Ministère de l'Enseignement Supérieur
et de la Recherche Scientifique

Université de Carthage

Ecole Nationale d'Ingénieurs de Carthage

ENICARTHAGE
المدرسة الوطنية للمهندسين بقرطاج
Ecole Nationale d'Ingénieurs de Carthage

وزارة التعليم العالي والبحث العلمي
جامعة قرطاج
المدرسة الوطنية للمهندسين بقرطاج

ANALYSE DE DONNÉES

Mettre en oeuvre les différentes méthodes statistiques grâce au logiciel R et FactoMineR

Zied khayechi_INFO 2B

2017/2018

Correspondence Analysis (CA)

Description:

Effectue la correspondance Analyse (ca) y compris la ligne supplémentaire

et/ou des points de colonne .

Usage:

CA (X, NCP = 5, Row. sup = null, col sup = null,

Quanta. sup = null, tel que. sup = null, Graph = true,

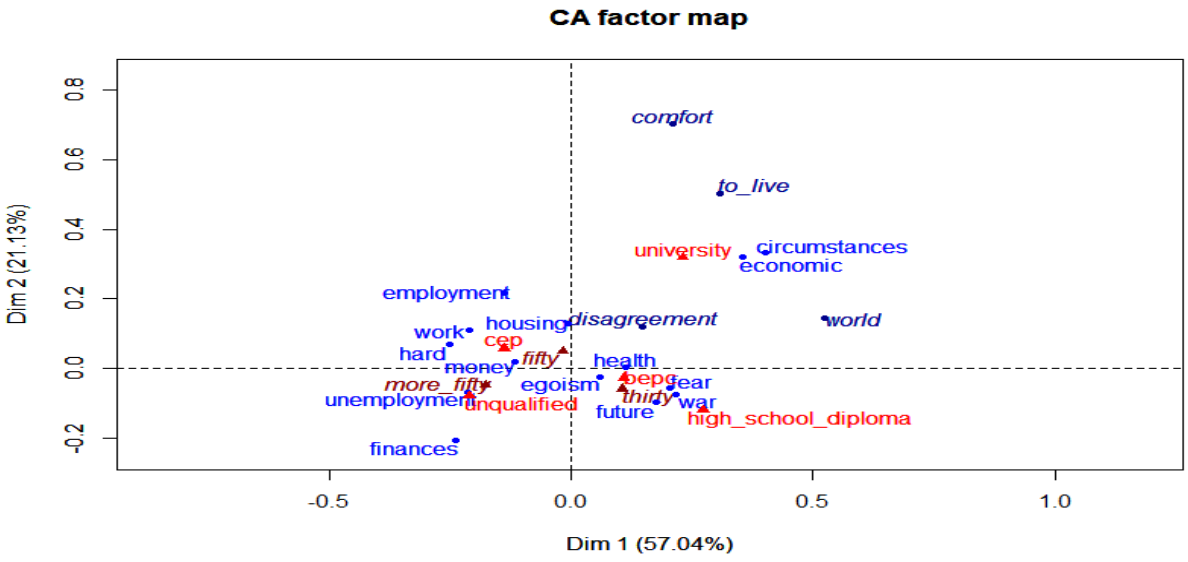
axes = c (1, 2), Row. w = null, excl = null)

```
> library(FactoMineR)
> data(children)
> children
```

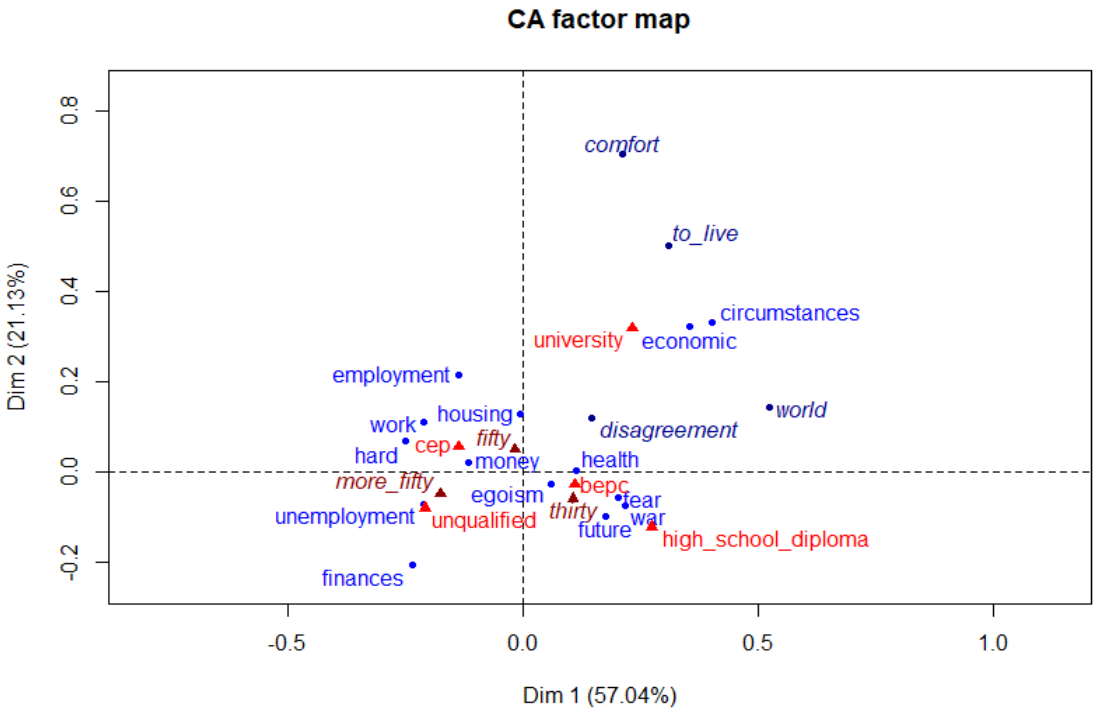
	unqualified	cep	bepc	high_school_diploma	university	thirty	fifty	more_fifty
money	51	64	32	29	17	59	66	70
future	53	90	78	75	22	115	117	86
unemployment	71	111	50	40	11	79	88	177
circumstances	1	7	5	5	4	9	8	5
hard	7	11	4	3	2	2	17	18
economic	7	13	12	11	11	18	19	17
egoism	21	37	14	26	9	14	34	61
employment	12	35	19	6	7	21	30	28
finances	10	7	7	3	1	8	12	8
war	4	7	7	6	2	7	6	13
housing	8	22	7	10	5	10	27	17
fear	25	45	38	38	13	48	59	52
health	18	27	20	19	9	13	29	53
work	35	61	29	14	12	30	63	58
comfort	2	4	3	1	4	NA	NA	NA
disagreement	2	8	2	5	2	NA	NA	NA
world	1	5	4	6	3	NA	NA	NA
to_live	3	3	1	3	4	NA	NA	NA

```
> 
```

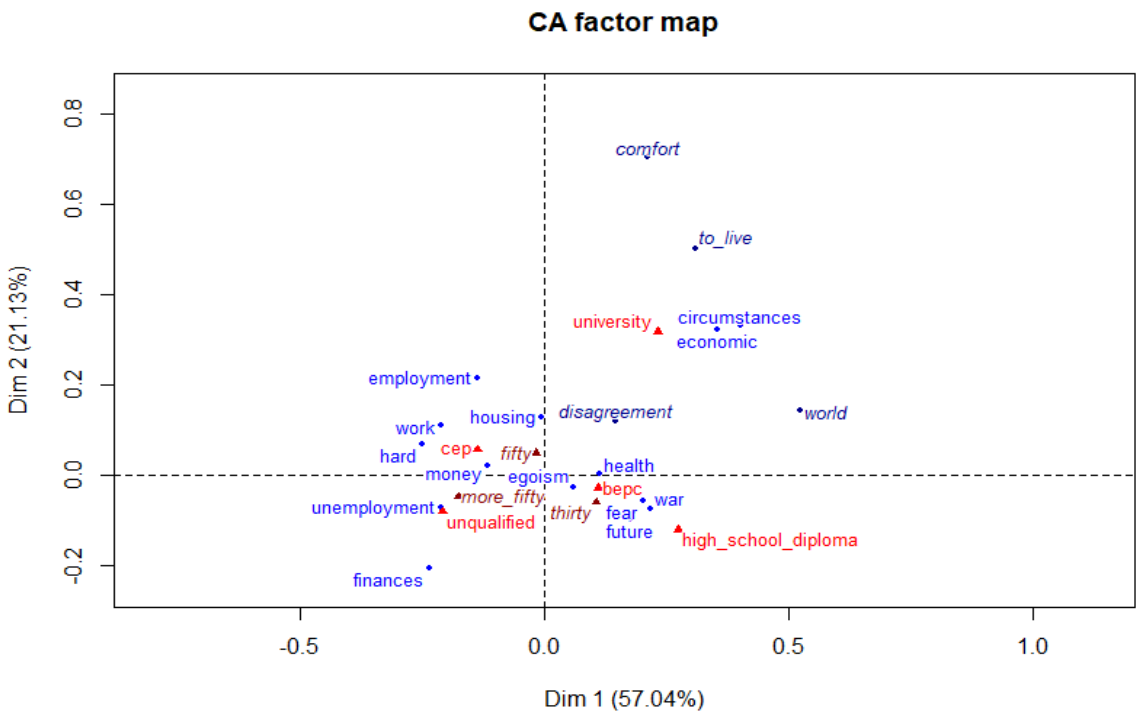
```
> res <- CA( children , row.sup =15:18 , col.sup =6:8)
```




```
> summary(res)

Call:
CA(X = children, row.sup = 15:18, col.sup = 6:8)

The chi square of independence between the two variables is equal to 98.80159 (p-value =  9.748064e-05 ).

Eigenvalues
                       Dim.1   Dim.2   Dim.3   Dim.4
Variance               0.035   0.013   0.007   0.006
% of var.             57.043  21.132  11.764  10.061
Cumulative % of var.  57.043  78.175  89.939 100.000


Rows (the 10 first)
                    Iner*1000    Dim.1     ctr   cos2    Dim.2     ctr   cos2    Dim.3     ctr   cos2
money           |     3.759 | -0.115  4.550 0.428 |  0.020  0.371 0.013 |  0.101 16.884 0.328 |
future          |     8.690 |  0.176 17.567 0.716 | -0.098 14.587 0.220 | -0.053  7.568 0.064 |
unemployment    |     9.151 | -0.212 22.616 0.875 | -0.071  6.779 0.097 | -0.004  0.046 0.000 |
circumstances   |     3.804 |  0.401  6.274 0.584 |  0.331 11.544 0.398 | -0.016  0.046 0.001 |
hard            |     1.199 | -0.250  2.994 0.884 |  0.068  0.592 0.065 |  0.060  0.845 0.051 |
economic        |     8.787 |  0.354 12.005 0.484 |  0.321 26.604 0.397 |  0.084  3.280 0.027 |
egoism          |     3.287 |  0.060  0.681 0.073 | -0.026  0.338 0.013 |  0.179 29.496 0.655 |
employment      |     5.648 | -0.137  2.621 0.164 |  0.215 17.555 0.408 | -0.213 30.815 0.398 |
finances        |     3.576 | -0.237  2.790 0.276 | -0.206  5.690 0.209 | -0.044  0.469 0.010 |
war             |     1.025 |  0.217  2.169 0.749 | -0.075  0.694 0.089 | -0.098  2.139 0.152 |

Columns
                    Iner*1000    Dim.1     ctr   cos2    Dim.2     ctr   cos2    Dim.3     ctr   cos2
unqualified     |    13.146 | -0.209 25.110 0.676 | -0.081 10.082 0.101 |  0.073 14.659 0.081 |
cep             |    10.044 | -0.139 18.297 0.645 |  0.056  8.079 0.105 | -0.018  1.520 0.011 |
bepc            |     7.670 |  0.109  6.758 0.312 | -0.028  1.251 0.021 | -0.147 59.874 0.570 |
high_school_diploma |    17.732 |  0.274 37.976 0.758 | -0.121 20.099 0.149 |  0.077 14.407 0.059 |
university      |    13.468 |  0.231 11.859 0.312 |  0.318 60.488 0.589 |  0.094  9.540 0.052 |

Supplementary rows
                  Dim.1  cos2   Dim.2  cos2   Dim.3  cos2
comfort         | 0.210 0.069 | 0.703 0.775 | 0.071 0.008 |
disagreement    | 0.146 0.131 | 0.119 0.087 | 0.171 0.180 |
world           | 0.523 0.876 | 0.143 0.065 | 0.084 0.023 |
to_live         | 0.308 0.139 | 0.502 0.369 | 0.521 0.397 |

Supplementary columns
                   Dim.1    cos2     Dim.2    cos2     Dim.3    cos2
thirty          |  0.105  0.138 | -0.060  0.044 | -0.103  0.132 |
fifty           | -0.017  0.011 |  0.049  0.090 | -0.016  0.009 |
more_fifty      | -0.177  0.286 | -0.048  0.021 |  0.101  0.093 |
> plot(res)
```




```
> plot(res,shadow= TRUE, cex= .8)
```



Principal Component Analysis (PCA)

Description:

Effectue l'analyse des composants principaux (PCA) avec

individuels, des variables quantitatives supplémentaires et

variables catégoriques supplémentaires.

Les valeurs manquantes sont remplacées par la moyenne de colonne.

Usage:

PCA (X, Echelle. Unit = true, NCP = 5, IND. sup = null,

quanti. sup = null, quali. sup = null, ligne. w = null, col w = null, Graph = true, axes = c (1,2))

```
> data( decathlon)
> decathlon
           100m Long.jump Shot.put High.jump  400m 110m.hurdle Discus Pole.vault Javeline  1500m Rank Points Competition
SEBRLE    11.04      7.58    14.83      2.07 49.81       14.69  43.75       5.02    63.19 291.70    1   8217    Decastar
CLAY      10.76      7.40    14.26      1.86 49.37       14.05  50.72       4.92    60.15 301.50    2   8122    Decastar
KARPOV    11.02      7.30    14.77      2.04 48.37       14.09  48.95       4.92    50.31 300.20    3   8099    Decastar
BERNARD   11.02      7.23    14.25      1.92 48.93       14.99  40.87       5.32    62.77 280.10    4   8067    Decastar
YURKOV    11.34      7.09    15.19      2.10 50.42       15.31  46.26       4.72    63.44 276.40    5   8036    Decastar
WARNERS   11.11      7.60    14.31      1.98 48.68       14.23  41.10       4.92    51.77 278.10    6   8030    Decastar
ZSIVOCZKY 11.13      7.30    13.48      2.01 48.62       14.17  45.67       4.42    55.37 268.00    7   8004    Decastar
McMULLEN  10.83      7.31    13.76      2.13 49.91       14.38  44.41       4.42    56.37 285.10    8   7995    Decastar
MARTINEAU 11.64      6.81    14.57      1.95 50.14       14.93  47.60       4.92    52.33 262.10    9   7802    Decastar
HERNU     11.37      7.56    14.41      1.86 51.10       15.06  44.99       4.82    57.19 285.10   10   7733    Decastar
BARRAS    11.33      6.97    14.09      1.95 49.48       14.48  42.10       4.72    55.40 282.00   11   7708    Decastar
NOOL      11.33      7.27    12.68      1.98 49.20       15.29  37.92       4.62    57.44 266.60   12   7651    Decastar
BOURGUIGNON 11.36    6.80    13.46      1.86 51.16       15.67  40.49       5.02    54.68 291.70   13   7313    Decastar
Sebrle    10.85      7.84    16.36      2.12 48.36       14.05  48.72       5.00    70.52 280.01    1   8893    OlympicG
Clay      10.44      7.96    15.23      2.06 49.19       14.13  50.11       4.90    69.71 282.00    2   8820    OlympicG
Karpov    10.50      7.81    15.93      2.09 46.81       13.97  51.65       4.60    55.54 278.11    3   8725    OlympicG
Macey     10.89      7.47    15.73      2.15 48.97       14.56  48.34       4.40    58.46 265.42    4   8414    OlympicG
Warners   10.62      7.74    14.48      1.97 47.97       14.01  43.73       4.90    55.39 278.05    5   8343    OlympicG
Zsivoczky 10.91      7.14    15.31      2.12 49.40       14.95  45.62       4.70    63.45 269.54    6   8287    OlympicG
Hernu     10.97      7.19    14.65      2.03 48.73       14.25  44.72       4.80    57.76 264.35    7   8237    OlympicG
Nool      10.80      7.53    14.26      1.88 48.81       14.80  42.05       5.40    61.33 276.33    8   8235    OlympicG
Bernard   10.69      7.48    14.80      2.12 49.13       14.17  44.75       4.40    55.27 276.31    9   8225    OlympicG
Schwarzl  10.98      7.49    14.01      1.94 49.76       14.25  42.43       5.10    56.32 273.56   10   8102    OlympicG
Pogorelov 10.95      7.31    15.10      2.06 50.79       14.21  44.60       5.00    53.45 287.63   11   8084    OlympicG
Schoenbeck 10.90     7.30    14.77      1.88 50.30       14.34  44.41       5.00    60.89 278.82   12   8077    OlympicG
Barras    11.14      6.99    14.91      1.94 49.41       14.37  44.83       4.60    64.55 267.09   13   8067    OlympicG
Smith     10.85      6.81    15.24      1.91 49.27       14.01  49.02       4.20    61.52 272.74   14   8023    OlympicG
Averyanov 10.55      7.34    14.44      1.94 49.72       14.39  39.88       4.80    54.51 271.02   15   8021    OlympicG
Ojaniemi  10.68      7.50    14.97      1.94 49.12       15.01  40.35       4.60    59.26 275.71   16   8006    OlympicG
Smirnov   10.89      7.07    13.88      1.94 49.11       14.77  42.47       4.70    60.88 263.31   17   7993    OlympicG
Qi        11.06      7.34    13.55      1.97 49.65       14.78  45.13       4.50    60.79 272.63   18   7934    OlympicG
Drews     10.87      7.38    13.07      1.88 48.51       14.01  40.11       5.00    51.53 274.21   19   7926    OlympicG
Parkhomenko 11.14    6.61    15.69      2.03 51.04       14.88  41.90       4.80    65.82 277.94   20   7918    OlympicG
Terek     10.92      6.94    15.15      1.94 49.56       15.12  45.62       5.30    50.62 290.36   21   7893    OlympicG
```

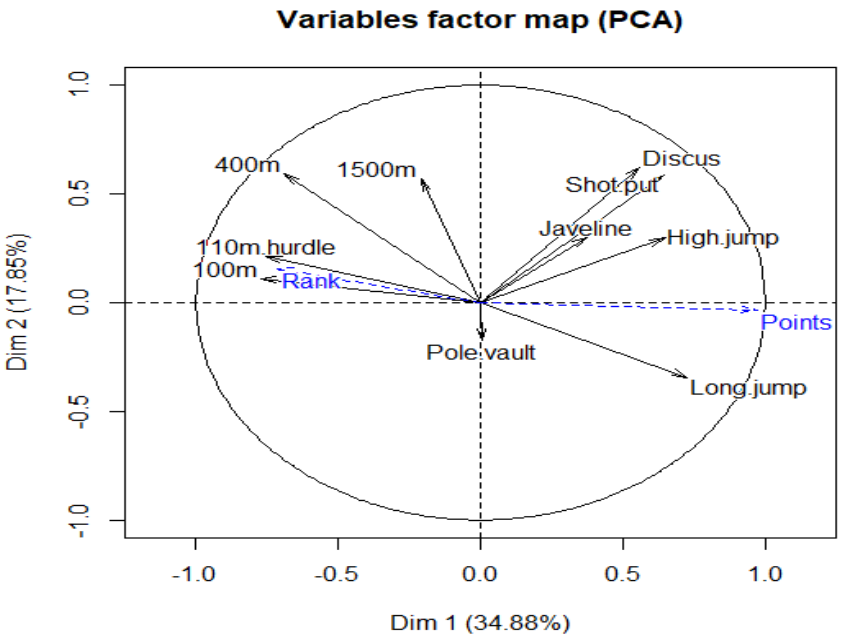
```
Gomez       11.08    7.26   14.57      1.85 48.61       14.41  40.95       4.40    60.71 269.70   22   7865    OlympicG
Turi        11.08    6.91   13.62      2.03 51.67       14.26  39.83       4.80    59.34 290.01   23   7708    OlympicG
Lorenzo     11.10    7.03   13.22      1.85 49.34       15.38  40.22       4.50    58.36 263.08   24   7592    OlympicG
Karlivans   11.33    7.26   13.30      1.97 50.54       14.98  43.34       4.50    52.92 278.67   25   7583    OlympicG
Korkizoglou 10.86    7.07   14.81      1.94 51.16       14.96  46.07       4.70    53.05 317.00   26   7573    OlympicG
Uldal       11.23    6.99   13.53      1.85 50.95       15.09  43.01       4.50    60.00 281.70   27   7495    OlympicG
Casarsa     11.36    6.68   14.92      1.94 53.20       15.39  48.66       4.40    58.62 296.12   28   7404    OlympicG
> |
```

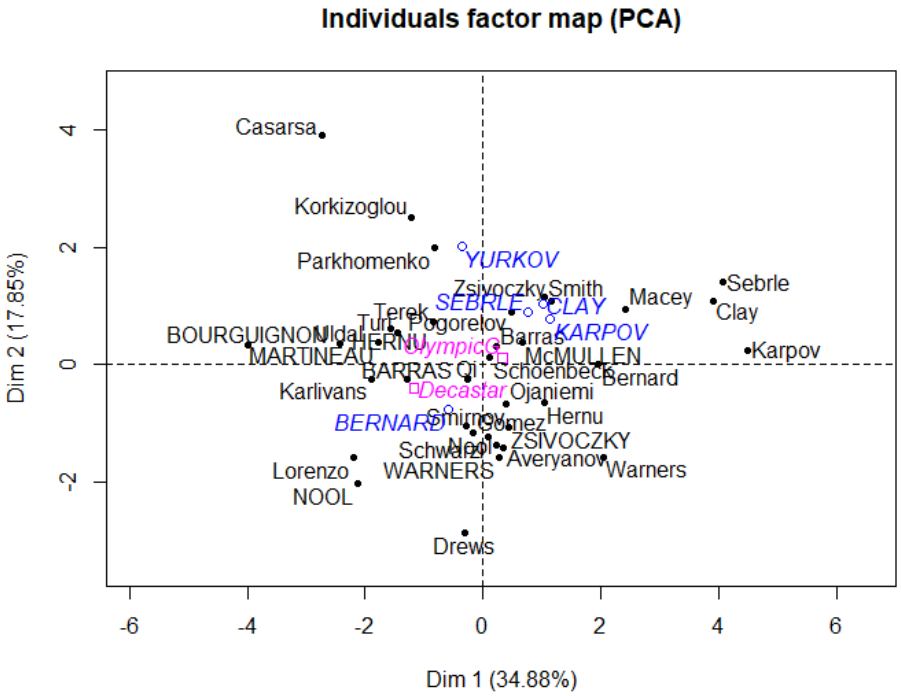
```
> summary(decathlon)
      100m         Long.jump      Shot.put        High.jump         400m         110m.hurdle       Discus      Pole.vault      Javeline        1500m      
 Min.   :10.44   Min.   :6.61   Min.   :12.68   Min.   :1.850   Min.   :46.81   Min.   :13.97   Min.   :37.92   Min.   :4.200   Min.   :50.31   Min.   :262.1  
 1st Qu.:10.85   1st Qu.:7.03   1st Qu.:13.88   1st Qu.:1.920   1st Qu.:48.93   1st Qu.:14.21   1st Qu.:41.90   1st Qu.:4.500   1st Qu.:55.27   1st Qu.:271.0  
 Median :10.98   Median :7.30   Median :14.57   Median :1.950   Median :49.40   Median :14.48   Median :44.41   Median :4.800   Median :58.36   Median :278.1  
 Mean   :11.00   Mean   :7.26   Mean   :14.48   Mean   :1.977   Mean   :49.62   Mean   :14.61   Mean   :44.33   Mean   :4.762   Mean   :58.32   Mean   :279.0  
 3rd Qu.:11.14   3rd Qu.:7.48   3rd Qu.:14.97   3rd Qu.:2.040   3rd Qu.:50.30   3rd Qu.:14.98   3rd Qu.:46.07   3rd Qu.:4.920   3rd Qu.:60.89   3rd Qu.:285.1  
 Max.   :11.64   Max.   :7.96   Max.   :16.36   Max.   :2.150   Max.   :53.20   Max.   :15.67   Max.   :51.65   Max.   :5.400   Max.   :70.52   Max.   :317.0  
      Rank           Points      Competition
 Min.   : 1.00   Min.   :7313   Decastar:13  
 1st Qu.: 6.00   1st Qu.:7802   OlympicG:28  
 Median :11.00   Median :8021                
 Mean   :12.12   Mean   :8005                
 3rd Qu.:18.00   3rd Qu.:8122                
 Max.   :28.00   Max.   :8893                
```

12 variables quantitatives

1 var qualitative correspondre au type de la compétition

```
> res <- PCA ( decathlon , quanti.sup=11:12 , quali.sup =13 , ind.sup= 1:5)
```






```
> summary(res , nbelements = Inf)

Call:
PCA(X = decathlon, ind.sup = 1:5, quanti.sup = 11:12, quali.sup = 13)


Eigenvalues
                       Dim.1   Dim.2   Dim.3   Dim.4   Dim.5   Dim.6   Dim.7   Dim.8   Dim.9  Dim.10
Variance               3.488   1.785   1.361   0.946   0.655   0.545   0.470   0.403   0.190   0.157
% of var.             34.876  17.853  13.615   9.459   6.552   5.448   4.698   4.032   1.901   1.566
Cumulative % of var.  34.876  52.729  66.344  75.803  82.355  87.803  92.501  96.533  98.434 100.000
```

Individuals

	Dist	Dim.1	ctr	cos2	Dim.2	ctr	cos2	Dim.3	ctr	cos2
WARNERS	2.414	0.283	0.064	0.014	-1.584	3.903	0.430	1.082	2.389	0.201
ZSIVOCZKY	2.462	0.429	0.146	0.030	-1.060	1.749	0.185	-1.342	3.675	0.297
McMULLEN	2.557	0.659	0.346	0.066	0.380	0.225	0.022	-0.274	0.153	0.012
MARTINEAU	3.688	-1.771	2.497	0.230	0.381	0.226	0.011	-0.900	1.651	0.059
HERNU	2.790	-1.574	1.973	0.318	0.606	0.571	0.047	0.769	1.205	0.076
BARRAS	1.883	-1.277	1.299	0.460	-0.258	0.103	0.019	-0.051	0.005	0.001
NOOL	3.615	-2.126	3.600	0.346	-2.023	6.370	0.313	-1.157	2.732	0.102
BOURGUIGNON	4.292	-3.980	12.615	0.860	0.342	0.182	0.006	1.214	3.005	0.080
Sebrle	4.906	4.081	13.263	0.692	1.407	3.082	0.082	0.249	0.127	0.003
Clay	4.704	3.907	12.157	0.690	1.078	1.808	0.052	0.650	0.862	0.019
Karpov	4.973	4.503	16.147	0.820	0.237	0.087	0.002	0.290	0.172	0.003
Macey	3.431	2.415	4.645	0.495	0.949	1.402	0.077	-1.540	4.839	0.201
Warners	2.925	2.044	3.326	0.488	-1.566	3.814	0.286	1.239	3.133	0.179
Zsivoczky	2.597	1.149	1.051	0.196	1.085	1.832	0.175	-1.115	2.537	0.184
Hernu	1.810	1.043	0.867	0.332	-0.650	0.657	0.129	-0.648	0.858	0.128
Nool	3.183	0.232	0.043	0.005	-1.363	2.890	0.183	1.782	6.481	0.314
Bernard	2.785	1.957	3.049	0.494	0.008	0.000	0.000	-0.438	0.391	0.025
Schwarzl	1.983	0.080	0.005	0.002	-1.237	2.381	0.389	1.098	2.460	0.307
Pogorelov	2.474	0.475	0.179	0.037	0.904	1.273	0.134	1.620	5.355	0.429
Schoenbeck	1.855	0.116	0.011	0.004	0.115	0.021	0.004	0.870	1.544	0.220
Barras	2.188	0.238	0.045	0.012	0.304	0.144	0.019	-1.558	4.953	0.507
Smith	3.492	1.040	0.862	0.089	1.141	2.026	0.107	-1.920	7.520	0.302
Averyanov	2.420	0.343	0.094	0.020	-1.409	3.088	0.339	0.697	0.992	0.083
Ojaniemi	2.257	0.385	0.118	0.029	-0.657	0.672	0.085	0.042	0.004	0.000
Smirnov	1.928	-0.282	0.063	0.021	-1.050	1.715	0.297	-1.066	2.318	0.306
Qi	1.665	-0.271	0.058	0.026	-0.258	0.104	0.024	-1.090	2.424	0.428
Drews	3.354	-0.319	0.081	0.009	-2.860	12.730	0.727	1.234	3.109	0.135
Parkhomenko	3.412	-0.822	0.539	0.058	1.987	6.141	0.339	-0.790	1.274	0.054
Terek	3.411	-0.841	0.563	0.061	0.735	0.840	0.046	2.369	11.449	0.482
Gomez	2.527	-0.176	0.025	0.005	-1.161	2.097	0.211	-1.268	3.279	0.252
Turi	3.036	-1.448	1.669	0.227	0.556	0.481	0.034	0.602	0.739	0.039
Lorenzo	3.400	-2.194	3.836	0.417	-1.583	3.899	0.217	-1.514	4.679	0.198
Karlivans	2.577	-1.895	2.862	0.541	-0.237	0.087	0.008	-0.455	0.422	0.031
Korkizoglou	4.229	-1.225	1.194	0.084	2.494	9.678	0.348	2.422	11.964	0.328
Uldal	2.846	-2.435	4.724	0.732	0.358	0.200	0.016	-0.672	0.922	0.056
Casarsa	4.875	-2.741	5.986	0.316	3.888	23.523	0.636	-0.431	0.380	0.008

Supplementary individuals

	Dist	Dim.1	cos2	Dim.2	cos2	Dim.3	cos2
SEBRLE	2.559	0.766	0.090	0.903	0.124	1.200	0.220
CLAY	3.742	1.024	0.075	1.032	0.076	1.903	0.259
KARPOV	3.609	1.141	0.100	0.774	0.046	1.936	0.288
BERNARD	2.880	-0.599	0.043	-0.766	0.071	1.242	0.186
YURKOV	3.052	-0.349	0.013	2.001	0.430	-1.068	0.123

Variables

	Dim.1	ctr	cos2	Dim.2	ctr	cos2	Dim.3	ctr	cos2
100m	-0.774	17.176	0.599	0.111	0.692	0.012	-0.273	5.456	0.074
Long.jump	0.724	15.043	0.525	-0.344	6.614	0.118	0.278	5.690	0.077
Shot.put	0.641	11.766	0.410	0.586	19.229	0.343	0.061	0.270	0.004
High.jump	0.648	12.036	0.420	0.296	4.915	0.088	-0.139	1.427	0.019
400m	-0.691	13.687	0.477	0.591	19.532	0.349	0.117	0.998	0.014
110m.hurdle	-0.754	16.287	0.568	0.213	2.547	0.045	-0.062	0.284	0.004
Discus	0.554	8.813	0.307	0.621	21.610	0.386	-0.096	0.677	0.009
Pole.vault	0.002	0.000	0.000	-0.173	1.667	0.030	0.763	42.744	0.582
Javeline	0.370	3.929	0.137	0.301	5.088	0.091	-0.368	9.941	0.135
1500m	-0.210	1.261	0.044	0.569	18.105	0.323	0.665	32.514	0.443

Supplementary continuous variables

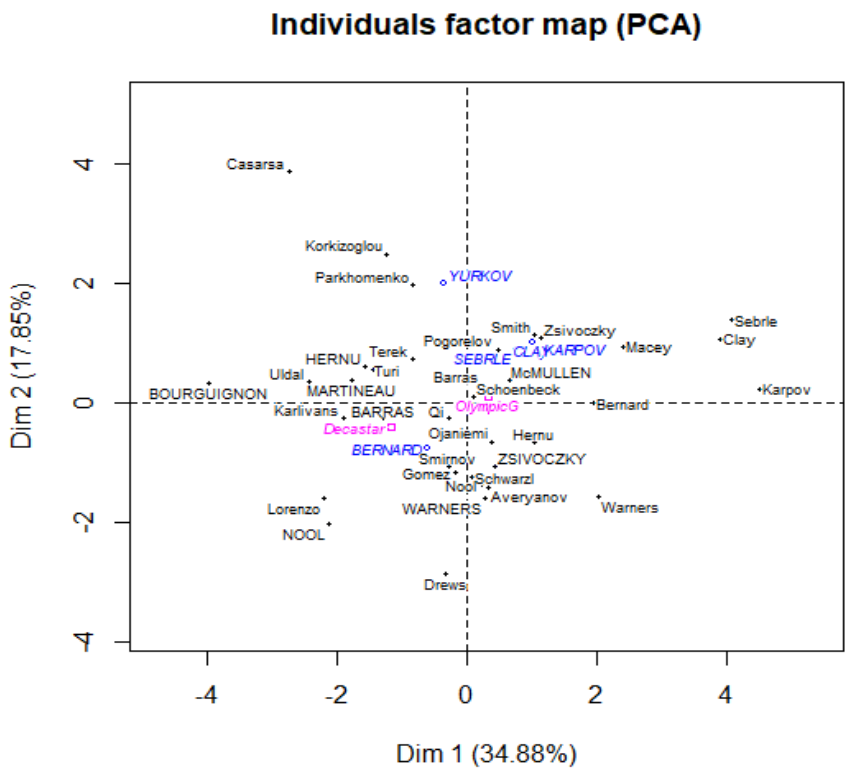
	Dim.1	cos2	Dim.2	cos2	Dim.3	cos2
Rank	-0.712	0.507	0.157	0.025	-0.028	0.001
Points	0.970	0.941	-0.035	0.001	0.035	0.001

Supplementary categories

	Dist	Dim.1	cos2	v.test	Dim.2	cos2	v.test	Dim.3	cos2	v.test
Decastar	1.490	-1.170	0.616	-1.981	-0.402	0.073	-0.951	-0.082	0.003	-0.224
OlympicG	0.426	0.334	0.616	1.981	0.115	0.073	0.951	0.024	0.003	0.224

```
>
```

```
plot (res , shadow = TRUE , cex = .6)
```



*** noir : Individu Active * bleu : Individu supplémentaire * Rose : modalité des variables qualitative*

Multiple Correspondence Analysis (MCA)

Description :

Effectue une analyse de correspondance multiple (MCA) avec individuels, des variables quantitatives supplémentaires et variables catégoriques supplémentaires.

Effectue également une analyse de correspondance multiple spécifique avec catégories supplémentaires et variables catégoriques supplémentaires.

Les valeurs manquantes sont traitées comme un niveau supplémentaire, les catégories qui sont rares peuvent être ventilées

Usage :

MCA (X, NCP = 5, IND. sup = null, quanti. sup = null, quali. sup = null, excl = null, Graph = true, Level. Ventil = 0, axes = c (1,2), Row. w = null,

Method = "indicateur", na. Method = "ND", Tab. Disj = null)

```
## Tea example
     > data(tea)
     > res.mca <- MCA(tea,quanti.sup=19,quali.sup=20:36)
     > summary(res.mca)
```

```
> data(tea)
>       res.mca <- MCA(tea,quanti.sup=19,quali.sup=20:36)
>       summary(res.mca)

Call:
MCA(X = tea, quanti.sup = 19, quali.sup = 20:36)


Eigenvalues
                       Dim.1   Dim.2   Dim.3   Dim.4   Dim.5   Dim.6   Dim.7   Dim.8   Dim.9  Dim.10  Dim.11  Dim.12  Dim.13  Dim.14  Dim.15  Dim.16  Dim.17  Dim.18
Variance               0.148   0.122   0.090   0.078   0.074   0.071   0.068   0.065   0.062   0.059   0.057   0.054   0.052   0.049   0.048   0.047   0.046   0.040
% of var.              9.885   8.103   6.001   5.204   4.917   4.759   4.522   4.355   4.123   3.902   3.805   3.628   3.462   3.250   3.221   3.127   3.037   2.683
Cumulative % of var.   9.885  17.988  23.989  29.192  34.109  38.868  43.390  47.745  51.867  55.769  59.574  63.202  66.664  69.914  73.135  76.262  79.298  81.982
                      Dim.19  Dim.20  Dim.21  Dim.22  Dim.23  Dim.24  Dim.25  Dim.26  Dim.27
Variance               0.038   0.037   0.036   0.035   0.031   0.029   0.027   0.021   0.017
% of var.              2.541   2.438   2.378   2.323   2.055   1.915   1.821   1.407   1.139
Cumulative % of var.  84.523  86.961  89.339  91.662  93.717  95.633  97.454  98.861 100.000


Individuals (the 10 first)
                  Dim.1    ctr   cos2    Dim.2    ctr   cos2    Dim.3    ctr   cos2
1              | -0.541  0.658  0.143 | -0.149  0.061  0.011 | -0.306  0.347  0.046 |
2              | -0.361  0.293  0.133 | -0.078  0.017  0.006 | -0.633  1.483  0.409 |
3              |  0.073  0.012  0.003 | -0.169  0.079  0.018 |  0.246  0.224  0.038 |
4              | -0.572  0.735  0.235 |  0.018  0.001  0.000 |  0.203  0.153  0.030 |
5              | -0.253  0.144  0.079 | -0.118  0.038  0.017 |  0.006  0.000  0.000 |
6              | -0.684  1.053  0.231 |  0.032  0.003  0.001 | -0.018  0.001  0.000 |
7              | -0.111  0.027  0.022 | -0.182  0.090  0.059 | -0.207  0.159  0.077 |
8              | -0.210  0.099  0.043 | -0.068  0.013  0.004 | -0.421  0.655  0.174 |
9              |  0.118  0.031  0.012 |  0.229  0.144  0.044 | -0.538  1.070  0.244 |
10             |  0.258  0.150  0.045 |  0.478  0.627  0.156 | -0.482  0.861  0.158 |

Categories (the 10 first)
                  Dim.1    ctr   cos2 v.test    Dim.2    ctr   cos2 v.test    Dim.3    ctr   cos2 v.test
breakfast      |  0.166  0.495  0.025  2.756 | -0.166  0.607  0.026 -2.764 | -0.483  6.900  0.215 -8.017 |
Not.breakfast  | -0.153  0.457  0.025 -2.756 |  0.154  0.560  0.026  2.764 |  0.445  6.369  0.215  8.017 |
Not.tea time   | -0.498  4.053  0.192 -7.578 |  0.093  0.174  0.007  1.423 |  0.265  1.886  0.054  4.027 |
tea time       |  0.386  3.142  0.192  7.578 | -0.072  0.135  0.007 -1.423 | -0.205  1.462  0.054 -4.027 |
evening        |  0.319  1.307  0.053  3.985 | -0.058  0.053  0.002 -0.728 |  0.451  4.312  0.106  5.640 |
Not.evening    | -0.167  0.683  0.053 -3.985 |  0.030  0.028  0.002  0.728 | -0.236  2.254  0.106 -5.640 |
lunch          |  0.659  2.385  0.075  4.722 | -0.390  1.018  0.026 -2.793 |  0.301  0.822  0.016  2.160 |
Not.lunch      | -0.113  0.410  0.075 -4.722 |  0.067  0.175  0.026  2.793 | -0.052  0.141  0.016 -2.160 |
dinner         | -0.661  1.146  0.033 -3.136 |  0.796  2.025  0.048  3.774 |  0.535  1.235  0.022  2.537 |
Not.dinner     |  0.050  0.086  0.033  3.136 | -0.060  0.152  0.048 -3.774 | -0.040  0.093  0.022 -2.537 |
```

Categorical variables (eta2)

	Dim.1	Dim.2	Dim.3
breakfast	0.025	0.026	0.215
tea.time	0.192	0.007	0.054
evening	0.053	0.002	0.106
lunch	0.075	0.026	0.016
dinner	0.033	0.048	0.022
always	0.045	0.001	0.101
home	0.005	0.000	0.134
work	0.112	0.043	0.005
tearoom	0.372	0.022	0.008
friends	0.243	0.015	0.103

Supplementary categories (the 10 first)

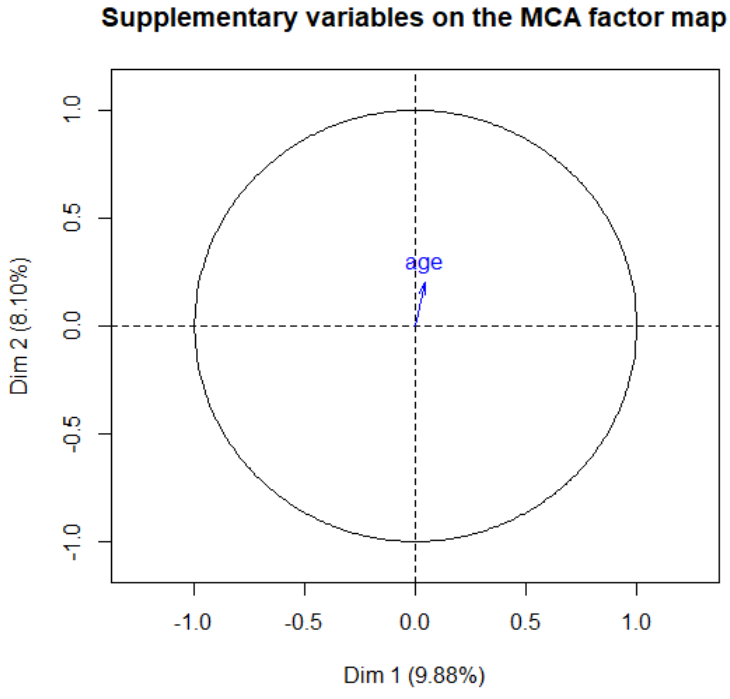
	Dim.1	cos2	v.test	Dim.2	cos2	v.test	Dim.3	cos2	v.test
F	0.151	0.033	3.158	-0.109	0.017	-2.278	-0.048	0.003	-0.998
M	-0.221	0.033	-3.158	0.159	0.017	2.278	0.070	0.003	0.998
employee	-0.153	0.006	-1.313	-0.151	0.006	-1.289	0.103	0.003	0.884
middle	-0.030	0.000	-0.205	0.336	0.017	2.281	-0.284	0.012	-1.928
non-worker	-0.036	0.000	-0.324	0.185	0.009	1.666	-0.291	0.023	-2.620
other worker	0.040	0.000	0.187	0.013	0.000	0.061	-0.063	0.000	-0.289
senior	0.415	0.023	2.608	0.072	0.001	0.452	-0.187	0.005	-1.177
student	0.032	0.000	0.305	-0.317	0.031	-3.022	0.394	0.047	3.760
workman	-0.417	0.007	-1.473	0.249	0.003	0.878	0.343	0.005	1.209
Not.sportsman	-0.030	0.001	-0.426	0.018	0.000	0.260	-0.051	0.002	-0.721

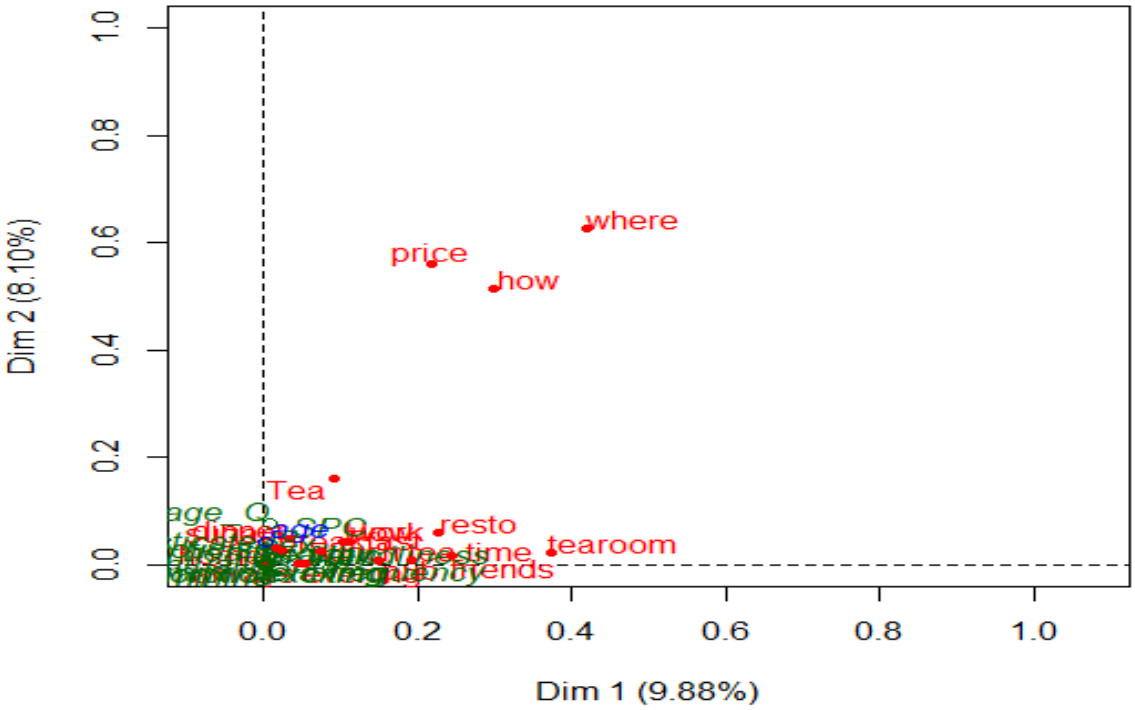
Supplementary categorical variables (eta2)

	Dim.1	Dim.2	Dim.3
sex	0.033	0.017	0.003
SPC	0.032	0.053	0.076
Sport	0.001	0.000	0.002
age_Q	0.008	0.077	0.146
frequency	0.094	0.006	0.064
escape.exoticism	0.000	0.007	0.000
spirituality	0.005	0.000	0.016
healthy	0.000	0.000	0.008
diuretic	0.004	0.000	0.013

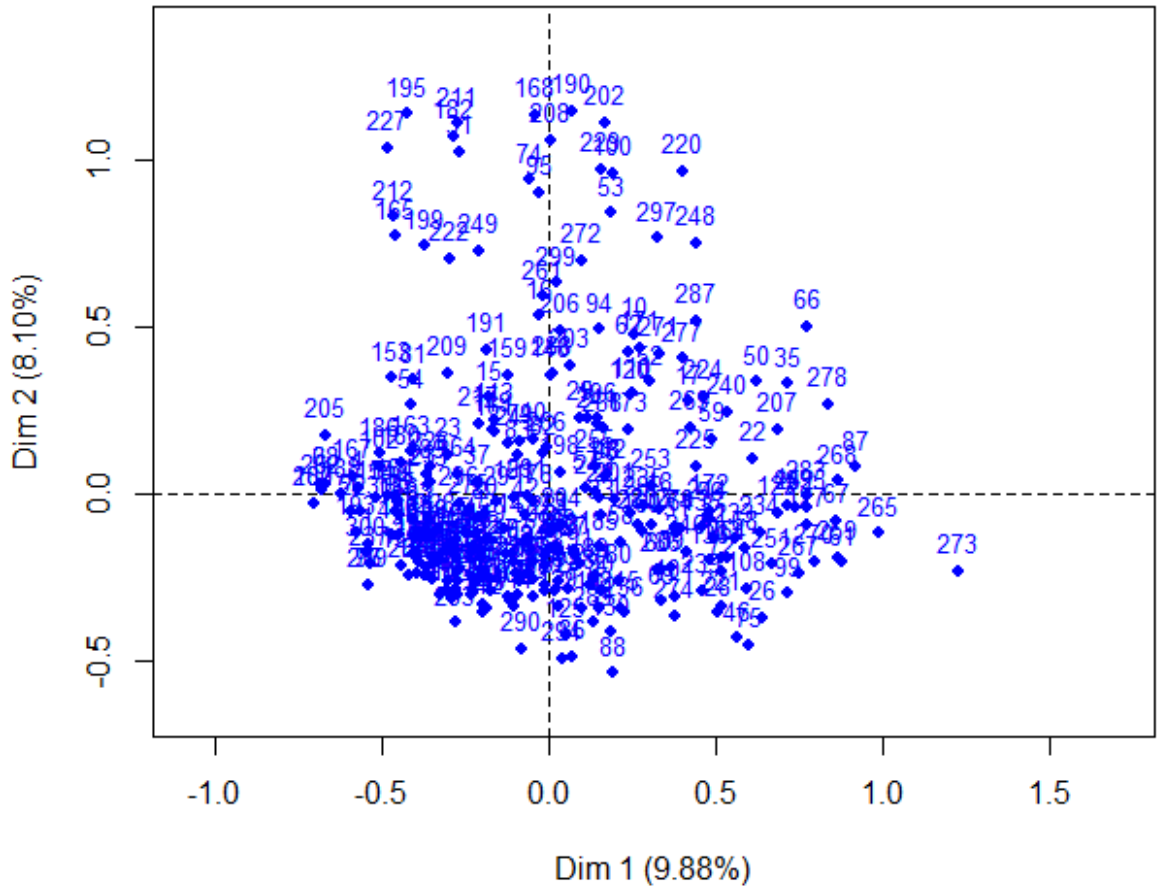
Supplementary continuous variable

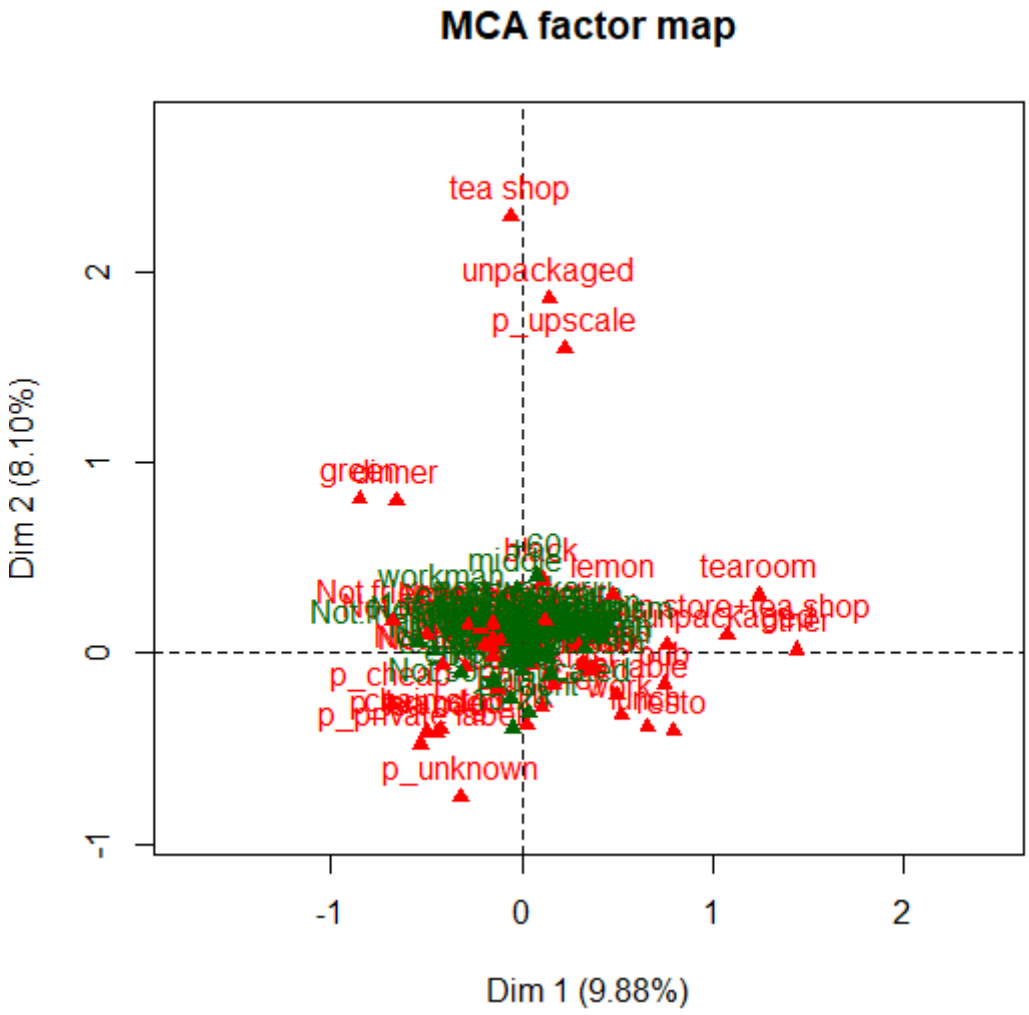
	Dim.1	Dim.2	Dim.3
age	0.042	0.204	-0.340





MCA factor map





Multiple Factor Analysis (MFA)

Description:

Effectue l'analyse factorielle multiple dans le sens de Escofier-pages

avec des personnes supplémentaires et des groupes

Variables. Les groupes de variables peuvent être quantitatifs, catégoriques ou

tables de contingence.

Une analyse multiple spécifique de FAC Tor peut être effectuée à l'aide

argument excl.

Les valeurs manquantes dans les variables numériques sont remplacées par la colonne Veux dire.

Les valeurs manquantes dans les variables catégoriques sont traitées comme un niveau supplémentaire.

Usage :

MFA (base, groupe, type = Rep ("s", longueur (groupe)), excl = null, IND. sup = null, NCP = 5, Name. Group = null, num. Group. sup = null, Graph = true, poids. col. AMF = null, Row. w = null, axes = c (1,2), Tab. COMP = null)

```
> data(wine)
>       res <- MFA(wine, group=c(2,5,3,10,9,2), type=c("n",rep("s",5)),
+           ncp=5, name.group=c("orig","olf","vis","olfag","gust","ens"),
+           num.group.sup=c(1,6))
>       summary(res)

Call:
MFA(base = wine, group = c(2, 5, 3, 10, 9, 2), type = c("n",
     rep("s", 5)), ncp = 5, name.group = c("orig", "olf", "vis",
     "olfag", "gust", "ens"), num.group.sup = c(1, 6))


Eigenvalues
                       Dim.1   Dim.2   Dim.3   Dim.4   Dim.5   Dim.6   Dim.7   Dim.8   Dim.9  Dim.10  Dim.11  Dim.12  Dim.13  Dim.14  Dim.15  Dim.16  Dim.17  Dim.18
Variance               3.462   1.367   0.615   0.372   0.270   0.202   0.176   0.126   0.105   0.079   0.074   0.060   0.029   0.022   0.019   0.011   0.009   0.006
% of var.             49.378  19.494   8.778   5.309   3.857   2.887   2.506   1.796   1.502   1.124   1.054   0.861   0.409   0.313   0.273   0.156   0.131   0.091
Cumulative % of var.  49.378  68.873  77.651  82.960  86.816  89.703  92.209  94.005  95.506  96.630  97.684  98.545  98.954  99.268  99.541  99.697  99.827  99.918
                       Dim.19  Dim.20
Variance               0.003   0.002
% of var.              0.047   0.035
Cumulative % of var.  99.965 100.000

Groups
                            Dim.1    ctr   cos2    Dim.2    ctr   cos2    Dim.3    ctr   cos2
olf                     |  0.782 22.591  0.380 |  0.620 45.346  0.239 |  0.374 60.695  0.087 |
vis                     |  0.855 24.688  0.728 |  0.040  2.937  0.002 |  0.014  2.337  0.000 |
olfag                   |  0.925 26.712  0.625 |  0.469 34.309  0.161 |  0.180 29.263  0.024 |
gust                    |  0.900 26.009  0.722 |  0.238 17.408  0.050 |  0.047  7.705  0.002 |

Supplementary groups
                          Dim.1  cos2   Dim.2  cos2   Dim.3  cos2
orig                    | 0.296 0.033 | 0.643 0.156 | 0.196 0.015 |
ens                     | 0.619 0.380 | 0.254 0.064 | 0.010 0.000 |
```

Groups

	Dim.1	ctr	cos2	Dim.2	ctr	cos2	Dim.3	ctr	cos2
olf	0.782	22.591	0.380	0.620	45.346	0.239	0.374	60.695	0.087
vis	0.855	24.688	0.728	0.040	2.937	0.002	0.014	2.337	0.000
olfag	0.925	26.712	0.625	0.469	34.309	0.161	0.180	29.263	0.024
gust	0.900	26.009	0.722	0.238	17.408	0.050	0.047	7.705	0.002

Supplementary groups

	Dim.1	cos2	Dim.2	cos2	Dim.3	cos2
orig	0.296	0.033	0.643	0.156	0.196	0.015
ens	0.619	0.380	0.254	0.064	0.010	0.000

Individuals (the 10 first)

	Dim.1	ctr	cos2	Dim.2	ctr	cos2	Dim.3	ctr	cos2
2EL	0.239	0.078	0.016	-0.797	2.211	0.182	0.936	6.775	0.250
1CHA	-2.045	5.751	0.419	-1.383	6.667	0.192	1.514	17.725	0.229
1FON	-1.220	2.048	0.367	-0.459	0.734	0.052	0.062	0.030	0.001
1VAU	-4.381	26.404	0.874	0.995	3.446	0.045	-0.033	0.009	0.000
1DAM	2.696	9.996	0.754	-0.120	0.050	0.002	-0.690	3.683	0.049
2BOU	0.869	1.038	0.219	-0.326	0.371	0.031	0.391	1.183	0.044
1BOI	1.553	3.318	0.617	-0.280	0.272	0.020	-0.414	1.324	0.044
3EL	0.129	0.023	0.003	0.789	2.167	0.115	1.858	26.707	0.636
DOM1	-0.066	0.006	0.002	-0.253	0.222	0.027	-0.459	1.629	0.090
1TUR	-1.202	1.987	0.310	-0.375	0.489	0.030	-0.716	3.964	0.110

Continuous variables (the 10 first)

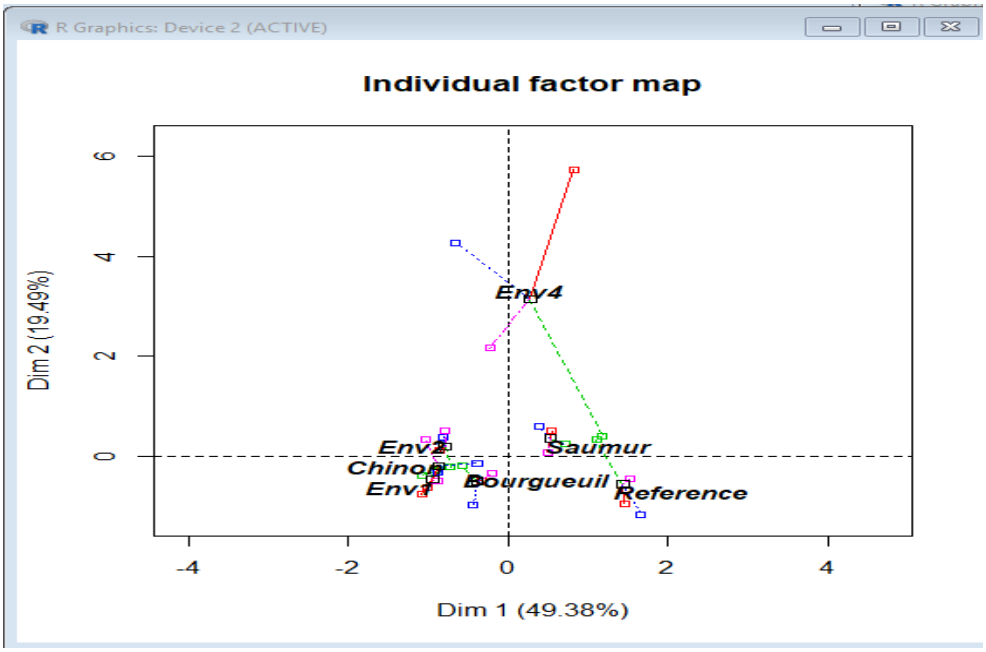
	Dim.1	ctr	cos2	Dim.2	ctr	cos2	Dim.3	ctr	cos2
Odor.Intensity.before.shaking	0.591	4.497	0.349	0.667	14.530	0.445	-0.023	0.039	0.001
Aroma.quality.before.shaking	0.835	8.989	0.698	-0.075	0.186	0.006	-0.354	9.092	0.125
Fruity.before.shaking	0.716	6.606	0.513	-0.151	0.741	0.023	-0.537	20.939	0.289
Flower.before.shaking	0.439	2.480	0.192	-0.409	5.469	0.168	0.637	29.439	0.406
Spice.before.shaking	0.038	0.019	0.001	0.865	24.420	0.748	0.128	1.187	0.016
Visual.intensity	0.881	7.912	0.776	0.238	1.466	0.057	0.141	1.139	0.020
Nuance	0.862	7.577	0.744	0.234	1.408	0.055	0.142	1.155	0.020
Surface.feeling	0.950	9.198	0.903	0.049	0.063	0.002	-0.027	0.043	0.001
Odor.Intensity	0.627	2.416	0.393	0.576	5.155	0.331	0.214	1.581	0.046
Quality.of.odour	0.791	3.844	0.626	-0.410	2.612	0.168	-0.221	1.684	0.049

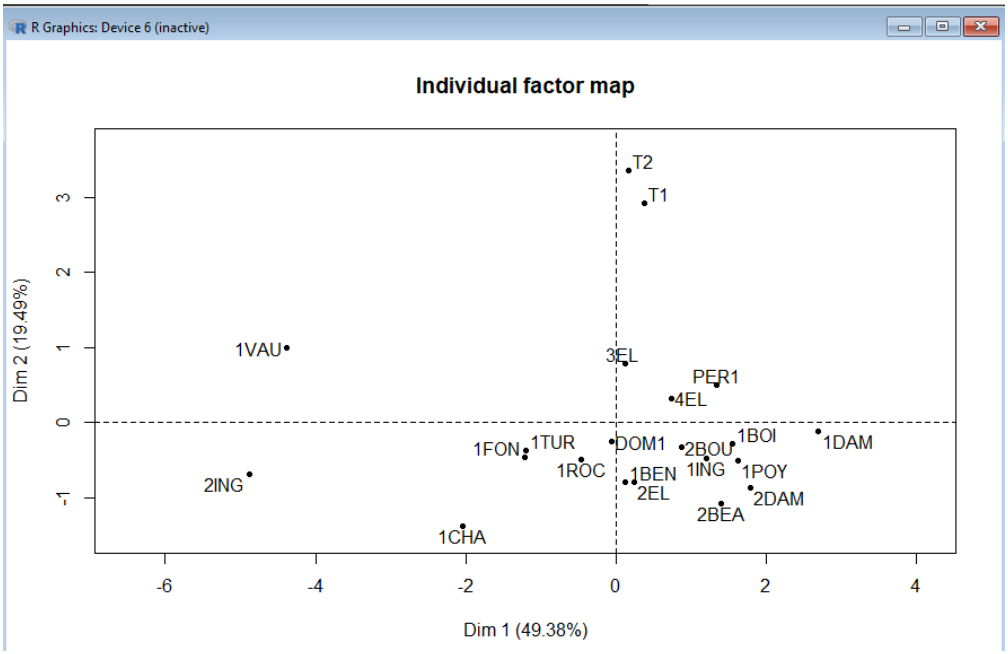
Supplementary continuous variables

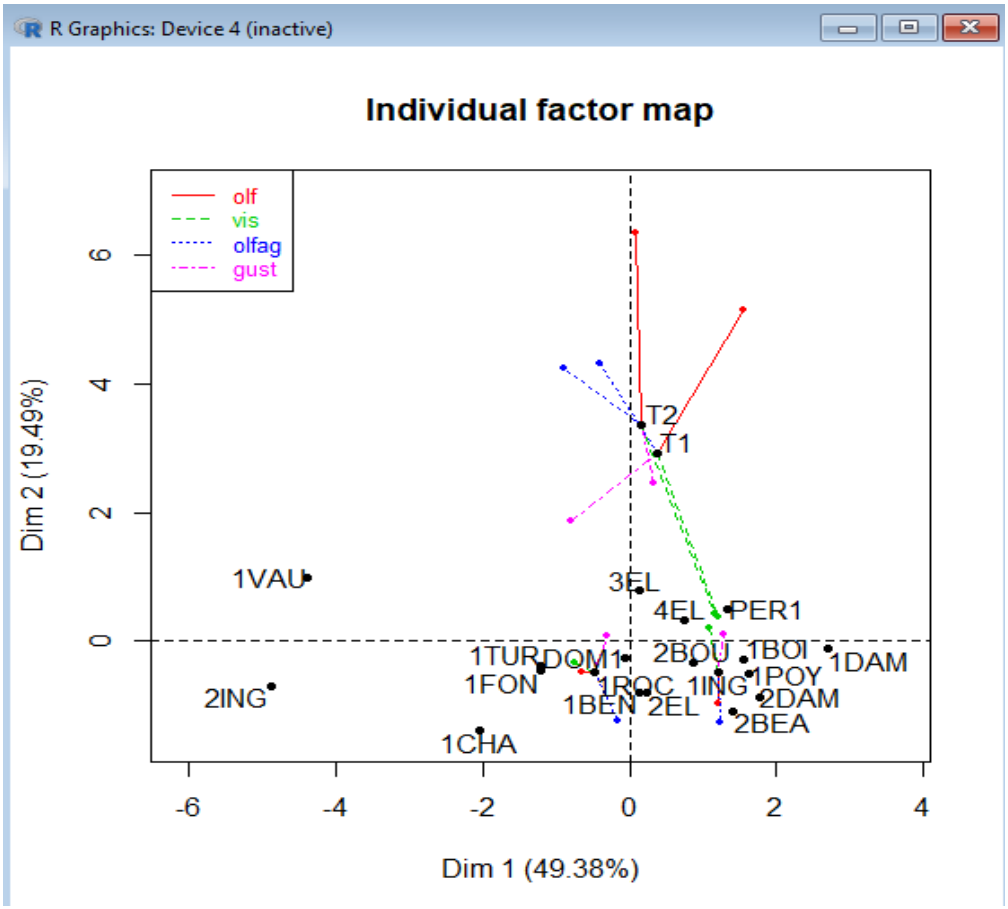
	Dim.1	cos2	Dim.2	cos2	Dim.3	cos2
Overall.quality	0.747	0.558	-0.504	0.254	0.130	0.017
Typical	0.766	0.586	-0.466	0.217	0.039	0.001

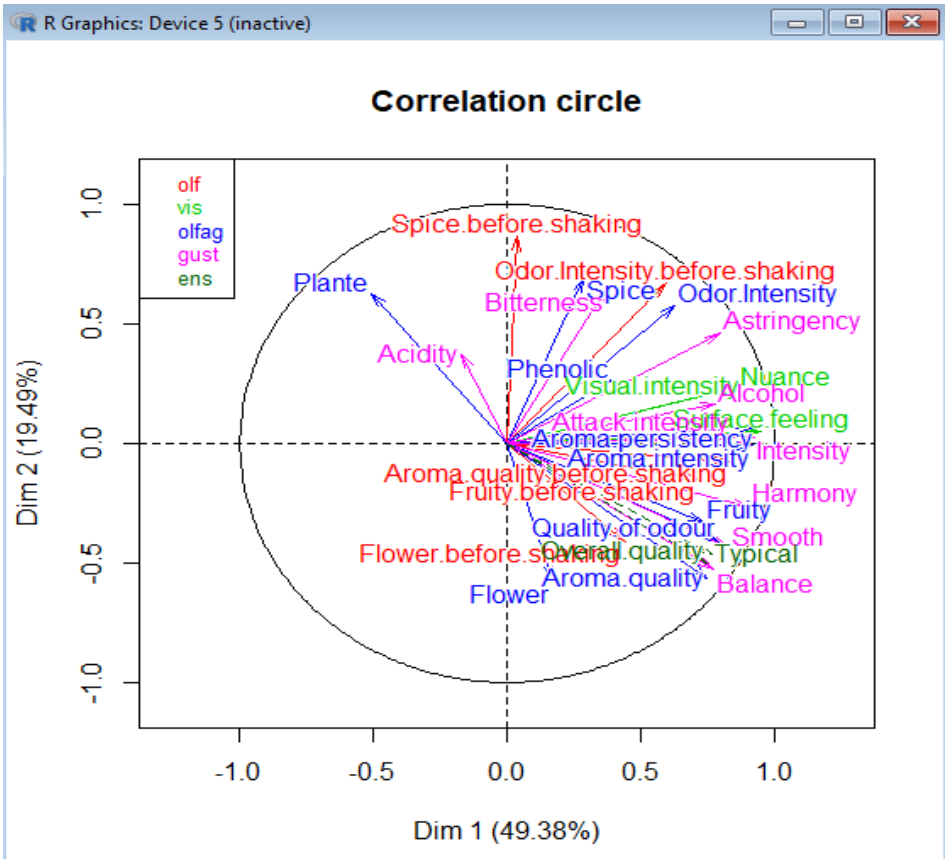
Supplementary categories

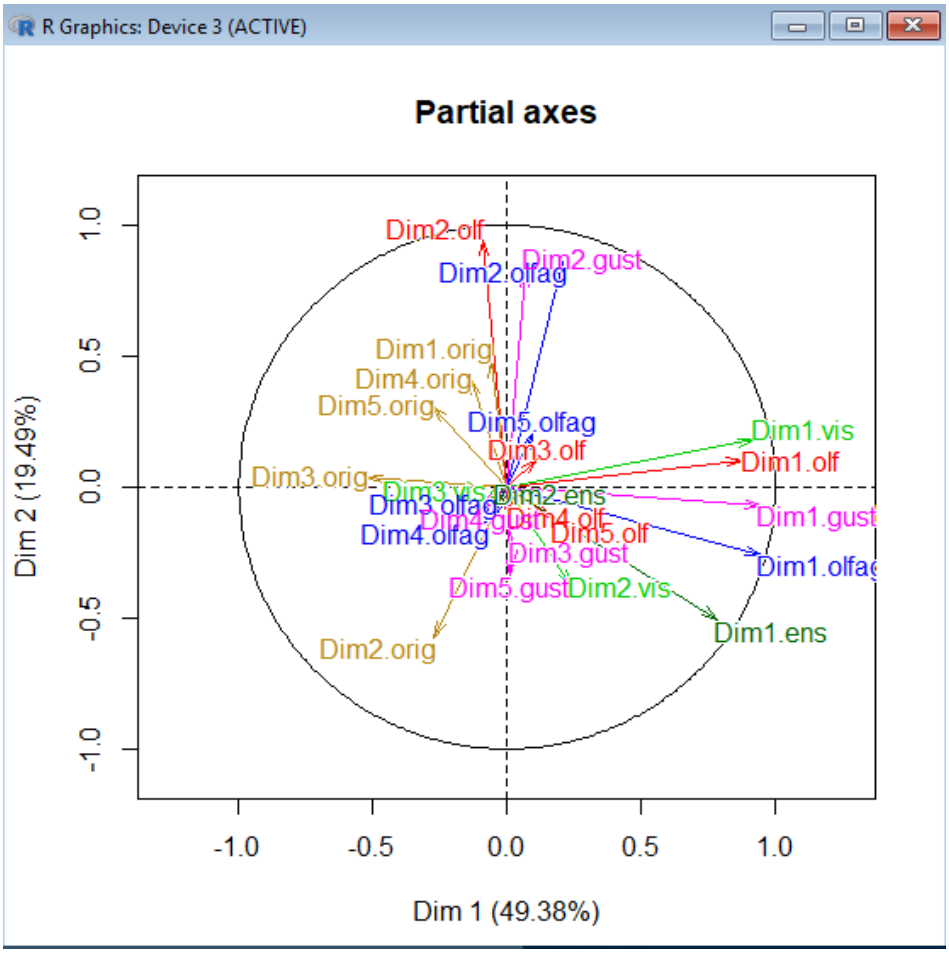
	Dim.1	cos2	v.test	Dim.2	cos2	v.test	Dim.3	cos2	v.test
Saumur	0.533	0.483	1.343	0.350	0.209	1.405	0.235	0.094	1.404
Bourgueuil	-0.392	0.176	-0.596	-0.504	0.291	-1.219	-0.216	0.054	-0.780
Chinon	-0.877	0.537	-1.022	-0.207	0.030	-0.384	-0.322	0.072	-0.889
Reference	1.437	0.823	2.442	-0.567	0.128	-1.534	-0.164	0.011	-0.662
Env1	-0.949	0.614	-1.613	-0.467	0.149	-1.263	0.455	0.141	1.834
Env2	-0.794	0.554	-1.067	0.191	0.032	0.409	-0.382	0.129	-1.218
Env4	0.277	0.008	0.216	3.141	0.971	3.899	-0.062	0.000	-0.116




R Graphics: Device 6 (inactive)
Individual factor map
T2
T1
1VAU
3EL
PER1
4EL
1FON
1TUR
DOM1
2BOU
1BOI
1DAM
1ROC
1BEN
1ING
1POY
2ING
2EL
2DAM
2BEA
1CHA
Dim 2 (19.49%)
Dim 1 (49.38%)


R Graphics: Device 4 (inactive)
Individual factor map
olf
vis
olfag
gust
T2
T1
1VAU
3EL
4EL
PER1
1TUR
DOM1
2BOU
1BOI
1DAM
1FON
1ROC
1ING
1POY
2ING
1BEN
2EL
2DAM
2BEA
1CHA
Dim 2 (19.49%)
Dim 1 (49.38%)


R Graphics: Device 5 (inactive)
Correlation circle
olf
vis
olfag
gust
ens
Spice.before.shaking
Odor.Intensity.before.shaking
Plante
Spice
Odor.Intensity
Bitterness
Astringency
Acidity
Phenolic
Visual.intensity
Nuance
Alcohol
Attack.intensity
Surface.feeling
Aroma.persistency
Intensity
Aroma.intensity
Aroma.quality.before.shaking
Harmony
Fruity.before.shaking
Fruity
Quality.of.odour
Smooth
Flower.before.shaking
Overall.quality
Typical
Aroma.quality
Balance
Flower
Dim 2 (19.49%)
Dim 1 (49.38%)
1.0
0.5
0.0
-0.5
-1.0


R Graphics: Device 3 (ACTIVE)
Partial axes
Dim2.olf
Dim2.olfag
Dim2.gust
Dim1.orig
Dim4.orig
Dim5.orig
Dim5.olfag
Dim1.vis
Dim3.olf
Dim1.olf
Dim3.orig
Dim3.vis
Dim2.ens
Dim3.olfag
Dim1.gust
Dim4.gust
Dim4.olf
Dim4.olfag
Dim5.olf
Dim1.olfag
Dim3.gust
Dim5.gust
Dim2.vis
Dim1.ens
Dim2.orig
Dim 2 (19.49%)
Dim 1 (49.38%)
1.0
0.5
0.0
-0.5
-1.0