

Multiple Correspondence Analysis (ACM) with FactoMineR (hobbies data)

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Script and outputs for the video of the course on the hobbies example.

Load FactoMineR

```
library(FactoMineR)
```

Reading the data from a file

```
hobbies <- read.table("Data_MCA_hobbies.csv", header=TRUE, sep=";")
```

```
summary(hobbies)
```

```
## Reading Listening music Cinema Show Exhibition Computer Sport
## 0:2757 0:2456 0:5044 0:5978 0:5808 0:5245 0:5308
## 1:5646 1:5947 1:3359 1:2425 1:2595 1:3158 1:3095
##
##
##
##
## Walking Travelling Playing music Collecting Volunteering Mechanic
## 0:4228 0:5040 0:6943 0:7541 0:7118 0:4864
## 1:4175 1:3363 1:1460 1: 862 1:1285 1:3539
##
##
##
## Gardening Knitting Cooking Fishing TV Sex Age
## 0:5047 0:6990 0:4717 0:7458 0:1017 M:3787 (45,55]:1837
## 1:3356 1:1413 1:3686 1: 945 1:1223 F:4616 (35,45]:1646
## 2:2156 (25,35]:1302
## 3:1775 (55,65]:1257
## 4:2232 (65,75]: 937
## [15,25]: 857
## (Other): 567
## Marital status Profession nb.activitees
## Single :2140 Employee :2552 Min. : 0.000
## Married :4333 Manual labourer :1161 1st Qu.: 4.000
## Widower : 734 Management :1052 Median : 7.000
```

```
## Divorcee : 792   Unskilled worker: 792   Mean   : 6.866
## Remarried: 404   Foreman           : 735   3rd Qu.: 9.000
##           (Other)           : 613   Max.    :16.000
##           NA's              :1498
```

Converting the TV variable as a factor

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

MCA

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

Summarizing the results on the first 2 components

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

```
##
## Call:
## MCA(X = hobbies, 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
## 11000210 | 0.667 0.027 0.336 | -0.191 0.005 0.027 |
## 11000410 | 0.140 0.001 0.011 | 0.434 0.028 0.108 |
## 11000610 | -0.155 0.001 0.032 | -0.244 0.009 0.079 |
```

```

## 11000710      | -0.108  0.001  0.011 | -0.285  0.012  0.073 |
## 11000810      | -0.022  0.000  0.001 | -0.268  0.011  0.087 |
## 11000910      | -0.636  0.024  0.449 |  0.019  0.000  0.000 |
## 11001010      | -0.206  0.003  0.046 | -0.239  0.008  0.063 |
## 11001110      |  0.284  0.005  0.065 | -0.611  0.055  0.304 |
## 11001210      |  0.598  0.021  0.261 | -0.577  0.049  0.243 |
## 11001310      |  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
## Reading_0      | -0.699  4.503  0.239 -44.766 | -0.051  0.058
## Reading_1      |  0.341  2.199  0.239  44.766 |  0.025  0.028
## Listening music_0 | -0.817  5.478  0.275 -48.111 |  0.241  1.170
## Listening music_1 |  0.337  2.262  0.275  48.111 | -0.100  0.483
## Cinema_0       | -0.509  4.369  0.389 -57.170 |  0.287  3.398
## Cinema_1       |  0.764  6.561  0.389  57.170 | -0.430  5.103
## Show_0         | -0.394  3.109  0.383 -56.753 |  0.109  0.586
## Show_1         |  0.972  7.663  0.383  56.753 | -0.270  1.444
## Exhibition_0   | -0.422  3.461  0.399 -57.885 | -0.005  0.001
## Exhibition_1   |  0.945  7.745  0.399  57.885 |  0.012  0.003
##           cos2  v.test
## Reading_0      0.001 -3.255 |
## Reading_1      0.001  3.255 |
## Listening music_0 0.024 14.202 |
## Listening music_1 0.024 -14.202 |
## Cinema_0       0.123 32.200 |
## Cinema_1       0.123 -32.200 |
## Show_0         0.029 15.735 |
## Show_1         0.029 -15.735 |
## Exhibition_0   0.000 -0.748 |
## Exhibition_1   0.000  0.748 |
##
## Categorical variables (eta2)
##           Dim.1 Dim.2
## Reading      | 0.239 0.001 |
## Listening music | 0.275 0.024 |
## Cinema       | 0.389 0.123 |
## Show         | 0.383 0.029 |
## Exhibition   | 0.399 0.000 |
## Computer     | 0.327 0.058 |
## Sport        | 0.287 0.053 |
## Walking      | 0.172 0.107 |
## Travelling   | 0.355 0.000 |
## Playing music | 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
## Sex             | 0.000 0.002 |
## Age             | 0.097 0.134 |
## Marital status  | 0.046 0.099 |
## Profession      | 0.128 0.017 |
##
## Supplementary continuous variable
##                Dim.1  Dim.2
## nb.activitees  | 0.975 | 0.198 |

```

Describing the dimensions

```
dimdesc(res.mca, axes=1:2)
```

```

## $`Dim 1`
## $`Dim 1`$quanti
##          correlation p.value
## nb.activitees  0.9753459      0
##
## $`Dim 1`$quali
##          R2          p.value
## Reading      0.23851813 0.000000e+00
## Listening music 0.27548544 0.000000e+00
## Cinema       0.38900068 0.000000e+00
## Show         0.38335191 0.000000e+00
## Exhibition   0.39878925 0.000000e+00
## Computer     0.32739645 0.000000e+00
## Sport        0.28683998 0.000000e+00
## Walking      0.17212148 0.000000e+00
## Travelling   0.35491399 0.000000e+00
## Playing music 0.20922813 0.000000e+00
## Mechanic     0.13493609 8.816716e-267
## Cooking      0.12539365 9.423346e-247
## Profession   0.12836813 7.201742e-245
## Volunteering 0.10877078 2.247113e-212
## Age          0.09747901 1.104310e-181
## TV           0.05192240 1.282203e-95
## Gardening    0.04696289 7.138377e-90
## Marital status 0.04566170 1.135400e-83
## Collecting   0.04356310 2.322542e-83
## Knitting     0.01143504 8.427145e-23
##
## $`Dim 1`$category
##          Estimate      p.value
## Playing music_1  0.26839870 0.000000e+00
## Travelling_1    0.27033560 0.000000e+00

```

```

## Walking_1      0.18447699  0.000000e+00
## Sport_1       0.24685643  0.000000e+00
## Computer_1    0.26265070  0.000000e+00
## Exhibition_1  0.30388560  0.000000e+00
## Show_1        0.30379833  0.000000e+00
## Cinema_1      0.28307598  0.000000e+00
## Listening music_1 0.25657041  0.000000e+00
## Reading_1     0.23125560  0.000000e+00
## Mechanic_1    0.16540452  8.816716e-267
## Cooking_1     0.15865273  9.423346e-247
## Volunteering_1 0.20372577  2.247113e-212
## Management    0.29445799  4.929397e-132
## Gardening_1   0.09837170  7.138377e-90
## Collecting_1  0.15293668  2.322542e-83
## Single        0.15105015  1.207987e-54
## [15,25]       0.24528149  2.108266e-30
## (25,35]       0.19984888  6.389909e-26
## Foreman       0.14904669  2.149018e-25
## TV_1          0.13159677  3.341439e-25
## TV_2          0.09449946  1.114616e-24
## Knitting_1    0.06356668  8.427145e-23
## (35,45]       0.17031375  7.998317e-20
## (55,65]       0.01289136  3.849963e-09
## Technician    0.05991778  6.892575e-04
## Profession.NA -0.05116908  3.088722e-04
## Married       -0.00169137  1.912935e-07
## TV_4          -0.05681694  9.650520e-17
## (85,100]      -0.37013968  4.325646e-21
## Knitting_0    -0.06356668  8.427145e-23
## Manual labourer -0.18364686  2.978737e-45
## Widower       -0.20369965  7.479622e-48
## (65,75]       -0.11794860  2.179375e-48
## TV_0          -0.19424004  7.701514e-56
## (75,85]       -0.23095998  1.734900e-57
## Unskilled worker -0.27848868  1.030645e-70
## Collecting_0  -0.15293668  2.322542e-83
## Gardening_0   -0.09837170  7.138377e-90
## Volunteering_0 -0.20372577  2.247113e-212
## Cooking_0     -0.15865273  9.423346e-247
## Mechanic_0    -0.16540452  8.816716e-267
## Playing music_0 -0.26839870  0.000000e+00
## Travelling_0  -0.27033560  0.000000e+00
## Walking_0     -0.18447699  0.000000e+00
## Sport_0       -0.24685643  0.000000e+00
## Computer_0    -0.26265070  0.000000e+00
## Exhibition_0  -0.30388560  0.000000e+00
## Show_0        -0.30379833  0.000000e+00
## Cinema_0      -0.28307598  0.000000e+00
## Listening music_0 -0.25657041  0.000000e+00
## Reading_0     -0.23125560  0.000000e+00
##
##
## $`Dim 2`
## $`Dim 2`$quanti

```

```

##          correlation      p.value
## nb.activitees  0.1980007 4.826398e-75
##
## $`Dim 2`$quali
##          R2      p.value
## Gardening      0.453046316 0.000000e+00
## Knitting        0.166169732 0.000000e+00
## Mechanic        0.140401965 2.363989e-278
## Cooking         0.135420874 8.354586e-268
## Age             0.133583530 9.125004e-256
## Cinema          0.123401798 1.341384e-242
## Walking         0.106756626 2.977082e-208
## Marital status  0.098904206 5.042868e-188
## Fishing         0.084751244 8.323766e-164
## Computer        0.058202284 1.463850e-111
## Sport           0.053442000 2.406308e-102
## TV              0.034425908 1.895739e-62
## Show            0.029467916 1.375541e-56
## Collecting      0.025914681 6.803897e-50
## Listening music  0.024006349 2.627936e-46
## Profession      0.017395750 1.450270e-28
## Volunteering   0.009426749 4.666146e-19
## Playing music   0.005420573 1.407100e-11
## Sex             0.002152884 2.090738e-05
## Reading         0.001260776 1.132204e-03
##
## $`Dim 2`$category
##          Estimate      p.value
## Knitting_1      0.154764175 0.000000e+00
## Gardening_1     0.195140682 0.000000e+00
## Mechanic_1      0.107759030 2.363989e-278
## Cooking_1       0.105301934 8.354586e-268
## Cinema_0        0.101829204 1.341384e-242
## Walking_1       0.092790996 2.977082e-208
## Fishing_1       0.130842880 8.323766e-164
## Computer_0      0.070728647 1.463850e-111
## Sport_0         0.068053382 2.406308e-102
## Married         0.058392178 7.920392e-93
## Show_0          0.053795386 1.375541e-56
## Collecting_1    0.075337113 6.803897e-50
## (55,65]         0.122588737 7.341769e-49
## Listening music_0 0.048373115 2.627936e-46
## TV_3            0.082847534 1.990737e-33
## (45,55]        0.075130020 4.614026e-25
## (65,75]        0.100358876 9.566953e-23
## Volunteering_1 0.038304920 4.666146e-19
## Manual labourer 0.062446063 2.315841e-16
## Playing music_0 0.027591591 1.407100e-11
## Widower         0.059301096 7.755244e-10
## TV_2            0.039534257 6.282529e-08
## F               0.013241401 2.090738e-05
## Remarried       0.048925026 2.061549e-04
## Unskilled worker 0.031284323 7.973605e-04
## Reading_1       0.010738269 1.132204e-03

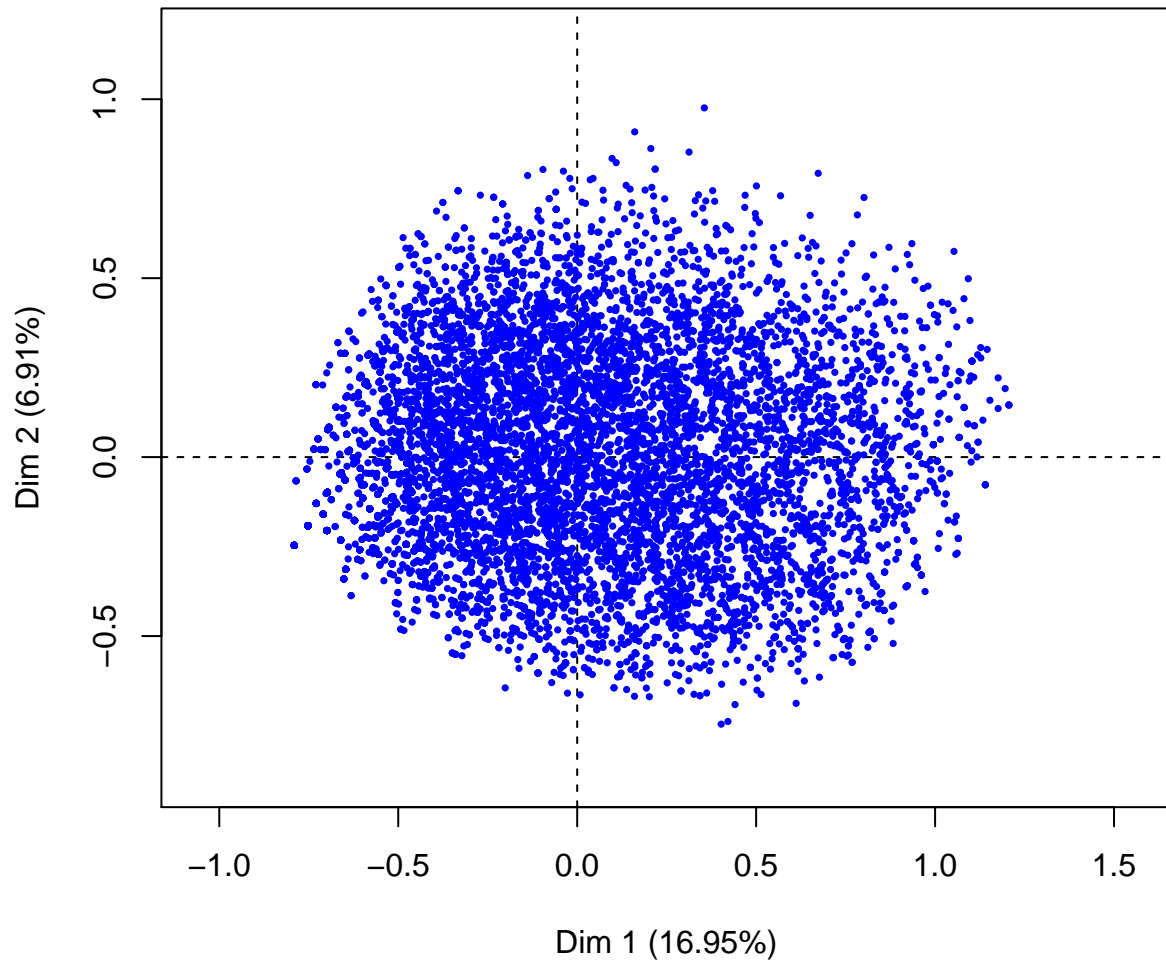
```

## (75,85]	0.043334701	2.283013e-02
## (85,100]	-0.046130519	4.698967e-02
## Reading_0	-0.010738269	1.132204e-03
## TV_4	-0.007916798	2.354582e-04
## M	-0.013241401	2.090738e-05
## TV_1	-0.027119018	3.688650e-07
## Management	-0.053914699	9.259268e-11
## Playing music_1	-0.027591591	1.407100e-11
## Profession.NA	-0.046307708	8.336614e-12
## Volunteering_0	-0.038304920	4.666146e-19
## TV_0	-0.087345976	2.743645e-32
## (25,35]	-0.074668353	2.201473e-35
## Listening music_1	-0.048373115	2.627936e-46
## Collecting_0	-0.075337113	6.803897e-50
## Show_1	-0.053795386	1.375541e-56
## Sport_1	-0.068053382	2.406308e-102
## Computer_1	-0.070728647	1.463850e-111
## [15,25]	-0.229609518	1.782463e-162
## Fishing_0	-0.130842880	8.323766e-164
## Single	-0.150611195	6.342662e-181
## Walking_0	-0.092790996	2.977082e-208
## Cinema_1	-0.101829204	1.341384e-242
## Cooking_0	-0.105301934	8.354586e-268
## Mechanic_0	-0.107759030	2.363989e-278
## Knitting_0	-0.154764175	0.000000e+00
## Gardening_0	-0.195140682	0.000000e+00

Graphic representations

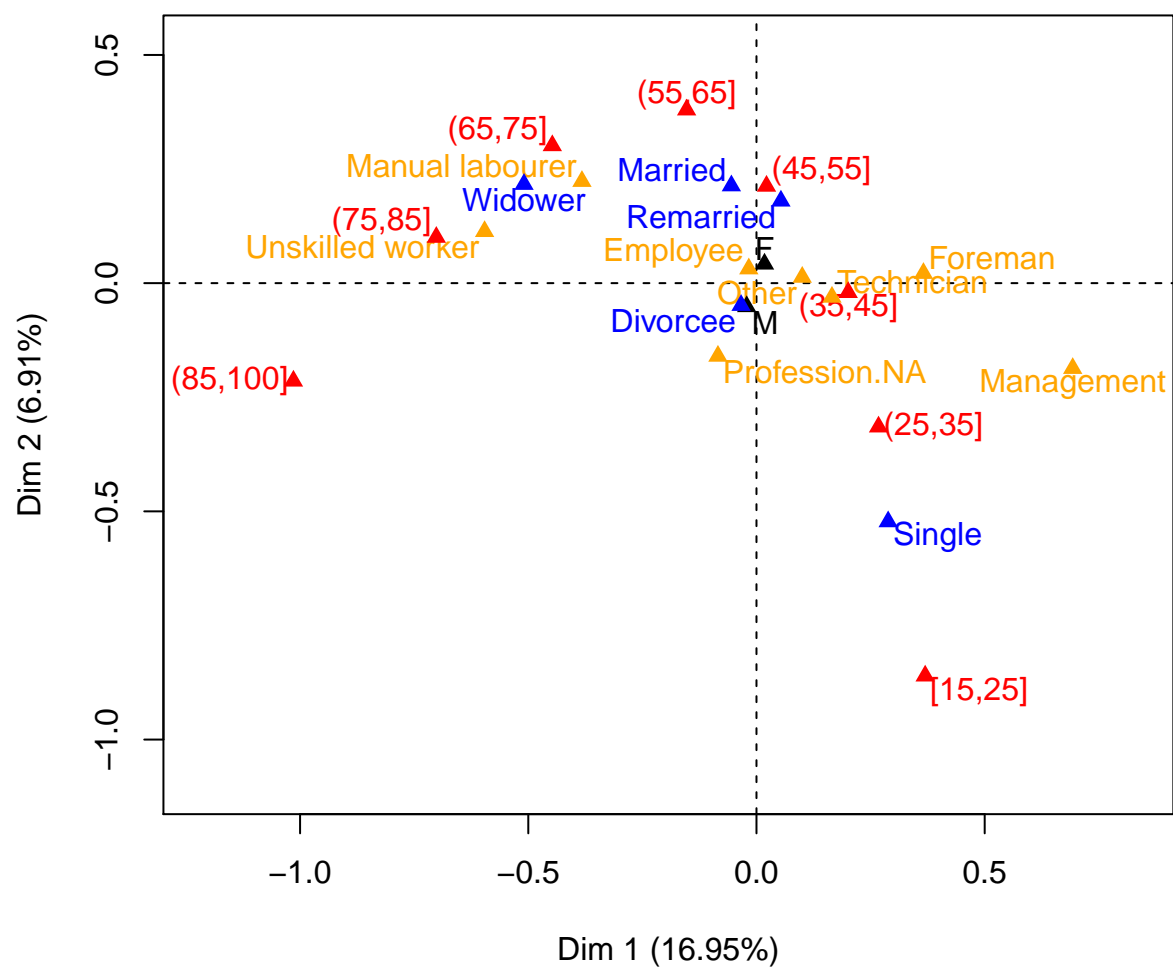
```
plot(res.mca,invisible=c("var","quali.sup"),cex=.5,label="none")
```

MCA factor map

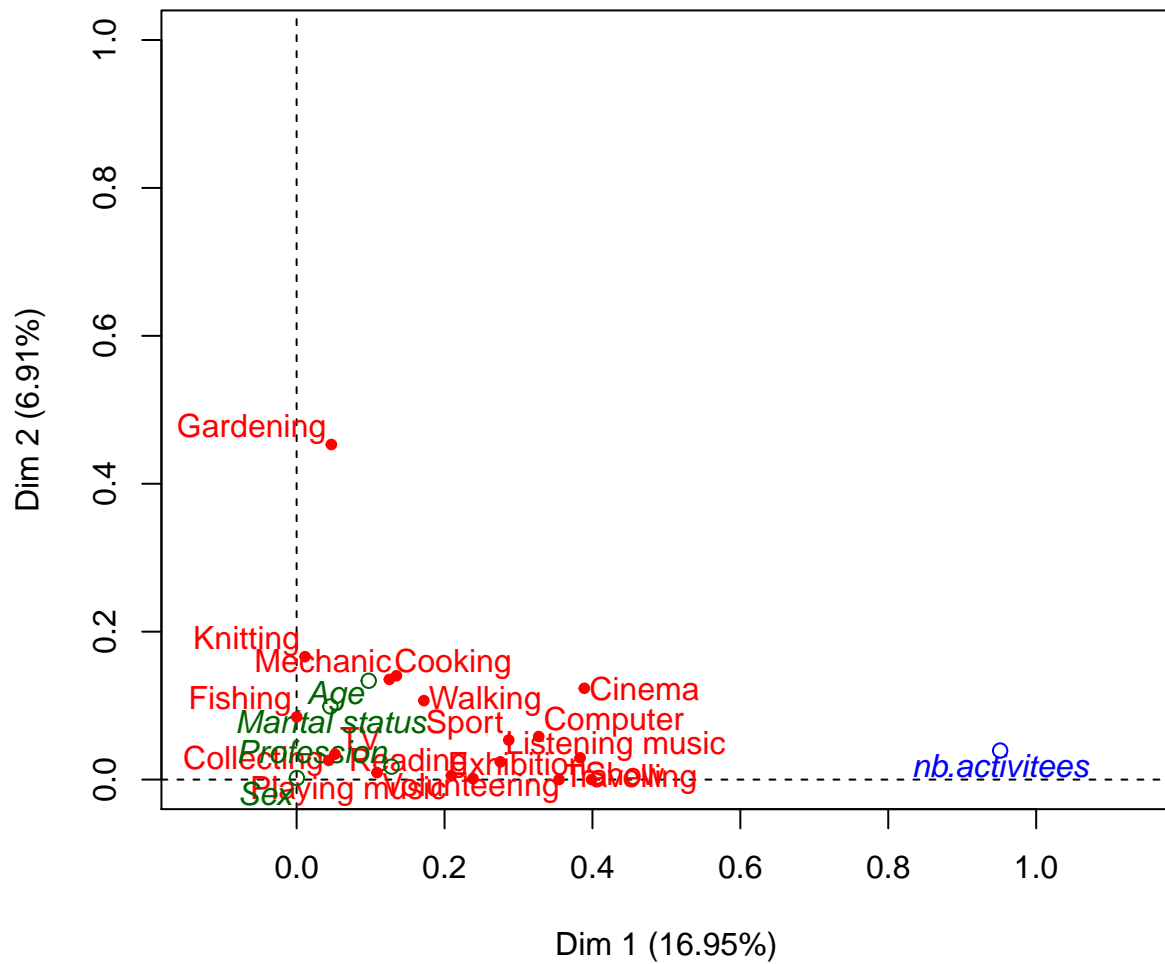


```
plot(res.mca,invisible=c("ind","var"),hab="quali", palette=palette(c("blue","orange","darkgreen","black")))
```


MCA factor map

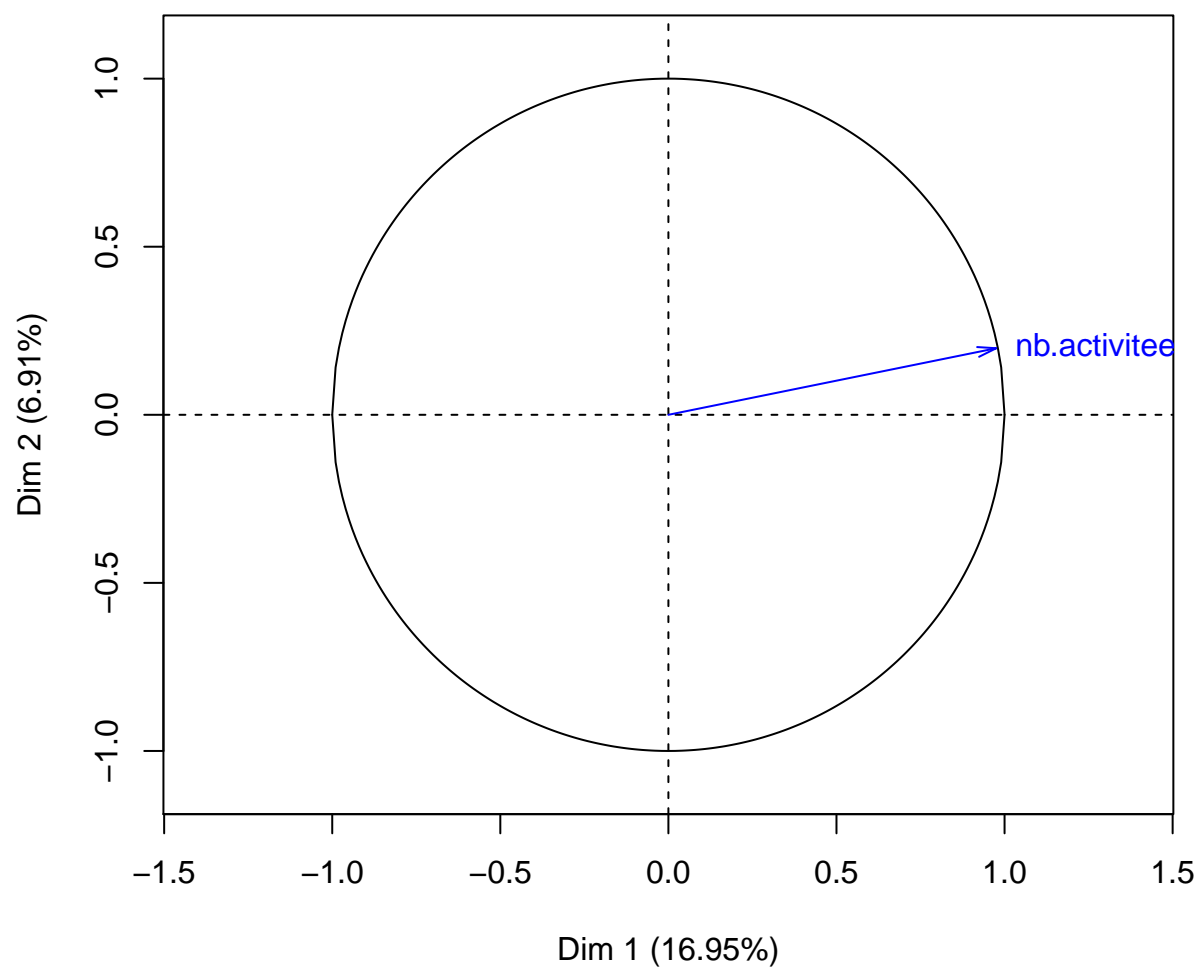


```
plot(res.mca,choix="var")
```



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

Supplementary variables on the MCA factor map



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

Eigenvalues

