PCA

Auzzer

2020/5/15

setwd("/Users/auzzer\_pang")  
data\_PCA = read.table("PCA上机数据.txt")  
data = cbind(data\_PCA$V1,data\_PCA$V2,data\_PCA$V3,data\_PCA$V4,data\_PCA$V5,data\_PCA$V6,data\_PCA$V7)

cor = cor(data)  
PCA=princomp(data, cor=T)  
summary(PCA, loadings=T) #列出主成分分析分析结果

## Importance of components:  
## Comp.1 Comp.2 Comp.3 Comp.4 Comp.5  
## Standard deviation 2.4094991 0.80848347 0.54761522 0.35422802 0.231984732  
## Proportion of Variance 0.8293837 0.09337793 0.04284035 0.01792536 0.007688131  
## Cumulative Proportion 0.8293837 0.92276161 0.96560196 0.98352731 0.991215445  
## Comp.6 Comp.7  
## Standard deviation 0.197608919 0.149808546  
## Proportion of Variance 0.005578469 0.003206086  
## Cumulative Proportion 0.996793914 1.000000000  
##

**#----Standard deviation 标准差   其平方为方差=特征值  
#----Proportion of Variance  方差贡献率  
#----Cumulative Proportion  方差累计贡献率（贡献率一般到多少？）**

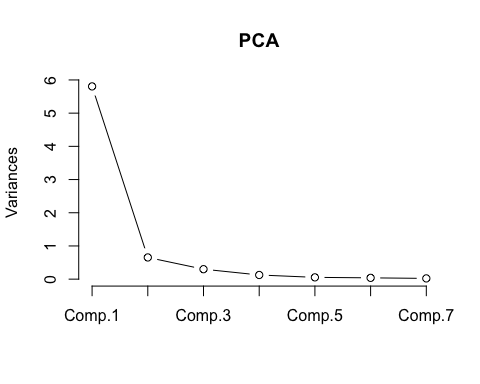
**对于这个问题，三个因素累计贡献率已经高达96.5%**

## Loadings:  
## Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7  
## [1,] 0.368 0.490 0.286 0.319 0.231 0.620   
## [2,] 0.365 0.537 0.230 -0.711 -0.109  
## [3,] 0.382 0.247 -0.515 -0.347 -0.572 0.191 0.208  
## [4,] 0.385 -0.155 -0.585 0.620 -0.315  
## [5,] 0.389 -0.360 0.430 -0.231 0.693  
## [6,] 0.389 -0.348 0.153 0.363 -0.463 -0.598  
## [7,] 0.367 -0.369 0.484 -0.672 0.131 0.142

round(predict(PCA),3) #作预测, 保留三位小数

## Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7  
## [1,] 0.532 -0.681 -0.621 0.046 -0.003 0.462 -0.081  
## [2,] -2.113 -0.538 0.044 0.189 -0.220 0.139 -0.010  
## [3,] -1.393 -0.278 0.537 0.430 -0.026 -0.082 -0.107  
## [4,] -1.524 0.092 0.084 -0.040 -0.031 0.063 0.140  
## [5,] 0.391 -0.985 -0.655 0.479 0.206 -0.050 0.048  
## [6,] -0.119 -0.920 -0.325 0.344 -0.097 -0.303 -0.007  
## [7,] 1.698 0.592 -0.077 -0.146 0.609 0.280 0.056  
## [8,] -2.632 -0.702 -0.111 0.034 0.142 -0.118 -0.118  
## [9,] 0.553 1.183 0.240 -0.097 -0.218 0.130 0.004  
## [10,] 0.647 0.989 -0.054 0.023 -0.058 0.047 0.174  
## [11,] 0.143 0.156 -0.217 0.178 0.191 -0.328 -0.124  
## [12,] 6.133 1.412 0.215 -0.283 -0.053 -0.056 -0.292  
## [13,] 2.643 0.309 -1.105 0.416 -0.590 -0.066 -0.045  
## [14,] -3.082 -1.022 1.058 0.377 -0.026 0.048 0.190  
## [15,] -1.127 0.545 -0.415 -0.178 -0.105 -0.182 0.325  
## [16,] 2.317 -0.622 -0.652 -0.265 0.400 -0.007 0.324  
## [17,] -2.202 -0.676 -0.082 0.088 0.333 -0.032 -0.184  
## [18,] -1.910 -0.448 -0.146 -0.054 -0.191 -0.036 0.054  
## [19,] -3.538 -1.214 0.531 -0.125 0.089 -0.048 -0.178  
## [20,] -2.953 -0.441 0.203 -0.026 0.048 -0.193 0.088  
## [21,] -2.809 -0.584 -0.134 -0.131 0.042 0.012 0.061  
## [22,] 0.822 0.236 0.161 -0.088 -0.459 0.095 -0.122  
## [23,] 3.257 -0.928 -0.447 -0.092 0.358 -0.282 -0.031  
## [24,] -1.491 0.060 0.151 0.126 0.093 0.062 -0.003  
## [25,] 1.024 0.256 0.515 0.053 0.051 0.136 -0.446  
## [26,] 2.132 -0.382 -0.340 -0.189 0.379 -0.014 -0.059  
## [27,] -1.128 0.518 -0.451 -0.089 -0.026 -0.151 -0.044  
## [28,] -0.144 0.157 -0.758 -0.168 -0.293 -0.092 -0.096  
## [29,] -2.159 0.355 0.078 -0.293 -0.227 0.012 0.081  
## [30,] -0.060 0.664 -0.404 0.434 0.124 -0.184 0.143  
## [31,] -0.435 0.485 0.760 -0.329 -0.065 0.120 -0.011  
## [32,] 1.245 0.822 -0.562 0.242 0.013 -0.028 -0.028  
## [33,] 0.467 1.734 1.937 0.345 0.341 -0.567 -0.073  
## [34,] 1.314 1.193 0.106 -0.032 -0.454 -0.116 0.125  
## [35,] 2.362 -0.001 -0.119 0.854 0.129 0.377 -0.141  
## [36,] 4.273 -1.191 0.089 -1.407 -0.166 -0.325 -0.211  
## [37,] -0.064 0.574 0.091 0.456 -0.299 0.407 -0.128  
## [38,] -1.811 -0.048 -0.144 -0.109 -0.366 0.052 -0.073  
## [39,] -1.525 0.381 -0.062 0.372 0.265 0.079 0.200  
## [40,] -1.497 0.913 -0.391 -0.147 0.132 0.228 0.087  
## [41,] 4.018 -0.343 0.291 -0.297 0.161 0.113 0.040  
## [42,] 1.655 -0.884 -0.224 -0.022 0.208 0.270 -0.096  
## [43,] -2.697 -0.709 0.601 -0.024 0.037 0.146 -0.251  
## [44,] -0.226 1.264 -0.466 -0.024 0.241 -0.041 0.041  
## [45,] -2.049 0.624 0.846 -0.474 -0.075 -0.051 0.169  
## [46,] 1.988 0.961 0.393 0.407 0.074 0.092 0.018  
## [47,] -0.359 0.934 0.051 -0.104 0.094 0.126 -0.022  
## [48,] -1.845 -0.257 -0.250 -0.150 -0.001 -0.161 0.037  
## [49,] -1.359 0.519 -0.247 -0.226 -0.087 0.048 0.069  
## [50,] -0.505 -1.246 -0.314 -0.048 0.009 0.024 -0.094  
## [51,] 1.971 -0.141 -0.821 0.662 -0.159 -0.486 -0.032  
## [52,] 1.623 0.600 -0.163 -0.823 0.149 0.290 0.193  
## [53,] -3.367 -0.691 -0.385 -0.273 -0.197 -0.047 0.041  
## [54,] -3.497 -0.247 0.652 -0.209 -0.083 0.099 0.018  
## [55,] 8.410 -2.348 1.506 0.408 -0.346 0.088 0.380

screeplot (PCA, type="lines") # 画碎石图，用直线图类型



PCA$scores# 可计算主成分得分

## Comp.1 Comp.2 Comp.3 Comp.4 Comp.5  
## [1,] 0.53212195 -0.680937797 -0.62126301 0.04594894 -0.0025811586  
## [2,] -2.11284700 -0.537709378 0.04357281 0.18910495 -0.2203680482  
## [3,] -1.39316656 -0.277530069 0.53721926 0.43016371 -0.0257389828  
## [4,] -1.52390695 0.091802341 0.08422604 -0.03978605 -0.0306058833  
## [5,] 0.39139200 -0.985408838 -0.65485261 0.47882949 0.2062048001  
## [6,] -0.11948856 -0.919916756 -0.32511042 0.34410818 -0.0968457310  
## [7,] 1.69754142 0.591594341 -0.07652477 -0.14645483 0.6089939909  
## [8,] -2.63217070 -0.701696215 -0.11055186 0.03359162 0.1423824032  
## [9,] 0.55287936 1.182727959 0.23952060 -0.09701175 -0.2176191364  
## [10,] 0.64718368 0.989080326 -0.05420239 0.02315029 -0.0584398887  
## [11,] 0.14287696 0.155892166 -0.21654575 0.17777045 0.1912689370  
## [12,] 6.13329130 1.412402548 0.21479144 -0.28344586 -0.0534064942  
## [13,] 2.64336942 0.308776354 -1.10468957 0.41583379 -0.5901095778  
## [14,] -3.08194526 -1.022064547 1.05845762 0.37661064 -0.0261044669  
## [15,] -1.12666477 0.545109728 -0.41477324 -0.17754024 -0.1050907283  
## [16,] 2.31659294 -0.621775472 -0.65228802 -0.26485362 0.4000628361  
## [17,] -2.20194950 -0.676426245 -0.08161977 0.08786917 0.3329832852  
## [18,] -1.90960964 -0.447922751 -0.14598782 -0.05371977 -0.1913722401  
## [19,] -3.53833101 -1.213583461 0.53088333 -0.12545146 0.0892198174  
## [20,] -2.95274367 -0.441166540 0.20306008 -0.02608293 0.0484772004  
## [21,] -2.80880784 -0.583680262 -0.13427581 -0.13144851 0.0421251378  
## [22,] 0.82175014 0.235868928 0.16138683 -0.08774033 -0.4590729787  
## [23,] 3.25704356 -0.927528451 -0.44712955 -0.09157478 0.3578559637  
## [24,] -1.49082853 0.059931588 0.15144440 0.12620125 0.0932958595  
## [25,] 1.02388750 0.255942992 0.51541826 0.05323981 0.0513764306  
## [26,] 2.13183387 -0.381756355 -0.33979611 -0.18942353 0.3786096894  
## [27,] -1.12764937 0.517771847 -0.45125716 -0.08878343 -0.0257994289  
## [28,] -0.14428519 0.157303606 -0.75829151 -0.16758828 -0.2932604006  
## [29,] -2.15926044 0.355236135 0.07802937 -0.29320309 -0.2265506376  
## [30,] -0.05977861 0.664038312 -0.40411743 0.43394737 0.1242097243  
## [31,] -0.43486576 0.485040815 0.76003818 -0.32902859 -0.0649744043  
## [32,] 1.24523372 0.821904700 -0.56153092 0.24180716 0.0131019597  
## [33,] 0.46655772 1.733718848 1.93732968 0.34498766 0.3406608161  
## [34,] 1.31374285 1.193070361 0.10608922 -0.03180666 -0.4536981596  
## [35,] 2.36210756 -0.001271429 -0.11928549 0.85435662 0.1289014697  
## [36,] 4.27286963 -1.191080643 0.08853806 -1.40696396 -0.1655729653  
## [37,] -0.06406697 0.574213788 0.09124219 0.45631268 -0.2989152081  
## [38,] -1.81096545 -0.047519331 -0.14402369 -0.10900426 -0.3659311379  
## [39,] -1.52518788 0.381404100 -0.06168639 0.37241743 0.2651386357  
## [40,] -1.49667849 0.912528976 -0.39098664 -0.14663839 0.1323825474  
## [41,] 4.01755107 -0.343380195 0.29100630 -0.29669938 0.1610292597  
## [42,] 1.65530683 -0.884117095 -0.22419099 -0.02248064 0.2075468646  
## [43,] -2.69672473 -0.708796713 0.60146348 -0.02405997 0.0367527726  
## [44,] -0.22635133 1.264207647 -0.46643810 -0.02370870 0.2406682777  
## [45,] -2.04853470 0.623743207 0.84617721 -0.47391000 -0.0746945195  
## [46,] 1.98828979 0.960756220 0.39288468 0.40700939 0.0739539451  
## [47,] -0.35893084 0.934008388 0.05056545 -0.10437043 0.0935688291  
## [48,] -1.84460096 -0.257169493 -0.25034454 -0.15039551 -0.0006341491  
## [49,] -1.35906564 0.518920084 -0.24744025 -0.22622341 -0.0866356489  
## [50,] -0.50472889 -1.246032831 -0.31447126 -0.04825215 0.0094885051  
## [51,] 1.97117932 -0.141163113 -0.82110657 0.66155209 -0.1590843033  
## [52,] 1.62302658 0.599820487 -0.16253455 -0.82274936 0.1491062390  
## [53,] -3.36655736 -0.691419036 -0.38475273 -0.27307377 -0.1972839807  
## [54,] -3.49662048 -0.247337282 0.65233230 -0.20934990 -0.0832371859  
## [55,] 8.40968394 -2.348426494 1.50639215 0.40801087 -0.3457387522  
## Comp.6 Comp.7  
## [1,] 0.462128370 -0.080699873  
## [2,] 0.139238539 -0.009905621  
## [3,] -0.082435556 -0.107151129  
## [4,] 0.063456859 0.139767314  
## [5,] -0.049881900 0.048270306  
## [6,] -0.303217238 -0.006786235  
## [7,] 0.279882154 0.056340098  
## [8,] -0.117509178 -0.118324358  
## [9,] 0.130070468 0.004004527  
## [10,] 0.047048439 0.173928433  
## [11,] -0.327553026 -0.123571003  
## [12,] -0.056219489 -0.291941223  
## [13,] -0.066261725 -0.045099878  
## [14,] 0.047845977 0.189965751  
## [15,] -0.181623092 0.325385154  
## [16,] -0.006839652 0.324435318  
## [17,] -0.031928343 -0.184419113  
## [18,] -0.036137721 0.053714341  
## [19,] -0.047587303 -0.177690502  
## [20,] -0.193244641 0.087528634  
## [21,] 0.012482219 0.060527247  
## [22,] 0.094738351 -0.122222962  
## [23,] -0.282280845 -0.030793981  
## [24,] 0.062273088 -0.002906953  
## [25,] 0.135730171 -0.446306741  
## [26,] -0.013558797 -0.058987131  
## [27,] -0.150791833 -0.044039586  
## [28,] -0.091782995 -0.095867007  
## [29,] 0.012160659 0.080935631  
## [30,] -0.183706704 0.143305470  
## [31,] 0.120250076 -0.011156425  
## [32,] -0.028441879 -0.027955187  
## [33,] -0.567062179 -0.072739937  
## [34,] -0.116390132 0.124542185  
## [35,] 0.377469165 -0.141452453  
## [36,] -0.324641495 -0.210982892  
## [37,] 0.406538778 -0.128453534  
## [38,] 0.052043082 -0.072629607  
## [39,] 0.078855177 0.200383029  
## [40,] 0.228463484 0.087093179  
## [41,] 0.112715839 0.039720948  
## [42,] 0.270288501 -0.095656782  
## [43,] 0.146256176 -0.250884729  
## [44,] -0.041462984 0.041425643  
## [45,] -0.051264108 0.169370959  
## [46,] 0.092279870 0.018173587  
## [47,] 0.125567520 -0.021728569  
## [48,] -0.161316105 0.036668857  
## [49,] 0.047766703 0.069231063  
## [50,] 0.024460467 -0.093939922  
## [51,] -0.486457551 -0.032495552  
## [52,] 0.289750729 0.193033266  
## [53,] -0.047483131 0.040740404  
## [54,] 0.098863036 0.017920516  
## [55,] 0.088455707 0.380377027

load=loadings(PCA) #提取主成分载荷矩阵  
plot(load[,1:2], xlim=c(-0.6,0.6), ylim=c(-0.8,0.8)) #作散点图  
text(load[,1], load[,2], adj=c(0.5, -0.5)) #为散点标号  
abline(h=0); abline(v=0) #划分象限

