Portfolio 10

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Portfolio 10: Principal Component Analysis & Factor Analysis - Real World Immitating Task

You are working in a head-hunting agency. Your job is to filter candidates for a top position in a large corporation. During the interviews, the 105 candidates have been subjected to an empathy questionnaire.

```
#set working directory
setwd("~/OneDrive - Aarhus universitet/Portfolio 10")

#load data
data <- read.csv("emp_all_all.csv", header = FALSE)

#packages
library(corrgram)
library(psych)

library(GPArotation)
library(tidyverse)

library(reshape2)

library(ggplot2)
library(reshape)
```

1) People at your agency disagree on how many interesting components/factors are present in the test, so they ask you, the factor analysis expert, to determine this. Please add your argument for the number you end on.

```
#principal component analysis
data_prcomp<-prcomp(data,scale=TRUE)

#rotate
data_prcomp$rotation
```

```
##               PC1          PC2          PC3           PC4          PC5
## V1  -0.086925864  0.079768186 -0.076783763  0.1399982913  0.006951213
## V2  -0.035235998 -0.099892853  0.005779913  0.0459267796 -0.228164910
## V3  -0.148862592 -0.134046315  0.024540505 -0.0307938171 -0.137214142
## V4  -0.109846872  0.116861015 -0.163456308  0.0350266650 -0.006465121
## V5  -0.106449108  0.027036095  0.107831689 -0.0958537499  0.043135286
## V6  -0.068986632 -0.003412869 -0.171872077  0.0405392887 -0.012250434
## V7  -0.132937796  0.012397517  0.212534724  0.0926391925  0.028374885
## V8  -0.101232230 -0.108915817 -0.056171892 -0.1222547134  0.039881244
## V9  -0.098600609  0.060045510 -0.167326118  0.0354569214 -0.059748446
## V10 -0.118669394  0.120958219 -0.082512547  0.0242446857 -0.189082313
## V11 -0.120560528 -0.090308491  0.054768222  0.0781414579  0.127665429
## V12 -0.099463157 -0.059899247 -0.087991193  0.2538594163  0.107809859
## V13 -0.145019626 -0.012980942  0.075993374  0.0926273476  0.099748805
## V14 -0.084711168 -0.043930891  0.081954178  0.2035772558  0.042731901
## V15 -0.109634721 -0.098644711 -0.082740877  0.0959744365  0.051699155
## V16 -0.133721500  0.155092069 -0.103005137  0.0009206662 -0.194141281
## V17 -0.154570264 -0.091653395  0.109399740 -0.0482963157 -0.046191730
## V18 -0.139619177  0.016853284 -0.119764351  0.1327539314  0.046357690
## V19 -0.120296653  0.004752964 -0.050816913  0.2356241292  0.052117079
## V20 -0.018182463 -0.090474896 -0.190381135  0.1904428592  0.044300317
## V21 -0.156705367 -0.007839441  0.103469909  0.0782009797  0.069390775
## V22 -0.099042146 -0.075051252 -0.150494602  0.1666094024  0.092551368
## V23 -0.096342069 -0.176620621  0.153310168 -0.0808233553 -0.073784507
## V24 -0.035132290 -0.189305882 -0.163186626  0.0119661678 -0.053669283
## V25 -0.152093029 -0.191671623 -0.002457333  0.0484446684  0.014343106
## V26 -0.140515586  0.158685734 -0.169930972  0.0600144301  0.007997550
## V27 -0.113820703 -0.125313574 -0.004146095  0.1371501862 -0.060560355
## V28 -0.086359682  0.042633686  0.004626543  0.1218128540  0.248265069
## V29 -0.134912287 -0.101084206 -0.007067710 -0.1086243454 -0.003711012
## V30 -0.100085657 -0.187891589 -0.131860142  0.0819825270  0.077070945
## V31 -0.134461908  0.094400960 -0.023204832 -0.1102470798 -0.209926160
## V32 -0.157211942  0.071451502 -0.059262556 -0.0837628427 -0.184721915
## V33 -0.117661896  0.048359496 -0.121012155 -0.0073090440 -0.193861162
## V34 -0.092523415  0.124193881 -0.013611933  0.0237797872 -0.220612308
## V35 -0.120745093 -0.052971774  0.079070640 -0.1108526787 -0.218627029
## V36 -0.053591401  0.009771921 -0.251028911  0.0952136854 -0.088544303
## V37 -0.165886405  0.076027022 -0.004573723 -0.1425272945 -0.195152018
## V38 -0.149027495 -0.105845344  0.078725741 -0.0596109401 -0.064658095
## V39 -0.138491578 -0.097278247  0.015894149 -0.0327205676  0.160948461
## V40 -0.106630154 -0.135894968 -0.017403310  0.0199457957 -0.176101453
## V41 -0.155898985 -0.021062386  0.017100179  0.1740643437  0.004133595
## V42 -0.122549407 -0.140694039 -0.068203190  0.0806484513  0.108746529
## V43 -0.159344867 -0.135925206 -0.002743601  0.1520934286 -0.037571377
## V44 -0.176863441 -0.045036852 -0.081626063  0.1045843187 -0.096475456
## V45 -0.101301609 -0.222807057  0.215168156 -0.0371156113 -0.021598341
## V46  0.022446358 -0.105793839 -0.108088691 -0.1278786124  0.044729068
## V47 -0.107190906 -0.178180937  0.094991266 -0.0616960999 -0.172027853
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## V48 -0.100338639 -0.181815695  0.197796967 -0.1383653396 -0.114305983
## V49 -0.005145770 -0.159344607 -0.034975800 -0.1863258671  0.177965382
## V50 -0.070714188 -0.088772860  0.184654678 -0.0689496071  0.235836902
## V51 -0.097129976 -0.254114676  0.081394916 -0.0377073779  0.048811777
## V52 -0.087943309  0.099727738  0.200687848 -0.0075647476 -0.065470116
## V53 -0.035327321  0.164241013  0.237230423  0.1519763510  0.004857984
## V54 -0.078264320  0.167532953  0.276647924  0.2372243866 -0.010700627
## V55  0.004722063  0.040977779  0.148763654  0.1095957519  0.000235136
## V56 -0.002690502  0.129451806  0.254176501  0.1764960102 -0.021550437
## V57 -0.068114621  0.107956351  0.154711267  0.0163664122 -0.004906230
## V58 -0.046945157  0.227990268  0.137225828  0.2155765647 -0.071125332
## V59 -0.151515595  0.112947458  0.009763601 -0.1776287343  0.012944300
## V60 -0.130224372  0.183404819 -0.038545585 -0.0840896352  0.034196601
## V61 -0.146987778  0.163406922 -0.047870743 -0.1804435356  0.016466862
## V62 -0.151352806  0.089055082  0.049458413 -0.1802024319  0.044978797
## V63 -0.151108633  0.021925593 -0.054113920 -0.0195677619 -0.031487309
## V64 -0.156571297  0.068127870  0.050805477 -0.0133799329  0.041886884
## V65 -0.038598635  0.068943102 -0.046250150 -0.1385270596  0.056680194
## V66 -0.119270789  0.093242098  0.007974304 -0.1256079030  0.230299100
## V67 -0.163315609  0.021337348 -0.039015744 -0.1364589261  0.235956969
## V68 -0.129142102  0.077088373 -0.054252739 -0.1542745781  0.059004328
## V69 -0.159007097  0.057972999  0.001501416 -0.0540495614  0.076203626
## V70 -0.107758346  0.141016120 -0.149784542 -0.0863223110  0.182163880
## V71 -0.128600964  0.050247804 -0.015709836 -0.0505626826  0.106762180
## V72 -0.124772500  0.154269141  0.086862189 -0.1297983456  0.173166239
## V73 -0.156571827  0.111286159 -0.029131874 -0.0084300275  0.119517567
##                PC6           PC7           PC8            PC9          PC10
## V1  -0.2524329784  0.161027732 -0.0109436957  2.370218e-01 -0.123940612
## V2   0.0587340547 -0.195440464  0.0676068968 -2.519068e-01  0.183130665
## V3   0.1098891382 -0.015497105 -0.0180411994  4.448771e-02 -0.124827371
## V4  -0.1285138030 -0.089331403 -0.3656118240 -4.962088e-02  0.138425787
## V5   0.1783946631 -0.003689989 -0.1814611862  1.724012e-01  0.151286023
## V6  -0.1461398167 -0.243254918 -0.0348832884  5.162736e-02 -0.162993481
## V7  -0.0228667634 -0.028959970 -0.0086892476 -1.443515e-02  0.126906839
## V8  -0.2197477735 -0.173374676  0.1389012301  6.459470e-02  0.054156888
## V9  -0.1393073960  0.038623981  0.2618304226  1.299817e-01 -0.021267848
## V10  0.0530696876  0.004876050 -0.0743634835 -9.271758e-03 -0.096068342
## V11 -0.0116690359 -0.082577005 -0.0321475050  2.825700e-01 -0.149009719
## V12 -0.0222413095  0.189271817 -0.0336495623 -9.196497e-02 -0.108398070
## V13 -0.0194153470  0.015441746 -0.0684714482  1.280586e-01  0.080466342
## V14  0.0681484230 -0.126960050 -0.0704391391  7.262255e-02 -0.058130219
## V15  0.1023250754 -0.209704182 -0.0430574777  1.150760e-02  0.085971308
## V16 -0.0406818063 -0.044175702  0.0146229683 -4.715067e-03  0.063990160
## V17 -0.0008223124 -0.117312551  0.0723394579  6.570411e-02  0.071013148
## V18 -0.0423208127  0.181882552 -0.0825127052  4.120054e-02 -0.053562503
## V19  0.1756045490 -0.088819022  0.0001074453  1.651318e-01 -0.191648091
## V20  0.1721706063  0.017257702 -0.0739496991 -2.430925e-01 -0.200104249
## V21  0.1682566078 -0.039382998 -0.0135037935  1.384543e-01  0.016125103
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## V22  0.0451338821  0.093617961  0.2299618093 -2.197747e-01 -0.053454325
## V23 -0.0050786742  0.002998385  0.1505112599 -6.328424e-02  0.072092509
## V24  0.1884375334  0.045687359  0.2868656823 -4.861688e-03  0.098387185
## V25  0.0152426612 -0.041759617  0.0653932355  1.199699e-01  0.031022246
## V26 -0.0992975293 -0.088809269 -0.2216392706 -6.584993e-02  0.132270447
## V27  0.0619674100  0.076018811 -0.0792937210 -1.669706e-01  0.201234494
## V28 -0.2259954913 -0.084083016 -0.0150874262 -6.082376e-02  0.010972151
## V29 -0.1672270321  0.072563603  0.2462678746 -8.168544e-03  0.091871777
## V30  0.0197592554  0.149847162 -0.0845306713  5.389092e-02  0.017484490
## V31 -0.0178897452  0.163409172  0.0889939734  1.962909e-02 -0.161987188
## V32  0.0527137146  0.016817922  0.0883655726 -8.401477e-02 -0.116552132
## V33 -0.2507919778 -0.195443717  0.0310192467  9.250089e-02  0.009216315
## V34 -0.0632269956  0.325349112 -0.0038685324  2.251806e-01  0.011612997
## V35  0.0311959617  0.034107218 -0.2205395552 -5.513121e-02  0.060570535
## V36 -0.1269503519 -0.066098020  0.0382972877 -1.620153e-01  0.107739471
## V37 -0.0611608386  0.012171913 -0.0514198443 -2.218149e-02  0.031568016
## V38  0.0172356278 -0.149910873  0.0138383135  6.022760e-02  0.018205540
## V39  0.0219000617 -0.137198364  0.0098348797  1.519654e-01  0.168062555
## V40  0.1044070404  0.051089337 -0.0631011406 -2.060804e-02 -0.087652477
## V41 -0.1333159960  0.125607450 -0.0334401157  2.925847e-02  0.063338943
## V42 -0.0213377723 -0.055227852  0.1038093570 -8.441382e-02  0.004475986
## V43  0.0945749397 -0.055442850 -0.0428931602  7.899671e-02 -0.072434717
## V44 -0.0706536452  0.084182201 -0.1234689583 -7.094011e-02  0.106530520
## V45 -0.0334517816  0.057994295 -0.0614244052 -1.405106e-01 -0.088019853
## V46 -0.3123309730  0.025362779 -0.1235362376 -1.231144e-01 -0.127352819
## V47 -0.0858670818  0.056696278  0.0946475941  1.368516e-03 -0.225960863
## V48 -0.0823694860  0.129278564 -0.0600369021 -5.024576e-02 -0.087316795
## V49 -0.1975073176 -0.099237035 -0.2151169369 -1.560178e-01 -0.217391023
## V50 -0.2599533648  0.143249133 -0.0031422890  2.252686e-02  0.105677949
## V51 -0.1022717531  0.178729622 -0.0645927514 -1.286820e-01  0.002872039
## V52  0.0239804198 -0.297085779 -0.0390891610 -1.118617e-03 -0.201161868
## V53 -0.1747124313 -0.012203329  0.1102564917 -9.596659e-02  0.320989715
## V54 -0.0600342990 -0.020360794  0.0187198432 -1.482498e-01 -0.040784278
## V55 -0.0840160600 -0.060209293  0.0904803503  7.340553e-02 -0.265576090
## V56 -0.0455978540  0.139468969  0.1089678532 -5.331363e-05 -0.005096980
## V57 -0.0527513997 -0.133664420  0.0601035035 -2.364372e-01 -0.228583643
## V58 -0.0641901805  0.014777475  0.0867805127 -1.409582e-01 -0.055500236
## V59  0.0754723248  0.053620447 -0.1463896893 -1.109710e-01  0.012072699
## V60  0.0334106981 -0.041329092  0.0209409994  5.283784e-02 -0.115917351
## V61  0.0267066680  0.091054141  0.0488206909 -2.417870e-02 -0.078539529
## V62  0.1537328575  0.147978918 -0.0263132824  3.525124e-03  0.087750620
## V63  0.0885367992 -0.108989790  0.1065274637  1.364805e-01  0.121918018
## V64  0.0533831781  0.075925573 -0.2213981592 -3.777729e-02 -0.007088962
## V65 -0.1601539241 -0.038872913  0.0950145520  1.842514e-01  0.012596154
## V66  0.1450224869  0.089881617 -0.0023662599  5.747686e-02 -0.161910548
## V67  0.0117574684  0.040464453  0.0725556626 -6.810260e-03  0.052988872
## V68  0.0223326310 -0.128301693  0.0469446513 -6.623120e-02 -0.027227503
## V69  0.1000049311 -0.122363230  0.0475650714 -1.051366e-01  0.060918640
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## V70  0.0924272287  0.191066072  0.1565971062 -1.469976e-01 -0.003887054
## V71 -0.0159511627 -0.107525448  0.2327184553 -1.597005e-01 -0.048039359
## V72  0.0896378396 -0.031790107 -0.0189780883 -1.513203e-01 -0.069141053
## V73  0.0971948429  0.059053112  0.0590785575 -4.805291e-02  0.062862953
##              PC11         PC12          PC13          PC14         PC15
## V1   0.064152293 -0.115681551  1.831014e-01 -0.0382780061  0.073610812
## V2   0.330014656 -0.054207410 -2.832189e-02 -0.2159963893 -0.040239116
## V3  -0.012804015  0.077752120  6.396353e-03 -0.1017339510 -0.140866991
## V4  -0.191661097 -0.137407258  1.271875e-01 -0.1235437515 -0.020829462
## V5  -0.057795193  0.011126993 -1.797596e-01 -0.2752834632 -0.066766837
## V6   0.204012440 -0.202811931  8.678385e-02  0.0139386657  0.076803711
## V7  -0.058810374 -0.065807372 -1.690110e-01  0.1093335150  0.180635916
## V8  -0.069878962 -0.058827162 -2.373847e-02  0.1295701918  0.002982770
## V9  -0.190453072 -0.020213014 -8.040042e-02 -0.0474321677  0.080049086
## V10  0.002609481  0.302225567  1.090217e-01  0.0771314573  0.064675785
## V11 -0.009875595  0.120555666 -2.263534e-01 -0.0515055447  0.043054724
## V12  0.283918696  0.011883586 -1.659529e-01  0.0285311029 -0.018708804
## V13  0.117308430 -0.102443238 -2.514181e-02 -0.2947161610  0.092592426
## V14 -0.215017976 -0.181100149  3.594463e-01  0.0683047187 -0.223857360
## V15  0.040951091  0.084261248  5.786740e-02  0.0343146533  0.167833702
## V16 -0.024839160 -0.023193430 -3.022332e-01  0.0902100222 -0.068518230
## V17 -0.146725441  0.014587278 -7.528148e-02  0.0692023309 -0.132868765
## V18  0.232963167  0.047712814  9.337357e-02  0.1089620777  0.030530614
## V19 -0.036418358 -0.099636367 -7.067348e-02  0.2156858759 -0.141760343
## V20 -0.073483105 -0.063897224 -2.439370e-01  0.1163897398 -0.098132609
## V21 -0.103889347 -0.048540071 -5.780084e-02  0.0644649781  0.212133269
## V22 -0.055194736 -0.038539514  7.552067e-02  0.0629918423  0.017111960
## V23  0.005310124 -0.064829232  1.181880e-01 -0.0382487831  0.094064536
## V24 -0.134664525  0.006539941 -3.611724e-02 -0.1349829024  0.206953840
## V25 -0.086916302  0.103271611  4.223981e-02  0.1746453296 -0.106417461
## V26 -0.205802087 -0.038771584  4.384788e-02 -0.0906131985 -0.038287298
## V27 -0.008045612 -0.096552597  9.196658e-02 -0.1165507168  0.031849590
## V28  0.002362274 -0.060173454 -4.202188e-03 -0.1710417982  0.023434813
## V29 -0.037060749 -0.076606972  6.571101e-02  0.0183992744 -0.045462785
## V30 -0.127561941  0.281364051 -4.286018e-02 -0.2379094359  0.025656651
## V31 -0.011727596 -0.263310512 -8.942733e-03 -0.1111780860  0.062115868
## V32  0.040605207 -0.167831785 -5.595425e-03 -0.0681508235  0.067370246
## V33  0.059077028  0.130966877  4.061890e-02 -0.0130016750  0.098155208
## V34 -0.055211841 -0.004523429  1.158963e-01  0.0549669471 -0.148114881
## V35  0.127796862 -0.235259764 -1.028916e-01  0.0405419451 -0.071480733
## V36 -0.029711838 -0.078200253 -9.167312e-02  0.0622725086 -0.266258187
## V37 -0.100603308  0.024184606 -8.006475e-02  0.1513864630 -0.007127927
## V38  0.128370211  0.019750875  1.099801e-01  0.2285693774 -0.036843361
## V39 -0.084314515 -0.052750078 -1.372792e-01 -0.0644846264 -0.223986863
## V40 -0.010279130  0.199262405 -3.006742e-02 -0.0157962384 -0.155828571
## V41  0.220867612  0.109554937 -5.003766e-02  0.0185997958  0.142329129
## V42  0.029183893 -0.055986913  5.920229e-02 -0.1335585352 -0.075118998
## V43 -0.048972536 -0.009009500  1.248710e-01 -0.0893573051  0.102302545
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## V44 -0.007587771  0.037246430  2.725605e-02  0.0277133644 -0.002503333
## V45  0.114431859 -0.031313605  8.427805e-02  0.0760338131 -0.099046036
## V46 -0.229696992  0.280472350 -2.556312e-02 -0.1288254522  0.046459442
## V47 -0.074740362  0.002561946 -1.240690e-01 -0.1778986027 -0.064704689
## V48 -0.074507280  0.053014899  1.153080e-02  0.1052017362  0.048129408
## V49 -0.022556389 -0.167539603 -6.021062e-02  0.0167433317  0.055526682
## V50  0.063090888 -0.032391568  3.781810e-03  0.1779371079 -0.131396690
## V51  0.018168323  0.004729317  3.243828e-02  0.0197024969  0.191757507
## V52  0.108305425  0.125847396  1.871691e-02 -0.1481755947  0.140812579
## V53  0.043489030  0.147519277 -9.641899e-05 -0.0061462158 -0.060385084
## V54 -0.016291440 -0.069325831 -1.538485e-01  0.0138596697  0.074512162
## V55  0.106334663  0.030670897 -9.282631e-02 -0.2799211099 -0.348510894
## V56 -0.124667591  0.024272130  1.759237e-01 -0.1581277353 -0.031300201
## V57 -0.296516585 -0.062157047 -2.340204e-02 -0.0272000556  0.229417278
## V58 -0.144166448  0.029845386 -1.393078e-01  0.1040225513 -0.006070542
## V59  0.038112598  0.064953338  1.434444e-01 -0.0958198199 -0.149662897
## V60  0.216970928  0.062949118  1.622749e-01 -0.0689852292  0.024708897
## V61  0.020861183  0.114566210  4.953043e-02 -0.0109621417  0.013174847
## V62 -0.063349406 -0.233541048 -7.062396e-02 -0.1013445028 -0.040931128
## V63  0.040736163 -0.098098231  7.676592e-02  0.0925365599  0.204577116
## V64  0.006588530  0.081209334 -1.760316e-01  0.1961878041  0.072584862
## V65  0.134251944 -0.013035644 -2.717003e-01  0.0162650211 -0.062151407
## V66 -0.062907588 -0.133286551  9.248284e-02  0.0255791673  0.022473918
## V67  0.034732490 -0.020430508 -5.636702e-02 -0.0182680162  0.014720995
## V68  0.057895636  0.129093808  9.591966e-03  0.0597483243  0.047458365
## V69  0.002736901  0.206999621 -1.846462e-02 -0.0413259354 -0.048106842
## V70  0.067594919 -0.049578985 -1.195973e-01 -0.1050982922  0.029659032
## V71  0.002385995  0.052849157  1.345478e-01 -0.0007720388 -0.264894224
## V72  0.076695868  0.067462631  1.098415e-01  0.0870068797 -0.044743099
## V73 -0.031047452  0.203438407  9.645065e-02  0.0523087499 -0.029521272
##             PC16         PC17          PC18         PC19         PC20
## V1  -0.148482517  0.083877704 -0.0883609837 -0.086265143  0.077441171
## V2  -0.093846882  0.024336239 -0.0857877335 -0.168380398  0.104595602
## V3   0.173382557 -0.109573703  0.1033093854  0.071728310 -0.023086685
## V4   0.073840982 -0.005979297  0.0824531406 -0.014101940  0.050271150
## V5  -0.083734779  0.001638133  0.0272274240 -0.049488355  0.145723231
## V6  -0.092145780 -0.228484229  0.3269195599 -0.014009235 -0.112119322
## V7  -0.049470694  0.064609230  0.0162651835 -0.114474575  0.054451470
## V8   0.127869138 -0.155508503 -0.0349207775 -0.154546563  0.120730099
## V9   0.020225431  0.038315420 -0.0004169679 -0.325415285 -0.083812733
## V10 -0.051637279 -0.098993717 -0.0654780844  0.131733480  0.122281123
## V11 -0.057146331 -0.086403359 -0.1987756927 -0.109780769 -0.166005651
## V12 -0.002458946 -0.149538337  0.0593559892 -0.054026078 -0.038664492
## V13  0.071350526 -0.055837748 -0.0589203363  0.196416005 -0.232385979
## V14 -0.177199876  0.046706364 -0.0694594531 -0.098861977  0.090976598
## V15  0.026910407  0.114959687  0.1745827116  0.105515835 -0.044763625
## V16 -0.034717058  0.093564938 -0.0325792522  0.064572740 -0.098744111
## V17 -0.094562435  0.050059905  0.0341461129  0.294883275 -0.094553891
```

```
## V18  0.028388750 -0.047025650 -0.0932592867  0.004963845  0.032218928
## V19 -0.064109473  0.095797654  0.1360849622 -0.047234908 -0.002300817
## V20 -0.006630442 -0.066875215  0.0300128732  0.100872931  0.132393251
## V21 -0.003541363  0.156344181 -0.0436099736  0.083510887  0.084349166
## V22 -0.154974922 -0.006796145 -0.1260947458  0.032228175  0.201544900
## V23  0.178575709 -0.043384256  0.3554010775  0.051116767  0.243353604
## V24 -0.074509211  0.073691314  0.1350933764  0.078300044 -0.112574709
## V25 -0.019550512 -0.035894081 -0.1505002619 -0.059332081  0.026166444
## V26  0.042043427 -0.033083320  0.1351947108  0.058652811 -0.010904244
## V27 -0.168408868  0.057514095 -0.1202256423 -0.068866220  0.191902615
## V28  0.275607863  0.117890701 -0.1260597221  0.180190001 -0.073798975
## V29  0.040956807 -0.169067380  0.0232800752 -0.002472597 -0.019104197
## V30  0.084641339 -0.165081646  0.0277039395 -0.015151191 -0.096337361
## V31  0.066617537  0.036363973 -0.0515389572  0.156054005  0.042883492
## V32  0.039653423  0.008939136 -0.1419631816  0.126422578 -0.045514420
## V33 -0.015915996  0.006443789 -0.0157271364  0.010574735  0.053635510
## V34  0.054009048  0.051080980  0.1155982309  0.085049464  0.014075624
## V35  0.001524067  0.159673706 -0.1705241851 -0.085126492 -0.190341485
## V36 -0.198919782 -0.008349982  0.0926843532  0.026288820 -0.207472748
## V37  0.006725839 -0.142314727 -0.1778415208 -0.013603377 -0.054406835
## V38  0.146818481 -0.174660899  0.0153263880  0.005853189  0.097506722
## V39  0.028947295 -0.230790910  0.0469286449  0.048252067  0.072950891
## V40  0.264004384  0.003288120 -0.3248936434  0.024609788  0.133190993
## V41  0.044363098  0.162714527  0.0641375438  0.063805275 -0.058952398
## V42  0.247974948  0.132662580 -0.1773498523 -0.031357467  0.123044589
## V43 -0.050817989 -0.094080766  0.0547788916  0.068063346  0.107724210
## V44  0.081124335  0.096038200  0.0191789167 -0.160747256 -0.057752178
## V45 -0.075777162  0.012285592  0.1352985000 -0.010889549 -0.111605961
## V46 -0.137910728  0.151150374  0.0875354984 -0.054908448  0.180699952
## V47 -0.217743163  0.061033036  0.1578971068 -0.028370078 -0.029043762
## V48 -0.082509945  0.021595121  0.0862622294  0.079914217 -0.094584672
## V49 -0.140750388  0.072323144 -0.1893684583  0.197165484  0.148684385
## V50  0.055514674  0.070782613 -0.0344031122  0.122100782 -0.051134807
## V51 -0.044103604  0.015406358  0.0350894529 -0.193713076 -0.122332499
## V52 -0.134717179 -0.125091625 -0.0912961338  0.041405686  0.026272944
## V53 -0.087197642 -0.086591158  0.0220250464  0.040071255 -0.009392780
## V54 -0.048247367 -0.100018232  0.0612985975  0.010181574  0.096362039
## V55  0.132205740  0.272816591  0.1468615933 -0.258705847  0.057613919
## V56 -0.296895588 -0.184644505 -0.1519036061  0.084080105  0.022019751
## V57  0.193199686  0.013669308 -0.0473498083 -0.051016014 -0.160063187
## V58  0.211389191 -0.120231555  0.0587550464 -0.083604821  0.069639838
## V59 -0.097741218 -0.104704484  0.0192789107 -0.165337971 -0.102684640
## V60  0.033636656 -0.048914321  0.0447556902  0.130864733  0.033860172
## V61  0.045400577  0.059568395  0.1049184222  0.031379107  0.160937136
## V62  0.049365546 -0.067969110  0.0483879390 -0.119426303  0.135116980
## V63 -0.011784162  0.287552057 -0.0723971089 -0.085425754  0.009540889
## V64 -0.025080034 -0.002187749  0.1453401628  0.014919751  0.067922071
## V65 -0.215348004  0.126858724  0.0047524498  0.120788238  0.357678646
```

```
## V66 -0.085856075 -0.023144130  0.0053640335 -0.087357881 -0.198311800
## V67 -0.027609850 -0.172106895 -0.0555259774 -0.105546372  0.073553022
## V68 -0.109633623 -0.127897772 -0.1409381325 -0.306361255 -0.091470256
## V69 -0.174735229  0.219021273  0.0567222805  0.047338803 -0.148360446
## V70 -0.065374876 -0.129650784  0.0202263457  0.073586237  0.030079197
## V71  0.012267728  0.093575882 -0.0825375705  0.215266787 -0.184754754
## V72  0.108615827  0.173233178  0.1349790169 -0.158583207  0.097643535
## V73 -0.039968096  0.213667216  0.0308487575  0.016254548 -0.035845051
##             PC21          PC22         PC23          PC24          PC25
## V1   0.253055732 -0.2373274104  0.085963414  0.0437591390 -0.0107344029
## V2   0.092629204 -0.1107596762 -0.109610315 -0.0232761113 -0.0720562137
## V3   0.078571088  0.0301939956 -0.187079170  0.0477687021  0.1816737594
## V4   0.012732380  0.0257284574  0.002122289 -0.1251659788 -0.0010926190
## V5   0.023073956 -0.0933185645 -0.024621226  0.1289165083 -0.1712065643
## V6   0.136919398 -0.0842048546 -0.194325832 -0.1247650236 -0.0194001407
## V7  -0.086691984 -0.0833027547  0.102054641  0.0285383429  0.2007615697
## V8  -0.048409351 -0.1851472992  0.265317020 -0.2081365144 -0.1491428277
## V9   0.071815427  0.1003075386 -0.271891515  0.0876504662 -0.0853798961
## V10  0.174353121 -0.0096205076  0.119891402  0.0709144764 -0.2965643062
## V11  0.017249980 -0.0664378728 -0.104565613  0.0177095375 -0.0754250570
## V12 -0.021613755  0.0866811432 -0.016686343  0.0342563395  0.0808407551
## V13 -0.168852271 -0.0743974554 -0.028015279  0.0332984036 -0.1150450424
## V14  0.015313017  0.0822089932  0.024510231  0.1480998251  0.1405388702
## V15  0.092602536  0.2561962725  0.272514865 -0.1335287170 -0.1296747423
## V16  0.001729919 -0.2148615641  0.082005351 -0.0020232289  0.0522277627
## V17 -0.092078631 -0.1947239274 -0.123492015  0.0109258250  0.0062177962
## V18 -0.311109840 -0.1116866842 -0.050890875  0.0376887455 -0.2316261490
## V19 -0.082174704 -0.0101025122  0.023624752 -0.0009101331  0.1215818036
## V20  0.025716826  0.0542557353 -0.065121806 -0.1130293283  0.0416498240
## V21 -0.170327009 -0.1098962633 -0.120962128  0.0404498489 -0.0663586392
## V22 -0.141425520 -0.0975306249 -0.142593691 -0.0360235636 -0.0749537871
## V23 -0.124520838 -0.0457616158 -0.057911235  0.1126859810 -0.1404692635
## V24  0.263129007  0.1448717002  0.055319412  0.0079734059 -0.0492928062
## V25  0.003016207  0.1814693169 -0.095679296  0.0655542800 -0.0318843159
## V26 -0.067711064 -0.0201114036 -0.046888591 -0.0669349592 -0.0685503427
## V27  0.013734567 -0.0434189952 -0.277708544 -0.1249146580 -0.0294914696
## V28  0.170098669  0.1127782246 -0.076855744 -0.0175819923  0.0301106751
## V29 -0.081799487 -0.0775201615  0.057655526  0.1377091059  0.0259430048
## V30 -0.142248739  0.1264303420  0.036713615 -0.0392478856  0.0325933491
## V31 -0.151593039  0.0468879861  0.138022137 -0.0785390813  0.1309330572
## V32 -0.111166053 -0.0746564567  0.106054635 -0.0383419312  0.0626177452
## V33 -0.052211820 -0.1565189505  0.039894633  0.0792110872  0.1132292582
## V34  0.143489684  0.1511436616  0.035915247  0.0516689705  0.0184681551
## V35 -0.060740431  0.2108772746 -0.139801403  0.0378306625 -0.0600557466
## V36 -0.021957524  0.0897214155  0.118226025  0.3149791330 -0.1868858503
## V37 -0.033964307  0.1071294066  0.088908453 -0.1224979291 -0.0860840577
## V38  0.079242173  0.1548087885 -0.200051118 -0.0131553949 -0.0080607853
## V39  0.040605304 -0.0217208677  0.066051855  0.0906701033  0.0077275356
```

```
## V40  0.253579813 -0.1814249386  0.050752453 -0.0552341235  0.0737335923
## V41  0.060780989  0.1201203554  0.077408278  0.0302825435  0.0672600394
## V42  0.040573759  0.0883733545  0.236194412  0.1740321187  0.1919043734
## V43 -0.088125269 -0.0325317067  0.207489356 -0.1715931825  0.0055336341
## V44 -0.021191617  0.0968769156 -0.014255463 -0.0820993299 -0.0299597523
## V45  0.009885712 -0.0704466726  0.244760727  0.0402322904  0.1267702484
## V46 -0.039045460 -0.0490068254 -0.101085983  0.1296189565  0.2313548111
## V47  0.002576329  0.0810922255  0.018183241 -0.0939906385 -0.0003030264
## V48  0.052928874  0.0002598011 -0.088221729  0.2111019708 -0.1485225807
## V49  0.080283844  0.0418848136  0.040037106  0.2004964882 -0.1215529429
## V50  0.088378587  0.0751897528 -0.123200439 -0.1845562660 -0.1268353904
## V51  0.069534183 -0.1089085436  0.041271988 -0.2335257789  0.0282177754
## V52  0.209087974  0.0811177673 -0.014727842  0.0516602014 -0.0746261362
## V53  0.068818041 -0.0241008207 -0.009150762  0.0455356864  0.2155350373
## V54  0.102899408  0.1014447439  0.010531010  0.1067711848  0.0069487944
## V55 -0.114980698 -0.0542470708  0.062845670 -0.0388192438 -0.2259099626
## V56 -0.100558376  0.1431719109  0.089913231 -0.1506087238 -0.1091224888
## V57 -0.112728212  0.1410255110 -0.054890201  0.0463901455 -0.0572855880
## V58  0.141079250 -0.0511539629 -0.037441403 -0.0765946240 -0.0197915959
## V59  0.067518366  0.0753433791  0.014417992 -0.0302839966  0.1147479811
## V60 -0.200521375  0.1031139436 -0.107944629  0.1835642352  0.2602792419
## V61 -0.036274082 -0.0009039127 -0.268787709 -0.1526680641  0.0257359397
## V62  0.102196533  0.0300285290  0.075986858 -0.0467278148 -0.0033220578
## V63  0.127975149  0.0423641954 -0.059009620  0.1264369364  0.0700888607
## V64  0.041014039 -0.1432416073  0.020079263  0.0705863506  0.0676214240
## V65 -0.012871754  0.3638252792  0.034991436 -0.2771717073  0.0330830023
## V66  0.247829041 -0.1436136840 -0.004605485 -0.1331078930  0.0542854115
## V67  0.008282246  0.0277729469 -0.034779807  0.0920286215  0.1094653220
## V68 -0.226323200  0.1820603018  0.111143783 -0.0024406802  0.0572948954
## V69 -0.033509898 -0.1275774062  0.034115470 -0.1880515417  0.1708874216
## V70  0.171884038 -0.0574286688  0.078757231  0.2079301320 -0.0743921608
## V71  0.056278006 -0.0746724385 -0.102738377 -0.2016846806 -0.0394942725
## V72 -0.006020315  0.0105610384  0.118206527  0.0787316360 -0.2206862059
## V73 -0.039739522 -0.0338806844  0.028360628  0.0583164506 -0.1801360113
##             PC26         PC27         PC28         PC29         PC30
## V1  -0.059031222 -0.033693607  0.148634791  0.077959105  0.051948511
## V2   0.113880995  0.121964791 -0.182213436  0.166993224  0.083067408
## V3   0.063019908 -0.071587336  0.018962697  0.058074159  0.016260320
## V4  -0.055836023 -0.090915564 -0.011858443  0.011888980 -0.024448787
## V5  -0.205753596  0.018810533  0.171565130 -0.117330069 -0.088277612
## V6  -0.020717582 -0.058892308  0.142170446 -0.046058746 -0.068891919
## V7   0.097906311 -0.235637809  0.126703764  0.088401175  0.097305596
## V8   0.180730553 -0.050737274 -0.141685304 -0.176435178  0.109984465
## V9   0.115524054  0.081519321 -0.016775773  0.071165676 -0.251082044
## V10  0.134557717 -0.148715292  0.038107096  0.038672347 -0.088447814
## V11 -0.134581700  0.061032902 -0.178768932 -0.174630008  0.048550308
## V12 -0.011616928 -0.082599686  0.036244372  0.210836172  0.148550960
## V13  0.037106817 -0.077237498 -0.220830593 -0.008043576  0.071241722
```

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## V14  0.101665713  0.055630226  0.085157065  0.034811769 -0.109654775
## V15 -0.275488441  0.267487094 -0.022950272  0.184848294  0.051396513
## V16  0.102742467 -0.099563930  0.125205567  0.098176745 -0.117878209
## V17 -0.103747966 -0.082197226 -0.077506154  0.137828918 -0.004560282
## V18  0.059288097  0.102961999  0.080817735 -0.073011619 -0.057392605
## V19  0.047592443  0.024793587 -0.086640417  0.018224368  0.045580074
## V20  0.096506374  0.221835907  0.179223378 -0.247120050 -0.007167877
## V21 -0.082488515  0.007704881  0.254814212 -0.137166676  0.048937495
## V22 -0.039002666 -0.039757230 -0.100201887  0.176699460 -0.025258790
## V23  0.130216293 -0.006247228  0.064395777  0.007785110 -0.043699439
## V24  0.168617737  0.101226345  0.010263310 -0.149031820  0.042396427
## V25  0.024827376 -0.103453482 -0.015592772 -0.108381176  0.087844910
## V26 -0.009451631  0.004019997 -0.013913447 -0.026600551 -0.041560665
## V27 -0.255186510 -0.013951796 -0.055235198 -0.078802534 -0.049260733
## V28  0.229435758 -0.005401101  0.215945212 -0.025615790  0.168313088
## V29 -0.258750338  0.120466354  0.271975254  0.113811578  0.108618597
## V30  0.129075538 -0.054281402  0.175726197  0.065651310 -0.109182148
## V31 -0.013411213  0.112899968 -0.024641178 -0.171159786 -0.034387380
## V32  0.060987598  0.103364418  0.023085161 -0.152630170 -0.195436187
## V33 -0.038133643  0.199744573 -0.048646198 -0.068634712  0.139505348
## V34 -0.172072563  0.093202608 -0.001177091 -0.007580493  0.124115341
## V35  0.109197538  0.151004806 -0.010682391 -0.027514459  0.068304176
## V36 -0.127423378 -0.205751198 -0.173512484 -0.222153154  0.078971724
## V37 -0.015852765  0.121980811  0.064804921  0.198164560  0.068924100
## V38 -0.054736281 -0.033543752  0.123663136 -0.121871536  0.230203465
## V39  0.108269733  0.076313038 -0.179119296  0.189993338 -0.072688958
## V40 -0.028272600 -0.074326566 -0.067410350 -0.103393751  0.100110174
## V41 -0.026450059 -0.025600629 -0.105804729 -0.006362081 -0.015787330
## V42 -0.259923942 -0.086807368 -0.078261192  0.122717921 -0.235583427
## V43  0.139080243  0.168416575 -0.173611563 -0.023478172  0.007192108
## V44  0.172506468 -0.273668892  0.030131429 -0.016781442 -0.074650869
## V45  0.076783529 -0.103218074 -0.025658644 -0.119739108 -0.115842818
## V46  0.093107745  0.119202770 -0.156266798 -0.042736830  0.149262361
## V47 -0.217716839 -0.037051050  0.031504152 -0.008420548  0.168363473
## V48  0.175599879  0.001915795 -0.040331064  0.085547119 -0.267815517
## V49  0.044987511  0.111730610  0.079536269  0.077778529  0.022835594
## V50  0.024465873  0.284180228 -0.113689175  0.056121806 -0.187769872
## V51 -0.192619265 -0.122278566  0.040739909 -0.108961131 -0.133433561
## V52 -0.059085345 -0.091166786  0.099469628  0.002576754 -0.210969014
## V53  0.062156335  0.148390015  0.112378644 -0.289965338  0.015142704
## V54  0.002377744  0.050642239 -0.157195842 -0.094786192  0.100273347
## V55  0.092002013  0.128414872  0.141951614  0.055778111  0.046336650
## V56  0.169248176 -0.055932260  0.002460002  0.094647931  0.161546302
## V57 -0.118229043 -0.121781335 -0.071373512  0.035480868  0.151802776
## V58 -0.150134753  0.154581196 -0.105378661  0.035358299 -0.318568041
## V59  0.044155737  0.155521259  0.060585083 -0.039519773  0.034653810
## V60 -0.012549322 -0.042086005 -0.180207243 -0.036638092 -0.165770903
## V61 -0.023673490 -0.065595978 -0.187757996  0.084357284  0.173409068
```

```
## V62  0.065063908 -0.093713781 -0.014270052  0.089686978  0.098947725
## V63  0.163884067  0.008101455  0.004744250  0.090221555  0.067054132
## V64 -0.005068993  0.084626561 -0.001992983  0.244396666  0.096437837
## V65  0.014541574 -0.248336254 -0.020058649 -0.061708037 -0.173130884
## V66  0.053258906 -0.003019707 -0.240662009 -0.022082343  0.035785307
## V67 -0.014538951  0.027612822  0.036218592 -0.216132740 -0.066540879
## V68 -0.053233050  0.099559212  0.104080572  0.115170553 -0.021345873
## V69  0.068441609  0.076745783  0.126823671  0.045861027 -0.054413271
## V70  0.038352972  0.013488862  0.071725839  0.058682280  0.090105983
## V71 -0.069517472 -0.143756865  0.154144934  0.057301671  0.016899637
## V72 -0.033260533 -0.118230247 -0.046502658 -0.172015428  0.063744366
## V73 -0.013908846  0.101811725 -0.072006932 -0.145828919 -0.003433220
##             PC31         PC32         PC33          PC34         PC35
## V1  -0.100107273 -0.024284127  0.200368000  0.0155605482  0.057984197
## V2  -0.057834570 -0.009763051  0.154073493  0.0392202239 -0.095168095
## V3  -0.067178698  0.240814016  0.064912866 -0.0350916936 -0.188343026
## V4   0.008374110  0.144876026 -0.086260006  0.0048360776  0.030221942
## V5  -0.015861846 -0.149991332  0.122556616 -0.1918714909 -0.065261722
## V6  -0.051072727  0.080085582 -0.093276807 -0.1066616971 -0.131877622
## V7  -0.297231827  0.058768409 -0.049138174 -0.1062850719  0.198627511
## V8  -0.012670563 -0.126970604  0.062201173 -0.1626822927 -0.136026457
## V9  -0.220893602  0.081390338  0.045857368 -0.0867209502 -0.002566283
## V10 -0.144030982  0.089450268  0.011983031  0.0421047771  0.073648641
## V11  0.021868824 -0.012276000  0.085900161 -0.1577285097  0.184248718
## V12  0.038834328  0.046265061 -0.175667793 -0.0917970066  0.204922771
## V13  0.019556192 -0.188133506  0.110244275  0.0911075481 -0.034631233
## V14  0.111176181  0.044537222  0.055560492  0.0227665197  0.101455246
## V15 -0.114308974  0.032946828  0.126730160 -0.1324457637 -0.076531302
## V16  0.008528294 -0.089253505  0.144398151  0.2193108989 -0.109422697
## V17  0.041222587 -0.063157009 -0.118404175 -0.0147638616  0.033804734
## V18 -0.007760061  0.062651041 -0.038455817 -0.0448881122 -0.042674793
## V19  0.122467572 -0.071505984 -0.084670870 -0.0968439728  0.063254854
## V20 -0.191293331 -0.184411591  0.182430129 -0.1079360392 -0.082191472
## V21  0.069888096  0.133600462 -0.048283662  0.1234323747 -0.096574363
## V22  0.044145409 -0.231931919 -0.236429416  0.0626043430 -0.177347659
## V23  0.302237002 -0.014167922  0.181170633 -0.1376147171  0.096749228
## V24  0.066121251  0.060761676 -0.129738470  0.1011589693  0.228254297
## V25 -0.019800328  0.060059579  0.056784612  0.1115413893 -0.301942252
## V26  0.032470091  0.089364434 -0.175221982 -0.0222840034  0.008563844
## V27 -0.019773413 -0.000583925  0.109492378  0.1169881632  0.306862470
## V28  0.013610699 -0.138639061  0.153839209  0.3237365952 -0.092081808
## V29 -0.061773570  0.187443549 -0.087054129  0.1089932996  0.004878564
## V30 -0.124856025 -0.175055543 -0.031437773  0.0805621280  0.120846947
## V31 -0.057186412 -0.009301604 -0.024653744 -0.0552558078  0.014518633
## V32 -0.126916688  0.214458300  0.089258850 -0.0116238600  0.170056505
## V33  0.157895668 -0.167792934 -0.231763297  0.0788811841  0.125322131
## V34  0.046539863 -0.293256816  0.121496438 -0.0779014257  0.032916033
## V35  0.044915596  0.128708446 -0.103627204 -0.0674778760 -0.053200941
```

```
## V36  0.012950460  0.036262168  0.183811039  0.0871466150  0.079736375
## V37  0.033688679 -0.008969064 -0.099475238  0.0110448741 -0.033488816
## V38 -0.009737858 -0.023838681  0.079968700  0.1694840181  0.189350397
## V39 -0.191930499  0.016163131 -0.105161018  0.0554532999  0.148163825
## V40  0.075039866  0.134878077 -0.117342650 -0.0881383976  0.101198584
## V41  0.177301212  0.081474922 -0.037670359 -0.2668334933 -0.068692837
## V42  0.036549111  0.037218720  0.018841553 -0.0314322694 -0.195108325
## V43  0.074804775  0.071169126  0.104624197  0.1278315676 -0.012706516
## V44  0.136844079 -0.051850064 -0.037839111 -0.1595472214 -0.076940271
## V45 -0.165348651 -0.128461515 -0.078874393  0.1227811820  0.131261389
## V46 -0.028883326  0.130252960  0.098025404 -0.1011684050  0.004458401
## V47 -0.175770109 -0.065761072 -0.092522097  0.0824403697 -0.259117248
## V48  0.161212297 -0.085493084  0.094122173 -0.0239196575 -0.038128421
## V49  0.009747415 -0.083980326 -0.053066998 -0.1419269215  0.046952512
## V50 -0.189288977  0.069786325 -0.050942942  0.0007001958  0.109817759
## V51  0.029814920  0.003057153  0.025347389  0.1481677092 -0.056285774
## V52  0.029732142 -0.045479144 -0.196626579 -0.0178942957 -0.035461257
## V53 -0.001660515  0.072951220 -0.008338687 -0.1318742256 -0.085082370
## V54 -0.034146403  0.056677829 -0.040042062  0.0459526704 -0.064146999
## V55  0.104341491  0.117198729 -0.088596814  0.1246138745  0.089158528
## V56 -0.039789888  0.080029595  0.071635419 -0.1367729622 -0.110428220
## V57  0.075948872 -0.023597795  0.012636209 -0.0239988556  0.137162068
## V58  0.096502701 -0.165322411  0.026125114  0.0814135676  0.023774131
## V59  0.110417003 -0.287095197 -0.178002746  0.1070511543 -0.001992503
## V60 -0.219336980 -0.024154696  0.094811340  0.0529183011 -0.032211595
## V61 -0.086249321 -0.075277110  0.066223099 -0.0059705837  0.058727681
## V62 -0.069698240  0.006903407 -0.054801209 -0.1400019523 -0.051798682
## V63 -0.114759239 -0.242053860 -0.096672918 -0.0670924312 -0.017584230
## V64  0.068077036  0.150167204  0.234288559  0.1757543934 -0.104273138
## V65  0.195085343  0.084787630  0.003551803  0.1826054399  0.104329228
## V66  0.169437553  0.151551762  0.082238897  0.1251601428 -0.055676270
## V67  0.179531695 -0.026650579 -0.077607402 -0.0719055974 -0.146366994
## V68  0.136901129  0.014806333  0.302248991  0.0348348603  0.113396761
## V69  0.058336562 -0.044763798  0.060675639 -0.1092632568  0.044438027
## V70  0.165823014  0.100288418 -0.025524889 -0.0201388841  0.068527827
## V71  0.036430959  0.006236125  0.149304944 -0.3167666169  0.099216260
## V72 -0.260549687 -0.095735667 -0.022391706  0.0163076427  0.068312236
## V73 -0.082217112  0.196131138 -0.214358213  0.1326484192 -0.141638474
##              PC36         PC37         PC38          PC39          PC40
## V1  -0.203960981 -0.108831848 -0.023759038  0.1339966164  0.0244727820
## V2   0.101302524  0.130620807 -0.086468483 -0.1431470052 -0.2405986744
## V3  -0.152198736 -0.067844160 -0.052232170  0.1022240499  0.0202739845
## V4   0.154150138 -0.010672774 -0.043024803  0.2010635044  0.0569842991
## V5   0.023318631 -0.114470685 -0.136659110 -0.3035368050 -0.0009024641
## V6   0.072976523 -0.073703126  0.226580837 -0.2019593627  0.0228694209
## V7   0.077894456  0.202968277  0.078588196  0.0352716464  0.0620536700
## V8   0.159534263  0.067579639  0.009046031 -0.1460668638  0.0506519783
## V9  -0.035063871  0.123335016 -0.027354363  0.0159229046 -0.0149912979
```

```
## V10  0.029809185 -0.145421588 -0.236970496  0.0338949207 -0.1509232844
## V11  0.188405902 -0.167504679 -0.077699165  0.0775582814  0.1232739476
## V12  0.241960854 -0.071429164 -0.271385299 -0.0309139903 -0.0278605677
## V13 -0.030285175 -0.061119672  0.022061784  0.1381563404 -0.1193677629
## V14  0.056407095 -0.156319236 -0.127849935 -0.2095839194 -0.1517443718
## V15 -0.049192627  0.032048594 -0.177261508 -0.0323255431  0.0487065475
## V16 -0.090003479 -0.021299977  0.046621116  0.0372227445 -0.2032514073
## V17  0.086427941 -0.081056360  0.070003270  0.0790889590  0.0877207136
## V18 -0.037619925  0.086834635  0.181817530 -0.1227720016  0.2070641600
## V19  0.062237398  0.196468272  0.077085187  0.0162524196 -0.3325475424
## V20  0.023404011 -0.026551656  0.012436287  0.1515845721  0.1645386759
## V21  0.019011732  0.072415497 -0.114803113 -0.0065526885 -0.1097147030
## V22 -0.128137921 -0.239621373 -0.043618666  0.0530377293  0.1036586975
## V23  0.008096217 -0.099184887 -0.035672343  0.1540264099  0.0555466628
## V24  0.074704720  0.012013282  0.101008690  0.0309466432  0.0899761594
## V25 -0.199375312  0.066463865  0.001982925  0.0702836742  0.1059860492
## V26  0.098966627 -0.141391992 -0.010840342  0.0646109484  0.0029095433
## V27 -0.014628795  0.258906476  0.164122405 -0.0057089135  0.1185088103
## V28  0.259639296  0.043687910 -0.022348299 -0.1091146439  0.0724384051
## V29  0.097752889  0.195460448 -0.176276485 -0.1434392549 -0.0040446501
## V30 -0.153733548  0.158451148 -0.078441064 -0.0178695825 -0.1623737719
## V31  0.019544388  0.053612160  0.015610896 -0.1062224180 -0.2218573396
## V32 -0.043220720 -0.150921086 -0.110427937  0.0659380522  0.0650418348
## V33 -0.128369772  0.132267498 -0.186159795  0.2386509066  0.1375829985
## V34  0.101323468  0.073968890  0.280987547 -0.0219694497 -0.0178932292
## V35  0.023744972 -0.068513524 -0.058658091  0.1102716418  0.0919612098
## V36 -0.133891064  0.063311057 -0.095109738 -0.1207918634  0.0757970978
## V37  0.007938669  0.043943422  0.081103465 -0.1157474422  0.0574329952
## V38 -0.050917589 -0.027500115  0.059897406  0.0883503876 -0.0969184086
## V39 -0.091231717 -0.059365071  0.226012206  0.0234002948 -0.0488842844
## V40  0.080477460 -0.034542048  0.114592566 -0.1891596518  0.0237905738
## V41 -0.156490554  0.053852906 -0.008657388 -0.0249000383 -0.0651135121
## V42  0.093216510 -0.009074115  0.117351020  0.1320415123  0.0871751580
## V43 -0.136053671  0.015755414  0.072672818 -0.0777878427 -0.0460527427
## V44 -0.093566794  0.064611183  0.056530863 -0.0489040501 -0.0212687843
## V45  0.024806641 -0.099072427 -0.138947569 -0.0940117409  0.1544666800
## V46  0.069296642 -0.054095701  0.066997949 -0.0737658136 -0.0251789449
## V47  0.118893646 -0.073486243 -0.015906342  0.0905980338 -0.0304839596
## V48  0.255419807  0.153120130 -0.023453519  0.0335870990  0.0507078956
## V49 -0.085729171  0.188571602  0.026347934  0.1088241719 -0.2006933783
## V50 -0.186415748 -0.115795452 -0.002152958 -0.1061973099 -0.0761466711
## V51  0.014926994 -0.191463604  0.121653591  0.0424080504 -0.2149712322
## V52 -0.083311354  0.172175051  0.180545821  0.0424805669  0.0515240754
## V53 -0.104038380 -0.138959577 -0.012990661  0.1050899456 -0.0805213605
## V54 -0.050154269 -0.035703783  0.094468004  0.0523276663 -0.1145073754
## V55 -0.110573539 -0.012132308  0.049734781  0.0315090142  0.1104215721
## V56  0.152018960  0.076095018  0.002384545  0.0226316953  0.1533259704
## V57 -0.275807305 -0.129178941  0.042424180 -0.3418117650  0.0239244700
```

```
## V58  0.143054333  0.075975655 -0.160614143  0.0204985786  0.0519009905
## V59 -0.066395176 -0.021865045 -0.034990571 -0.0648593298  0.0549792504
## V60  0.110485572  0.092967186  0.039022760 -0.1171935231  0.1589142821
## V61 -0.025152089 -0.032536708 -0.144545421 -0.0463832350 -0.1664721563
## V62 -0.127653791  0.030048898 -0.057697513  0.1703678225  0.0958643756
## V63  0.084408509 -0.281938155 -0.032599299 -0.1004796536  0.1196554511
## V64 -0.043291647 -0.018690668  0.045003218 -0.1050508074  0.2110296475
## V65  0.031472915 -0.053637508 -0.074879207 -0.0928667100  0.0849239136
## V66 -0.022470525  0.243574525 -0.189628905  0.0762199063  0.1029518332
## V67 -0.060065628  0.094944438 -0.191902857 -0.0517070006 -0.1102781734
## V68  0.163089488 -0.212073410  0.204889546  0.2456550269 -0.1162298968
## V69 -0.119300088  0.091662547  0.059561578 -0.1174515410  0.1575740714
## V70 -0.021817549 -0.125438711  0.252331341 -0.0567482549  0.0001694047
## V71  0.021021733  0.065251695 -0.048706954  0.1053091076 -0.0869227637
## V72 -0.014731358  0.081880289  0.033654728  0.1573691596 -0.0061677870
## V73  0.269603530 -0.001008731  0.142972418  0.0009223894 -0.1829545417
##              PC41          PC42          PC43          PC44          PC45
## V1   0.119759100  1.181156e-01 -0.2159072967 -0.1223227155  0.0728664548
## V2  -0.131979559 -7.130381e-02 -0.0983839368 -0.1621247383  0.1782636995
## V3  -0.240047861 -2.485927e-02 -0.0647445371 -0.3274424328 -0.0782386054
## V4   0.051596134  1.139384e-01 -0.0937816474  0.0705861348  0.1687478321
## V5  -0.078166233 -2.734157e-01 -0.0513168502  0.2454938251  0.0227144004
## V6   0.160070271 -9.094243e-02  0.1562946557 -0.1084344744  0.0009263780
## V7  -0.064702283 -1.163702e-01  0.0997705278 -0.0426867140  0.0006425089
## V8  -0.047344310  1.685217e-01 -0.1377855262  0.0134907791 -0.1667595621
## V9   0.050755404 -1.506436e-01  0.2112629974  0.0997266493  0.0409917198
## V10  0.111746952 -8.011085e-02  0.1545584193 -0.1376888405 -0.2220318639
## V11 -0.082750529  1.434106e-02  0.0217436530 -0.2486532588  0.1273018102
## V12  0.051383464 -6.544855e-02 -0.0624331145  0.0259646912 -0.0630819695
## V13  0.116422247  3.826023e-03 -0.0697712928 -0.0516668107  0.0277003814
## V14 -0.166591861  1.144127e-01 -0.0199485057 -0.0300978194  0.0604780662
## V15  0.081405408  1.065176e-01 -0.0568918512  0.1072977667 -0.1595609254
## V16 -0.047864320 -9.727880e-02 -0.1543548846  0.1413486205 -0.1601392972
## V17 -0.113653380  2.134577e-01  0.0105838752 -0.0899086552 -0.1042992199
## V18 -0.091462656 -8.339070e-02 -0.2419409171 -0.0704341536  0.0345648055
## V19 -0.042270618 -9.293468e-03 -0.1001234854  0.1296188996  0.0160939912
## V20 -0.114266315  3.468304e-02 -0.0323075296 -0.0548116429 -0.1854352835
## V21  0.184080984 -1.676084e-01 -0.0520171754 -0.0987112886 -0.1025011530
## V22  0.209951437 -1.124601e-01 -0.0200091010  0.0980849352  0.0269715304
## V23 -0.022933315 -7.516206e-02  0.1111731687  0.0112027214  0.1340752816
## V24  0.126596516 -4.173994e-02 -0.3644977983  0.0175854918  0.1099412083
## V25 -0.134880230  2.006312e-03 -0.1576621018  0.1370975874  0.2407955304
## V26 -0.132279417 -1.117111e-01 -0.0902188075  0.1428495166  0.0243614061
## V27 -0.015853790  1.018353e-01  0.0970576816  0.0053351152 -0.1816245158
## V28 -0.076422280 -3.303901e-02  0.1269352208  0.0674058436 -0.0247221633
## V29 -0.050216555  1.189580e-01 -0.1796992157 -0.0927691045 -0.1374017327
## V30 -0.003534661  1.528884e-01  0.0459003437 -0.0445887618  0.1081807221
## V31  0.181279130 -8.266897e-03 -0.0347079674 -0.0476331491  0.0843729453
```

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## V32 -0.175241281  2.050163e-01  0.0791882650  0.1875618022  0.1236793093
## V33 -0.194902766 -1.627322e-01  0.2121576914  0.0454668343 -0.0816719548
## V34 -0.034168654 -1.043648e-01  0.1094015699 -0.1000524190 -0.0945005125
## V35  0.190585415  9.146456e-05  0.0022554018 -0.0082291247 -0.1453313766
## V36  0.060324867  5.229224e-02  0.0896934443 -0.0281008661 -0.0346053680
## V37 -0.018703648 -1.521537e-01 -0.0180869806 -0.0288657372  0.2479540626
## V38  0.067046592 -7.686726e-02  0.0297867772  0.1842447861  0.0697711581
## V39  0.215003231  1.418094e-02 -0.0162303932  0.0232849704 -0.0191897889
## V40  0.230652070  5.826064e-02  0.0729205392  0.1673019956  0.0375937357
## V41 -0.183403062  5.479623e-02 -0.0385117801  0.1255035326  0.1157719779
## V42  0.054511755 -2.249004e-01  0.0560996570 -0.0982703606 -0.1294713229
## V43  0.021229050 -1.379208e-01  0.1978101002 -0.1044172212 -0.0478570378
## V44  0.029196733  5.913965e-02  0.0639823517  0.0006279136 -0.0779018844
## V45 -0.059479157 -2.676906e-01 -0.0063099143  0.1178915515  0.0422088042
## V46  0.061677365 -1.410134e-01 -0.2137586756  0.0195037876 -0.1000099906
## V47  0.019811726  5.408003e-02  0.1682961737  0.1380794904  0.1928041886
## V48  0.136273451  1.160243e-01 -0.1004948610  0.0179863398 -0.1457269577
## V49  0.012977349  8.881432e-03  0.0785534426 -0.0743409984  0.1850400509
## V50 -0.113809535 -9.929955e-02  0.0412502348  0.0709595531 -0.1115833597
## V51 -0.113535778  1.020418e-01 -0.0142198255  0.0212294616 -0.0508812071
## V52 -0.112733774  8.928449e-02 -0.1927447526  0.1636067408 -0.1337594570
## V53  0.236068142 -3.854270e-02 -0.0886580455 -0.0255533456  0.0103754672
## V54 -0.011616711  8.516695e-02 -0.0117027550 -0.0116090376 -0.1030087447
## V55  0.094526174  1.565315e-01  0.0002296396  0.0989513995 -0.1235920213
## V56 -0.018751939 -4.530011e-04  0.0897859801  0.1186400965 -0.0239759042
## V57 -0.006611251 -6.056577e-02 -0.0607602669 -0.1440786569 -0.0737640376
## V58  0.006444171  5.295595e-02 -0.0881356155 -0.1136672698  0.2402036335
## V59  0.014742545 -2.429811e-03 -0.1161192484 -0.2202007986 -0.0285331451
## V60  0.085438333  6.995999e-02 -0.1001636523  0.1267369368  0.0161825675
## V61 -0.064540962  1.299087e-01 -0.0802728193  0.1561879995 -0.1371455051
## V62 -0.070492781 -8.988435e-03 -0.0612684926 -0.1440904577 -0.1028328454
## V63 -0.042954143  1.921857e-01  0.0470720013 -0.0168764173 -0.0186965190
## V64  0.180015022  1.628068e-01  0.1037639585  0.0273373635  0.2362651402
## V65 -0.015522793 -5.349117e-02 -0.0646049570 -0.2294613854  0.0420350347
## V66  0.006350391 -2.425098e-01  0.0008214223  0.1270849054 -0.1000134599
## V67  0.165934363  2.730506e-01  0.2457457517  0.0292561343 -0.0510858485
## V68  0.033316998 -5.968460e-02 -0.0205090621  0.0783164588 -0.1049975054
## V69  0.087259162  5.399510e-02  0.1514338298 -0.1250833862  0.0803427990
## V70 -0.290821684  3.256885e-02  0.1068431346  0.1090083168  0.0128711073
## V71  0.091341507 -1.230053e-01 -0.0755822919 -0.0121613592  0.1144080701
## V72  0.059258795 -8.381589e-03 -0.0519000707 -0.1031156399  0.1867190926
## V73 -0.145090432  1.651735e-02  0.1415666500 -0.1854774796  0.0430583504
##             PC46         PC47          PC48         PC49         PC50
## V1   0.075556507  0.015138781  0.1170758572 -0.097430805 -0.112543516
## V2   0.147214153 -0.061567322  0.0352137386 -0.092475454 -0.054057683
## V3  -0.155241943  0.377072960 -0.1450382746  0.011361168 -0.079382104
## V4   0.224149436 -0.002808037  0.0014919006  0.020782053  0.050326304
## V5   0.011676736  0.031283508 -0.1769479775 -0.011202219 -0.040334866
```

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## V6  -0.190999502 -0.050471175 -0.0550905239 -0.034549723 -0.138989566
## V7  -0.110440813  0.148735826  0.0749999520 -0.101087423  0.037893878
## V8   0.060839514  0.251660148  0.0020445418  0.150135518  0.054902362
## V9   0.182317769 -0.021575623  0.2161246996  0.033760125  0.147693585
## V10  0.028766289 -0.021021237 -0.1129228435  0.209055960  0.091709044
## V11  0.005660148 -0.068539032 -0.1227569985  0.050591351  0.156764513
## V12 -0.077417719 -0.107109784  0.1205552825  0.123337310 -0.075260046
## V13  0.073928314  0.177323800  0.2482020844  0.179944410 -0.071147969
## V14 -0.087260242 -0.011896903  0.2123150031  0.004285035  0.144868656
## V15 -0.136059265  0.102760843  0.1415579414 -0.157529648  0.183504849
## V16 -0.128222609 -0.077197071 -0.0980636913 -0.065186773 -0.064352349
## V17 -0.153684225 -0.230875801  0.1152859966 -0.024207813 -0.032062641
## V18 -0.080884937  0.031219428  0.1122098964 -0.115613153  0.059216246
## V19  0.183660024  0.141926385 -0.1417077182  0.006848499 -0.083360437
## V20  0.237972197 -0.221994562  0.0984435346  0.006399158 -0.115523716
## V21 -0.016975669 -0.010348587  0.1197542854 -0.101549007  0.012992724
## V22  0.046877593  0.232961274 -0.0846750774  0.011390732  0.158558964
## V23  0.057771902 -0.079068532  0.0404674692  0.022297753  0.005969481
## V24 -0.115869915  0.039924995 -0.1653595891  0.079501990 -0.045516497
## V25 -0.130043465 -0.187961708 -0.0003088916  0.106319235  0.028556922
## V26 -0.004601312  0.135815703 -0.0181740452 -0.017876499 -0.170362932
## V27 -0.215767588  0.082583213 -0.0836085258  0.135614321 -0.010472573
## V28 -0.111993354 -0.049158406  0.0171579034 -0.021707267  0.164312429
## V29  0.244216483 -0.069372683 -0.1533578320  0.036689577 -0.053543788
## V30  0.030486197  0.103063928 -0.0989913318 -0.116838270 -0.100515500
## V31 -0.190547577 -0.190758379  0.0308040796  0.200296194  0.068258526
## V32  0.047225382  0.132779223  0.0198341329 -0.053412788 -0.085090175
## V33  0.036125926 -0.085787164 -0.0848400367 -0.177559467  0.038371392
## V34  0.111983311  0.109373220 -0.0570412999  0.068471600  0.048628318
## V35  0.136568599  0.007205929 -0.1191673548 -0.042224291  0.048673495
## V36 -0.078092467  0.005299785  0.0343673181  0.011280715 -0.055129166
## V37 -0.126633523  0.047826230  0.0673355650  0.125785533  0.027425787
## V38  0.152077135  0.077210520  0.0681946966  0.125705027 -0.080879910
## V39  0.104784919 -0.256162490 -0.0328009875 -0.093294078  0.044059343
## V40  0.003094372  0.044685049  0.1556626200 -0.270531189 -0.073924639
## V41  0.017598107 -0.159334415 -0.0077311964  0.030875247 -0.049528232
## V42  0.072947209 -0.021686375  0.0126803560  0.134378579 -0.250572965
## V43 -0.052884024 -0.177300716 -0.0552790191 -0.148055057  0.009403121
## V44 -0.071197674 -0.106619301 -0.0768199231 -0.016498313  0.091729922
## V45  0.018784011  0.029308731  0.0207504663  0.180477514  0.106838171
## V46 -0.103506120 -0.037017837  0.0370493801  0.045958410  0.026723171
## V47 -0.044070488  0.079621059  0.1750574382 -0.145278477 -0.032607036
## V48  0.045470913  0.075463210  0.1472154432 -0.241899385 -0.080345252
## V49 -0.084413198  0.075750991 -0.1946089032  0.123998470 -0.018297181
## V50 -0.061859485  0.079405289 -0.0112759836 -0.035145139 -0.180507115
## V51  0.161441222 -0.156373966 -0.2132409546 -0.033595907  0.180669739
## V52  0.086158279 -0.078793962  0.1496756059  0.210031766  0.020849022
## V53 -0.009088948 -0.005575192  0.0511549451  0.053190154 -0.036538534
```

```
## V54  0.038252784  0.238922794 -0.1098578344 -0.132180226  0.239958980
## V55 -0.096559480  0.010056253 -0.1375675810  0.139347225  0.043946776
## V56  0.050182003 -0.122428955 -0.2200642085 -0.038962992 -0.308675799
## V57  0.203687985 -0.091916804 -0.0014547397 -0.072587388 -0.135839604
## V58 -0.222626946 -0.008316580 -0.0679260767  0.026715487 -0.065952150
## V59  0.031761973 -0.009589619  0.0847465295 -0.154005607  0.020184426
## V60  0.064708544 -0.011565396 -0.2293739087 -0.115243601  0.221354820
## V61 -0.069879066 -0.108532867  0.1106829219  0.135395560 -0.082629853
## V62 -0.115362918 -0.145290476  0.0932401325  0.059653139  0.236185945
## V63 -0.046516546 -0.018953873 -0.2296140635 -0.001428846 -0.216771147
## V64  0.120714487 -0.028364680 -0.1519495079  0.151500204  0.029532725
## V65  0.164879407  0.069833478  0.0510544875 -0.150693391 -0.030490498
## V66  0.010010840  0.017481256 -0.0227642562 -0.014873228 -0.116346819
## V67 -0.125229261  0.041265650 -0.0185615790 -0.010736569 -0.093480116
## V68 -0.194161869  0.048628717  0.0045311596 -0.030495363 -0.078988161
## V69  0.190479243  0.143209172  0.1509283187  0.277651132 -0.045201143
## V70  0.029655936  0.075870688  0.1245390586 -0.116267795  0.106146970
## V71  0.022822727 -0.039567201 -0.1861032935 -0.177801285  0.274389659
## V72 -0.089788319 -0.078359053 -0.0075038955 -0.214087091 -0.226882175
## V73  0.099943365 -0.045983305  0.0323222725  0.115704714  0.011609855
##             PC51         PC52          PC53         PC54         PC55
## V1  -0.010948720 -0.023807047  2.540378e-02  0.080361015  0.045648236
## V2  -0.110651266  0.007813209  1.241397e-01 -0.020121627  0.119342110
## V3   0.114739500 -0.021040128  5.974391e-02  0.116771404 -0.040302363
## V4  -0.005767521 -0.092903928 -8.791675e-03  0.001488911  0.001464432
## V5  -0.113827281  0.019723165  4.345740e-02  0.072139033 -0.059061656
## V6   0.046360812  0.074459724  1.058136e-01 -0.047943203 -0.062320124
## V7  -0.251481114  0.073360227  1.569084e-01  0.100376579  0.142290777
## V8  -0.053619767 -0.095826934  1.329368e-02  0.001907003 -0.061677748
## V9  -0.040752487 -0.022283141 -1.176172e-01  0.075314397 -0.055901453
## V10 -0.144223961  0.278751504 -1.114855e-01 -0.103982520  0.146896390
## V11  0.198110571 -0.053909129 -7.857262e-02 -0.075135117 -0.004873355
## V12 -0.053842964 -0.208887818  1.282460e-01  0.165257567 -0.053929245
## V13 -0.061742738  0.138457420  8.531221e-02 -0.010922446 -0.113561868
## V14 -0.050948444 -0.009483584  8.956173e-02 -0.111859283  0.012926451
## V15  0.085020239  0.097870621  1.271703e-01  0.028609861 -0.122288638
## V16  0.194773781 -0.062140693 -6.339117e-02  0.038493051 -0.031296499
## V17 -0.356561910  0.152685262 -4.647647e-02 -0.030315101  0.035709479
## V18  0.005944463  0.028977672 -1.608165e-01 -0.158437502  0.197664125
## V19  0.256778999  0.202590749 -2.628785e-03 -0.046253860  0.089734587
## V20 -0.123310578  0.033580449 -8.210528e-03  0.100014248 -0.016201145
## V21  0.079422520 -0.143977394  1.092677e-01 -0.167045462  0.013683106
## V22  0.059932038  0.076750020  9.371820e-02  0.122858861 -0.005731043
## V23  0.085441896 -0.059646577 -8.033061e-02  0.123373597  0.206173116
## V24 -0.078878653 -0.075342196  6.701963e-02 -0.097435085  0.228792239
## V25 -0.168286019 -0.032720707  1.362105e-01  0.045148532 -0.040922213
## V26 -0.159135714 -0.070842828 -1.148068e-01  0.085232434  0.076971656
## V27  0.178940006  0.113272199 -1.717696e-01  0.121263107 -0.122985831
```

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## V28  0.170130941  0.132137346 -4.969740e-02  0.030947265  0.174885286
## V29  0.017952109  0.044521343 -2.425862e-01 -0.094275841 -0.058594736
## V30 -0.069608691 -0.092832473  3.542365e-02 -0.044022165 -0.109895083
## V31 -0.130956565 -0.047618474  3.619918e-02  0.181604578 -0.156381415
## V32  0.157025477  0.157980782  1.360033e-01  0.010421985  0.065699415
## V33  0.036651838 -0.082667448  2.522513e-01 -0.020059507 -0.047002563
## V34 -0.072672835 -0.049993363  1.892969e-01 -0.014376745  0.193769463
## V35 -0.057679083  0.067266948  9.530507e-02 -0.261592583  0.047653657
## V36  0.050790575 -0.151358176  9.005436e-02  0.060639587  0.090012520
## V37  0.069984353  0.200532564  7.353072e-03  0.107844984  0.000955489
## V38 -0.095611142  0.133105477  2.167859e-02 -0.044970211 -0.279307261
## V39  0.176675129  0.133110314 -1.612731e-05 -0.008116536  0.070675637
## V40  0.013337196 -0.131001829 -3.775670e-02  0.075459756  0.025162688
## V41  0.001753729  0.268575588 -2.745824e-01  0.147733333  0.018855296
## V42 -0.037267973 -0.023979060 -3.000228e-03 -0.160561630  0.035341127
## V43 -0.086916390 -0.179443472 -1.668235e-01 -0.027161787 -0.085467460
## V44  0.038889953 -0.093111037 -2.499199e-02 -0.267875456 -0.139671982
## V45  0.167170553 -0.026152782 -1.104372e-01 -0.074929203 -0.042456954
## V46  0.047635803  0.273388411  1.380951e-01 -0.065351501 -0.047188234
## V47  0.056237530 -0.042274419 -2.555781e-01 -0.168240961  0.125457703
## V48  0.073332728 -0.010756065  6.417026e-02  0.148102308 -0.221926824
## V49 -0.051850145 -0.161149398 -9.877919e-02 -0.055975196 -0.082402773
## V50 -0.025781530 -0.205077408  1.154528e-01 -0.014226449  0.160302584
## V51 -0.089591388  0.081237614  2.613986e-01  0.009749530  0.049501869
## V52  0.099203376 -0.182192944  9.661040e-02  0.071974246  0.150980884
## V53  0.083754546 -0.040366839 -6.417367e-02 -0.027239817 -0.172117007
## V54 -0.189194756 -0.125790342 -2.405337e-01  0.002472622  0.048283137
## V55 -0.169403365  0.075231852  6.851557e-02  0.092720709 -0.095953530
## V56  0.147747712  0.031123769  1.660732e-01 -0.059157235 -0.047060529
## V57  0.049035751  0.023349308  4.420263e-02  0.087669011  0.027576684
## V58 -0.034652281  0.059062877  9.697114e-02 -0.265013402 -0.107604175
## V59 -0.015347576  0.076566375 -1.441193e-01  0.170039898  0.037683422
## V60 -0.126070198 -0.072196176  4.504177e-02 -0.013517302 -0.026390918
## V61  0.100764036 -0.222293638 -4.012686e-02 -0.250643065  0.106967076
## V62  0.232889626 -0.047957275  6.629310e-02  0.006149869 -0.021868369
## V63 -0.012840695 -0.075154147 -1.647892e-01  0.078992877 -0.171272231
## V64  0.025190500 -0.141111636  7.145231e-02  0.077802268  0.057423385
## V65 -0.012612032  0.050678598 -1.873259e-03  0.033483265 -0.084361120
## V66 -0.211121199  0.072077942 -1.219756e-01  0.048013082 -0.059605280
## V67 -0.021007085  0.167498049  1.181677e-01  0.069607290  0.345619043
## V68 -0.056931700 -0.119241211 -1.099024e-01  0.057854192  0.089813455
## V69 -0.046480786 -0.056377137 -2.707733e-03 -0.192153208  0.031352217
## V70 -0.062667898  0.052592037  1.011063e-01 -0.304422481 -0.318614525
## V71 -0.035210488 -0.064885344 -6.955972e-03  0.097981877 -0.008884707
## V72  0.041204989  0.127911358  3.957653e-02 -0.082109724 -0.036982433
## V73  0.140061225 -0.121066583  1.063009e-01  0.298754611 -0.138585838
##             PC56         PC57         PC58         PC59          PC60
## V1   0.142361760 -0.019570070 -0.189826704 -0.105282964 -0.0575844344
```

```
## V2  -0.127269709 -0.036799863  0.078989593 -0.071882158 -0.0335372790
## V3  -0.007584277  0.187094934  0.015196578 -0.105186981  0.0919127027
## V4   0.024338316  0.033906656  0.112315712 -0.056085979  0.1228210747
## V5   0.188047693  0.024212269 -0.201517073 -0.119284438  0.0389878454
## V6   0.134948604 -0.102439716 -0.027564366 -0.012242742 -0.1004345606
## V7  -0.193371507 -0.153475737 -0.089505549 -0.112941184  0.1016624941
## V8   0.060597959  0.130064104 -0.115890559  0.082445599 -0.0484514766
## V9   0.098232814  0.115393725  0.073782624 -0.005247926  0.1869749951
## V10  0.020533625 -0.094254701  0.039618088 -0.041678120  0.0282278943
## V11 -0.234765401 -0.083568752  0.156085897 -0.050114410 -0.0479985876
## V12  0.153899272  0.134626618 -0.015856617  0.168743946 -0.0242703425
## V13  0.159681024 -0.163337303  0.092810006  0.122427536  0.0205569560
## V14 -0.032482032  0.023496091 -0.052693012  0.235783911 -0.0706741127
## V15 -0.041583290 -0.093436115  0.056399966  0.020674345  0.1485451535
## V16 -0.083406918 -0.169116327  0.045182419  0.348778712 -0.0033831395
## V17  0.185193728  0.042945893 -0.009857670 -0.066844184  0.2110644508
## V18 -0.175554755  0.019115574 -0.131681034  0.147365044  0.2397301525
## V19  0.188423004 -0.069045249  0.094298390 -0.184551856  0.2462337628
## V20  0.007344553 -0.015404740  0.020052761  0.013918280 -0.0153474772
## V21 -0.095673975  0.221051585  0.203150449 -0.091071852 -0.1592337557
## V22 -0.094333009 -0.049394487  0.046209090 -0.144228185 -0.0677354526
## V23  0.119198274 -0.127056083  0.178451300  0.169626497  0.1081322644
## V24  0.042432029 -0.030530993 -0.157847431 -0.028029912  0.0398624337
## V25  0.196315380 -0.134591379  0.064713893 -0.093895754 -0.1432479387
## V26 -0.274131411 -0.026589900  0.073721156 -0.034894309 -0.1866770213
## V27  0.129895065  0.039560910 -0.023916844  0.109016718 -0.0571947429
## V28  0.063889388  0.063057176 -0.014479382 -0.184118243  0.0349999779
## V29  0.078079047 -0.175983744  0.171731129 -0.066277830 -0.0969895075
## V30  0.027836227  0.027561585 -0.007303606  0.196850710 -0.0501163814
## V31 -0.111796945  0.012434585  0.157602675 -0.186357082 -0.0651272424
## V32  0.045794198  0.020543861 -0.095553662 -0.060689231 -0.0765113416
## V33  0.118681506  0.026757669 -0.099466003 -0.019445440 -0.0477688513
## V34 -0.082641786  0.037022675  0.070688971  0.098104529 -0.1045903164
## V35  0.153654587  0.020381714 -0.160774322  0.164126196 -0.0565899359
## V36 -0.140121219  0.092294505  0.111358425 -0.102093531  0.1366980164
## V37  0.118418497  0.342619308  0.089934914  0.114964374  0.0828544864
## V38 -0.342734801 -0.102640945 -0.150630643  0.038490000  0.0103049501
## V39 -0.107886256  0.175318175 -0.147400502 -0.040983213 -0.1833555883
## V40  0.112340940 -0.176678884  0.173033918 -0.010359984  0.1004756769
## V41 -0.123097650  0.078421559 -0.089598993 -0.081354840 -0.2365611689
## V42 -0.060061912  0.092189225 -0.118269413  0.026142009  0.0572859688
## V43 -0.012848412  0.101775961 -0.065213988 -0.001621254  0.0498064950
## V44  0.046995319 -0.193980613 -0.004655932 -0.199921309 -0.0496576881
## V45  0.068283680  0.028339235 -0.003345484 -0.052717395 -0.0464196980
## V46  0.004867725 -0.073277333  0.138607668  0.174385567 -0.0898654146
## V47 -0.095126661 -0.095161910 -0.114581231  0.137818077  0.0176525286
## V48 -0.140422235  0.092438738 -0.110353875 -0.196557204 -0.1205603329
## V49 -0.027636336 -0.057502960 -0.075894978 -0.020228321  0.2159730829
```

```
## V50  0.036425945 -0.193146189  0.210066426 -0.053877969 -0.0173794270
## V51 -0.078713631  0.198673843  0.104290469  0.019759806  0.2277821600
## V52 -0.058647711  0.048614716  0.150091920  0.097787774  0.0002072244
## V53 -0.008831342  0.090828432 -0.051865885  0.014564664  0.3601181574
## V54  0.211922496  0.094871115  0.039562798  0.044140127 -0.2337202056
## V55 -0.149821094  0.022009991  0.028862933 -0.034853893  0.0674205809
## V56 -0.059651117 -0.019126408  0.078673538 -0.021776562  0.0742991578
## V57  0.024339504 -0.110384642 -0.182255014  0.057755947  0.0537196454
## V58 -0.031593020 -0.131976162 -0.098013485  0.004567722  0.0017685652
## V59 -0.036573747 -0.081027208  0.038352821 -0.171360290  0.1343424460
## V60  0.027131890 -0.117639124  0.044727500  0.064000936  0.1041387785
## V61 -0.028102829  0.210293362 -0.222193929 -0.174688547  0.0973741125
## V62 -0.056545499 -0.261094585 -0.015860485  0.038018618 -0.0013127031
## V63 -0.120401568  0.082051215  0.197968514  0.168017658  0.0721447226
## V64 -0.008664083  0.013930212 -0.043330134  0.013876001  0.0190126930
## V65  0.054171056 -0.023263234  0.001451626  0.043702044  0.0559272178
## V66 -0.063706257 -0.007321105  0.028360984  0.148888639  0.0691512530
## V67 -0.104636294 -0.013645133 -0.046988312  0.148262046 -0.0356806623
## V68  0.133521061 -0.091471970 -0.005393507 -0.207418302 -0.0772982489
## V69  0.028146727 -0.015288816  0.079425255 -0.058448218 -0.1886615752
## V70 -0.015623017  0.050254984  0.126701935 -0.041527687  0.0300328081
## V71 -0.037723765  0.095259471 -0.104361759  0.172267198 -0.1110941036
## V72  0.169545680  0.209698721  0.221581581  0.079313598 -0.1202164742
## V73  0.082946824 -0.210452961 -0.331146164  0.085381262 -0.0074652591
##              PC61         PC62         PC63         PC64          PC65
## V1   0.1134922716  0.172964867  0.213418897 -0.062490721 -0.1739694538
## V2   0.0797384416  0.065935413 -0.022724368 -0.180598261  0.0190396056
## V3   0.1815902277 -0.089611904  0.054334557  0.087496889  0.0269585458
## V4   0.1615923770 -0.181984235 -0.037047506 -0.119461496  0.0447942278
## V5  -0.0517185790 -0.102850748  0.022701505 -0.050473424 -0.0140588713
## V6  -0.0950681244  0.022291593 -0.044002153  0.020982437  0.1185433043
## V7  -0.0212947812 -0.092838967 -0.011811315  0.105910480  0.1452514383
## V8   0.0053465540  0.048860326  0.088628935  0.021373141  0.0309157026
## V9   0.0441155433  0.149780123 -0.052183737  0.191975988 -0.0356965266
## V10 -0.0080961660 -0.084388155 -0.106060968  0.001743989  0.0015904616
## V11  0.1581324019  0.058697244 -0.026439737 -0.122510583  0.0050717958
## V12 -0.0153007517 -0.179083275 -0.014325684 -0.032039111 -0.2595512490
## V13 -0.0837755153 -0.027880542 -0.129818448  0.267732229  0.1947500726
## V14  0.0866205981 -0.059417884 -0.006571246  0.054609752  0.2478811913
## V15  0.1368460995  0.073784790 -0.067569997 -0.018592677 -0.0803704291
## V16  0.2500067924 -0.013949161  0.010825341  0.064775345 -0.1057088784
## V17  0.0310573395  0.211099452  0.108467206 -0.184587584 -0.0415366063
## V18 -0.0427280526 -0.092495750 -0.223717700 -0.060662691 -0.0829984375
## V19 -0.0948412848  0.066783565 -0.076693024 -0.028352518 -0.0932761589
## V20  0.0722166569  0.014402587  0.065870539  0.019528157  0.1827565127
## V21 -0.1103235011  0.148156690  0.195370530  0.011194332  0.0006955823
## V22  0.0392078559 -0.117218149  0.136875249 -0.084450923  0.1820930726
## V23  0.0175215052  0.013152949  0.135627012 -0.057785711 -0.0905182273
```

```
## V24  0.0945565648  0.051875974 -0.005383070  0.040893113  0.0707741844
## V25 -0.0161816614 -0.148030094 -0.259555736  0.095984648 -0.1926694938
## V26  0.0563476015  0.180110484 -0.066035887  0.174255512 -0.1521137417
## V27  0.0866321969  0.014119702 -0.086232117  0.021454841 -0.0201549791
## V28 -0.0291707881 -0.076918097  0.049857507 -0.058243890 -0.0360609332
## V29 -0.0402433914 -0.136126273 -0.019329866  0.094592519  0.1544815226
## V30 -0.1426223327  0.167498014  0.075005755 -0.234366878  0.1482493959
## V31  0.1390074064  0.044662807 -0.167162220 -0.121177832  0.0010921831
## V32 -0.3282220256 -0.081493626 -0.083856739 -0.183100797 -0.0867136335
## V33  0.0589061515 -0.026877716 -0.146096618  0.021900218  0.0989613521
## V34  0.0123549881 -0.155445018 -0.045418352 -0.060667886  0.0611829694
## V35  0.0270513368  0.049972667  0.145553078  0.144422382  0.0524525782
## V36 -0.2401325644 -0.014780740  0.203363699  0.033721753  0.0211707081
## V37  0.0185787514  0.060882302  0.220034351 -0.127374627  0.0202314533
## V38 -0.0579289813  0.125787397  0.124516791 -0.083924924 -0.1776065815
## V39  0.0362353942 -0.199207611 -0.002089115 -0.017068707 -0.0621017050
## V40 -0.0003869862 -0.014674984  0.072259472  0.184589070  0.0756508732
## V41 -0.0015129571 -0.014405494  0.262481570  0.174470299  0.2378954168
## V42 -0.1008397171  0.193710839 -0.132917618 -0.094627916 -0.0641661520
## V43 -0.1128362100 -0.125928912  0.071806475  0.181038371 -0.0663502416
## V44  0.0619447357  0.038318160  0.009979523 -0.329937554  0.0337603212
## V45  0.1875205077  0.279023519 -0.056768768  0.066336889  0.0448521843
## V46 -0.2259916533  0.061567660  0.019432389 -0.052463767 -0.0596578482
## V47 -0.0012916514 -0.145575854 -0.007577342 -0.080500977  0.0185770315
## V48  0.0258072242 -0.139096247 -0.158588100 -0.013962960 -0.0533230081
## V49  0.0285052911 -0.085993617  0.074081790  0.126580915 -0.0585177680
## V50 -0.0171812672  0.023972681  0.035163140 -0.105958764  0.0585957238
## V51 -0.0717455072 -0.105001423  0.027995523  0.176625640 -0.1174762366
## V52 -0.1206036205 -0.002150913  0.043947367 -0.060095808  0.1400300807
## V53  0.0293982816 -0.159253732 -0.078602022 -0.149544316  0.1400737942
## V54 -0.1163850098  0.119547834 -0.096227241 -0.125470187 -0.1922448174
## V55  0.0176424665 -0.005361418  0.002429718  0.007062352  0.0452006709
## V56  0.0744772836  0.179443208  0.037942085  0.135761987 -0.0998098450
## V57  0.1753680893 -0.081878106 -0.078496626 -0.068947661 -0.0332012161
## V58 -0.1434817389 -0.066323998  0.154584167  0.190355854 -0.0321039612
## V59 -0.1822501903  0.190680744 -0.063795345  0.144242541 -0.1269653388
## V60  0.1401524153 -0.006974693  0.332848458  0.028629591 -0.0795614301
## V61 -0.0035373196  0.026527136 -0.060294076  0.131718082  0.1239953964
## V62 -0.2563339653  0.007003208  0.089662008  0.025362801 -0.0438800637
## V63 -0.2152118116 -0.082400277 -0.098448932 -0.002739267 -0.0212941308
## V64 -0.0760231827  0.248919662 -0.265028896  0.002896431  0.2566784404
## V65 -0.0049611075  0.004017634 -0.082584092  0.038136761  0.0724672336
## V66 -0.0275806023 -0.160417218  0.070081987 -0.300782091  0.1189589224
## V67  0.2524884681  0.119273270 -0.094758349  0.031294196 -0.0995983057
## V68 -0.0009839936 -0.069502865  0.070788185  0.003304687  0.1668403719
## V69  0.0616667220 -0.261905332  0.089885731  0.067546091 -0.3370043617
## V70  0.1581098581  0.067319430 -0.039345326  0.039523643  0.0085053382
## V71 -0.1648765908  0.123896968 -0.190124196  0.089083311  0.0606000498
```

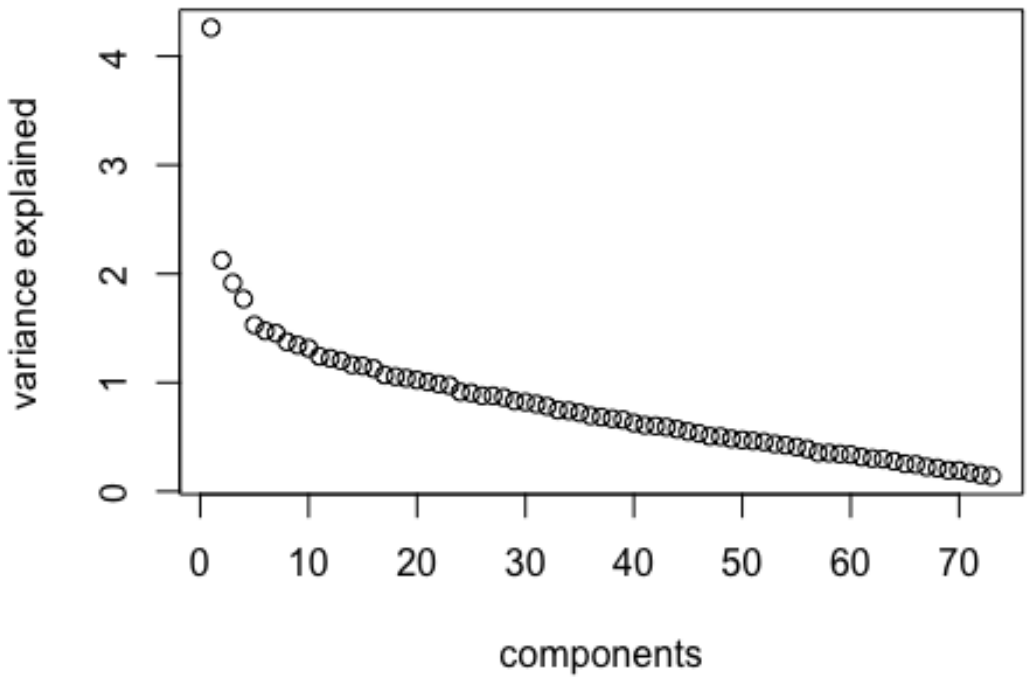
```
## V72  0.1463961250 -0.084888972 -0.041182279  0.016598979  0.0860294390
## V73 -0.0001945679  0.052906342  0.144772139 -0.053918933  0.0049581881
##            PC66          PC67         PC68         PC69          PC70
## V1  -0.04136007  1.137227e-02  0.126206538  0.025060124  0.0037900177
## V2  -0.04856690 -4.942601e-02 -0.093766761  0.102635992 -0.0295106102
## V3   0.05059887  2.187230e-01  0.005411549 -0.048163830  0.0118371304
## V4  -0.06528264 -1.083947e-01  0.219094430  0.150167652  0.1216851338
## V5   0.05320303  6.296699e-02 -0.002342876 -0.022702890  0.0934591151
## V6   0.09056864 -2.659835e-01 -0.038474817 -0.009152095 -0.0473876911
## V7   0.06838875 -7.090247e-02  0.269828244 -0.017749921  0.0092619036
## V8  -0.12450908  1.150634e-01 -0.018664362  0.008013246 -0.2391153216
## V9   0.09920338  1.296033e-01 -0.160813074  0.049774729  0.0145253909
## V10 -0.20984964 -4.616225e-02  0.013891980 -0.046645324 -0.1348312864
## V11  0.09186208 -1.514649e-01  0.052950140  0.035513400  0.0179797771
## V12 -0.05191460  1.630497e-01 -0.065252259  0.034964298 -0.0231433637
## V13 -0.04768188  4.934134e-02 -0.002824241 -0.154325291  0.2090425711
## V14  0.02808477 -1.980196e-02 -0.140363753 -0.183999715  0.0135276505
## V15  0.18849607 -8.283593e-03  0.013157131 -0.029201769 -0.0580576970
## V16  0.13260295 -7.908838e-02  0.024781958  0.012022652  0.0306361208
## V17  0.09508618  7.986038e-02 -0.193419766  0.196261830 -0.0195972534
## V18  0.11053657  3.322768e-02 -0.070337560 -0.055558773  0.0023671468
## V19 -0.16908721 -2.225314e-02  0.016536816  0.081453101 -0.0637514911
## V20 -0.07187205 -4.846971e-02  0.037253088 -0.143652125  0.1214907842
## V21 -0.16933772  1.996663e-02 -0.020440346 -0.063668239 -0.1277139367
## V22  0.18089123  7.139407e-04 -0.020273731  0.143497908 -0.0069797404
## V23  0.11960900 -5.850995e-02  0.201701053 -0.152379952 -0.1582966146
## V24 -0.06902640  3.678926e-03 -0.107863936 -0.080809738  0.1412798523
## V25 -0.03261582 -1.858514e-01  0.125873925  0.081621067 -0.1741976155
## V26 -0.03972862  9.585683e-03 -0.225167882  0.045592787 -0.1165769148
## V27 -0.16917499  1.571120e-02  0.025197571 -0.019669871 -0.1554672017
## V28  0.05613373  4.069638e-02 -0.061954326  0.080503429 -0.0756074526
## V29  0.13070647  1.285077e-02  0.002077768  0.038364555  0.1629882981
## V30  0.09357432 -2.285938e-01 -0.009771735  0.114641707 -0.2391378253
## V31  0.08435747  1.021255e-01  0.079979915 -0.095584217 -0.1757285961
## V32  0.10615999  4.041636e-02 -0.080490425  0.063953917  0.0250292435
## V33 -0.08625426 -4.862732e-03 -0.107457099 -0.209549747  0.0079346130
## V34  0.11460332  8.872415e-03 -0.103914027  0.216774574 -0.0391200997
## V35  0.12975005  2.365220e-02  0.182721106  0.165536417 -0.2258297607
## V36  0.02996041 -1.878543e-02  0.069648534 -0.054727796  0.0011593962
## V37 -0.16130414 -2.469235e-01  0.079801047 -0.160569843  0.2954742862
## V38  0.05750514  9.354319e-02 -0.077117071  0.019099148  0.1556805476
## V39  0.07371548  1.348956e-01  0.067700185 -0.222173732 -0.1428721597
## V40  0.11412811 -8.765347e-02 -0.118426738 -0.061506089 -0.0129512678
## V41 -0.04049998 -4.027538e-02 -0.081353719  0.003459847 -0.0937589146
## V42 -0.04392864 -1.664012e-01  0.037265975 -0.094205163  0.0120508572
## V43 -0.06624843  8.647394e-02  0.128249010  0.421098283  0.2686186129
## V44  0.02865728  3.250200e-01  0.004118155 -0.214799018  0.2702892632
## V45  0.07185863 -6.106708e-02  0.012429989  0.192514105  0.0323672866
```

```
## V46  0.05292648  1.071170e-01  0.098817735  0.077150479  0.0892663767
## V47 -0.28842195  1.490518e-01  0.031740131 -0.102974877 -0.0905325876
## V48 -0.13221829 -2.139997e-01 -0.049798444  0.043677167  0.0954682775
## V49  0.12201229 -4.873102e-03 -0.170656287 -0.048107440 -0.0415009158
## V50 -0.24627920  3.451760e-02  0.078647599 -0.039011988  0.0421568475
## V51  0.05087506 -3.428507e-02 -0.137449557 -0.164018292 -0.0102637120
## V52  0.07157264  2.097911e-01  0.126194142  0.146103390 -0.0008937578
## V53 -0.07842103 -9.090563e-02 -0.124685228  0.126247650 -0.1369239215
## V54  0.19508973 -1.813486e-01 -0.034411372 -0.174115690  0.1610792977
## V55 -0.07245957 -1.643121e-01  0.001002091 -0.002491244  0.0721966111
## V56  0.12695613  3.003253e-02 -0.065112705 -0.130061575 -0.0104616839
## V57 -0.14575949 -2.720823e-02 -0.062870113  0.077347900 -0.1000066856
## V58  0.02394391  1.247115e-01  0.119589728  0.026595759 -0.0620909801
## V59  0.02841881  8.962071e-02  0.179699647 -0.151964132 -0.1372963320
## V60 -0.26868386 -7.315331e-02 -0.086962496 -0.093234005 -0.0105385960
## V61  0.19786491 -2.838467e-01  0.138382585 -0.069114047  0.0529144391
## V62 -0.17365040 -1.901642e-01 -0.382846829  0.129313828  0.0510540286
## V63 -0.05639568  3.910811e-03  0.118739840 -0.011812293  0.0472790655
## V64 -0.06711426  1.884821e-01 -0.133473327 -0.020681665 -0.0607180773
## V65  0.08363151  1.173514e-02 -0.053447905  0.005293846 -0.0136906316
## V66  0.14172895 -1.295635e-02 -0.003532739 -0.112003306 -0.1328135744
## V67 -0.05552628  1.715715e-02  0.069911179  0.168658473  0.2642213115
## V68 -0.01310619  3.763310e-02 -0.099022908  0.048458865 -0.0432444418
## V69  0.06967251 -8.738749e-02 -0.097927815 -0.076582196 -0.0064741735
## V70 -0.16073727 -4.795586e-03  0.219872066  0.083421628 -0.1336109458
## V71 -0.13191176  7.755719e-02  0.144361241  0.031478543  0.0744166220
## V72  0.10035327  1.293067e-01 -0.180142664  0.088800540  0.0481300956
## V73  0.09971411  5.340876e-05  0.113222235 -0.033558014  0.0244177854
##             PC71         PC72         PC73
## V1  -0.073303889 -0.098190093  0.157823386
## V2   0.037740686 -0.124962420 -0.043621449
## V3  -0.105813415 -0.042667476 -0.064609206
## V4  -0.088900444  0.056637462 -0.441122583
## V5  -0.110637094  0.088024504 -0.020508463
## V6   0.050206663  0.044558104 -0.071569978
## V7   0.068077908  0.068227657  0.087097712
## V8   0.077538705  0.130771659 -0.082147386
## V9   0.034619796  0.043619022 -0.092913953
## V10 -0.016614060  0.032331792 -0.024284538
## V11  0.097183209  0.190861026  0.110064786
## V12  0.120062505  0.082379561 -0.022363493
## V13  0.056579210 -0.091013523  0.011286611
## V14 -0.020332749  0.157662790  0.031802136
## V15  0.056967348 -0.082088034  0.026058877
## V16  0.103650773  0.231956922 -0.128253103
## V17 -0.007304333  0.019701159 -0.107433102
## V18 -0.227649833 -0.099900104 -0.117352069
## V19 -0.127958037 -0.001337099  0.118003814
```

```
## V20  0.010307969 -0.104664123  0.030595087
## V21  0.209253055 -0.149964289 -0.253410040
## V22 -0.006766486  0.138318956  0.025597440
## V23  0.022876203  0.005506389  0.104054277
## V24  0.022823715  0.128097205 -0.064245223
## V25  0.144112583 -0.069236461  0.008382167
## V26  0.065919966 -0.152634322  0.435529577
## V27  0.048630060  0.004787822  0.023196613
## V28 -0.108752491  0.053998682  0.101331149
## V29  0.021740177 -0.004881347  0.129989687
## V30 -0.129963465 -0.011283273  0.012870805
## V31 -0.314926389  0.076906184  0.044112839
## V32  0.340470352  0.031486853 -0.050696591
## V33 -0.166818209  0.002637613 -0.026220507
## V34  0.254551281 -0.137046973 -0.090669441
## V35 -0.127803442  0.069720205  0.179090499
## V36 -0.147480642 -0.007573494  0.007874910
## V37  0.064007167 -0.060621391  0.189502820
## V38 -0.127294114  0.142765294 -0.097479491
## V39  0.032799387 -0.216825722 -0.031657531
## V40 -0.048847984 -0.097681087 -0.016104695
## V41  0.004493539  0.104283806 -0.217249977
## V42  0.020015075  0.203030114  0.015300240
## V43  0.049322645  0.127247473  0.132657374
## V44  0.211569056 -0.099247390  0.141062293
## V45 -0.005527950 -0.351250783 -0.147723464
## V46 -0.038663205 -0.028742115 -0.045012784
## V47 -0.024985511  0.025148833  0.015665446
## V48 -0.062822705  0.069806496  0.064984374
## V49  0.220043620 -0.100586571 -0.070477959
## V50 -0.079008936  0.162129941 -0.073505868
## V51 -0.069629916 -0.035655471  0.078207900
## V52 -0.069261891  0.006636335  0.136293184
## V53  0.133400659 -0.033458974  0.152833811
## V54 -0.095922866  0.013922041 -0.099951851
## V55  0.126843465 -0.074466520 -0.042866165
## V56 -0.045902828  0.025492896 -0.154793785
## V57  0.032331046 -0.082773197 -0.064564564
## V58 -0.084549855 -0.165056071 -0.064161071
## V59  0.275274121  0.251126318 -0.152707900
## V60  0.119521894  0.010692683  0.066136027
## V61  0.078066989 -0.004506501  0.078333728
## V62 -0.188354706 -0.006752285 -0.018987721
## V63 -0.123170659 -0.238694190 -0.057431608
## V64 -0.007746859  0.117015284  0.037167966
## V65 -0.002595410 -0.102114633  0.039090178
## V66  0.031369717 -0.135088939  0.028300009
## V67 -0.035362408 -0.148195809 -0.050432779
```

```
## V68 -0.114370172 -0.174191709 -0.122309220
## V69 -0.175212815  0.059994594 -0.003743948
## V70 -0.014120090 -0.001288440  0.008314308
## V71 -0.039299511 -0.065939329 -0.012709111
## V72 -0.005013776  0.236945229  0.099334754
## V73 -0.014931619 -0.102143317  0.005390612
```

```
#scree plot
plot(data_prcomp$sdev, xlab = 'components', ylab = 'variance explained')
```




```
#Summarize the importance of the components
summary(data_prcomp)
```

```
## Importance of components%s:
##                            PC1     PC2     PC3     PC4     PC5     PC6
## Standard deviation     4.2610 2.12493 1.91693 1.76872 1.52985 1.47477
## Proportion of Variance 0.2487 0.06185 0.05034 0.04285 0.03206 0.02979
## Cumulative Proportion  0.2487 0.31057 0.36090 0.40376 0.43582 0.46561
##                            PC7    PC8     PC9    PC10    PC11    PC12
## Standard deviation     1.45326 1.3749 1.34445 1.31607 1.24156 1.22316
## Proportion of Variance 0.02893 0.0259 0.02476 0.02373 0.02112 0.02049
## Cumulative Proportion  0.49454 0.5204 0.54520 0.56893 0.59005 0.61054
```

```
##                            PC13    PC14    PC15    PC16    PC17    PC18
## Standard deviation     1.20091 1.16263 1.15331 1.12953 1.07033 1.05467
## Proportion of Variance 0.01976 0.01852 0.01822 0.01748 0.01569 0.01524
## Cumulative Proportion  0.63030 0.64881 0.66703 0.68451 0.70020 0.71544
##                            PC19    PC20    PC21    PC22    PC23    PC24
## Standard deviation     1.04055 1.02406 1.00649 0.98787 0.97319 0.91394
## Proportion of Variance 0.01483 0.01437 0.01388 0.01337 0.01297 0.01144
## Cumulative Proportion  0.73027 0.74464 0.75852 0.77188 0.78486 0.79630
##                            PC25    PC26    PC27    PC28    PC29    PC30
## Standard deviation     0.90479 0.87929 0.87846 0.86367 0.83082 0.82082
## Proportion of Variance 0.01121 0.01059 0.01057 0.01022 0.00946 0.00923
## Cumulative Proportion  0.80752 0.81811 0.82868 0.83890 0.84835 0.85758
##                            PC31    PC32    PC33    PC34    PC35    PC36
## Standard deviation     0.80322 0.78275 0.74775 0.74082 0.72287 0.69466
## Proportion of Variance 0.00884 0.00839 0.00766 0.00752 0.00716 0.00661
## Cumulative Proportion  0.86642 0.87481 0.88247 0.88999 0.89715 0.90376
##                           PC37    PC38    PC39    PC40    PC41    PC42
## Standard deviation     0.6834 0.66807 0.65836 0.62817 0.60798 0.60191
## Proportion of Variance 0.0064 0.00611 0.00594 0.00541 0.00506 0.00496
## Cumulative Proportion  0.9102 0.91627 0.92221 0.92761 0.93268 0.93764
##                            PC43    PC44    PC45   PC46    PC47    PC48
## Standard deviation     0.59153 0.57228 0.55053 0.5336 0.50690 0.50344
## Proportion of Variance 0.00479 0.00449 0.00415 0.0039 0.00352 0.00347
## Cumulative Proportion  0.94243 0.94692 0.95107 0.9550 0.95849 0.96196
##                           PC49    PC50    PC51    PC52   PC53    PC54
## Standard deviation     0.4837 0.47266 0.46453 0.45412 0.4356 0.42462
## Proportion of Variance 0.0032 0.00306 0.00296 0.00282 0.0026 0.00247
## Cumulative Proportion  0.9652 0.96823 0.97118 0.97401 0.9766 0.97908
##                            PC55    PC56    PC57   PC58    PC59    PC60
## Standard deviation     0.40816 0.39015 0.35508 0.3528 0.34387 0.33863
## Proportion of Variance 0.00228 0.00209 0.00173 0.0017 0.00162 0.00157
## Cumulative Proportion  0.98136 0.98344 0.98517 0.9869 0.98850 0.99007
##                            PC61    PC62    PC63    PC64    PC65    PC66
## Standard deviation     0.31572 0.30224 0.29721 0.27756 0.25409 0.24765
## Proportion of Variance 0.00137 0.00125 0.00121 0.00106 0.00088 0.00084
## Cumulative Proportion  0.99143 0.99268 0.99389 0.99495 0.99583 0.99667
##                            PC67    PC68    PC69    PC70    PC71    PC72
## Standard deviation     0.22387 0.21376 0.19332 0.19243 0.17312 0.15281
## Proportion of Variance 0.00069 0.00063 0.00051 0.00051 0.00041 0.00032
## Cumulative Proportion  0.99736 0.99799 0.99850 0.99901 0.99942 0.99974
##                            PC73
## Standard deviation     0.13886
## Proportion of Variance 0.00026
## Cumulative Proportion  1.00000
```

According to the scree plot and the summary of importance of components it would make most sense to focus on 4 factors. However, using the general rule of thumb of a standard deviation of 1 it could be justifiable to extract 21 components.

2) In order to short-list candidates for the position, your job is to find the highest and lowest scoring candidate on each factor.

```
#We want to extract the scores in order to see how the individual participant scor
ed on each components
#We conduct a factorial analysis and set scores = TRUE
pca_score <- principal(data, nfactors = 4, rotate = "oblimin", scores = TRUE)

#Add scores to separate data frame
score_data <- as.data.frame(pca_score$scores)

#Find the candidate that scored the highest on each component
which.max(score_data$TC1)

## [1] 83

which.max(score_data$TC4)

## [1] 92

which.max(score_data$TC2)

## [1] 53

which.max(score_data$TC3)

## [1] 102

#Find the candidate that scored the lowest on each component
which.min(score_data$TC1)

## [1] 34

which.min(score_data$TC4)

## [1] 83

which.min(score_data$TC2)

## [1] 34

which.min(score_data$TC3)

## [1] 34
```

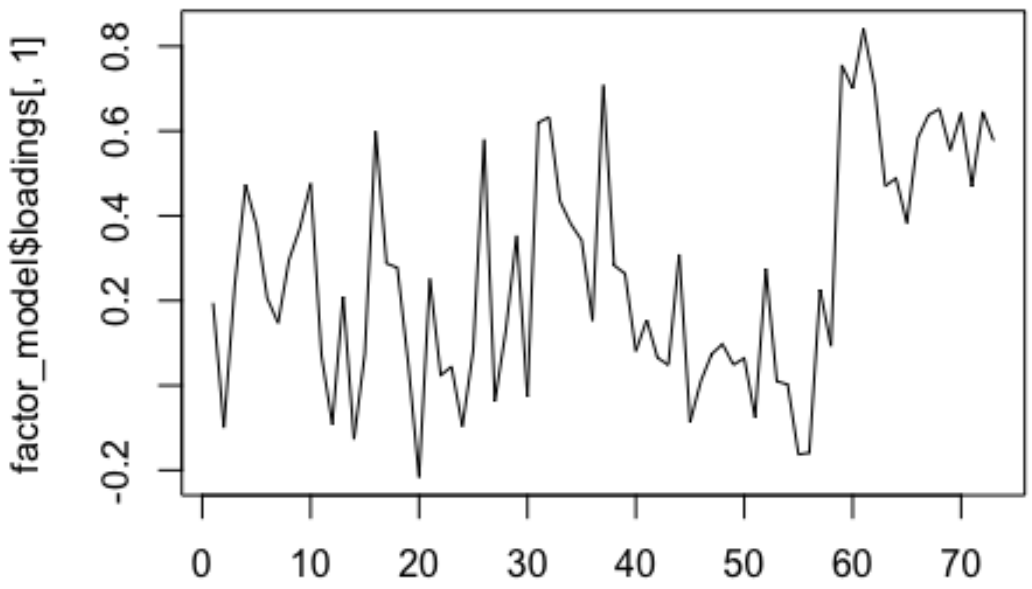
The results show that candidate 34 scored lowest on three out of four components (TC1, 2 and 3). On component TC4 candidate 83 scored lowest, however with component 1 candidate 83 scored highest. Component 4 candidate 92 scored the highest. Component 2 candidate 53 scored the highest. Lastly component 3 participant 102 scored the highest.

3) Your boss asks you what you think of his new empathy test (The physical empathy test). Does it really measure anything that the old scales cannot capture?

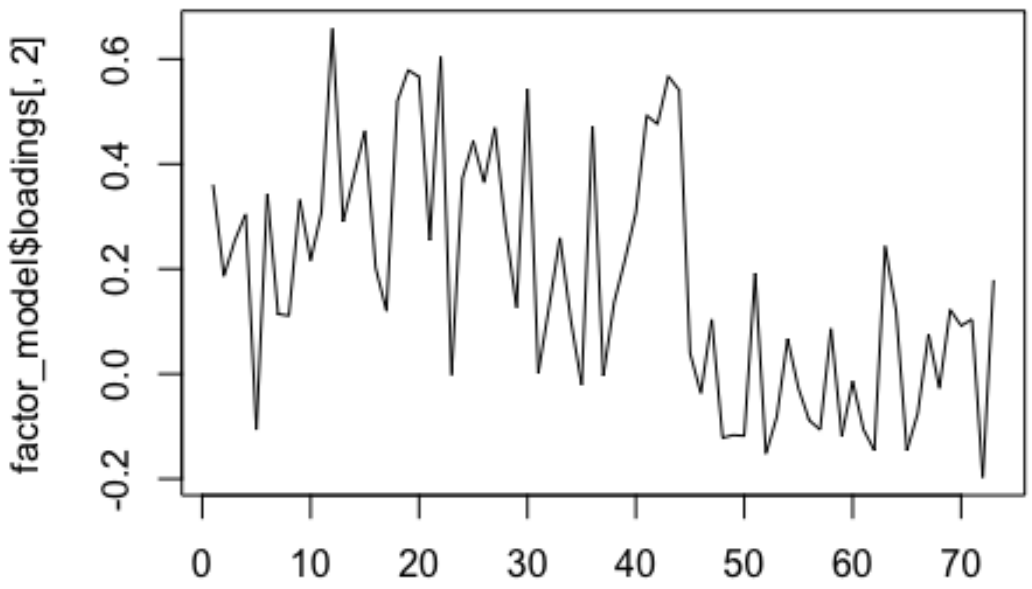
```
#Make a correlation matrix
data_cor <- cor(data,use='complete.obs')

#Tests if the correlation matrix is the identity matrix (i.e. all correlations are zero)
cortest.bartlett(data_cor)

## Warning in cortest.bartlett(data_cor): n not specified, 100 used

## $chisq
## [1] 4833.294
##
## $p.value
## [1] 8.937229e-134
##
## $df
## [1] 2628

#A factorial analysis of the correlation matrix
factor_model <- principal(data_cor, nfactors = 4, rotate = "oblimin")

#Extract Factor loadings above the threshold of 0.3
print.psych(factor_model, cut = 0.3, sort = TRUE)

## Principal Components Analysis
## Call: principal(r = data_cor, nfactors = 4, rotate = "oblimin")
## Standardized loadings (pattern matrix) based upon correlation matrix
##     item   TC1   TC4   TC2   TC3    h2   u2 com
## V61   61  0.84                   0.623 0.38 1.0
## V59   59  0.76                   0.573 0.43 1.1
## V62   62  0.71                   0.562 0.44 1.3
## V37   37  0.71                   0.589 0.41 1.1
## V60   60  0.70                   0.487 0.51 1.1
## V68   68  0.65                   0.415 0.59 1.1
## V72   72  0.65                   0.471 0.53 1.4
## V70   70  0.64                   0.406 0.59 1.3
## V67   67  0.64                   0.550 0.45 1.3
## V32   32  0.63                   0.507 0.49 1.1
## V31   31  0.62                   0.409 0.59 1.0
## V16   16  0.60                   0.472 0.53 1.5
## V66   66  0.58                   0.347 0.65 1.1
## V26   26  0.58  0.36             0.590 0.41 2.3
## V73   73  0.58                   0.504 0.50 1.3
## V69   69  0.55                   0.483 0.52 1.3
```

```
## V64   64  0.49                    0.476 0.52 1.7
## V10   10  0.48                    0.349 0.65 1.7
## V4     4  0.47  0.30              0.383 0.62 2.3
## V63   63  0.47                    0.429 0.57 1.6
## V71   71  0.47                    0.321 0.68 1.2
## V33   33  0.43                    0.316 0.68 1.7
## V65   65  0.38                    0.116 0.88 1.5
## V34   34  0.38                    0.228 0.77 1.7
## V5     5  0.38                    0.281 0.72 2.2
## V9     9  0.37  0.33              0.300 0.70 2.5
## V12   12        0.66              0.426 0.57 1.1
## V22   22        0.60              0.374 0.63 1.0
## V19   19        0.58              0.446 0.55 1.4
## V43   43        0.57  0.36        0.617 0.38 1.8
## V20   20        0.57              0.290 0.71 1.5
## V30   30        0.54              0.426 0.57 1.8
## V44   44  0.31  0.54              0.636 0.36 1.8
## V18   18        0.52              0.463 0.54 1.6
## V41   41        0.49              0.539 0.46 2.1
## V42   42        0.48              0.399 0.60 1.7
## V36   36        0.47              0.312 0.69 2.3
## V27   27        0.47              0.365 0.63 1.7
## V15   15        0.46              0.316 0.68 1.3
## V14   14        0.38         0.33 0.293 0.71 2.7
## V24   24        0.37        -0.37 0.283 0.72 2.5
## V1     1        0.36              0.249 0.75 2.5
## V6     6        0.34              0.200 0.80 2.4
## V13   13                          0.431 0.57 3.8
## V28   28                          0.190 0.81 2.4
## V45   45              0.76        0.585 0.42 1.1
## V48   48              0.72        0.536 0.46 1.1
## V51   51              0.65        0.492 0.51 1.3
## V23   23              0.63        0.416 0.58 1.0
## V47   47              0.57        0.397 0.60 1.1
## V17   17              0.50        0.523 0.48 1.8
## V38   38              0.49        0.488 0.51 1.8
## V25   25        0.44  0.49        0.593 0.41 2.1
## V50   50              0.48        0.267 0.73 1.3
## V3     3              0.46        0.489 0.51 2.1
## V35   35  0.34        0.39        0.339 0.66 2.0
## V29   29  0.35        0.39        0.414 0.59 2.5
## V39   39              0.38        0.395 0.60 2.5
## V11   11        0.31  0.33        0.331 0.67 2.4
## V40   40        0.31  0.33        0.292 0.71 2.2
## V21   21              0.30        0.505 0.50 3.9
## V8     8              0.30        0.298 0.70 3.2
## V2     2                          0.074 0.93 2.5
## V54   54                    0.82 0.695 0.30 1.0
```

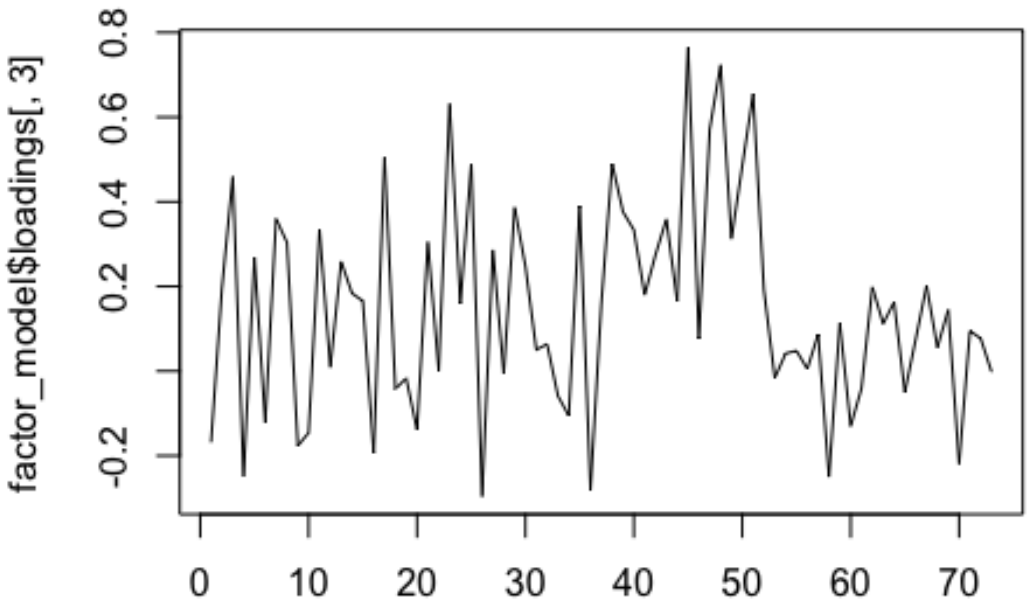
```
## V53   53                    0.65 0.424 0.58 1.0
## V56   56                    0.65 0.411 0.59 1.2
## V58   58                    0.65 0.489 0.51 1.4
## V7     7              0.36  0.46 0.514 0.49 2.3
## V52   52                    0.40 0.334 0.67 2.6
## V46   46                   -0.39 0.154 0.85 1.1
## V49   49              0.31 -0.39 0.228 0.77 2.1
## V57   57                    0.36 0.226 0.77 2.0
## V55   55                    0.35 0.127 0.87 1.5
##
##                         TC1  TC4  TC2  TC3
## SS loadings           11.42 7.10 6.71 4.25
## Proportion Var         0.16 0.10 0.09 0.06
## Cumulative Var         0.16 0.25 0.35 0.40
## Proportion Explained   0.39 0.24 0.23 0.14
## Cumulative Proportion  0.39 0.63 0.86 1.00
##
##  With component correlations of
##      TC1  TC4  TC2  TC3
## TC1 1.00 0.40 0.29 0.23
## TC4 0.40 1.00 0.25 0.09
## TC2 0.29 0.25 1.00 0.09
## TC3 0.23 0.09 0.09 1.00
##
## Mean item complexity =  1.8
## Test of the hypothesis that 4 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.07
##
## Fit based upon off diagonal values = 0.93

#Plot to see each components factor loadings in relation to each question
matplot(factor_model$loadings [,1], type = 'l')
```



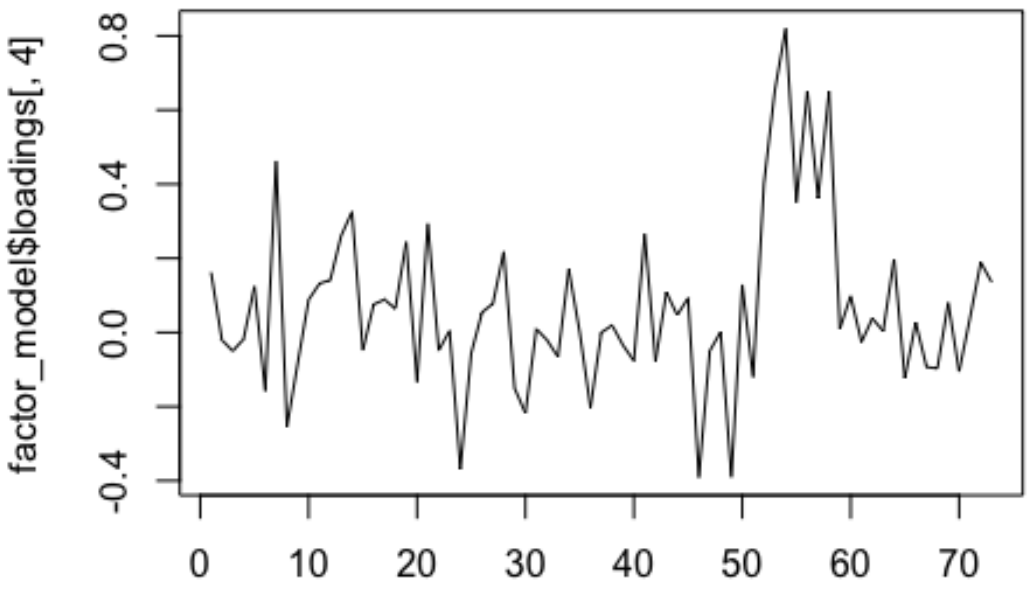

```r
matplot(factor_model$loadings [,2], type = 'l')
```




```r
matplot(factor_model$loadings [,3], type = 'l')
```




```r
matplot(factor_model$loadings [,4], type = 'l')
```

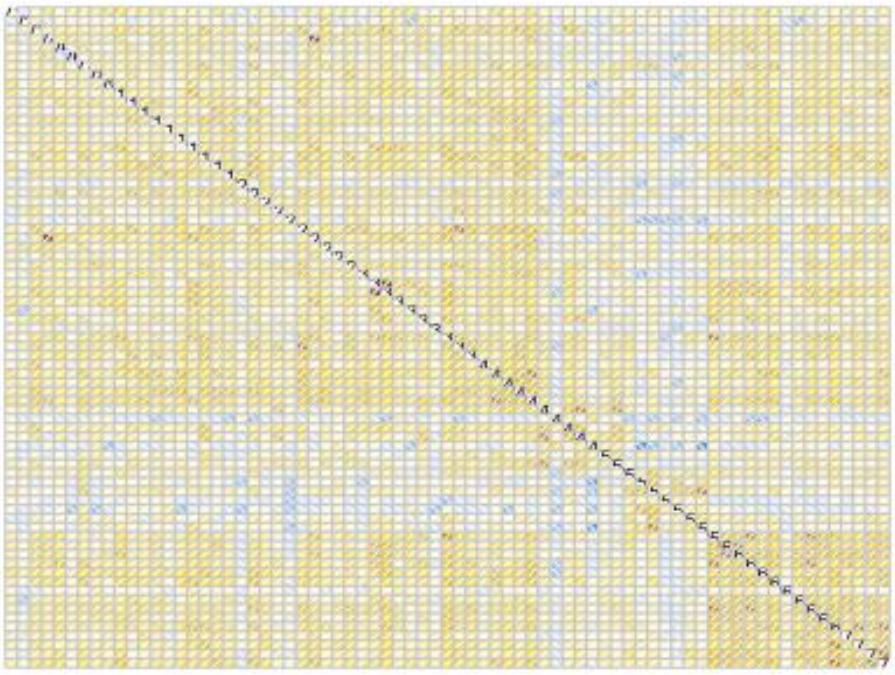


According to the factor loadings it appears that the first component captures a lot of the questions involved in the new physical empathy test. It loads on 21 questions where 14 of these questions are from the new test. Therefore it appears that the new test captures parts that the old tests did not. This component seems to capture features that involves external factors (watching movies, emotional reactions, seeing, physical reactions related to others misfortunes)

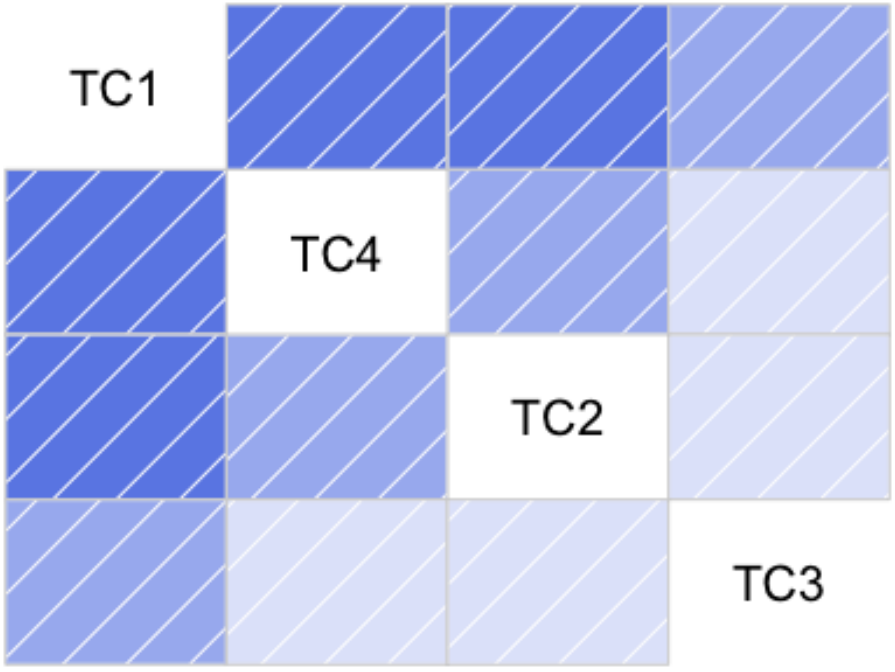
So it appears that the addition of the physical empathy test adds a "physical-component" (TC1) whereas the others adds: "parental-component" (TC4), "conflict & justice - component" (TC2) and "concerned empathy - component" (TC3)

4) You also want to impress your boss with a couple of illustrative plots.

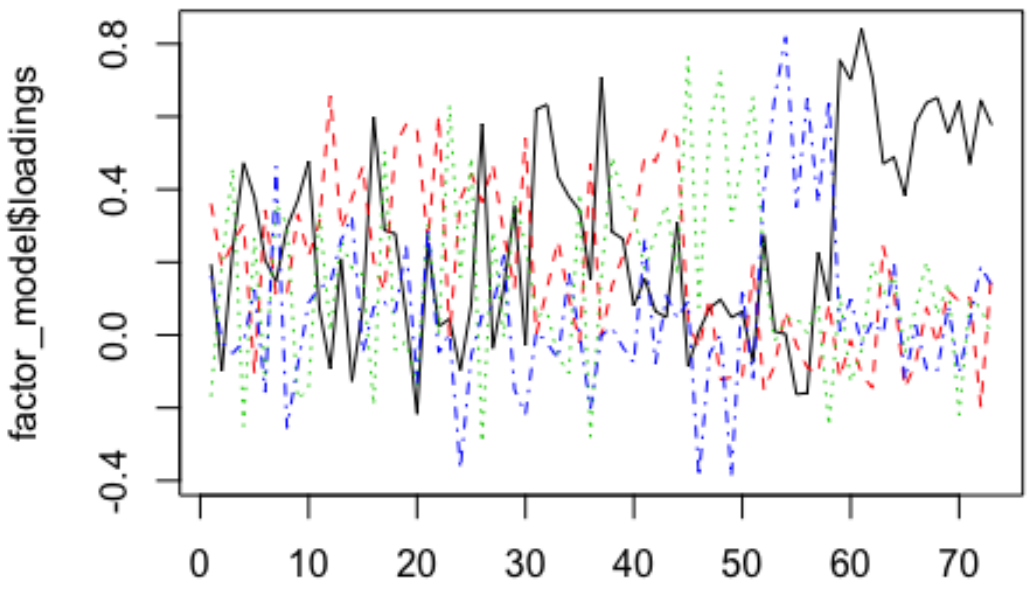
```
#Correlation plot of all questions
corrgram(data, col.regions =  colorRampPalette(c("dodgerblue4", 'dodgerblue','whit
e', 'gold',"firebrick4")),cor.method='pearson')
```



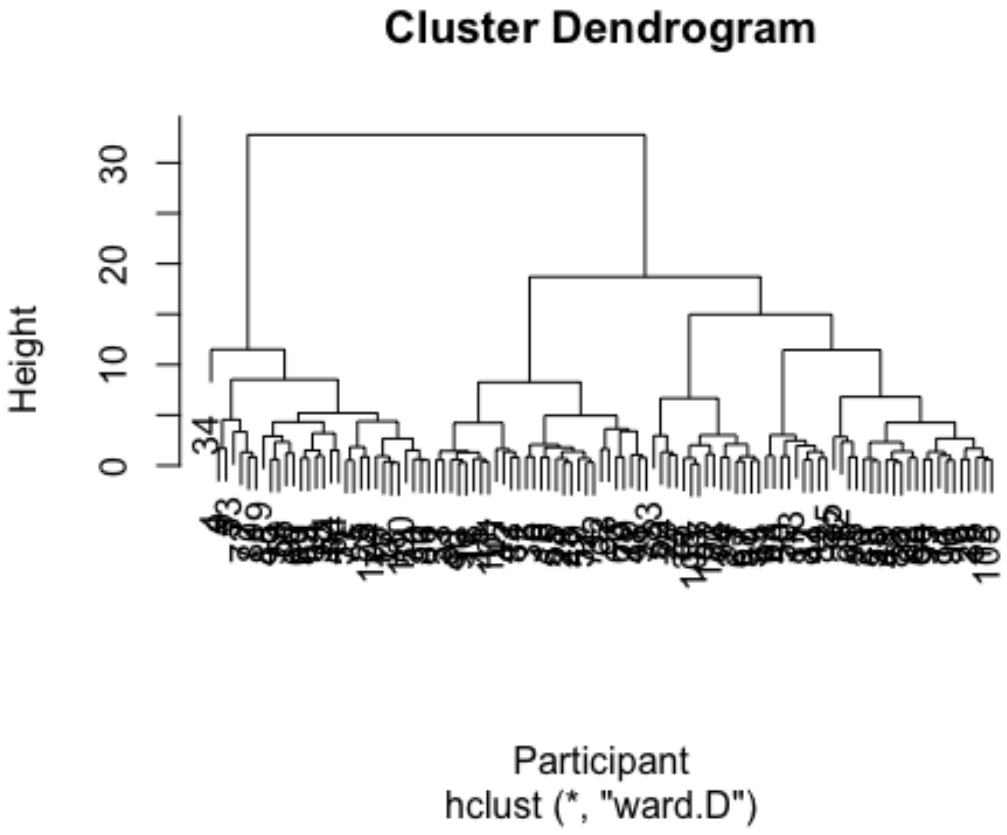
```r
#Correlation plot of the 4 components
corrgram(score_data, cor.method='pearson')
```



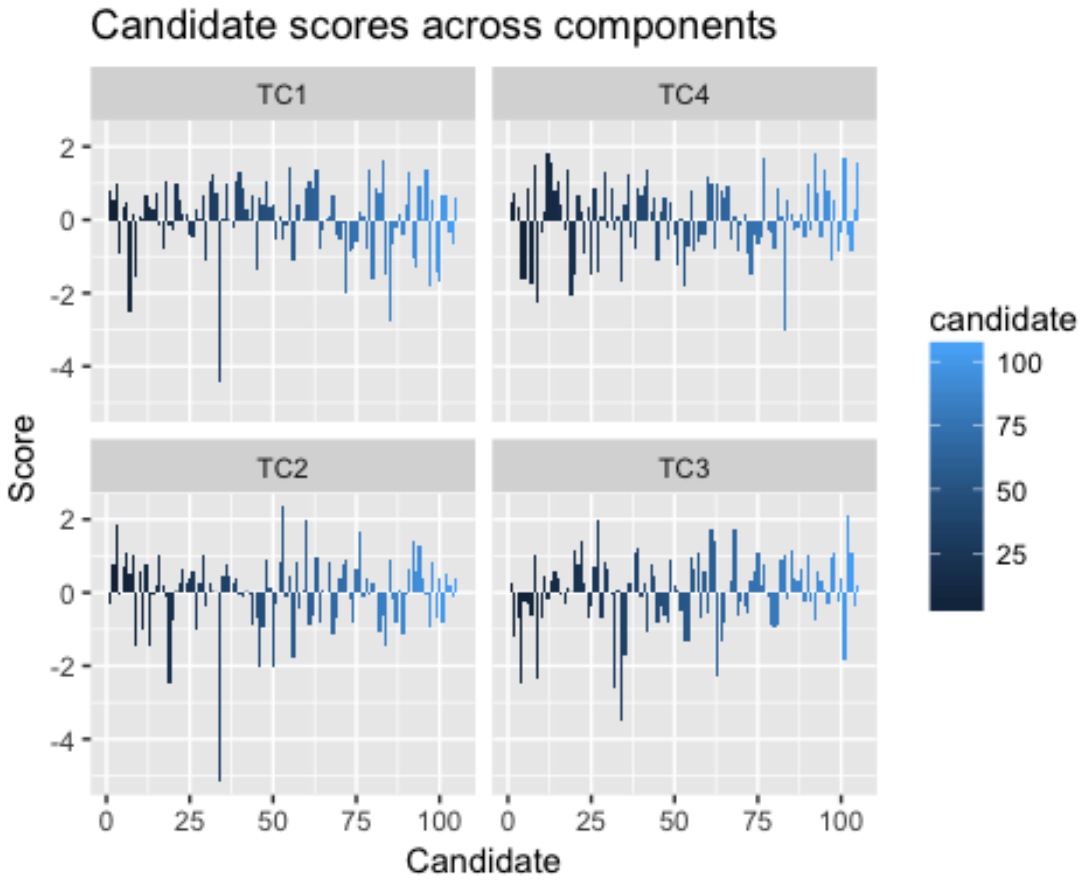

```r
#Factor loadings according to each component
matplot(factor_model$loadings, type = 'l')
```




```r
#Plotting dendrogram on participants
tree <- hclust(dist(score_data),method="ward.D")
plot(tree, xlab = "Participant")
```




```
#Add a column that counts for each candidate
new_score_data <- mutate(score_data, candidate = 1:105)

#Melt score data
melt_score_data <- melt(new_score_data, id = "candidate", measured = c("TC1", "TC4
", "TC2", "TC3"))

#Plot individual participants score on each of the components
ggplot(melt_score_data) +
  geom_bar(aes(x= candidate, y=value, fill = candidate), stat="identity")+
  facet_wrap(~ variable)+
  labs(title = "Candidate scores across components", y = "Score", x = "Candidate")
```




```r
#Plot individual scores on all components
ggplot(melt_score_data) +
  geom_bar(aes(x= candidate, y=value, fill = variable), stat="identity")+
  labs(title = "Candidate scores across components", y = "Score", x = "Candidate")
```

Conclusion:
According to our findings, we do not recommend hiring candidate 34 if you wish to hire an empathic employee. However, if you wish to hire a parental and caring individual, we suggest the following candidate: 92 or individuals in the dendrogram that surrounds this candidate. If you are more interested in an individual with a focus on justice and fairplay we recommend candidate 53.
If you wish to focus on an individual that scores high on your new physical empathy test we recommend to interview candidate 83. However, this candidate has the lowest score on parental dilemmas.
Lastly, if your main focus is concerned empathy we recommend interviewing candidate 102.