Devoir_6

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

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

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

```
library("corrplot")
```

```
## corrplot 0.84 loaded
```

```
library("fpc")
```

Application de CAH et K-means sur les données Dechathlon

```
# chargement des données decathlon2
data("decathlon2")
decathlon2.active <- decathlon2[1:23,1:10]
head(decathlon2.active,4)
```

```
##         X100m Long.jump Shot.put High.jump X400m X110m.hurdle Discus Pole.vault
## SEBRLE  11.04      7.58    14.83      2.07 49.81        14.69  43.75       5.02
## CLAY    10.76      7.40    14.26      1.86 49.37        14.05  50.72       4.92
## BERNARD 11.02      7.23    14.25      1.92 48.93        14.99  40.87       5.32
## YURKOV  11.34      7.09    15.19      2.10 50.42        15.31  46.26       4.72
##         Javeline X1500m
## SEBRLE     63.19  291.7
## CLAY       60.15  301.5
## BERNARD    62.77  280.1
## YURKOV     63.44  276.4
```

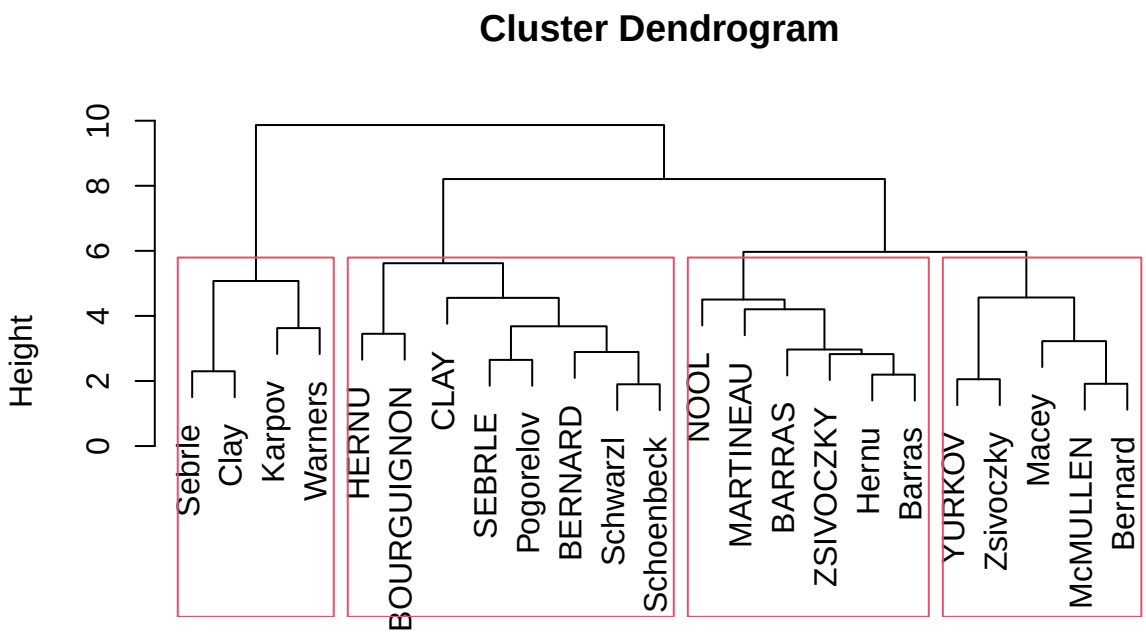
```
summary(decathlon2.active)
```

```
##      X100m         Long.jump        Shot.put       High.jump
##  Min.   :10.44   Min.   :6.800   Min.   :12.68   Min.   :1.860
##  1st Qu.:10.84   1st Qu.:7.165   1st Qu.:14.17   1st Qu.:1.940
##  Median :10.97   Median :7.310   Median :14.65   Median :2.010
##  Mean   :11.00   Mean   :7.350   Mean   :14.62   Mean   :2.007
##  3rd Qu.:11.23   3rd Qu.:7.525   3rd Qu.:15.14   3rd Qu.:2.095
##  Max.   :11.64   Max.   :7.960   Max.   :16.36   Max.   :2.150
##      X400m        X110m.hurdle       Discus        Pole.vault
##  Min.   :46.81   Min.   :13.97   Min.   :37.92   Min.   :4.400
##  1st Qu.:48.95   1st Qu.:14.17   1st Qu.:43.74   1st Qu.:4.610
##  Median :49.40   Median :14.37   Median :44.75   Median :4.820
##  Mean   :49.43   Mean   :14.53   Mean   :45.16   Mean   :4.797
##  3rd Qu.:50.02   3rd Qu.:14.94   3rd Qu.:46.93   3rd Qu.:5.000
```

```
##  Max.   :51.16   Max.   :15.67   Max.   :51.65   Max.   :5.320
##     Javeline         X1500m
##  Min.   :52.33   Min.   :262.1
##  1st Qu.:55.40   1st Qu.:268.8
##  Median :57.44   Median :278.1
##  Mean   :59.11   Mean   :277.9
##  3rd Qu.:62.98   3rd Qu.:283.6
##  Max.   :70.52   Max.   :301.5
```

Realisation d'une CAH

```
decathlon2.active.cr <- scale(decathlon2.active,center=T,scale=T)
dist.dec2 <- dist(decathlon2.active.cr)
clust.dc2 <- hclust(dist.dec2,method = "ward.D2")
plot(clust.dc2)
rect.hclust(clust.dc2,k=4)
```



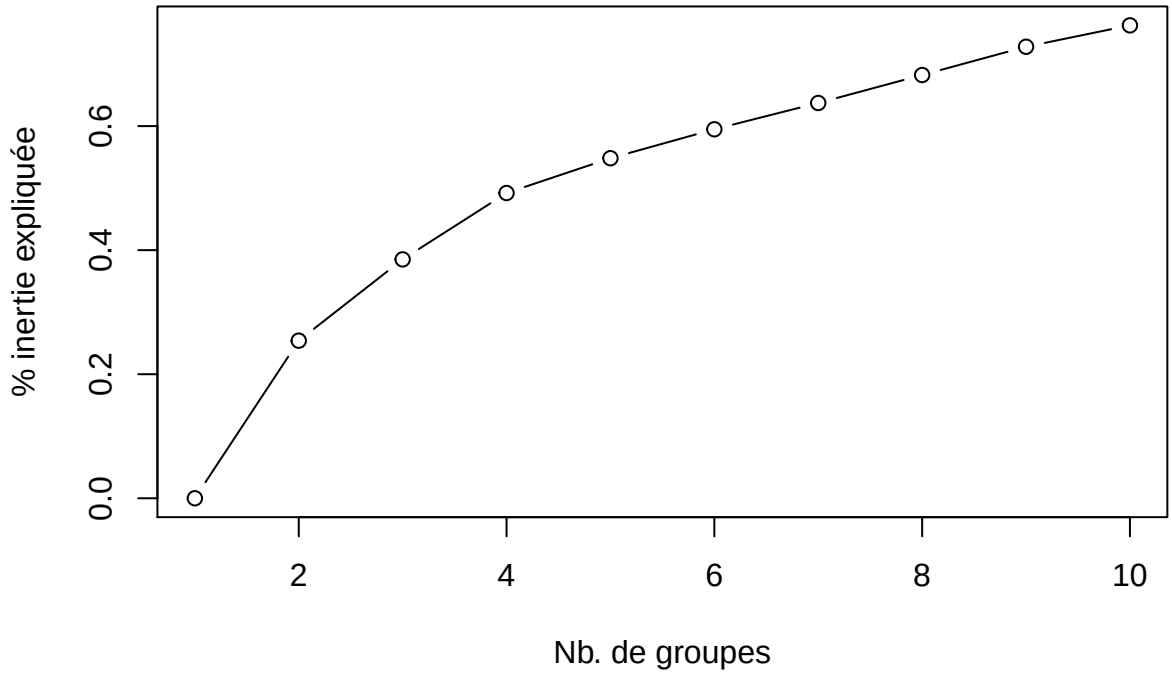

```
print(sort(cutree(clust.dc2,k=4)))
```

```
##      SEBRLE        CLAY     BERNARD       HERNU BOURGUIGNON    Schwarzl
##           1           1           1           1           1           1
##   Pogorelov  Schoenbeck      YURKOV    McMULLEN       Macey   Zsivoczky
##           1           1           2           2           2           2
##     Bernard   ZSIVOCZKY   MARTINEAU      BARRAS        NOOL       Hernu
##           2           3           3           3           3           3
##      Barras      Sebrle        Clay      Karpov     Warners
##           3           4           4           4           4
```

Le dendogramme suggere un decoupage en 4 groupes, nous verrons ensuite la methode de K-means pour trouver le nombre de decoupages (k) optimal afin de confirmer ou rejetter le nombre de decoupages trouvés

sur la methode de classification. La methode de K-means

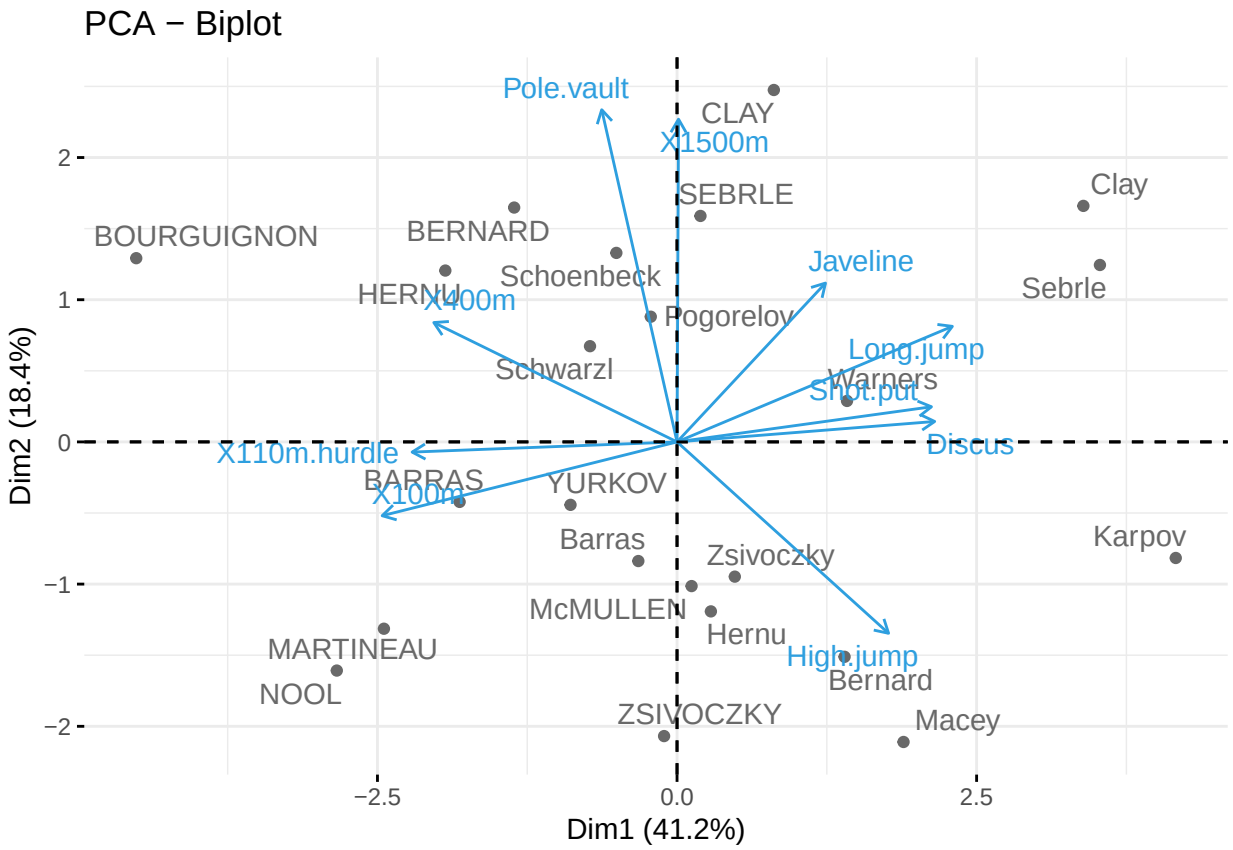
```
groupes.kmeans <- kmeans(decathlon2.active.cr,centers=4,nstart=5)
inertie <- rep(0,times=10)
for (k in 2:10){
  group <- kmeans(decathlon2.active.cr,centers = k,nstart=5)
  inertie[k] <- group$betweenss/group$totss
}
plot(1:10,inertie,type="b",xlab="Nb. de groupes",ylab="% inertie expliquée")
```



Le graphe ci - dessus montre l'evolution de la proportion d'inertie, on constate qu'a partir de k = 4 classes, l'adjonction d'un groupe supplémentaire n'augmente pas «significativement» la part d'inertie expliquée par la partition.

Construction d'un diagramme d'individus et des variables

```
res.da <- PCA(decathlon2.active,scale.unit = TRUE,graph = FALSE)
fviz_pca_biplot(res.da,repel = TRUE,col.var = "#2E9FDF", col.ind = "#696969")
```



Le biplot confirme aussi que les individus peuvent etre regrouper pour former quatre classes.