

Network creation

1. Creation of a Network with Edge, Node

```
library(igraph)
```

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

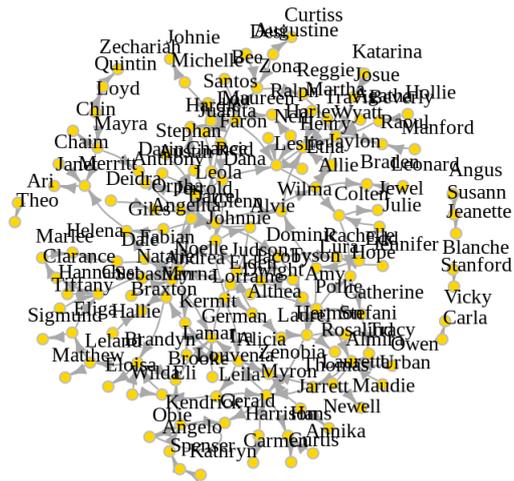
```
## The following objects are masked from 'package:stats':  
##  
## decompose, spectrum
```

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

```
g4 <- graph( c('Susann', 'Jeanette', 'Harrison', 'Myron', 'Julie', 'Colten', 'Brandyn', 'Leland', 'Catherine',  
'Tracy', 'Bee', 'Maureen', 'Annika', 'Hans', 'Spenser', 'Angelo', 'Blanche', 'Stanford', 'Hope', 'Catherine',  
'Almira', 'Thomas', 'Henry', 'Ralph', 'Louvenia', 'German', 'Lura', 'Wilma', 'Lauretta', 'Maudie', 'Martha',  
'Henry', 'Lloyd', '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', 'Kendrick',  
'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', 'Angelita',  
'Glenn', 'Allie', 'Braden', 'Manford', 'Raoul', 'Dwight', 'Pollie', 'Zona', 'Reggie', 'Dominic', 'Amy',  
'Santos', 'Faron', 'Leslie', 'Etha', 'Maureen', 'Juanita', 'Gust', 'Noelle', 'Darrel', 'Darin', 'Faron',  
'Zona', 'Myron', 'Hans', 'German', 'Elden', 'Mayra', 'Merritt', 'Myron', 'Gerald', 'Andrea', 'German', 'Angelita',  
'Giles', 'Reggie', 'Wyatt', 'Alvie', 'Darrel', 'Jarrett', 'Newell', 'Brandyn', 'Eloisa', 'Santos', 'Lou',  
'Quintin', 'Zechariah', 'Leola', 'Anthony', 'Eliga', 'Gust', 'Obie', 'Obie', 'Brandyn', 'Brooke', 'Dominic',  
'Jacob', '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', 'Johnnie', 'Judson',  
'Johnnie', 'Leslie', 'Wyatt', 'Lou', 'Maureen', 'Jacob', 'Noelle', 'Johnnie', 'Alvie', 'Leila', 'Myron',  
'Wilda', 'Brandyn', 'Kendrick', 'Gerald', 'Tyson', 'Jacob', 'Ari', 'Theo', 'Harrison', 'Carmen', 'Leonard',  
'Braden', 'Desi', 'Zona', 'Maureen', 'Ralph', 'Thomas', 'Myron', 'Austin', 'Leola', 'Lloyd', 'Quintin', 'Lorraine',  
'Glenn', 'Merritt', 'Janet', 'Myron', 'Alicia', 'Maureen', 'Leslie', 'Carla', 'Vicky', 'Harley', 'Leslie',  
'Hannah', 'Gust', 'Andrea', 'Giles', 'Wilma', 'Henry', 'Hermon', 'Stefani', 'Henry', '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', 'Jacob', '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'))
```

```
## Warning in matrix(edges, ncol = 2, byrow = TRUE): data length [347] is not a  
## sub-multiple or multiple of the number of rows [174]
```

```
plot(g4, edge.arrow.size=.5, vertex.color="gold", vertex.size=5,  
      vertex.frame.color="gray", vertex.label.color="black",  
      vertex.label.cex=0.8, vertex.label.dist=2, edge.curved=0.2)
```



Result: A Teacher-student network is created

2. Adding the various vertex and edge attributes

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

##	[1]	"Susann"	"Jeanette"	"Harrison"	"Myron"	"Julie"	"Colten"
##	[7]	"Brandyn"	"Leland"	"Catherine"	"Tracy"	"Bee"	"Maureen"
##	[13]	"Annika"	"Hans"	"Spenser"	"Angelo"	"Blanche"	"Stanford"
##	[19]	"Hope"	"Almira"	"Thomas"	"Henry"	"Ralph"	"Louvenia"
##	[25]	"German"	"Lura"	"Wilma"	"Lauretta"	"Maudie"	"Martha"
##	[31]	"Loyd"	"Mayra"	"Noelle"	"Fabian"	"Ira"	"Zenobia"
##	[37]	"Natalie"	"Brooke"	"Hallie"	"Braxton"	"Lorraine"	"Alicia"
##	[43]	"Allie"	"Jaylon"	"Myrna"	"Darrel"	"Hermon"	"Wyatt"
##	[49]	"Raoul"	"Althea"	"Laurel"	"Leola"	"Giles"	"Merritt"
##	[55]	"Kendrick"	"Travis"	"Owen"	"Michelle"	"Lou"	"Stephan"
##	[61]	"Eli"	"Chin"	"Clarence"	"Marlee"	"Glenn"	"Reid"
##	[67]	"Jerrold"	"Dale"	"Helena"	"Alvie"	"Elden"	"Chaim"
##	[73]	"Augustine"	"Curtiss"	"Pollie"	"Angelita"	"Braden"	"Manford"
##	[79]	"Dwight"	"Zona"	"Reggie"	"Dominic"	"Amy"	"Santos"
##	[85]	"Faron"	"Leslie"	"Etha"	"Juanita"	"Gust"	"Darin"
##	[91]	"Gerald"	"Andrea"	"Jarrett"	"Newell"	"Eloisa"	"Quintin"
##	[97]	"Zechariah"	"Anthony"	"Eliga"	"Obie"	"Jacoby"	"Hardie"
##	[103]	"Kermit"	"Wilda"	"Chance"	"Johnnie"	"Kathryn"	"Dana"
##	[109]	"Rachelle"	"Deidra"	"Orpha"	"Rosalind"	"Curtis"	"Josue"
##	[115]	"Agatha"	"Hollie"	"Beverly"	"Katarina"	"Leila"	"Lamar"
##	[121]	"Judson"	"Matthew"	"Jewel"	"Johnnie"	"Tyson"	"Ari"
##	[127]	"Theo"	"Carmen"	"Leonard"	"Desi"	"Austin"	"Janet"
##	[133]	"Carla"	"Vicky"	"Harley"	"Hannah"	"Stefani"	"Sebastian"
##	[139]	"Sigmund"	"Urban"	"Tiffany"	"Nell"	"Edd"	"Jennifer"
##	[145]	"Angus"					


```
## [1] 0.38948975 0.83353694 0.15291035 0.02269613 0.91650950 0.57793172
## [7] 0.93178703 0.55614529 0.07183287 0.51227535 0.78462118 0.20748722
## [13] 0.45152537 0.72115012 0.71734152 0.87660967 0.42445400 0.50949113
## [19] 0.40572838 0.34933640 0.81387226 0.23038174 0.48189530 0.29569019
## [25] 0.93316874 0.43533067 0.78400581 0.29329710 0.76474341 0.80559230
## [31] 0.63942494 0.52270424 0.99244093 0.51664937 0.86153313 0.78123174
## [37] 0.91420806 0.63211526 0.04372872 0.04436701 0.55829665 0.86691525
## [43] 0.10988123 0.89025140 0.60087666 0.31327186 0.77560662 0.06312711
## [49] 0.57588690 0.55885273 0.46042095 0.85736246 0.41715612 0.52545003
## [55] 0.73006006 0.62463844 0.70390608 0.75449531 0.94716455 0.36884449
## [61] 0.62090223 0.49660159 0.97277274 0.44433450 0.55059879 0.36626377
## [67] 0.36573945 0.59481714 0.59619066 0.51244030 0.93745327 0.20043412
## [73] 0.89948391 0.47426242 0.50902570 0.85433873 0.15146555 0.29241650
## [79] 0.02013940 0.80413580 0.70887294 0.18839992 0.74361489 0.73095671
## [85] 0.49840358 0.34093473 0.76711973 0.96108983 0.26330920 0.61627607
## [91] 0.67179389 0.19930472 0.07051537 0.29047971 0.49878816 0.09204059
## [97] 0.57508671 0.52929534 0.48021283 0.91399714 0.58482197 0.20540896
## [103] 0.70460519 0.79557655 0.84159914 0.99522479 0.84246610 0.98588161
## [109] 0.53319921 0.91865400 0.42721803 0.38666356 0.95913936 0.49718479
## [115] 0.38528108 0.94074190 0.65861517 0.05282828 0.24150149 0.89054104
## [121] 0.81467397 0.68694855 0.71958666 0.92944272 0.10975394 0.17536680
## [127] 0.38586845 0.26850014 0.56761807 0.99795460 0.59960923 0.62747229
## [133] 0.31328819 0.61638108 0.32106556 0.35684482 0.66617756 0.49489385
## [139] 0.45043909 0.17733676 0.10232097 0.12278865 0.19800685 0.95167096
## [145] 0.68358142 0.18596665 0.90988132 0.52074571 0.42697966 0.12402522
## [151] 0.27672806 0.34563615 0.03505096 0.55138140 0.60763502 0.24420606
## [157] 0.67572375 0.04626122 0.37935359 0.85811262 0.67314453 0.79282023
## [163] 0.73435453 0.94167209 0.06664354 0.37118206 0.75854597 0.27222236
## [169] 0.57114905 0.27125399 0.41401062 0.78109278 0.34846172 0.49756515
```

```
edge_attr(g4)
```

```

## $type
## [1] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [10] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [19] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [28] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [37] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [46] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [55] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [64] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [73] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [82] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [91] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [100] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [109] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [118] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [127] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [136] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [145] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [154] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [163] "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows" "knows"
## [172] "knows" "knows" "knows"
##
## $weight
## [1] 0.38948975 0.83353694 0.15291035 0.02269613 0.91650950 0.57793172
## [7] 0.93178703 0.55614529 0.07183287 0.51227535 0.78462118 0.20748722
## [13] 0.45152537 0.72115012 0.71734152 0.87660967 0.42445400 0.50949113
## [19] 0.40572838 0.34933640 0.81387226 0.23038174 0.48189530 0.29569019
## [25] 0.93316874 0.43533067 0.78400581 0.29329710 0.76474341 0.80559230
## [31] 0.63942494 0.52270424 0.99244093 0.51664937 0.86153313 0.78123174
## [37] 0.91420806 0.63211526 0.04372872 0.04436701 0.55829665 0.86691525
## [43] 0.10988123 0.89025140 0.60087666 0.31327186 0.77560662 0.06312711
## [49] 0.57588690 0.55885273 0.46042095 0.85736246 0.41715612 0.52545003
## [55] 0.73006006 0.62463844 0.70390608 0.75449531 0.94716455 0.36884449
## [61] 0.62090223 0.49660159 0.97277274 0.44433450 0.55059879 0.36626377
## [67] 0.36573945 0.59481714 0.59619066 0.51244030 0.93745327 0.20043412
## [73] 0.89948391 0.47426242 0.50902570 0.85433873 0.15146555 0.29241650
## [79] 0.02013940 0.80413580 0.70887294 0.18839992 0.74361489 0.73095671
## [85] 0.49840358 0.34093473 0.76711973 0.96108983 0.26330920 0.61627607
## [91] 0.67179389 0.19930472 0.07051537 0.29047971 0.49878816 0.09204059
## [97] 0.57508671 0.52929534 0.48021283 0.91399714 0.58482197 0.20540896
## [103] 0.70460519 0.79557655 0.84159914 0.99522479 0.84246610 0.98588161
## [109] 0.53319921 0.91865400 0.42721803 0.38666356 0.95913936 0.49718479
## [115] 0.38528108 0.94074190 0.65861517 0.05282828 0.24150149 0.89054104
## [121] 0.81467397 0.68694855 0.71958666 0.92944272 0.10975394 0.17536680
## [127] 0.38586845 0.26850014 0.56761807 0.99795460 0.59960923 0.62747229
## [133] 0.31328819 0.61638108 0.32106556 0.35684482 0.66617756 0.49489385
## [139] 0.45043909 0.17733676 0.10232097 0.12278865 0.19800685 0.95167096
## [145] 0.68358142 0.18596665 0.90988132 0.52074571 0.42697966 0.12402522
## [151] 0.27672806 0.34563615 0.03505096 0.55138140 0.60763502 0.24420606
## [157] 0.67572375 0.04626122 0.37935359 0.85811262 0.67314453 0.79282023
## [163] 0.73435453 0.94167209 0.06664354 0.37118206 0.75854597 0.27222236
## [169] 0.57114905 0.27125399 0.41401062 0.78109278 0.34846172 0.49756515

```

```
vertex_attr(g4)
```

```

## $name
## [1] "Susann" "Jeanette" "Harrison" "Myron" "Julie" "Colten"
## [7] "Brandyn" "Leland" "Catherine" "Tracy" "Bee" "Maureen"
## [13] "Annika" "Hans" "Spenser" "Angelo" "Blanche" "Stanford"
## [19] "Hope" "Almira" "Thomas" "Henry" "Ralph" "Louvenia"
## [25] "German" "Lura" "Wilma" "Lauretta" "Maudie" "Martha"
## [31] "Loyd" "Mayra" "Noelle" "Fabian" "Ira" "Zenobia"
## [37] "Natalie" "Brooke" "Hallie" "Braxton" "Lorraine" "Alicia"
## [43] "Allie" "Jaylon" "Myrna" "Darrel" "Hermon" "Wyatt"
## [49] "Raoul" "Althea" "Laurel" "Leola" "Giles" "Merritt"
## [55] "Kendrick" "Travis" "Owen" "Michelle" "Lou" "Stephan"
## [61] "Eli" "Chin" "Clarence" "Marlee" "Glenn" "Reid"
## [67] "Jerrold" "Dale" "Helena" "Alvie" "Elden" "Chaim"
## [73] "Augustine" "Curtiss" "Pollie" "Angelita" "Braden" "Manford"
## [79] "Dwight" "Zona" "Reggie" "Dominic" "Amy" "Santos"
## [85] "Faron" "Leslie" "Etha" "Juanita" "Gust" "Darin"
## [91] "Gerald" "Andrea" "Jarrett" "Newell" "Eloisa" "Quintin"
## [97] "Zechariah" "Anthony" "Eliga" "Obie" "Jacob" "Hardie"
## [103] "Kermit" "Wilda" "Chance" "Johnnie" "Kathryn" "Dana"
## [109] "Rachelle" "Deidra" "Orpha" "Rosalind" "Curtis" "Josue"
## [115] "Agatha" "Hollie" "Beverly" "Katarina" "Leila" "Lamar"
## [121] "Judson" "Matthew" "Jewel" "Johnnie" "Tyson" "Ari"
## [127] "Theo" "Carmen" "Leonard" "Desi" "Austin" "Janet"
## [133] "Carla" "Vicky" "Harley" "Hannah" "Stefani" "Sebastian"
## [139] "Sigmund" "Urban" "Tiffany" "Nell" "Edd" "Jennifer"
## [145] "Angus"
##
## $part
## [1] "teacher" "teacher" "student" "teacher" "teacher" "teacher" "teacher"
## [8] "teacher" "teacher" "student" "teacher" "student" "teacher" "student"
## [15] "student" "teacher" "teacher" "teacher" "student" "teacher" "student"
## [22] "teacher" "student" "student" "student" "student" "teacher" "student"
## [29] "teacher" "student" "student" "student" "teacher" "student" "teacher"
## [36] "student" "teacher" "teacher" "student" "student" "student" "student"
## [43] "teacher" "teacher" "teacher" "student" "teacher" "teacher" "teacher"
## [50] "student" "teacher" "teacher" "teacher" "student" "student" "teacher"
## [57] "teacher" "student" "teacher" "student" "teacher" "student" "student"
## [64] "student" "teacher" "student" "teacher" "student" "student" "teacher"
## [71] "teacher" "student" "student" "student" "teacher" "teacher" "teacher"
## [78] "student" "student" "student" "student" "student" "teacher" "teacher"
## [85] "student" "student" "student" "student" "student" "student" "student"
## [92] "student" "student" "student" "student" "student" "student" "student"
## [99] "student" "student" "student" "student" "student" "student" "student"
## [106] "student" "student" "student" "student" "student" "teacher" "student"
## [113] "teacher" "student" "student" "teacher" "teacher" "teacher" "student"
## [120] "teacher" "student" "student" "student" "student" "teacher" "student"
## [127] "student" "teacher" "student" "student" "teacher" "teacher" "teacher"
## [134] "student" "teacher" "teacher" "student" "student" "teacher" "student"
## [141] "student" "teacher" "student" "student" "teacher"

```

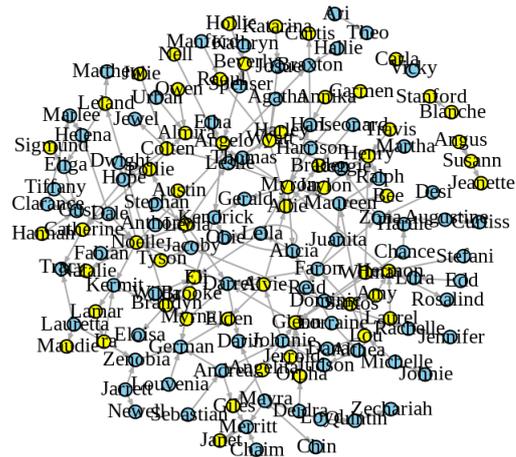
Result: The edge and vertex attributes are checked

3. Colouring the vertex according to vertex attributes i.e. student and teacher

```

plot(g4, edge.arrow.size=.2, vertex.label.color="black", vertex.label.dist=0.1, vertex.size=6, vertex.label.cex=0.8,
     vertex.color=c("yellow", "skyblue")[1+(V(g4)$part=="student")])

```



Result: The student vertex is coloured blue and the teacher vertex is coloured yellow

4. Changing shapes of the vertices according to attributes:

```
plot(g4, edge.arrow.size=.5, vertex.label.color="black", vertex.label.dist=1.5, vertex.size=5,
     vertex.color=c("yellow", "skyblue")[1+(V(g4)$part=="student")],
     vertex.shape=c("circle", "square")[1+(V(g4)$part=="student")]
)
```



Result: The vertices with students are changed to square and the vertices with teachers are changed to circle

5. Exploring the various layouts available in the igraph package

```
layouts <- grep("^layout_", ls("package:igraph"), value=TRUE)[-1]
layouts <- layouts[!grepl("bipartite|merge|norm|sugiyama|tree", layouts)]
par(mfrow=c(3,5), mar=c(1,1,1,1))
for (layout in layouts) {
  print(layout)
  l <- do.call(layout, list(g4))
  plot(g4, edge.arrow.mode=0, layout=l, main=layout, vertex.color=c("yellow", "skyblue")[1+(V(g4)$part=="student")], vertex.label=NA) }
}
```

```
## [1] "layout_as_star"
```

```
## [1] "layout_components"
```

```
## [1] "layout_in_circle"
```

```
## [1] "layout_nicely"
```

```
## [1] "layout_on_grid"
```

```
## [1] "layout_on_sphere"
```

```
## [1] "layout_randomly"
```

```
## [1] "layout_with_dh"
```

```
## [1] "layout_with_drl"
```

```
## [1] "layout_with_fr"
```

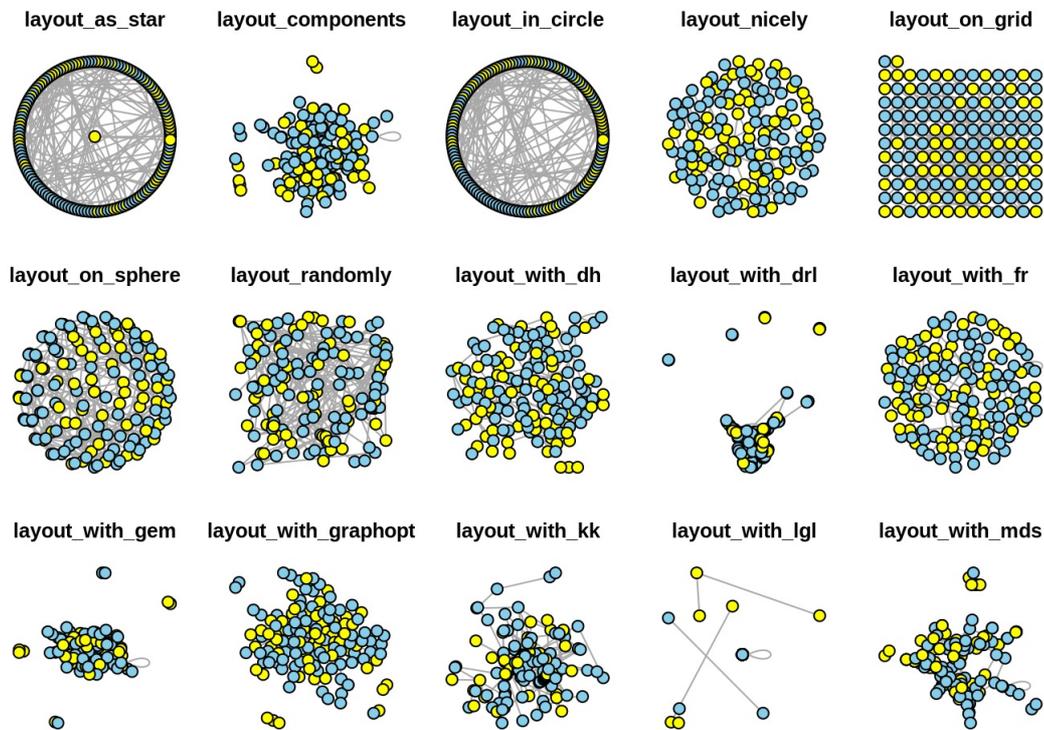
```
## [1] "layout_with_gem"
```

```
## [1] "layout_with_graphopt"
```

```
## [1] "layout_with_kk"
```

```
## [1] "layout_with_lgl"
```

```
## [1] "layout_with_mds"
```



Result: The various layout styles are explored

6. The basic layout for various styles that can be used

```

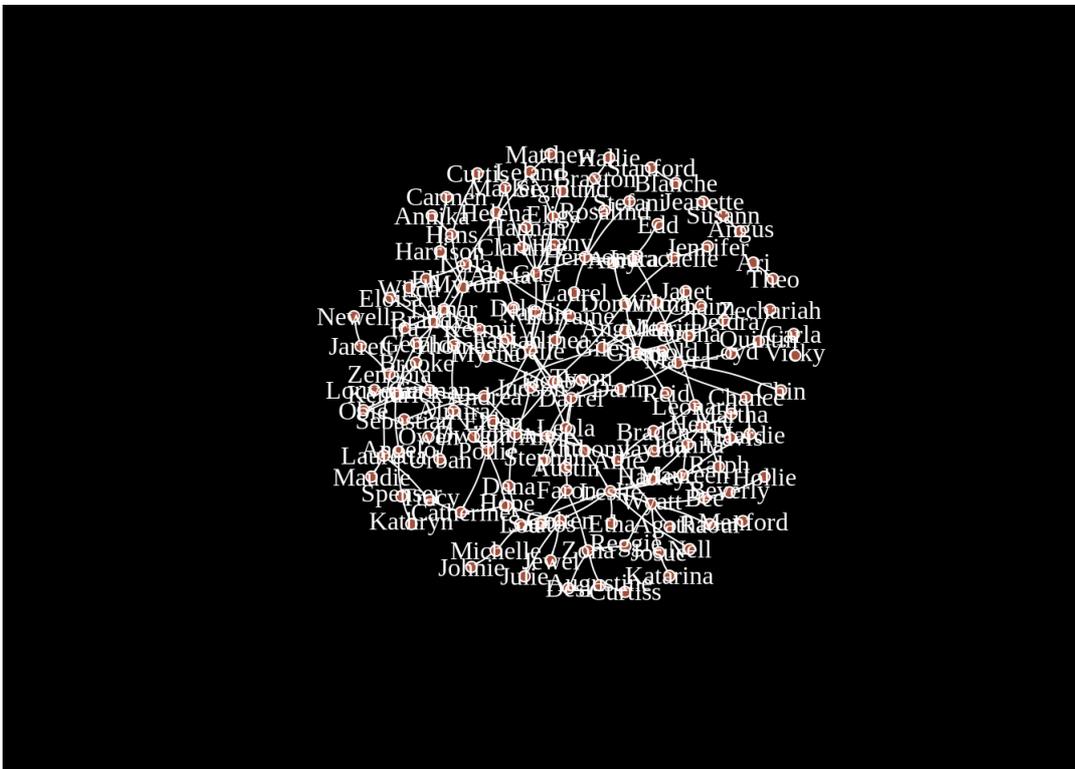
par(bg="black")
plot(g4,

# === vertex
vertex.color = rgb(0.8,0.4,0.3,0.8),
vertex.frame.color = "white",
vertex.shape="circle", # One of "none", "circle", "square", "csquare", "rectangle"
"crectangle", "vrectangle", "pie", "raster", or "sphere"
vertex.size=5,
vertex.size2=NA,

# === vertex label
vertex.label.color="white",
vertex.label.family="Times",
vertex.label.font=0.05,
vertex.label.cex=1,
vertex.label.dist=0,
vertex.label.degree=0 ,

# === Edge
edge.color="white",
edge.width=1,
edge.arrow.size=0.1,
edge.arrow.width=0.1,
edge.lty="solid", # Line type, could be 0 or "blank", 1 or "solid", 2 or "
dashed", 3 or "dotted", 4 or "dotdash", 5 or "longdash", 6 or "twodash"
edge.curved=0.1 ,
)

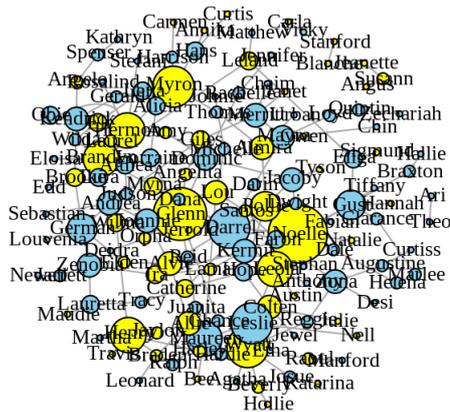
```



Result: The various vertex and edge styles were explored in igraph

7. Changing the vertex size according to people known i.e. the degree of the vertex

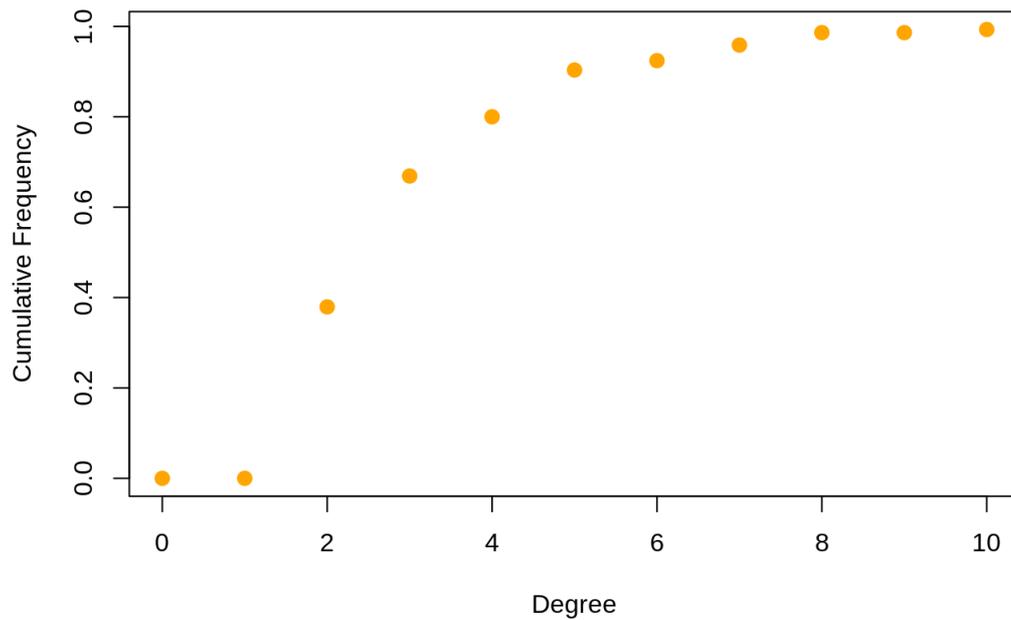
```
deg <- degree(g4, mode="all")
plot(g4, vertex.size=deg*3, edge.arrow.size=.05, vertex.label.color="black", vertex.label.dist=0.1, vertex.size=6, vertex.label.cex=0.8, vertex.color=c("yellow", "skyblue")[1+(V(g4)$part=="student")])
```



Result: The vertex size was changed according to the degree of the vertex the larger circles showing more degree of the vertex so they know more people

8. Plotting the degree distribution

```
deg.dist <- degree_distribution(g4, cumulative=T, mode="all")
plot(x=0:max(deg), y=1-deg.dist, pch=19, cex=1.2, col="orange",
     xlab="Degree", ylab="Cumulative Frequency")
```



Result: The graph for degree distribution vs Cumulative frequency is plotted for all the vertices

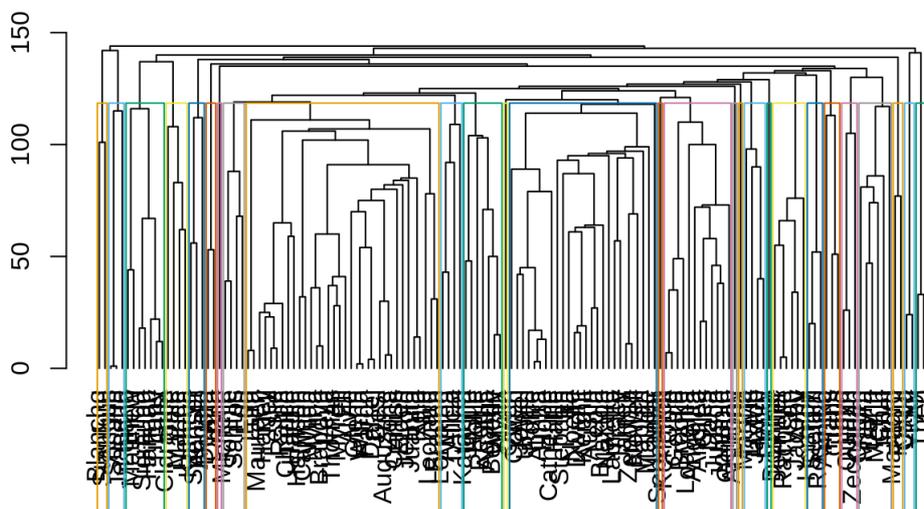
9. Community detection based on edge betweenness

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

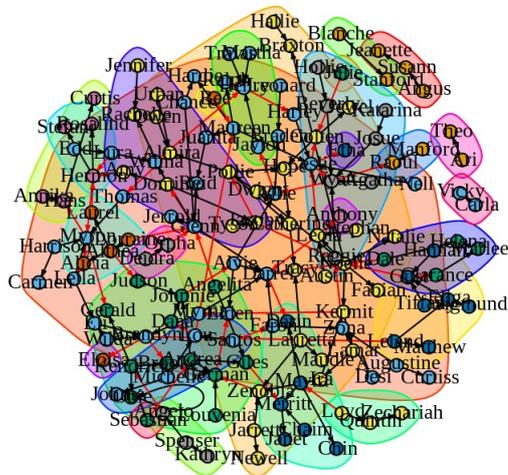
```
## Warning in cluster_edge_betweenness(g4): At community.c:459 :Membership vector
## will be selected based on the lowest modularity score.
```

```
## Warning in cluster_edge_betweenness(g4): At community.c:464 :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.labe
el.cex=0.8)
```



Conclusion: A Teacher-student network was created alongwith the Network attributes and are then plotted using vaarious parameters like color, shape, size etc with respect to the family they belong to and the various communitities inside the graph are detected.