

Analyse des Correspondances Multiples (ACM) avec FactoMineR sur les données du cours (Loisirs)

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Script et sorties R de la vidéo du cours sur les données des loisirs des Français.

Chargement de FactoMineR

```
library(FactoMineR)
```

Importation du jeu de données depuis le site

```
loisirs <- read.table("AnaDo_JeuDonnees_Loisirs.csv",  
                      header=TRUE, sep=";", fileEncoding="latin1")
```

```
summary(loisirs)
```

```
## Lecture Ecouter.musique Cinéma Spectacle Exposition Ordinateur  
## N:2757 N:2456 N:5044 N:5978 N:5808 N:5245  
## 0:5646 0:5947 0:3359 0:2425 0:2595 0:3158  
##  
##  
##  
##  
## Sport Marche Voyage Jouer.musique Collection Activité.bénévole  
## N:5308 N:4228 N:5040 N:6943 N:7541 N:7118  
## 0:3095 0:4175 0:3363 0:1460 0: 862 0:1285  
##  
##  
##  
##  
## Bricolage Jardinage Tricot Cuisine Pêche TV Sexe  
## N:4864 N:5047 N:6990 N:4717 N:7458 Min. :0.000 F:4616  
## 0:3539 0:3356 0:1413 0:3686 0: 945 1st Qu.:1.000 M:3787  
## Median :2.000  
## Mean :2.355  
## 3rd Qu.:4.000  
## Max. :4.000  
##  
## Age Situation.matrimoniale Profession  
## (45,55]:1837 Divorcé: 792 employé :2552  
## (35,45]:1646 Marié :4333 ouvrier :1161
```

```
## (25,35]:1302   remarié: 404           cadre           :1052
## (55,65]:1257   Seul      :2140        manoeuvre        : 792
## (65,75]: 937   Veuf      : 734        agent de maîtrise: 735
## [15,25]: 857           (Other)       : 613
## (Other): 567           NA's          :1498
## Nb.activités
## Min.      : 0.000
## 1st Qu.: 4.000
## Median : 7.000
## Mean      : 6.866
## 3rd Qu.: 9.000
## Max.      :16.000
##
```

Transformation de la variable TV en facteur

```
loisirs[, "TV"] = as.factor(loisirs[, "TV"])
```

L'ACM

```
res.mca <- MCA(loisirs,quali.sup=19:22,quanti.sup=23,graph=FALSE)
```

Résumé des résultats sur les 2 premières composantes

```
summary(res.mca, ncp=2)
```

```
##
## Call:
## MCA(X = loisirs, quanti.sup = 23, quali.sup = 19:22, graph = FALSE)
##
##
## Eigenvalues
##           Dim.1   Dim.2   Dim.3   Dim.4   Dim.5   Dim.6
## Variance      0.198   0.081   0.072   0.063   0.058   0.056
## % of var.     16.947   6.913   6.173   5.389   5.011   4.784
## Cumulative % of var. 16.947  23.859  30.033  35.422  40.433  45.217
##           Dim.7   Dim.8   Dim.9   Dim.10  Dim.11  Dim.12
## Variance      0.056   0.053   0.053   0.049   0.046   0.045
## % of var.      4.759   4.569   4.547   4.211   3.985   3.864
## Cumulative % of var. 49.976  54.545  59.092  63.303  67.288  71.152
##           Dim.13  Dim.14  Dim.15  Dim.16  Dim.17  Dim.18
## Variance      0.044   0.043   0.041   0.038   0.037   0.036
## % of var.      3.730   3.717   3.497   3.256   3.200   3.105
## Cumulative % of var. 74.881  78.598  82.095  85.351  88.551  91.655
##           Dim.19  Dim.20  Dim.21
```

```

## Variance          0.035  0.032  0.030
## % of var.        2.997  2.772  2.575
## Cumulative % of var. 94.652 97.425 100.000
##
## Individuals (the 10 first)
##          Dim.1    ctr    cos2    Dim.2    ctr    cos2
## 1          |  0.667  0.027  0.336 | -0.191  0.005  0.027 |
## 2          |  0.140  0.001  0.011 |  0.434  0.028  0.108 |
## 3          | -0.155  0.001  0.032 | -0.244  0.009  0.079 |
## 4          | -0.108  0.001  0.011 | -0.285  0.012  0.073 |
## 5          | -0.022  0.000  0.001 | -0.268  0.011  0.087 |
## 6          | -0.636  0.024  0.449 |  0.019  0.000  0.000 |
## 7          | -0.206  0.003  0.046 | -0.239  0.008  0.063 |
## 8          |  0.284  0.005  0.065 | -0.611  0.055  0.304 |
## 9          |  0.598  0.021  0.261 | -0.577  0.049  0.243 |
## 10         |  0.204  0.003  0.033 | -0.015  0.000  0.000 |
##
## Categories (the 10 first)
##          Dim.1    ctr    cos2  v.test    Dim.2    ctr
## Lecture_N    | -0.699  4.503  0.239 -44.766 | -0.051  0.058
## Lecture_O    |  0.341  2.199  0.239  44.766 |  0.025  0.028
## Ecouter.musique_N | -0.817  5.478  0.275 -48.111 |  0.241  1.170
## Ecouter.musique_O |  0.337  2.262  0.275  48.111 | -0.100  0.483
## Cinéma_N     | -0.509  4.369  0.389 -57.170 |  0.287  3.398
## Cinéma_O     |  0.764  6.561  0.389  57.170 | -0.430  5.103
## Spectacle_N  | -0.394  3.109  0.383 -56.753 |  0.109  0.586
## Spectacle_O  |  0.972  7.663  0.383  56.753 | -0.270  1.444
## Exposition_N | -0.422  3.461  0.399 -57.885 | -0.005  0.001
## Exposition_O |  0.945  7.745  0.399  57.885 |  0.012  0.003
##
##          cos2  v.test
## Lecture_N    0.001 -3.255 |
## Lecture_O    0.001  3.255 |
## Ecouter.musique_N 0.024 14.202 |
## Ecouter.musique_O 0.024 -14.202 |
## Cinéma_N     0.123 32.200 |
## Cinéma_O     0.123 -32.200 |
## Spectacle_N  0.029 15.735 |
## Spectacle_O  0.029 -15.735 |
## Exposition_N  0.000 -0.748 |
## Exposition_O  0.000  0.748 |
##
## Categorical variables (eta2)
##          Dim.1 Dim.2
## Lecture    | 0.239 0.001 |
## Ecouter.musique | 0.275 0.024 |
## Cinéma     | 0.389 0.123 |
## Spectacle  | 0.383 0.029 |
## Exposition | 0.399 0.000 |
## Ordinateur | 0.327 0.058 |
## Sport      | 0.287 0.053 |
## Marche     | 0.172 0.107 |
## Voyage     | 0.355 0.000 |
## Jouer.musique | 0.209 0.005 |
##

```

```
## Supplementary categories (the 10 first)
##           Dim.1   cos2 v.test   Dim.2   cos2 v.test
## F          |  0.018 0.000  1.779 |  0.042 0.002  4.253 |
## M          | -0.021 0.000 -1.779 | -0.051 0.002 -4.253 |
## (25,35]    |  0.267 0.013 10.495 | -0.315 0.018 -12.358 |
## (35,45]    |  0.201 0.010  9.092 | -0.020 0.000 -0.916 |
## (45,55]    |  0.022 0.000  1.064 |  0.213 0.013 10.309 |
## (55,65]    | -0.153 0.004 -5.885 |  0.380 0.025 14.599 |
## (65,75]    | -0.447 0.025 -14.526 |  0.301 0.011  9.789 |
## (75,85]    | -0.701 0.030 -15.862 |  0.101 0.001  2.276 |
## (85,100]   | -1.015 0.011 -9.400 | -0.214 0.000 -1.986 |
## [15,25]    |  0.370 0.016 11.416 | -0.860 0.084 -26.580 |
##
## Supplementary categorical variables (eta2)
##           Dim.1 Dim.2
## Sexe          | 0.000 0.002 |
## Age           | 0.097 0.134 |
## Situation.matrimoniale | 0.046 0.099 |
## Profession     | 0.128 0.017 |
##
## Supplementary continuous variable
##           Dim.1 Dim.2
## Nb.activités  | 0.975 | 0.198 |
```

Description des dimensions

```
dimdesc(res.mca)
```

```
## $`Dim 1`
## $`Dim 1`$quanti
##           correlation p.value
## Nb.activités  0.9753459      0
##
## $`Dim 1`$quali
##           R2      p.value
## Lecture      0.23851813 0.000000e+00
## Ecouter.musique 0.27548544 0.000000e+00
## Cinéma       0.38900068 0.000000e+00
## Spectacle    0.38335191 0.000000e+00
## Exposition   0.39878925 0.000000e+00
## Ordinateur   0.32739645 0.000000e+00
## Sport        0.28683998 0.000000e+00
## Marche       0.17212148 0.000000e+00
## Voyage       0.35491399 0.000000e+00
## Jouer.musique 0.20922813 0.000000e+00
## Bricolage    0.13493609 8.816716e-267
## Cuisine     0.12539365 9.423346e-247
## Profession   0.12836813 7.201742e-245
## Activité.bénévole 0.10877078 2.247113e-212
## Age          0.09747901 1.104310e-181
## TV           0.05192240 1.282203e-95
```

```

## Jardinage          0.04696289  7.138377e-90
## Situation.matrimoniale 0.04566170  1.135400e-83
## Collection         0.04356310  2.322542e-83
## Tricot             0.01143504  8.427145e-23
##
## $`Dim 1`$category
##               Estimate      p.value
## Jouer.musique_0    0.26839870  0.000000e+00
## Voyage_0          0.27033560  0.000000e+00
## Marche_0          0.18447699  0.000000e+00
## Sport_0           0.24685643  0.000000e+00
## Ordinateur_0      0.26265070  0.000000e+00
## Exposition_0      0.30388560  0.000000e+00
## Spectacle_0       0.30379833  0.000000e+00
## Cinéma_0          0.28307598  0.000000e+00
## Ecouter.musique_0 0.25657041  0.000000e+00
## Lecture_0         0.23125560  0.000000e+00
## Bricolage_0       0.16540452  8.816716e-267
## Cuisine_0         0.15865273  9.423346e-247
## Activité.bénévole_0 0.20372577  2.247113e-212
## cadre             0.29445799  4.929397e-132
## Jardinage_0       0.09837170  7.138377e-90
## Collection_0      0.15293668  2.322542e-83
## Seul             0.15105015  1.207987e-54
## [15,25]          0.24528149  2.108266e-30
## (25,35]          0.19984888  6.389909e-26
## agent de maîtrise 0.14904669  2.149018e-25
## 1                0.13159677  3.341439e-25
## 2                0.09449946  1.114616e-24
## Tricot_0         0.06356668  8.427145e-23
## (35,45]          0.17031375  7.998317e-20
## (55,65]          0.01289136  3.849963e-09
## technicien       0.05991778  6.892575e-04
## Profession.NA    -0.05116908  3.088722e-04
## Marié            -0.00169137  1.912935e-07
## 4                -0.05681694  9.650520e-17
## (85,100]         -0.37013968  4.325646e-21
## Tricot_N         -0.06356668  8.427145e-23
## ouvrier          -0.18364686  2.978737e-45
## Veuf             -0.20369965  7.479622e-48
## (65,75]          -0.11794860  2.179375e-48
## 0                -0.19424004  7.701514e-56
## (75,85]          -0.23095998  1.734900e-57
## manoeuvre        -0.27848868  1.030645e-70
## Collection_N     -0.15293668  2.322542e-83
## Jardinage_N      -0.09837170  7.138377e-90
## Activité.bénévole_N -0.20372577  2.247113e-212
## Cuisine_N        -0.15865273  9.423346e-247
## Bricolage_N      -0.16540452  8.816716e-267
## Jouer.musique_N  -0.26839870  0.000000e+00
## Voyage_N         -0.27033560  0.000000e+00
## Marche_N         -0.18447699  0.000000e+00
## Sport_N          -0.24685643  0.000000e+00
## Ordinateur_N     -0.26265070  0.000000e+00

```

```

## Exposition_N      -0.30388560  0.000000e+00
## Spectacle_N       -0.30379833  0.000000e+00
## Cinéma_N          -0.28307598  0.000000e+00
## Ecouter.musique_N -0.25657041  0.000000e+00
## Lecture_N         -0.23125560  0.000000e+00
##
##
## $`Dim 2`
## $`Dim 2`$quanti
##               correlation      p.value
## Nb.activités    0.1980007 4.826398e-75
##
## $`Dim 2`$quali
##               R2      p.value
## Jardinage      0.453046316 0.000000e+00
## Tricot         0.166169732 0.000000e+00
## Bricolage      0.140401965 2.363989e-278
## Cuisine        0.135420874 8.354586e-268
## Age            0.133583530 9.125004e-256
## Cinéma         0.123401798 1.341384e-242
## Marche         0.106756626 2.977082e-208
## Situation.matrimoniale 0.098904206 5.042868e-188
## Pêche          0.084751244 8.323766e-164
## Ordinateur     0.058202284 1.463850e-111
## Sport          0.053442000 2.406308e-102
## TV             0.034425908 1.895739e-62
## Spectacle      0.029467916 1.375541e-56
## Collection     0.025914681 6.803897e-50
## Ecouter.musique 0.024006349 2.627936e-46
## Profession     0.017395750 1.450270e-28
## Activité.bénévole 0.009426749 4.666146e-19
## Jouer.musique  0.005420573 1.407100e-11
## Sexe           0.002152884 2.090738e-05
## Lecture        0.001260776 1.132204e-03
##
## $`Dim 2`$category
##               Estimate      p.value
## Tricot_0       0.154764175 0.000000e+00
## Jardinage_0    0.195140682 0.000000e+00
## Bricolage_0    0.107759030 2.363989e-278
## Cuisine_0      0.105301934 8.354586e-268
## Cinéma_N       0.101829204 1.341384e-242
## Marche_0       0.092790996 2.977082e-208
## Pêche_0        0.130842880 8.323766e-164
## Ordinateur_N   0.070728647 1.463850e-111
## Sport_N        0.068053382 2.406308e-102
## Marié          0.058392178 7.920392e-93
## Spectacle_N    0.053795386 1.375541e-56
## Collection_0    0.075337113 6.803897e-50
## (55,65]        0.122588737 7.341769e-49
## Ecouter.musique_N 0.048373115 2.627936e-46
## 3              0.082847534 1.990737e-33
## (45,55]        0.075130020 4.614026e-25
## (65,75]        0.100358876 9.566953e-23

```

```

## Activité.bénévole_0 0.038304920 4.666146e-19
## ouvrier 0.062446063 2.315841e-16
## Jouer.musique_N 0.027591591 1.407100e-11
## Veuf 0.059301096 7.755244e-10
## 2 0.039534257 6.282529e-08
## F 0.013241401 2.090738e-05
## remarié 0.048925026 2.061549e-04
## manoeuvre 0.031284323 7.973605e-04
## Lecture_0 0.010738269 1.132204e-03
## (75,85] 0.043334701 2.283013e-02
## (85,100] -0.046130519 4.698967e-02
## Lecture_N -0.010738269 1.132204e-03
## 4 -0.007916798 2.354582e-04
## M -0.013241401 2.090738e-05
## 1 -0.027119018 3.688650e-07
## cadre -0.053914699 9.259268e-11
## Jouer.musique_0 -0.027591591 1.407100e-11
## Profession.NA -0.046307708 8.336614e-12
## Activité.bénévole_N -0.038304920 4.666146e-19
## 0 -0.087345976 2.743645e-32
## (25,35] -0.074668353 2.201473e-35
## Ecouter.musique_0 -0.048373115 2.627936e-46
## Collection_N -0.075337113 6.803897e-50
## Spectacle_0 -0.053795386 1.375541e-56
## Sport_0 -0.068053382 2.406308e-102
## Ordinateur_0 -0.070728647 1.463850e-111
## [15,25] -0.229609518 1.782463e-162
## Pêche_N -0.130842880 8.323766e-164
## Seul -0.150611195 6.342662e-181
## Marche_N -0.092790996 2.977082e-208
## Cinéma_0 -0.101829204 1.341384e-242
## Cuisine_N -0.105301934 8.354586e-268
## Bricolage_N -0.107759030 2.363989e-278
## Tricot_N -0.154764175 0.000000e+00
## Jardinage_N -0.195140682 0.000000e+00
##
##
## $`Dim 3`
## $`Dim 3`$quali
##
## R2 p.value
## Bricolage 0.209469073 0.000000e+00
## Tricot 0.326760742 0.000000e+00
## Pêche 0.331040836 0.000000e+00
## Sexe 0.256598886 0.000000e+00
## Lecture 0.103546767 1.057035e-201
## TV 0.075506229 2.154507e-141
## Cuisine 0.068174772 5.148288e-131
## Sport 0.062202668 2.431680e-119
## Profession 0.062120420 4.080525e-112
## Ordinateur 0.041225998 6.762202e-79
## Age 0.037096503 1.135166e-64
## Jardinage 0.030314206 3.475006e-58
## Situation.matrimoniale 0.030381795 7.010460e-55
## Ecouter.musique 0.022109556 9.532570e-43

```

```

## Exposition          0.012834600  2.072824e-25
## Activité.bénévole   0.003760979  1.842666e-08
## Cinéma              0.003011654  4.812422e-07
## Spectacle           0.002498472  4.557774e-06
## Jouer.musique       0.002317306  1.011746e-05
## Marche              0.001577370  2.709621e-04
##
## $`Dim 3`$category
##              Estimate      p.value
## M              0.136610232  0.000000e+00
## Pêche_0        0.244371238  0.000000e+00
## Tricot_N       0.205088669  0.000000e+00
## Bricolage_0    0.124382502  0.000000e+00
## Lecture_N      0.091963576  1.057035e-201
## Cuisine_N      0.070605355  5.148288e-131
## Sport_0        0.069381729  2.431680e-119
## Ordinateur_0   0.056252675  6.762202e-79
## Jardinage_0    0.047701482  3.475006e-58
## Ecouter.musique_N 0.043869558  9.532570e-43
## ouvrier        0.074927886  2.425621e-41
## 2              0.051269543  9.688900e-39
## 0              0.074320988  7.695837e-29
## Exposition_N   0.032903764  2.072824e-25
## technicien     0.106451165  3.134871e-23
## 1              0.046966483  1.721087e-17
## [15,25]        0.089295409  2.250144e-13
## (35,45]        0.068211010  6.999672e-13
## Seul           0.054243734  1.428671e-10
## Activité.bénévole_0 0.022864214  1.842666e-08
## Cinéma_0       0.015033026  4.812422e-07
## cadre          0.014062563  1.621277e-06
## (25,35]        0.057570669  3.068950e-06
## Spectacle_N    0.014802663  4.557774e-06
## agent de maîtrise 0.018757669  9.818621e-06
## Jouer.musique_N 0.017048181  1.011746e-05
## Marié          0.034417811  1.547920e-05
## Marche_N       0.010658779  2.709621e-04
## Divorcé        -0.010341038  3.409293e-04
## Marche_0       -0.010658779  2.709621e-04
## (55,65]        -0.005079741  1.038252e-05
## Jouer.musique_0 -0.017048181  1.011746e-05
## (85,100]       -0.102325499  9.780901e-06
## Spectacle_0    -0.014802663  4.557774e-06
## Cinéma_N       -0.015033026  4.812422e-07
## Activité.bénévole_N -0.022864214  1.842666e-08
## 3              -0.065496551  2.227645e-20
## (75,85]        -0.085282226  7.049703e-21
## (65,75]        -0.054868462  1.460573e-22
## Exposition_0   -0.032903764  2.072824e-25
## Ecouter.musique_0 -0.043869558  9.532570e-43
## Veuf           -0.118694340  9.651417e-51
## Jardinage_N    -0.047701482  3.475006e-58
## employé        -0.103790767  1.329776e-75
## Ordinateur_N   -0.056252675  6.762202e-79

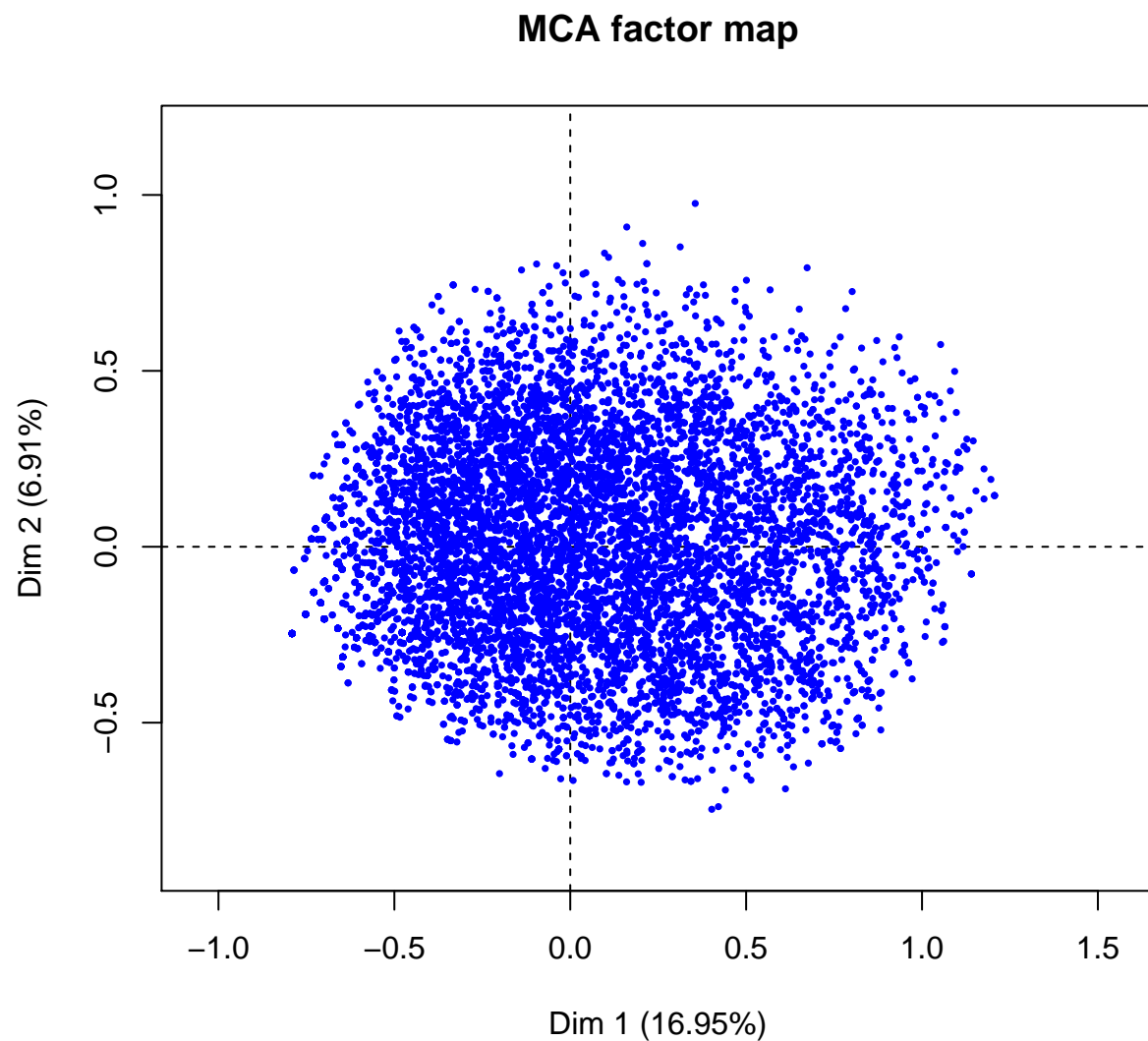
```



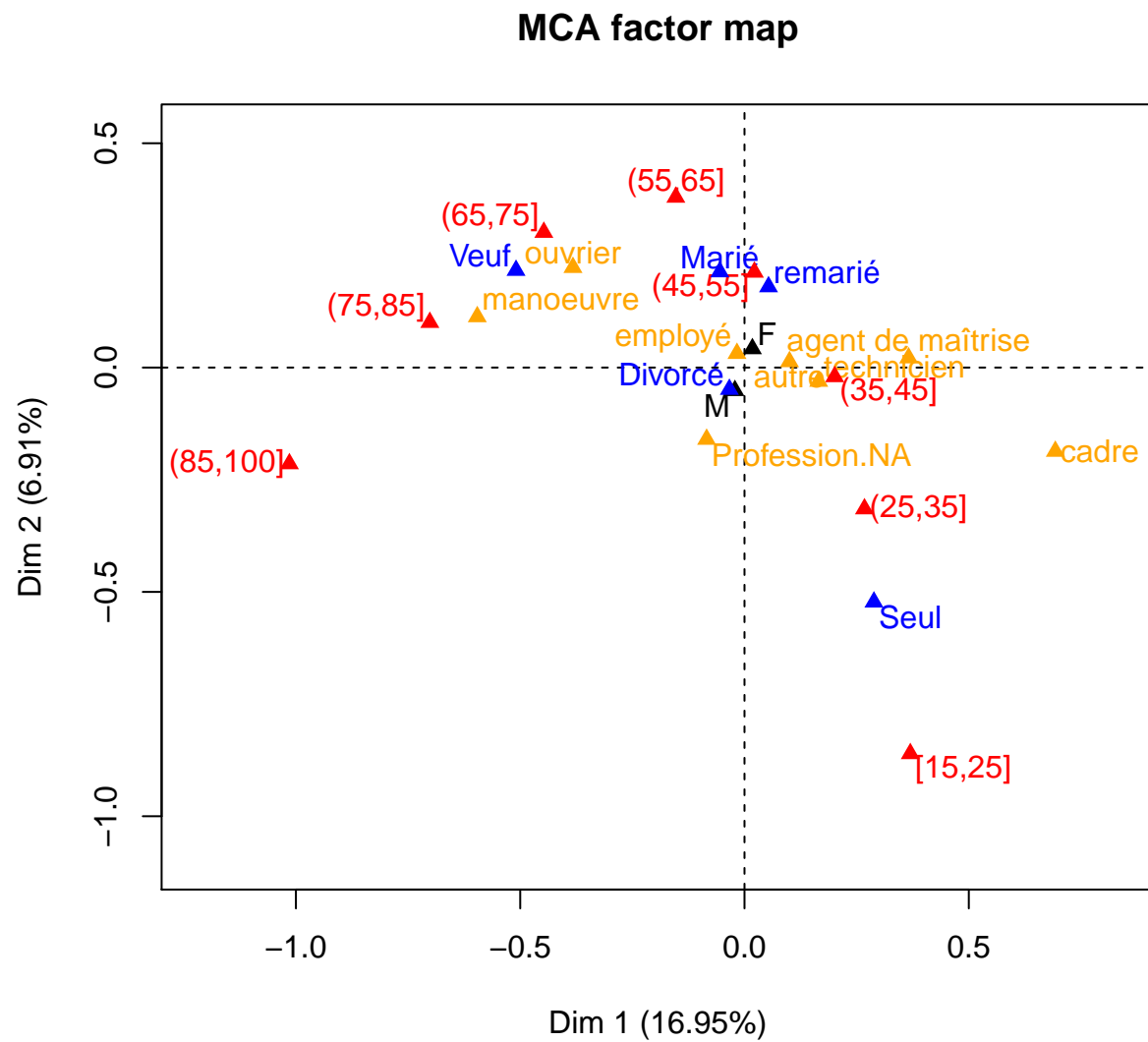
```
## 4 -0.107060462 1.674088e-84
## Sport_N -0.069381729 2.431680e-119
## Cuisine_0 -0.070605355 5.148288e-131
## Lecture_0 -0.091963576 1.057035e-201
## F -0.136610232 0.000000e+00
## Pêche_N -0.244371238 0.000000e+00
## Tricot_0 -0.205088669 0.000000e+00
## Bricolage_N -0.124382502 0.000000e+00
```

Construction des graphes

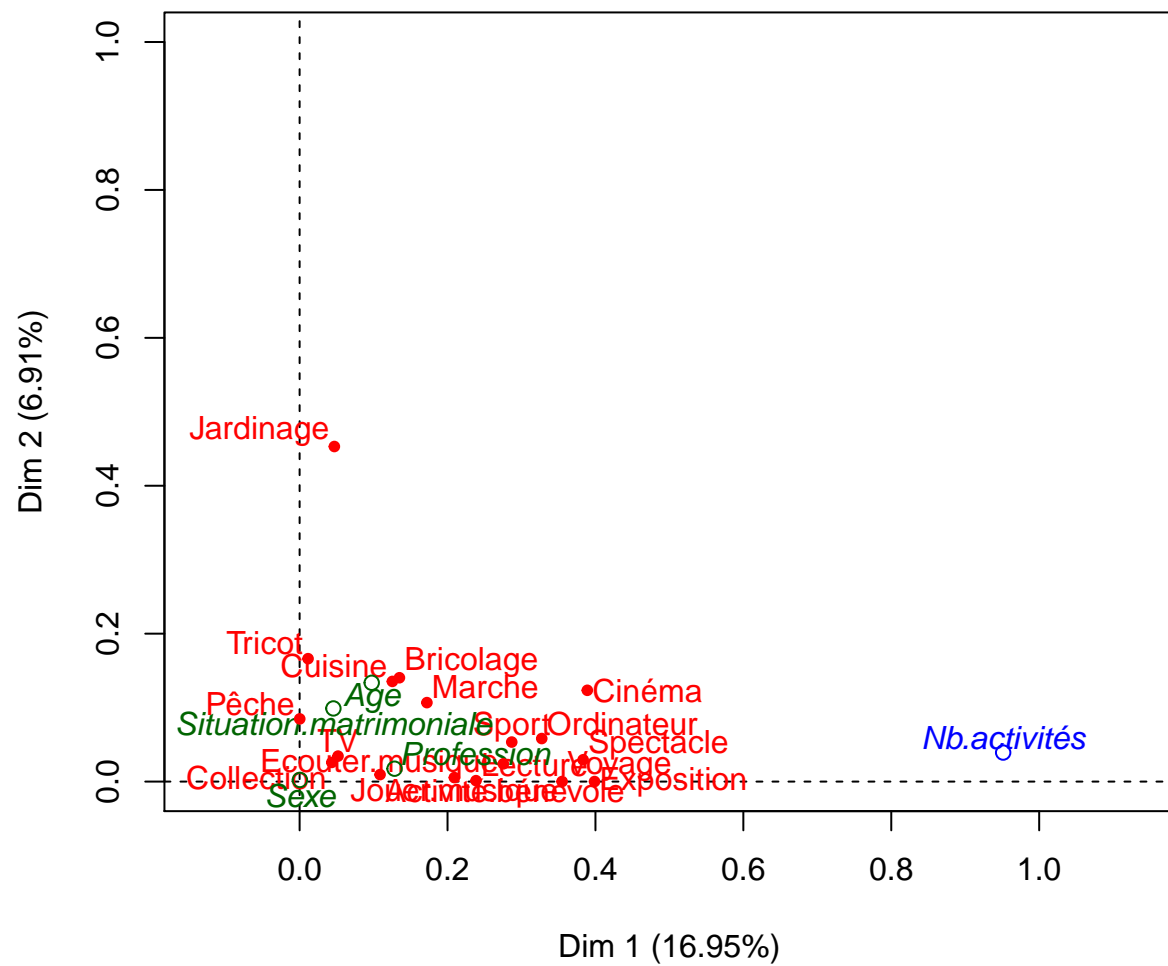
```
plot(res.mca,invisible=c("var","quali.sup"),cex=.5,label="none")
```



```
plot(res.mca,invisible=c("ind","var"),hab="quali", palette=palette(c("blue","orange","darkgreen","black"))
```

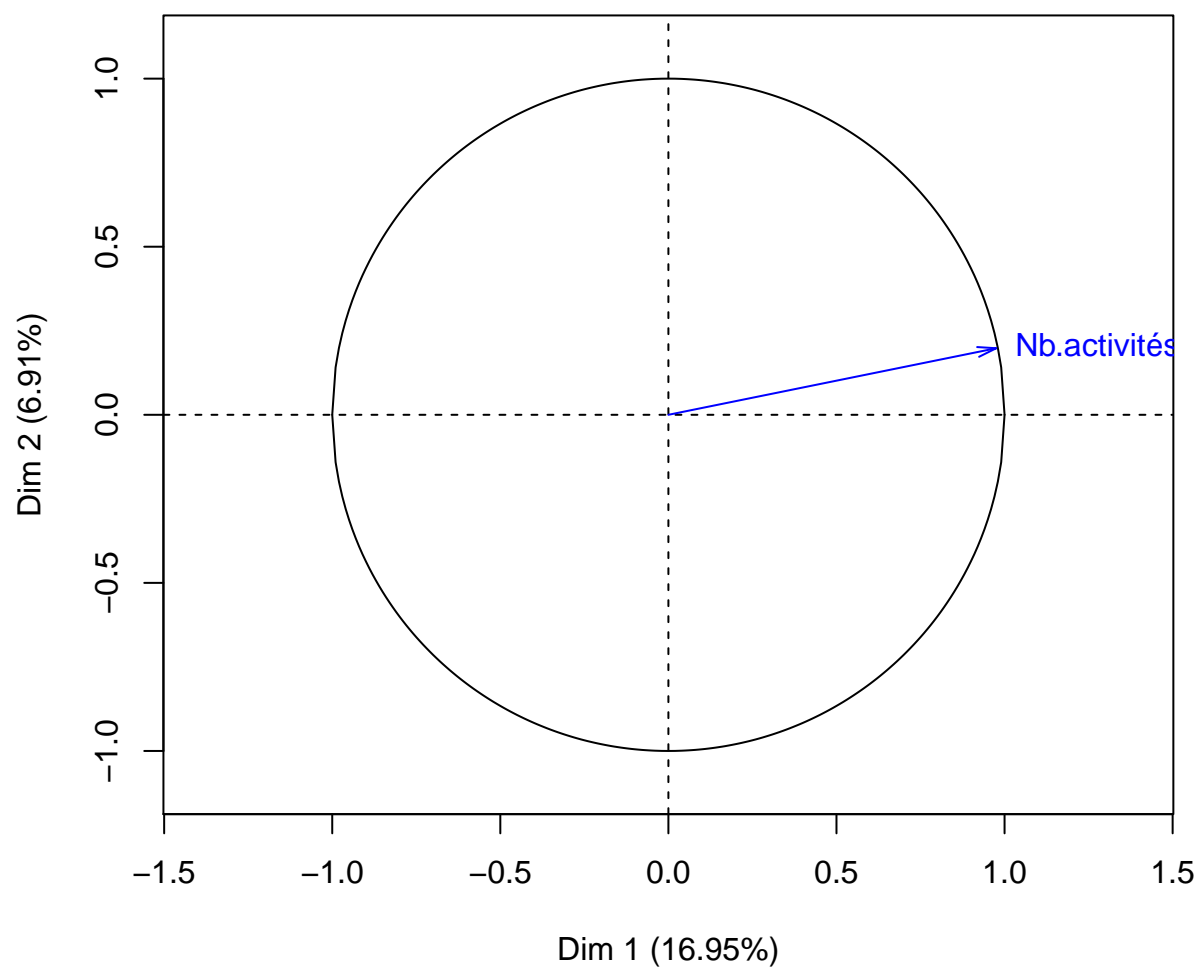


```
plot(res.mca,choix="var")
```



```
plot(res.mca,choix="quanti.sup")
```

Supplementary variables on the MCA factor map



```
barplot(res.mca$eig[,2],main="Pourcentage d'inertie", names.arg=1:nrow(res.mca$eig))
```

Pourcentage d'inertie

