R_File_Young_Survey

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```r
data <- read.csv("G:/Rutgers/MVA/Project/responses.csv")
View(data)

# The structure of the datasets
dim(data)

## [1] 1010  150

## Separate out numeric variables and categoric variables
data_cat <- data[,sapply(data, is.factor)]
data_num <- data[,!sapply(data, is.factor)]
dim(data_cat) # 11 features

## [1] 1010    11

dim(data_num) # 139 features

## [1] 1010  139

# Grouping of columns accoring to the preferences
music_data = data[,1:19]
movie_data = data[,20:31]
hobbies_data = data[,32:63]
phobia_data =  data[,64:73]
health_data = data[,74:76]
traits_data = data[,77:133]
spend_data = data[,134:140]
demo_data = data[,141:150]
```

MISSING VALUES ANALYSIS

```r
sum(is.na(data))

## [1] 571

colSums(is.na(data)) #suming the na values as per the column level
```

```
##                      Music          Slow.songs.or.fast.songs
##                          3                                 2
##                      Dance                              Folk
##                          4                                 5
##                    Country                   Classical.music
##                          5                                 7
##                    Musical                               Pop
##                          2                                 3
##                       Rock                  Metal.or.Hardrock
##                          6                                 3
##                       Punk                       Hiphop..Rap
##                          8                                 4
##                Reggae..Ska                        Swing..Jazz
##                          7                                 6
##                 Rock.n.roll                      Alternative
##                          7                                 7
##                     Latino                   Techno..Trance
##                          8                                 7
##                      Opera                            Movies
##                          1                                 6
##                     Horror                          Thriller
##                          2                                 1
##                     Comedy                          Romantic
##                          3                                 3
##                     Sci.fi                               War
##                          2                                 2
##        Fantasy.Fairy.tales                          Animated
##                          3                                 3
##                Documentary                           Western
##                          8                                 4
##                     Action                           History
##                          2                                 2
##                 Psychology                          Politics
##                          5                                 1
##                Mathematics                           Physics
##                          3                                 3
##                   Internet                               PC
##                          4                                 6
##        Economy.Management                           Biology
##                          5                                 6
##                  Chemistry                           Reading
##                         10                                 6
##                  Geography                 Foreign.languages
##                          9                                 5
##                   Medicine                               Law
##                          5                                 1
##                       Cars                   Art.exhibitions
##                          4                                 6
##                   Religion              Countryside..outdoors
##                          3                                 7
```

```
##                     Dancing         Musical.instruments
##                           3                           1
##                     Writing               Passive.sport
##                           6                          15
##                 Active.sport                   Gardening
##                           4                           7
##                  Celebrities                    Shopping
##                           2                           2
##        Science.and.technology                     Theatre
##                           6                           8
##              Fun.with.friends           Adrenaline.sports
##                           4                           3
##                         Pets                      Flying
##                           4                           3
##                        Storm                    Darkness
##                           1                           2
##                      Heights                     Spiders
##                           3                           5
##                       Snakes                        Rats
##                           0                           3
##                       Ageing             Dangerous.dogs
##                           1                           1
##        Fear.of.public.speaking                    Smoking
##                           1                           0
##                      Alcohol             Healthy.eating
##                           0                           3
##                 Daily.events        Prioritising.workload
##                           7                           5
##                Writing.notes                 Workaholism
##                           3                           5
##               Thinking.ahead             Final.judgement
##                           3                           7
##                  Reliability            Keeping.promises
##                           4                           1
##              Loss.of.interest         Friends.versus.money
##                           4                           6
##                    Funniness                        Fake
##                           4                           1
##              Criminal.damage             Decision.making
##                           7                           4
##                    Elections              Self.criticism
##                           3                           5
##                Judgment.calls                 Hypochondria
##                           4                           4
##                      Empathy            Eating.to.survive
##                           5                           0
##                       Giving         Compassion.to.animals
##                           6                           7
##                Borrowed.stuff                  Loneliness
##                           2                           1
```

```
##        Cheating.in.school                       Health
##                        4                            1
##        Changing.the.past                          God
##                        2                            2
##                   Dreams                      Charity
##                        0                            3
##        Number.of.friends                  Punctuality
##                        0                            0
##                    Lying                      Waiting
##                        0                            3
##          New.environment                  Mood.swings
##                        2                            4
##    Appearence.and.gestures                 Socializing
##                        3                            5
##             Achievements Responding.to.a.serious.letter
##                        2                            6
##                 Children                Assertiveness
##                        4                            2
##            Getting.angry       Knowing.the.right.people
##                        4                            2
##          Public.speaking                 Unpopularity
##                        2                            3
##           Life.struggles            Happiness.in.life
##                        3                            4
##             Energy.levels                Small...big.dogs
##                        5                            4
##              Personality       Finding.lost.valuables
##                        4                            4
##                Getting.up          Interests.or.hobbies
##                        5                            3
##           Parents..advice      Questionnaires.or.polls
##                        2                            4
##           Internet.usage                     Finances
##                        0                            3
##         Shopping.centres             Branded.clothing
##                        2                            2
##   Entertainment.spending             Spending.on.looks
##                        3                            3
##       Spending.on.gadgets      Spending.on.healthy.eating
##                        0                            2
##                      Age                       Height
##                        7                           20
##                   Weight          Number.of.siblings
##                       20                            6
##                   Gender          Left...right.handed
##                        0                            0
##                Education                   Only.child
##                        0                            0
##            Village...town         House...block.of.flats
##                        0                            0
```

```r
# Finding missing values with more than 1%
# Create a function
pMiss <- function(x){sum(is.na(x))/length(x)*100}

perc_cat <- apply(data_cat, 2, pMiss)
perc_num <- apply(data_num, 2, pMiss)
perc_cat # this shows the percentage of missing value in the categorial data
sat
```

```
##                 Smoking              Alcohol           Punctuality
##                       0                    0                     0
##                   Lying       Internet.usage                Gender
##                       0                    0                     0
##       Left...right.handed           Education            Only.child
##                       0                    0                     0
##           Village...town House...block.of.flats
##                       0                    0
```

```r
# this shows the percentage of missing value in the numerical data
perc_num
```

```
##                      Music       Slow.songs.or.fast.songs
##                  0.2970297                      0.1980198
##                      Dance                           Folk
##                  0.3960396                      0.4950495
##                    Country                Classical.music
##                  0.4950495                      0.6930693
##                    Musical                            Pop
##                  0.1980198                      0.2970297
##                       Rock               Metal.or.Hardrock
##                  0.5940594                      0.2970297
##                       Punk                    Hiphop..Rap
##                  0.7920792                      0.3960396
##                 Reggae..Ska                    Swing..Jazz
##                  0.6930693                      0.5940594
##                 Rock.n.roll                    Alternative
##                  0.6930693                      0.6930693
##                     Latino                 Techno..Trance
##                  0.7920792                      0.6930693
##                      Opera                         Movies
##                  0.0990099                      0.5940594
##                     Horror                       Thriller
##                  0.1980198                      0.0990099
##                     Comedy                       Romantic
##                  0.2970297                      0.2970297
##                     Sci.fi                            War
##                  0.1980198                      0.1980198
##          Fantasy.Fairy.tales                       Animated
##                  0.2970297                      0.2970297
##                Documentary                        Western
##                  0.7920792                      0.3960396
```

```
##                      Action                      History
##                   0.1980198                   0.1980198
##                  Psychology                    Politics
##                   0.4950495                   0.0990099
##                 Mathematics                     Physics
##                   0.2970297                   0.2970297
##                    Internet                          PC
##                   0.3960396                   0.5940594
##          Economy.Management                     Biology
##                   0.4950495                   0.5940594
##                   Chemistry                     Reading
##                   0.9900990                   0.5940594
##                   Geography           Foreign.languages
##                   0.8910891                   0.4950495
##                    Medicine                         Law
##                   0.4950495                   0.0990099
##                        Cars             Art.exhibitions
##                   0.3960396                   0.5940594
##                    Religion         Countryside..outdoors
##                   0.2970297                   0.6930693
##                     Dancing         Musical.instruments
##                   0.2970297                   0.0990099
##                     Writing               Passive.sport
##                   0.5940594                   1.4851485
##                 Active.sport                   Gardening
##                   0.3960396                   0.6930693
##                 Celebrities                    Shopping
##                   0.1980198                   0.1980198
##        Science.and.technology                     Theatre
##                   0.5940594                   0.7920792
##             Fun.with.friends           Adrenaline.sports
##                   0.3960396                   0.2970297
##                        Pets                      Flying
##                   0.3960396                   0.2970297
##                       Storm                    Darkness
##                   0.0990099                   0.1980198
##                     Heights                     Spiders
##                   0.2970297                   0.4950495
##                      Snakes                        Rats
##                   0.0000000                   0.2970297
##                      Ageing             Dangerous.dogs
##                   0.0990099                   0.0990099
##        Fear.of.public.speaking             Healthy.eating
##                   0.0990099                   0.2970297
##                 Daily.events         Prioritising.workload
##                   0.6930693                   0.4950495
##                 Writing.notes                 Workaholism
##                   0.2970297                   0.4950495
##               Thinking.ahead             Final.judgement
##                   0.2970297                   0.6930693
```

```
##                     Reliability              Keeping.promises
##                       0.3960396                   0.0990099
##                  Loss.of.interest          Friends.versus.money
##                       0.3960396                   0.5940594
##                       Funniness                         Fake
##                       0.3960396                   0.0990099
##                 Criminal.damage              Decision.making
##                       0.6930693                   0.3960396
##                       Elections                Self.criticism
##                       0.2970297                   0.4950495
##                  Judgment.calls                  Hypochondria
##                       0.3960396                   0.3960396
##                         Empathy              Eating.to.survive
##                       0.4950495                   0.0000000
##                          Giving          Compassion.to.animals
##                       0.5940594                   0.6930693
##                   Borrowed.stuff                   Loneliness
##                       0.1980198                   0.0990099
##                Cheating.in.school                      Health
##                       0.3960396                   0.0990099
##                Changing.the.past                         God
##                       0.1980198                   0.1980198
##                          Dreams                      Charity
##                       0.0000000                   0.2970297
##                Number.of.friends                      Waiting
##                       0.0000000                   0.2970297
##                 New.environment                  Mood.swings
##                       0.1980198                   0.3960396
##             Appearence.and.gestures               Socializing
##                       0.2970297                   0.4950495
##                    Achievements Responding.to.a.serious.letter
##                       0.1980198                   0.5940594
##                        Children                 Assertiveness
##                       0.3960396                   0.1980198
##                   Getting.angry        Knowing.the.right.people
##                       0.3960396                   0.1980198
##                  Public.speaking                  Unpopularity
##                       0.1980198                   0.2970297
##                   Life.struggles              Happiness.in.life
##                       0.2970297                   0.3960396
##                    Energy.levels                Small...big.dogs
##                       0.4950495                   0.3960396
##                     Personality          Finding.lost.valuables
##                       0.3960396                   0.3960396
##                       Getting.up             Interests.or.hobbies
##                       0.4950495                   0.2970297
##                  Parents..advice          Questionnaires.or.polls
##                       0.1980198                   0.3960396
##                        Finances              Shopping.centres
##                       0.2970297                   0.1980198
```

```
##                Branded.clothing       Entertainment.spending
##                       0.1980198                    0.2970297
##                Spending.on.looks          Spending.on.gadgets
##                       0.2970297                    0.0000000
##        Spending.on.healthy.eating                          Age
##                       0.1980198                    0.6930693
##                          Height                        Weight
##                       1.9801980                    1.9801980
##              Number.of.siblings
##                       0.5940594
```

IMPUTE MISSING VALUES : Imputation based on predictive method using features

```
# Numeric variable imputation
library(mice)

## Warning: package 'mice' was built under R version 3.6.2

## Loading required package: lattice

## Warning: package 'lattice' was built under R version 3.6.2

##
## Attaching package: 'mice'

## The following objects are masked from 'package:base':
##
##     cbind, rbind

# methods(mice)

impu_num = mice(data_num, m=1, method = 'pmm', maxit = 1, seed = 200)

##
##  iter imp variable
##   1   1  Music  Slow.songs.or.fast.songs  Dance  Folk  Country
Classical.music  Musical  Pop  Rock  Metal.or.Hardrock  Punk  Hiphop..Rap
Reggae..Ska  Swing..Jazz  Rock.n.roll  Alternative  Latino  Techno..Trance
Opera  Movies  Horror  Thriller  Comedy  Romantic  Sci.fi  War
Fantasy.Fairy.tales  Animated  Documentary  Western  Action  History
Psychology  Politics  Mathematics  Physics  Internet  PC  Economy.Management
Biology  Chemistry  Reading  Geography  Foreign.languages  Medicine  Law
Cars  Art.exhibitions  Religion  Countryside..outdoors  Dancing
Musical.instruments  Writing  Passive.sport  Active.sport  Gardening
Celebrities  Shopping  Science.and.technology  Theatre  Fun.with.friends
Adrenaline.sports  Pets  Flying  Storm  Darkness  Heights  Spiders  Rats
Ageing  Dangerous.dogs  Fear.of.public.speaking  Healthy.eating  Daily.events
Prioritising.workload  Writing.notes  Workaholism  Thinking.ahead
Final.judgement  Reliability  Keeping.promises  Loss.of.interest
Friends.versus.money  Funniness  Fake  Criminal.damage  Decision.making
Elections  Self.criticism  Judgment.calls  Hypochondria  Empathy  Giving
Compassion.to.animals  Borrowed.stuff  Loneliness  Cheating.in.school  Health
```

```
Changing.the.past  God  Charity  Waiting  New.environment  Mood.swings
Appearence.and.gestures  Socializing  Achievements
Responding.to.a.serious.letter  Children  Assertiveness  Getting.angry
Knowing.the.right.people  Public.speaking  Unpopularity  Life.struggles
Happiness.in.life  Energy.levels  Small...big.dogs  Personality
Finding.lost.valuables  Getting.up  Interests.or.hobbies  Parents..advice
Questionnaires.or.polls  Finances  Shopping.centres  Branded.clothing
Entertainment.spending  Spending.on.looks  Spending.on.healthy.eating  Age
Height  Weight  Number.of.siblings
```

```r
# summary(impu_num)
impu_num$imp$Age # Imputed data at each iterations
```

```
##      1
## 138 20
## 143 22
## 463 19
## 550 22
## 736 25
## 903 18
## 961 20
```

```r
impu_num$imp$Weight
```

```
##       1
## 138 74
## 143 55
## 165 92
## 210 89
## 277 65
## 406 63
## 454 64
## 496 51
## 510 57
## 552 70
## 559 58
## 647 68
## 704 76
## 713 64
## 791 57
## 843 50
## 876 88
## 890 60
## 903 58
## 961 60
```

Parameters: 'pmm' - predictive mean matching method m=5 - no.of multiple imputed datasets maxit = 10 - no.of iterations The computational time is dependent on the 'maxit' - for me it took more than 20 min

```
# Get the numeirc imputed data
impu_num_compl = complete(impu_num,action = 1)
```

Imputing categorical missing variables

```
impu_cat = mice(data_cat, m=5, maxit = 10, seed = 200, method = 'pmm')
```

```
##
##  iter imp variable
##   1   1
##   1   2
##   1   3
##   1   4
##   1   5
##   2   1
##   2   2
##   2   3
##   2   4
##   2   5
##   3   1
##   3   2
##   3   3
##   3   4
##   3   5
##   4   1
##   4   2
##   4   3
##   4   4
##   4   5
##   5   1
##   5   2
##   5   3
##   5   4
##   5   5
##   6   1
##   6   2
##   6   3
##   6   4
##   6   5
##   7   1
##   7   2
##   7   3
##   7   4
##   7   5
##   8   1
##   8   2
##   8   3
##   8   4
##   8   5
##   9   1
```

```
##     9    2
##     9    3
##     9    4
##     9    5
##    10    1
##    10    2
##    10    3
##    10    4
##    10    5
```

```
# Get categoric imputed data
impu_cat_compl = complete(impu_cat, 1)

sum(is.na(impu_num_compl)) # No missing values
```

```
## [1] 0
```

```
sum(is.na(impu_cat_compl)) # No missing values
```

```
## [1] 0
```

Outlier detection:

```
library(outliers)
```

```
outlier(data_num)
```

```
##                     Music        Slow.songs.or.fast.songs
##                         1                               1
##                     Dance                            Folk
##                         1                               5
##                   Country                 Classical.music
##                         5                               5
##                   Musical                             Pop
##                         5                               1
##                      Rock                 Metal.or.Hardrock
##                         1                               5
##                      Punk                      Hiphop..Rap
##                         5                               5
##                Reggae..Ska                      Swing..Jazz
##                         5                               5
##                Rock.n.roll                      Alternative
##                         1                               5
##                    Latino                   Techno..Trance
##                         5                               5
##                     Opera                           Movies
##                         5                               1
##                    Horror                         Thriller
##                         5                               1
##                    Comedy                         Romantic
##                         1                               1
##                     Sci.fi                              War
```

```
##                             1                                 1 
##             Fantasy.Fairy.tales                          Animated 
##                             1                                 1 
##                     Documentary                           Western 
##                             1                                 5 
##                          Action                           History 
##                             1                                 1 
##                      Psychology                          Politics 
##                             1                                 5 
##                     Mathematics                           Physics 
##                             5                                 5 
##                        Internet                                PC 
##                             1                                 1 
##             Economy.Management                           Biology 
##                             5                                 5 
##                       Chemistry                           Reading 
##                             5                                 1 
##                       Geography                 Foreign.languages 
##                             1                                 1 
##                        Medicine                               Law 
##                             5                                 5 
##                            Cars                   Art.exhibitions 
##                             5                                 5 
##                        Religion             Countryside..outdoors 
##                             5                                 1 
##                         Dancing               Musical.instruments 
##                             5                                 5 
##                         Writing                     Passive.sport 
##                             5                                 1 
##                    Active.sport                         Gardening 
##                             1                                 5 
##                     Celebrities                          Shopping 
##                             5                                 1 
##           Science.and.technology                          Theatre 
##                             1                                 1 
##                Fun.with.friends                 Adrenaline.sports 
##                             2                                 5 
##                            Pets                            Flying 
##                             1                                 5 
##                           Storm                          Darkness 
##                             5                                 5 
##                         Heights                           Spiders 
##                             5                                 5 
##                          Snakes                              Rats 
##                             1                                 5 
##                          Ageing                    Dangerous.dogs 
##                             5                                 1 
##         Fear.of.public.speaking                    Healthy.eating 
##                             5                                 1 
##                     Daily.events            Prioritising.workload 
```

```
##                              1                             5
##                  Writing.notes                   Workaholism
##                              1                             5
##                  Thinking.ahead               Final.judgement
##                              1                             5
##                     Reliability              Keeping.promises
##                              1                             1
##                 Loss.of.interest          Friends.versus.money
##                              5                             1
##                       Funniness                          Fake
##                              1                             5
##                  Criminal.damage               Decision.making
##                              5                             1
##                       Elections                Self.criticism
##                              1                             1
##                   Judgment.calls                   Hypochondria
##                              1                             5
##                         Empathy              Eating.to.survive
##                              1                             5
##                          Giving          Compassion.to.animals
##                              5                             1
##                   Borrowed.stuff                    Loneliness
##                              1                             5
##                Cheating.in.school                       Health
##                              1                             1
##                 Changing.the.past                          God
##                              5                             1
##                          Dreams                       Charity
##                              1                             5
##               Number.of.friends                       Waiting
##                              1                             5
##                 New.environment                   Mood.swings
##                              1                             1
##           Appearence.and.gestures                   Socializing
##                              1                             1
##                    Achievements Responding.to.a.serious.letter
##                              5                             1
##                        Children                 Assertiveness
##                              1                             1
##                   Getting.angry       Knowing.the.right.people
##                              1                             1
##                 Public.speaking                   Unpopularity
##                              1                             1
##                  Life.struggles            Happiness.in.life
##                              1                             1
##                   Energy.levels               Small...big.dogs
##                              1                             5
##                     Personality         Finding.lost.valuables
##                              1                             5
##                      Getting.up            Interests.or.hobbies
```

```
##                                   1                              1
##                       Parents..advice    Questionnaires.or.polls
##                                   1                              5
##                            Finances          Shopping.centres
##                                   1                              1
##                    Branded.clothing    Entertainment.spending
##                                   1                              1
##                   Spending.on.looks       Spending.on.gadgets
##                                   1                              5
##         Spending.on.healthy.eating                          Age
##                                   1                             30
##                              Height                       Weight
##                                  62                            165
##                  Number.of.siblings
##                                  10
```

Demographic category - Height, Weight, Age, No.of siblings have maximum no.of outliers

```
library(ggplot2)
```

The boxplot.stats function; is a ancillary function that produces statistics for drawing boxplots. It returns among other information a vector stats with five elements: the extreme of the lower whisker, the lower 'hinge', the median, the upper 'hinge' and the extreme of the upper whisker, the extreme of the whiskers are the adjacent values (last non-missing value, i.e. every value beyond is an outlier.

```
id1 = boxplot.stats(impu_num_compl$Weight)

id1$stats

## [1]  41  55  64  75 105

id1$stats[1] #The lower adjacent value

## [1] 41

id1$stats[5] # The upper adjacent value

## [1] 105

id2 = boxplot.stats(impu_num_compl$Height)

id2$stats[1] #The lower adjacent value

## [1] 148

id2$stats[5] # The upper adjacent value

## [1] 197
```

```r
id3 = boxplot.stats(impu_num_compl$Age)

id3$stats[1] #The lower adjacent value

## [1] 15

id3$stats[5] # The upper adjacent value

## [1] 26

id4 = boxplot.stats(impu_num_compl$Number.of.siblings)

id4$stats[1] #The lower adjacent value

## [1] 0

id4$stats[5] # The upper adjacent value

## [1] 3
```

```r
# Boxplot
par(mfrow=c(1,2))
boxplot(impu_num_compl$Weight, main = 'Outliers in Weight', ylab = 'Weight')
boxplot(impu_num_compl$Height, main = 'Otliers in Height', ylab = 'Height')
```
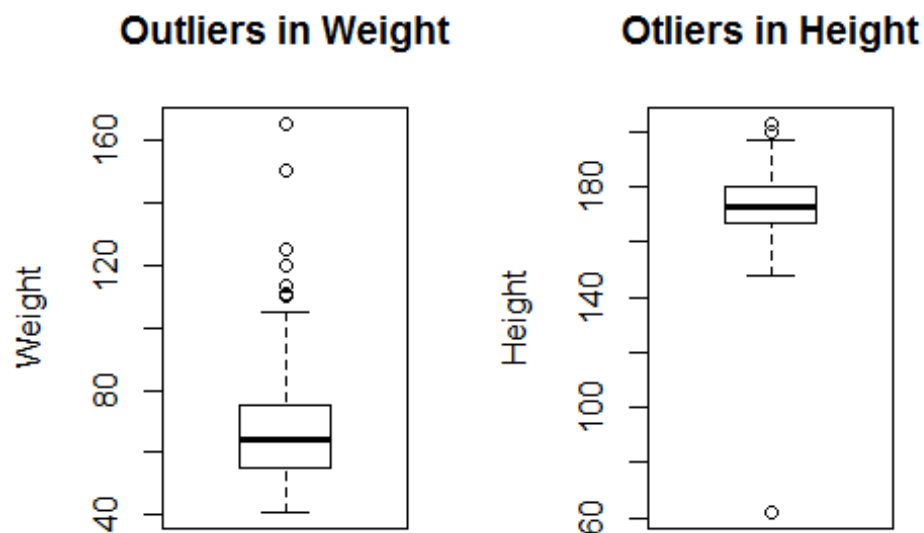


```r
boxplot(impu_num_compl$Age, main = 'Outliers in Age', ylab = 'Age')
```

Outliers in Age
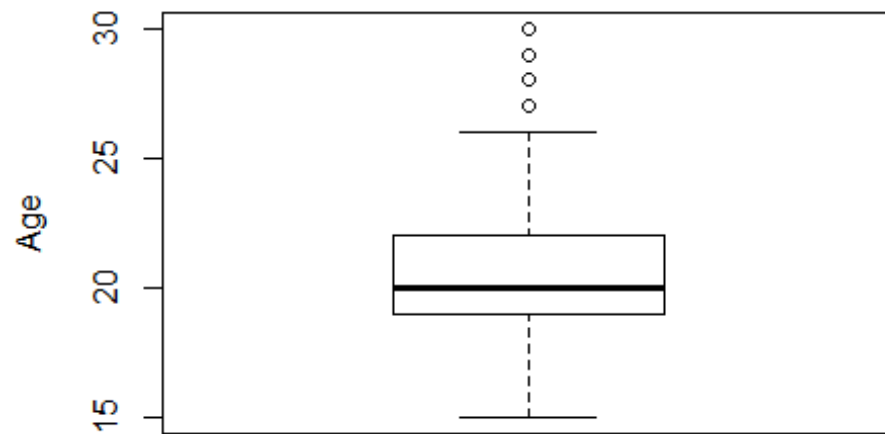

```
boxplot(impu_num_compl$Number.of.siblings , main = 'Otliers in
Number.of.siblings', ylab  ='Number.of.siblings')
```

Otliers in Number.of.siblings
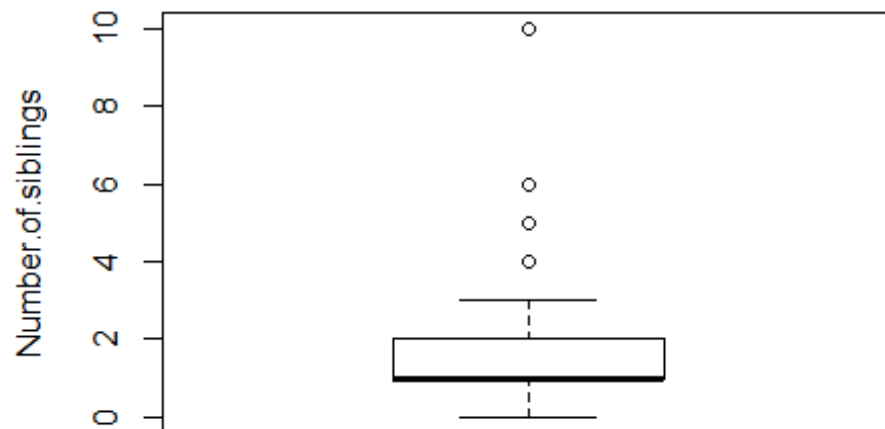
```r
# You can get the actual values of the outliers with this

boxplot(impu_num_compl$Weight, plot=FALSE)$out
```

```
## [1] 120 110 111 120 113 125 165 120 150
```

```r
boxplot(impu_num_compl$Height, plot=FALSE)$out
```

```
## [1] 200 200 203  62 203 200
```

```r
# no of rows having outliers
Outlier_height = boxplot(impu_num_compl$Height, plot=FALSE)$out
impu_num_compl[which(impu_num_compl$Height %in% Outlier_height),]
```

```
##      Music Slow.songs.or.fast.songs Dance Folk Country Classical.music
Musical
## 98      5                            3    2    1          1                 1
1
## 221     5                            3    4    3          3                 4
2
## 548     5                            4    1    4          2                 5
3
## 677     5                            4    2    2          1                 2
2
## 800     5                            3    1    2          3                 4
5
## 993     4                            4    4    1          4                 4
1
##      Pop Rock Metal.or.Hardrock Punk Hiphop..Rap Reggae..Ska Swing..Jazz
## 98    2    1                 1    1           5           2           2
## 221   1    3                 1    2           5           4           4
## 548   1    4                 5    2           2           2           1
## 677   1    2                 2    1           2           1           2
## 800   2    4                 5    4           1           1           2
## 993   3    4                 4    3           2           3           2
##      Rock.n.roll Alternative Latino Techno..Trance Opera Movies Horror
Thriller
## 98             1           1      1              2     1      5      2
3
## 221            2           5      3              1     3      5      3
3
## 548            4           3      1              1     5      5      3
5
## 677            1           5      2              2     2      5      1
2
## 800            4           4      2              2     4      5      1
1
## 993            1           1      2              5     2      4      4
4
##      Comedy Romantic Sci.fi War Fantasy.Fairy.tales Animated Documentary
Western
```

##								
## 98	5	3	5	5	3	5	5	3
## 221	5	3	2	3	4	5	4	3
## 548	5	2	2	4	4	4	5	3
## 677	2	3	1	2	3	4	5	1
## 800	4	3	4	4	3	4	5	3
## 993	4	3	5	3	4	4	4	3

##	Action	History	Psychology	Politics	Mathematics	Physics	Internet	PC
## 98	5	3	2	2	4	1	5	5
## 221	4	3	3	1	1	1	3	4
## 548	4	5	3	5	1	1	3	3
## 677	3	3	1	1	1	1	5	1
## 800	3	4	2	3	4	3	5	5
## 993	4	5	2	3	5	5	4	3

##	Economy.Management	Biology	Chemistry	Reading	Geography	Foreign.languages
## 98	2	1	1	3	1	4
## 221	1	5	5	3	1	5
## 548	1	2	1	5	5	5
## 677	1	1	1	1	3	4
## 800	2	3	2	5	3	4
## 993	1	4	4	2	4	2

##	Medicine	Law	Cars	Art.exhibitions	Religion	Countryside..outdoors	Dancing
## 98	1	2	2	1	4	4	1
## 221	3	2	4	3	2	4	2
## 548	2	2	1	4	4	3	1
## 677	1	5	2	3	1	4	1
## 800	3	2	3	4	2	4	2
## 993	1	1	2	1	1	1	1

##	Musical.instruments	Writing	Passive.sport	Active.sport	Gardening
## 98	1	1	1	5	2
## 221	5	1	5	5	3

```
## 548                  5        4                5          5            2
## 677                  1        1                5          5            2
## 800                  3        3                3          2            4
## 993                  1        5                4          1            1
##      Celebrities Shopping Science.and.technology Theatre Fun.with.friends
## 98             1        1                     4       1                3
## 221            1        3                     4       2                5
## 548            1        1                     2       5                5
## 677            4        3                     3       5                5
## 800            3        3                     4       5                4
## 993            1        1                     5       2                5
##      Adrenaline.sports Pets Flying Storm Darkness Heights Spiders Snakes
## Rats
## 98                   3    5      1     1        2       3       2      4
## 1
## 221                  3    5      1     3        2       2       2      3
## 2
## 548                  5    4      1     1        2       3       1      1
## 1
## 677                  2    3      1     2        2       2       3      3
## 4
## 800                  3    5      2     1        3       2       3      3
## 2
## 993                  1    1      3     1        1       5       5      3
## 2
##      Ageing Dangerous.dogs Fear.of.public.speaking Healthy.eating
## Daily.events
## 98        1             1                       2              3
## 1
## 221       1             4                       3              4
## 2
## 548       1             4                       1              2
## 5
## 677       3             3                       3              4
## 2
## 800       2             2                       4              3
## 3
## 993       2             3                       4              1
## 3
##      Prioritising.workload Writing.notes Workaholism Thinking.ahead
## 98                       1             1           3              2
## 221                      2             2           1              2
## 548                      2             1           2              2
## 677                      1             2           1              2
## 800                      3             2           4              3
## 993                      1             1           1              3
##      Final.judgement Reliability Keeping.promises Loss.of.interest
## 98                 1           4                5                5
## 221                2           3                5                2
## 548                1           4                4                1
```

```
## 677                   3                3                      3                  4
## 800                   1                4                      4                  2
## 993                   3                3                      5                  1
##      Friends.versus.money Funniness Fake Criminal.damage Decision.making
## 98                      3         4    4               5               1
## 221                     4         4    2               5               4
## 548                     5         5    1               1               3
## 677                     4         2    2               5               2
## 800                     4         3    3               2               3
## 993                     1         2    1               1               3
##      Elections Self.criticism Judgment.calls Hypochondria Empathy
## 98           5              4              3            1       4
## 221          4              2              4            1       4
## 548          5              5              5            1       4
## 677          1              2              4            2       4
## 800          2              4              4            2       4
## 993          5              2              3            1       4
##      Eating.to.survive Giving Compassion.to.animals Borrowed.stuff
## Loneliness
## 98                   4      1                     2              5
## 5
## 221                  2      3                     5              5
## 2
## 548                  1      1                     5              5
## 1
## 677                  1      2                     1              2
## 2
## 800                  2      3                     5              4
## 4
## 993                  1      4                     2              4
## 3
##      Cheating.in.school Health Changing.the.past God Dreams Charity
## 98                    5      1                 5   5      4       2
## 221                   5      3                 1   2      3       1
## 548                   5      2                 2   1      3       2
## 677                   5      3                 4   4      3       2
## 800                   3      3                 2   2      4       3
## 993                   1      3                 4   5      3       3
##      Number.of.friends Waiting New.environment Mood.swings
## 98                   2       4               5           5
## 221                  4       2               4           3
## 548                  3       5               5           1
## 677                  3       3               3           5
## 800                  2       4               2           2
## 993                  3       2               2           4
##      Appearence.and.gestures Socializing Achievements
## 98                         2           3            4
## 221                        3           4            3
## 548                        1           4            2
## 677                        3           3            3
```

```
## 800                                   3               2             3
## 993                                   2               1             3
##     Responding.to.a.serious.letter Children Assertiveness Getting.angry
## 98                                3        5             5             2
## 221                               4        3             3             2
## 548                               3        4             2             1
## 677                               4        4             1             2
## 800                               4        3             3             2
## 993                               3        3             5             3
##     Knowing.the.right.people Public.speaking Unpopularity Life.struggles
## 98                         4               2            3              1
## 221                        4               5            3              1
## 548                        3               1            3              1
## 677                        4               2            3              3
## 800                        4               4            3              4
## 993                        3               5            3              1
##     Happiness.in.life Energy.levels Small...big.dogs Personality
## 98                  3             3                3           3
## 221                 5             4                3           4
## 548                 4             4                3           3
## 677                 3             2                2           4
## 800                 3             2                2           3
## 993                 2             3                4           3
##     Finding.lost.valuables Getting.up Interests.or.hobbies Parents..advice
## 98                       1          1                    5               3
## 221                      3          4                    5               4
## 548                      4          4                    5               4
## 677                      4          2                    3               3
## 800                      4          2                    2               3
## 993                      1          5                    3               3
##     Questionnaires.or.polls Finances Shopping.centres Branded.clothing
## 98                        1        2                1                1
## 221                       3        2                3                2
## 548                       3        3                2                1
## 677                       1        3                4                2
## 800                       3        4                3                3
## 993                       2        1                1                1
##     Entertainment.spending Spending.on.looks Spending.on.gadgets
## 98                       5                 1                   5
## 221                      5                 4                   2
## 548                      3                 1                   1
## 677                      2                 4                   2
## 800                      2                 3                   4
## 993                      5                 1                   1
##     Spending.on.healthy.eating Age Height Weight Number.of.siblings
## 98                           2  19    200     75                  1
## 221                          3  18    200     90                  2
## 548                          4  21    203     80                  2
## 677                          4  20     62     55                  2
```

```
## 800                                  4  18    203    89                    2
## 993                                  4  30    200   150                    1
```

```r
outlier_siblings = boxplot(impu_num_compl$Number.of.siblings, plot=FALSE)$out
impu_num_compl[which(impu_num_compl$Number.of.siblings %in%
outlier_siblings),]
```

	Music	Slow.songs.or.fast.songs	Dance	Folk	Country	Classical.music	Musical
## 13	5	3	1	2	1	4	3
## 33	5	5	3	1	3	2	3
## 35	5	4	3	2	1	3	4
## 54	5	3	4	4	3	4	5
## 92	5	5	1	5	1	2	5
## 125	4	4	1	4	5	5	5
## 139	5	3	2	3	3	4	5
## 150	2	3	1	3	1	3	4
## 230	4	3	4	2	4	1	1
## 260	2	3	3	3	3	2	2
## 366	5	3	2	2	3	4	2
## 372	5	3	5	5	5	5	5
## 443	5	3	4	2	4	3	3
## 476	5	3	3	2	5	4	5
## 503	5	4	4	3	2	4	2
## 525	5	3	2	1	2	4	2
## 571	5	3	3	1	1	2	1
## 620	5	1	3	3	1	5	4
## 683	4	4	4	2	3	3	3
## 695	5	3	3	3	4	5	2
## 743	5	3	1	3	4	5	

```
3
## 751         5                       3     5     5     2                 5
3
## 804         5                       5     2     1     1                 2
4
## 847         5                       3     5     2     2                 3
3
## 849         5                       2     2     1     1                 3
1
## 854         5                       3     4     4     2                 3
4
## 931         5                       3     3     2     1                 2
3
## 938         5                       3     4     1     1                 5
4
## 941         5                       3     2     1     1                 3
3
## 958         5                       4     2     1     1                 1
2
## 1007        4                       4     5     1     3                 4
1
##        Pop Rock Metal.or.Hardrock Punk Hiphop..Rap Reggae..Ska Swing..Jazz
## 13       3    5                 4    2           3           1           1
## 33       3    4                 3    4           4           2           2
## 35       4    5                 3    4           2           3           3
## 54       4    3                 2    2           3           3           3
## 92       3    5                 5    5           1           5           1
## 125      3    5                 3    3           1           2           4
## 139      2    1                 1    1           3           3           4
## 150      1    2                 2    2           3           2           1
## 230      4    3                 1    4           2           5           3
## 260      3    4                 2    2           2           1           3
## 366      1    5                 4    5           1           5           4
## 372      5    5                 3    3           2           2           5
## 443      5    4                 1    4           3           4           4
## 476      3    5                 4    4           3           4           3
## 503      2    5                 3    4           3           3           4
## 525      2    5                 5    5           2           5           2
## 571      3    3                 1    2           2           1           1
## 620      3    3                 2    2           3           2           3
## 683      4    4                 3    4           3           4           3
## 695      3    5                 4    2           3           3           5
## 743      2    4                 2    1           3           4           2
## 751      3    3                 1    1           5           1           5
## 804      3    5                 4    5           1           1           2
## 847      4    2                 1    1           4           2           4
## 849      3    5                 3    4           1           4           2
## 854      3    3                 1    1           2           3           2
## 931      3    2                 2    3           5           3           1
## 938      5    5                 4    5           4           5           5
```

```
## 941     3    3                     1    1        4            4              5
## 958     2    2                     1    1        5            1              2
## 1007    4    1                     1    4        1            1              2
##       Rock.n.roll Alternative Latino Techno..Trance Opera Movies Horror
## Thriller
## 13              4           3      2              1     2      5      1
## 5
## 33              4           4      2              3     1      5      5
## 5
## 35              4           4      2              1     1      5      2
## 3
## 54              3           3      5              2     5      5      3
## 3
## 92              3           1      1              1     1      5      4
## 4
## 125             5           2      3              1     3      4      5
## 5
## 139             4           2      3              1     2      5      1
## 2
## 150             1           1      1              1     2      3      2
## 2
## 230             3           2      2              3     3      3      1
## 3
## 260             5           2      5              1     5      3      1
## 1
## 366             5           5      1              2     4      5      1
## 5
## 372             5           3      5              2     5      5      1
## 2
## 443             4           2      2              2     1      5      5
## 4
## 476             5           3      4              1     2      4      4
## 3
## 503             5           3      1              3     3      5      3
## 5
## 525             3           5      2              1     3      5      3
## 4
## 571             3           2      2              1     1      5      4
## 2
## 620             3           2      3              2     5      5      2
## 4
## 683             4           3      2              5     2      5      2
## 4
## 695             5           1      5              4     3      5      4
## 5
## 743             3           4      5              5     2      5      2
## 3
## 751             4           5      5              1     4      4      3
## 4
## 804             3           2      1              1     2      5      3
```

```
4
## 847               2         2    3           5      3      5           3
3
## 849               3         5    1           2      1      3           1
2
## 854               2         2    3           1      4      5           3
3
## 931               1         1    3           3      2      5           3
2
## 938               5         5    5           2      5      5           1
3
## 941               2         2    1           5      1      4           4
2
## 958               1         1    2           2      1      4           4
4
## 1007              3         1    3           4      1      5           2
5
```

##	Comedy	Romantic	Sci.fi	War	Fantasy.Fairy.tales	Animated	Documentary
## 13	4	3	1	4	5	3	3
## 33	5	5	2	3	5	5	3
## 35	5	4	4	2	2	5	3
## 54	5	5	1	5	5	3	3
## 92	5	5	3	1	5	5	1
## 125	5	4	5	5	5	5	5
## 139	5	5	1	3	5	4	4
## 150	4	2	5	5	4	4	4
## 230	4	1	2	2	3	2	3
## 260	5	1	1	4	3	1	5
## 366	2	2	1	5	2	2	5
## 372	5	5	3	2	5	5	3
## 443	5	4	3	3	5	5	4
## 476	5	5	2	3	5	5	3
## 503	4	2	5	5	5	5	3
## 525	3	3	3	3	4	5	4
## 571	5	3	1	5	3	3	3
## 620	4	2	2	5	3	3	5
## 683	4	2	4	5	5	4	4
## 695	5	3	4	5	4	4	5
## 743	5	4	3	5	5	5	4
## 751	5	4	4	4	5	5	5
## 804	5	4	1	2	3	2	2
## 847	5	5	5	2	2	4	4
## 849	3	4	4	2	1	2	1
## 854	5	5	1	3	5	3	4
## 931	5	5	2	3	5	5	3
## 938	5	5	4	2	4	5	3
## 941	5	3	5	5	4	3	5
## 958	5	4	4	4	3	2	3
## 1007	5	1	5	5	1	5	5

```
##          Western Action History Psychology Politics Mathematics Physics
```

```
        Internet PC
## 13      1     1     4     4     4     1     1
3   2
## 33      2     4     4     5     3     1     1
5   4
## 35      1     5     4     5     4     3     1
5   4
## 54      1     5     3     3     4     1     1
3   2
## 92      1     3     1     1     1     1     1
5   5
## 125     5     4     4     4     4     1     3
4   5
## 139     3     2     2     3     2     1     1
3   1
## 150     2     2     2     3     1     5     5
3   5
## 230     3     5     2     1     1     4     2
5   5
## 260     1     1     5     4     4     1     2
2   2
## 366     3     4     5     5     4     1     1
3   2
## 372     3     2     2     5     1     5     3
3   3
## 443     3     3     2     2     3     3     2
3   4
## 476     1     2     4     5     3     3     2
4   2
## 503     5     5     2     1     4     3     1
5   5
## 525     1     1     3     4     1     3     2
5   2
## 571     1     5     4     3     2     1     1
5   3
## 620     2     4     3     2     2     5     5
5   4
## 683     3     5     3     3     2     4     2
4   4
## 695     2     4     5     5     5     5     3
5   5
## 743     5     5     3     5     3     4     3
5   4
## 751     3     3     4     5     2     4     3
3   3
## 804     1     2     3     3     3     1     1
5   3
## 847     2     3     2     1     1     2     2
5   4
## 849     1     3     1     5     2     1     2
```

```
5   3
## 854          4        3        3          3        2          3        3
4   3
## 931          2        3        3          2        2          1        2
5   4
## 938          5        5        3          5        1          5        4
5   3
## 941          4        5        4          3        2          3        3
5   5
## 958          2        5        3          3        3          1        1
4   4
## 1007         2        5        4          1        1          5        4
5   5
##        Economy.Management Biology Chemistry Reading Geography
Foreign.languages
## 13                     1       5         5       5         3
5
## 33                     3       1         1       3         3
3
## 35                     4       3         1       3         2
5
## 54                     2       4         2       4         5
5
## 92                     1       5         1       1         1
5
## 125                    3       2         2       4         4
4
## 139                    2       5         4       5         3
5
## 150                    3       2         3       2         3
3
## 230                    2       3         2       1         5
3
## 260                    2       4         3       5         4
4
## 366                    4       4         4       4         5
5
## 372                    3       5         5       5         2
3
## 443                    2       3         3       2         3
3
## 476                    2       3         2       5         3
3
## 503                    4       1         1       1         1
4
## 525                    1       5         4       3         4
3
## 571                    2       2         1       1         4
5
## 620                    2       3         2       1         5
```

```
4
## 683                  2        2        1        3        4
3
## 695                  3        2        2        2        4
5
## 743                  5        4        1        5        4
5
## 751                  2        3        2        2        2
2
## 804                  2        2        1        2        2
3
## 847                  3        1        1        3        2
5
## 849                  5        2        2        1        2
3
## 854                  3        3        3        4        4
3
## 931                  3        2        1        1        3
3
## 938                  2        4        2        5        5
4
## 941                  1        2        1        2        1
3
## 958                  1        1        1        1        1
1
## 1007                 2        2        1        1        2
2
##       Medicine Law Cars Art.exhibitions Religion Countryside..outdoors
Dancing
## 13           5   2    3               1        1                     5
3
## 33           1   2    3               4        2                     2
1
## 35           3   2    5               3        5                     5
2
## 54           4   3    5               5        5                     4
5
## 92           5   1    1               1        1                     5
5
## 125          4   4    4               5        3                     5
2
## 139          5   1    1               1        5                     5
2
## 150          2   1    2               1        3                     4
1
## 230          2   2    2               2        2                     5
2
## 260          3   4    4               2        3                     5
5
## 366          4   4    5               4        4                     5
```

```
1
## 372          5   2   2           3   5           5
5
## 443          2   2   2           4   3           3
2
## 476          2   3   1           2   2           4
2
## 503          1   2   5           1   1           2
1
## 525          5   1   1           3   3           5
2
## 571          1   1   5           1   1           5
1
## 620          2   3   4           1   1           2
1
## 683          2   2   4           2   4           4
1
## 695          1   3   4           3   5           4
3
## 743          4   4   2           3   5           5
4
## 751          5   3   5           5   5           2
5
## 804          1   1   3           3   2           4
1
## 847          2   1   3           2   2           3
5
## 849          1   2   1           2   1           2
2
## 854          3   3   3           3   3           5
3
## 931          3   2   4           3   3           4
2
## 938          3   2   3           3   3           2
2
## 941          1   1   1           2   4           5
1
## 958          1   1   5           1   1           3
1
## 1007         1   1   5           1   5           5
5
##      Musical.instruments Writing Passive.sport Active.sport Gardening
## 13                     4       1             5            3         4
## 33                     2       1             2            2         1
## 35                     3       2             5            3         1
## 54                     4       1             5            5         3
## 92                     1       1             5            3         1
## 125                    5       3             4            5         1
## 139                    5       3             2            4         1
## 150                    1       1             2            3         1
```

```
## 230                        4        1            5              3      2
## 260                        2        2            5              2      1
## 366                        3        2            4              3      1
## 372                        5        3            2              5      3
## 443                        5        2            3              4      2
## 476                        5        3            3              3      1
## 503                        3        1            2              3      1
## 525                        1        1            5              1      1
## 571                        2        1            5              5      1
## 620                        1        1            2              1      1
## 683                        1        1            4              1      1
## 695                        5        1            4              5      1
## 743                        3        4            3              5      1
## 751                        1        3            2              5      4
## 804                        4        1            4              5      3
## 847                        2        1            2              2      2
## 849                        2        1            5              1      2
## 854                        3        4            5              3      4
## 931                        4        1            3              1      1
## 938                        5        1            5              2      1
## 941                        5        1            5              1      1
## 958                        1        1            2              1      1
## 1007                       5        1            1              5      5
##      Celebrities Shopping Science.and.technology Theatre Fun.with.friends
## 13             3        2                     3       2                4
## 33             4        5                     3       3                5
## 35             1        3                     5       3                5
## 54             1        3                     3       5                5
## 92             3        3                     1       3                5
## 125            1        1                     5       4                4
## 139            2        3                     2       2                4
## 150            1        2                     4       2                3
## 230            1        2                     4       2                4
## 260            1        1                     3       5                5
## 366            1        3                     2       3                4
## 372            1        3                     3       3                5
## 443            4        3                     4       4                5
## 476            4        2                     2       3                5
## 503            1        4                     5       1                5
## 525            5        3                     1       4                5
## 571            3        5                     4       3                4
## 620            1        1                     5       1                5
## 683            2        3                     4       3                4
## 695            2        2                     5       2                5
## 743            1        3                     4       4                5
## 751            2        5                     5       5                5
## 804            3        3                     1       3                5
## 847            1        5                     2       2                5
## 849            1        4                     3       1                5
## 854            3        4                     3       5                5
```

```
## 931                  3        5                   3        2                5
## 938                  1        3                   3        4                5
## 941                  1        3                   2        2                5
## 958                  1        2                   4        2                4
## 1007                 1        2                   5        1                5
##       Adrenaline.sports Pets Flying Storm Darkness Heights Spiders Snakes
Rats
## 13                   1       2      1     1        1       1       1      3
1
## 33                   1       5      3     5        5       5       5      5
5
## 35                   5       1      1     2        2       1       2      2
2
## 54                   3       1      3     1        1       1       5      1
3
## 92                   4       1      1     3        1       1       5      5
5
## 125                  5       4      1     1        1       2       1      1
1
## 139                  1       3      1     1        1       1       1      2
2
## 150                  3       1      1     1        2       3       1      2
1
## 230                  5       1      1     1        1       1       1      2
1
## 260                  1       1      1     1        1       3       1      1
1
## 366                  5       1      1     1        1       1       1      1
1
## 372                  2       3      2     4        1       3       2      3
2
## 443                  2       5      2     1        2       2       2      4
3
## 476                  2       5      2     3        5       1       1      4
3
## 503                  3       1      2     1        1       2       3      3
1
## 525                  5       5      1     2        3       2       2      1
1
## 571                  4       3      1     1        1       4       1      5
4
## 620                  3       1      1     1        2       2       3      5
2
## 683                  3       5      3     1        1       2       2      5
3
## 695                  3       1      2     2        1       1       3      5
2
## 743                  4       1      1     1        2       4       2      2
3
## 751                  5       1      1     1        1       1       1      1
```

1
804   5   3   1   1   1   2   5   5
4
847   2   5   5   2   2   4   5   5
5
849   4   2   1   1   1   1   1   1
1
854   3   5   1   1   1   1   1   2
3
931   2   1   3   3   3   4   5   5
5
938   4   5   1   3   4   2   3   5
4
941   3   4   1   3   4   5   3   5
1
958   1   1   1   1   1   3   3   3
1
1007   1   5   1   1   1   1   1   1
1
Ageing Dangerous.dogs Fear.of.public.speaking Healthy.eating Daily.events
13   5   2   2   3
4
33   1   5   2   3
3
35   1   2   3   3
5
54   1   3   5   3
3
92   5   5   1   3
3
125   1   2   1   4
4
139   1   4   3   1
4
150   2   3   4   2
2
230   3   2   2   2
2
260   1   5   1   4
4
366   3   1   1   4
4
372   1   5   1   1
2
443   3   3   2   3
3
476   1   2   3   2
3
503   2   3   2   3

```
2
## 525          3           2               5           2
3
## 571          5           4               1           5
3
## 620          4           3               1           1
3
## 683          2           4               3           2
3
## 695          1           2               1           4
3
## 743          1           3               2           3
5
## 751          1           2               1           4
5
## 804          3           3               1           2
3
## 847          4           5               3           3
3
## 849          1           1               1           4
3
## 854          3           4               1           3
3
## 931          3           5               4           4
3
## 938          4           3               4           3
3
## 941          5           3               4           1
3
## 958          1           2               3           1
1
## 1007         2           5               5           3
1
##      Prioritising.workload Writing.notes Workaholism Thinking.ahead
## 13                       3             5           4              5
## 33                       1             1           1              2
## 35                       3             1           5              3
## 54                       3             5           2              5
## 92                       3             5           5              5
## 125                      2             2           3              4
## 139                      2             2           1              5
## 150                      3             2           3              2
## 230                      1             2           1              3
## 260                      5             3           4              2
## 366                      3             1           3              4
## 372                      3             3           4              4
## 443                      3             4           3              2
## 476                      1             2           2              3
## 503                      4             2           5              4
## 525                      3             2           3              4
```

```
## 571                     3              2            3              3
## 620                     3              5            5              4
## 683                     1              1            2              2
## 695                     3              4            3              5
## 743                     2              5            2              2
## 751                     3              4            4              3
## 804                     1              4            1              4
## 847                     3              4            3              3
## 849                     3              3            4              2
## 854                     5              5            3              3
## 931                     2              3            2              2
## 938                     2              4            1              2
## 941                     2              1            1              3
## 958                     2              1            1              3
## 1007                    3              1            5              5
##      Final.judgement Reliability Keeping.promises Loss.of.interest
## 13                 1           5                5                4
## 33                 1           1                1                1
## 35                 5           4                4                4
## 54                 3           5                5                1
## 92                 5           3                5                3
## 125                2           4                4                1
## 139                2           5                5                5
## 150                3           2                2                2
## 230                3           3                5                2
## 260                4           3                3                1
## 366                5           4                5                2
## 372                3           4                5                1
## 443                3           4                5                2
## 476                3           2                4                2
## 503                3           5                5                2
## 525                3           4                5                1
## 571                1           4                4                5
## 620                1           4                3                1
## 683                3           1                2                3
## 695                5           5                4                2
## 743                5           2                5                5
## 751                2           4                4                2
## 804                5           5                5                2
## 847                5           5                3                3
## 849                3           3                1                1
## 854                3           4                4                2
## 931                3           4                3                1
## 938                3           4                5                2
## 941                5           1                1                4
## 958                4           3                3                2
## 1007               5           5                4                1
##      Friends.versus.money Funniness Fake Criminal.damage Decision.making
## 13                      4         3    1               2               5
## 33                      1         1    1               3               1
```

```
## 35                    5       5  1          1           3
## 54                    5       1  1          1           3
## 92                    5       3  1          1           5
## 125                   2       3  1          1           2
## 139                   4       3  1          1           4
## 150                   5       3  3          3           2
## 230                   4       3  3          3           3
## 260                   5       3  1          1           3
## 366                   5       4  2          2           2
## 372                   4       1  1          1           2
## 443                   5       3  1          2           2
## 476                   4       5  2          1           2
## 503                   2       4  2          1           4
## 525                   4       4  2          3           3
## 571                   1       3  2          5           4
## 620                   3       3  2          3           4
## 683                   2       3  3          2           1
## 695                   5       5  1          2           3
## 743                   5       5  2          3           2
## 751                   5       2  2          2           3
## 804                   3       3  1          5           3
## 847                   5       4  2          5           3
## 849                   4       3  2          4           2
## 854                   3       3  1          1           3
## 931                   4       4  2          5           4
## 938                   4       2  1          1           3
## 941                   4       5  2          5           2
## 958                   4       3  1          4           4
## 1007                  2       1  1          3           5
##       Elections Self.criticism Judgment.calls Hypochondria Empathy
## 13            5             5              2            5       5
## 33            1             1              5            1       5
## 35            5             4              3            1       2
## 54            5             3              5            1       5
## 92            1             3              3            3       5
## 125           3             5              3            1       3
## 139           5             4              5            1       5
## 150           3             1              2            1       2
## 230           4             4              4            1       5
## 260           4             5              5            5       5
## 366           5             2              4            1       2
## 372           5             1              5            1       4
## 443           1             4              4            1       4
## 476           5             4              4            2       5
## 503           5             2              5            2       4
## 525           5             5              4            2       4
## 571           3             2              5            1       3
## 620           1             3              4            1       3
## 683           1             1              1            5       4
## 695           1             5              5            1       5
```

```
## 743            2            2            5            2       5
## 751            5            3            4            2       5
## 804            3            3            2            3       5
## 847            2            2            2            3       3
## 849            3            5            4            1       2
## 854            3            4            3            1       3
## 931            1            3            5            3       5
## 938            4            2            5            4       4
## 941            1            2            4            2       4
## 958            5            4            3            2       5
## 1007           5            5            5            1       2
##       Eating.to.survive Giving Compassion.to.animals Borrowed.stuff
## Loneliness
## 13                    3      2                     5              5
## 5
## 33                    1      1                     5              5
## 1
## 35                    2      3                     1              3
## 2
## 54                    5      5                     3              5
## 3
## 92                    3      3                     1              2
## 2
## 125                   2      4                     2              4
## 2
## 139                   2      1                     2              5
## 4
## 150                   3      2                     1              2
## 3
## 230                   5      3                     3              4
## 2
## 260                   1      1                     5              5
## 3
## 366                   2      3                     4              4
## 2
## 372                   3      3                     4              4
## 1
## 443                   1      3                     4              4
## 4
## 476                   2      2                     5              4
## 3
## 503                   1      3                     2              4
## 2
## 525                   1      1                     5              3
## 3
## 571                   1      3                     3              3
## 3
## 620                   2      3                     5              4
## 2
## 683                   2      2                     4              4
```

```
3
## 695                           4             1                            3            5
5
## 743                           4             1                            4            2
1
## 751                           3             4                            3            4
2
## 804                           1             5                            5            5
3
## 847                           4             3                            5            5
4
## 849                           1             2                            3            1
1
## 854                           3             5                            5            5
3
## 931                           2             5                            2            4
5
## 938                           2             1                            4            5
5
## 941                           2             2                            3            2
2
## 958                           3             1                            5            4
3
## 1007                          1             4                            3            4
1
##       Cheating.in.school Health Changing.the.past God Dreams Charity
## 13                     2      5                 3   1      3       2
## 33                     5      1                 1   3      3       1
## 35                     2      2                 4   5      4       4
## 54                     5      3                 5   5      3       1
## 92                     5      3                 3   5      3       2
## 125                    2      2                 2   1      4       4
## 139                    4      3                 5   5      3       3
## 150                    2      2                 1   4      3       2
## 230                    5      2                 2   5      3       1
## 260                    3      5                 5   5      4       3
## 366                    3      1                 3   5      4       3
## 372                    2      3                 1   5      4       3
## 443                    5      3                 2   5      4       2
## 476                    5      3                 2   5      3       2
## 503                    5      2                 2   4      4       1
## 525                    4      3                 4   5      3       1
## 571                    5      4                 4   3      4       3
## 620                    3      5                 2   1      3       1
## 683                    3      2                 4   5      3       2
## 695                    4      3                 3   5      2       2
## 743                    5      1                 2   5      4       3
## 751                    3      3                 2   5      3       5
## 804                    5      5                 5   5      3       3
## 847                    4      4                 5   5      3       2
```

```
## 849                        5           3                         1   5        4             1
## 854                        3           5                         3   5        4             3
## 931                        4           4                         3   4        3             2
## 938                        4           4                         1   3        4             2
## 941                        5           4                         5   4        2             1
## 958                        5           3                         3   4        3             1
## 1007                       1           3                         4   5        3             3
##       Number.of.friends Waiting New.environment Mood.swings
## 13                    3       2               1           4
## 33                    5       2               5           2
## 35                    4       4               3           2
## 54                    5       1               4           2
## 92                    3       1               4           4
## 125                   4       4               4           2
## 139                   4       5               5           2
## 150                   2       2               4           3
## 230                   4       3               4           2
## 260                   4       1               5           2
## 366                   3       4               4           2
## 372                   5       3               4           2
## 443                   3       4               4           3
## 476                   5       3               2           3
## 503                   4       3               5           1
## 525                   2       1               3           3
## 571                   5       3               5           3
## 620                   4       3               3           3
## 683                   3       3               5           4
## 695                   4       2               5           4
## 743                   5       2               5           4
## 751                   3       3               4           2
## 804                   3       2               5           2
## 847                   2       2               4           4
## 849                   5       5               4           2
## 854                   5       4               4           4
## 931                   2       3               4           5
## 938                   1       2               4           4
## 941                   4       2               4           4
## 958                   2       3               3           3
## 1007                  3       5               5           1
##       Appearence.and.gestures Socializing Achievements
## 13                          4           2            3
## 33                          2           4            2
## 35                          3           4            3
## 54                          1           5            2
## 92                          3           5            3
## 125                         3           2            3
## 139                         3           5            3
## 150                         2           3            4
## 230                         4           4            3
## 260                         2           4            3
```

```
## 366                                      4              3              3
## 372                                      4              5              3
## 443                                      4              3              3
## 476                                      2              1              4
## 503                                      3              3              4
## 525                                      2              3              1
## 571                                      5              4              3
## 620                                      4              3              3
## 683                                      2              3              4
## 695                                      4              5              3
## 743                                      1              5              4
## 751                                      4              3              2
## 804                                      4              3              3
## 847                                      3              2              4
## 849                                      5              3              2
## 854                                      4              4              4
## 931                                      4              3              3
## 938                                      2              3              1
## 941                                      4              1              5
## 958                                      3              3              3
## 1007                                     3              3              3
##      Responding.to.a.serious.letter Children Assertiveness Getting.angry
## 13                                 4        5             5             5
## 33                                 3        3             4             1
## 35                                 3        3             4             1
## 54                                 1        5             5             2
## 92                                 3        4             4             5
## 125                                1        4             4             1
## 139                                5        5             4             1
## 150                                3        5             2             2
## 230                                4        4             4             1
## 260                                2        3             3             3
## 366                                3        4             4             1
## 372                                2        5             4             1
## 443                                2        5             5             3
## 476                                4        4             4             2
## 503                                2        3             5             1
## 525                                4        3             2             2
## 571                                3        5             4             4
## 620                                2        3             5             3
## 683                                4        5             3             3
## 695                                5        4             3             1
## 743                                3        4             4             2
## 751                                1        5             3             3
## 804                                1        4             3             3
## 847                                2        5             4             3
## 849                                4        4             4             1
## 854                                2        5             3             3
## 931                                2        4             3             4
## 938                                2        5             3             4
```

```
## 941                             3          3          4          3
## 958                             4          3          2          4
## 1007                            5          5          4          1
##      Knowing.the.right.people Public.speaking Unpopularity Life.struggles
## 13                          3               3            2              5
## 33                          3               4            3              3
## 35                          4               4            4              1
## 54                          2               2            5              2
## 92                          5               5            5              2
## 125                         3               2            4              1
## 139                         2               5            5              5
## 150                         3               5            4              2
## 230                         3               4            3              2
## 260                         3               3            3              2
## 366                         1               1            3              2
## 372                         3               2            3              2
## 443                         4               4            4              4
## 476                         3               3            3              4
## 503                         5               2            2              1
## 525                         4               4            4              3
## 571                         3               5            5              3
## 620                         5               1            3              1
## 683                         3               3            4              1
## 695                         4               1            3              1
## 743                         4               2            2              1
## 751                         5               1            3              2
## 804                         3               3            3              3
## 847                         3               5            5              4
## 849                         5               2            5              2
## 854                         4               4            3              5
## 931                         3               4            4              5
## 938                         4               3            5              5
## 941                         2               2            4              4
## 958                         2               5            4              3
## 1007                        2               5            1              1
##      Happiness.in.life Energy.levels Small...big.dogs Personality
## 13                   4             3                4           3
## 33                   4             5                1           4
## 35                   3             5                3           3
## 54                   4             5                4           3
## 92                   5             5                1           3
## 125                  3             4                5           3
## 139                  4             4                3           3
## 150                  3             2                3           2
## 230                  5             4                3           3
## 260                  4             5                3           3
## 366                  4             4                4           3
## 372                  5             4                2           4
## 443                  4             3                5           3
## 476                  4             3                3           3
```

```
## 503                         4              4             3            4
## 525                         3              2             3            3
## 571                         4              4             3            3
## 620                         4              4             3            4
## 683                         4              3             3            3
## 695                         4              4             5            3
## 743                         4              5             5            4
## 751                         4              4             5            3
## 804                         3              4             3            4
## 847                         4              3             1            3
## 849                         5              5             3            5
## 854                         3              4             3            3
## 931                         3              3             3            3
## 938                         4              3             3            2
## 941                         4              4             4            3
## 958                         3              2             4            3
## 1007                        4              4             3            5
##        Finding.lost.valuables Getting.up Interests.or.hobbies
## Parents..advice
## 13                         1          3                    2
## 4
## 33                         1          5                    5
## 3
## 35                         5          2                    3
## 2
## 54                         3          5                    5
## 4
## 92                         3          5                    4
## 4
## 125                        3          3                    4
## 3
## 139                        4          3                    3
## 5
## 150                        3          2                    3
## 3
## 230                        1          3                    4
## 4
## 260                        5          3                    5
## 3
## 366                        2          2                    4
## 3
## 372                        3          3                    5
## 3
## 443                        3          2                    4
## 3
## 476                        3          5                    5
## 3
## 503                        1          2                    4
## 4
## 525                        3          3                    3
```

```
4
## 571                            1          3                    3
3
## 620                            3          3                    1
3
## 683                            3          5                    2
3
## 695                            5          5                    5
3
## 743                            3          5                    4
1
## 751                            1          3                    3
3
## 804                            2          5                    4
4
## 847                            5          4                    4
4
## 849                            1          4                    5
2
## 854                            4          1                    5
5
## 931                            4          3                    4
3
## 938                            2          5                    5
2
## 941                            2          5                    3
4
## 958                            4          4                    2
4
## 1007                           3          1                    3
4
##      Questionnaires.or.polls Finances Shopping.centres Branded.clothing
## 13                         2        4                1                1
## 33                         3        1                3                1
## 35                         2        3                3                4
## 54                         4        3                5                3
## 92                         3        5                5                5
## 125                        2        3                3                3
## 139                        5        4                1                1
## 150                        3        3                2                1
## 230                        2        1                2                2
## 260                        5        4                1                3
## 366                        1        3                3                3
## 372                        3        3                3                2
## 443                        1        2                4                2
## 476                        2        1                2                2
## 503                        3        2                5                5
## 525                        5        4                2                5
## 571                        1        3                5                5
## 620                        1        2                2                4
```

```
## 683                              3              1              4              4
## 695                              3              3              2              3
## 743                              3              1              4              5
## 751                              3              4              3              3
## 804                              1              3              3              2
## 847                              5              4              4              3
## 849                              2              3              4              5
## 854                              3              4              2              1
## 931                              3              3              5              2
## 938                              4              5              2              2
## 941                              3              2              5              5
## 958                              3              3              2              5
## 1007                             3              3              1              1
##      Entertainment.spending Spending.on.looks Spending.on.gadgets
## 13                        2                 3                   2
## 33                        4                 5                   1
## 35                        3                 3                   1
## 54                        3                 1                   2
## 92                        5                 3                   2
## 125                       3                 4                   3
## 139                       1                 1                   1
## 150                       2                 1                   2
## 230                       4                 1                   2
## 260                       4                 3                   1
## 366                       3                 4                   2
## 372                       3                 3                   4
## 443                       4                 5                   3
## 476                       5                 2                   1
## 503                       4                 4                   5
## 525                       3                 2                   2
## 571                       3                 5                   5
## 620                       3                 2                   4
## 683                       4                 4                   4
## 695                       3                 2                   4
## 743                       5                 4                   4
## 751                       3                 3                   3
## 804                       3                 3                   3
## 847                       4                 4                   4
## 849                       5                 5                   5
## 854                       1                 3                   2
## 931                       2                 3                   2
## 938                       4                 2                   3
## 941                       4                 4                   4
## 958                       3                 3                   3
## 1007                      1                 1                   5
##      Spending.on.healthy.eating Age Height Weight Number.of.siblings
## 13                            3  24    168     55                 10
## 33                            1  20    158     46                  4
## 35                            2  20    177     67                  5
## 54                            1  18    164     51                  4
```

```
## 92                              2   18    168    50              4
## 125                             5   20    176    69              4
## 139                             1   20    168    50              4
## 150                             4   19    184    85              5
## 230                             2   21    173    73              5
## 260                             3   19    175    72              4
## 366                             4   24    175    70              5
## 372                             3   19    164    53              4
## 443                             3   18    163    58              6
## 476                             3   18    172    60              4
## 503                             5   22    193    86              6
## 525                             2   19    171    60              4
## 571                             5   23    189    88              4
## 620                             5   27    175    83              4
## 683                             1   19    172    75              4
## 695                             4   21    187    73              4
## 743                             5   26    183    90              5
## 751                             3   22    175    86              6
## 804                             3   27    173    79              5
## 847                             4   23    171    54              4
## 849                             5   19    184    60              4
## 854                             2   30    175    68              4
## 931                             4   18    165    45              5
## 938                             5   18    167    62              4
## 941                             4   16    172    59              4
## 958                             3   20    175    65              5
## 1007                            3   27    183    80              5
```

```r
# Function for outlier treatment
# Capping and Flooring function
treat_outlier <- function(x){
  qnt <- quantile(x, probs=c(.25, .75), na.rm = T)
  caps <- quantile(x, probs=c(.05, .95), na.rm = T)
  H <- 1.5 * IQR(x, na.rm = T)
  x[x < (qnt[1] - H)]  <- caps[1]
  x[x > (qnt[2] + H)] <- caps[2]
  return(as.data.frame(x))
}

impu_num_compl$Age <- treat_outlier(impu_num_compl$Age)$x
impu_num_compl$Height <- treat_outlier(impu_num_compl$Height)$x
impu_num_compl$Weight <- treat_outlier(impu_num_compl$Weight)$x

dim(impu_num_compl)
```

```
## [1] 1010  139
```

```r
dim(impu_cat_compl)
```

```
## [1] 1010    11
```

```
boxplot(impu_num_compl$Height)
```
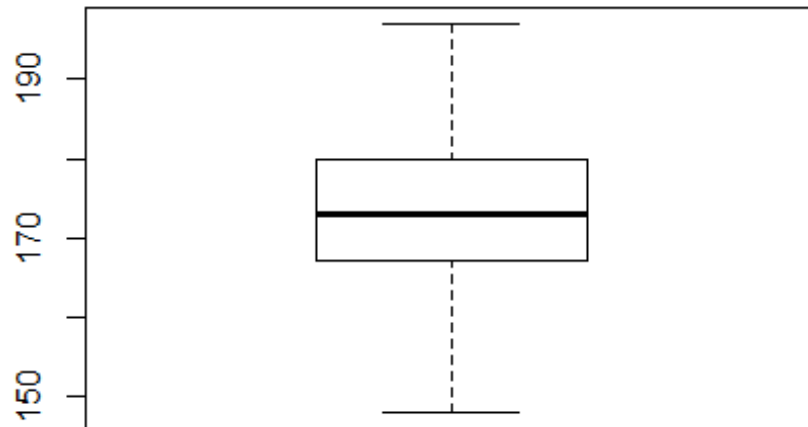


```
boxplot(impu_num_compl$Weight)
```
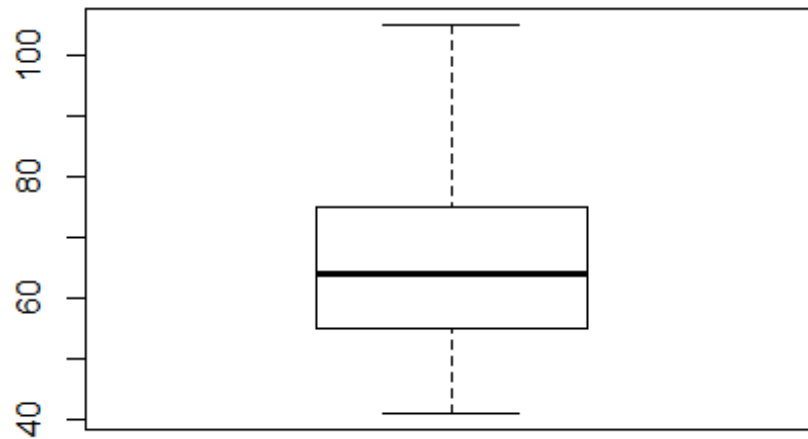
```
data_transformed = cbind(impu_num_compl, impu_cat_compl)
dim(data_transformed)
```

[1] 1010 150

Corelation Analysis:

```
data_num_trans <- data_transformed[,!sapply(data_transformed, is.factor)]
dim(data_num_trans)
```

[1] 1010   139

```
music_trans = data_transformed[,names(music_data)]
dim(music_trans)
```

[1] 1010   19

```
library(corrgram)
```

Warning: package 'corrgram' was built under R version 3.6.2

Registered S3 method overwritten by 'seriation':
method   from
reorder.hclust gclus

##
Attaching package: 'corrgram'

The following object is masked from 'package:lattice':
##
panel.fill

```
corrgram(music_trans)
```
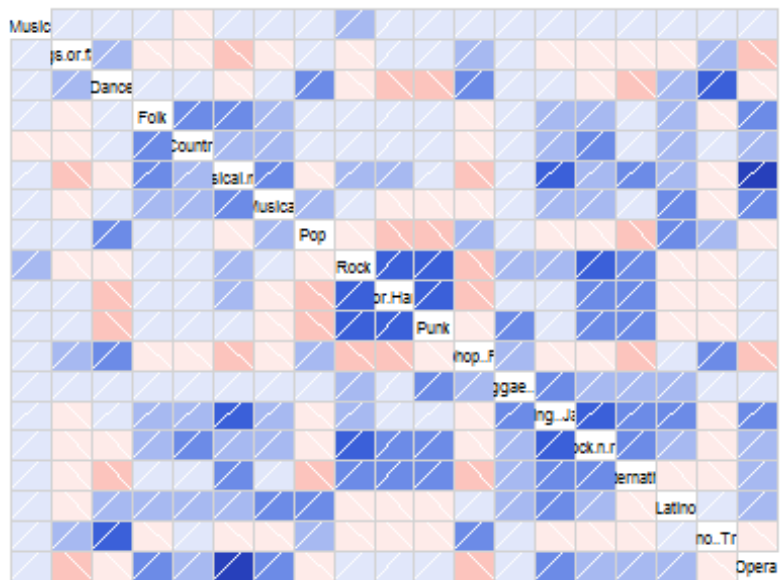
```
library(corrplot)

## Warning: package 'corrplot' was built under R version 3.6.2

## corrplot 0.84 loaded

music_cor = cor(music_trans)
corrplot(music_cor)
```
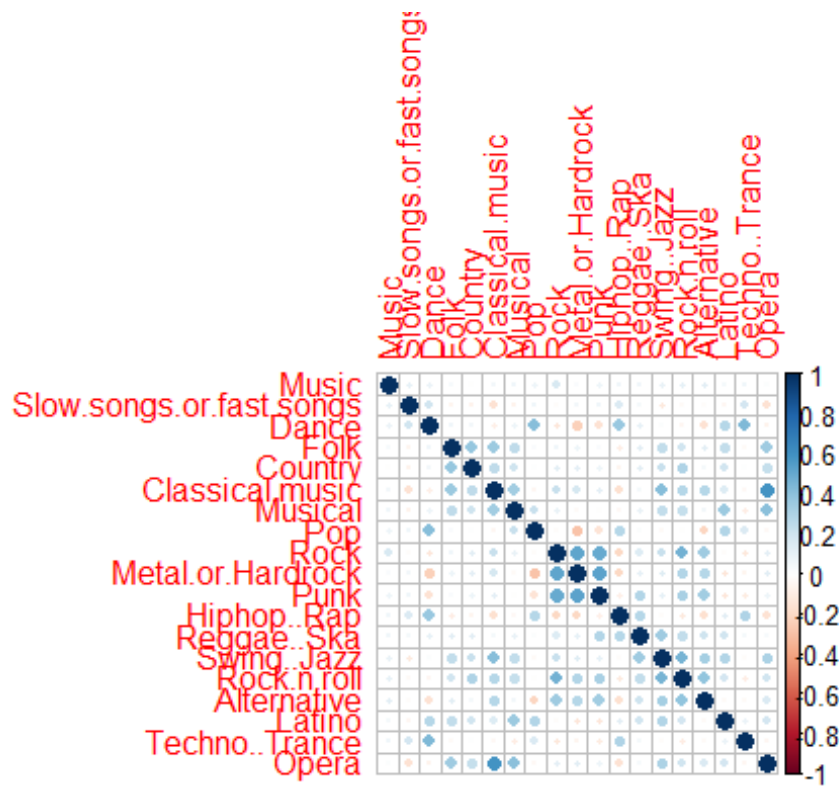
```
movie_trans = data_transformed[,names(movie_data)]
dim(movie_trans)

## [1] 1010    12

movie_cor = cor(movie_trans)
corrplot(movie_cor,type="upper")
```
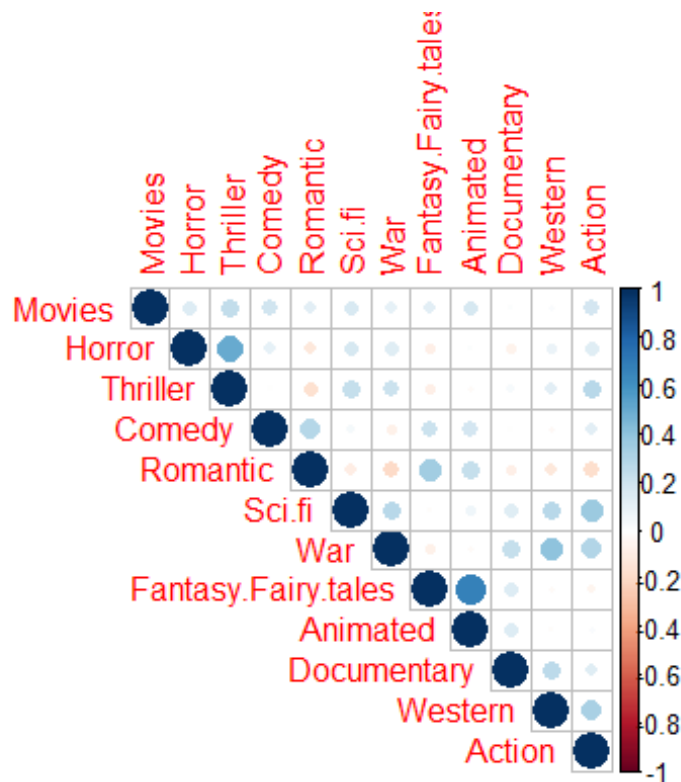
```
demo_cor <- cor(data_transformed[,c('Age','Weight','Height')])
corrplot(demo_cor, method="shade", shade.col=NA, tl.col="black", tl.srt=45,
tl.cex =0.7)
```
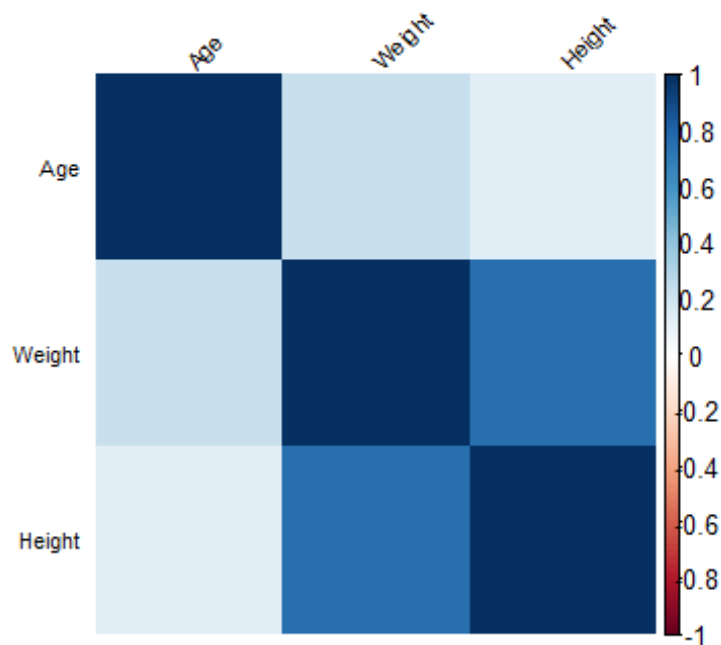
```
phobia_cor = cor(data_transformed[,names(phobia_data)])
corrplot(phobia_cor,type = "lower")
```
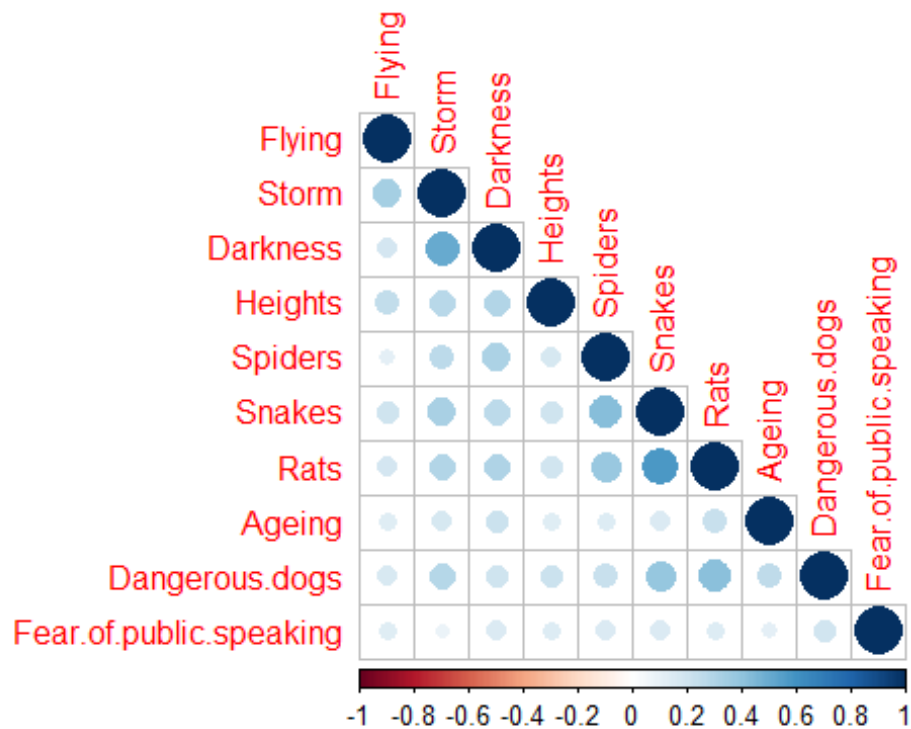


```
spend_cor = cor(data_transformed[,names(spend_data)])
corrplot(spend_cor)
```

Heat map

```
heatmap(phobia_cor, scale="column", col = terrain.colors(256))
```

Exploratory Data Analysis

```
data_transformed$Gender
```

```
##     [1] female female female female female male   female male   female
female
##    [11] female female female female female male   female female male   male
##    [21] male   male   female female female female female female male
female
##    [31] male   female female female male   female female male   female
female
##    [41] female male   female female female male   female female female
female
##    [51] female female female female female female female female male   male
##    [61] male   male   male   male   female male   male   female female
female
##    [71] male   male   female male   male   male   male   female female
female
##    [81] female male   female female female male   male   female female
female
##    [91] female female female male   male   male   male   male   male
female
##   [101] female male   female male   male   male   male   female female male
##   [111] male   female female female female female female female male
female
##   [121] male   male   female female male   female female female female
female
##   [131] female male   female female female male   male          female
female
##   [141] female female male   female male   female male   male   male   male
##   [151] female male   male   female male   female male   male   female male
##   [161] male   female male   male   male   female female male   female
female
##   [171] male   male   male   male   male   female male   male   female male
##   [181] male   male   female male   female female female female female
female
##   [191] female female female male   male   male   female female male   male
##   [201] male          male   female female female male   female female male
##   [211] male   female male   female female male   female female male   male
##   [221] male   male   female female male   male          female female male
##   [231] female female female female female female female female female
female
##   [241] male   female female female female female male   female female
female
##   [251] female female female female female female female male   female male
##   [261] male   female female female female female female female female
female
##   [271] female male   female female female female female male   male
female
##   [281] female male   female male   male   female female female male   male
```

```
##   [291] female male   female female female female male   male   female
female
##   [301] female male   female female female female female female female
female
##   [311] male   female male   female male   male   female male   female
female
##   [321] male   female female male   female male   female female male
female
##   [331] female male   female female female male   male   male   female
female
##   [341] female male   female female female female male   male   male
female
##   [351] male   female male   female female male   male   male   male
female
##   [361] female female female female male   male   male   male   female male
##   [371] female female male   male   female female female female female male
##   [381] female female female male   female male   female female female
female
##   [391] male   female female male   male   male   female female female
female
##   [401] male   female male   male   female female female female female
female
##   [411] male   female female male   male   female female male   female
female
##   [421] female female female female female female female male   female
female
##   [431] female male   male   female male   female male   female female male
##   [441] female female female female female female male   female female
female
##   [451] male   male   female female female female male   male   female
female
##   [461] male   male   female female female female male   female female male
##   [471] female male   male   male   male   female female female male
female
##   [481] female male   male   female female female female female male
female
##   [491] female female female male   female female female female female male
##   [501] female female male   female female male   male   female male
female
##   [511] male   male   female male   male   male   male   female female male
##   [521] female female female male   female female male   female male   male
##   [531] female male   female male   female male   female male   female male
##   [541] male   female        male   male   male   male   male   female
female
##   [551] female female female female male   female female female female
female
##   [561] female male   male   male   male   female female male   female
female
##   [571] male   male   female male   female female male   female female male
##   [581] male   female male   male   female male   male   female female
```

```
female
## [591] male     female female female male     male     male     male     male     male
## [601] female female male     female female male     male     female male     male
## [611] male     female male     female female male     male     female female male
## [621] male              female male     female female female female male
female
## [631] female female male     male     female female male     male     female male
## [641] female male     male     female female male     male     female female
female
## [651] male     male     male     female male     female female female male     male
## [661] female female female male     female female female male     male     male
## [671] female female female female male     female female female female
female
## [681] female female male     female female female male     male     female male
## [691] male     female male     female male     female female female female
female
## [701] female female male     male     female female male     female male
female
## [711] female female female female female male     male     female female male
## [721] female female female female female male     male     male     female male
## [731] female female female female female female female female male     male
## [741] male     female male     male     male     male     female female female male
## [751] female female female female male     female male     female male     male
## [761] female male     male     male     female male     female male     male
female
## [771] female male     female female female female male     male     female
female
## [781] male     female female male     male     male     male     male     female male
## [791] female female male     male     male     female male     male     female male
## [801] male     female female female female female male     male     male     male
## [811] male     male     female male     female male     male     male     male
female
## [821] female male     female male     female female female female male
female
## [831] female female female male     male     male     male     male     female
female
## [841] female male     female female male     female female female male
female
## [851] female male     male     female male     male     female male     male     male
## [861] male     female male     male     male     female male     female male
female
## [871] female male     male     male     female female male     male     male     male
## [881] female female female female female female male     male     female
female
## [891] male     male     male     female female male     male     male     female male
## [901] male     female male     male     female male     female female male
female
## [911] female female female female female female male     male     female
female
## [921] female male     female female female female male     female female
```

```
female
## [931] female male    female female         female female female female
female
## [941] male    female male    female female male    male    female female
female
## [951] male    male    male    female female female male    male    female
female
## [961] female male    female male    male    female female male    male    male
## [971] male    male    female female female female female male    female male
## [981] female female male    female female female female male    male
female
## [991] male    male    male    female female female male    female male    male
## [1001] female female male    female male    female male    female female male
## Levels:  female male
```

```
a = split(data_transformed$Gender, 3, drop =TRUE)

str(data_transformed$Gender)
```

```
##  Factor w/ 3 levels "","female","male": 2 2 2 2 2 3 2 3 2 2 ...
```

```
library(ggplot2)
library(gridExtra)
```

```
## Warning: package 'gridExtra' was built under R version 3.6.2
```

```
library(magrittr) # needs to be run every time you start R and want to use
%>%
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following object is masked from 'package:gridExtra':
##
##     combine
```

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

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(reshape2)
```

```
## Warning: package 'reshape2' was built under R version 3.6.2
```

```
p1 =ggplot(na.omit(data), aes(x=Age)) + geom_bar(fill = "#23b0db") +
theme_bw() + theme(panel.border = element_blank(), panel.grid.major =
element_blank(),
```

```
panel.grid.minor = element_blank(), axis.line = element_line(colour =
"black"))

age = data %>% select(Age) %>% group_by(Age) %>% summarize(count = n()) %>%
arrange(desc(count))
age = tableGrob(as.data.frame(age))
grid.arrange(p1, head(age, 7), ncol=2)
```
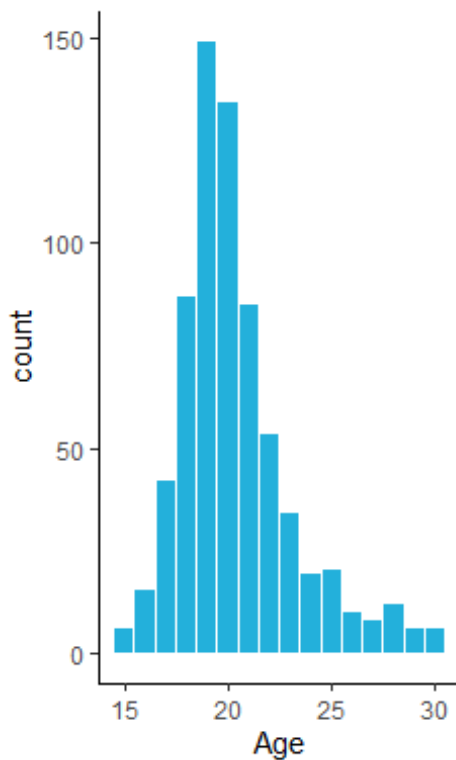

	Age	count
1	19	210
2	20	194
3	21	127
4	18	123
5	22	84
6	17	53

```
counts <- table(data_transformed$Gender, data_transformed$Music)
barplot(counts, main="RATING",
        xlab="Music Rating", ylab = "Count of people", col=c("blue","red"),
        legend = rownames(counts))
```

RATTING
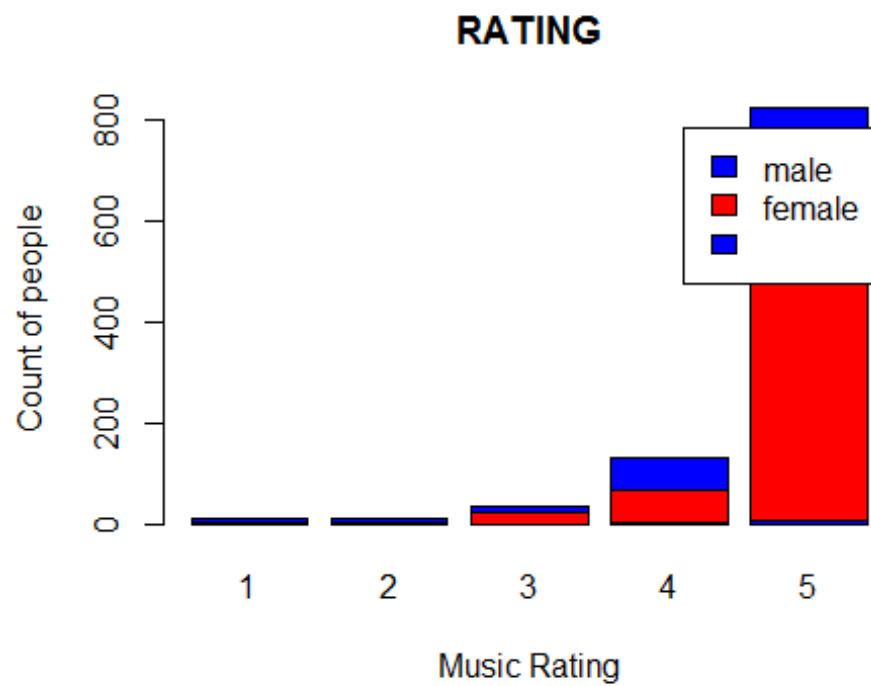

```
counts <- table(data_transformed$Gender, data_transformed$Movies)
barplot(counts, main="RATING",
        xlab="Music Rating", ylab = "Count of people", col=c("Yellow","red"),
        legend = rownames(counts))
```
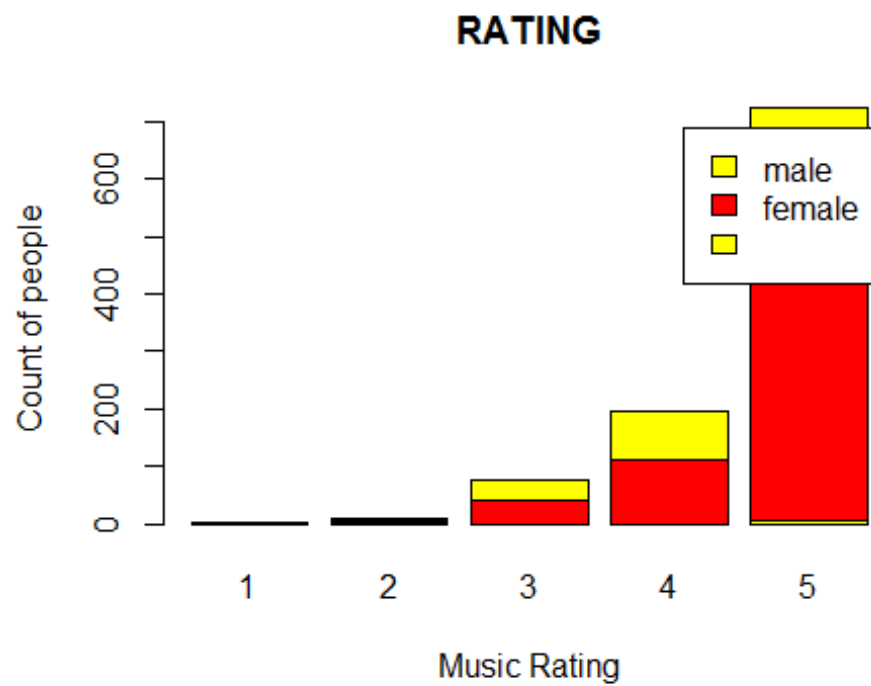
RATING


```
#Health
counts <- table(data_transformed$Health, data_transformed$Gender)
barplot(counts, main="RATING",
        xlab="Gender", col=c("purple1","red"),
        legend = rownames(counts), beside=TRUE)
```
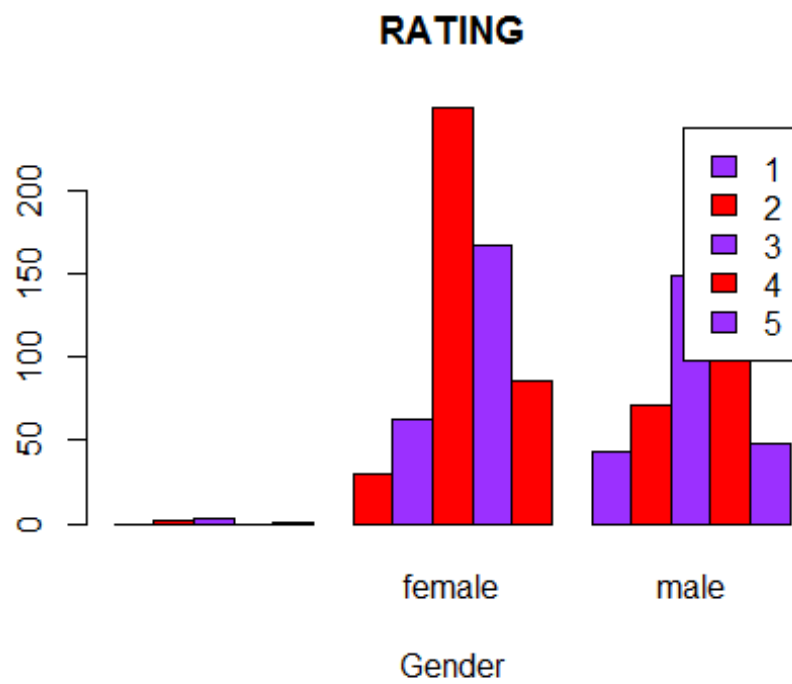
RATING

```
#Flying_----- Phobias
counts <- table(data_transformed$Flying, data_transformed$Gender)
barplot(counts, main="RATING",
        xlab="Gender", col=c("#56B4E9","seagreen2"),
        legend = rownames(counts), beside=TRUE)
```
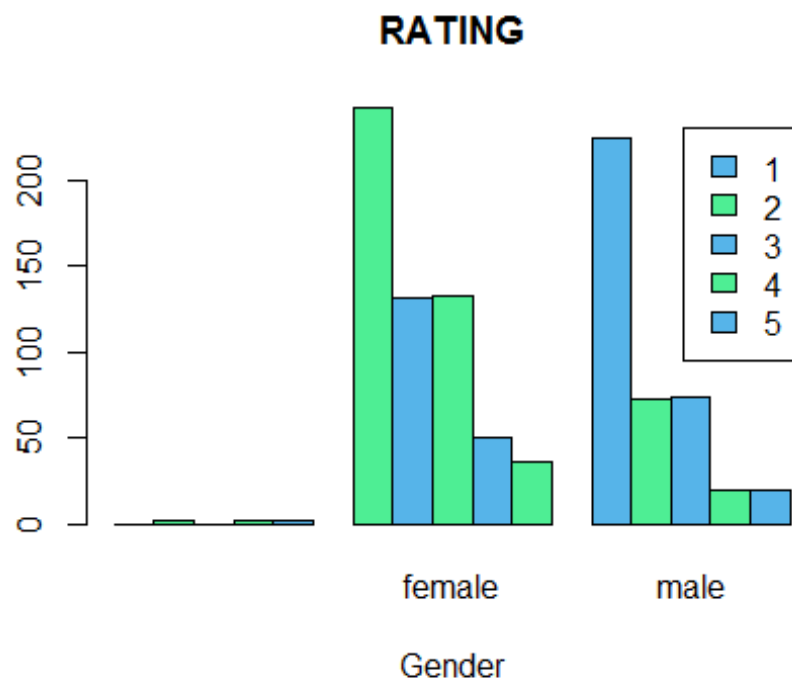
RATING


```
#Public Speaking-----Phobias
counts <- table(data_transformed$Public.speaking, data_transformed$Gender)
barplot(counts, main="RATING",
        xlab="Gender", col=c("slateblue1","red"),
        legend = rownames(counts), beside=TRUE)
```
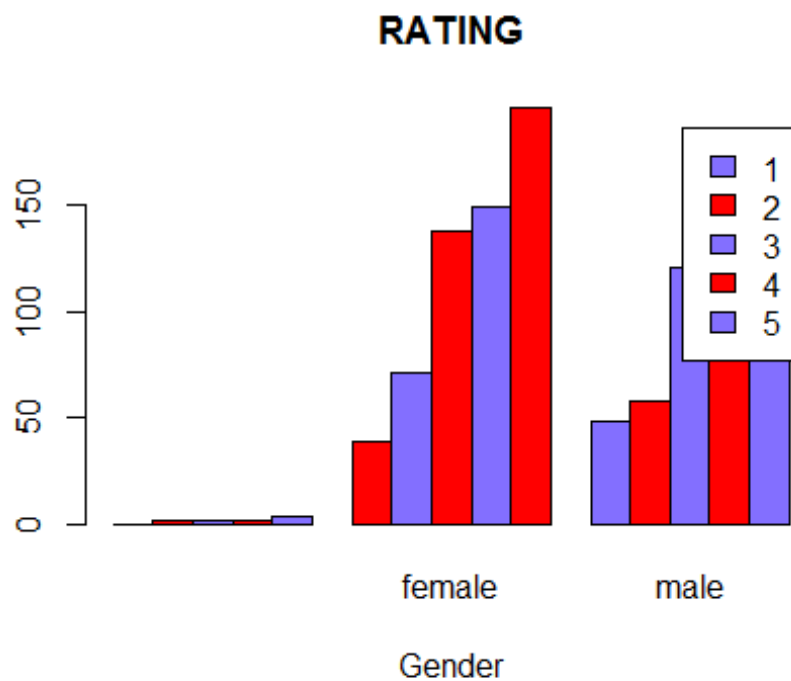
RATING


```r
#Left/Right Handed
counts <- table(data_transformed$Left...right.handed,
data_transformed$Gender)
barplot(counts, main="RATING",
        xlab="Gender", col=c("deepskyblue1","red"),
        legend = rownames(counts), beside=TRUE)
```

RATING
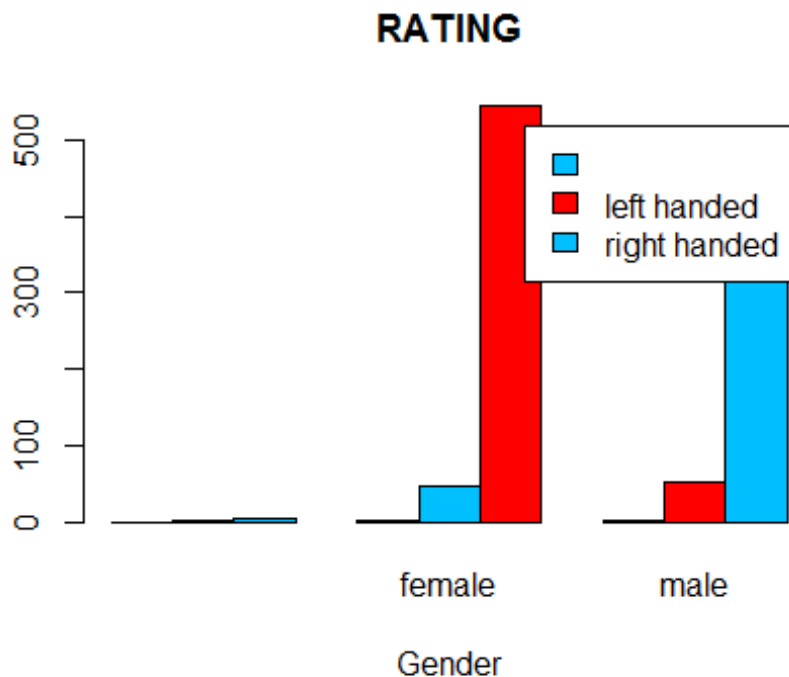

```
dim(hobbies_data)

## [1] 1010    32

hobbies_transformed <- data_transformed[,names(hobbies_data)]
hobbies_pca <- prcomp(hobbies_transformed, scale= T)
names(hobbies_pca)

## [1] "sdev"     "rotation" "center"   "scale"    "x"

#rotation - represents the loadings of each variables on components
hobbies_pca$rotation

##                             PC1         PC2          PC3         PC4
## History             0.188458129 -0.09972504  0.191659752 -0.22991541
## Psychology          0.230036558  0.01786097  0.099845621 -0.12092486
## Politics            0.123498901 -0.20221515  0.261041540 -0.21465574
## Mathematics         0.071298342 -0.28497563 -0.148794306 -0.11696119
## Physics             0.117537829 -0.32127215 -0.264318100 -0.13787033
## Internet           -0.047107481 -0.24945405  0.114615245  0.10689102
## PC                 -0.040810044 -0.37916578 -0.026702872 -0.01947711
## Economy.Management -0.004247973 -0.19189231  0.297016846  0.01081594
## Biology             0.275152415  0.02013486 -0.351237734  0.16443892
## Chemistry           0.220249354 -0.02970157 -0.402713435  0.09655225
## Reading             0.273290822  0.20243199  0.075074553 -0.17176942
## Geography           0.165733285 -0.15102913  0.150868856 -0.07075296
## Foreign.languages   0.196795893  0.01943294  0.224850707 -0.01840982
## Medicine            0.283815963 -0.01061050 -0.296379491  0.11658962
```

```
## Law                      0.139885598 -0.14966276  0.276167023 -0.02315421
## Cars                     -0.054065830 -0.35287817  0.054454401  0.15197566
## Art.exhibitions           0.307286358  0.08363239  0.106223775 -0.05528705
## Religion                  0.234554023 -0.02118824 -0.009334782 -0.16050540
## Countryside..outdoors     0.196673276 -0.02578241 -0.009371219  0.11783931
## Dancing                   0.232312679  0.05907080  0.086621432  0.24672526
## Musical.instruments       0.216399667 -0.01219800 -0.012291430 -0.08626889
## Writing                   0.231718611  0.07397364  0.067636420 -0.15644741
## Passive.sport            -0.023439504 -0.15300983  0.051616951  0.20587472
## Active.sport              0.069058573 -0.20429023  0.043485929  0.24414843
## Gardening                 0.192890484  0.03464648 -0.080288637  0.18959498
## Celebrities               0.015776035  0.09462840  0.186510020  0.34123592
## Shopping                  0.083917204  0.12707686  0.199581102  0.39774969
## Science.and.technology    0.097311047 -0.33700031 -0.117622329 -0.03484404
## Theatre                   0.293866571  0.13860458  0.110875136 -0.03254494
## Fun.with.friends          0.062460243 -0.05187930  0.139364342  0.26018379
## Adrenaline.sports         0.074602609 -0.25199639  0.062705429  0.22378600
## Pets                      0.087440530  0.03835047 -0.026758239  0.25545973
##                                   PC5         PC6         PC7         PC8
## History                   0.092591265 -0.232015433  0.25239113 -0.06548575
## Psychology                0.148720516  0.014508725 -0.14185033  0.08552131
## Politics                  0.247013176 -0.132333726  0.12069825  0.12790917
## Mathematics              -0.002370872  0.290108551 -0.24097120  0.17220703
## Physics                  -0.005937990  0.138911115 -0.15417460  0.13472563
## Internet                 -0.031563650  0.409201245  0.15277805 -0.33138111
## PC                       -0.140059444  0.319267598  0.09215982 -0.08493418
## Economy.Management        0.219596773  0.149171977 -0.20031212  0.17069411
## Biology                   0.237872115 -0.035475460  0.02578910 -0.11433832
## Chemistry                 0.254623212 -0.044583322 -0.03483529 -0.07935483
## Reading                   0.009166497  0.073519057 -0.01308066 -0.14064121
## Geography                -0.001296033 -0.207056165  0.27032491 -0.27703787
## Foreign.languages         0.062444420  0.094568340 -0.14992093 -0.41035039
## Medicine                  0.274674151 -0.056459180  0.01393986 -0.12804866
## Law                       0.358448817 -0.101036149  0.02537942  0.16761041
## Cars                     -0.003879326 -0.088122453  0.11289934  0.04308159
## Art.exhibitions          -0.194064673  0.083454620 -0.08848909  0.01818948
## Religion                 -0.066276692  0.064782579  0.19193962  0.06085112
## Countryside..outdoors    -0.352637463 -0.097031086  0.22136307 -0.14052420
## Dancing                  -0.079618956  0.012731339 -0.16346012  0.18230175
## Musical.instruments      -0.366971152  0.082456456 -0.01926015  0.09180239
## Writing                  -0.205552004  0.136106746  0.03084835  0.23993099
## Passive.sport            -0.146071143 -0.127491042  0.15782316 -0.17095880
## Active.sport             -0.141964721 -0.325163564 -0.12763567  0.26173364
## Gardening                -0.147538683  0.082339921  0.35510845  0.31300178
## Celebrities               0.162685242  0.307917512  0.18206845  0.13487536
## Shopping                  0.157865883  0.241111976  0.02183875  0.02799432
## Science.and.technology    0.001477316  0.083055353  0.04019640 -0.08928700
## Theatre                  -0.101931633  0.064560558 -0.21810241 -0.07438009
## Fun.with.friends         -0.109742421 -0.063689827 -0.39486085 -0.29098669
## Adrenaline.sports        -0.143782184 -0.329756935 -0.24642978  0.03323823
```

```
## Pets                     0.051462435 -0.009519456   0.21944914   0.10229865
##                                  PC9        PC10         PC11         PC12
## History                  0.2342319487   0.013213679   0.02656929   0.014686171
## Psychology               0.1634428977  -0.173316277   0.29922905  -0.217844043
## Politics                 0.0003330098   0.028409473   0.11560478   0.089453472
## Mathematics             -0.1227967977   0.415744678  -0.03102544   0.146137501
## Physics                  0.0605717983   0.187165070  -0.05964467   0.118388354
## Internet                 0.0501169630  -0.135904736   0.13256657  -0.038345456
## PC                       0.0836480239  -0.194955920  -0.08441881  -0.110075826
## Economy.Management      -0.2578599951   0.237036055  -0.05440312  -0.099314337
## Biology                 -0.0656992949  -0.068240695   0.06665055  -0.004194024
## Chemistry               -0.0448282578  -0.012743686  -0.03919365   0.109878401
## Reading                  0.1311171386   0.121373314  -0.16553035   0.121776808
## Geography               -0.2121255816   0.075893927  -0.40988342   0.173529969
## Foreign.languages       -0.2743702248  -0.085613319  -0.18114315  -0.019851505
## Medicine                -0.1044512509  -0.176308133   0.08116972   0.001417123
## Law                     -0.0129844112   0.024797536   0.13392287   0.042392594
## Cars                     0.1126257763  -0.100383522   0.05174534  -0.138464290
## Art.exhibitions          0.1480556405   0.028108790  -0.03140235   0.049578834
## Religion                -0.2035988869  -0.004848608   0.35849183  -0.393017524
## Countryside..outdoors   -0.1682045383   0.334944022  -0.04810741  -0.379477869
## Dancing                 -0.2718126978  -0.035144419  -0.02929581  -0.169902419
## Musical.instruments     -0.1518894347  -0.228909445   0.26370229   0.136685469
## Writing                  0.0859320390  -0.365865217  -0.11663001   0.303731172
## Passive.sport           -0.1388167380   0.193524389   0.49466560   0.554056046
## Active.sport            -0.0978546087  -0.191441181  -0.20297874   0.037383030
## Gardening               -0.0174921768   0.134950497  -0.07051273   0.075730596
## Celebrities             -0.0213124787  -0.112807899  -0.10859489   0.173889435
## Shopping                 0.0241152752  -0.022607496  -0.02547038  -0.019461421
## Science.and.technology   0.2525523547  -0.146066026  -0.18943901  -0.072974790
## Theatre                  0.2373060604   0.203906538  -0.02908785   0.045437909
## Fun.with.friends         0.2492036609   0.070038751   0.20242860   0.038986631
## Adrenaline.sports        0.1002526616  -0.115681528  -0.07578508  -0.052770482
## Pets                     0.4875204274   0.294586372  -0.01534318  -0.099785036
##                                 PC13         PC14         PC15         PC16
## History                 -0.11918292  -0.264841906   0.23562129   0.048499587
## Psychology              -0.53147080  -0.134003144  -0.25960270  -0.212537201
## Politics                 0.14225150   0.020275698   0.17110829  -0.030416836
## Mathematics             -0.17389206  -0.088680894   0.04575537   0.190550851
## Physics                 -0.02725997  -0.176143809   0.01568440   0.150602790
## Internet                -0.24231809  -0.094006707   0.14534745  -0.080953151
## PC                       0.03656889   0.065041281   0.07195299  -0.073035218
## Economy.Management      -0.02685626   0.258389802  -0.09402371  -0.306934336
## Biology                 -0.03674544   0.014119227  -0.03946773  -0.083243298
## Chemistry                0.07105813   0.018197628   0.10117714  -0.021308793
## Reading                  0.05977048  -0.012847994   0.11893710   0.045485171
## Geography               -0.12965737  -0.141435945   0.01708068   0.037413428
## Foreign.languages       -0.11516304   0.336766162  -0.04416348   0.114506778
## Medicine                 0.05568575   0.112221784  -0.05484492  -0.011739787
## Law                      0.20052654   0.220965966   0.03155761   0.053131138
```

```
## Cars                  0.35424863  0.088685964 -0.19272303  0.127627879
## Art.exhibitions        0.15766714 -0.095611890 -0.35873345  0.021981645
## Religion               0.14689966 -0.232714089  0.02768653  0.224113200
## Countryside..outdoors -0.02248433  0.064114677 -0.13582649 -0.052047476
## Dancing               -0.07621054 -0.156530043  0.29739895  0.006507375
## Musical.instruments    0.08865918  0.372599208  0.20443150  0.279091075
## Writing               -0.13370538  0.143648944 -0.01997338 -0.120877714
## Passive.sport         -0.10655182 -0.033802622 -0.27309109 -0.053951301
## Active.sport          -0.16497639 -0.187370312  0.05512601  0.165136097
## Gardening              0.08029240  0.051113842  0.16972346 -0.577177451
## Celebrities            0.06850153 -0.234754041 -0.08292139  0.248466200
## Shopping               0.06411123 -0.170558272 -0.09922488  0.126536851
## Science.and.technology 0.17199686 -0.004297953 -0.15015236 -0.130311971
## Theatre                0.26338123 -0.078838818 -0.21457617 -0.028072652
## Fun.with.friends       0.17384884 -0.101511359  0.47844396 -0.185474306
## Adrenaline.sports     -0.10302385  0.065904906 -0.16953678 -0.015564040
## Pets                  -0.33225220  0.440512655  0.11433088  0.322198191
##                               PC17         PC18         PC19         PC20
## History                0.140568535  0.019058804 -0.063137882 -0.340299967
## Psychology             0.005707387  0.129875824  0.031426925 -0.214641018
## Politics              -0.121565756  0.217081565 -0.068302094  0.003366495
## Mathematics           -0.087735929 -0.110900070 -0.023429064 -0.143880906
## Physics               -0.073782415  0.068293026  0.076768503 -0.050267426
## Internet               0.217522404 -0.215441375  0.162339326  0.176880420
## PC                     0.211440075 -0.111475474 -0.031609704 -0.047651596
## Economy.Management    -0.045930537  0.027840840  0.036412935  0.102489385
## Biology                0.003257511 -0.012333933  0.069147808 -0.038975437
## Chemistry              0.065622261 -0.045303826  0.024145774 -0.027908462
## Reading                0.118537094 -0.343128291 -0.273039466  0.051648044
## Geography             -0.176918197  0.137768750  0.384144671  0.184347919
## Foreign.languages     -0.095618470 -0.048243639 -0.400141090 -0.196940783
## Medicine               0.028008379 -0.062090399  0.091488004  0.042749446
## Law                    0.232253891 -0.212837437  0.163565688  0.047394133
## Cars                   0.101290718 -0.105382064  0.064788378 -0.077041582
## Art.exhibitions        0.153430645 -0.122627223  0.216359971  0.014236907
## Religion              -0.385963102 -0.232352629 -0.186134785  0.334236445
## Countryside..outdoors  0.041465898  0.063372624  0.104381153 -0.213741811
## Dancing                0.347373197  0.315367885  0.078103955  0.303012386
## Musical.instruments    0.023551049  0.261318628  0.136422927 -0.305837922
## Writing               -0.232484887 -0.091472367  0.092251598  0.294789399
## Passive.sport          0.080514277  0.071173847 -0.224338422  0.159425948
## Active.sport           0.244062647 -0.171008779 -0.379805344  0.038079046
## Gardening             -0.083220637 -0.152562035 -0.158094901 -0.204521380
## Celebrities           -0.162035703  0.019266520  0.116912722 -0.286153981
## Shopping              -0.169084120  0.142479980 -0.132551335 -0.061052617
## Science.and.technology -0.123494310  0.487730771 -0.345660363  0.152263003
## Theatre                0.223948702  0.105474154 -0.003676628  0.108807117
## Fun.with.friends      -0.282540907 -0.008602802  0.091997421 -0.028442837
## Adrenaline.sports     -0.331133280 -0.278594683  0.153394827 -0.068272781
## Pets                  -0.046438159  0.058743608 -0.021156648  0.241707897
```

```
##                             PC21        PC22        PC23        PC24
## History               0.089378024  0.27249982  0.081685958  0.404197186
## Psychology            0.105591700 -0.00341174 -0.142315832 -0.212594526
## Politics             -0.169374235 -0.31925693 -0.086141769 -0.168492841
## Mathematics           0.077297990  0.03806932 -0.006096263 -0.035969797
## Physics              -0.013570922  0.11217012  0.162977863 -0.240395516
## Internet             -0.155409428 -0.09517320  0.174672673  0.013745440
## PC                   -0.029353779 -0.12653046 -0.172011307  0.097874903
## Economy.Management    0.056489720  0.03141804 -0.161727689  0.522600837
## Biology               0.036599800 -0.09641642 -0.019273983  0.149770112
## Chemistry            -0.042457150  0.10832498  0.063636914  0.192233868
## Reading              -0.143087905  0.20705552 -0.348080118 -0.001703690
## Geography             0.213153785 -0.12339851 -0.024883673 -0.022706934
## Foreign.languages     0.213276835 -0.00187073  0.098434706 -0.251287644
## Medicine             -0.033030822 -0.05857201 -0.124398783 -0.031707678
## Law                  -0.261291638  0.07208552  0.310180864 -0.283896857
## Cars                  0.487331938  0.36616198 -0.200557843 -0.139096644
## Art.exhibitions       0.296753202 -0.33764367  0.195876942  0.058571883
## Religion              0.061461577 -0.07981032 -0.032296540  0.098511884
## Countryside..outdoors -0.405737882  0.18979428  0.044101941 -0.119357905
## Dancing               0.100580228  0.23799480 -0.165722489 -0.146517269
## Musical.instruments  -0.022222980 -0.10777622  0.013830321  0.222434963
## Writing              -0.068715353  0.37683012  0.070487540 -0.025514325
## Passive.sport        -0.006673113  0.10716349 -0.094521343  0.014066381
## Active.sport         -0.035453278 -0.29817392  0.081032254  0.066455305
## Gardening             0.191596177 -0.13655688  0.078457744 -0.157125078
## Celebrities          -0.193970300 -0.08718504 -0.443689860 -0.071644312
## Shopping              0.011889605  0.18851704  0.504202132  0.182827722
## Science.and.technology -0.167691163  0.02308271  0.015102689 -0.001437206
## Theatre              -0.137914691 -0.12133188 -0.093273415  0.082180350
## Fun.with.friends      0.107272447 -0.03169795 -0.033741293 -0.096182782
## Adrenaline.sports    -0.274955137  0.04690266 -0.068476535  0.117502955
## Pets                  0.120812178 -0.12080933 -0.059398012  0.020557043
##                             PC25        PC26        PC27        PC28
## History              -0.015325238 -0.053328696 -0.30396841  0.165928980
## Psychology            0.110054126  0.151113617  0.19481959 -0.132513914
## Politics             -0.347059475 -0.438008513  0.26221721 -0.074297731
## Mathematics          -0.022970305  0.072390127  0.01836953  0.102939921
## Physics               0.024431136 -0.066306695 -0.02225712 -0.033656426
## Internet             -0.155178320 -0.041469767  0.22223796  0.398051285
## PC                    0.015283657  0.026053169 -0.21824761 -0.580466363
## Economy.Management    0.183985283 -0.095838917  0.04118931  0.052189789
## Biology               0.071131033 -0.088068770 -0.04602056 -0.060382767
## Chemistry            -0.131050003 -0.155411984  0.07054633 -0.055676060
## Reading              -0.059989639  0.116711124  0.34129790 -0.258231158
## Geography             0.118727757  0.292600948  0.15721901 -0.122039954
## Foreign.languages    -0.101072969 -0.085507934 -0.23360523  0.135039521
## Medicine              0.107828167 -0.005904270  0.02810581  0.138094731
## Law                   0.226302203  0.291996307 -0.21384712 -0.089548162
## Cars                 -0.012959607 -0.077885679  0.29806334  0.143823156
```

```
## Art.exhibitions       -0.088515158 -0.305624403 -0.19551497 -0.128551909
## Religion                0.051195327  0.108817872 -0.11200946  0.024296446
## Countryside..outdoors   0.207300073 -0.308268090  0.08157090 -0.043944572
## Dancing               -0.306851079  0.006402375 -0.21306071 -0.040119998
## Musical.instruments     0.011472790  0.237780789  0.20544425  0.020807957
## Writing                 0.183600601 -0.295185892 -0.02768596  0.070409544
## Passive.sport         -0.013564230 -0.001914892 -0.11556287 -0.129317040
## Active.sport            0.328790684 -0.091217882  0.19676068  0.081321547
## Gardening             -0.124510434  0.217420577 -0.01340209  0.117973210
## Celebrities             0.132522166 -0.065358357 -0.21211129  0.135374613
## Shopping              -0.109395978  0.069785761  0.29544826 -0.299961683
## Science.and.technology  0.087363698  0.163581113 -0.10841696  0.113833901
## Theatre               -0.023644657  0.226538771  0.05989364  0.309597289
## Fun.with.friends        0.321433616 -0.102270132 -0.02456618 -0.068338982
## Adrenaline.sports     -0.498461041  0.180729640 -0.11356323  0.003381675
## Pets                    0.006329268 -0.038696539 -0.06279122 -0.011001691
##                                PC29        PC30        PC31        PC32
## History                 0.0436252264  0.08885972 -0.103643613  0.024873786
## Psychology              0.0003107664 -0.11531229  0.115281418  0.089776263
## Politics                0.1014169997 -0.04752005 -0.112039360 -0.049791245
## Mathematics           -0.1355805402 -0.34968646 -0.460256858  0.006634840
## Physics                 0.2005685773  0.54567187  0.397435033 -0.060552789
## Internet              -0.1195715221  0.03743514  0.085149185 -0.047635005
## PC                      0.3364108291 -0.07193913 -0.109636364  0.059974932
## Economy.Management    -0.0416391116  0.18651618  0.161571740  0.028396348
## Biology                 0.0034737992 -0.03368850 -0.076829898 -0.782877286
## Chemistry               0.0016929119 -0.46994875  0.452349152  0.368489468
## Reading               -0.3029578433  0.18862194  0.049639285 -0.076930129
## Geography               0.0434073886 -0.07451515  0.028324979  0.026165782
## Foreign.languages       0.1328496283 -0.01348350  0.107185899 -0.019764701
## Medicine                0.0670882078  0.40844571 -0.477668691  0.434044599
## Law                   -0.1208068942 -0.11101063  0.041150511 -0.055407938
## Cars                    0.0285055732 -0.07887428  0.005240120 -0.085151482
## Art.exhibitions       -0.3798787386  0.05354058  0.010294708  0.096928939
## Religion                0.0538250641 -0.05636915  0.116502577  0.030215774
## Countryside..outdoors -0.0140779316 -0.05361508 -0.042472613  0.031224932
## Dancing               -0.0817104451  0.02524419 -0.036321042 -0.022423769
## Musical.instruments   -0.1095417829  0.05151530  0.088708506 -0.022241308
## Writing                 0.1553783156 -0.13250198 -0.106361802 -0.046039769
## Passive.sport           0.0056073362  0.02706482  0.029672665  0.031963639
## Active.sport            0.0329459508 -0.01366870  0.033893795  0.005157876
## Gardening               0.0286857110  0.04824095  0.041577449  0.037166519
## Celebrities           -0.0600954317 -0.03197759  0.154158929  0.019391548
## Shopping                0.1108551014  0.07020307 -0.165240833  0.033732846
## Science.and.technology -0.4034422108 -0.05396951 -0.022175035  0.003311783
## Theatre                 0.5421808200 -0.14293657 -0.003959493 -0.046385582
## Fun.with.friends      -0.0469591626 -0.03661335 -0.013638638  0.037373544
## Adrenaline.sports     -0.0248298425  0.05120411 -0.004412017 -0.026971282
## Pets                    0.0339082048  0.01427524  0.039473323  0.037922218
```

```r
# Calculate the variance explained by each component
eigen_hobbies <- hobbies_pca$sdev^2
names(eigen_hobbies) <- paste("PC",1:32,sep="")
eigen_hobbies
```

```
##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
PC8
## 4.2391294 3.2188434 2.5628009 2.1936649 1.5704999 1.3868499 1.1689198
1.1287278
##       PC9      PC10      PC11      PC12      PC13      PC14      PC15
PC16
## 1.0887872 0.9921651 0.9212331 0.8913134 0.8595703 0.7790779 0.7677160
0.7298606
##      PC17      PC18      PC19      PC20      PC21      PC22      PC23
PC24
## 0.6634885 0.6386832 0.6241286 0.5868250 0.5521857 0.5316185 0.5036362
0.4961543
##      PC25      PC26      PC27      PC28      PC29      PC30      PC31
PC32
## 0.4709276 0.4429519 0.4079236 0.3757610 0.3676952 0.3061206 0.2978055
0.2349349
```

```r
sum_hobbies <- sum(eigen_hobbies)
sum_hobbies
```

```
## [1] 32
```

```r
## Proportion of variance explained by each component

propvar_hobbies <- eigen_hobbies/sum_hobbies
propvar_hobbies
```

```
##         PC1         PC2         PC3         PC4         PC5         PC6
## 0.132472795 0.100588857 0.080087528 0.068552030 0.049078121 0.043339059
##         PC7         PC8         PC9        PC10        PC11        PC12
## 0.036528744 0.035272745 0.034024598 0.031005160 0.028788535 0.027853544
##        PC13        PC14        PC15        PC16        PC17        PC18
## 0.026861573 0.024346185 0.023991126 0.022808142 0.020734014 0.019958849
##        PC19        PC20        PC21        PC22        PC23        PC24
## 0.019504019 0.018338280 0.017255805 0.016613077 0.015738632 0.015504822
##        PC25        PC26        PC27        PC28        PC29        PC30
## 0.014716488 0.013842245 0.012747613 0.011742532 0.011490476 0.009566268
##        PC31        PC32
## 0.009306422 0.007341716
```

```r
cumvar_hobbies <- cumsum(propvar_hobbies)
cumvar_hobbies
```

```
##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
PC8
## 0.1324728 0.2330617 0.3131492 0.3817012 0.4307793 0.4741184 0.5106471
```

```
0.5459199
##         PC9      PC10      PC11      PC12      PC13      PC14      PC15
PC16
## 0.5799445 0.6109496 0.6397382 0.6675917 0.6944533 0.7187995 0.7427906
0.7655987
##        PC17      PC18      PC19      PC20      PC21      PC22      PC23
PC24
## 0.7863328 0.8062916 0.8257956 0.8441339 0.8613897 0.8780028 0.8937414
0.9092462
##        PC25      PC26      PC27      PC28      PC29      PC30      PC31
PC32
## 0.9239627 0.9378050 0.9505526 0.9622951 0.9737856 0.9833519 0.9926583
1.0000000

matlambdas <- rbind(eigen_hobbies,propvar_hobbies,cumvar_hobbies)
rownames(matlambdas) <- c("Eigenvalues","Prop. variance","Cum. prop.
variance")
round(matlambdas,4)

##                          PC1    PC2    PC3    PC4    PC5    PC6    PC7
PC8
## Eigenvalues           4.2391 3.2188 2.5628 2.1937 1.5705 1.3868 1.1689
1.1287
## Prop. variance        0.1325 0.1006 0.0801 0.0686 0.0491 0.0433 0.0365
0.0353
## Cum. prop. variance 0.1325 0.2331 0.3131 0.3817 0.4308 0.4741 0.5106
0.5459
##                          PC9   PC10   PC11   PC12   PC13   PC14   PC15
PC16
## Eigenvalues           1.0888 0.9922 0.9212 0.8913 0.8596 0.7791 0.7677
0.7299
## Prop. variance        0.0340 0.0310 0.0288 0.0279 0.0269 0.0243 0.0240
0.0228
## Cum. prop. variance 0.5799 0.6109 0.6397 0.6676 0.6945 0.7188 0.7428
0.7656
##                         PC17   PC18   PC19   PC20   PC21   PC22   PC23
PC24
## Eigenvalues           0.6635 0.6387 0.6241 0.5868 0.5522 0.5316 0.5036
0.4962
## Prop. variance        0.0207 0.0200 0.0195 0.0183 0.0173 0.0166 0.0157
0.0155
## Cum. prop. variance 0.7863 0.8063 0.8258 0.8441 0.8614 0.8780 0.8937
0.9092
##                         PC25   PC26   PC27   PC28   PC29   PC30   PC31
PC32
## Eigenvalues           0.4709 0.4430 0.4079 0.3758 0.3677 0.3061 0.2978
0.2349
## Prop. variance        0.0147 0.0138 0.0127 0.0117 0.0115 0.0096 0.0093
0.0073
```

```
## Cum. prop. variance 0.9240 0.9378 0.9506 0.9623 0.9738 0.9834 0.9927
1.0000
```

```r
summary(hobbies_pca)
```

```
## Importance of components:
##                            PC1    PC2     PC3     PC4     PC5     PC6
PC7
## Standard deviation     2.0589 1.7941 1.60088 1.48110 1.25320 1.17765
1.08117
## Proportion of Variance 0.1325 0.1006 0.08009 0.06855 0.04908 0.04334
0.03653
## Cumulative Proportion  0.1325 0.2331 0.31315 0.38170 0.43078 0.47412
0.51065
##                            PC8     PC9    PC10    PC11    PC12    PC13
PC14
## Standard deviation     1.06242 1.04345 0.99607 0.95981 0.94409 0.92713
0.88265
## Proportion of Variance 0.03527 0.03402 0.03101 0.02879 0.02785 0.02686
0.02435
## Cumulative Proportion  0.54592 0.57994 0.61095 0.63974 0.66759 0.69445
0.71880
##                           PC15    PC16    PC17    PC18    PC19    PC20
PC21
## Standard deviation     0.87619 0.85432 0.81455 0.79918 0.7900 0.76605
0.74309
## Proportion of Variance 0.02399 0.02281 0.02073 0.01996 0.0195 0.01834
0.01726
## Cumulative Proportion  0.74279 0.76560 0.78633 0.80629 0.8258 0.84413
0.86139
##                           PC22    PC23    PC24    PC25    PC26    PC27
PC28
## Standard deviation     0.72912 0.70967 0.7044 0.68624 0.66555 0.63869
0.61299
## Proportion of Variance 0.01661 0.01574 0.0155 0.01472 0.01384 0.01275
0.01174
## Cumulative Proportion  0.87800 0.89374 0.9093 0.92396 0.93780 0.95055
0.96230
##                           PC29    PC30    PC31    PC32
## Standard deviation     0.60638 0.55328 0.54572 0.48470
## Proportion of Variance 0.01149 0.00957 0.00931 0.00734
## Cumulative Proportion  0.97379 0.98335 0.99266 1.00000
```

```r
## Plot a biplot to view components on n-dimensional plane
biplot(hobbies_pca, scale = 0, main = 'Principal componets')
```
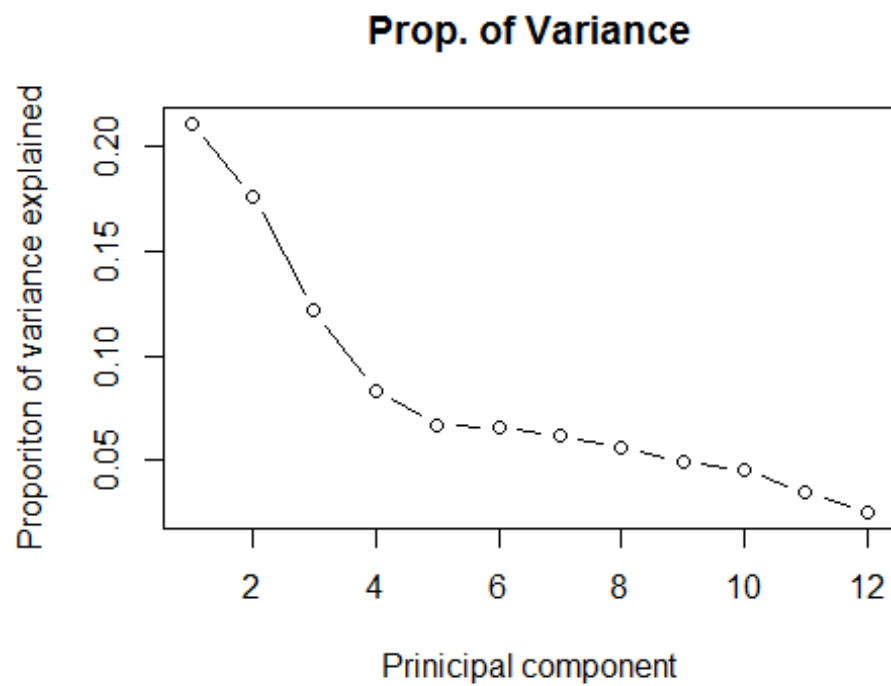
Principal componets


```
##scree plot - to identify the elbow point
plot(propvar_hobbies,xlab = 'Prinicipal component',ylab = 'Proporiton of
variance explained',type = 'b', main = 'Prop. of Variance')
```

Prop. of Variance

```
#The optimum number of components are ~ 8 i.e PC1 : PC8

# cumulative scree plot
plot(cumvar_hobbies,xlab = 'Principal component',ylab = 'Cumulative
proportion of variance explained',type = 'b', main = 'Cumulative Prop.of
Variance')
```


Cumulative Prop.of Variance
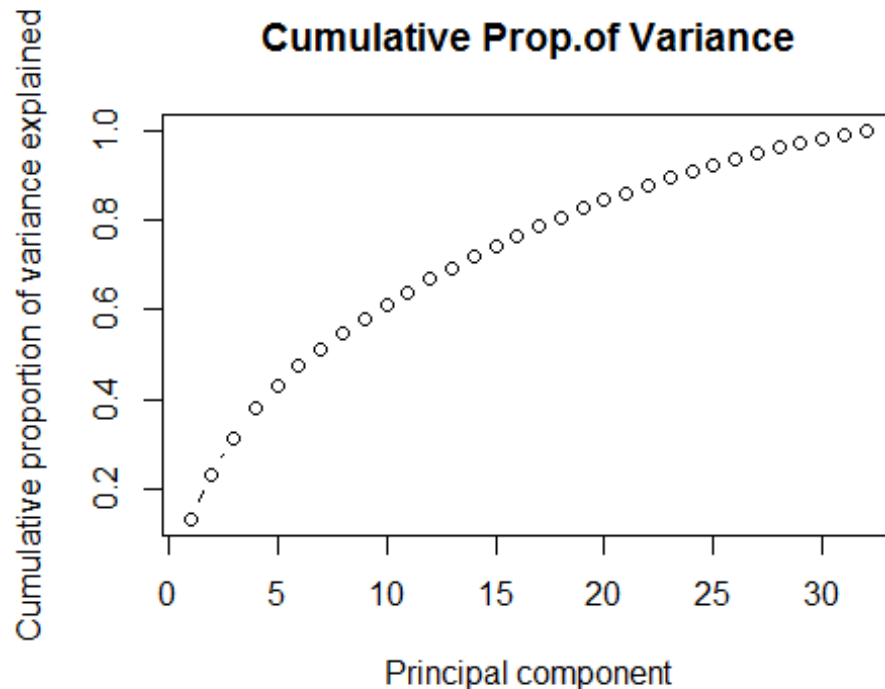
```
#Approx: ~ 75% of the variance is explained by 20 components i.e PC1 to PC20

dim(movie_data)

## [1] 1010   12

movie_transformed <- data_transformed[,names(movie_data)]
movie_pca <- prcomp(movie_transformed, scale= T)
names(movie_pca)

## [1] "sdev"     "rotation" "center"   "scale"    "x"

#rotation - represents the loadings of each variables on components
movie_pca$rotation

##                          PC1          PC2          PC3          PC4
## Movies           -0.18067387  0.2943522148 -0.29434144  0.1753636709
## Horror           -0.29774492  0.0281326824 -0.48865014 -0.3468640042
## Thriller         -0.38637808  0.0264578000 -0.39885764 -0.3255496550
## Comedy            0.00957783  0.3601720121 -0.23777270  0.5045943972
## Romantic          0.25313650  0.3635153351 -0.09666751  0.2900854864
```

```
## Sci.fi              -0.37660398 0.1182255631   0.04518061   0.1849454105
## War                 -0.40483304 0.0003113374   0.24428376  -0.0005316756
## Fantasy.Fairy.tales  0.13147403 0.5530319979   0.14626774  -0.2789775438
## Animated             0.05080348 0.5454401638   0.10708136  -0.3574114799
## Documentary         -0.18889650 0.1506598727   0.47688883  -0.1906702214
## Western             -0.36669650 0.0334098269   0.35553267   0.1424325175
## Action              -0.41171847 0.0941099146   0.03483277   0.3282782261
##                             PC5          PC6          PC7          PC8
## Movies              -0.58171966   0.542758857 -0.063103472 -0.05424721
## Horror               0.40181487  -0.053550228  0.101364547  0.06897342
## Thriller             0.03984132   0.113480694 -0.031760285  0.07288430
## Comedy               0.50260892  -0.003243588 -0.318932106 -0.08324422
## Romantic             0.14940500   0.206681921  0.476449707  0.32906483
## Sci.fi              -0.26744131  -0.481445533  0.116396679  0.65269730
## War                  0.02545531   0.268568571  0.383612801 -0.25097709
## Fantasy.Fairy.tales -0.03100975  -0.148531492  0.071361143 -0.14464158
## Animated            -0.10495198  -0.237208831 -0.005510402 -0.17859759
## Documentary          0.20900897   0.403789550 -0.512050412  0.41447721
## Western              0.28455333   0.055422480  0.377146568 -0.15168470
## Action              -0.12172688  -0.313963737 -0.292826826 -0.36763211
##                             PC9         PC10         PC11         PC12
## Movies              -0.003660409   0.33290656 -0.098891004  0.052868440
## Horror               0.087255268   0.19915946 -0.553794897  0.134689408
## Thriller            -0.297400380  -0.33471692  0.595001950 -0.098215100
## Comedy               0.319128438   0.11521465  0.283954563 -0.044854364
## Romantic            -0.296782981  -0.40454959 -0.215875985 -0.107768793
## Sci.fi               0.212854244   0.10154056  0.087993301  0.041342734
## War                  0.604553122  -0.35768442 -0.001701204 -0.009188477
## Fantasy.Fairy.tales -0.017579240  -0.03239820  0.148441139  0.710786335
## Animated             0.071388848   0.08856167 -0.065700856 -0.666511889
## Documentary         -0.061502779  -0.08527072 -0.161446239  0.002305173
## Western             -0.425260296   0.51196209  0.154642040 -0.039639315
## Action              -0.336418372  -0.37950074 -0.343795999  0.054460149
```

```r
# Calculate the variance explained by each component
eigen_movie <- movie_pca$sdev^2
names(eigen_movie) <- paste("PC",1:12,sep="")
eigen_movie
```

```
##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
PC8
## 2.5328872 2.1154265 1.4605655 1.0037483 0.8077760 0.7887751 0.7483881
0.6730806
##       PC9      PC10      PC11      PC12
## 0.5946969 0.5502757 0.4200133 0.3043667
```

```r
sum_movie <- sum(eigen_movie)
sum_movie
```

```
## [1] 12
```

```r
## Proportion of variance explained by each component

propvar_movie <- eigen_movie/sum_movie
propvar_movie

##        PC1        PC2        PC3        PC4        PC5        PC6
PC7
## 0.21107393 0.17628555 0.12171380 0.08364569 0.06731467 0.06573126
0.06236568
##        PC8        PC9       PC10       PC11       PC12
## 0.05609005 0.04955807 0.04585630 0.03500111 0.02536389

cumvar_movie <- cumsum(propvar_movie)
cumvar_movie

##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
PC8
## 0.2110739 0.3873595 0.5090733 0.5927190 0.6600336 0.7257649 0.7881306
0.8442206
##       PC9      PC10      PC11      PC12
## 0.8937787 0.9396350 0.9746361 1.0000000

matlambdas_movie <- rbind(eigen_movie,propvar_movie,cumvar_movie)
rownames(matlambdas_movie) <- c("Eigenvalues","Prop. variance","Cum. prop.
variance")
round(matlambdas_movie,4)

##                          PC1    PC2    PC3    PC4    PC5    PC6    PC7
PC8
## Eigenvalues           2.5329 2.1154 1.4606 1.0037 0.8078 0.7888 0.7484
0.6731
## Prop. variance        0.2111 0.1763 0.1217 0.0836 0.0673 0.0657 0.0624
0.0561
## Cum. prop. variance 0.2111 0.3874 0.5091 0.5927 0.6600 0.7258 0.7881
0.8442
##                          PC9   PC10   PC11   PC12
## Eigenvalues           0.5947 0.5503 0.4200 0.3044
## Prop. variance        0.0496 0.0459 0.0350 0.0254
## Cum. prop. variance 0.8938 0.9396 0.9746 1.0000

summary(movie_pca)

## Importance of components:
##                          PC1    PC2    PC3     PC4     PC5     PC6
PC7
## Standard deviation     1.5915 1.4545 1.2085 1.00187 0.89876 0.88813
0.86509
## Proportion of Variance 0.2111 0.1763 0.1217 0.08365 0.06731 0.06573
0.06237
## Cumulative Proportion  0.2111 0.3874 0.5091 0.59272 0.66003 0.72576
0.78813
```

```
##                         PC8     PC9    PC10   PC11    PC12
## Standard deviation    0.82041 0.77117 0.74181 0.6481 0.55169
## Proportion of Variance 0.05609 0.04956 0.04586 0.0350 0.02536
## Cumulative Proportion  0.84422 0.89378 0.93963 0.9746 1.00000

## Plot a biplot to view components on n-dimensional plane
biplot(movie_pca, scale = 0, main = 'Principal componets')
```
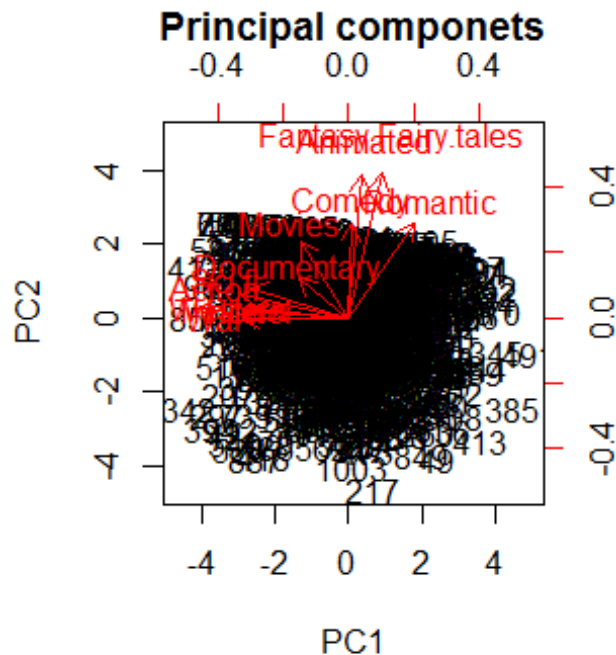


```
##scree plot - to identify the elbow point
plot(propvar_movie,xlab = 'Prinicipal component',ylab = 'Proporiton of
variance explained',type = 'b', main = 'Prop. of Variance')
```

Prop. of Variance


```
#The optimum number of components are ~ 5 i.e PC1 : PC5

# cumulative scree plot
plot(cumvar_movie,xlab = 'Principal component',ylab = 'Cumulative proportion
of variance explained',type = 'b', main = 'Cumulative Prop.of Variance')
```

Cumulative Prop.of Variance
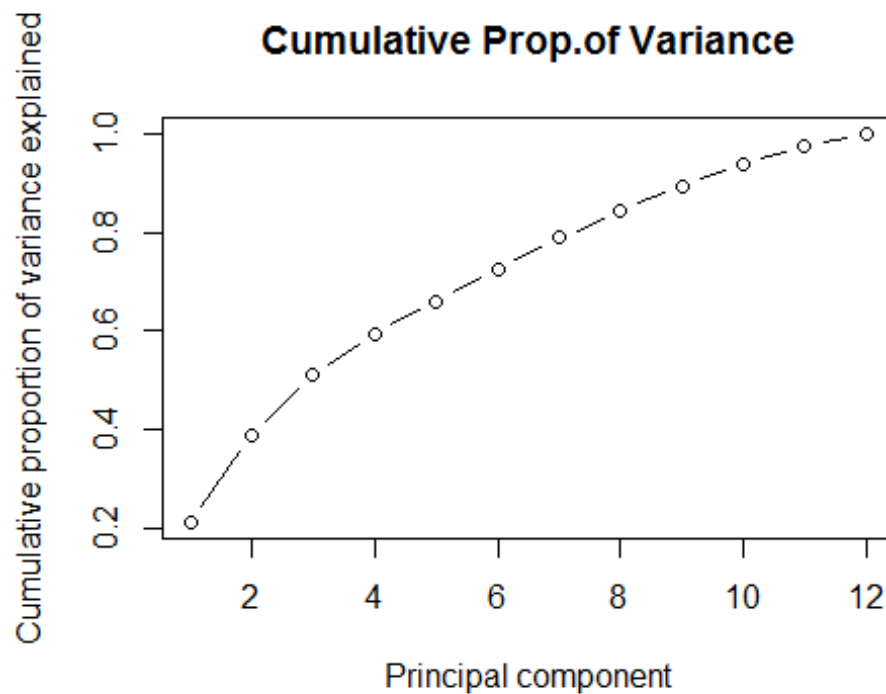

```r
#Approx: ~ 75% of the variance is explained by 8 components i.e PC1 to PC8

dim(music_data)

## [1] 1010    19

music_transformed <- data_transformed[,names(music_data)]
music_pca <- prcomp(music_transformed, scale= T)
names(music_pca)

## [1] "sdev"     "rotation" "center"    "scale"     "x"

#rotation - represents the loadings of each variables on components
music_pca$rotation

##                                 PC1         PC2         PC3         PC4
## Music                   -0.07348587 -0.06637258  0.20393520 -0.27285334
## Slow.songs.or.fast.songs  0.07909389 -0.03715789  0.33673187 -0.38692865
## Dance                    0.10593604 -0.40686613  0.25266992 -0.18809943
## Folk                    -0.23536427 -0.20395715 -0.17735902 -0.15261096
## Country                 -0.22165587 -0.16378995 -0.08826069 -0.07278389
## Classical.music         -0.33427216 -0.11363745 -0.22530674 -0.19648989
## Musical                 -0.21306339 -0.27761360 -0.19176926 -0.04813964
## Pop                      0.07948200 -0.36864939  0.10610310 -0.08628967
## Rock                    -0.31408320  0.16381242  0.24497619 -0.13760973
## Metal.or.Hardrock       -0.26788754  0.27493723  0.20888397 -0.20728971
## Punk                    -0.25877936  0.22880832  0.32746991 -0.01776324
## Hiphop..Rap              0.14668504 -0.28399372  0.32226482  0.21487767
```

```
## Reggae..Ska              -0.17063495 -0.13437788  0.33404941  0.51149310
## Swing..Jazz              -0.32246691 -0.16834386  0.02878952  0.30067030
## Rock.n.roll              -0.35567777 -0.02784195  0.15705958  0.11136720
## Alternative              -0.29273952  0.12627082  0.16107910  0.04377580
## Latino                   -0.11432176 -0.39837369 -0.03575959  0.17249177
## Techno..Trance            0.09648161 -0.23597716  0.27927306 -0.33307335
## Opera                    -0.28734109 -0.14638664 -0.29342147 -0.21923779
##                                 PC5         PC6         PC7         PC8
## Music                     0.32592753 -0.47761802  0.53270546 -0.19974554
## Slow.songs.or.fast.songs -0.07423270  0.07177854  0.12369657 -0.47694134
## Dance                    -0.05577652  0.06055365 -0.05942948  0.21887240
## Folk                     -0.26544668  0.20827679  0.30003736 -0.17663204
## Country                  -0.24305255  0.49366779  0.40798558  0.10106895
## Classical.music          -0.13812859 -0.25098533 -0.22358870 -0.01890419
## Musical                   0.32990755  0.04105766 -0.22303756 -0.29312977
## Pop                       0.46499371  0.15721120 -0.19059791  0.13285282
## Rock                      0.31499048  0.14180077 -0.08393359  0.20370011
## Metal.or.Hardrock        -0.07920439  0.21455617 -0.19275758 -0.01276431
## Punk                      0.03787992  0.19456396 -0.23696787 -0.16828955
## Hiphop..Rap              -0.14591724 -0.05330011 -0.16891849 -0.21654015
## Reggae..Ska              -0.18318806  0.01510496 -0.02608224 -0.33284595
## Swing..Jazz              -0.09855736 -0.27677329  0.06829684  0.13525914
## Rock.n.roll               0.15407054  0.08154945  0.17375175  0.27605014
## Alternative              -0.10328380 -0.37016042  0.05279782  0.17869982
## Latino                    0.16866976  0.09636174  0.05687371  0.07392996
## Techno..Trance           -0.40272503 -0.16159061 -0.17221071  0.36838201
## Opera                    -0.12224120 -0.15441720 -0.32365349 -0.21004774
##                                 PC9        PC10        PC11
PC12
## Music                     0.407713408 -0.08118246  0.163265029 -
0.046192469
## Slow.songs.or.fast.songs -0.626930018 -0.15449805 -0.117591247
0.142963357
## Dance                    -0.005060525  0.15836972 -0.001963950
0.034498068
## Folk                      0.101978314  0.59768376 -0.044187886
0.266968801
## Country                   0.187947460 -0.34757560 -0.176241400 -
0.296622461
## Classical.music           0.074840699 -0.11353868 -0.197110022
0.215496597
## Musical                  -0.127942176 -0.06550861  0.043660995 -
0.530976566
## Pop                       0.089375763  0.17576542 -0.360479495
0.206155249
## Rock                      0.093377372 -0.01603115  0.012947358
0.194189967
## Metal.or.Hardrock         0.095803135 -0.09200573  0.378608727
0.148009287
## Punk                      0.188934780  0.18211426 -0.009197961 -
```

```
                                              0.136728601
## Hiphop..Rap                 0.291127995 -0.19951768 -0.212893673
0.016816754
## Reggae..Ska                 0.109227439  0.09666073  0.055259444 -
0.033726863
## Swing..Jazz                -0.180981008 -0.25859960  0.011764742
0.393901884
## Rock.n.roll               -0.227212134 -0.21678701 -0.222790454 -
0.050344008
## Alternative               -0.252502677  0.43193360 -0.239920191 -
0.392991837
## Latino                    -0.233292591  0.10051712  0.644329108
0.009843656
## Techno..Trance             0.049583019 -0.05716672  0.202874089 -
0.232242161
## Opera                      0.098588439 -0.11619488  0.012943917
0.014313820
##                                   PC13        PC14        PC15
PC16
## Music                      0.049792397 -0.02112800 -0.021711972 -
0.024489556
## Slow.songs.or.fast.songs  0.003296287 -0.12450736  0.072331948 -
0.011696895
## Dance                      0.305288988  0.10278145 -0.636427969
0.312758934
## Folk                      -0.152396906  0.33786207  0.078929868 -
0.115326873
## Country                    0.033698701 -0.30836572  0.067818499
0.203982029
## Classical.music           -0.081254762 -0.22963497  0.078587122
0.183762909
## Musical                    0.012225873  0.44293088  0.107137446
0.250791103
## Pop                        0.039315867 -0.21197082  0.351688766 -
0.023506412
## Rock                      -0.019546117  0.05416288  0.143052503
0.071888142
## Metal.or.Hardrock         -0.239674138  0.16759903  0.028215133
0.274542443
## Punk                       0.158206848 -0.23587526 -0.223276307 -
0.151087803
## Hiphop..Rap               -0.650067679  0.07539266 -0.148338423 -
0.004739777
## Reggae..Ska                0.409507673 -0.01913020  0.255708315 -
0.040735037
## Swing..Jazz                0.161510400  0.13579529  0.038880226
0.271349720
## Rock.n.roll               -0.090920432  0.29860848 -0.205885619 -
0.545870152
## Alternative               -0.244048277 -0.23543333 -0.004240393
```

```
0.204720244
## Latino                      -0.277520061 -0.40294002 -0.040696024 -
0.117740140
## Techno..Trance               0.085649349  0.14642498  0.421244095 -
0.240536719
## Opera                        0.142288289 -0.17563687 -0.235717510 -
0.398788272
##                                      PC17          PC18         PC19
## Music                        -0.066875434  2.567921e-02  0.07345943
## Slow.songs.or.fast.songs      0.033053577 -1.410316e-02 -0.04974487
## Dance                         0.140182891 -2.906194e-02  0.11125996
## Folk                         -0.051850387 -3.490200e-02 -0.10739444
## Country                       0.006149017  9.814582e-02 -0.06497751
## Classical.music               0.028773192 -5.759827e-01  0.34337770
## Musical                      -0.066238082 -8.145992e-02 -0.07751286
## Pop                          -0.216265041  2.928257e-01  0.17206160
## Rock                          0.583382189 -1.360268e-01 -0.43938942
## Metal.or.Hardrock            -0.119696729  3.588220e-01  0.43444249
## Punk                         -0.523054151 -2.601956e-01 -0.25901292
## Hiphop..Rap                   0.056186635  8.017653e-03 -0.15671264
## Reggae..Ska                   0.302779309  9.179124e-05  0.28654917
## Swing..Jazz                  -0.369360329  1.762901e-01 -0.35365088
## Rock.n.roll                  -0.039227337 -8.664268e-02  0.31816965
## Alternative                   0.084954381  2.479808e-01  0.01148615
## Latino                        0.008442401 -1.256294e-01 -0.01498152
## Techno..Trance               -0.095918082 -8.103699e-02 -0.10837567
## Opera                         0.206245145  4.752428e-01 -0.12849210
```

```r
# Calculate the variance explained by each component
eigen_music <- music_pca$sdev^2
names(eigen_music) <- paste("PC",1:19,sep="")
eigen_music
```

```
##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
PC8
## 3.8053009 2.6634739 1.9555901 1.1307190 1.1176877 1.0349666 0.8881561
0.8590806
##       PC9      PC10      PC11      PC12      PC13      PC14      PC15
PC16
## 0.7991110 0.6495392 0.6424224 0.5720013 0.4996263 0.4616361 0.4427409
0.4127463
##      PC17      PC18      PC19
## 0.3801299 0.3576233 0.3274485
```

```r
sum_music <- sum(eigen_music)
sum_music
```

```
## [1] 19
```

```r
## Proportion of variance explained by each component
```

```
propvar_music <- eigen_music/sum_music
propvar_music

##        PC1        PC2        PC3        PC4        PC5        PC6
PC7
## 0.20027900 0.14018284 0.10292580 0.05951152 0.05882567 0.05447193
0.04674506
##        PC8        PC9       PC10       PC11       PC12       PC13
PC14
## 0.04521477 0.04205847 0.03418627 0.03381170 0.03010533 0.02629612
0.02429663
##       PC15       PC16       PC17       PC18       PC19
## 0.02330215 0.02172349 0.02000684 0.01882228 0.01723413

cumvar_music <- cumsum(propvar_music)
cumvar_music

##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
PC8
## 0.2002790 0.3404618 0.4433876 0.5028992 0.5617248 0.6161967 0.6629418
0.7081566
##       PC9      PC10      PC11      PC12      PC13      PC14      PC15
PC16
## 0.7502151 0.7844013 0.8182130 0.8483184 0.8746145 0.8989111 0.9222133
0.9439368
##      PC17      PC18      PC19
## 0.9639436 0.9827659 1.0000000

matlambdas_music <- rbind(eigen_music,propvar_music,cumvar_music)
rownames(matlambdas_music) <- c("Eigenvalues","Prop. variance","Cum. prop.
variance")
round(matlambdas_music,4)

##                        PC1    PC2    PC3    PC4    PC5    PC6    PC7
PC8
## Eigenvalues         3.8053 2.6635 1.9556 1.1307 1.1177 1.0350 0.8882
0.8591
## Prop. variance      0.2003 0.1402 0.1029 0.0595 0.0588 0.0545 0.0467
0.0452
## Cum. prop. variance 0.2003 0.3405 0.4434 0.5029 0.5617 0.6162 0.6629
0.7082
##                        PC9   PC10   PC11   PC12   PC13   PC14   PC15
PC16
## Eigenvalues         0.7991 0.6495 0.6424 0.5720 0.4996 0.4616 0.4427
0.4127
## Prop. variance      0.0421 0.0342 0.0338 0.0301 0.0263 0.0243 0.0233
0.0217
## Cum. prop. variance 0.7502 0.7844 0.8182 0.8483 0.8746 0.8989 0.9222
0.9439
##                       PC17   PC18   PC19
## Eigenvalues         0.3801 0.3576 0.3274
```

```
## Prop. variance      0.0200 0.0188 0.0172
## Cum. prop. variance 0.9639 0.9828 1.0000

summary(music_pca)

## Importance of components:
##                          PC1    PC2    PC3    PC4    PC5    PC6
PC7
## Standard deviation    1.9507 1.6320 1.3984 1.06335 1.05721 1.01733
0.94242
## Proportion of Variance 0.2003 0.1402 0.1029 0.05951 0.05883 0.05447
0.04675
## Cumulative Proportion  0.2003 0.3405 0.4434 0.50290 0.56172 0.61620
0.66294
##                          PC8    PC9   PC10   PC11   PC12   PC13
PC14
## Standard deviation    0.92687 0.89393 0.80594 0.80151 0.75631 0.7068
0.6794
## Proportion of Variance 0.04521 0.04206 0.03419 0.03381 0.03011 0.0263
0.0243
## Cumulative Proportion  0.70816 0.75022 0.78440 0.81821 0.84832 0.8746
0.8989
##                          PC15   PC16   PC17   PC18   PC19
## Standard deviation    0.6654 0.64245 0.61655 0.59802 0.57223
## Proportion of Variance 0.0233 0.02172 0.02001 0.01882 0.01723
## Cumulative Proportion  0.9222 0.94394 0.96394 0.98277 1.00000

## Plot a biplot to view components on n-dimensional plane
biplot(music_pca, scale = 0, main = 'Principal componets')
```
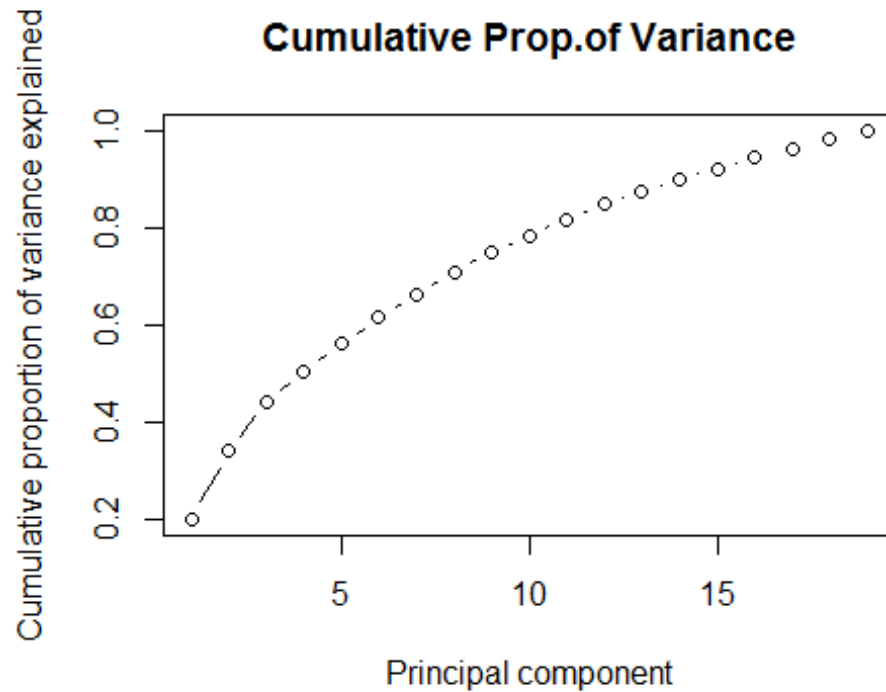
Principal componets


```
##scree plot - to identify the elbow point
plot(propvar_music,xlab = 'Prinicipal component',ylab = 'Proporiton of
variance explained',type = 'b', main = 'Prop. of Variance')
```

Prop. of Variance

```
#The optimum number of components are ~ 4 i.e PC1 : PC4

# cumulative scree plot
plot(cumvar_music,xlab = 'Principal component',ylab = 'Cumulative proportion
of variance explained',type = 'b', main = 'Cumulative Prop.of Variance')
```

Cumulative Prop.of Variance


```
#Approx: ~ 75% of the variance is explained by 8 components i.e PC1 to PC8
```