

## Assignment-6.R

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### GitHub Links:

.R File: [https://github.com/kunwangRU/Survival-Analysis-of-Patients-with-Heart-Failure/blob/master/Factor%20Analysis%20\(Assignment%206\).R](https://github.com/kunwangRU/Survival-Analysis-of-Patients-with-Heart-Failure/blob/master/Factor%20Analysis%20(Assignment%206).R)

#### *#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/wangk/Desktop/Rutgers/Rutgers Courseware/Fall 2020/Multivariate Analysis/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
```

```
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
```

```
dim(dataset)
```

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

```
#Checking for missing values
```

```
is.null(dataset)
```

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

```
##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

# 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

# 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

# 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
## [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
## [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
## [217,]	0.77059724	0.639151068	1.006890437
## [218,]	-0.57452734	-0.159580953	2.696816008
## [219,]	0.60245667	0.452608493	-0.260553742
## [220,]	-0.49045705	0.000165451	-0.260553742

## [221, ]	1.02280810	0.000165451	-1.527997920
## [222, ]	0.35024581	-0.478043140	1.006890437
## [223, ]	-1.58337077	-0.511023042	-0.260553742
## [224, ]	-1.16301934	0.000165451	-1.105516528
## [225, ]	-0.23824619	0.000165451	-1.105516528
## [226, ]	1.19094867	0.096013294	1.851853222
## [227, ]	-0.23824619	-0.540911079	-1.105516528
## [228, ]	-0.49045705	2.279901233	-0.260553742
## [229, ]	0.35024581	-0.541941701	-1.105516528
## [230, ]	0.93873781	-0.382195297	-1.105516528
## [231, ]	-0.07010562	-0.428573285	-0.683035135
## [232, ]	0.77059724	-0.503808689	-0.260553742
## [233, ]	-1.75151134	-0.466706298	-0.260553742
## [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
## [257, ]	0.35024581	-0.263673771	-0.007064906
## [258, ]	-0.23824619	-0.463614432	-0.007064906
## [259, ]	-1.33115991	-0.531635482	-1.105516528
## [260, ]	-0.65859762	-0.541941701	1.006890437
## [261, ]	-0.49045705	-0.531635482	0.161927651
## [262, ]	0.09803495	0.075400854	0.161927651
## [263, ]	0.35024581	-0.333756065	-1.105516528
## [264, ]	0.60245667	-0.437848883	1.851853222
## [265, ]	0.01396466	0.000165451	-0.007064906
## [266, ]	-0.91080848	-0.292531186	-0.260553742
## [267, ]	-0.49045705	0.636059202	-1.527997920
## [268, ]	-0.40638676	-0.460522566	-0.007064906
## [269, ]	-1.33115991	0.000165451	-0.007064906
## [270, ]	-1.75151134	0.000165451	-0.260553742

## [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	
## [276,]	-1.33115991	0.000165451	-0.007064906	
## [277,]	0.77059724	0.037267842	-0.260553742	
## [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
##	[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
## [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
## [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
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## [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
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## [176,]	7.529528e-01	-0.380740229	0.31152159	0.202786717
## [177,]	-1.619133e+00	-0.380740229	-0.36836860	0.215670956
## [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
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## [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
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## [206,]	1.008565e+00	-0.380740229	-0.14173853	0.731040513
## [207,]	-3.819674e-01	-0.574068459	0.99141178	0.731040513
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## [209,]	2.008294e-01	-0.380740229	0.99141178	0.731040513
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## [219,]	7.813538e-02	-0.284076114	-0.59499866	0.859882903
## [220,]	1.100586e+00	-0.670732575	0.76478171	0.859882903

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## [239, ]	-6.500771e-02	-0.380740229	-0.14173853	1.027378009
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## [243, ]	-8.545672e-02	-0.284076114	-0.14173853	1.053146487
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## [250, ]	-4.126409e-01	-0.187411999	-1.50151891	1.078914965
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## [257, ]	3.132990e-01	0.295908577	0.53815165	1.156220398
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## [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
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## [276,] 1.622036e+00      -0.574068459  0.08489153 1.478326372
## [277,] 6.507077e-01      -0.284076114  1.21804184 1.478326372
## [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
```

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## [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 1.34444474338
## [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
```



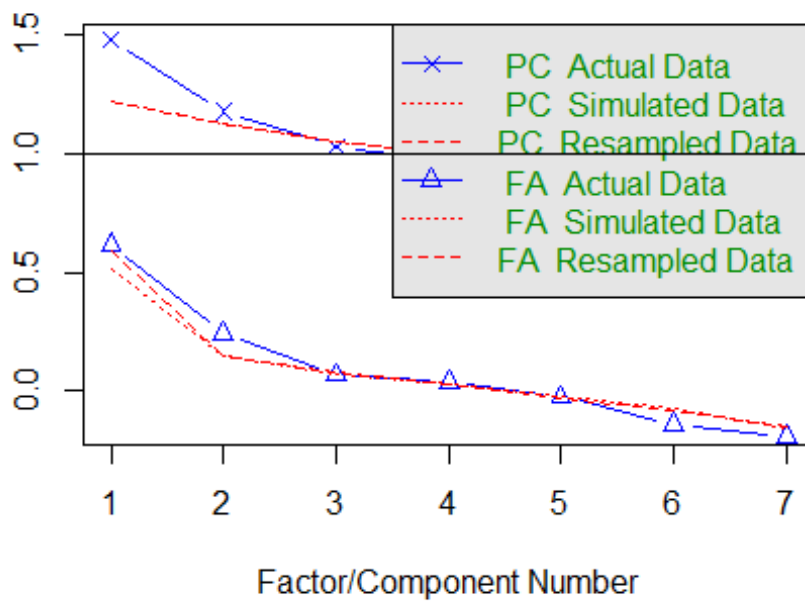
```
## [262,] -0.784809716 -0.167920028 -0.3269090559
## [263,] -0.493708629 -1.695450884 -0.9796642972
## [264,] -0.497304930  1.601722724 -1.1761804108
## [265,] -0.976574569  0.192412282 -0.6509580136
## [266,] -1.467961242  0.427896169  0.1003924068
## [267,] -0.902077101 -1.496147172  0.4109312622
## [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)])
```

eigenvalues of principal components and factor analysis

## Parallel Analysis Scree Plots

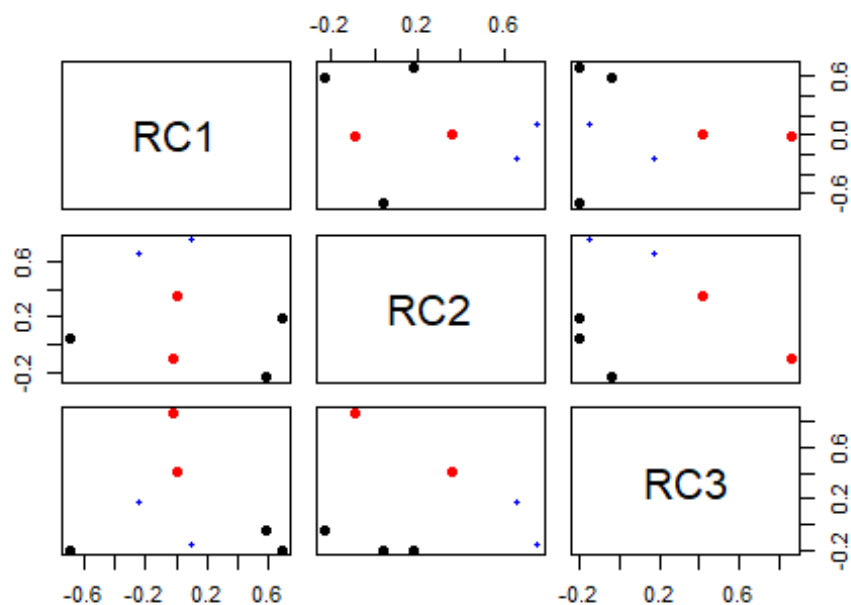


```
## Parallel analysis suggests that the number of factors = 0 and the number  
of components = 1
```

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

```
fa.plot(fit.pc)
```

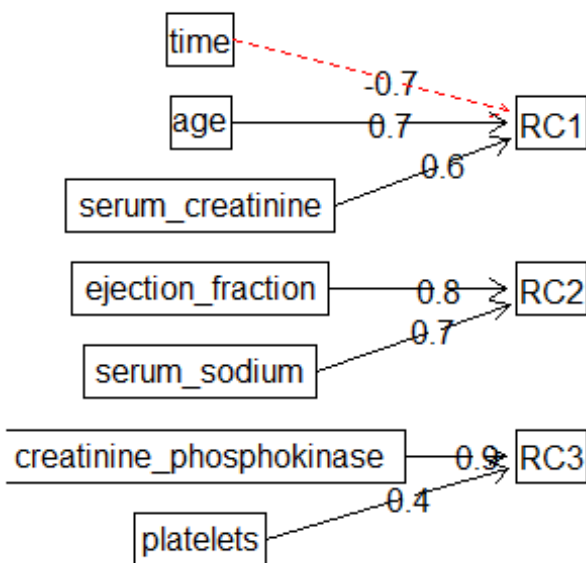
## Principal Component Analysis



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

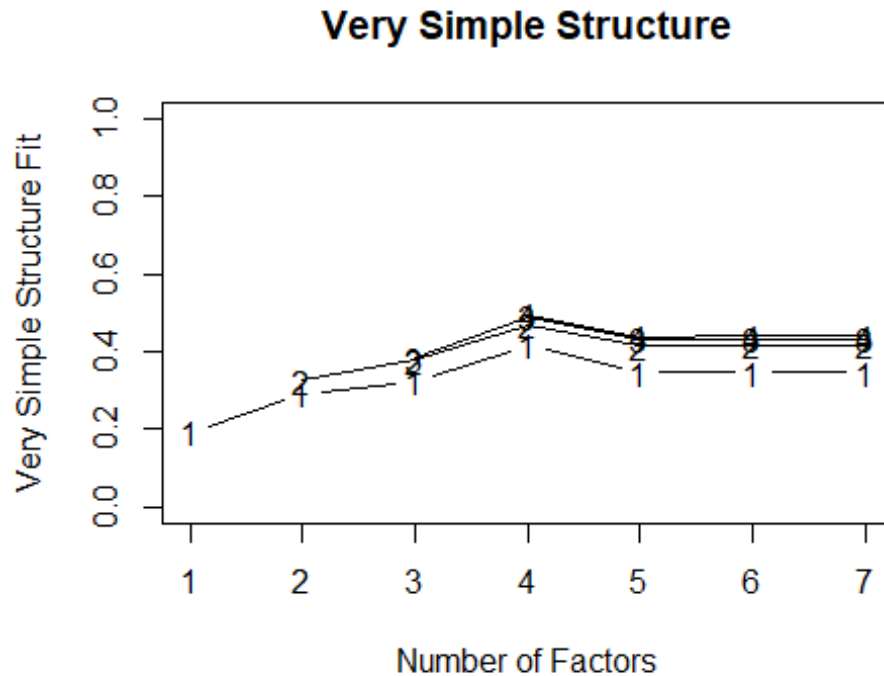
```
fa.diagram(fit.pc)
```

## Components Analysis



*#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 maximum of 0.42 with 4 factors
## VSS complexity 2 achieves a maximum 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)
```