# TP3

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```
mydata=read.table("Race-canine.txt",sep="\t", head=T,encoding = "latin1", colClasses = "factor" )
## encoding pour lire les accents
```

```
rownames(mydata)<-mydata$Race
mydata<-mydata[,-1]
head(mydata)
```

```
##      Taille Poids Vélocité Intelligence Affection Agressivité Fonction
## BEAU      3     2        3            3         2           2        3
## BASS      1     1        1            1         1           2        2
## B.AL      3     2        3            3         2           2        3
## BOXE      2     2        2            2         2           2        1
## BULD      1     1        1            2         2           1        1
## BULM      3     3        1            3         1           2        3
```

```
library(FactoMineR)
library(factoextra)
```

```
## Loading required package: ggplot2
```

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

```
library(ggplot2)
library(plyr)
```

```
mydata.mca = MCA(mydata, graph=FALSE,quali.sup = 7,ncp=4)
```

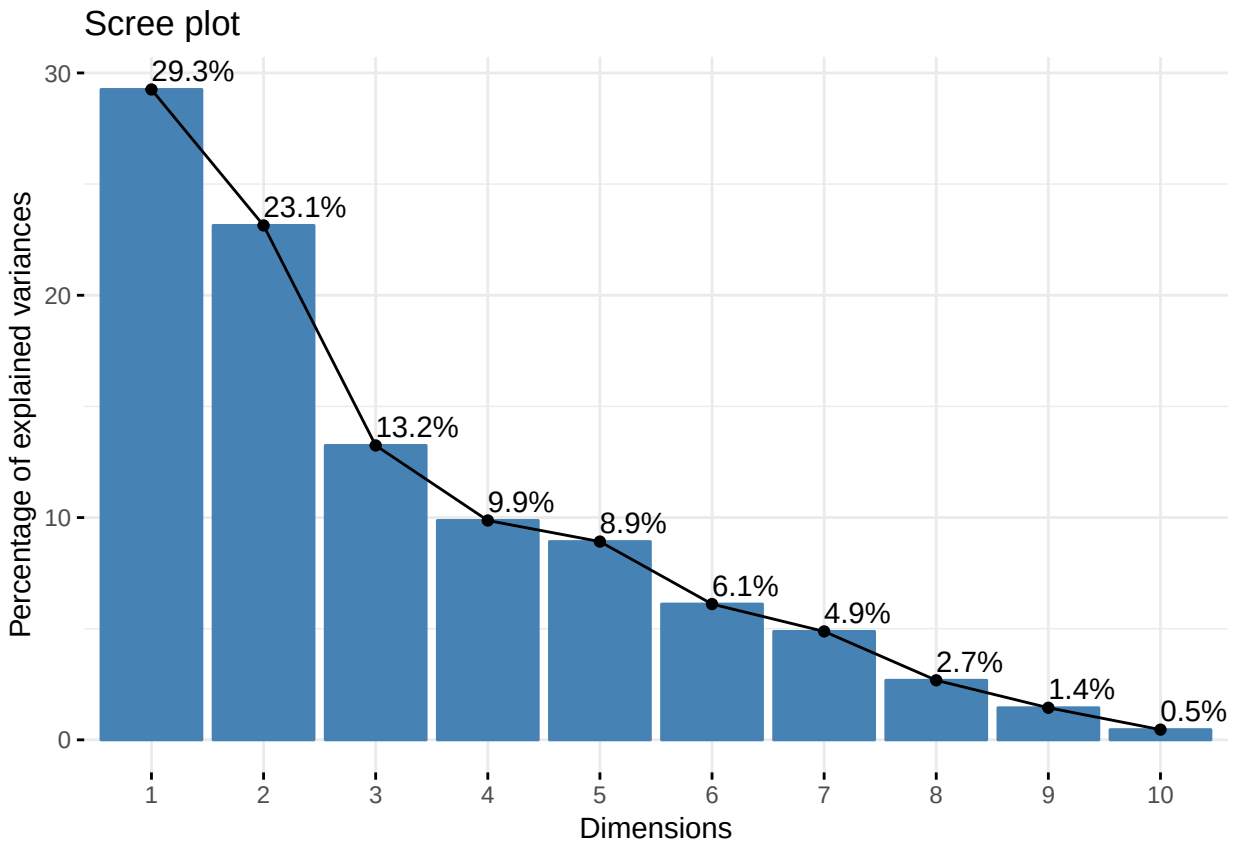
RQ: Le nombre de valeurs propres maxiamale dans ]0,1[ est la somme sur les variables (nb modalité -1) ici (3-1)+(3-1)+(3-1)+(3-1)+(2-1)+(2-1)=10

```
library(xlsx)
mydata.mca$eig
```

```
##         eigenvalue percentage of variance
## dim 1  0.487590671             29.2554403
## dim 2  0.385667752             23.1400651
## dim 3  0.220728360             13.2437016
## dim 4  0.164472270              9.8683362
## dim 5  0.148659735              8.9195841
## dim 6  0.101816275              6.1089765
## dim 7  0.081305114              4.8783069
## dim 8  0.044665793              2.6799476
## dim 9  0.024078978              1.4447387
## dim 10 0.007681718              0.4609031
##        cumulative percentage of variance
## dim 1                           29.25544
## dim 2                           52.39551
## dim 3                           65.63921
## dim 4                           75.50754
## dim 5                           84.42713
## dim 6                           90.53610
## dim 7                           95.41441
```

```
## dim 8                          98.09436
## dim 9                          99.53910
## dim 10                        100.00000
```

```
fviz_eig(mydata.mca, addlabels = TRUE)
```




```
eig=mydata.mca$eig
write.xlsx(as.data.frame(eig),file="TP3.xlsx",sheetName="eig")
```

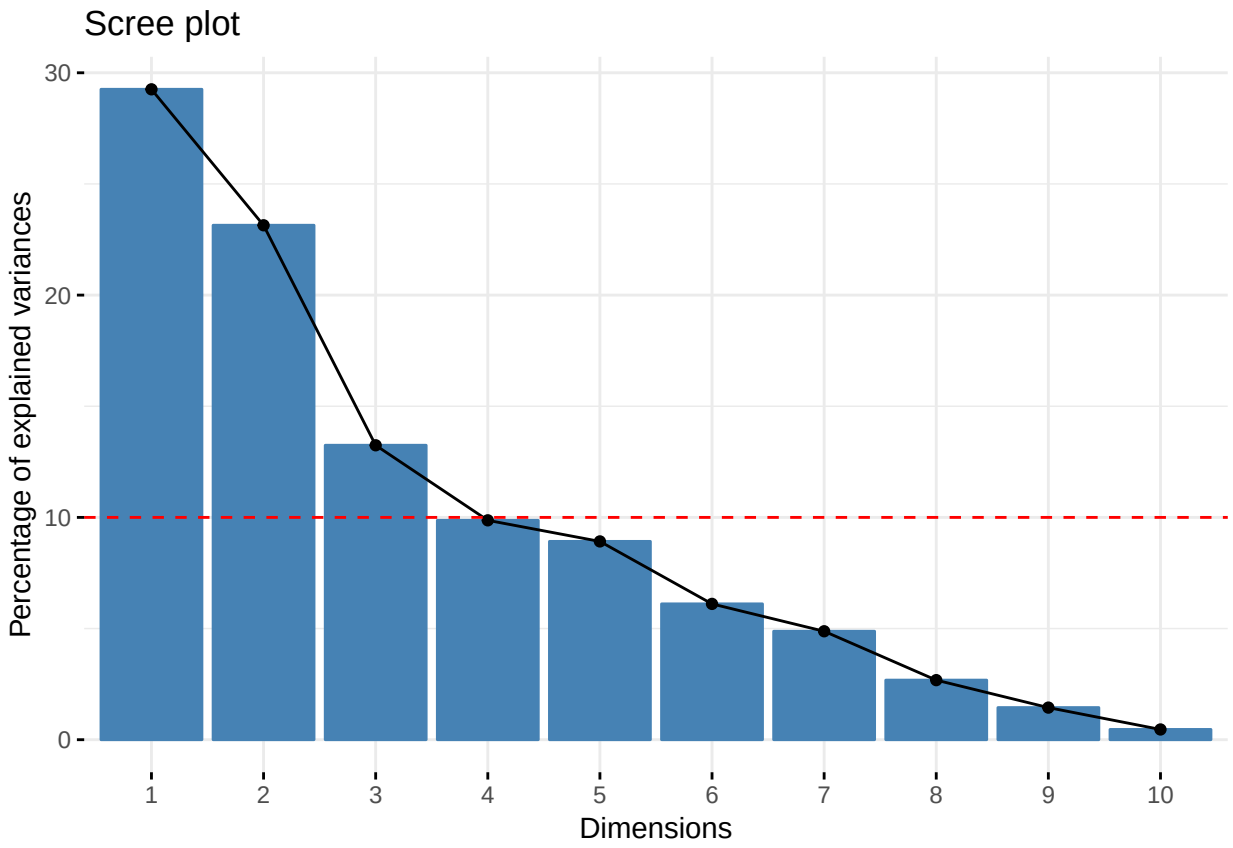
```
## inercie moyenne (Critère de Kaiser)

# code
## les commandes sont équivalents
sum(mydata.mca$eig[,2]>(100/nrow(mydata.mca$eig)), na.rm=TRUE)
```

```
## [1] 3
```

```
sum(mydata.mca$eig[,1]>(sum(mydata.mca$eig[,1])/nrow(mydata.mca$eig)), na.rm=TRUE)
```

```
## [1] 3
```

```
### graphiquement
fviz_screeplot (mydata.mca) +
  geom_hline (yintercept = 100/nrow(mydata.mca$eig), linetype = 2, color = "red")
```



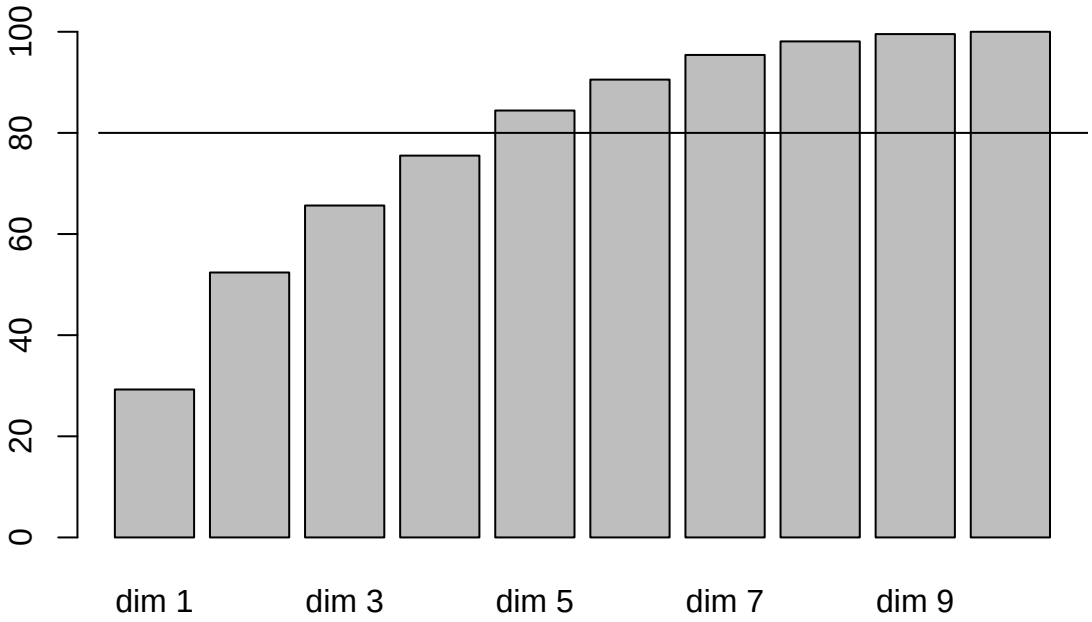

```
png("eig11.png", height=1000, width=1200, res=250, pointsize=8)
fviz_screeplot (mydata.mca) +
  geom_hline (yintercept = 100/nrow(mydata.mca$eig), linetype = 2, color = "red")

dev.off()
```

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

```
## inercie totale,

# code
which(mydata.mca$eig[,3]>80)[1]
```

```
## dim 5
##     5
```

```
##graphiquement
barplot(mydata.mca$eig[,3])
lines(c(0,20),c(80,80))
```




```
png("eig12.png", height=1000, width=1200, res=250, pointsize=8)
barplot(mydata.mca$eig[,3])
lines(c(0,20),c(80,80))
dev.off()
```

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

```
##Q2##

mydata.mca$var$contrib
```

```
##                    Dim 1        Dim 2       Dim 3       Dim 4
## Taille_1       12.553839 8.704555e+00  8.68815258  0.01578023
## Taille_2        4.535510 1.224454e+01 13.46697104  3.82791292
## Taille_3       13.322448 2.307632e-05  0.01105694  1.47720499
## Poids_1        14.010709 7.906445e+00  4.23412382  0.86334566
## Poids_2         1.922595 1.479251e+01  1.35478624  1.28604643
## Poids_3         5.829749 8.288840e+00 20.70679054  0.52172002
## Vélocité_1      1.582963 1.736933e+01  3.60747890  0.01978518
## Vélocité_2      3.637845 1.024184e+01  3.47591976  1.18138110
## Vélocité_3      9.762175 1.892912e+00 14.13634026  1.37597681
## Intelligence_1  1.101761 8.530147e+00  2.07170863  0.38972813
## Intelligence_2  3.299734 1.119923e+00 13.20977953  9.05229126
## Intelligence_3  1.578185 3.016142e+00 10.36832982 21.22170349
## Affection_1    10.750805 2.095476e+00  1.06659687  2.72454975
## Affection_2     9.982890 1.945799e+00  0.99041137  2.52993905
## Agressivité_1   2.950901 8.914721e-01  1.25741474 25.76534276
## Agressivité_2   3.177893 9.600469e-01  1.35413895 27.74729221
```

```
mydata.mca$var$cos2
```

```
##                     Dim 1        Dim 2        Dim 3        Dim 4
## Taille_1       0.49581192 2.719224e-01 0.1553354552 0.0002102282
## Taille_2       0.16284478 3.477347e-01 0.2188872152 0.0463603889
## Taille_3       0.87694667 1.201472e-06 0.0003294784 0.0327995000
```

```
## Poids_1        0.58247448 2.599896e-01 0.0796861975 0.0121070633
## Poids_2        0.11681934 7.109302e-01 0.0372649528 0.0263585186
## Poids_3        0.20931365 2.353962e-01 0.3365605898 0.0063186241
## Vélocité_1     0.07355161 6.383552e-01 0.0758801234 0.0003100978
## Vélocité_2     0.15123804 3.367850e-01 0.0654167993 0.0165670095
## Vélocité_3     0.42839511 6.570317e-02 0.2808262078 0.0203679027
## Intelligence_1 0.04580407 2.804990e-01 0.0389895501 0.0054653233
## Intelligence_2 0.17376329 4.664716e-02 0.3149034805 0.1607958967
## Intelligence_3 0.06233016 9.422151e-02 0.1853753391 0.2827209221
## Affection_1    0.60657339 9.351538e-02 0.0272424033 0.0518530622
## Affection_2    0.60657339 9.351538e-02 0.0272424033 0.0518530622
## Agressivité_1  0.17930056 4.284427e-02 0.0345866377 0.5280806741
## Agressivité_2  0.17930056 4.284427e-02 0.0345866377 0.5280806741
```

```
mydata.mca$var$coord
```

```
##                    Dim 1         Dim 2       Dim 3      Dim 4
## Taille_1        1.1902124  0.8814312493 -0.66619486  0.0245082
## Taille_2        0.8464733 -1.2369449391  0.98137849  0.4516478
## Taille_3       -0.8375902  0.0009803967 -0.01623523 -0.1619864
## Poids_1         1.1761704  0.7857960033 -0.43503416  0.1695709
## Poids_2        -0.3293556 -0.8124958119 -0.18601927 -0.1564473
## Poids_3        -0.9596770  1.0177146680  1.21690862  0.1667392
## Vélocité_1      0.3536067  1.0417311970  0.35916042  0.0229601
## Vélocité_2      0.5993249 -0.8943513681  0.39416354  0.1983599
## Vélocité_3     -0.9256296 -0.3625001139 -0.74943473 -0.2018311
## Intelligence_1 -0.3298252  0.8162016046 -0.30430278 -0.1139304
## Intelligence_2  0.4660516 -0.2414724706  0.62739888 -0.4483245
## Intelligence_3 -0.4220026 -0.5188490270 -0.72776633  0.8987625
## Affection_1    -0.8082282  0.3173466033  0.17128331 -0.2363086
## Affection_2     0.7504976 -0.2946789888 -0.15904879  0.2194294
## Agressivité_1   0.4080360 -0.1994591783 -0.17920983 -0.7002575
## Agressivité_2  -0.4394234  0.2148021920  0.19299520  0.7541235
```

```
mydata.mca$var$v.test
```

```
##                     Dim 1        Dim 2       Dim 3       Dim 4
## Taille_1         3.590419  2.658943687 -2.00965714  0.07393195
## Taille_2         2.057660 -3.006842664  2.38559586  1.09789349
## Taille_3        -4.774999  0.005589121 -0.09255506 -0.92346467
## Poids_1          3.891572  2.599948123 -1.43938915  0.56105583
## Poids_2         -1.742786 -4.299323719 -0.98432148 -0.82784146
## Poids_3         -2.332843  2.473924090  2.95813714  0.40531991
## Vélocité_1       1.382874  4.073970535  1.40459361  0.08979167
## Vélocité_2       1.982975 -2.959123171  1.30416133  0.65630957
## Vélocité_3      -3.337405 -1.307012748 -2.70212535 -0.72771249
## Intelligence_1 -1.091286  2.700550551 -1.00684075 -0.37695942
## Intelligence_2  2.125522 -1.101283907  2.86137912 -2.04467438
## Intelligence_3 -1.273022 -1.565170677 -2.19539491  2.71122555
## Affection_1     -3.971260  1.559294642  0.84160708 -1.16111137
## Affection_2      3.971260 -1.559294642 -0.84160708  1.16111137
## Agressivité_1    2.159124 -1.055438765 -0.94828929 -3.70541462
## Agressivité_2   -2.159124  1.055438765  0.94828929  3.70541462
```

```
write.xlsx(mydata.mca$var$contrib,file="TP3.xlsx",sheetName="var_contrib",append=T)
write.xlsx(mydata.mca$var$cos2,file="TP3.xlsx",sheetName="var_cos2",append=T)
```

```r
write.xlsx(mydata.mca$var$coord,file="TP3.xlsx",sheetName="var_coord",append=T)
write.xlsx(mydata.mca$var$v.test,file="TP3.xlsx",sheetName="var_vtest",append=T)

sign(mydata.mca$var$coord)
```

```
##                Dim 1 Dim 2 Dim 3 Dim 4
## Taille_1           1     1    -1     1
## Taille_2           1    -1     1     1
## Taille_3          -1     1    -1    -1
## Poids_1            1     1    -1     1
## Poids_2           -1    -1    -1    -1
## Poids_3           -1     1     1     1
## Vélocité_1         1     1     1     1
## Vélocité_2         1    -1     1     1
## Vélocité_3        -1    -1    -1    -1
## Intelligence_1    -1     1    -1    -1
## Intelligence_2     1    -1     1    -1
## Intelligence_3    -1    -1    -1     1
## Affection_1       -1     1     1    -1
## Affection_2        1    -1    -1     1
## Agressivité_1      1    -1    -1    -1
## Agressivité_2     -1     1     1     1
```

```r
#Q 3
Taille=colSums(mydata.mca$var$contrib[1:3,])
Poid=colSums(mydata.mca$var$contrib[4:6,])
Velocité=colSums(mydata.mca$var$contrib[7:9,])
Intellegence=colSums(mydata.mca$var$contrib[10:12,])
Affection=colSums(mydata.mca$var$contrib[12:14,])
Agressivité=colSums(mydata.mca$var$contrib[14:16,])
tab=rbind(Taille,Poid,Velocité,Intellegence,Affection,Agressivité)
tab
```

```
##                   Dim 1     Dim 2     Dim 3     Dim 4
## Taille       30.411797 20.949116 22.166181  5.320898
## Poid         21.763052 30.987798 26.295701  2.671112
## Velocité     14.982983 29.504080 21.219739  2.577143
## Intellegence  5.979679 12.666212 25.649818 30.663723
## Affection    22.311880  7.057417 12.425338 26.476192
## Agressivité  16.111684  3.797318  3.601965 56.042574
```

```r
write.xlsx(tab,file="TP3.xlsx",sheetName="var",append=T)
```

```r
# 4
mydata.mca$ind$contrib
```

```
##            Dim 1       Dim 2       Dim 3       Dim 4
## BEAU 2.10111844  2.17369113  5.71765657  6.95239166
## BASS 0.56486551 11.38631564  0.98243645  1.46630641
## B.AL 2.10111844  2.17369113  5.71765657  6.95239166
## BOXE 1.55161864  7.37413469  7.23383138  3.94745005
## BULD 8.16803372  2.69348375  0.43318803  1.92862044
## BULM 4.19439182  2.97447169  3.02225475  7.93336291
## CANI 5.93132626  0.03987790  6.63864170  2.49757571
## CHIH 5.44955505  6.35455623  4.04841413  0.54260890
## COCK 4.30303195  0.05013761  5.18408763  5.20091611
```

```
## COLL 0.09477557  2.52234098  0.92694388  7.98979010
## DAL  3.25124622  9.36400725  4.61695759  0.72162030
## DOBE 6.12510519  0.93187754  3.65246368  3.05539455
## DA.L 8.00267820  2.77932193  0.55185326  0.16265782
## E.BR 1.48580379 10.82905948  0.03220594  3.15977886
## E.FR 0.10894759  2.31498957  1.39016885  8.61392102
## FX.H 5.82864293  0.02102208  1.67906747  0.05151197
## FX.T 6.06211255  0.14101775  0.00441401  3.20271975
## GBLG 1.99121023  0.08840951  0.13397424  0.30634135
## LABR 3.25124622  9.36400725  4.61695759  0.72162030
## LEVR 3.44762033  0.03981654  3.37330515  9.38358594
## MAST 3.94969799  8.03718894  5.54045425  0.70844447
## PEKI 5.44955505  6.35455623  4.04841413  0.54260890
## POIN 3.67647489  1.71575624  6.01235105  1.18446820
## ST-B 2.14281499  3.82340445 13.74714214  0.03593434
## SETT 1.77749654  1.16463313  0.23305630 13.80413634
## TECK 8.16803372  2.69348375  0.43318803  1.92862044
## T.NE 0.82147815  2.59474760 10.02891524  7.00522151
```

```
mydata.mca$ind$cos2
```

```
##           Dim 1       Dim 2        Dim 3        Dim 4
## BEAU 0.19318200 0.158078170 0.2379780727 0.2156193132
## BASS 0.03893080 0.620711031 0.0306517673 0.0340886922
## B.AL 0.19318200 0.158078170 0.2379780727 0.2156193132
## BOXE 0.11183606 0.420403058 0.2360304269 0.0959733835
## BULD 0.64266568 0.167625423 0.0154293198 0.0511860542
## BULM 0.27815801 0.156023623 0.0907311457 0.1774668333
## CANI 0.38024293 0.002022086 0.1926598936 0.0540088961
## CHIH 0.38556757 0.355617092 0.1296663063 0.0129498182
## COCK 0.28975347 0.002670396 0.1580262244 0.1181329992
## COLL 0.01095173 0.230541033 0.0484889401 0.3114290851
## DAL  0.23755593 0.541172466 0.1527125209 0.0177853352
## DOBE 0.55359781 0.066618921 0.1494408973 0.0931505474
## DA.L 0.53895247 0.148051191 0.0168244731 0.0036951098
## E.BR 0.09451162 0.544844311 0.0009273902 0.0677981326
## E.FR 0.01169406 0.196541690 0.0675488576 0.3118788278
## FX.H 0.55756256 0.001590595 0.0727104867 0.0016621553
## FX.T 0.44081779 0.008110859 0.0001453019 0.0785581701
## GBLG 0.18220281 0.006398746 0.0055496040 0.0094554212
## LABR 0.23755593 0.541172466 0.1527125209 0.0177853352
## LEVR 0.33582962 0.003067758 0.1487503335 0.3083228462
## MAST 0.27298068 0.439369729 0.1733469229 0.0165162378
## PEKI 0.38556757 0.355617092 0.1296663063 0.0129498182
## POIN 0.33802415 0.124775596 0.2502437311 0.0367347283
## ST-B 0.16426904 0.231835114 0.4770745045 0.0009292189
## SETT 0.20103461 0.104185949 0.0119323415 0.5266336570
## TECK 0.64266568 0.167625423 0.0154293198 0.0511860542
## T.NE 0.06389477 0.159632893 0.3531230245 0.1837928020
```

```
mydata.mca$ind$coord
```

```
##           Dim 1       Dim 2       Dim 3       Dim 4
## BEAU -0.5259384 -0.47575949 -0.58374071  0.55564235
## BASS  0.2726981  1.08888034 -0.24197092  0.25517645
```

```
## B.AL -0.5259384 -0.47575949 -0.58374071  0.55564235
## BOXE  0.4519622 -0.87628238  0.65659133  0.41868418
## BULD  1.0369751  0.52959725 -0.16067532 -0.29265208
## BULM -0.7430945  0.55653626  0.42440108  0.59354942
## CANI  0.8836606 -0.06443988 -0.62899988  0.33303322
## CHIH  0.8470130  0.81345055 -0.49119441 -0.15522858
## COCK  0.7526566  0.07225541  0.55583657  0.48058272
## COLL -0.1117012 -0.51249596 -0.23503778 -0.59565654
## DAL   0.6542361 -0.98745978  0.52455242 -0.17901219
## DOBE -0.8979794 -0.31150711 -0.46655613  0.36835102
## DA.L -1.0264251  0.53796989  0.18135217  0.08498958
## E.BR  0.4422729 -1.06190072  0.04381058  0.37459034
## E.FR -0.1197618 -0.49097917  0.28783575 -0.61848428
## FX.H -0.8759782  0.04678712 -0.31633338 -0.04782801
## FX.T  0.8933499  0.12117846 -0.01621913  0.37712706
## GBLG -0.5119978 -0.09594847  0.08935556  0.11663557
## LABR  0.6542361 -0.98745978  0.52455242 -0.17901219
## LEVR -0.6737043 -0.06439028 -0.44837229 -0.64552437
## MAST -0.7210934  0.91483050  0.57462384  0.17737039
## PEKI  0.8470130  0.81345055 -0.49119441 -0.15522858
## POIN -0.6957054 -0.42268452 -0.59859504 -0.22934534
## ST-B -0.5311313  0.63097720  0.90514293  0.03994690
## SETT -0.4837422 -0.34824358 -0.11785320 -0.78294787
## TECK  1.0369751  0.52959725 -0.16067532 -0.29265208
## T.NE -0.3288574  0.51979980  0.77310402 -0.55774946
```

```
sign(mydata.mca$ind$coord)
```

```
##      Dim 1 Dim 2 Dim 3 Dim 4
## BEAU    -1    -1    -1     1
## BASS     1     1    -1     1
## B.AL    -1    -1    -1     1
## BOXE     1    -1     1     1
## BULD     1     1    -1    -1
## BULM    -1     1     1     1
## CANI     1    -1    -1     1
## CHIH     1     1    -1    -1
## COCK     1     1     1     1
## COLL    -1    -1    -1    -1
## DAL      1    -1     1    -1
## DOBE    -1    -1    -1     1
## DA.L    -1     1     1     1
## E.BR     1    -1     1     1
## E.FR    -1    -1     1    -1
## FX.H    -1     1    -1    -1
## FX.T     1     1    -1     1
## GBLG    -1    -1     1     1
## LABR     1    -1     1    -1
## LEVR    -1    -1    -1    -1
## MAST    -1     1     1     1
## PEKI     1     1    -1    -1
## POIN    -1    -1    -1    -1
## ST-B    -1     1     1     1
## SETT    -1    -1    -1    -1
## TECK     1     1    -1    -1
```

```
## T.NE    -1     1     1    -1
```

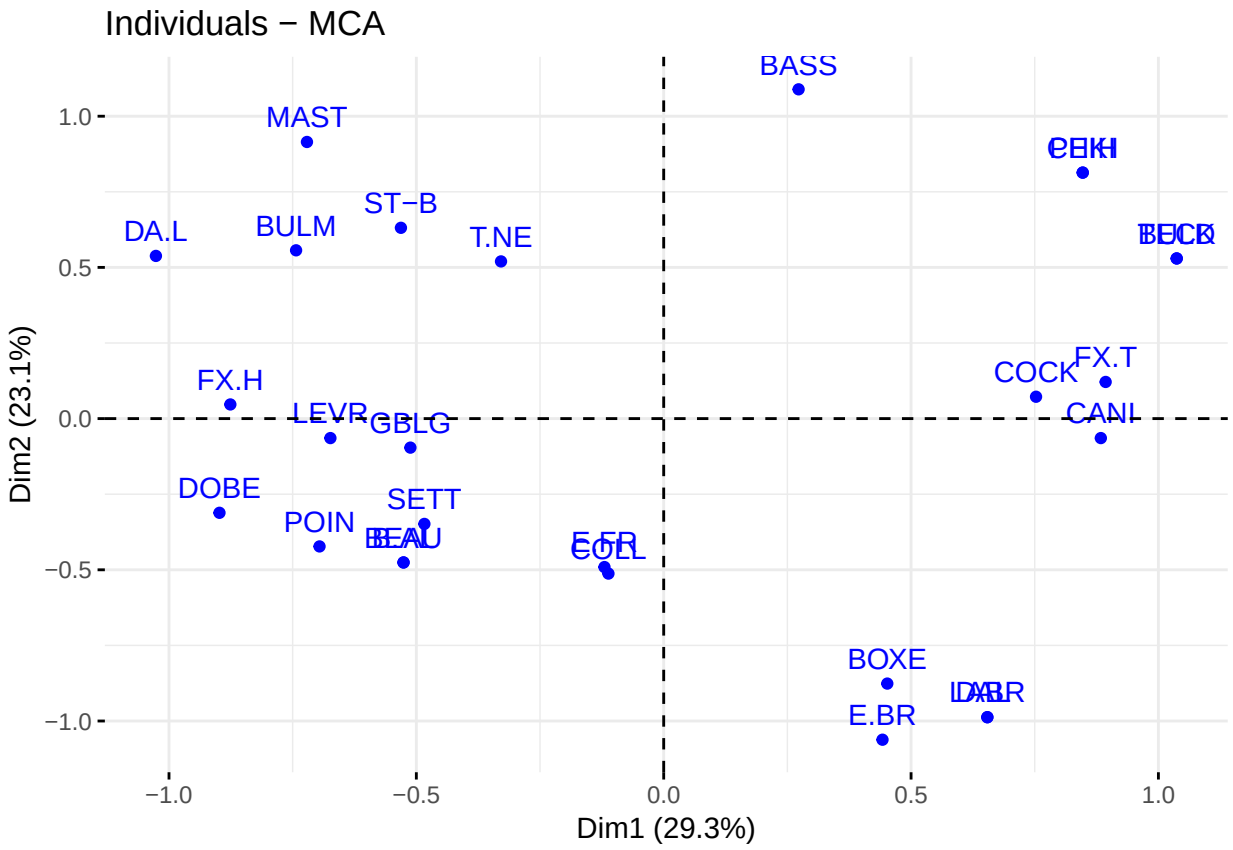
```
write.xlsx(mydata.mca$ind,file="TP3.xlsx",sheetName="ind",append=T)
```

```
###5
mydata.mca$quali.sup
```

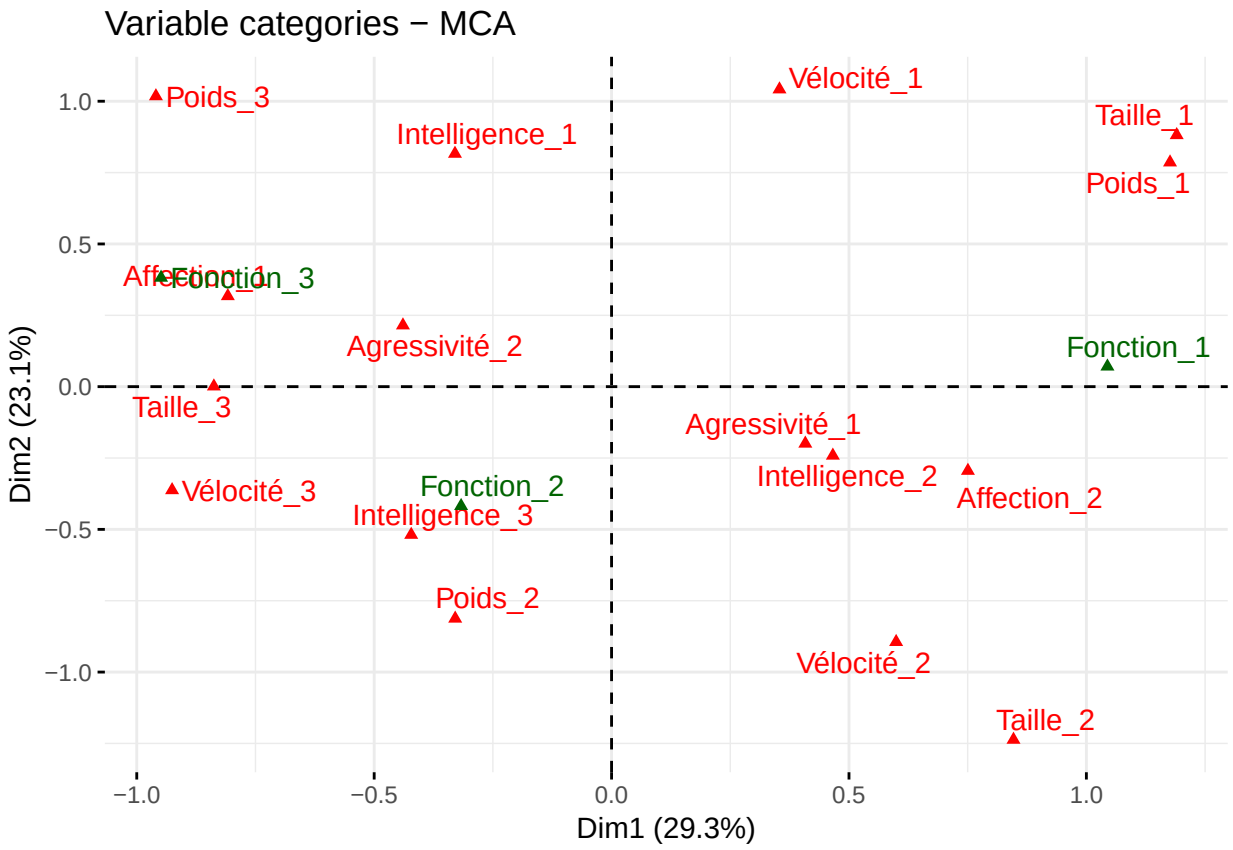
```
## $coord
##                 Dim 1       Dim 2       Dim 3       Dim 4
## Fonction_1  1.0443049  0.07066607 -0.09514675 -0.01504194
## Fonction_2 -0.3169202 -0.41793846 -0.18389428 -0.48130299
## Fonction_3 -0.9488459  0.38184818  0.32581450  0.56026829
##
## $cos2
##                 Dim 1       Dim 2       Dim 3        Dim 4
## Fonction_1 0.64151341 0.002937466 0.005325237 0.0001330941
## Fonction_2 0.05021921 0.087336276 0.016908553 0.1158262858
## Fonction_3 0.37907730 0.061392855 0.044696878 0.1321686561
##
## $v.test
##                Dim 1      Dim 2      Dim 3       Dim 4
## Fonction_1  4.084036  0.2763587 -0.3720970 -0.05882555
## Fonction_2 -1.142672 -1.5068985 -0.6630403 -1.73536262
## Fonction_3 -3.139428  1.2634137  1.0780162  1.85374892
##
## $eta2
##              Dim 1     Dim 2      Dim 3     Dim 4
## Fonction 0.7041534 0.1032761 0.04607865 0.1703089
```

```
write.xlsx(mydata.mca$quali.sup,file="TP3.xlsx",sheetName="quali.sup",append=T)
```

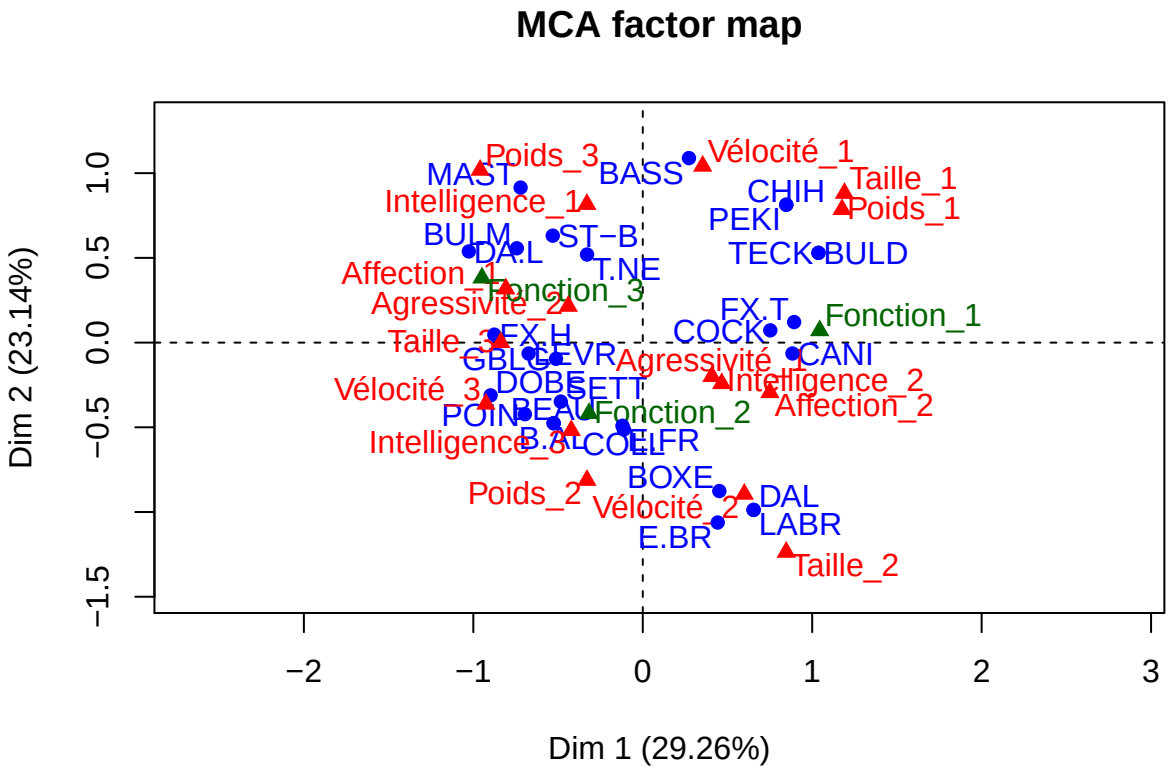
```
##6
fviz_mca_ind(mydata.mca,)
```




```
fviz_mca_var(mydata.mca, repel = TRUE)
```




```
plot(mydata.mca)
```



```r
png("plot1.png", height=800, width=800, res=250, pointsize=8)

fviz_mca_ind(mydata.mca,)
dev.off()
```

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

```r
png("plot2.png", height=800, width=800, res=250, pointsize=8)

fviz_mca_var(mydata.mca, repel = TRUE)
dev.off()
```

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

```r
png("plot3.png", height=800, width=800, res=250, pointsize=8)

plot(mydata.mca)
dev.off()
```

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