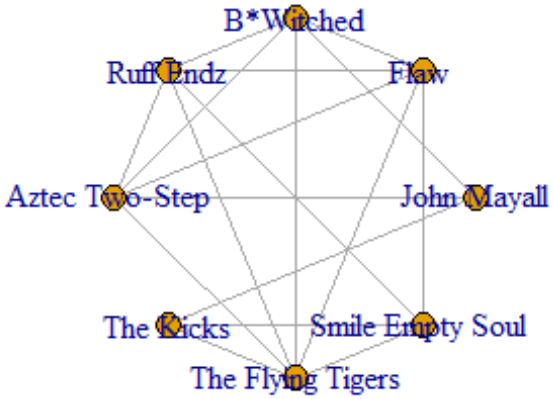
3. Visualization & interpretation

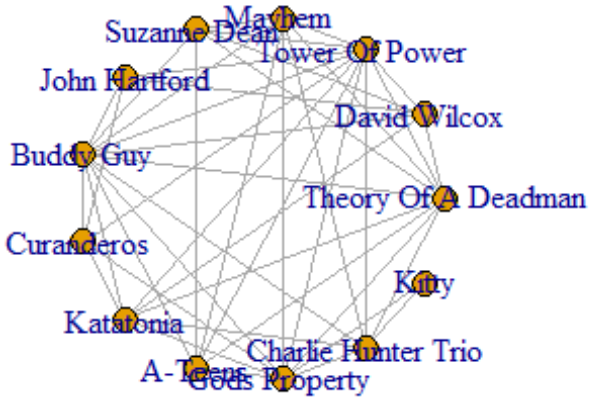
Visulize five of the most dense clusters. Use names of artists as node labels on the graph.

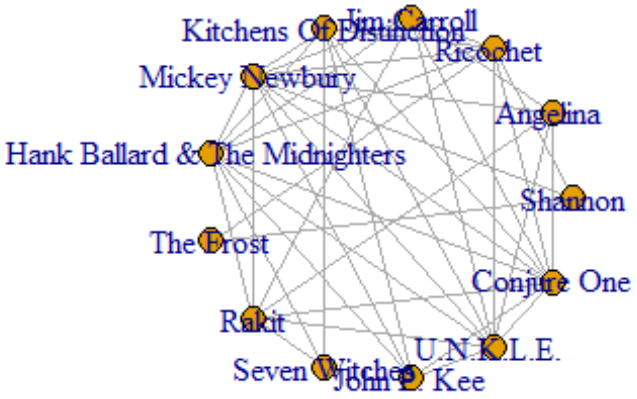
```
## Put your code here
artists = scan("artists.txt", character(), sep = "\n")
#artists
V(g)$label = artists
```

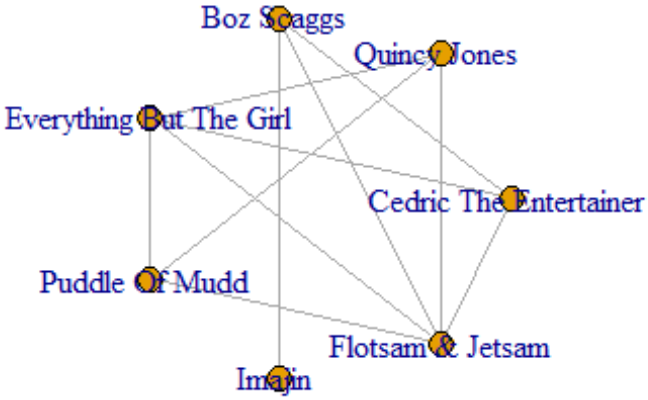
```
## Warning in vattrs[[name]][index] <- value: number of items to replace is
## not a multiple of replacement length
```

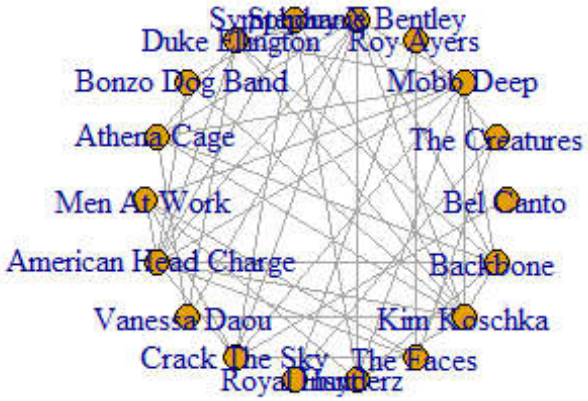
```
top5 = list()
for (i in seq(5)){

  i = which.max(density.list)
  top5=append(top5, density.list[i])
  density.list[i] = -1

  subgraph = induced.subgraph(g,which(mm$membership == i))
  plot(subgraph, layout=layout.circle)

}
```


B*Witched
Ruff Endz
Flaw
Aztec Two-Step
John Mayall
The Kicks
Smile Empty Soul
The Flying Tigers


Mayhem
Suzanne Dean
Tower Of Power
John Hartford
David Wilcox
Buddy Guy
Theory Of A Deadman
Curanderos
Kitty
Katatonia
Charlie Hunter Trio
A-Teens
Gods Property


Jim Carroll
Kitchens Of Distinction
Ricochet
Mickey Newbury
Angelina
Hank Ballard & The Midnighters
Shannon
The Frost
Conjure One
Rakit
U.N.K.L.E.
Seven Witches
John P. Kee


Boz Scaggs
Quincy Jones
Everything But The Girl
Cedric The Entertainer
Puddle Of Mudd
Flotsam & Jetsam
Imajin




```
top5
```

```
## [[1]]
## [1] 0.6428571
##
## [[2]]
## [1] 0.5769231
##
## [[3]]
## [1] 0.5384615
##
## [[4]]
## [1] 0.5238095
##
## [[5]]
## [1] 0.3398693
```

(Extra task) Try to interpret (using Wikipedia or other resources) obtained clusters.

Insert comments here