TP1-2

Slim Kammoun

```
## Loading required package: ggplot2

## Welcome! Related Books: `Practical Guide To Cluster Analysis in R` at https://goo.gl/13EFCZ

## Loading required package: lattice

## Loading required package: survival

## Loading required package: Formula

##
## Attaching package: 'Hmisc'

## The following objects are masked from 'package:base':
##
##     format.pval, units
```

```
mydata_2<-read.table("Data_eleves_tp1.txt",sep="\t",dec=",",header=TRUE,fileEncoding="UTF16LE") #pb enc
rownames(mydata_2)=mydata_2$eleves
mydata_2=mydata_2[,-1]
```

```
###Q1###
mydata_2.pca = PCA(mydata_2, scale.unit=TRUE,graph=FALSE)
```

```
###Q2###
summary(mydata_2)
```

```
##       ORTH            GRAM            EXPR            RECI
##  Min.   : 0.00   Min.   : 2.000   Min.   : 2.000   Min.   : 4.00
##  1st Qu.: 5.75   1st Qu.: 6.500   1st Qu.: 7.500   1st Qu.: 6.50
##  Median :11.00   Median : 7.500   Median : 9.000   Median :10.00
##  Mean   :10.02   Mean   : 7.556   Mean   : 8.889   Mean   :10.07
##  3rd Qu.:14.00   3rd Qu.: 8.500   3rd Qu.:10.500   3rd Qu.:12.50
##  Max.   :20.00   Max.   :14.500   Max.   :16.500   Max.   :16.00
##       MATH            ANGL            HIST            BIOL
##  Min.   : 8.00   Min.   : 3.00   Min.   : 5.000   Min.   : 2.000
##  1st Qu.:10.00   1st Qu.: 8.75   1st Qu.: 7.750   1st Qu.: 7.000
##  Median :12.00   Median :11.00   Median : 9.000   Median :10.000
##  Mean   :12.57   Mean   :10.93   Mean   : 9.204   Mean   : 9.593
##  3rd Qu.:14.50   3rd Qu.:12.75   3rd Qu.:11.000   3rd Qu.:12.000
##  Max.   :18.00   Max.   :17.00   Max.   :15.000   Max.   :17.000
##       EDMU            ARTS            TECH            EPS
##  Min.   : 7.00   Min.   : 1.500   Min.   : 0.00   Min.   : 5.00
##  1st Qu.:13.75   1st Qu.: 6.750   1st Qu.:11.50   1st Qu.:11.00
##  Median :16.00   Median : 9.000   Median :14.00   Median :13.50
##  Mean   :15.20   Mean   : 9.019   Mean   :12.63   Mean   :13.07
##  3rd Qu.:17.50   3rd Qu.:12.500   3rd Qu.:16.00   3rd Qu.:15.25
##  Max.   :19.00   Max.   :14.500   Max.   :18.00   Max.   :18.50
##       GEO             EXPO
##  Min.   : 0.00   Min.   : 0.00
##  1st Qu.:13.00   1st Qu.:13.50
##  Median :14.00   Median :15.00
##  Mean   :13.80   Mean   :14.48
```

```
##  3rd Qu.:15.25   3rd Qu.:17.00
##  Max.   :18.00   Max.   :18.00
```

```
library(psych)
```

```
##
## Attaching package: 'psych'
```

```
## The following object is masked from 'package:Hmisc':
##
##     describe
```

```
## The following objects are masked from 'package:ggplot2':
##
##     %+%, alpha
```

```
psych::describe(mydata_2)
```

```
##       vars  n  mean   sd median trimmed  mad min  max range  skew kurtosis
## ORTH     1 27 10.02 4.82   11.0   10.00 6.67 0.0 20.0  20.0  0.02    -0.98
## GRAM     2 27  7.56 2.88    7.5    7.46 1.48 2.0 14.5  12.5  0.35     0.27
## EXPR     3 27  8.89 3.05    9.0    8.80 2.22 2.0 16.5  14.5  0.27     0.29
## RECI     4 27 10.07 3.58   10.0   10.04 5.19 4.0 16.0  12.0  0.00    -1.22
## MATH     5 27 12.57 2.82   12.0   12.46 2.97 8.0 18.0  10.0  0.39    -0.96
## ANGL     6 27 10.93 3.33   11.0   10.93 2.97 3.0 17.0  14.0 -0.06    -0.31
## HIST     7 27  9.20 2.13    9.0    9.11 2.97 5.0 15.0  10.0  0.52     0.20
## BIOL     8 27  9.59 3.70   10.0    9.54 4.45 2.0 17.0  15.0  0.11    -0.75
## EDMU     9 27 15.20 3.24   16.0   15.59 2.97 7.0 19.0  12.0 -1.14     0.38
## ARTS    10 27  9.02 3.93    9.0    9.22 5.19 1.5 14.5  13.0 -0.30    -1.09
## TECH    11 27 12.63 4.86   14.0   13.26 2.97 0.0 18.0  18.0 -1.27     0.90
## EPS     12 27 13.07 2.98   13.5   13.15 3.71 5.0 18.5  13.5 -0.37     0.16
## GEO     13 27 13.80 3.25   14.0   14.20 1.48 0.0 18.0  18.0 -2.65     9.32
## EXPO    14 27 14.48 4.50   15.0   15.43 2.97 0.0 18.0  18.0 -2.35     5.00
##         se
## ORTH 0.93
## GRAM 0.55
## EXPR 0.59
## RECI 0.69
## MATH 0.54
## ANGL 0.64
## HIST 0.41
## BIOL 0.71
## EDMU 0.62
## ARTS 0.76
## TECH 0.94
## EPS  0.57
## GEO  0.63
## EXPO 0.87
```

```
des=psych::describe(mydata_2)
write.xlsx(as.data.frame(des),file="TP1-2.xlsx",sheetName="Descript")
```

```
###Q3###
cor=rcorr(as.matrix(mydata_2))
cor$P
```

```
##              ORTH        GRAM         EXPR       RECI         MATH
## ORTH           NA 0.004293198 0.0062725660 0.74421188 5.228715e-02
```

```
## GRAM 0.0042931980          NA 0.0699523107 0.60558682 8.158363e-02
## EXPR 0.0062725660 0.069952311           NA 0.23556562 1.217572e-03
## RECI 0.7442118797 0.605586819 0.2355656178         NA 3.674945e-01
## MATH 0.0522871467 0.081583630 0.0012175723 0.36749447           NA
## ANGL 0.0002129458 0.036841195 0.0037878986 0.83748431 5.369169e-05
## HIST 0.0033089340 0.135116908 0.0011585091 0.77533094 3.467399e-04
## BIOL 0.0731908336 0.919544417 0.0378302241 0.50316642 5.561797e-01
## EDMU 0.3598891937 0.304575783 0.0003821281 0.03290090 1.642749e-01
## ARTS 0.1188049750 0.469852587 0.0000188982 0.09824448 5.656475e-02
## TECH 0.1371458181 0.407212150 0.9857483051 0.08189150 2.932794e-01
## EPS  0.8444927033 0.638379422 0.8961200453 0.23499589 7.653354e-01
## GEO  0.4181919445 0.722071794 0.0414620006 0.58188877 9.683315e-02
## EXPO 0.4776804220 0.793732075 0.1099462947 0.09290177 3.323776e-02
##              ANGL         HIST         BIOL         EDMU         ARTS
## ORTH 2.129458e-04 0.0033089340 0.073190834 3.598892e-01 1.188050e-01
## GRAM 3.684120e-02 0.1351169081 0.919544417 3.045758e-01 4.698526e-01
## EXPR 3.787899e-03 0.0011585091 0.037830224 3.821281e-04 1.889820e-05
## RECI 8.374843e-01 0.7753309438 0.503166422 3.290090e-02 9.824448e-02
## MATH 5.369169e-05 0.0003467399 0.556179660 1.642749e-01 5.656475e-02
## ANGL           NA 0.0011370841 0.392228809 9.837107e-01 1.468252e-01
## HIST 1.137084e-03           NA 0.191511038 2.672989e-01 1.875185e-01
## BIOL 3.922288e-01 0.1915110378          NA 1.693208e-02 1.403175e-03
## EDMU 9.837107e-01 0.2672988677 0.016932078           NA 4.769473e-05
## ARTS 1.468252e-01 0.1875184895 0.001403175 4.769473e-05           NA
## TECH 2.567912e-01 0.9418192597 0.410697678 3.797965e-01 7.892905e-01
## EPS  1.676155e-01 0.7386786537 0.626639254 1.389364e-01 7.454480e-01
## GEO  5.040508e-01 0.0939113637 0.015059398 1.013513e-01 2.286582e-01
## EXPO 2.018419e-01 0.1931205532 0.002293884 2.412845e-02 1.885228e-03
##           TECH        EPS        GEO        EXPO
## ORTH 0.1371458 0.84449270 0.41819194 0.477680422
## GRAM 0.4072122 0.63837942 0.72207179 0.793732075
## EXPR 0.9857483 0.89612005 0.04146200 0.109946295
## RECI 0.0818915 0.23499589 0.58188877 0.092901774
## MATH 0.2932794 0.76533545 0.09683315 0.033237760
## ANGL 0.2567912 0.16761552 0.50405079 0.201841879
## HIST 0.9418193 0.73867865 0.09391136 0.193120553
## BIOL 0.4106977 0.62663925 0.01505940 0.002293884
## EDMU 0.3797965 0.13893635 0.10135130 0.024128448
## ARTS 0.7892905 0.74544797 0.22865818 0.001885228
## TECH        NA 0.72981974 0.44137525 0.144130537
## EPS  0.7298197         NA 0.07606997 0.273652278
## GEO  0.4413752 0.07606997         NA 0.639531560
## EXPO 0.1441305 0.27365228 0.63953156          NA
```

```
write.xlsx(as.data.frame(cor$P),file="TP1-2.xlsx",sheetName="P-values",append=T)
write.xlsx(as.data.frame(cor$r),file="TP1-2.xlsx",sheetName="corr",append=T)
l=list()
for (i in row.names(cor$P))
{ for (j in row.names(cor$P)){
    if (cor$P[i,j]<0.05 && i !=j)
    {
      l=c(l,list(c(i,j)))
    }
  }
```

```
}
str(l)
```

```
## List of 48
##  $ : chr [1:2] "ORTH" "GRAM"
##  $ : chr [1:2] "ORTH" "EXPR"
##  $ : chr [1:2] "ORTH" "ANGL"
##  $ : chr [1:2] "ORTH" "HIST"
##  $ : chr [1:2] "GRAM" "ORTH"
##  $ : chr [1:2] "GRAM" "ANGL"
##  $ : chr [1:2] "EXPR" "ORTH"
##  $ : chr [1:2] "EXPR" "MATH"
##  $ : chr [1:2] "EXPR" "ANGL"
##  $ : chr [1:2] "EXPR" "HIST"
##  $ : chr [1:2] "EXPR" "BIOL"
##  $ : chr [1:2] "EXPR" "EDMU"
##  $ : chr [1:2] "EXPR" "ARTS"
##  $ : chr [1:2] "EXPR" "GEO"
##  $ : chr [1:2] "RECI" "EDMU"
##  $ : chr [1:2] "MATH" "EXPR"
##  $ : chr [1:2] "MATH" "ANGL"
##  $ : chr [1:2] "MATH" "HIST"
##  $ : chr [1:2] "MATH" "EXPO"
##  $ : chr [1:2] "ANGL" "ORTH"
##  $ : chr [1:2] "ANGL" "GRAM"
##  $ : chr [1:2] "ANGL" "EXPR"
##  $ : chr [1:2] "ANGL" "MATH"
##  $ : chr [1:2] "ANGL" "HIST"
##  $ : chr [1:2] "HIST" "ORTH"
##  $ : chr [1:2] "HIST" "EXPR"
##  $ : chr [1:2] "HIST" "MATH"
##  $ : chr [1:2] "HIST" "ANGL"
##  $ : chr [1:2] "BIOL" "EXPR"
##  $ : chr [1:2] "BIOL" "EDMU"
##  $ : chr [1:2] "BIOL" "ARTS"
##  $ : chr [1:2] "BIOL" "GEO"
##  $ : chr [1:2] "BIOL" "EXPO"
##  $ : chr [1:2] "EDMU" "EXPR"
##  $ : chr [1:2] "EDMU" "RECI"
##  $ : chr [1:2] "EDMU" "BIOL"
##  $ : chr [1:2] "EDMU" "ARTS"
##  $ : chr [1:2] "EDMU" "EXPO"
##  $ : chr [1:2] "ARTS" "EXPR"
##  $ : chr [1:2] "ARTS" "BIOL"
##  $ : chr [1:2] "ARTS" "EDMU"
##  $ : chr [1:2] "ARTS" "EXPO"
##  $ : chr [1:2] "GEO" "EXPR"
##  $ : chr [1:2] "GEO" "BIOL"
##  $ : chr [1:2] "EXPO" "MATH"
##  $ : chr [1:2] "EXPO" "BIOL"
##  $ : chr [1:2] "EXPO" "EDMU"
##  $ : chr [1:2] "EXPO" "ARTS"
```

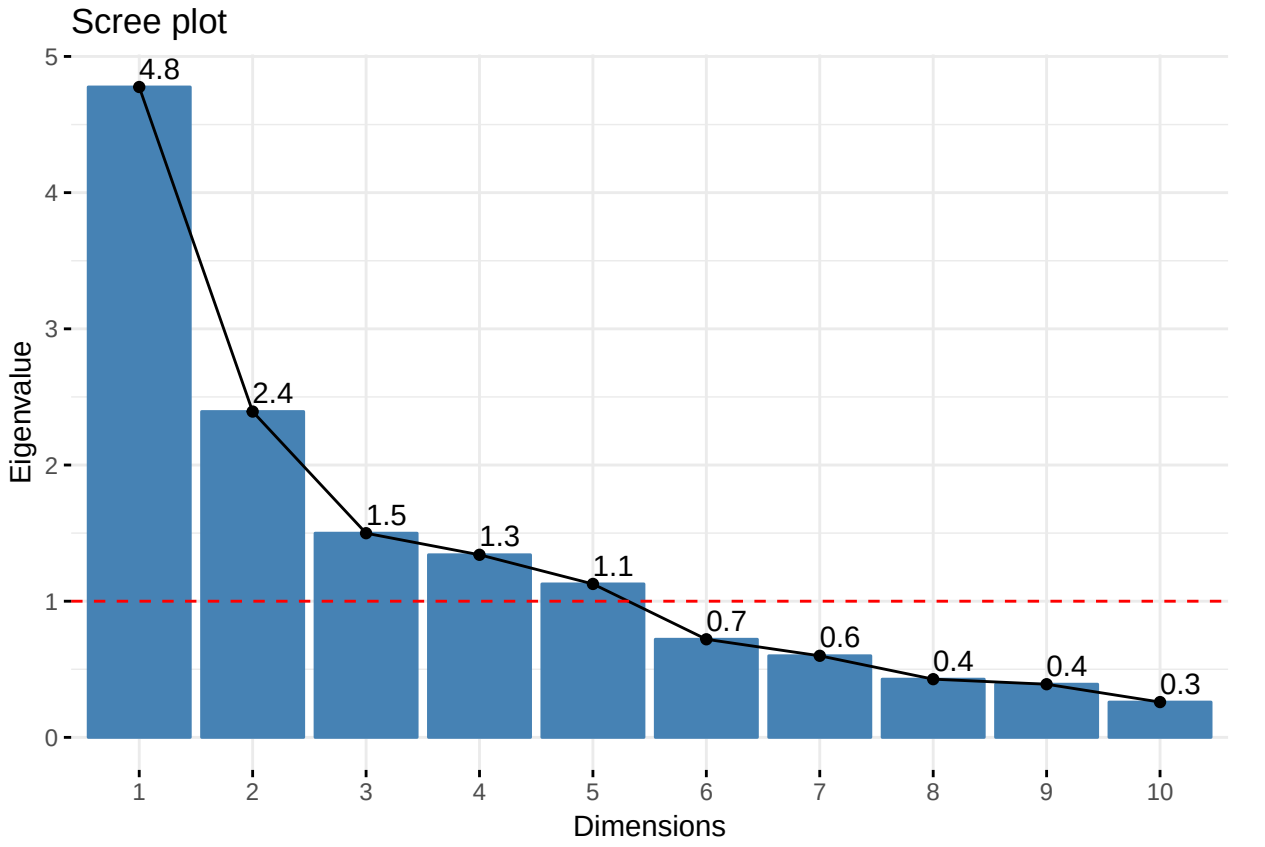
```r
eigen(cor$r) ## faire une ACP revient à diagonaliser la matrice de corrélation.
```

```
## eigen() decomposition
## $values
##  [1] 4.77570045 2.39238450 1.49934217 1.34084173 1.12670192 0.72038480
##  [7] 0.59919071 0.42748490 0.39040787 0.25931678 0.18210022 0.12552548
## [13] 0.09728799 0.06333049
##
## $vectors
##               [,1]        [,2]         [,3]         [,4]        [,5]
##  [1,] -0.297610121  0.31855456  0.141813814 -0.090513135  0.14032852
##  [2,] -0.190995109  0.31405333 -0.058591102 -0.009079599  0.47652506
##  [3,] -0.400014537 -0.00995971  0.038218157  0.037753134  0.14023058
##  [4,] -0.113162886 -0.38471989 -0.303332541  0.017413198  0.36928240
##  [5,] -0.335542517  0.11176037 -0.250648149  0.369385999 -0.08006072
##  [6,] -0.302452561  0.37635130 -0.145982887  0.055174934 -0.09397547
##  [7,] -0.319467424  0.19964886  0.059344157  0.296855011 -0.12002138
##  [8,] -0.273745425 -0.18951182  0.265252033 -0.383734333 -0.32784322
##  [9,] -0.295083374 -0.34596093  0.079511350 -0.080226002  0.28222330
## [10,] -0.346891976 -0.21410211  0.004941196 -0.312011254  0.07572226
## [11,] -0.004348059 -0.33303686 -0.380741613  0.488314359 -0.11808363
## [12,] -0.019826966 -0.27931076  0.491485353  0.327076787  0.33429545
## [13,] -0.204692596 -0.14272551  0.441508733  0.331229721 -0.39021710
## [14,] -0.267114164 -0.21691596 -0.370365143 -0.237066847 -0.31099812
##               [,6]        [,7]        [,8]        [,9]       [,10]
##  [1,]  0.10413266 -0.38421953 -0.26606076  0.45559652 -0.38550248
##  [2,] -0.52451008 -0.32195231 -0.10349132 -0.28120885  0.24116312
##  [3,] -0.06280487  0.44413034 -0.04069318  0.31714635  0.10917247
##  [4,]  0.52410429 -0.10565139 -0.30378847  0.07504311  0.38757121
##  [5,]  0.09073384  0.12366291 -0.02693234 -0.45243694  0.01233623
##  [6,]  0.31028677  0.09439234 -0.23846667 -0.16911604 -0.15655844
##  [7,]  0.15965780 -0.11456360  0.67017138  0.27955188  0.27541052
##  [8,]  0.06724356 -0.33542098 -0.10649087  0.01021944  0.26857837
##  [9,] -0.31695711  0.12448932  0.14615510  0.07643656  0.10197912
## [10,] -0.02944832  0.34487914  0.08675208 -0.11734320 -0.46749269
## [11,] -0.29943252 -0.21159487 -0.13433028  0.34171102 -0.27931212
## [12,]  0.25903416 -0.27088377  0.18477424 -0.30422401 -0.32542781
## [13,] -0.19423526  0.07585732 -0.42503133 -0.09614749  0.17403278
## [14,] -0.07126082 -0.36349644  0.21159195 -0.23960806 -0.12367296
##              [,11]       [,12]       [,13]       [,14]
##  [1,] -0.24957689  0.30963396  0.08891777  0.10222627
##  [2,]  0.30285399 -0.03405591  0.05843078 -0.10626737
##  [3,]  0.31157362 -0.16776629 -0.07010585  0.60979306
##  [4,]  0.06671150  0.10169143  0.21366069 -0.12681129
##  [5,] -0.21289543  0.48868613 -0.36758210  0.14451144
##  [6,] -0.08932427 -0.66998752 -0.04060843 -0.24498858
##  [7,]  0.10525679  0.04672508  0.14627488 -0.27500411
##  [8,]  0.17873955 -0.03169829 -0.56997460 -0.07500129
##  [9,] -0.69178350 -0.19764394 -0.08971414 -0.14693335
## [10,]  0.34074158  0.24581442  0.11092277 -0.42688398
## [11,]  0.19353930 -0.13725998 -0.24624721 -0.16587565
## [12,]  0.11439252 -0.18703297 -0.06346134  0.19008893
## [13,] -0.01574286  0.06579338  0.44964030 -0.10197962
## [14,] -0.05169151 -0.12631960  0.40973994  0.38769218
```

```
eig=mydata_2.pca$eig
write.xlsx(as.data.frame(eig),file="TP1-2.xlsx",sheetName="eig",append=T)

png("eig1.png", height=1000, width=1200, res=250, pointsize=8)
fviz_eig(mydata_2.pca,choice = "eigenvalue", addlabels = TRUE )+
  geom_hline (yintercept = 1, linetype = 2, color = "red")
dev.off()
```

```
## pdf
##   2
```

```
fviz_eig(mydata_2.pca,choice = "eigenvalue", addlabels = TRUE )+
  geom_hline (yintercept = 1, linetype = 2, color = "red")
```



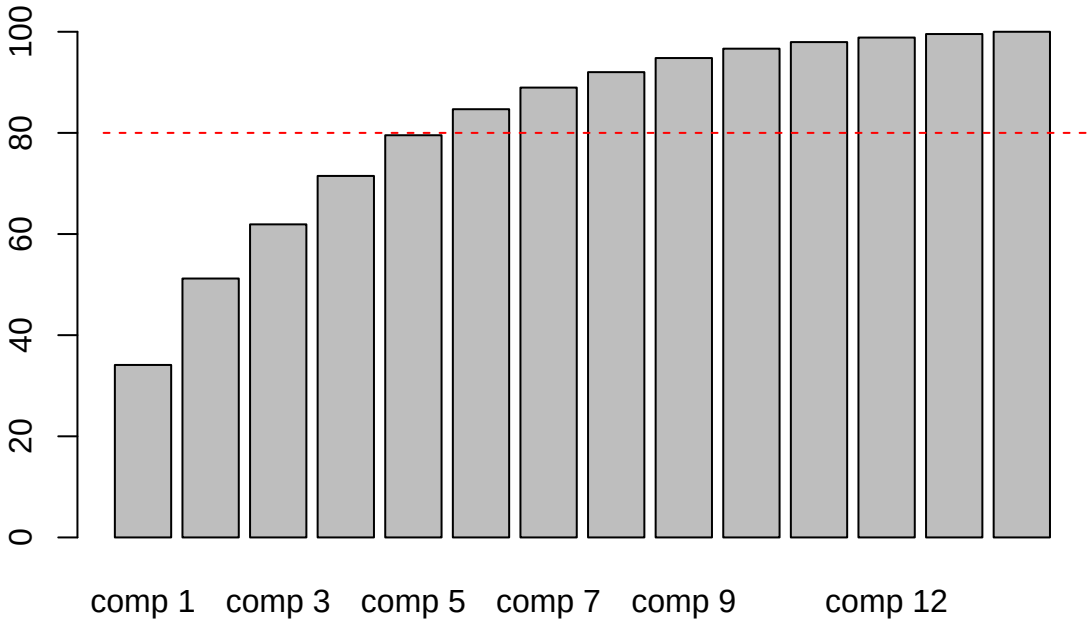

```
png("eig2.png", height=1000, width=1200, res=250, pointsize=8)

barplot(mydata_2.pca$eig[,3]) +
lines(c(0,20),c(80,80),type = "l", lty=2,col="red")
```

```
## numeric(0)
```

```
dev.off()
```

```
## pdf
##   2
```

```
barplot(mydata_2.pca$eig[,3]) +
lines(c(0,20),c(80,80),type = "l", lty=2,col="red")
```




```
## numeric(0)
```

```
mydata_2.pca$var$contrib[,1:3]
```

```
##             Dim.1        Dim.2        Dim.3
## ORTH  8.857178434 10.147700841  2.011115774
## GRAM  3.647913177  9.862949216  0.343291721
## EXPR 16.001163011  0.009919583  0.146062754
## RECI  1.280583878 14.800939040  9.201063052
## MATH 11.258878062  1.249038115  6.282449446
## ANGL  9.147755175 14.164029878  2.131100334
## HIST 10.205943479  3.985966555  0.352172894
## BIOL  7.493655757  3.591472838  7.035864125
## EDMU  8.707419780 11.968896845  0.632205474
## ARTS 12.033404324  4.583971428  0.002441541
## TECH  0.001890561 11.091355234 14.496417584
## EPS   0.039310859  7.801449997 24.155785266
## GEO   4.189905868  2.037057095 19.492996119
## EXPO  7.134997636  4.705253336 13.717033917
```

```
mydata_2.pca$var$cos2[,1:3]
```

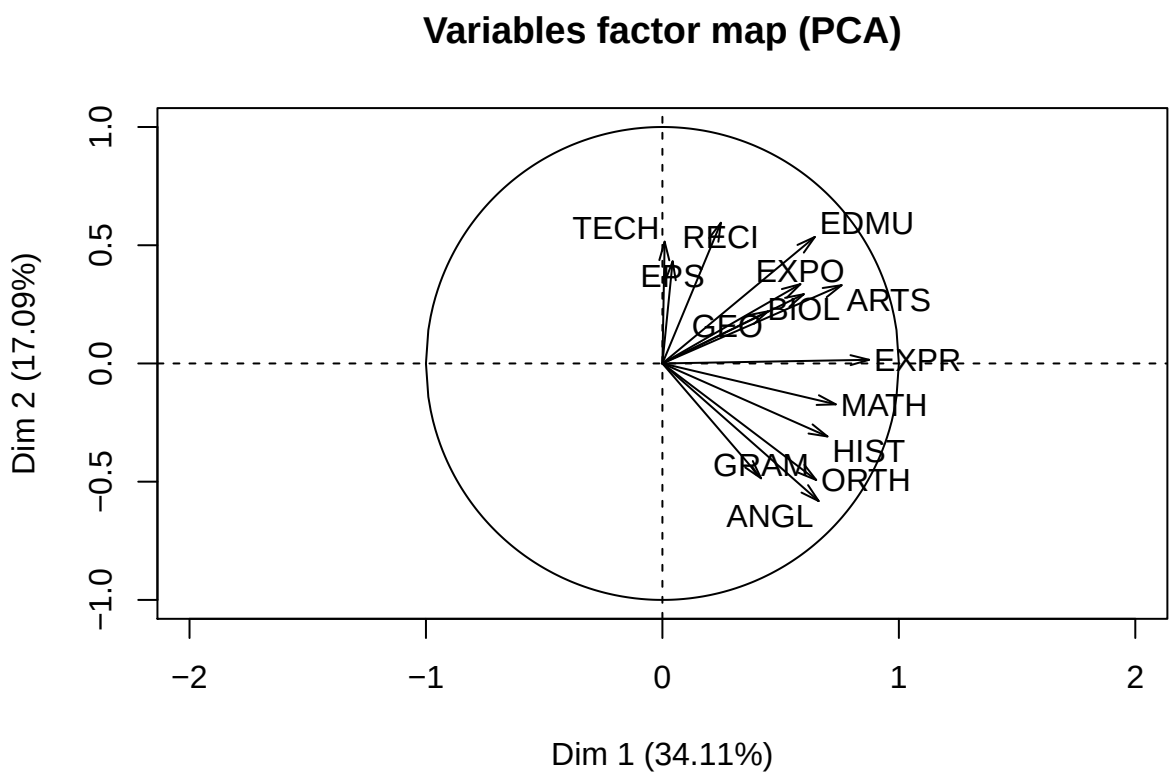
```
##             Dim.1        Dim.2        Dim.3
## ORTH 4.229923e-01 0.2427720217 3.015351e-02
## GRAM 1.742134e-01 0.2359596680 5.147118e-03
## EXPR 7.641676e-01 0.0002373146 2.189980e-03
## RECI 6.115685e-02 0.3540953710 1.379554e-01
## MATH 5.376903e-01 0.0298817942 9.419541e-02
## ANGL 4.368694e-01 0.3388580549 3.195249e-02
## HIST 4.874053e-01 0.0953596459 5.280277e-03
## BIOL 3.578746e-01 0.0859218394 1.054917e-01
## EDMU 4.158403e-01 0.2863420326 9.478923e-03
## ARTS 5.746793e-01 0.1096662218 3.660706e-05
## TECH 9.028755e-05 0.2653478631 2.173509e-01
## EPS  1.877369e-03 0.1866406803 3.621779e-01
```

```
## GEO  2.000974e-01 0.0487342381 2.922667e-01
## EXPO 3.407461e-01 0.1125677514 2.056653e-01
```

```
mydata_2.pca$var$coord[,1:3]
```

```
##            Dim.1       Dim.2        Dim.3
## ORTH 0.650378590 -0.49271901  0.173647652
## GRAM 0.417388795 -0.48575680 -0.071743415
## EXPR 0.874166811  0.01540502  0.046797227
## RECI 0.247299110  0.59505913 -0.371423503
## MATH 0.733273680 -0.17286351 -0.306912714
## ANGL 0.660960956 -0.58211516 -0.178752583
## HIST 0.698144175 -0.30880357  0.072665513
## BIOL 0.598226171  0.29312427  0.324794825
## EDMU 0.644856795  0.53510937  0.097359762
## ARTS 0.758076081  0.33115891  0.006050377
## TECH 0.009501976  0.51511927 -0.466209076
## EPS  0.043328615  0.43201931  0.601812160
## GEO  0.447322427  0.22075833  0.540616973
## EXPO 0.583734627  0.33551118 -0.453503335
```

```
plot.PCA(mydata_2.pca, axes=c(1,2), choix="var")
```




```
write.xlsx(mydata_2.pca$var,file="TP1-2.xlsx",sheetName="var",append=T)

png("var.png", height=800, width=800, res=250, pointsize=8)
plot.PCA(mydata_2.pca, axes=c(1,2), choix="var")
dev.off()
```

```
## pdf
##   2
```

```
mydata_2.pca$ind$contrib[c("EL12","EL10"),c(1,2)]
```

```
##         Dim.1      Dim.2
## EL12 20.98589 0.00230761
## EL10 18.58838 7.22537004
```

```
write.xlsx(mydata_2.pca$ind$contrib[c("EL12","EL10"),c(1,2)],file="TP1-2.xlsx",sheetName="el10_12",appe

mydata_2.pca$ind$contrib[,c(1,2,3)]
```

```
##             Dim.1       Dim.2        Dim.3
## EL01  9.328905241  9.59126708  0.616515806
## EL02  0.125275069  3.96118861  0.258445075
## EL03  0.090900704  0.16283004  5.087265764
## EL04  0.565357272  1.30848854  9.031255314
## EL05  1.487781989  1.64284957  0.148851085
## EL06  0.707432497  0.57129277  3.707371169
## EL07  1.853709107  0.76715711  5.398964876
## EL08  0.112046826  2.41932985  0.013041174
## EL09  7.407644214  1.52394402  0.009609208
## EL10 18.588377979  7.22537004  0.003702659
## EL11  0.306502245  1.89876424  1.487091590
## EL12 20.985890664  0.00230761  2.387411364
## EL13  3.231582745 14.07178676 14.446330034
## EL14  0.043589696  0.38069178  0.008154061
## EL15  0.158993355  1.06053122  0.105021975
## EL16  0.008219267  6.63073046  0.008769846
## EL17  1.187170818  5.85814498  1.849005639
## EL18  0.293940859  1.67494396  3.919286109
## EL19  0.002322024  5.62257996  0.012798694
## EL20  2.054270051  0.03005751  4.669204845
## EL21 12.582779600  5.23836937  0.273267018
## EL22  1.781543769  5.83680752  1.427638803
## EL23  4.620411054 16.67349157 22.144458992
## EL24 11.219745959  0.10732552 15.428296052
## EL25  0.484483948  0.01002931  5.460474394
## EL26  0.057921681  5.00334513  1.027681671
## EL27  0.713201366  0.72637544  1.070086782
```

```
mydata_2.pca$ind$cos2[,c(1,2,3)]
```

```
##             Dim.1        Dim.2        Dim.3
## EL01 0.4939871802 2.544221e-01 1.024927e-02
## EL02 0.0153995953 2.439294e-01 9.974166e-03
## EL03 0.0166886948 1.497558e-02 2.932265e-01
## EL04 0.0479934437 5.564457e-02 2.406970e-01
## EL05 0.3600361353 1.991583e-01 1.130896e-02
## EL06 0.1129788331 4.570510e-02 1.858839e-01
## EL07 0.2632166806 5.456951e-02 2.406833e-01
## EL08 0.0182880009 1.978134e-01 6.682624e-04
## EL09 0.7087389345 7.304140e-02 2.886406e-04
## EL10 0.7054236666 1.373607e-01 4.411496e-05
## EL11 0.0578275144 1.794592e-01 8.808506e-02
## EL12 0.7479313706 4.119938e-05 2.671316e-02
## EL13 0.1890057468 4.122901e-01 2.652656e-01
```

```
## EL14 0.0117306940 5.132244e-02 6.889338e-04
## EL15 0.0661412413 2.210094e-01 1.371631e-02
## EL16 0.0011253451 4.547869e-01 3.769713e-04
## EL17 0.1047887060 2.590331e-01 5.123930e-02
## EL18 0.0674655222 1.925822e-01 2.824181e-01
## EL19 0.0004757406 5.770759e-01 8.232519e-04
## EL20 0.3713275349 2.721739e-03 2.649758e-01
## EL21 0.7298912794 1.522200e-01 4.976597e-03
## EL22 0.2559401091 4.200598e-01 6.439081e-02
## EL23 0.1827312433 3.303335e-01 2.749546e-01
## EL24 0.3846758662 1.843354e-03 1.660709e-01
## EL25 0.0524308493 5.437167e-04 1.855246e-01
## EL26 0.0084552474 3.658807e-01 4.709854e-02
## EL27 0.1868929233 9.535330e-02 8.803662e-02
```

```
write.xlsx(mydata_2.pca$ind,file="TP1-2.xlsx",sheetName="ind",append=T)

png("ind.png", height=800, width=800, res=250, pointsize=8)
plot.PCA(mydata_2.pca, axes=c(1,2), choix="ind")
dev.off()
```

```
## pdf
##   2
```