Assignment-6.R

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```
#Loading Packages
library(mvtnorm)

## Warning: package 'mvtnorm' was built under R version 3.6.3

library(dplyr)

##
## Attaching package: 'dplyr'

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

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

library(psych)

## Warning: package 'psych' was built under R version 3.6.3

#Loading dataset
dataset <-
read.csv("C:/Users/nidhi/OneDrive/Desktop/MVA/heart_failure_clinical_records_
dataset.csv")
View(dataset)
attach(dataset)

#Identifying different columns names
names(dataset)

##  [1] "age"                       "anaemia"
##  [3] "creatinine_phosphokinase" "diabetes"
##  [5] "ejection_fraction"         "high_blood_pressure"
##  [7] "platelets"                 "serum_creatinine"
##  [9] "serum_sodium"              "sex"
## [11] "smoking"                   "time"
## [13] "DEATH_EVENT"

#Data Summary
str(dataset)
```

```
## 'data.frame':    299 obs. of  13 variables:
##  $ age                     : num  75 55 65 50 65 90 75 60 65 80 ...
##  $ anaemia                 : int  0 0 0 1 1 1 1 1 0 1 ...
##  $ creatinine_phosphokinase: int  582 7861 146 111 160 47 246 315 157 123
...
##  $ diabetes                : int  0 0 0 0 1 0 0 1 0 0 ...
##  $ ejection_fraction       : int  20 38 20 20 20 40 15 60 65 35 ...
##  $ high_blood_pressure     : int  1 0 0 0 0 1 0 0 0 1 ...
##  $ platelets               : num  265000 263358 162000 210000 327000 ...
##  $ serum_creatinine        : num  1.9 1.1 1.3 1.9 2.7 2.1 1.2 1.1 1.5 9.4
...
##  $ serum_sodium            : int  130 136 129 137 116 132 137 131 138 133
...
##  $ sex                     : Factor w/ 2 levels "Female","male": 2 2 2 2 1
2 2 2 1 2 ...
##  $ smoking                 : int  0 0 1 0 0 1 0 1 0 1 ...
##  $ time                    : int  4 6 7 7 8 8 10 10 10 10 ...
##  $ DEATH_EVENT             : Factor w/ 2 levels "Death","No Death": 2 2 2
2 2 2 2 2 2 2 ...
```

```
summary(dataset)
```

```
##       age           anaemia       creatinine_phosphokinase
##  Min.   :40.00   Min.   :0.0000   Min.   :  23.0
##  1st Qu.:51.00   1st Qu.:0.0000   1st Qu.: 116.5
##  Median :60.00   Median :0.0000   Median : 250.0
##  Mean   :60.83   Mean   :0.4314   Mean   : 581.8
##  3rd Qu.:70.00   3rd Qu.:1.0000   3rd Qu.: 582.0
##  Max.   :95.00   Max.   :1.0000   Max.   :7861.0
##     diabetes      ejection_fraction high_blood_pressure   platelets
##  Min.   :0.0000   Min.   :14.00     Min.   :0.0000      Min.   : 25100
##  1st Qu.:0.0000   1st Qu.:30.00     1st Qu.:0.0000      1st Qu.:212500
##  Median :0.0000   Median :38.00     Median :0.0000      Median :262000
##  Mean   :0.4181   Mean   :38.08     Mean   :0.3512      Mean   :263358
##  3rd Qu.:1.0000   3rd Qu.:45.00     3rd Qu.:1.0000      3rd Qu.:303500
##  Max.   :1.0000   Max.   :80.00     Max.   :1.0000      Max.   :850000
##  serum_creatinine  serum_sodium       sex         smoking
##  Min.   :0.500    Min.   :113.0   Female:105   Min.   :0.0000
##  1st Qu.:0.900    1st Qu.:134.0   male  :194   1st Qu.:0.0000
##  Median :1.100    Median :137.0                Median :0.0000
##  Mean   :1.394    Mean   :136.6                Mean   :0.3211
##  3rd Qu.:1.400    3rd Qu.:140.0                3rd Qu.:1.0000
##  Max.   :9.400    Max.   :148.0                Max.   :1.0000
##       time         DEATH_EVENT
##  Min.   :  4.0   Death   :203
##  1st Qu.: 73.0   No Death: 96
##  Median :115.0
##  Mean   :130.3
##  3rd Qu.:203.0
##  Max.   :285.0
```

```r
head(dataset)
```

```
##   age anaemia creatinine_phosphokinase diabetes ejection_fraction
## 1  75       0                     582        0                20
## 2  55       0                    7861        0                38
## 3  65       0                     146        0                20
## 4  50       1                     111        0                20
## 5  65       1                     160        1                20
## 6  90       1                      47        0                40
##   high_blood_pressure platelets serum_creatinine serum_sodium    sex
## 1                   1    265000              1.9          130   male
## 2                   0    263358              1.1          136   male
## 3                   0    162000              1.3          129   male
## 4                   0    210000              1.9          137   male
## 5                   0    327000              2.7          116 Female
## 6                   1    204000              2.1          132   male
##   smoking time DEATH_EVENT
## 1       0    4    No Death
## 2       0    6    No Death
## 3       1    7    No Death
## 4       0    7    No Death
## 5       0    8    No Death
## 6       1    8    No Death
```

```r
dim(dataset)
```

```
## [1] 299  13
```

```r
#Checking for missing values
is.null(dataset)
```

```
## [1] FALSE
```

```r
##The "FALSE" output shows there is no missing data in the dataset.

#Correlation
correlation<-cor(dataset[c(1,3,5,7,8,9,12)])
View(correlation)
#From the table, we can see all the continuous variables are uncorrelated


#Principal components
dataset_pca <- prcomp(dataset[c(1,3,5,7,8,9,12)],scale=TRUE)
dataset_pca
```

```
## Standard deviations (1, .., p=7):
## [1] 1.2143198 1.0842469 1.0146325 0.9829678 0.9421964 0.8587448 0.8537882
##
## Rotation (n x k) = (7 x 7):
##                                PC1         PC2         PC3         PC4
## age                      0.4649617 -0.45213222  0.00779977  0.19809211
```

```
## creatinine_phosphokinase -0.1379593  0.19389349 -0.81505355  0.33440577
## ejection_fraction        -0.1788924 -0.68147830  0.10671326  0.01299509
## platelets                -0.1992576 -0.24678636 -0.40331735 -0.82095373
## serum_creatinine          0.5117770 -0.04569638 -0.10167226 -0.18226520
## serum_sodium             -0.4474108 -0.42971962 -0.11797610  0.36260682
## time                     -0.4806034  0.21428597  0.37056533 -0.10046937
##                                 PC5        PC6          PC7
## age                       0.1912135 -0.6341378  0.318421659
## creatinine_phosphokinase -0.2948224 -0.1008787  0.264832516
## ejection_fraction        -0.4694857  0.3913478  0.344177806
## platelets                 0.1807563 -0.1733047  0.007459381
## serum_creatinine         -0.6335802 -0.1069130 -0.528757042
## serum_sodium              0.1513990 -0.1865190 -0.641912443
## time                     -0.4461860 -0.5985695  0.135357997

#Recreating the summary table manually
(eigen_dataset <- dataset_pca$sdev^2)

## [1] 1.4745726 1.1755914 1.0294792 0.9662257 0.8877341 0.7374427 0.7289544

names(eigen_dataset) <- paste("PC",1:7,sep="")
eigen_dataset

##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
## 1.4745726 1.1755914 1.0294792 0.9662257 0.8877341 0.7374427 0.7289544

sumlambdas <- sum(eigen_dataset)
sumlambdas

## [1] 7

propvar <- eigen_dataset/sumlambdas
propvar

##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
## 0.2106532 0.1679416 0.1470685 0.1380322 0.1268192 0.1053490 0.1041363

cumvar_dataset <- cumsum(propvar)
cumvar_dataset

##       PC1       PC2       PC3       PC4       PC5       PC6       PC7
## 0.2106532 0.3785949 0.5256633 0.6636956 0.7905147 0.8958637 1.0000000

matlambdas <- rbind(eigen_dataset,propvar,cumvar_dataset)
rownames(matlambdas) <- c("Eigenvalues","Prop. variance","Cum. prop.
variance")
round(matlambdas,6)

##                            PC1      PC2      PC3      PC4      PC5      PC6
## Eigenvalues           1.474573 1.175591 1.029479 0.966226 0.887734 0.737443
## Prop. variance        0.210653 0.167942 0.147068 0.138032 0.126819 0.105349
## Cum. prop. variance 0.210653 0.378595 0.525663 0.663696 0.790515 0.895864
```

```
##                             PC7
## Eigenvalues           0.728954
## Prop. variance        0.104136
## Cum. prop. variance 1.000000
```

```
#Based on Option 2 rule, which says components whose Eigenvalues are larger
than 1 should be considered, so we need to keep PC1 through PC3
```

```
summary(dataset_pca)
```

```
## Importance of components:
##                            PC1    PC2    PC3    PC4    PC5    PC6    PC7
## Standard deviation     1.2143 1.0842 1.0146 0.9830 0.9422 0.8587 0.8538
## Proportion of Variance 0.2107 0.1679 0.1471 0.1380 0.1268 0.1053 0.1041
## Cumulative Proportion  0.2107 0.3786 0.5257 0.6637 0.7905 0.8959 1.0000
```

```
eigvec.heart<-dataset_pca$rotation
print(eigvec.heart)
```

```
##                                 PC1         PC2         PC3         PC4
## age                          0.4649617 -0.45213222  0.00779977  0.19809211
## creatinine_phosphokinase -0.1379593  0.19389349 -0.81505355  0.33440577
## ejection_fraction        -0.1788924 -0.68147830  0.10671326  0.01299509
## platelets                -0.1992576 -0.24678636 -0.40331735 -0.82095373
## serum_creatinine          0.5117770 -0.04569638 -0.10167226 -0.18226520
## serum_sodium             -0.4474108 -0.42971962 -0.11797610  0.36260682
## time                     -0.4806034  0.21428597  0.37056533 -0.10046937
##                                 PC5        PC6          PC7
## age                          0.1912135 -0.6341378  0.318421659
## creatinine_phosphokinase -0.2948224 -0.1008787  0.264832516
## ejection_fraction        -0.4694857  0.3913478  0.344177806
## platelets                 0.1807563 -0.1733047  0.007459381
## serum_creatinine         -0.6335802 -0.1069130 -0.528757042
## serum_sodium              0.1513990 -0.1865190 -0.641912443
## time                     -0.4461860 -0.5985695  0.135357997
```

```
# Taking the first three PCs to generate linear combinations for all the
variables with three factors
pcafactors.heart <- eigvec.heart[,1:3]
pcafactors.heart
```

```
##                                 PC1         PC2         PC3
## age                          0.4649617 -0.45213222  0.00779977
## creatinine_phosphokinase -0.1379593  0.19389349 -0.81505355
## ejection_fraction        -0.1788924 -0.68147830  0.10671326
## platelets                -0.1992576 -0.24678636 -0.40331735
## serum_creatinine          0.5117770 -0.04569638 -0.10167226
## serum_sodium             -0.4474108 -0.42971962 -0.11797610
## time                     -0.4806034  0.21428597  0.37056533
```

```r
# Multiplying each column of the eigenvector's matrix by the square-root of
the corresponding eigenvalue in order to get the factor loadings
unrot.fact.heart <-
sweep(pcafactors.heart,MARGIN=2,dataset_pca$sdev[1:3],`*`)
unrot.fact.heart
```

```
##                                PC1         PC2          PC3
## age                         0.5646122 -0.49022298  0.007913901
## creatinine_phosphokinase -0.1675268  0.21022842 -0.826979846
## ejection_fraction        -0.2172326 -0.73889076  0.108274741
## platelets                -0.2419625 -0.26757736 -0.409218900
## serum_creatinine          0.6214609 -0.04954616 -0.103159985
## serum_sodium             -0.5432998 -0.46592218 -0.119702387
## time                     -0.5836063  0.23233891  0.375987635
```

```r
# Computing communalities
communalities.heart <- rowSums(unrot.fact.heart^2)
communalities.heart
```

```
##                      age creatinine_phosphokinase        ejection_fraction
##                0.5591682                0.7561569                0.6048730
##                platelets         serum_creatinine             serum_sodium
##                0.2976036                0.3993105                0.5265868
##                     time
##                0.5359443
```

```r
# Performing the varimax rotation. The default in the varimax function is
norm=TRUE thus, Kaiser normalization is carried out
rot.fact.heart <- varimax(unrot.fact.heart)
View(unrot.fact.heart)
rot.fact.heart
```

```
## $loadings
##
## Loadings:
##                          PC1    PC2    PC3
## age                       0.696 -0.185  0.200
## creatinine_phosphokinase                -0.864
## ejection_fraction               -0.755  0.157
## platelets                       -0.357 -0.412
## serum_creatinine          0.586  0.232
## serum_sodium             -0.240 -0.663 -0.173
## time                     -0.702         0.201
##
##                  PC1   PC2   PC3
## SS loadings    1.390 1.235 1.054
## Proportion Var 0.199 0.176 0.151
## Cumulative Var 0.199 0.375 0.526
##
## $rotmat
##            [,1]      [,2]       [,3]
```

```
## [1,]  0.8660041 0.4477622  0.2225891
## [2,] -0.4270706 0.8938525 -0.1365226
## [3,] -0.2600915 0.0231679  0.9653060
```

```
# The print method of varimax omits loadings less than abs(0.1). In order to
display all the loadings, it is necessary to ask explicitly the contents of
the object $loadings
fact.load.heart <- rot.fact.heart$loadings[1:7,1:3]
fact.load.heart
```

```
##                                PC1         PC2         PC3
## age                        0.69625801 -0.18519166  0.20024241
## creatinine_phosphokinase -0.01977081  0.09374166 -0.86427917
## ejection_fraction          0.09927290 -0.75521937  0.15703997
## platelets                  0.01116830 -0.35699707 -0.41234930
## serum_creatinine           0.58617844  0.23158975  0.04551365
## serum_sodium              -0.24038458 -0.66250806 -0.17287312
## time                      -0.70242172 -0.04492927  0.20131920
```

```
# Computing the rotated factor scores for the 299 Patients
scale.heart <- scale(dataset[c(1,3,5,7,8,9,12)])
scale.heart
```

```
##                age creatinine_phosphokinase ejection_fraction
##   [1,]  1.19094867              0.000165451      -1.527997920
##   [2,] -0.49045705              7.502062717      -0.007064906
##   [3,]  0.35024581             -0.449185725      -1.527997920
##   [4,] -0.91080848             -0.485257493      -1.527997920
##   [5,]  0.35024581             -0.434757017      -1.527997920
##   [6,]  2.45200296             -0.551217299       0.161927651
##   [7,]  1.19094867             -0.346123528      -1.950479313
##   [8,] -0.07010562             -0.275010613       1.851853222
##   [9,]  0.35024581             -0.437848883       2.274334615
##  [10,]  1.61130010             -0.472890030      -0.260553742
##  [11,]  1.19094867             -0.516176152      -0.007064906
##  [12,]  0.09803495             -0.361582858      -1.105516528
##  [13,] -1.33115991              0.411383614      -0.683035135
##  [14,] -0.91080848             -0.426512042      -0.007064906
##  [15,] -0.99487877             -0.517206774      -0.683035135
##  [16,]  1.77944067             -0.209050807       1.006890437
##  [17,]  2.19979210             -0.446093859      -0.007064906
##  [18,] -1.33115991              0.000165451      -2.034975592
##  [19,]  0.77059724             -0.470828786      -1.105516528
##  [20,] -1.07894905              0.000165451       1.429371829
##  [21,]  0.35024581             -0.546064189      -1.105516528
##  [22,]  0.35024581             -0.467736920      -0.683035135
##  [23,]  0.60245667             -0.372919699      -0.260553742
##  [24,] -0.65859762             -0.534727348       1.851853222
##  [25,]  1.19094867              0.000165451      -0.683035135
##  [26,]  1.61130010             -0.447124481      -0.007064906
##  [27,]  2.87235439             -0.484226871       0.161927651
```

```
##  [28,]  0.77059724 -0.473920652  0.584409044
##  [29,] -0.23824619 -0.537819214 -0.007064906
##  [30,]  1.77944067 -0.527512994 -0.683035135
##  [31,]  2.78828410  0.000165451 -0.007064906
##  [32,]  2.03165153 -0.575952226  0.584409044
##  [33,] -0.91080848 -0.343031663 -0.260553742
##  [34,] -0.91080848 -0.435787639 -0.683035135
##  [35,]  0.35024581 -0.502778067  1.006890437
##  [36,]  0.68652695  0.000165451 -0.260553742
##  [37,]  2.45200296 -0.537819214  1.006890437
##  [38,]  1.77944067  0.281525247  1.006890437
##  [39,] -0.07010562  2.137675402 -0.683035135
##  [40,] -0.07010562 -0.357460370 -0.007064906
##  [41,]  0.77059724  0.000165451 -1.527997920
##  [42,] -0.91080848 -0.471859408 -0.683035135
##  [43,]  0.77059724 -0.011171391  0.584409044
##  [44,]  0.93873781 -0.468767542  1.006890437
##  [45,] -0.07010562  0.006349183  1.851853222
##  [46,] -0.91080848  0.000165451 -0.007064906
##  [47,] -0.82673819  0.822601777 -1.105516528
##  [48,] -0.07010562  0.000165451 -0.007064906
##  [49,]  1.61130010 -0.029722586 -1.527997920
##  [50,] -0.32231648 -0.466706298 -0.683035135
##  [51,]  0.60245667 -0.004987659 -1.105516528
##  [52,] -0.65859762 -0.505869933 -1.527997920
##  [53,] -0.07010562  3.485728929  2.020845779
##  [54,]  0.77059724 -0.528543616  1.006890437
##  [55,] -0.07010562 -0.331694821 -0.007064906
##  [56,]  2.87235439 -0.217295783 -0.683035135
##  [57,]  0.77059724 -0.522359884 -0.260553742
##  [58,] -0.07010562  0.025931000  0.161927651
##  [59,] -0.99487877  0.213504197 -1.527997920
##  [60,]  0.93873781 -0.224510137 -1.527997920
##  [61,] -1.33115991  7.338193825 -1.105516528
##  [62,] -0.91080848 -0.271918747  0.161927651
##  [63,] -0.49045705 -0.487318737 -0.260553742
##  [64,] -1.33115991  0.000165451 -0.260553742
##  [65,] -1.33115991  0.000165451  3.541778793
##  [66,] -0.07010562 -0.529574238 -1.527997920
##  [67,] -1.58337077 -0.342001041 -1.950479313
##  [68,]  0.93873781 -0.486288115 -1.105516528
##  [69,]  0.77059724 -0.433726395 -1.105516528
##  [70,]  0.35024581 -0.483196249 -1.105516528
##  [71,] -1.66744105 -0.447124481  0.161927651
##  [72,] -0.23824619  0.000165451 -0.260553742
##  [73,]  2.03165153  5.462461853 -0.260553742
##  [74,]  0.35024581 -0.368797212  1.006890437
##  [75,]  0.68652695  0.000165451 -1.527997920
##  [76,] -0.07010562 -0.551217299 -1.527997920
##  [77,]  0.77059724 -0.504839311  1.851853222
```

```
##  [78,] -1.58337077           -0.494533091      0.161927651
##  [79,]  1.19094867           -0.390440273     -0.007064906
##  [80,] -0.49045705           -0.253367552      0.584409044
##  [81,]  0.77059724           -0.528543616      0.161927651
##  [82,]  0.51838638            0.000165451      1.006890437
##  [83,] -0.07010562           -0.521329262     -1.105516528
##  [84,]  1.52722981           -0.542972323      1.006890437
##  [85,] -0.15417591           -0.311082382     -1.105516528
##  [86,] -0.82673819           -0.519268018      1.006890437
##  [87,] -0.49045705           -0.551217299     -0.260553742
##  [88,]  0.35024581           -0.529574238      1.851853222
##  [89,] -1.41523020           -0.513084286      0.161927651
##  [90,] -0.32231648           -0.481135006     -1.105516528
##  [91,]  0.77059724           -0.531635482      0.584409044
##  [92,] -0.07010562            0.324811369      0.584409044
##  [93,] -1.58337077            0.000165451      1.851853222
##  [94,] -0.07010562           -0.440940749     -1.105516528
##  [95,] -0.23824619           -0.451246969     -0.007064906
##  [96,] -0.23824619           -0.462583810      1.851853222
##  [97,]  0.18210524           -0.069916842     -1.105516528
##  [98,]  0.77059724           -0.538849835      1.851853222
##  [99,] -0.07010562           -0.438879505     -1.105516528
## [100,]  0.18210524           -0.536788592      0.161927651
## [101,]  0.35024581           -0.285316833     -1.105516528
## [102,]  1.19094867            0.000165451      0.584409044
## [103,]  1.61130010            0.325841991     -1.105516528
## [104,] -1.58337077            4.768853272     -0.683035135
## [105,] -0.07010562           -0.545033567      1.006890437
## [106,]  0.93873781           -0.261612528     -0.683035135
## [107,] -0.49045705            0.171248697      0.584409044
## [108,] -1.33115991            1.333790271     -0.260553742
## [109,]  0.18210524            0.365005626     -0.007064906
## [110,] -1.33115991           -0.298714918     -0.260553742
## [111,]  2.03165153           -0.466706298      1.851853222
## [112,] -0.49045705           -0.537819214     -0.260553742
## [113,] -0.91080848           -0.219357027     -1.105516528
## [114,]  0.77059724           -0.452277591      1.851853222
## [115,] -0.07010562            0.177432429      0.161927651
## [116,] -0.23824619           -0.187407746      0.161927651
## [117,] -0.07010562           -0.500716823      1.851853222
## [118,]  2.03165153           -0.494533091      1.851853222
## [119,]  0.35024581           -0.483196249      1.851853222
## [120,]  2.11572181            0.000165451     -0.007064906
## [121,] -0.07010562            0.159911855      1.851853222
## [122,]  0.43431609           -0.529574238     -0.007064906
## [123,] -0.07010562           -0.500716823     -0.007064906
## [124,] -0.07010562            0.000165451     -0.683035135
## [125,] -0.07010562            0.000165451      0.161927651
## [126,] -1.49930048           -0.230693869      1.006890437
## [127,] -1.24708962           -0.426512042     -1.781486756
```

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## [128,] -0.23824619 -0.393532139  1.851853222
## [129,]  0.01396466 -0.344062285 -0.683035135
## [130,] -0.65859762 -0.321388601 -0.260553742
## [131,] -0.65859762  1.263707977  1.851853222
## [132,] -0.07010562  0.515476432  0.584409044
## [133,] -1.24708962  0.141360660  0.161927651
## [134,]  0.18210524 -0.400746492  1.851853222
## [135,]  1.69537038  4.079367179 -0.260553742
## [136,]  1.19094867  0.000165451  0.161927651
## [137,]  0.35024581 -0.538849835  1.851853222
## [138,]  0.60245667  0.066125257 -1.105516528
## [139,]  0.09803495 -0.310051760 -0.260553742
## [140,] -0.91080848  0.995746267 -0.683035135
## [141,]  1.61130010  0.229994149 -0.007064906
## [142,] -1.24708962 -0.299745540 -0.260553742
## [143,] -0.91080848 -0.102896745 -0.683035135
## [144,]  0.01396466 -0.513084286  0.161927651
## [145,]  0.93873781  0.372219980 -1.105516528
## [146,] -0.91080848 -0.408991468 -0.683035135
## [147,] -0.74266791 -0.463614432 -0.683035135
## [148,]  0.26617552  1.059644829  1.851853222
## [149,]  1.19094867  0.000165451 -0.683035135
## [150,] -0.07010562  1.730579726 -0.260553742
## [151,]  0.93873781 -0.359521614  0.584409044
## [152,]  0.09803495 -0.568737872  1.851853222
## [153,] -0.91080848 -0.481135006  0.584409044
## [154,] -0.91080848  1.302871612 -0.260553742
## [155,]  0.35024581 -0.254398174 -0.260553742
## [156,] -0.07010562 -0.361582858 -1.105516528
## [157,] -0.74266791 -0.539880457 -0.260553742
## [158,] -0.91080848 -0.342001041 -1.105516528
## [159,]  2.03165153  0.338209455  1.006890437
## [160,] -0.15417591 -0.466706298  0.584409044
## [161,]  0.43431609 -0.525451750  0.161927651
## [162,] -1.33115991 -0.465675676 -0.260553742
## [163,]  0.18210524  0.000165451  0.161927651
## [164,] -0.91080848  1.805815130 -0.260553742
## [165,] -1.33115991  1.917122302 -0.683035135
## [166,]  1.61130010  0.200106112 -0.007064906
## [167,] -0.65859762 -0.397654627  1.851853222
## [168,] -0.15417591 -0.531635482 -1.527997920
## [169,]  0.35024581  0.000165451  0.161927651
## [170,]  0.77059724  0.260912808 -0.260553742
## [171,] -0.82673819  0.000165451 -0.260553742
## [172,] -0.74266791  3.487790173  0.161927651
## [173,]  0.77059724 -0.423420176  1.851853222
## [174,] -0.91080848 -0.481135006 -1.527997920
## [175,]  0.35024581 -0.395593383 -0.260553742
## [176,] -0.07010562 -0.501747445  1.851853222
## [177,]  0.68652695  0.862796034  0.161927651
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## [178,] -0.99487877 -0.528543616  1.006890437
## [179,]  0.18210524 -0.473920652  1.851853222
## [180,] -0.49045705  0.260912808  0.161927651
## [181,] -1.75151134 -0.107019233 -0.683035135
## [182,] -0.15417591 -0.418267066 -1.105516528
## [183,]  0.35024581 -0.192560856 -1.105516528
## [184,]  1.19094867 -0.497624957 -0.007064906
## [185,] -0.23824619 -0.450216347 -1.105516528
## [186,] -0.01403074 -0.492471847 -0.683035135
## [187,] -0.91080848  0.000165451  1.006890437
## [188,] -0.07010562  1.354402710 -1.105516528
## [189,] -0.01403074 -0.444032615  0.161927651
## [190,] -1.75151134 -0.348184772  0.584409044
## [191,]  1.61130010  0.000165451 -0.260553742
## [192,]  0.26617552 -0.535757970  1.851853222
## [193,] -0.91080848 -0.474951274  0.161927651
## [194,]  1.02280810 -0.361582858 -0.683035135
## [195,] -1.33115991  0.000165451 -1.527997920
## [196,]  1.35908924 -0.168856551  0.584409044
## [197,] -1.33115991  0.000165451 -0.007064906
## [198,]  0.35024581 -0.427542664 -0.683035135
## [199,] -0.91080848  0.000165451 -1.527997920
## [200,] -0.07010562  0.648426666 -0.260553742
## [201,]  0.18210524  1.221452477  0.584409044
## [202,] -1.33115991 -0.282224967  1.851853222
## [203,]  0.77059724 -0.499686201  1.851853222
## [204,] -0.07010562 -0.538849835 -1.105516528
## [205,]  1.44315953 -0.533696726  0.161927651
## [206,] -0.91080848 -0.427542664  0.584409044
## [207,] -1.75151134 -0.495563713  0.161927651
## [208,]  2.03165153 -0.381164675 -0.007064906
## [209,] -0.07010562  1.751192166  0.161927651
## [210,] -0.99487877  0.402108016 -0.260553742
## [211,]  0.77059724 -0.381164675 -1.781486756
## [212,] -0.91080848  0.000165451  2.020845779
## [213,]  1.44315953 -0.368797212  1.006890437
## [214,] -1.07894905 -0.464645054 -0.683035135
## [215,]  0.35024581 -0.460522566 -0.260553742
## [216,]  1.02280810  0.000165451 -0.260553742
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## [219,]  0.60245667  0.452608493 -0.260553742
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## [223,] -1.58337077 -0.511023042 -0.260553742
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## [227,] -0.23824619 -0.540911079 -1.105516528
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## [228,] -0.49045705  2.279901233 -0.260553742
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## [234,] -0.65859762  0.128993196 -0.007064906
## [235,] -0.65859762  0.000165451  0.584409044
## [236,]  1.35908924 -0.487318737  1.006890437
## [237,]  1.19094867 -0.477012518  1.006890437
## [238,]  0.77059724 -0.360552236 -0.683035135
## [239,]  0.35024581  0.142391282  0.161927651
## [240,] -0.49045705 -0.414144578  0.584409044
## [241,]  0.77059724 -0.516176152 -0.260553742
## [242,]  0.35024581  0.000165451 -0.683035135
## [243,] -1.75151134 -0.506900555 -0.260553742
## [244,]  1.02280810  0.621630495  0.161927651
## [245,] -0.57452734  0.000165451 -0.007064906
## [246,]  0.01396466 -0.517206774 -0.007064906
## [247,] -0.49045705  1.479107967 -1.105516528
## [248,]  0.26617552 -0.452277591 -1.105516528
## [249,] -1.75151134  0.043451573 -0.260553742
## [250,] -0.65859762 -0.386317785  0.161927651
## [251,] -0.91080848  1.999572059 -0.683035135
## [252,] -0.49045705 -0.010140769 -0.260553742
## [253,] -0.91080848 -0.347154150  0.584409044
## [254,]  0.77059724 -0.508961799 -0.260553742
## [255,] -0.65859762 -0.139999136  1.851853222
## [256,] -0.74266791 -0.402807736 -0.683035135
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## [260,] -0.65859762 -0.541941701  1.006890437
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## [262,]  0.09803495  0.075400854  0.161927651
## [263,]  0.35024581 -0.333756065 -1.105516528
## [264,]  0.60245667 -0.437848883  1.851853222
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## [266,] -0.91080848 -0.292531186 -0.260553742
## [267,] -0.49045705  0.636059202 -1.527997920
## [268,] -0.40638676 -0.460522566 -0.007064906
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## [271,] -1.41523020  0.000165451 -0.683035135
## [272,] -0.82673819  0.000165451  0.161927651
## [273,]  0.51838638 -0.380134053 -0.007064906
## [274,] -1.58337077 -0.533696726  0.161927651
## [275,] -0.07010562 -0.334786687 -0.683035135
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## [277,]  0.77059724  0.037267842 -0.260553742
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## [278,]  0.77059724              0.000165451      -0.007064906
## [279,] -0.91080848              0.483527152      -0.683035135
## [280,] -0.49045705             -0.513084286      -0.007064906
## [281,]  0.77059724              2.177869658       0.161927651
## [282,]  0.77059724              0.000165451       0.161927651
## [283,] -1.58337077             -0.533696726      -0.683035135
## [284,]  0.35024581              1.140033342      -0.007064906
## [285,] -0.91080848             -0.544002945       0.161927651
## [286,] -0.49045705             -0.424450798       0.161927651
## [287,] -0.07010562             -0.338909175      -0.260553742
## [288,] -1.33115991              0.000165451       1.429371829
## [289,]  0.35024581              0.319658259      -0.260553742
## [290,]  2.45200296             -0.252336930      -0.007064906
## [291,] -1.33115991              0.034175976       1.429371829
## [292,] -0.07010562             -0.269857503      -0.260553742
## [293,] -0.74266791             -0.403838358      -0.007064906
## [294,]  0.18210524             -0.493502469      -0.260553742
## [295,]  0.09803495             -0.536788592      -0.007064906
## [296,] -0.49045705              1.276075441      -0.007064906
## [297,] -1.33115991              1.523424712       1.851853222
## [298,] -1.33115991              1.887234265      -0.007064906
## [299,] -0.91080848             -0.397654627       0.584409044
##            platelets serum_creatinine serum_sodium         time
##   [1,]  1.678834e-02      0.489236808  -1.50151891 -1.626775212
##   [2,]  7.523048e-09     -0.284076114  -0.14173853 -1.601006734
##   [3,] -1.036336e+00     -0.090747883  -1.72814897 -1.588122495
##   [4,] -5.455595e-01      0.489236808   0.08489153 -1.588122495
##   [5,]  6.507077e-01      1.262549729  -4.67433977 -1.575238256
##   [6,] -6.069065e-01      0.682565038  -1.04825878 -1.575238256
##   [7,] -1.394193e+00     -0.187411999   0.08489153 -1.549469778
##   [8,]  1.949220e+00     -0.284076114  -1.27488884 -1.549469778
##   [9,]  7.523048e-09      0.102580347   0.31152159 -1.549469778
##  [10,]  1.274403e+00      7.739045447  -0.82162872 -1.549469778
##  [11,]  1.069912e+00      2.519183227  -1.27488884 -1.549469778
##  [12,] -1.059057e-01     -0.477404344   0.76478171 -1.549469778
##  [13,] -1.302173e+00     -0.284076114   0.08489153 -1.536585539
##  [14,]  1.292579e-01     -0.284076114   0.08489153 -1.536585539
##  [15,]  1.673158e+00     -0.380740229   0.31152159 -1.523701300
##  [16,] -2.212154e+00     -0.090747883  -0.14173853 -1.510817061
##  [17,] -1.388518e-02     -0.477404344   0.76478171 -1.497932822
##  [18,] -9.954377e-01     -0.574068459  -2.18140909 -1.497932822
##  [19,] -2.694978e-01     -0.380740229   0.76478171 -1.485048583
##  [20,] -1.803174e+00      0.489236808  -3.54118946 -1.485048583
##  [21,]  1.292579e-01     -0.090747883   0.08489153 -1.472164344
##  [22,]  3.439725e-01      0.199244462  -0.14173853 -1.420627389
##  [23,]  2.621765e-01     -0.477404344   0.76478171 -1.420627389
##  [24,]  1.069912e+00     -0.574068459  -0.36836860 -1.394858911
##  [25,]  7.523048e-09      0.421571927  -0.59499866 -1.381974672
##  [26,] -1.169254e+00      0.489236808   1.67130196 -1.381974672
##  [27,] -6.887026e-01     -0.380740229   0.31152159 -1.369090433
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##  [28,]  2.110540e-01     -0.090747883  -0.14173853 -1.343321955
##  [29,] -1.128356e+00      4.259137300  -0.59499866 -1.343321955
##  [30,] -6.478045e-01     -0.187411999  -1.04825878 -1.343321955
##  [31,]  7.523048e-09      0.421571927  -0.59499866 -1.330437716
##  [32,]  9.881164e-01      1.552542075  -1.04825878 -1.317553477
##  [33,]  5.689117e-01     -0.380740229  -1.95477903 -1.317553477
##  [34,]  3.950951e-01     -0.187411999   0.31152159 -1.304669238
##  [35,] -7.704986e-01     -0.380740229   0.76478171 -1.304669238
##  [36,] -3.615184e-01      2.035862651  -0.59499866 -1.291784999
##  [37,] -3.819674e-01     -0.380740229  -0.59499866 -1.291784999
##  [38,]  5.893607e-01     -0.380740229   1.89793202 -1.291784999
##  [39,]  4.257686e-01      0.875893269   0.08489153 -1.291784999
##  [40,]  6.711567e-01      1.552542075   1.21804184 -1.291784999
##  [41,]  7.523048e-09      0.421571927  -0.59499866 -1.278900760
##  [42,] -1.128356e+00     -0.187411999  -0.14173853 -1.266016521
##  [43,] -8.011721e-01     -0.187411999   0.53815165 -1.253132283
##  [44,] -4.637634e-01     -0.380740229  -0.59499866 -1.253132283
##  [45,] -7.091516e-01     -0.284076114   1.21804184 -1.253132283
##  [46,]  4.768911e-01      0.489236808  -0.36836860 -1.227363805
##  [47,]  7.813538e-02     -0.477404344  -1.50151891 -1.188711088
##  [48,]  1.918546e+00     -0.767396690   0.31152159 -1.162942610
##  [49,] -1.261275e+00      2.905839687  -0.82162872 -1.150058371
##  [50,]  1.345974e+00     -0.380740229   0.76478171 -1.137174132
##  [51,] -9.954377e-01     -0.380740229   0.31152159 -1.124289893
##  [52,]  1.581138e+00      0.005916232   0.53815165 -1.124289893
##  [53,]  7.523048e-09      5.225778452   2.12456209 -1.124289893
##  [54,]  8.960958e-01     -0.380740229  -0.59499866 -1.111405654
##  [55,] -8.545672e-02      0.779229153  -1.04825878 -1.098521415
##  [56,]  2.020792e+00      0.585900923  -1.04825878 -1.034100221
##  [57,] -4.126409e-01      1.262549729   0.31152159 -0.982563265
##  [58,] -4.842125e-01     -0.767396690   0.31152159 -0.982563265
##  [59,]  5.689117e-01     -0.284076114  -0.14173853 -0.969679026
##  [60,] -9.568123e-02     -0.090747883  -0.14173853 -0.918142070
##  [61,]  1.294852e+00     -0.380740229   0.53815165 -0.905257831
##  [62,] -4.842125e-01      0.875893269  -1.27488884 -0.905257831
##  [63,] -9.568123e-02     -0.284076114   0.53815165 -0.905257831
##  [64,]  1.243729e+00     -0.380740229   1.89793202 -0.892373592
##  [65,]  7.523048e-09     -0.206744822   0.08489153 -0.866605114
##  [66,] -1.475990e+00      1.455877960  -2.18140909 -0.853720876
##  [67,] -5.148860e-01     -0.090747883  -0.14173853 -0.840836637
##  [68,]  1.088089e-01     -0.380740229   0.76478171 -0.840836637
##  [69,] -1.979263e-01     -0.187411999   1.21804184 -0.827952398
##  [70,]  2.388874e+00      0.421571927  -0.36836860 -0.815068159
##  [71,]  1.131259e+00     -0.574068459   0.76478171 -0.802183920
##  [72,] -1.445316e+00     -0.477404344   0.53815165 -0.763531203
##  [73,] -2.081508e-01     -0.380740229  -1.04825878 -0.750646964
##  [74,] -1.169254e+00     -0.090747883   0.08489153 -0.750646964
##  [75,]  2.701285e-02     -0.187411999  -0.59499866 -0.737762725
##  [76,] -6.069065e-01     -0.670732575   0.53815165 -0.737762725
##  [77,]  5.484626e-01     -0.574068459   0.76478171 -0.724878486
```

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##  [78,] -2.694978e-01     -0.187411999   0.76478171 -0.724878486
##  [79,]  2.008294e-01     -0.767396690  -1.27488884 -0.724878486
##  [80,]  6.200342e-01     -0.477404344   0.76478171 -0.724878486
##  [81,]  3.030745e-01      0.295908577  -0.14173853 -0.711994247
##  [82,]  7.523048e-09     -0.206744822   0.08489153 -0.699110008
##  [83,] -6.887026e-01      1.069221499  -1.04825878 -0.686225769
##  [84,] -9.340907e-01      0.392572693  -0.82162872 -0.673341530
##  [85,]  3.950951e-01     -0.380740229   0.99141178 -0.673341530
##  [86,]  1.458444e+00     -0.670732575   0.76478171 -0.660457292
##  [87,] -9.238662e-01     -0.284076114   0.08489153 -0.660457292
##  [88,]  4.155441e-01     -0.574068459   0.76478171 -0.660457292
##  [89,] -2.899468e-01     -0.670732575   0.53815165 -0.660457292
##  [90,] -8.420702e-01     -0.284076114   1.67130196 -0.660457292
##  [91,] -1.468038e-01     -0.574068459  -0.14173853 -0.647573053
##  [92,]  3.439725e-01     -0.380740229  -0.82162872 -0.647573053
##  [93,]  7.523048e-09     -0.206744822   0.08489153 -0.621804575
##  [94,] -5.455595e-01      0.295908577  -0.36836860 -0.621804575
##  [95,]  6.507077e-01     -0.670732575   1.21804184 -0.608920336
##  [96,] -4.535389e-01     -0.380740229   0.99141178 -0.608920336
##  [97,] -9.568123e-02     -0.090747883  -0.59499866 -0.608920336
##  [98,] -8.545672e-02     -0.284076114  -0.14173853 -0.583151858
##  [99,]  5.586872e-01     -0.187411999   0.08489153 -0.583151858
## [100,] -4.330899e-01     -0.284076114   0.76478171 -0.570267619
## [101,]  3.541970e-01     -0.284076114   0.99141178 -0.557383380
## [102,]  7.523048e-09     -0.206744822   0.08489153 -0.557383380
## [103,] -1.169254e+00     -0.284076114   1.67130196 -0.557383380
## [104,] -3.819674e-01     -0.380740229   0.76478171 -0.557383380
## [105,]  2.315030e-01      0.875893269   1.44467190 -0.557383380
## [106,]  3.656712e+00      0.295908577   0.31152159 -0.544499141
## [107,] -3.660672e-03     -0.090747883   0.08489153 -0.544499141
## [108,] -3.819674e-01     -0.477404344   0.31152159 -0.544499141
## [109,]  4.155441e-01     -0.284076114  -0.82162872 -0.544499141
## [110,]  5.998124e+00     -0.090747883   1.21804184 -0.544499141
## [111,]  4.359931e-01     -0.187411999  -1.04825878 -0.518730663
## [112,] -3.615184e-01     -0.187411999  -0.36836860 -0.518730663
## [113,] -1.161302e-01      0.199244462  -0.14173853 -0.518730663
## [114,]  8.960958e-01     -0.090747883   0.08489153 -0.518730663
## [115,]  6.609322e-01     -0.187411999  -2.40803915 -0.505846424
## [116,] -1.015887e+00     -0.380740229   0.53815165 -0.505846424
## [117,]  7.813538e-02     -0.670732575  -0.14173853 -0.467193707
## [118,]  2.491119e+00      1.745870305   0.31152159 -0.467193707
## [119,] -6.171310e-01     -0.477404344   0.76478171 -0.467193707
## [120,]  7.523048e-09      0.421571927  -0.59499866 -0.454309469
## [121,] -5.455595e-01      0.102580347  -0.36836860 -0.454309469
## [122,] -1.036336e+00     -0.380740229  -0.14173853 -0.454309469
## [123,] -3.615184e-01     -0.622400517   0.76478171 -0.454309469
## [124,] -1.394193e+00     -0.477404344   1.89793202 -0.454309469
## [125,] -4.739879e-01      2.229190881  -0.59499866 -0.441425230
## [126,] -2.694978e-01     -0.090747883  -0.36836860 -0.428540991
## [127,]  7.813538e-02      0.682565038  -2.86129928 -0.389888274
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## [128,]  3.746460e-01     -0.574068459   0.08489153 -0.338351318
## [129,]  3.723735e-02     -0.670732575  -0.14173853 -0.338351318
## [130,] -3.717429e-01      1.939198536   1.89793202 -0.325467079
## [131,] -1.468038e-01     -0.670732575   0.31152159 -0.312582840
## [132,] -1.365792e-01      4.549129646  -1.27488884 -0.299698601
## [133,]  7.523048e-09     -0.206744822   0.08489153 -0.299698601
## [134,]  3.235235e-01     -0.090747883   1.89793202 -0.299698601
## [135,] -3.308449e-01     -0.206744822   0.08489153 -0.299698601
## [136,]  7.523048e-09     -0.206744822   0.08489153 -0.299698601
## [137,] -9.340907e-01     -0.477404344   0.08489153 -0.299698601
## [138,]  4.257686e-01      0.682565038  -1.50151891 -0.286814362
## [139,] -4.330899e-01     -0.380740229  -0.14173853 -0.286814362
## [140,] -5.353350e-01     -0.574068459   0.31152159 -0.286814362
## [141,]  7.523048e-09     -0.284076114  -0.59499866 -0.273930123
## [142,]  8.654223e-01     -0.477404344   0.76478171 -0.273930123
## [143,]  6.711567e-01     -0.477404344  -1.04825878 -0.273930123
## [144,] -3.512939e-01     -0.477404344   0.99141178 -0.261045885
## [145,]  7.631773e-01      0.295908577   0.53815165 -0.248161646
## [146,]  2.701285e-02     -0.670732575   0.99141178 -0.235277407
## [147,] -4.637634e-01     -0.670732575  -0.14173853 -0.235277407
## [148,] -2.183753e-01     -0.380740229   0.08489153 -0.222393168
## [149,] -3.921919e-01      0.421571927  -0.59499866 -0.222393168
## [150,] -3.615184e-01     -0.477404344  -0.14173853 -0.196624690
## [151,] -2.899468e-01      1.069221499  -0.36836860 -0.196624690
## [152,] -1.979263e-01     -0.477404344   0.53815165 -0.170856212
## [153,] -8.113966e-01     -0.477404344  -0.59499866 -0.157971973
## [154,]  7.523048e-09     -0.206744822   0.08489153 -0.145087734
## [155,] -2.899468e-01     -0.574068459  -0.14173853 -0.132203495
## [156,] -7.091516e-01      0.295908577   0.76478171 -0.132203495
## [157,]  1.394824e-01      0.005916232  -0.14173853 -0.132203495
## [158,] -1.388518e-02     -0.380740229  -0.14173853 -0.132203495
## [159,] -2.899468e-01     -0.090747883  -0.59499866 -0.119319256
## [160,]  1.008565e+00     -0.284076114   0.53815165 -0.119319256
## [161,] -2.183753e-01     -0.187411999  -0.59499866 -0.119319256
## [162,] -9.136417e-01     -0.574068459   0.53815165 -0.119319256
## [163,]  1.887873e+00     -0.477404344   0.08489153 -0.093550778
## [164,] -1.925868e+00     -0.477404344   1.21804184 -0.054898062
## [165,]  7.222792e-01     -0.284076114   0.53815165 -0.016245345
## [166,] -7.296006e-01     -0.090747883  -0.36836860 -0.003361106
## [167,] -4.433144e-01     -0.670732575  -0.82162872  0.048175850
## [168,] -1.976990e+00      0.972557384  -0.59499866  0.061060089
## [169,]  6.791087e-02     -0.380740229   0.31152159  0.125481284
## [170,]  4.257686e-01     -0.574068459  -0.82162872  0.189902478
## [171,]  7.523048e-09      0.102580347  -0.14173853  0.189902478
## [172,]  6.302587e-01     -0.477404344   0.76478171  0.202786717
## [173,] -8.931927e-01     -0.284076114   1.89793202  0.202786717
## [174,] -7.602741e-01     -0.574068459   0.53815165  0.202786717
## [175,]  1.803804e-01     -0.477404344   0.08489153  0.202786717
## [176,]  7.529528e-01     -0.380740229   0.31152159  0.202786717
## [177,] -1.619133e+00     -0.380740229  -0.36836860  0.215670956
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## [178,] -1.343071e+00     -0.380740229   0.76478171  0.215670956
## [179,]  3.723735e-02     -0.187411999   1.89793202  0.215670956
## [180,]  1.599314e-01     -0.670732575   0.76478171  0.215670956
## [181,]  4.053196e-01     -0.477404344  -0.14173853  0.228555195
## [182,] -4.330899e-01     -0.380740229  -0.14173853  0.254323673
## [183,]  1.678834e-02     -0.187411999  -0.14173853  0.305860629
## [184,] -4.024164e-01      1.069221499  -0.59499866  0.408934540
## [185,] -4.535389e-01     -0.187411999   0.08489153  0.512008452
## [186,]  1.284627e+00      0.102580347  -0.14173853  0.524892691
## [187,] -1.128356e+00     -0.767396690  -0.59499866  0.537776929
## [188,]  1.039239e+00      0.682565038   1.67130196  0.537776929
## [189,] -6.375800e-01     -0.380740229  -0.14173853  0.537776929
## [190,]  1.190334e-01     -0.477404344   0.76478171  0.563545407
## [191,]  8.858713e-01      0.682565038  -0.59499866  0.563545407
## [192,]  4.666666e-01      0.102580347  -0.36836860  0.563545407
## [193,] -3.433419e-02     -0.670732575  -1.50151891  0.576429646
## [194,] -1.056785e+00     -0.206744822   1.21804184  0.640850841
## [195,] -1.404418e+00      0.199244462  -0.36836860  0.640850841
## [196,] -4.126409e-01      0.392572693   1.89793202  0.640850841
## [197,]  7.523048e-09     -0.206744822   0.08489153  0.705272036
## [198,] -4.455870e-02     -0.574068459   0.31152159  0.718156275
## [199,]  1.599314e-01     -0.380740229  -0.59499866  0.718156275
## [200,]  7.523048e-09      0.392572693  -5.35422996  0.718156275
## [201,] -1.946317e+00     -0.670732575   0.08489153  0.718156275
## [202,]  1.161933e+00     -0.380740229  -0.14173853  0.718156275
## [203,] -4.433144e-01     -0.477404344   0.31152159  0.718156275
## [204,] -5.251105e-01      2.035862651  -0.14173853  0.731040513
## [205,]  1.394824e-01     -0.670732575   0.08489153  0.731040513
## [206,]  1.008565e+00     -0.380740229  -0.14173853  0.731040513
## [207,] -3.819674e-01     -0.574068459   0.99141178  0.731040513
## [208,] -7.909476e-01     -0.477404344  -0.14173853  0.731040513
## [209,]  2.008294e-01     -0.380740229   0.99141178  0.731040513
## [210,]  4.746186e-02     -0.574068459  -1.50151891  0.731040513
## [211,]  1.284627e+00     -0.380740229  -0.14173853  0.743924752
## [212,] -1.189703e+00     -0.574068459   0.76478171  0.795461708
## [213,]  2.225282e+00      0.005916232   0.31152159  0.795461708
## [214,] -1.979263e-01      0.199244462  -1.50151891  0.808345947
## [215,]  2.724010e-01     -0.574068459  -0.59499866  0.821230186
## [216,] -6.171310e-01     -0.090747883  -0.59499866  0.834114425
## [217,]  9.676674e-01     -0.477404344   0.99141178  0.846998664
## [218,] -1.148805e+00      7.352388986   0.08489153  0.846998664
## [219,]  7.813538e-02     -0.284076114  -0.59499866  0.859882903
## [220,]  1.100586e+00     -0.670732575   0.76478171  0.859882903
## [221,]  7.523048e-09      0.421571927  -0.59499866  0.872767142
## [222,] -7.091516e-01     -0.284076114   1.89793202  0.898535620
## [223,]  1.039239e+00     -0.284076114   0.53815165  0.911419859
## [224,] -1.363520e+00     -0.574068459  -0.59499866  0.911419859
## [225,]  2.460445e+00     -0.380740229   0.31152159  0.962956814
## [226,]  1.678834e-02      0.005916232  -2.63466921  0.962956814
## [227,] -7.602741e-01     -0.090747883  -1.04825878  0.962956814
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## [228,] -1.251050e+00     -0.380740229   0.76478171  0.975841053
## [229,] -2.694978e-01      3.485824379  -1.50151891  0.988725292
## [230,]  1.088089e-01     -0.187411999  -0.59499866  0.988725292
## [231,] -2.058786e+00      0.295908577  -2.18140909  0.988725292
## [232,] -8.011721e-01     -0.284076114  -0.59499866  1.001609531
## [233,] -8.545672e-02     -0.477404344   0.08489153  1.014493770
## [234,]  6.813812e-01      0.005916232   0.08489153  1.014493770
## [235,]  4.257686e-01     -0.284076114   0.08489153  1.014493770
## [236,]  1.458444e+00     -0.284076114   0.08489153  1.014493770
## [237,] -1.570283e-01     -0.284076114   2.57782221  1.014493770
## [238,] -9.238662e-01     -0.187411999  -1.04825878  1.027378009
## [239,] -6.500771e-02     -0.380740229  -0.14173853  1.027378009
## [240,]  7.523048e-09     -0.206744822   0.08489153  1.040262248
## [241,]  2.756956e+00     -0.090747883   0.53815165  1.053146487
## [242,] -1.468038e-01     -0.090747883  -0.14173853  1.053146487
## [243,] -8.545672e-02     -0.284076114  -0.14173853  1.053146487
## [244,] -4.433144e-01     -0.477404344   0.99141178  1.066030726
## [245,]  6.563834e-03      0.392572693  -0.59499866  1.066030726
## [246,]  1.906049e-01      0.005916232   0.08489153  1.066030726
## [247,]  5.177891e-01     -0.284076114   0.31152159  1.078914965
## [248,] -1.774773e-01      0.972557384  -0.36836860  1.078914965
## [249,]  3.848706e-01     -0.380740229   1.21804184  1.078914965
## [250,] -4.126409e-01     -0.187411999  -1.50151891  1.078914965
## [251,]  1.437995e+00     -0.864060805   0.53815165  1.078914965
## [252,] -3.308449e-01     -0.574068459   1.44467190  1.091799204
## [253,]  1.088089e-01     -0.380740229  -0.82162872  1.091799204
## [254,] -2.797223e-01     -0.187411999  -1.04825878  1.091799204
## [255,]  7.523048e-09     -0.380740229   0.53815165  1.091799204
## [256,]  7.222792e-01     -0.380740229   1.21804184  1.104683443
## [257,]  3.132990e-01      0.295908577   0.53815165  1.156220398
## [258,] -1.059057e-01     -0.380740229   0.53815165  1.285062788
## [259,] -3.103959e-01     -0.574068459  -0.36836860  1.285062788
## [260,]  4.564421e-01     -0.670732575  -0.36836860  1.297947027
## [261,] -6.171310e-01     -0.380740229   0.31152159  1.323715505
## [262,]  2.008294e-01     -0.670732575  -0.82162872  1.323715505
## [263,] -6.682536e-01      0.005916232  -1.72814897  1.349483982
## [264,] -5.660085e-01     -0.380740229   0.76478171  1.375252460
## [265,] -1.189703e+00     -0.187411999   0.99141178  1.375252460
## [266,]  1.008565e+00     -0.477404344   0.76478171  1.413905177
## [267,]  7.523048e-09      0.421571927  -0.59499866  1.426789416
## [268,] -1.332846e+00      0.295908577   0.76478171  1.465442133
## [269,]  3.950951e-01     -0.477404344   0.76478171  1.465442133
## [270,] -4.228654e-01     -0.380740229  -1.04825878  1.465442133
## [271,]  7.523048e-09      0.199244462  -1.50151891  1.465442133
## [272,] -4.330899e-01     -0.477404344  -0.59499866  1.465442133
## [273,] -4.944370e-01     -0.187411999  -0.82162872  1.478326372
## [274,] -7.602741e-01     -0.670732575   0.76478171  1.478326372
## [275,] -1.159030e+00     -0.380740229   0.08489153  1.478326372
## [276,]  1.622036e+00     -0.574068459   0.08489153  1.478326372
## [277,]  6.507077e-01     -0.284076114   1.21804184  1.478326372
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## [278,] -2.436071e+00     -0.284076114   0.76478171  1.491210611
## [279,] -3.206204e-01     -0.670732575  -0.14173853  1.491210611
## [280,]  1.918546e+00     -0.090747883  -0.14173853  1.491210611
## [281,] -2.285998e-01     -0.380740229   0.08489153  1.504094850
## [282,] -2.171256e+00      1.262549729  -0.14173853  1.542747566
## [283,] -4.944370e-01      2.325854996  -1.95477903  1.542747566
## [284,]  7.523048e-09     -0.284076114   0.31152159  1.542747566
## [285,]  1.599314e-01     -0.574068459   0.99141178  1.542747566
## [286,]  7.427283e-01     -0.187411999  -0.36836860  1.542747566
## [287,]  1.599314e-01      0.295908577   0.76478171  1.542747566
## [288,]  2.859201e+00     -0.380740229  -1.04825878  1.542747566
## [289,]  7.523048e-09     -0.284076114   1.21804184  1.620053000
## [290,]  1.294852e+00     -0.477404344   1.67130196  1.620053000
## [291,] -4.228654e-01     -0.574068459   0.99141178  1.632937239
## [292,] -1.332846e+00      0.005916232   0.53815165  1.645821478
## [293,]  1.213056e+00     -0.380740229   0.76478171  1.645821478
## [294,] -8.625192e-01     -0.477404344  -0.14173853  1.800432345
## [295,] -1.107907e+00     -0.284076114   1.44467190  1.800432345
## [296,]  6.791087e-02     -0.187411999   0.53815165  1.813316584
## [297,]  4.893878e+00     -0.574068459   0.31152159  1.903506257
## [298,] -1.261275e+00      0.005916232   0.76478171  1.929274734
## [299,]  1.345974e+00      0.199244462  -0.14173853  1.993695929
## attr(,"scaled:center")
##                      age creatinine_phosphokinase        ejection_fraction
##                 60.83389                581.83946                 38.08361
##                platelets         serum_creatinine             serum_sodium
##             263358.02926                  1.39388                136.62542
##                     time
##                130.26087
## attr(,"scaled:scale")
##                      age creatinine_phosphokinase        ejection_fraction
##                11.894809               970.287881                11.834841
##                platelets         serum_creatinine             serum_sodium
##             97804.236869                1.034510                 4.412477
##                     time
##                77.614208
```

```
as.matrix(scale.heart)%*%fact.load.heart%*%solve(t(fact.load.heart)%*%fact.lo
ad.heart)
```

```
##                 PC1          PC2           PC3
##   [1,]  1.661261807  1.554800886 -0.2391648108
##   [2,]  0.743266680  0.800052166 -6.6257827317
##   [3,]  0.927179080  2.016941671  0.4549872007
##   [4,]  0.334885605  1.266839858 -0.1473115437
##   [5,]  1.925456863  3.274592726  0.2063397138
##   [6,]  2.435918328  0.165636681  0.8575735122
##   [7,]  1.012119703  1.263416904  0.3244895181
##   [8,]  1.124477246 -1.115611048 -0.4460294461
##   [9,]  1.234722890 -1.691814397  0.3538296415
```

```
##  [10,]  4.919709448  0.999011928 -0.1358685604
##  [11,]  2.640695114  0.439924198  0.0044503303
##  [12,]  0.428072549  0.186827135 -0.2931060423
##  [13,] -0.139463181  1.005910129 -0.5149623433
##  [14,]  0.205750073  0.013367351 -0.2133024344
##  [15,]  0.100190044 -0.129530927 -0.8853088186
##  [16,]  1.649820322 -0.324891744  1.1159824597
##  [17,]  1.595345623 -0.956323503  0.2371917548
##  [18,] -0.156822106  2.866432703 -0.1779870700
##  [19,]  0.762120879  0.103388790 -0.0231261139
##  [20,]  0.907950332  1.748387342  0.9061044026
##  [21,]  0.762655848  0.465114447 -0.0799383657
##  [22,]  0.944646930  0.308381123 -0.1180144130
##  [23,]  0.733921935 -0.548331547 -0.1903647967
##  [24,]  0.457662548 -1.284173827 -0.0687137964
##  [25,]  1.492282733  0.549949036 -0.1711517403
##  [26,]  1.455420414 -0.835943301  0.5028730340
##  [27,]  1.941662073 -0.755655310  0.7523795208
##  [28,]  1.134926967 -0.573778900  0.2150997676
##  [29,]  2.308580309  1.259927295  0.6226136569
##  [30,]  1.520043263  0.715581081  0.6753536792
##  [31,]  2.353027773 -0.193596104  0.1844817096
##  [32,]  2.584217212 -0.341226598  0.3233372990
##  [33,]  0.295532144  1.105549289 -0.1548664887
##  [34,]  0.035612527  0.257097226 -0.3899811986
##  [35,]  0.663877522 -0.991149461  0.5046204217
##  [36,]  1.876218740  0.731427455 -0.0146293253
##  [37,]  1.908293478 -0.818363037  0.8903389408
##  [38,]  1.353571970 -2.188128649 -0.6137036191
##  [39,]  1.007463177  0.588312865 -2.3617777846
##  [40,]  1.154552043 -0.620878762 -0.4508776138
##  [41,]  1.129162665  1.163688178 -0.3401328031
##  [42,] -0.020711589  0.926623118  0.3053509355
##  [43,]  0.923607487 -0.610849610  0.1530495710
##  [44,]  1.117429820 -0.484077775  0.6480190259
##  [45,]  0.525787658 -1.628332541  0.0773460918
##  [46,]  0.449719713  0.306472980 -0.5615070471
##  [47,]  0.092432608  1.612860316 -1.0768836850
##  [48,]  0.331904065 -0.816335765 -1.0803374958
##  [49,]  2.457169977  1.841559436  0.3705196143
##  [50,]  0.168206595 -0.400124857 -0.6707819730
##  [51,]  0.516047584  0.626436159 -0.0009576655
##  [52,]  0.092532663  0.300954180 -0.8749494801
##  [53,]  2.783428934 -1.275225506 -3.1242865473
##  [54,]  1.035561944 -0.843644912  0.1766442263
##  [55,]  0.964937677  0.667315954  0.1836188315
##  [56,]  2.396441039 -0.122309343 -0.3800272497
##  [57,]  1.311884637  0.096229075  0.3931885056
##  [58,]  0.117242708 -0.230750573 -0.0975868884
##  [59,] -0.230865053  1.036172140 -0.9937338718
```

```
##  [60,]  0.749126012  0.827038561 -0.0716641805
##  [61,] -0.222187227  0.906990443 -7.2203194356
##  [62,]  0.501754161  0.984400714  0.2677696975
##  [63,] -0.008689059 -0.085367104  0.0345107941
##  [64,] -0.549357130 -0.979474617 -1.2025062067
##  [65,]  0.083935800 -2.028983076  0.1298242971
##  [66,]  0.988680110  2.692397650  0.8718446516
##  [67,] -0.648148747  1.708399982 -0.2357704108
##  [68,]  0.532711245 -0.034977861  0.0205406501
##  [69,]  0.449358882 -0.116363372  0.0114748486
##  [70,]  0.817628362  0.142198633 -0.7901497375
##  [71,] -0.684673449 -0.620888501 -0.5949996183
##  [72,] -0.096008591  0.266505695  0.2283303489
##  [73,]  1.537899958  0.792079545 -4.1950500318
##  [74,]  0.555768980 -0.462584538  0.7769184732
##  [75,]  0.556411378  1.086577298 -0.2364415509
##  [76,] -0.216828225  0.707001512  0.1918664146
##  [77,]  0.668441464 -2.005827437  0.3236278154
##  [78,] -0.607749063 -0.183163996  0.0212675426
##  [79,]  0.819260082  0.217708128  0.4254147686
##  [80,] -0.063297651 -0.943013569 -0.2959498846
##  [81,]  0.919009855 -0.278359780  0.3100879741
##  [82,]  0.647771674 -0.814464099  0.0545080160
##  [83,]  0.701850273  1.556076413  0.5038258391
##  [84,]  1.426833013 -0.236687990  1.1519445673
##  [85,] -0.113963882  0.001775022 -0.3909018947
##  [86,] -0.258837308 -1.431743479 -0.3730824376
##  [87,] -0.132936474  0.384334804  0.5311877910
##  [88,]  0.412780099 -1.884983446  0.3481862241
##  [89,] -0.728453310 -0.165887725  0.1153721621
##  [90,] -0.325982563  0.033839181  0.1137702233
##  [91,]  0.551045835 -0.542978350  0.5658370679
##  [92,]  0.342583850 -0.053331595 -0.3617566227
##  [93,] -0.363720014 -0.919551965 -0.1109323635
##  [94,]  0.281720144  1.053032127  0.2996120563
##  [95,] -0.201173206 -0.914928165 -0.2348252272
##  [96,]  0.090540886 -1.601030602  0.5241222915
##  [97,]  0.310968078  0.967996687 -0.1101564113
##  [98,]  0.783213325 -1.310128264  0.7599096037
##  [99,]  0.074300534  0.429114466 -0.1875312235
## [100,]  0.157269661 -0.508384870  0.4203188124
## [101,]  0.119602956 -0.070347549 -0.2929838037
## [102,]  0.867269604 -0.684410717  0.1234748027
## [103,]  0.610298824 -0.187678958 -0.1110579911
## [104,] -0.696897702  0.825599986 -4.3693073628
## [105,]  0.550164436 -1.359203255  0.1724102706
## [106,]  0.972097738 -0.954499910 -1.3444474338
## [107,]  0.060003135 -0.312400494 -0.2643827297
## [108,] -0.630359888  0.422572840 -1.3656024435
## [109,]  0.394779402  0.264159990 -0.4517056571
```

```
## [110,] -0.263211207 -1.966140938 -2.6273981587
## [111,]  1.570689585 -1.218400716  0.8286984171
## [112,] -0.079851430  0.476705134  0.3987411216
## [113,] -0.232857424  0.987410715 -0.1836507253
## [114,]  0.861926056 -1.672184717  0.2905798137
## [115,]  0.502907066  0.964718479 -0.1722577393
## [116,] -0.124361588 -0.121099491  0.3427441451
## [117,]  0.148570664 -1.241001991  0.5654697557
## [118,]  2.291232248 -2.230747174 -0.1209613524
## [119,]  0.292592223 -1.569407098  0.7579634732
## [120,]  1.554116575 -0.051411596  0.2919360483
## [121,]  0.471353622 -0.769453621  0.3000942339
## [122,]  0.239404523  0.179511841  0.8150414891
## [123,] -0.183468621 -0.418602246  0.3254376420
## [124,] -0.379654647 -0.225010617  0.0511604751
## [125,]  1.168530259  0.687054723  0.1837383744
## [126,] -0.439853331 -0.096473505  0.1761735895
## [127,] -0.020406232  2.895762575  0.1700108754
## [128,]  0.029381207 -1.385234054  0.3355970649
## [129,] -0.160749776  0.354127757  0.1035501859
## [130,]  0.339556664 -0.332058477 -0.0667005248
## [131,] -0.237984674 -1.134193809 -0.9177089771
## [132,]  2.210066656  1.073871848 -0.1719603923
## [133,] -0.548148785  0.084896488 -0.3618093076
## [134,]  0.200275116 -2.329893544  0.1807820612
## [135,]  1.012954927  0.207848181 -3.1075914230
## [136,]  0.684773385 -0.418180700  0.1193766853
## [137,]  0.265991270 -1.127564425  1.0622916315
## [138,]  0.816047289  1.337238996 -0.1567333112
## [139,] -0.004758957  0.254210240  0.3494468499
## [140,] -0.659513150  0.603226065 -0.9684829433
## [141,]  0.923062231 -0.032713985  0.0676803357
## [142,] -0.766013551 -0.333299547 -0.4898487459
## [143,] -0.431084079  0.882918765 -0.3375768085
## [144,] -0.190133535 -0.640424682  0.3848998983
## [145,]  0.594737173  0.078962400 -0.7680732406
## [146,] -0.822369651 -0.053442218 -0.1115508170
## [147,] -0.632086337  0.639659696  0.3084664918
## [148,]  0.318971640 -1.156013079 -0.5291490901
## [149,]  0.863876747  0.671332644  0.2568422316
## [150,] -0.102833245  0.438284149 -1.3662033639
## [151,]  1.097728686 -0.154049087  0.6481837510
## [152,]  0.058513888 -1.525735600  0.7298158827
## [153,] -0.501623706  0.244712801  0.7113591605
## [154,] -0.466410671  0.387641116 -1.2984836637
## [155,] -0.026249918  0.140029667  0.3217130039
## [156,] -0.116271543  0.519456212  0.2552566197
## [157,] -0.328502961  0.297409376  0.2283230337
## [158,] -0.670127696  0.863873950 -0.0320977323
## [159,]  1.236631450 -0.628600664  0.3480628341
```

```
## [160,] -0.087149306 -0.989271375 -0.0447048996
## [161,]  0.264931050  0.108130352  0.6630592328
## [162,] -1.011591855  0.282794292  0.3950346566
## [163,]  0.064674548 -0.794095498 -0.7180245971
## [164,] -0.855164135  0.353179379 -1.1021613126
## [165,] -0.817630171  0.338158269 -2.2477161022
## [166,]  0.790071410  0.085952387  0.4093134146
## [167,] -0.364973805 -0.605203649  0.8129999106
## [168,]  0.051590540  1.959827996  1.0494779489
## [169,] -0.058338220 -0.409337783  0.0359104234
## [170,]  0.159737156  0.254669123 -0.1473645979
## [171,] -0.489533321  0.419949638 -0.0988150804
## [172,] -0.595220420 -0.285623727 -3.2696000954
## [173,]  0.085653123 -2.126932185  0.8797935760
## [174,] -1.101774379  0.948102234  0.2916000702
## [175,] -0.166037172 -0.108567577  0.3032487590
## [176,] -0.097398428 -1.622331214  0.4001096589
## [177,]  0.077392575  0.439270324  0.1476584803
## [178,] -0.847221750 -0.547109788  0.9085380018
## [179,] -0.127606139 -2.264892371  0.4746835928
## [180,] -0.690762926 -0.522014464 -0.3837300635
## [181,] -1.244346835  0.658517059 -0.3641916993
## [182,] -0.514946965  0.827817681  0.3989361780
## [183,] -0.172665628  0.647201739  0.1258618235
## [184,]  0.858257113  0.307871855  0.9277885573
## [185,] -0.642483481  0.760191790  0.4506613356
## [186,] -0.241494042  0.111254457 -0.0564260901
## [187,] -0.937666219  0.077076546  0.6672609206
## [188,] -0.255431065 -0.236095185 -1.8079088692
## [189,] -0.460797704  0.065475798  0.7839240452
## [190,] -1.408796077 -0.544433129  0.0945931696
## [191,]  0.896368333  0.001930967  0.0750159818
## [192,]  0.146044715 -1.181534430  0.7722082772
## [193,] -0.858056614  0.737315437  0.6394594140
## [194,] -0.197251951 -0.170279072  0.7379426061
## [195,] -1.140428526  1.852050166  0.3155272212
## [196,]  0.325426969 -1.463111748  0.4808327148
## [197,] -1.139571685  0.202664970 -0.0453437056
## [198,] -0.563968269  0.088513773  0.4422084068
## [199,] -1.086028156  1.352543347 -0.1819051765
## [200,]  0.382812764  3.094221200  0.3362310993
## [201,] -0.572810886  0.126824436  0.0238687266
## [202,] -0.921088541 -1.225260712  0.0570952712
## [203,] -0.049124158 -1.459231030  1.1118129779
## [204,]  0.257805972  1.189500127  0.6668767422
## [205,]  0.074748808 -0.617912310  0.7867845639
## [206,] -0.872191759 -0.486364167  0.1067486746
## [207,] -1.645178492 -0.281541525  0.3536193491
## [208,]  0.411305453 -0.203541128  1.1172313308
## [209,] -0.601616408 -0.554671402 -1.4750001020
```

```
## [210,] -0.955119693  1.089864345 -0.1569386064
## [211,] -0.276077959  0.580271097 -0.1500176716
## [212,] -1.044240318 -1.218357423  0.7190084888
## [213,]  0.514319443 -1.745361381 -0.0449525080
## [214,] -0.813768250  1.478470608  0.5964264070
## [215,] -0.444032668  0.204602604  0.5628851690
## [216,]  0.052099177  0.437476293  0.6339590882
## [217,] -0.172145649 -1.585499295 -0.5722453206
## [218,]  2.496763775 -0.200777416  1.1196635080
## [219,] -0.197712351  0.335412570 -0.0672413174
## [220,] -1.028972799 -0.545444230 -0.4469534152
## [221,]  0.133728397  1.129970941  0.2085540954
## [222,] -0.578029718 -1.566105155  0.8250059417
## [223,] -1.446534248 -0.178091687 -0.1196636579
## [224,] -1.435219779  1.547758563  0.4838741521
## [225,] -0.798291149 -0.176369046 -0.9801923146
## [226,]  0.633708473 -0.010070080  0.9765007437
## [227,] -0.723949834  1.449128438  0.9110323577
## [228,] -1.030544496  0.377486823 -1.3845133459
## [229,]  1.107193215  1.958924376  0.8886990582
## [230,] -0.177352212  0.727349896  0.5602343511
## [231,] -0.382554098  2.181949995  1.5801305215
## [232,] -0.270465487  0.467890423  1.1229275581
## [233,] -1.674866120  0.390174384  0.3437570553
## [234,] -0.828338660 -0.081849356 -0.2421741564
## [235,] -0.899183143 -0.433349049  0.0541855242
## [236,]  0.216850133 -1.442856753  0.4216441943
## [237,] -0.260734248 -2.247006891  0.6672969538
## [238,] -0.240412393  1.031285447  1.0570939845
## [239,] -0.477973585 -0.114754991  0.2479793462
## [240,] -0.834705507 -0.371072459  0.5932273199
## [241,] -0.146097282 -1.113592351 -0.3975691472
## [242,] -0.478350273  0.467514588  0.2735254772
## [243,] -1.590244047  0.533883949  0.4184106249
## [244,] -0.337491933 -0.703958612 -0.0495325011
## [245,] -0.616985393  0.495454082  0.2479309897
## [246,] -0.564588356 -0.134668438  0.5948572768
## [247,] -1.010428348  0.579147470 -1.4544247652
## [248,] -0.137655299  0.993127257  0.6218160308
## [249,] -1.759514498 -0.274842579 -0.4034560489
## [250,] -0.813783277  0.878697260  0.8719692563
## [251,] -1.368612816 -0.021316492 -2.2729743066
## [252,] -1.275899254 -0.475442827  0.0786717985
## [253,] -1.029142756  0.136056729  0.5715204228
## [254,] -0.193496871  0.569879346  1.0094653812
## [255,] -0.919133283 -1.367103676  0.4859672953
## [256,] -1.304260771 -0.350205504 -0.0748085330
## [257,] -0.360695064 -0.407225800  0.3469299128
## [258,] -1.034864271 -0.286602875  0.6156970433
## [259,] -1.699350741  1.116851998  0.5446641225
```

```
## [260,] -1.119929739 -0.573998136  0.6845877600
## [261,] -1.169037355 -0.082835319  0.9001028427
## [262,] -0.784809716  0.167920028  0.3269090559
## [263,] -0.493708629  1.695450884  0.9796642972
## [264,] -0.497304930 -1.601722724  1.1761804108
## [265,] -0.976574569 -0.192412282  0.6509580136
## [266,] -1.467961242 -0.427896169 -0.1003924068
## [267,] -0.902077101  1.496147172 -0.4109312622
## [268,] -1.036389744  0.082329109  1.0784647253
## [269,] -1.705386507 -0.299483803 -0.1146301416
## [270,] -1.739073319  1.138271940  0.3559990233
## [271,] -1.300129495  1.536663050  0.2416124330
## [272,] -1.315969968  0.440075513  0.4998004636
## [273,] -0.529848105  0.419933966  1.0482014072
## [274,] -1.985877359 -0.100740767  0.7664031671
## [275,] -1.130127906  0.653364324  0.9493329437
## [276,] -1.598593607 -0.309970406 -0.4940385513
## [277,] -0.632759027 -0.841159617 -0.0294273529
## [278,] -0.738333683  0.116872897  1.3081957816
## [279,] -1.578182522  0.731749724 -0.1439136175
## [280,] -0.953911115 -0.420001999 -0.0239870270
## [281,] -0.480593516 -0.083066046 -1.2235734344
## [282,]  0.010452664  0.638979802  1.3749238633
## [283,] -0.548950968  2.217153856  0.9372928135
## [284,] -0.743013091 -0.155648639 -0.5674839806
## [285,] -1.612155439 -0.603633903  0.5012124553
## [286,] -1.039827166 -0.076912746  0.4303027182
## [287,] -0.843330937 -0.242317466  0.4266714040
## [288,] -1.182272798 -0.941536117 -0.5788535918
## [289,] -0.948575182 -0.543794864 -0.0384268999
## [290,]  0.070130052 -1.812508190  0.2191244979
## [291,] -1.743137930 -1.091959585  0.4053547510
## [292,] -1.073623081  0.267028528  1.0060410433
## [293,] -1.427227293 -0.672588422  0.0315439986
## [294,] -1.122843832  0.345719829  1.1758990412
## [295,] -1.263199681 -0.528831385  1.1119318115
## [296,] -1.290036191 -0.095482767 -0.7991514192
## [297,] -1.393302226 -2.385879900 -2.6677123780
## [298,] -1.782271248  0.420525876 -0.9155996847
## [299,] -1.273483991 -0.483974683  0.2522706621

fit.pc <- principal(dataset[c(1,3,5,7,8,9,12)], nfactors=3, rotate="varimax")
fit.pc

## Principal Components Analysis
## Call: principal(r = dataset[c(1, 3, 5, 7, 8, 9, 12)], nfactors = 3,
##     rotate = "varimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                            RC1   RC2   RC3   h2   u2 com
## age                       0.70  0.19 -0.20 0.56 0.44 1.3
```

```
## creatinine_phosphokinase -0.02 -0.09  0.86 0.76 0.24 1.0
## ejection_fraction         0.10  0.76 -0.16 0.60 0.40 1.1
## platelets                 0.01  0.36  0.41 0.30 0.70 2.0
## serum_creatinine          0.59 -0.23 -0.05 0.40 0.60 1.3
## serum_sodium             -0.24  0.66  0.17 0.53 0.47 1.4
## time                     -0.70  0.04 -0.20 0.54 0.46 1.2
##
##                        RC1  RC2  RC3
## SS loadings           1.39 1.24 1.05
## Proportion Var        0.20 0.18 0.15
## Cumulative Var        0.20 0.38 0.53
## Proportion Explained  0.38 0.34 0.29
## Cumulative Proportion 0.38 0.71 1.00
##
## Mean item complexity =  1.3
## Test of the hypothesis that 3 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.16
##  with the empirical chi square  326.89  with prob <  1.5e-70
##
## Fit based upon off diagonal values = -1.65
```

```
round(fit.pc$values, 3)
```

```
## [1] 1.475 1.176 1.029 0.966 0.888 0.737 0.729
```

```
fit.pc$loadings
```

```
##
## Loadings:
##                          RC1    RC2    RC3
## age                       0.696  0.185 -0.200
## creatinine_phosphokinase                0.864
## ejection_fraction                0.755 -0.157
## platelets                        0.357  0.412
## serum_creatinine          0.586 -0.232
## serum_sodium             -0.240  0.663  0.173
## time                     -0.702        -0.201
##
##                  RC1   RC2   RC3
## SS loadings    1.390 1.235 1.054
## Proportion Var 0.199 0.176 0.151
## Cumulative Var 0.199 0.375 0.526
```

```
# Loadings with more digits
pc.load.heart <- fit.pc$loadings[1:7,1:3]
print(pc.load.heart)
```

```
##                                  RC1         RC2         RC3
## age                        0.69625801  0.18519166 -0.20024241
## creatinine_phosphokinase -0.01977081 -0.09374166  0.86427917
```

```
## ejection_fraction         0.09927290  0.75521937 -0.15703997
## platelets                 0.01116830  0.35699707  0.41234930
## serum_creatinine          0.58617844 -0.23158975 -0.04551365
## serum_sodium             -0.24038458  0.66250806  0.17287312
## time                     -0.70242172  0.04492927 -0.20131920
```

```
# Communalities
fit.pc$communality
```

```
##                      age creatinine_phosphokinase        ejection_fraction
##                0.5591682                0.7561569                0.6048730
##                platelets         serum_creatinine             serum_sodium
##                0.2976036                0.3993105                0.5265868
##                     time
##                0.5359443
```

```
# Rotated factor scores
fit.pc$scores
```

```
##                  RC1          RC2           RC3
##   [1,]  1.661261807 -1.554800886  0.2391648108
##   [2,]  0.743266680 -0.800052166  6.6257827317
##   [3,]  0.927179080 -2.016941671 -0.4549872007
##   [4,]  0.334885605 -1.266839858  0.1473115437
##   [5,]  1.925456863 -3.274592726 -0.2063397138
##   [6,]  2.435918328 -0.165636681 -0.8575735122
##   [7,]  1.012119703 -1.263416904 -0.3244895181
##   [8,]  1.124477246  1.115611048  0.4460294461
##   [9,]  1.234722890  1.691814397 -0.3538296415
##  [10,]  4.919709448 -0.999011928  0.1358685604
##  [11,]  2.640695114 -0.439924198 -0.0044503303
##  [12,]  0.428072549 -0.186827135  0.2931060423
##  [13,] -0.139463181 -1.005910129  0.5149623433
##  [14,]  0.205750073 -0.013367351  0.2133024344
##  [15,]  0.100190044  0.129530927  0.8853088186
##  [16,]  1.649820322  0.324891744 -1.1159824597
##  [17,]  1.595345623  0.956323503 -0.2371917548
##  [18,] -0.156822106 -2.866432703  0.1779870700
##  [19,]  0.762120879 -0.103388790  0.0231261139
##  [20,]  0.907950332 -1.748387342 -0.9061044026
##  [21,]  0.762655848 -0.465114447  0.0799383657
##  [22,]  0.944646930 -0.308381123  0.1180144130
##  [23,]  0.733921935  0.548331547  0.1903647967
##  [24,]  0.457662548  1.284173827  0.0687137964
##  [25,]  1.492282733 -0.549949036  0.1711517403
##  [26,]  1.455420414  0.835943301 -0.5028730340
##  [27,]  1.941662073  0.755655310 -0.7523795208
##  [28,]  1.134926967  0.573778900 -0.2150997676
##  [29,]  2.308580309 -1.259927295 -0.6226136569
##  [30,]  1.520043263 -0.715581081 -0.6753536792
##  [31,]  2.353027773  0.193596104 -0.1844817096
```

```
##  [32,]  2.584217212  0.341226598 -0.3233372990
##  [33,]  0.295532144 -1.105549289  0.1548664887
##  [34,]  0.035612527 -0.257097226  0.3899811986
##  [35,]  0.663877522  0.991149461 -0.5046204217
##  [36,]  1.876218740 -0.731427455  0.0146293253
##  [37,]  1.908293478  0.818363037 -0.8903389408
##  [38,]  1.353571970  2.188128649  0.6137036191
##  [39,]  1.007463177 -0.588312865  2.3617777846
##  [40,]  1.154552043  0.620878762  0.4508776138
##  [41,]  1.129162665 -1.163688178  0.3401328031
##  [42,] -0.020711589 -0.926623118 -0.3053509355
##  [43,]  0.923607487  0.610849610 -0.1530495710
##  [44,]  1.117429820  0.484077775 -0.6480190259
##  [45,]  0.525787658  1.628332541 -0.0773460918
##  [46,]  0.449719713 -0.306472980  0.5615070471
##  [47,]  0.092432608 -1.612860316  1.0768836850
##  [48,]  0.331904065  0.816335765  1.0803374958
##  [49,]  2.457169977 -1.841559436 -0.3705196143
##  [50,]  0.168206595  0.400124857  0.6707819730
##  [51,]  0.516047584 -0.626436159  0.0009576655
##  [52,]  0.092532663 -0.300954180  0.8749494801
##  [53,]  2.783428934  1.275225506  3.1242865473
##  [54,]  1.035561944  0.843644912 -0.1766442263
##  [55,]  0.964937677 -0.667315954 -0.1836188315
##  [56,]  2.396441039  0.122309343  0.3800272497
##  [57,]  1.311884637 -0.096229075 -0.3931885056
##  [58,]  0.117242708  0.230750573  0.0975868884
##  [59,] -0.230865053 -1.036172140  0.9937338718
##  [60,]  0.749126012 -0.827038561  0.0716641805
##  [61,] -0.222187227 -0.906990443  7.2203194356
##  [62,]  0.501754161 -0.984400714 -0.2677696975
##  [63,] -0.008689059  0.085367104 -0.0345107941
##  [64,] -0.549357130  0.979474617  1.2025062067
##  [65,]  0.083935800  2.028983076 -0.1298242971
##  [66,]  0.988680110 -2.692397650 -0.8718446516
##  [67,] -0.648148747 -1.708399982  0.2357704108
##  [68,]  0.532711245  0.034977861 -0.0205406501
##  [69,]  0.449358882  0.116363372 -0.0114748486
##  [70,]  0.817628362 -0.142198633  0.7901497375
##  [71,] -0.684673449  0.620888501  0.5949996183
##  [72,] -0.096008591 -0.266505695 -0.2283303489
##  [73,]  1.537899958 -0.792079545  4.1950500318
##  [74,]  0.555768980  0.462584538 -0.7769184732
##  [75,]  0.556411378 -1.086577298  0.2364415509
##  [76,] -0.216828225 -0.707001512 -0.1918664146
##  [77,]  0.668441464  2.005827437 -0.3236278154
##  [78,] -0.607749063  0.183163996 -0.0212675426
##  [79,]  0.819260082 -0.217708128 -0.4254147686
##  [80,] -0.063297651  0.943013569  0.2959498846
##  [81,]  0.919009855  0.278359780 -0.3100879741
```

```
##  [82,]  0.647771674  0.814464099 -0.0545080160
##  [83,]  0.701850273 -1.556076413 -0.5038258391
##  [84,]  1.426833013  0.236687990 -1.1519445673
##  [85,] -0.113963882 -0.001775022  0.3909018947
##  [86,] -0.258837308  1.431743479  0.3730824376
##  [87,] -0.132936474 -0.384334804 -0.5311877910
##  [88,]  0.412780099  1.884983446 -0.3481862241
##  [89,] -0.728453310  0.165887725 -0.1153721621
##  [90,] -0.325982563 -0.033839181 -0.1137702233
##  [91,]  0.551045835  0.542978350 -0.5658370679
##  [92,]  0.342583850  0.053331595  0.3617566227
##  [93,] -0.363720014  0.919551965  0.1109323635
##  [94,]  0.281720144 -1.053032127 -0.2996120563
##  [95,] -0.201173206  0.914928165  0.2348252272
##  [96,]  0.090540886  1.601030602 -0.5241222915
##  [97,]  0.310968078 -0.967996687  0.1101564113
##  [98,]  0.783213325  1.310128264 -0.7599096037
##  [99,]  0.074300534 -0.429114466  0.1875312235
## [100,]  0.157269661  0.508384870 -0.4203188124
## [101,]  0.119602956  0.070347549  0.2929838037
## [102,]  0.867269604  0.684410717 -0.1234748027
## [103,]  0.610298824  0.187678958  0.1110579911
## [104,] -0.696897702 -0.825599986  4.3693073628
## [105,]  0.550164436  1.359203255 -0.1724102706
## [106,]  0.972097738  0.954499910  1.3444474338
## [107,]  0.060003135  0.312400494  0.2643827297
## [108,] -0.630359888 -0.422572840  1.3656024435
## [109,]  0.394779402 -0.264159990  0.4517056571
## [110,] -0.263211207  1.966140938  2.6273981587
## [111,]  1.570689585  1.218400716 -0.8286984171
## [112,] -0.079851430 -0.476705134 -0.3987411216
## [113,] -0.232857424 -0.987410715  0.1836507253
## [114,]  0.861926056  1.672184717 -0.2905798137
## [115,]  0.502907066 -0.964718479  0.1722577393
## [116,] -0.124361588  0.121099491 -0.3427441451
## [117,]  0.148570664  1.241001991 -0.5654697557
## [118,]  2.291232248  2.230747174  0.1209613524
## [119,]  0.292592223  1.569407098 -0.7579634732
## [120,]  1.554116575  0.051411596 -0.2919360483
## [121,]  0.471353622  0.769453621 -0.3000942339
## [122,]  0.239404523 -0.179511841 -0.8150414891
## [123,] -0.183468621  0.418602246 -0.3254376420
## [124,] -0.379654647  0.225010617 -0.0511604751
## [125,]  1.168530259 -0.687054723 -0.1837383744
## [126,] -0.439853331  0.096473505 -0.1761735895
## [127,] -0.020406232 -2.895762575 -0.1700108754
## [128,]  0.029381207  1.385234054 -0.3355970649
## [129,] -0.160749776 -0.354127757 -0.1035501859
## [130,]  0.339556664  0.332058477  0.0667005248
## [131,] -0.237984674  1.134193809  0.9177089771
```

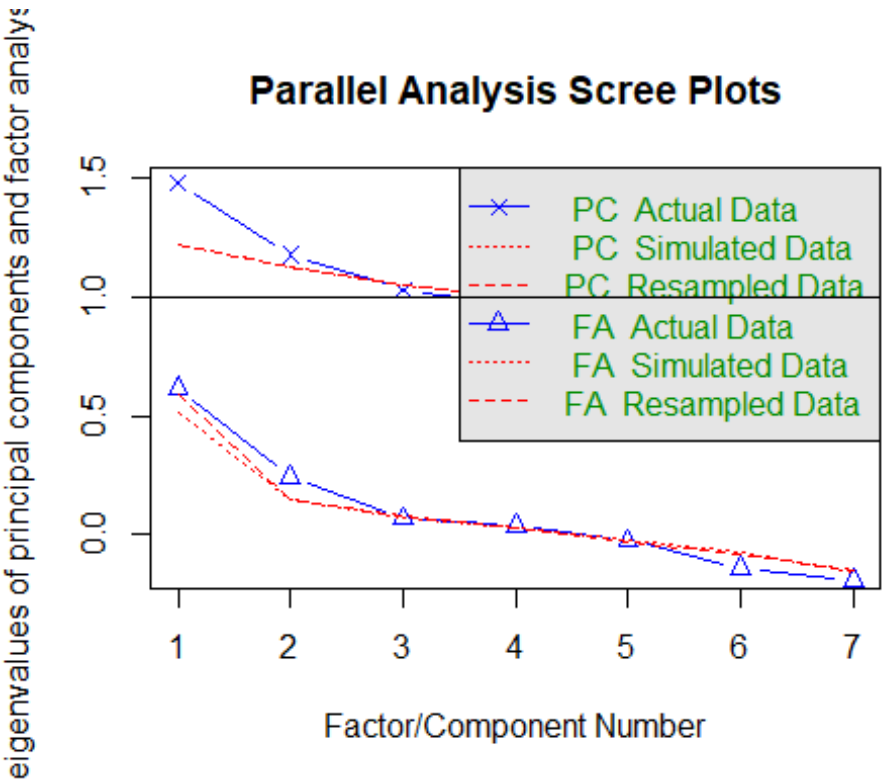
```
## [132,]  2.210066656 -1.073871848  0.1719603923
## [133,] -0.548148785 -0.084896488  0.3618093076
## [134,]  0.200275116  2.329893544 -0.1807820612
## [135,]  1.012954927 -0.207848181  3.1075914230
## [136,]  0.684773385  0.418180700 -0.1193766853
## [137,]  0.265991270  1.127564425 -1.0622916315
## [138,]  0.816047289 -1.337238996  0.1567333112
## [139,] -0.004758957 -0.254210240 -0.3494468499
## [140,] -0.659513150 -0.603226065  0.9684829433
## [141,]  0.923062231  0.032713985 -0.0676803357
## [142,] -0.766013551  0.333299547  0.4898487459
## [143,] -0.431084079 -0.882918765  0.3375768085
## [144,] -0.190133535  0.640424682 -0.3848998983
## [145,]  0.594737173 -0.078962400  0.7680732406
## [146,] -0.822369651  0.053442218  0.1115508170
## [147,] -0.632086337 -0.639659696 -0.3084664918
## [148,]  0.318971640  1.156013079  0.5291490901
## [149,]  0.863876747 -0.671332644 -0.2568422316
## [150,] -0.102833245 -0.438284149  1.3662033639
## [151,]  1.097728686  0.154049087 -0.6481837510
## [152,]  0.058513888  1.525735600 -0.7298158827
## [153,] -0.501623706 -0.244712801 -0.7113591605
## [154,] -0.466410671 -0.387641116  1.2984836637
## [155,] -0.026249918 -0.140029667 -0.3217130039
## [156,] -0.116271543 -0.519456212 -0.2552566197
## [157,] -0.328502961 -0.297409376 -0.2283230337
## [158,] -0.670127696 -0.863873950  0.0320977323
## [159,]  1.236631450  0.628600664 -0.3480628341
## [160,] -0.087149306  0.989271375  0.0447048996
## [161,]  0.264931050 -0.108130352 -0.6630592328
## [162,] -1.011591855 -0.282794292 -0.3950346566
## [163,]  0.064674548  0.794095498  0.7180245971
## [164,] -0.855164135 -0.353179379  1.1021613126
## [165,] -0.817630171 -0.338158269  2.2477161022
## [166,]  0.790071410 -0.085952387 -0.4093134146
## [167,] -0.364973805  0.605203649 -0.8129999106
## [168,]  0.051590540 -1.959827996 -1.0494779489
## [169,] -0.058338220  0.409337783 -0.0359104234
## [170,]  0.159737156 -0.254669123  0.1473645979
## [171,] -0.489533321 -0.419949638  0.0988150804
## [172,] -0.595220420  0.285623727  3.2696000954
## [173,]  0.085653123  2.126932185 -0.8797935760
## [174,] -1.101774379 -0.948102234 -0.2916000702
## [175,] -0.166037172  0.108567577 -0.3032487590
## [176,] -0.097398428  1.622331214 -0.4001096589
## [177,]  0.077392575 -0.439270324 -0.1476584803
## [178,] -0.847221750  0.547109788 -0.9085380018
## [179,] -0.127606139  2.264892371 -0.4746835928
## [180,] -0.690762926  0.522014464  0.3837300635
## [181,] -1.244346835 -0.658517059  0.3641916993
```

```
## [182,] -0.514946965 -0.827817681 -0.3989361780
## [183,] -0.172665628 -0.647201739 -0.1258618235
## [184,]  0.858257113 -0.307871855 -0.9277885573
## [185,] -0.642483481 -0.760191790 -0.4506613356
## [186,] -0.241494042 -0.111254457  0.0564260901
## [187,] -0.937666219 -0.077076546 -0.6672609206
## [188,] -0.255431065  0.236095185  1.8079088692
## [189,] -0.460797704 -0.065475798 -0.7839240452
## [190,] -1.408796077  0.544433129 -0.0945931696
## [191,]  0.896368333 -0.001930967 -0.0750159818
## [192,]  0.146044715  1.181534430 -0.7722082772
## [193,] -0.858056614 -0.737315437 -0.6394594140
## [194,] -0.197251951  0.170279072 -0.7379426061
## [195,] -1.140428526 -1.852050166 -0.3155272212
## [196,]  0.325426969  1.463111748 -0.4808327148
## [197,] -1.139571685 -0.202664970  0.0453437056
## [198,] -0.563968269 -0.088513773 -0.4422084068
## [199,] -1.086028156 -1.352543347  0.1819051765
## [200,]  0.382812764 -3.094221200 -0.3362310993
## [201,] -0.572810886 -0.126824436 -0.0238687266
## [202,] -0.921088541  1.225260712 -0.0570952712
## [203,] -0.049124158  1.459231030 -1.1118129779
## [204,]  0.257805972 -1.189500127 -0.6668767422
## [205,]  0.074748808  0.617912310 -0.7867845639
## [206,] -0.872191759  0.486364167 -0.1067486746
## [207,] -1.645178492  0.281541525 -0.3536193491
## [208,]  0.411305453  0.203541128 -1.1172313308
## [209,] -0.601616408  0.554671402  1.4750001020
## [210,] -0.955119693 -1.089864345  0.1569386064
## [211,] -0.276077959 -0.580271097  0.1500176716
## [212,] -1.044240318  1.218357423 -0.7190084888
## [213,]  0.514319443  1.745361381  0.0449525080
## [214,] -0.813768250 -1.478470608 -0.5964264070
## [215,] -0.444032668 -0.204602604 -0.5628851690
## [216,]  0.052099177 -0.437476293 -0.6339590882
## [217,] -0.172145649  1.585499295  0.5722453206
## [218,]  2.496763775  0.200777416 -1.1196635080
## [219,] -0.197712351 -0.335412570  0.0672413174
## [220,] -1.028972799  0.545444230  0.4469534152
## [221,]  0.133728397 -1.129970941 -0.2085540954
## [222,] -0.578029718  1.566105155 -0.8250059417
## [223,] -1.446534248  0.178091687  0.1196636579
## [224,] -1.435219779 -1.547758563 -0.4838741521
## [225,] -0.798291149  0.176369046  0.9801923146
## [226,]  0.633708473  0.010070080 -0.9765007437
## [227,] -0.723949834 -1.449128438 -0.9110323577
## [228,] -1.030544496 -0.377486823  1.3845133459
## [229,]  1.107193215 -1.958924376 -0.8886990582
## [230,] -0.177352212 -0.727349896 -0.5602343511
## [231,] -0.382554098 -2.181949995 -1.5801305215
```

```
## [232,] -0.270465487 -0.467890423 -1.1229275581
## [233,] -1.674866120 -0.390174384 -0.3437570553
## [234,] -0.828338660  0.081849356  0.2421741564
## [235,] -0.899183143  0.433349049 -0.0541855242
## [236,]  0.216850133  1.442856753 -0.4216441943
## [237,] -0.260734248  2.247006891 -0.6672969538
## [238,] -0.240412393 -1.031285447 -1.0570939845
## [239,] -0.477973585  0.114754991 -0.2479793462
## [240,] -0.834705507  0.371072459 -0.5932273199
## [241,] -0.146097282  1.113592351  0.3975691472
## [242,] -0.478350273 -0.467514588 -0.2735254772
## [243,] -1.590244047 -0.533883949 -0.4184106249
## [244,] -0.337491933  0.703958612  0.0495325011
## [245,] -0.616985393 -0.495454082 -0.2479309897
## [246,] -0.564588356  0.134668438 -0.5948572768
## [247,] -1.010428348 -0.579147470  1.4544247652
## [248,] -0.137655299 -0.993127257 -0.6218160308
## [249,] -1.759514498  0.274842579  0.4034560489
## [250,] -0.813783277 -0.878697260 -0.8719692563
## [251,] -1.368612816  0.021316492  2.2729743066
## [252,] -1.275899254  0.475442827 -0.0786717985
## [253,] -1.029142756 -0.136056729 -0.5715204228
## [254,] -0.193496871 -0.569879346 -1.0094653812
## [255,] -0.919133283  1.367103676 -0.4859672953
## [256,] -1.304260771  0.350205504  0.0748085330
## [257,] -0.360695064  0.407225800 -0.3469299128
## [258,] -1.034864271  0.286602875 -0.6156970433
## [259,] -1.699350741 -1.116851998 -0.5446641225
## [260,] -1.119929739  0.573998136 -0.6845877600
## [261,] -1.169037355  0.082835319 -0.9001028427
## [262,] -0.784809716 -0.167920028 -0.3269090559
## [263,] -0.493708629 -1.695450884 -0.9796642972
## [264,] -0.497304930  1.601722724 -1.1761804108
## [265,] -0.976574569  0.192412282 -0.6509580136
## [266,] -1.467961242  0.427896169  0.1003924068
## [267,] -0.902077101 -1.496147172  0.4109312622
## [268,] -1.036389744 -0.082329109 -1.0784647253
## [269,] -1.705386507  0.299483803  0.1146301416
## [270,] -1.739073319 -1.138271940 -0.3559990233
## [271,] -1.300129495 -1.536663050 -0.2416124330
## [272,] -1.315969968 -0.440075513 -0.4998004636
## [273,] -0.529848105 -0.419933966 -1.0482014072
## [274,] -1.985877359  0.100740767 -0.7664031671
## [275,] -1.130127906 -0.653364324 -0.9493329437
## [276,] -1.598593607  0.309970406  0.4940385513
## [277,] -0.632759027  0.841159617  0.0294273529
## [278,] -0.738333683 -0.116872897 -1.3081957816
## [279,] -1.578182522 -0.731749724  0.1439136175
## [280,] -0.953911115  0.420001999  0.0239870270
## [281,] -0.480593516  0.083066046  1.2235734344
```

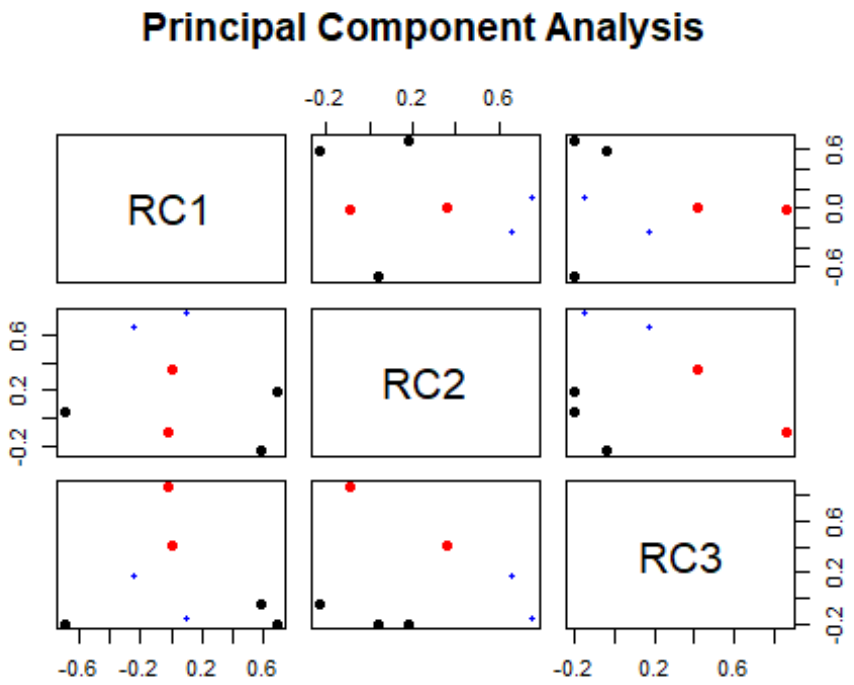
```
## [282,]  0.010452664 -0.638979802 -1.3749238633
## [283,] -0.548950968 -2.217153856 -0.9372928135
## [284,] -0.743013091  0.155648639  0.5674839806
## [285,] -1.612155439  0.603633903 -0.5012124553
## [286,] -1.039827166  0.076912746 -0.4303027182
## [287,] -0.843330937  0.242317466 -0.4266714040
## [288,] -1.182272798  0.941536117  0.5788535918
## [289,] -0.948575182  0.543794864  0.0384268999
## [290,]  0.070130052  1.812508190 -0.2191244979
## [291,] -1.743137930  1.091959585 -0.4053547510
## [292,] -1.073623081 -0.267028528 -1.0060410433
## [293,] -1.427227293  0.672588422 -0.0315439986
## [294,] -1.122843832 -0.345719829 -1.1758990412
## [295,] -1.263199681  0.528831385 -1.1119318115
## [296,] -1.290036191  0.095482767  0.7991514192
## [297,] -1.393302226  2.385879900  2.6677123780
## [298,] -1.782271248 -0.420525876  0.9155996847
## [299,] -1.273483991  0.483974683 -0.2522706621
```

```
# Factor Analysis utilities

fa.parallel(dataset[c(1,3,5,7,8,9,12)])
```

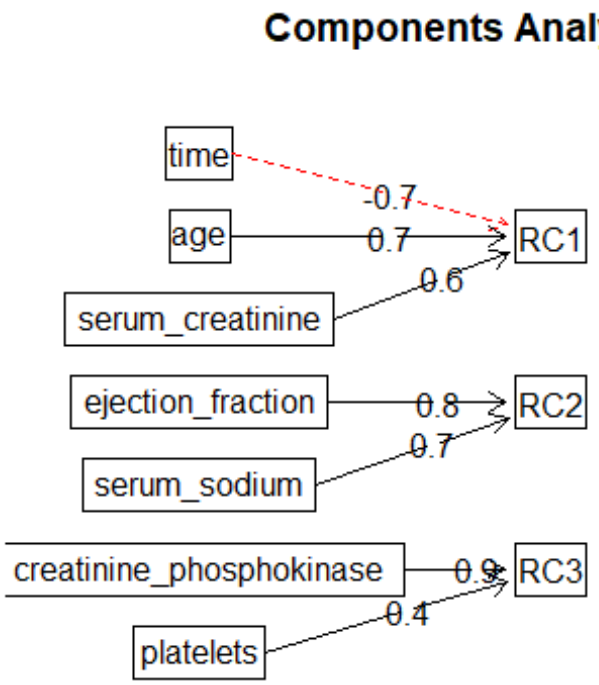



```
## Parallel analysis suggests that the number of factors =  0  and the number
of components =  1
```

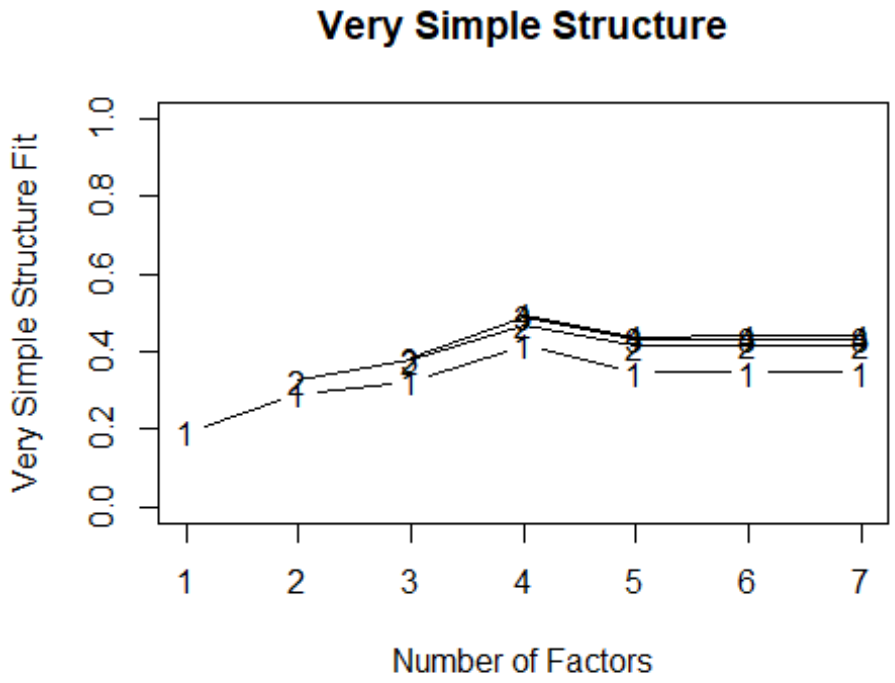
```r
#Based on the plot, we should retain two factors(based on the first elbow)

fa.plot(fit.pc)
```




```r
#Based on the plot, we can confirm that there is no correlation between RCs

fa.diagram(fit.pc)
```




```
#This diagram visualizes the relationship

vss(dataset[c(1,3,5,7,8,9,12)])
```



```
##
## Very Simple Structure
## Call: vss(x = dataset[c(1, 3, 5, 7, 8, 9, 12)])
## VSS complexity 1 achieves a maximimum of 0.42  with  4  factors
## VSS complexity 2 achieves a maximimum of 0.47  with  4  factors
##
## The Velicer MAP achieves a minimum of NA  with  1  factors
## BIC achieves a minimum of  NA  with  1  factors
## Sample Size adjusted BIC achieves a minimum of  NA  with  2  factors
##
## Statistics by number of factors
##   vss1 vss2   map dof   chisq  prob sqresid  fit RMSEA BIC SABIC complex
## 1 0.19 0.00 0.035  14 2.1e+01 0.095     6.0 0.19 0.042 -59 -14.1     1.0
## 2 0.29 0.33 0.075   8 5.0e+00 0.760     5.0 0.33 0.000 -41 -15.3     1.3
## 3 0.33 0.38 0.134   3 1.9e+00 0.589     4.6 0.38 0.000 -15  -5.7     1.5
## 4 0.42 0.47 0.251  -1 3.0e-02    NA     3.7 0.49    NA  NA    NA     1.5
## 5 0.35 0.42 0.417  -4 2.0e-08    NA     4.1 0.44    NA  NA    NA     1.4
## 6 0.35 0.42 1.000  -6 2.6e-13    NA     4.1 0.45    NA  NA    NA     1.4
## 7 0.35 0.42    NA  -7 2.6e-13    NA     4.1 0.45    NA  NA    NA     1.4
##    eChisq    SRMR eCRMS eBIC
## 1 3.7e+01 5.4e-02 0.066  -43
## 2 7.8e+00 2.5e-02 0.040  -38
## 3 3.0e+00 1.6e-02 0.041  -14
## 4 4.7e-02 1.9e-03    NA   NA
## 5 2.6e-08 1.4e-06    NA   NA
## 6 5.0e-13 6.3e-09    NA   NA
## 7 5.0e-13 6.3e-09    NA   NA
```

```
#The Very Simple Structure recommends to retain 4 factors to achieve the
maximum fit
```

```
detach(dataset)
```