

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_0 |  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_0 |  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_0 |  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_0 |  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_0 |  0.945  7.745  0.399  57.885 |  0.012  0.003
##           cos2 v.test
## Lecture_N |  0.001 -3.255 |
## Lecture_0 |  0.001  3.255 |
## Ecouter.musique_N |  0.024 14.202 |
## Ecouter.musique_0 |  0.024 -14.202 |
## Cinéma_N |  0.123 32.200 |
## Cinéma_0 |  0.123 -32.200 |
## Spectacle_N |  0.029 15.735 |
## Spectacle_0 |  0.029 -15.735 |
## Exposition_N |  0.000 -0.748 |
## Exposition_0 |  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

```

```

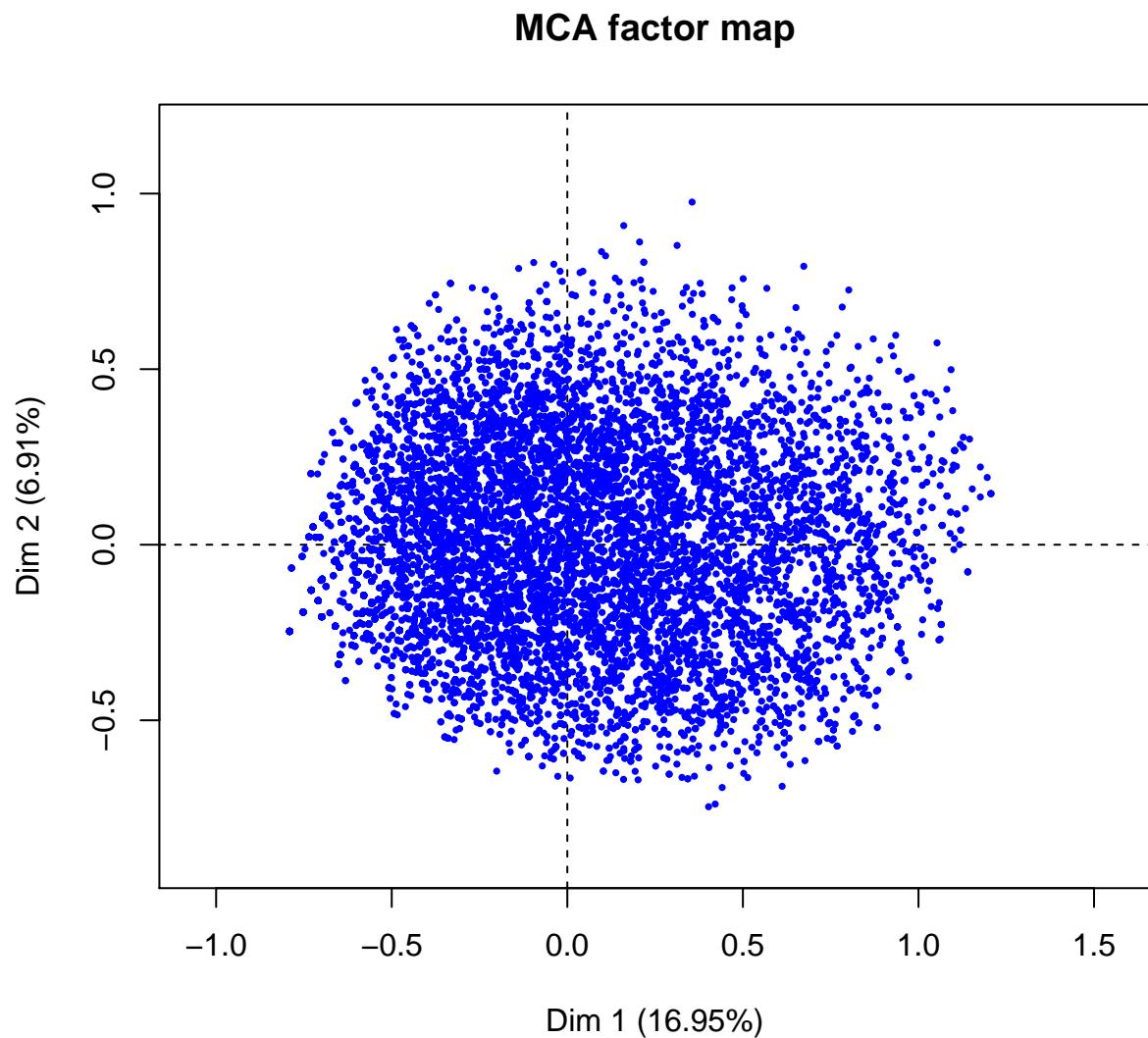
## Exposition          0.012834600 2.072824e-25
## Activité.bénévole  0.003760979 1.842666e-08
## Cinéma             0.003011654 4.812422e-07
## Spectacle           0.002498472 4.557774e-06
## Jouer.musique       0.002317306 1.011746e-05
## Marche              0.001577370 2.709621e-04
##
## $`Dim 3`$category
##                               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

```

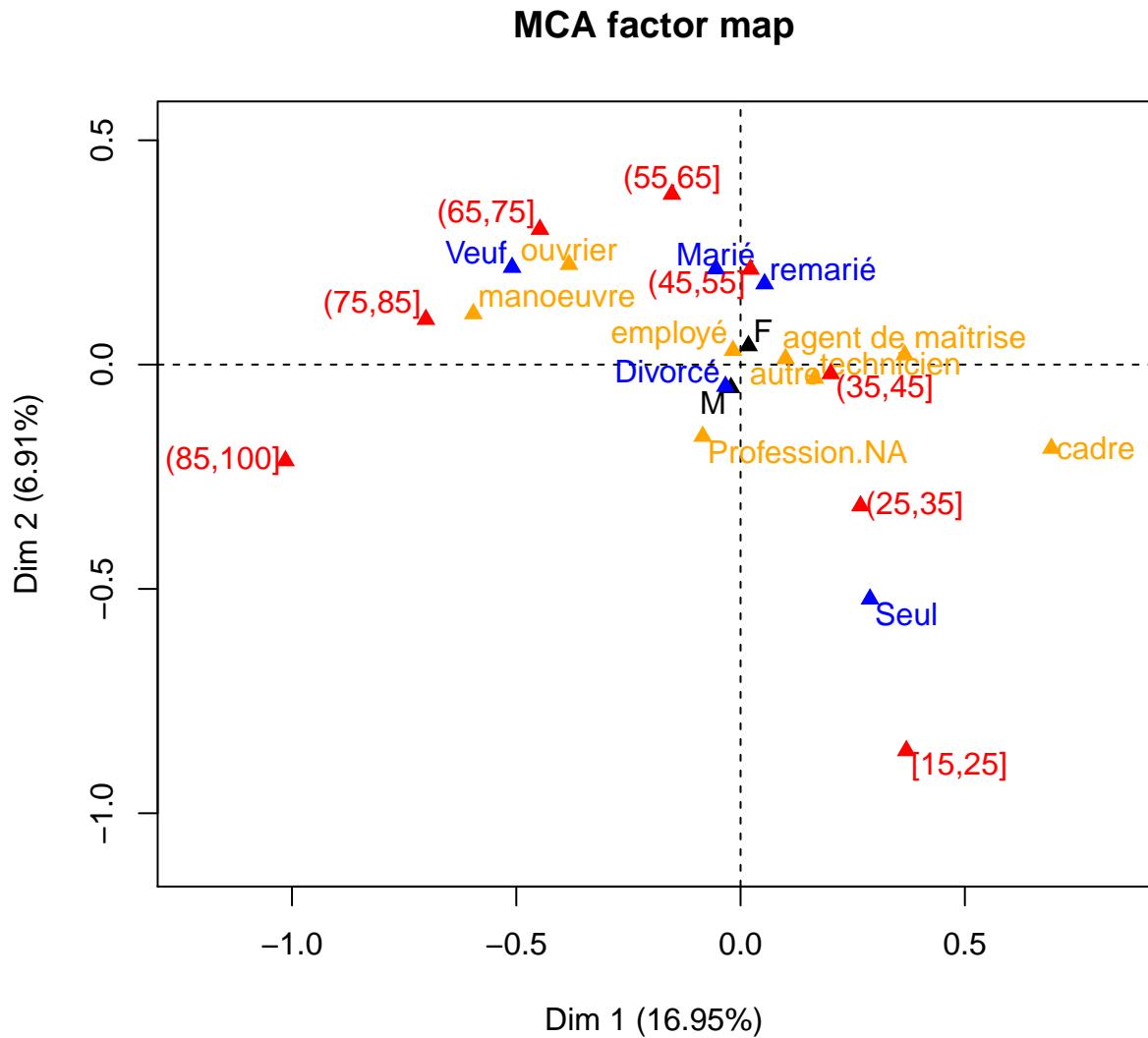
```
## 4          -0.107060462  1.674088e-84
## Sport_N     -0.069381729  2.431680e-119
## Cuisine_0    -0.070605355  5.148288e-131
## Lecture_0   -0.091963576  1.057035e-201
## F           -0.136610232  0.000000e+00
## Pêche_N      -0.244371238  0.000000e+00
## Tricot_0     -0.205088669  0.000000e+00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

Construction des graphes

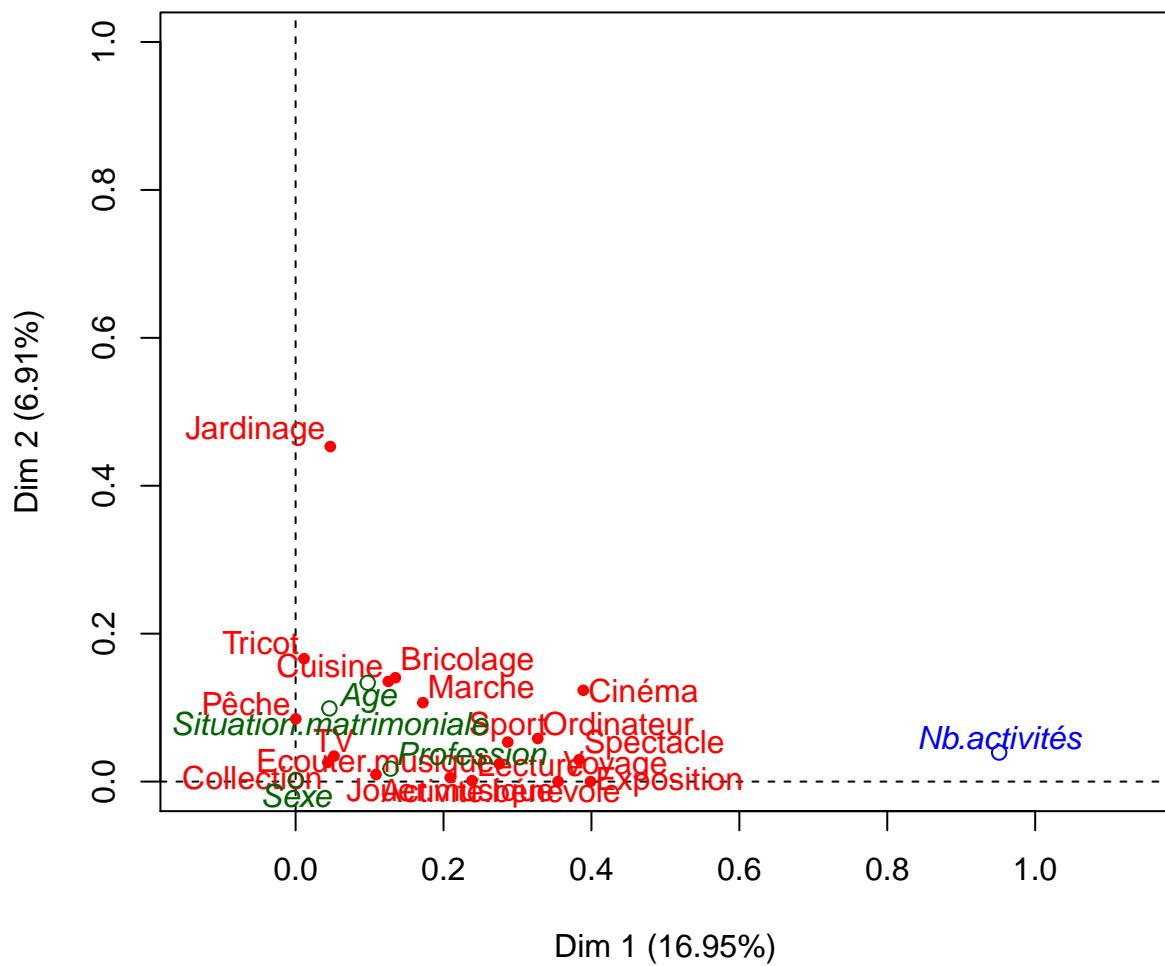
```
plot(res.mca,invisible=c("var","quali.sup"),cex=.5,label="none")
```



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

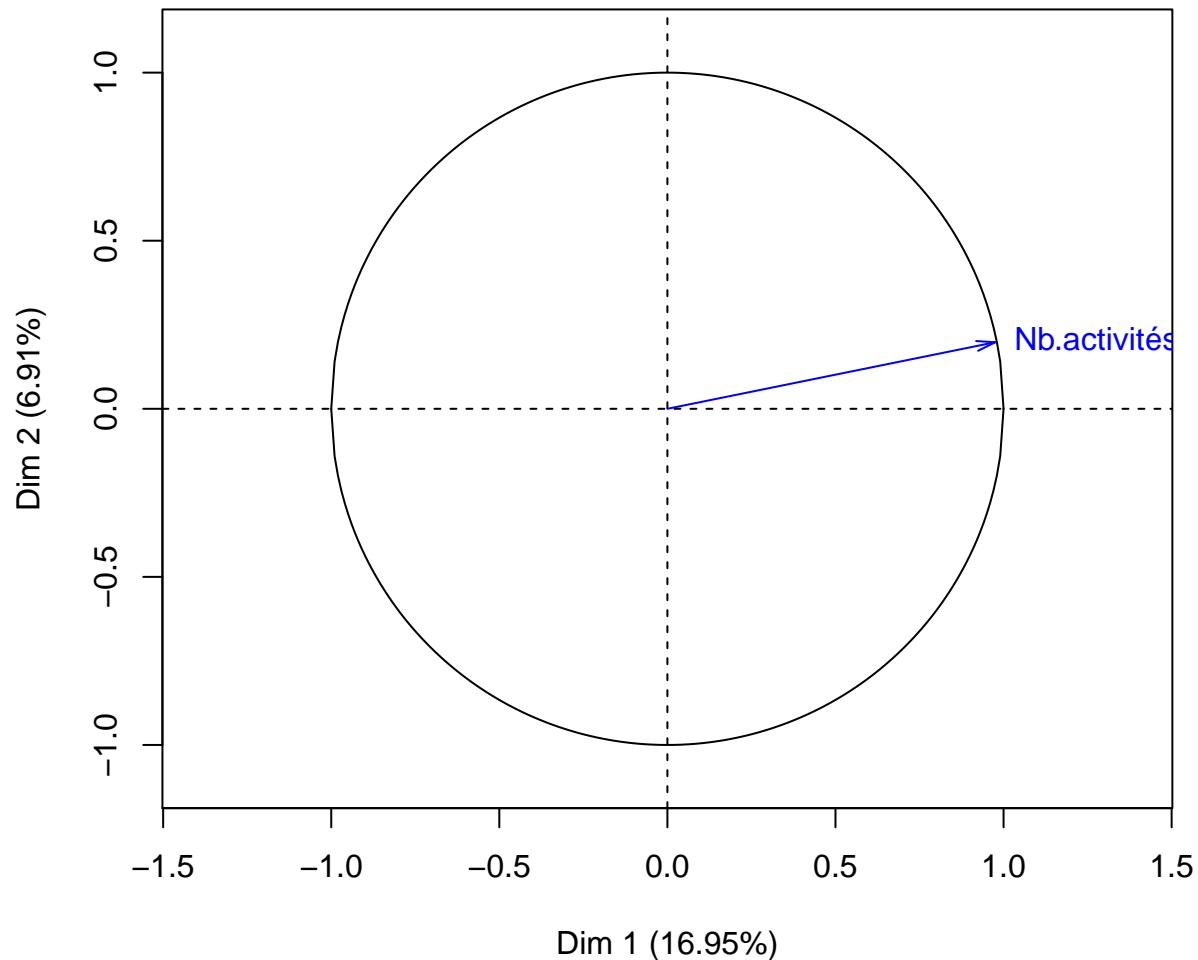


```
plot(res.mca,choix="var")
```



```
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

