

Visualization of Subgroups and Communities in a Network

Using the Teacher-Student network

```
library(igraph)
```

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

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

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

```
g4 <- graph( c('Susann', 'Jeag4te', 'Harrison', 'Myron', 'Julie', 'Colten', 'Brandyn', 'Leland', 'Catherine',  
, 'Tracy', 'Bee', 'Maureen', 'Annika', 'Hans', 'Spenser', 'Angelo', 'Blanche', 'Stanford', 'Hope', 'Catherin  
e', 'Almira', 'Thomas', 'Henry', 'Ralph', 'Louvenia', 'German', 'Lura', 'Wilma', 'Lauretta', 'Maudie', 'Mar  
tha', 'Henry', 'Loyd', 'Mayra', 'Noelle', 'Fabian', 'Ira', 'Zenobia', 'Noelle', 'Natalie', 'Brooke', 'German',  
, 'Lauretta', 'Zenobia', 'Hallie', 'Braxton', 'Lorraine', 'Alicia', 'Allie', 'Jaylon', 'Myrna', 'Darrel', '  
Lura', 'Hermon', 'Wyatt', 'Raoul', 'Althea', 'Laurel', 'Leola', 'Darrel', 'Giles', 'Merritt', 'Angelo', 'Ken  
drick', 'Travis', 'Henry', 'Owen', 'Almira', 'Michelle', 'Lou', 'Stephan', 'Leola', 'Wyatt', 'Allie', 'Eli',  
, 'Brandyn', 'Mayra', 'Chin', 'Clarence', 'Marlee', 'Glenn', 'Reid', 'Glenn', 'Jerrold', 'Dale', 'Helena',  
, 'Alvie', 'Elden', 'Chaim', 'Merritt', 'Augustine', 'Curtiss', 'Alvie', 'Allie', 'Pollie', 'Catherine', 'Ang  
elita', 'Glenn', 'Allie', 'Braden', 'Manford', 'Raoul', 'Dwight', 'Pollie', 'Zona', 'Reggie', 'Dominic', 'Am  
y', 'Santos', 'Faron', 'Leslie', 'Etha', 'Maureen', 'Juanita', 'Gust', 'Noelle', 'Darrel', 'Darin', 'Faron',  
, 'Zona', 'Myron', 'Hans', 'German', 'Elden', 'Mayra', 'Merritt', 'Myron', 'Gerald', 'Andrea', 'German', 'A  
ngelita', 'Giles', 'Reggie', 'Wyatt', 'Alvie', 'Darrel', 'Jarrett', 'Newell', 'Brandyn', 'Eloisa', 'Santos',  
, 'Lou', 'Quintin', 'Zechariah', 'Leola', 'Anthony', 'Eliga', 'Gust', 'Obie', 'Obie', 'Brandyn', 'Brooke', 'D  
ominic', 'Jacoby', 'Maureen', 'Hardie', 'Noelle', 'Braxton', 'Noelle', 'Leola', 'Marlee', 'Helena', 'Ira', '  
Kermit', 'Wilda', 'Eli', 'Chance', 'Hardie', 'Andrea', 'Johnnie', 'Lauretta', 'Tracy', 'Kathryn', 'Spenser',  
, 'Lou', 'Dana', 'Dominic', 'Rachelle', 'Glenn', 'Darrel', 'Deidra', 'Orpha', 'Hermon', 'Rosalind', 'Hans', '  
Curtis', 'Josue', 'Wyatt', 'Agatha', 'Wyatt', 'Chance', 'Glenn', 'Kendrick', 'Brooke', 'Hollie', 'Beverly',  
, 'Katarina', 'Josue', 'Leslie', 'Colten', 'Mayra', 'Darin', 'Hermon', 'Myron', 'Alicia', 'Leila', 'Kermit',  
, 'Lamar', 'Dana', 'Johnnie', 'Althea', 'Judson', 'Colten', 'Hope', 'Gust', 'Clarence', 'Leland', 'Matthew', '  
Lorraine', 'Althea', 'Colten', 'Jewel', 'Leila', 'Eli', 'Zenobia', 'German', 'Jaylon', 'Henry', 'Michelle',  
, 'Johnie', 'Judson', 'Johnnie', 'Leslie', 'Wyatt', 'Lou', 'Maureen', 'Jacoby', 'Noelle', 'Johnnie', 'Alvie',  
, 'Leila', 'Myron', 'Wilda', 'Brandyn', 'Kendrick', 'Gerald', 'Tyson', 'Jacoby', 'Ari', 'Theo', 'Harrison', '  
Carmen', 'Leonard', 'Braden', 'Desi', 'Zona', 'Maureen', 'Ralph', 'Thomas', 'Myron', 'Austin', 'Leola', 'Lo  
yd', 'Quintin', 'Lorraine', 'Glenn', 'Merritt', 'Janet', 'Myron', 'Alicia', 'Maureen', 'Leslie', 'Carla', '  
Vicky', 'Harley', 'Leslie', 'Hannah', 'Gust', 'Andrea', 'Giles', 'Wilma', 'Henry', 'Hermon', 'Stefani', 'Hen  
ry', 'Lou', 'Harley', 'Noelle', 'Kermit', 'Laurel', 'Hermon', 'Sebastian', 'Andrea', 'Eliga', 'Sigmund', 'Darrel',  
, 'Noelle', 'Urban', 'Almira', 'Noelle', 'Dwight', 'Beverly', 'Wyatt', 'Juanita', 'Reid', 'Kermit', 'Myrna', '  
Pollie', 'Hope', 'Leola', 'Leslie', 'Jacoby', 'Pollie', 'Tiffany', 'Gust', 'Leland', 'Eliga', 'Lamar', 'Ira',  
, 'Dale', 'Noelle', 'Jarrett', 'Zenobia', 'Orpha', 'Glenn', 'Amy', 'Hermon', 'Myrna', 'Brandyn', 'Nell', '  
Leslie', 'Edd', 'Lura', 'Kendrick', 'Obie', 'Augustine', 'Zona', 'Glenn', 'Dominic', 'Jennifer', 'Rachelle',  
, 'Faron', 'Darrel', 'Pollie', 'Almira', 'Glenn', 'Wilma', 'Angus', 'Leila', 'Sherri'))
```

```
## Warning in matrix(edges, ncol = 2, byrow = TRUE): data length [349] is not a  
## sub-multiple or multiple of the number of rows [175]
```

```
V(g4)$name
```



```
net.sym <- as.undirected(g4, mode= "collapse",  
                        edge.attr.comb=list(weight="sum", "ignore"))
```

1. Finding cliques and plotting them

```
cliques(net.sym) # list of cliques
```

```
## [[1]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Noelle  
##  
## [[2]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Glenn  
##  
## [[3]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Leslie  
##  
## [[4]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Myron  
##  
## [[5]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Henry  
##  
## [[6]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Brandyn  
##  
## [[7]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Pollie  
##  
## [[8]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] German  
##  
## [[9]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Johnnie  
##  
## [[10]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Zona  
##  
## [[11]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Lou  
##  
## [[12]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Kendrick  
##  
## [[13]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Merritt  
##  
## [[14]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Allie  
##  
## [[15]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Eliga  
##  
## [[16]]  
## + 1/146 vertex, named, from 5f93cb3:  
## [1] Althea  
##
```

```
##
## [[17]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Ira
##
## [[18]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Lauretta
##
## [[19]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Lura
##
## [[20]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Beverly
##
## [[21]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Josue
##
## [[22]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Rachelle
##
## [[23]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hardie
##
## [[24]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Quintin
##
## [[25]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jarrett
##
## [[26]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Darin
##
## [[27]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Juanita
##
## [[28]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Amy
##
## [[29]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Helena
##
## [[30]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Clarence
##
## [[31]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Raoul
##
## [[32]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Spenser
##
## [[33]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Susann
##
## [[34]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Angus
##
```

```
## [[35]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Tiffany
##
## [[36]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Urban
##
## [[37]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Sebastian
##
## [[38]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Stefani
##
## [[39]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hannah
##
## [[40]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Vicky
##
## [[41]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Austin
##
## [[42]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Leonard
##
## [[43]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Carmen
##
## [[44]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Theo
##
## [[45]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Tyson
##
## [[46]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Johnie
##
## [[47]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jewel
##
## [[48]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Matthew
##
## [[49]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Agatha
##
## [[50]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Curtis
##
## [[51]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Rosalind
##
## [[52]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Deidra
##
## [[53]]
```

```

## + 1/146 vertex, named, from 5f93cb3:
## [1] Anthony
##
## [[54]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Curtiss
##
## [[55]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Chin
##
## [[56]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Stephan
##
## [[57]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Owen
##
## [[58]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hallie
##
## [[59]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Stanford
##
## [[60]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Annika
##
## [[61]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Bee
##
## [[62]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Julie
##
## [[63]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Darrel
##
## [[64]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Darrel Darin
##
## [[65]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Darrel Glenn
##
## [[66]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Darrel
##
## [[67]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Leila
##
## [[68]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leila Angus
##
## [[69]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myron Leila
##
## [[70]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Kermit
##
## [[71]]
## + 2/146 vertices, named, from 5f93cb3:

```

```

## + 2/146 vertices, named, from 5f93cb3:
## [1] Ira      Kermit
##
## [[72]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Kermit
##
## [[73]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Giles
##
## [[74]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Giles  Merritt
##
## [[75]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hope
##
## [[76]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hope  Pollie
##
## [[77]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Wilda
##
## [[78]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Brandyn Wilda
##
## [[79]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jacoby
##
## [[80]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Jacoby Tyson
##
## [[81]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Pollie Jacoby
##
## [[82]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Jacoby
##
## [[83]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Santos
##
## [[84]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lou      Santos
##
## [[85]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Reggie
##
## [[86]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Zona  Reggie
##
## [[87]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Elden
##
## [[88]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] German Elden
##
## [[89]]
## + 1/146 vertex, named, from 5f93cb3:

```

```
## [1] Laurel
##
## [[90]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Althea Laurel
##
## [[91]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Lorraine
##
## [[92]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lorraine Althea
##
## [[93]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lorraine Glenn
##
## [[94]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Mayra
##
## [[95]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Mayra Chin
##
## [[96]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Mayra Darin
##
## [[97]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Mayra Merritt
##
## [[98]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Ralph
##
## [[99]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Henry Ralph
##
## [[100]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Thomas
##
## [[101]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myron Thomas
##
## [[102]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Tracy
##
## [[103]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Tracy Laurette
##
## [[104]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Sherri
##
## [[105]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Susann Sherri
##
## [[106]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jennifer
##
## [[107]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Rachelle Jennifer
```



```

##
## [[108]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Edd
##
##
## [[109]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lura Edd
##
##
## [[110]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Nell
##
##
## [[111]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leslie Nell
##
##
## [[112]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Sigmund
##
##
## [[113]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Eliga Sigmund
##
##
## [[114]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Harley
##
##
## [[115]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Henry Harley
##
##
## [[116]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leslie Harley
##
##
## [[117]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Carla
##
##
## [[118]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Carla Vicky
##
##
## [[119]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Janet
##
##
## [[120]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Merritt Janet
##
##
## [[121]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Desi
##
##
## [[122]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Zona Desi
##
##
## [[123]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Ari
##
##
## [[124]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Ari Theo
##
##
## [[125]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Judson
##
##

```

```

##
## [[126]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Althea Judson
##
## [[127]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Johnnie Judson
##
## [[128]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Katarina
##
## [[129]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Josue      Katarina
##
## [[130]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hollie
##
## [[131]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hollie Beverly
##
## [[132]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Orpha
##
## [[133]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Deidra Orpha
##
## [[134]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Glenn Orpha
##
## [[135]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Dana
##
## [[136]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lou   Dana
##
## [[137]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Johnnie Dana
##
## [[138]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Kathryn
##
## [[139]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Spenser Kathryn
##
## [[140]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Chance
##
## [[141]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hardie Chance
##
## [[142]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Glenn  Chance
##
## [[143]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Obie
##

```

```
## [[144]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Kendrick Obie
##
## [[145]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Zechariah
##
## [[146]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Quintin Zechariah
##
## [[147]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Eloisa
##
## [[148]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Brandyn Eloisa
##
## [[149]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Newell
##
## [[150]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Jarrett Newell
##
## [[151]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Gerald
##
## [[152]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Kendrick Gerald
##
## [[153]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myron Gerald
##
## [[154]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Gust
##
## [[155]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Gust Hannah
##
## [[156]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Gust Tiffany
##
## [[157]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Clarence Gust
##
## [[158]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Gust Eliga
##
## [[159]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Gust
##
## [[160]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Etha
##
## [[161]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leslie Etha
##
## [[162]]
```

```

## + 1/146 vertex, named, from 5f93cb3:
## [1] Dwight
##
## [[163]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Pollie Dwight
##
## [[164]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Dwight
##
## [[165]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Manford
##
## [[166]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Raoul Manford
##
## [[167]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Braden
##
## [[168]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Braden Leonard
##
## [[169]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Allie Braden
##
## [[170]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Augustine
##
## [[171]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Augustine Curtiss
##
## [[172]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Augustine Zona
##
## [[173]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Chaim
##
## [[174]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Merritt Chaim
##
## [[175]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Dale
##
## [[176]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Dale Helena
##
## [[177]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Dale
##
## [[178]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jerrold
##
## [[179]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Glenn Jerrold
##
## [[180]]
## + 1/146 vertex, named, from 5f93cb3:

```

```

## + 1/146 vertex, named, from 5f93cb3:
## [1] Reid
##
## [[181]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Reid      Juanita
##
## [[182]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Glenn Reid
##
## [[183]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Marlee
##
## [[184]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Clarence Marlee
##
## [[185]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Marlee Helena
##
## [[186]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Michelle
##
## [[187]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Michelle Johnie
##
## [[188]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Michelle Lou
##
## [[189]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Travis
##
## [[190]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Henry Travis
##
## [[191]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jaylon
##
## [[192]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Allie Jaylon
##
## [[193]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Henry Jaylon
##
## [[194]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Braxton
##
## [[195]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hallie Braxton
##
## [[196]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Braxton
##
## [[197]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Brooke
##
## [[198]]
## + 2/146 vertices, named, from 5f93cb3:

```

```
## [1] Brooke    Kendrick
##
## [[199]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] German Brooke
##
## [[200]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Brandyn Brooke
##
## [[201]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Natalie
##
## [[202]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle  Natalie
##
## [[203]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Zenobia
##
## [[204]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Zenobia Jarrett
##
## [[205]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lauretta Zenobia
##
## [[206]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Ira      Zenobia
##
## [[207]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] German  Zenobia
##
## [[208]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Fabian
##
## [[209]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Fabian
##
## [[210]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Martha
##
## [[211]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Henry  Martha
##
## [[212]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Maudie
##
## [[213]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lauretta Maudie
##
## [[214]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Wilma
##
## [[215]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lura  Wilma
##
## [[216]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Henry Wilma
```

```
##
## [[217]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wilma Glenn
##
## [[218]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Louvenia
##
## [[219]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Louvenia German
##
## [[220]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Blanche
##
## [[221]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Blanche Stanford
##
## [[222]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Angelo
##
## [[223]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Spenser Angelo
##
## [[224]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Angelo Kendrick
##
## [[225]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hans
##
## [[226]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Annika Hans
##
## [[227]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hans Curtis
##
## [[228]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myron Hans
##
## [[229]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Leland
##
## [[230]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leland Matthew
##
## [[231]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leland Eliga
##
## [[232]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Brandyn Leland
##
## [[233]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Harrison
##
## [[234]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Harrison Carmen
##
```

```
##
## [[235]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Harrison Myron
##
## [[236]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Jeag4te
##
## [[237]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Susann Jeag4te
##
## [[238]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Lamar
##
## [[239]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Kermit Lamar
##
## [[240]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Ira Kermit Lamar
##
## [[241]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Ira Lamar
##
## [[242]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Andrea
##
## [[243]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Giles Andrea
##
## [[244]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Andrea Sebastian
##
## [[245]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Andrea Johnnie
##
## [[246]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] German Andrea
##
## [[247]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Faron
##
## [[248]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Santos Faron
##
## [[249]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Darrel Faron
##
## [[250]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Zona Faron
##
## [[251]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Dominic
##
## [[252]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Dominic Jacoby
##
```



```
## [[253]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Dominic Amy
##
## [[254]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Dominic Rachelle
##
## [[255]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Glenn Dominic
##
## [[256]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Angelita
##
## [[257]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Giles Angelita
##
## [[258]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Glenn Angelita
##
## [[259]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Alvie
##
## [[260]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Alvie Elden
##
## [[261]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Darrel Alvie
##
## [[262]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Allie Alvie
##
## [[263]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Alvie Johnnie
##
## [[264]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Eli
##
## [[265]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Eli Wilda
##
## [[266]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Brandyn Eli Wilda
##
## [[267]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Eli Leila
##
## [[268]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Brandyn Eli
##
## [[269]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Leola
##
## [[270]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Darrel Leola
##
## [[271]]
```

```

## + 3/146 vertices, named, from 5f93cb3:
## [1] Noelle Darrel Leola
##
## [[272]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leola   Stephan
##
## [[273]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leola   Anthony
##
## [[274]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leola   Austin
##
## [[275]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Leola   Leslie
##
## [[276]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Noelle Leola
##
## [[277]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Wyatt
##
## [[278]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wyatt   Reggie
##
## [[279]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wyatt   Agatha
##
## [[280]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wyatt   Raoul
##
## [[281]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wyatt   Josue
##
## [[282]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wyatt   Beverly
##
## [[283]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Allie Wyatt
##
## [[284]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Wyatt   Leslie
##
## [[285]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Hermon
##
## [[286]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hermon   Laurel
##
## [[287]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hermon   Rosalind
##
## [[288]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Hermon   Stefani
##
## [[289]]
## + 2/146 vertices, named, from 5f93cb3:

```

```

## + 2/146 vertices, named, from 5f93cb3:
## [1] Hermon Amy
##
## [[290]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lura Hermon
##
## [[291]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myron Hermon
##
## [[292]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Myrna
##
## [[293]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myrna Kermit
##
## [[294]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myrna Darrel
##
## [[295]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Brandyn Myrna
##
## [[296]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Alicia
##
## [[297]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Lorraine Alicia
##
## [[298]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Alicia Leila
##
## [[299]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Myron Alicia Leila
##
## [[300]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Myron Alicia
##
## [[301]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Loyd
##
## [[302]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Loyd Mayra
##
## [[303]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Loyd Quintin
##
## [[304]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Almira
##
## [[305]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Almira Thomas
##
## [[306]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Almira Owen
##
## [[307]]
## + 2/146 vertices, named, from 5f93cb3:

```

```
## [1] Almira Urban
##
## [[308]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Almira Pollie
##
## [[309]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Maureen
##
## [[310]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Maureen Ralph
##
## [[311]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Bee      Maureen
##
## [[312]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Maureen Juanita
##
## [[313]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Maureen Hardie
##
## [[314]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Maureen Lou
##
## [[315]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Maureen Leslie
##
## [[316]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Catherine
##
## [[317]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Catherine Tracy
##
## [[318]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Catherine Hope
##
## [[319]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Catherine Hope      Pollie
##
## [[320]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Catherine Pollie
##
## [[321]]
## + 1/146 vertex, named, from 5f93cb3:
## [1] Colten
##
## [[322]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Colten Hope
##
## [[323]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Julie  Colten
##
## [[324]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Colten Jewel
##
## [[325]]
## + 2/146 vertices, named, from 5f93cb3:
## [1] Colten Leslie
```

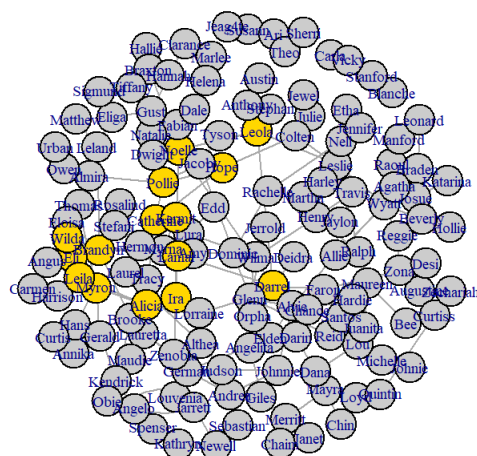
```
sapply(cliques(net.sym), length) # clique sizes
```

##	[1]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							
##	[38]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	2	1	2	2	1	2				
##	[75]	1	2	1	2	1	2	2	2	1	2	1	2	1	2	1	2	2	1	2	2	1	2	1	2	1	2	1	2	1	2	1	2			
##	[112]	1	2	1	2	2	1	2	1	2	1	2	1	2	1	2	1	2	2	1	2	2	1	2	1	2	2	1	2	1	2	1	2			
##	[149]	1	2	1	2	2	1	2	2	2	2	1	2	1	2	2	1	2	2	1	2	2	1	2	1	2	2	1	2	1	2	2	1	2		
##	[186]	1	2	2	1	2	1	2	2	1	2	2	1	2	2	2	1	2	2	2	2	1	2	1	2	1	2	2	2	1	2	1	2	1		
##	[223]	2	2	1	2	2	2	1	2	2	2	1	2	2	1	2	1	2	3	2	1	2	2	2	2	1	2	2	2	2	1	2	2	2	1	
##	[260]	2	2	2	2	1	2	3	2	2	1	2	3	2	2	2	2	1	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	2	2	1
##	[297]	2	2	3	2	1	2	2	1	2	2	2	2	1	2	2	2	2	2	2	2	1	2	2	3	2	1	2	2	2	2	2	2	2	2	

```
largest_cliques(net.sym) # cliques with max number of nodes
```

```
## [[1]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Lamar   Ira     Kermit
##
## [[2]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Leila   Myron   Alicia
##
## [[3]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Wilda    Brandyn Eli
##
## [[4]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Pollie    Catherine Hope
##
## [[5]]
## + 3/146 vertices, named, from 5f93cb3:
## [1] Noelle Darrel Leola
```

```
vcol <- rep("grey80", vcount(net.sym))
vcol[unlist(largest_cliques(net.sym))] <- "gold"
plot(as.undirected(net.sym), vertex.label=V(net.sym)$name, vertex.color=vcol, vertex.label.cex= 0.6)
```



Result: Cliques i.e. complete subgraphs of an undirected graph were found and visualized

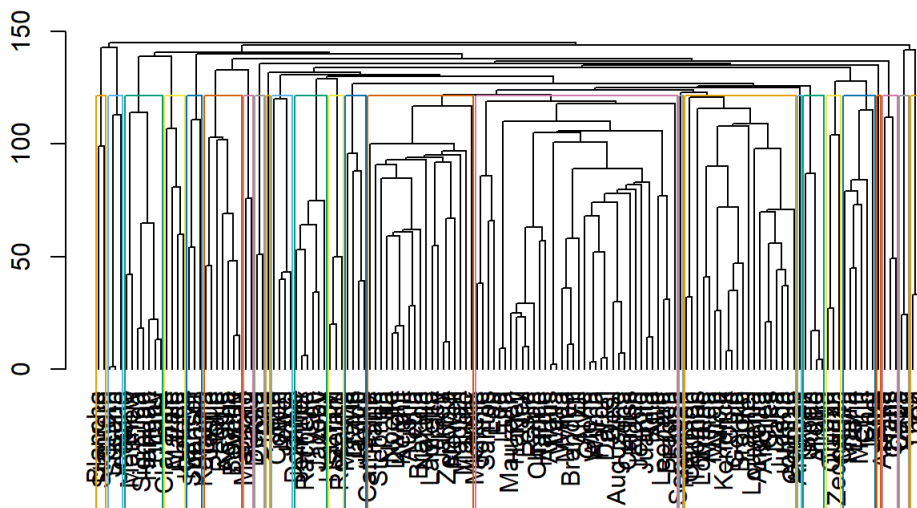
2. Community detection based on edge betweenness (Newman-Girvan)

```
ceb <- cluster_edge_betweenness(g4)
```

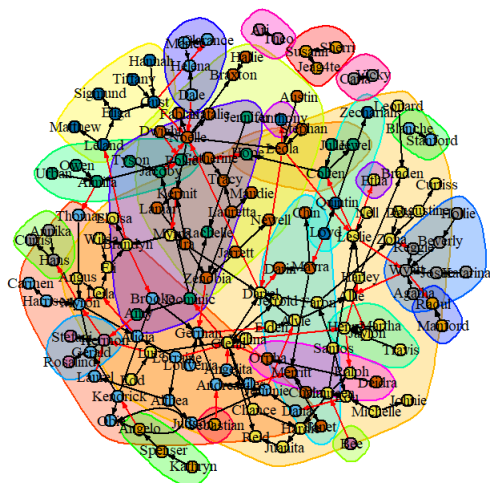
```
## Warning in cluster_edge_betweenness(g4): At community.c:460 :Membership vector
## will be selected based on the lowest modularity score.
```

```
## Warning in cluster_edge_betweenness(g4): At community.c:467 :Modularity
## calculation with weighted edge betweenness community detection might not make
## sense -- modularity treats edge weights as similarities while edge betweenness
## treats them as distances
```

```
dendPlot(ceb, mode="hclust")
```



```
plot(ceb, g4, edge.arrow.size=.2, vertex.label.color="black", vertex.label.dist=0.1, vertex.size=6, vertex.label.cex= 0.6)
```



```
class(ceb)
```

```
## [1] "communities"
```

```
length(ceb) # number of communities
```

```
## [1] 25
```

```
membership(ceb) # community membership for each node
```

```
##      Susann  Jeag4te  Harrison    Myron    Julie    Colten  Brandyn  Leland
##      1        1        2        2        3        3        4        5
## Catherine   Tracy    Bee  Maureen  Annika    Hans  Spenser  Angelo
##      6        6        7        4        8        8        9        9
##  Blanche  Stanford    Hope  Almira  Thomas    Henry    Ralph  Louvenia
##     10       10        3       11        2       12        4        2
##   German    Lura    Wilma  Lauretta  Maudie  Martha    Loyd    Mayra
##      2        4        4        6        6       12       13       14
##   Noelle   Fabian    Ira  Zenobia  Natalie  Brooke  Hallie  Braxton
##      6        6        6        6        6        2        6        6
## Lorraine  Alicia    Allie  Jaylon  Myrna  Darrel  Hermon  Wyatt
##      2        2        4       12        4        4       15       16
##   Raoul   Althea  Laurel  Leola  Giles  Merritt  Kendrick  Travis
##     17       2        2        6        2       14        2       12
##   Owen  Michelle    Lou  Stephan    Eli    Chin  Clarence  Marlee
##     11       4        4        6        4       14       18       18
##   Glenn    Reid  Jerrold    Dale  Helena  Alvie    Elden  Chaim
##      4        4        4       18       18        4        4       14
## Augustine  Curtiss  Pollie  Angelita  Braden  Manford  Dwight  Zona
##      4        4       11        2        4       17        6        4
##  Reggie  Dominic    Amy  Santos  Faron  Leslie    Etha  Juanita
##     16       19       19        4        4        4       20        4
##   Gust    Darin  Gerald  Andrea  Jarrett  Newell  Eloisa  Quintin
##      5       14        2        2        6        6        4       13
## Zechariah  Anthony  Eliga  Obie  Jacoby  Hardie  Kermit  Wilda
##     13       21        5        2       19        4        6        4
##  Chance  Johnnie  Kathryn  Dana  Rachelle  Deidra  Orpha  Rosalind
##      4        2        9        2       19       22       22       15
##  Curtis   Josue  Agatha  Hollie  Beverly  Katarina  Leila  Lamar
##      8       16       16       16       16       16        4        6
##  Judson  Matthew  Jewel  Johnnie  Tyson    Ari    Theo  Carmen
##      2        5        3        4       19       23       23        2
## Leonard   Desi  Austin  Janet  Carla  Vicky  Harley  Hannah
##      4        4        6       14       24       24        4        5
## Stefani  Sebastian  Sigmund  Urban  Tiffany    Nell    Edd  Jennifer
##     15       25        5       11        5        4        4       19
##   Angus   Sherri
##      4        1
```

```
modularity(ceb) # how modular the graph partitioning is
```

```
## [1] 0.5730185
```

```
crossing(ceb, g4) # boolean vector: TRUE for edges across communities
```

```
##      Susann|Jeag4te  Harrison|Myron    Julie|Colten  Brandyn|Leland
##      FALSE          FALSE          FALSE          TRUE
## Catherine|Tracy    Bee|Maureen    Annika|Hans  Spenser|Angelo
##      FALSE          TRUE          FALSE          FALSE
## Blanche|Stanford  Hope|Catherine  Almira|Thomas    Henry|Ralph
##      FALSE          TRUE          TRUE          TRUE
## Louvenia|German    Lura|Wilma  Lauretta|Maudie  Martha|Henry
##      FALSE          FALSE          FALSE          FALSE
##      Loyd|Mayra    Noelle|Fabian    Ira|Zenobia  Noelle|Natalie
##      TRUE          FALSE          FALSE          FALSE
##      Brooke|German  Lauretta|Zenobia  Hallie|Braxton  Lorraine|Alicia
```

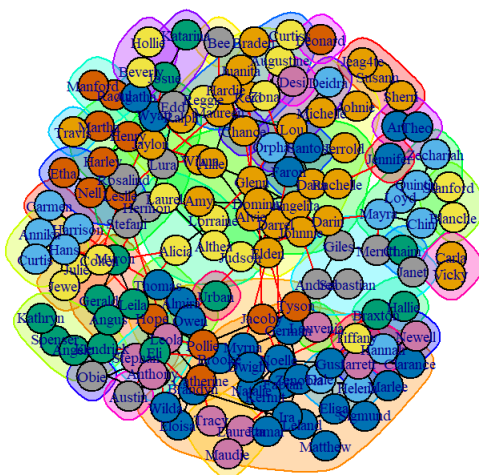
##	FALSE	FALSE	FALSE	FALSE
##	Allie Jaylon	Myrna Darrel	Lura Hermon	Wyatt Raoul
##	TRUE	FALSE	TRUE	TRUE
##	Althea Laurel	Leola Darrel	Giles Merritt	Angelo Kendrick
##	FALSE	TRUE	TRUE	TRUE
##	Travis Henry	Owen Almira	Michelle Lou	Stephan Leola
##	FALSE	FALSE	FALSE	FALSE
##	Wyatt Allie	Eli Brandyn	Mayra Chin	Clarance Marlee
##	TRUE	FALSE	FALSE	FALSE
##	Glenn Reid	Glenn Jerrold	Dale Helena	Alvie Elden
##	FALSE	FALSE	FALSE	FALSE
##	Chaim Merritt	Augustine Curtiss	Alvie Allie	Pollie Catherine
##	FALSE	FALSE	FALSE	TRUE
##	Angelita Glenn	Allie Braden	Manford Raoul	Dwight Pollie
##	TRUE	FALSE	FALSE	TRUE
##	Zona Reggie	Dominic Amy	Santos Faron	Leslie Etha
##	TRUE	FALSE	FALSE	TRUE
##	Maureen Juanita	Gust Noelle	Darrel Darin	Faron Zona
##	FALSE	TRUE	TRUE	FALSE
##	Myron Hans	German Elden	Mayra Merritt	Myron Gerald
##	TRUE	TRUE	FALSE	FALSE
##	Andrea German	Angelita Giles	Reggie Wyatt	Alvie Darrel
##	FALSE	FALSE	FALSE	FALSE
##	Jarrett Newell	Brandyn Eloisa	Santos Lou	Quintin Zechariah
##	FALSE	FALSE	FALSE	FALSE
##	Leola Anthony	Eliga Gust	Obie Obie	Brandyn Brooke
##	TRUE	FALSE	FALSE	TRUE
##	Dominic Jacoby	Maureen Hardie	Noelle Braxton	Noelle Leola
##	FALSE	FALSE	FALSE	FALSE
##	Marlee Helena	Ira Kermit	Wilda Eli	Chance Hardie
##	FALSE	FALSE	FALSE	FALSE
##	Andrea Johnnie	Lauretta Tracy	Kathryn Spenser	Lou Dana
##	FALSE	FALSE	FALSE	TRUE
##	Dominic Rachelle	Glenn Darrel	Deidra Orpha	Hermon Rosalind
##	FALSE	FALSE	FALSE	FALSE
##	Hans Curtis	Josue Wyatt	Agatha Wyatt	Chance Glenn
##	FALSE	FALSE	FALSE	FALSE
##	Kendrick Brooke	Hollie Beverly	Katarina Josue	Leslie Colten
##	FALSE	FALSE	FALSE	TRUE
##	Mayra Darin	Hermon Myron	Alicia Leila	Kermit Lamar
##	FALSE	TRUE	TRUE	FALSE
##	Dana Johnnie	Althea Judson	Colten Hope	Gust Clarance
##	FALSE	FALSE	FALSE	TRUE
##	Leland Matthew	Lorraine Althea	Colten Jewel	Leila Eli
##	FALSE	FALSE	FALSE	FALSE
##	Zenobia German	Jaylon Henry	Michelle Johnnie	Judson Johnnie
##	TRUE	FALSE	FALSE	FALSE
##	Leslie Wyatt	Lou Maureen	Jacoby Noelle	Johnnie Alvie
##	TRUE	FALSE	TRUE	TRUE
##	Leila Myron	Wilda Brandyn	Kendrick Gerald	Tyson Jacoby
##	TRUE	FALSE	FALSE	FALSE
##	Ari Theo	Harrison Carmen	Leonard Braden	Desi Zona
##	FALSE	FALSE	FALSE	FALSE
##	Maureen Ralph	Thomas Myron	Austin Leola	Loyd Quintin
##	FALSE	FALSE	FALSE	FALSE
##	Lorraine Glenn	Merritt Janet	Myron Alicia	Maureen Leslie
##	TRUE	FALSE	FALSE	FALSE
##	Carla Vicky	Harley Leslie	Hannah Gust	Andrea Giles
##	FALSE	FALSE	FALSE	FALSE
##	Wilma Henry	Hermon Stefani	Henry Harley	Noelle Kermit
##	TRUE	FALSE	TRUE	FALSE
##	Laurel Hermon	Sebastian Andrea	Eliga Sigmund	Darrel Noelle
##	TRUE	TRUE	FALSE	TRUE
##	Urban Almira	Noelle Dwight	Beverly Wyatt	Juanita Reid
##	FALSE	FALSE	FALSE	FALSE
##	Kermit Myrna	Pollie Hope	Leola Leslie	Jacoby Pollie
##	TRUE	TRUE	TRUE	TRUE
##	Tiffany Gust	Leland Eliga	Lamar Ira	Dale Noelle
##	FALSE	FALSE	FALSE	TRUE
##	Jarrett Zenobia	Orpha Glenn	Amy Hermon	Myrna Brandyn
##	FALSE	TRUE	TRUE	FALSE
##	Nell Leslie	Edd Lura	Kendrick Obie	Augustine Zona
##	FALSE	FALSE	FALSE	FALSE

##	Glenn Dominic	Jennifer Rachelle	Faron Darrel	Pollie Almira
##	TRUE	FALSE	FALSE	FALSE
##	Glenn Wilma	Angus Leila	Sherri Susann	
##	FALSE	FALSE	FALSE	

Visualization of Community detection based on edge betweenness (Newman-Girvan)

3. Community detection based on based on propagating labels

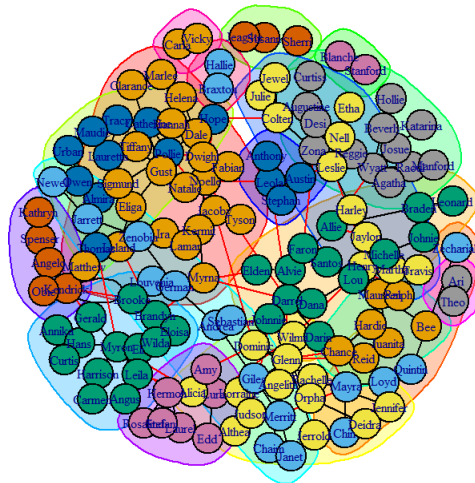
```
clp <- cluster_label_prop(g4)
plot(clp, g4, edge.arrow.size=.05, vertex.label.cex= 0.6)
```



Visualization of Community detection based on based on propagating labels

4. Community detection based on greedy optimization of modularity

```
cfg <- cluster_fast_greedy(as.undirected(g4))
plot(cfg, as.undirected(g4), vertex.label.cex=0.5, edge.arrow.size=.05)
```



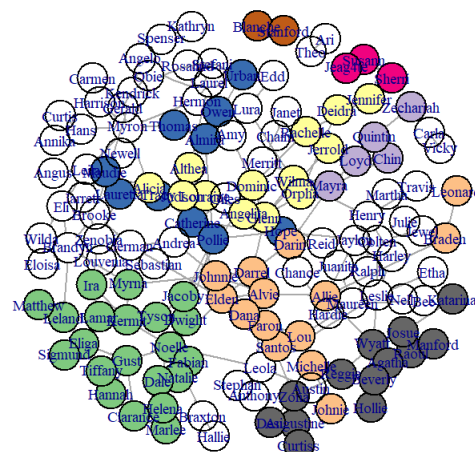
Visualization of Community detection based on greedy optimization of modularity

5. Plotting the communities without relying on their built-in plot

```
library("RColorBrewer")
V(g4)$community <- cfg$membership
colrs <- adjustcolor( col=brewer.pal(n = 10, name = "Accent"))
```

```
## Warning in brewer.pal(n = 10, name = "Accent"): n too large, allowed maximum for palette Accent is 8
## Returning the palette you asked for with that many colors
```

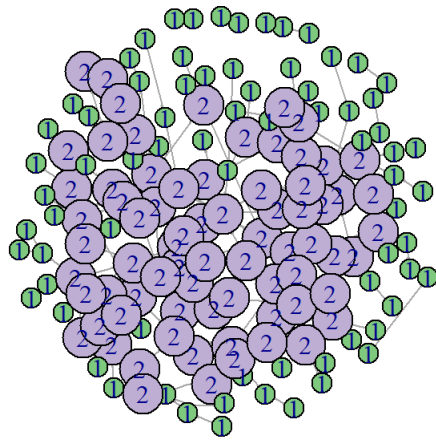
```
plot(g4, vertex.color=colrs[V(g4)$community], vertex.label.cex= 0.6, edge.arrow.size=.05)
```



Result: A number of algorithms aim to detect groups that consist of densely connected nodes with fewer connections across groups were applied

6. K-core decomposition

```
kc <- coreness(g4, mode="all")  
plot(g4, vertex.size=kc*10, vertex.label=kc, vertex.color=colrs[kc], edge.arrow.size=.05)
```



Result: The result here gives the coreness of each vertex in the network. A node has coreness D if it belongs to a D -core but not to $(D+1)$ -core

Conclusion: Visualized various subgroups and communities in a network using Cliques, Community detection and K-core decomposition