ACP_University

Moussa

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Import of dataset

```
library(readxl)
universite <- read_excel("~/GitHub/SORADATA/ACP-R/Dataset/universite.xlsx")
```

```
## New names:
## • `` -> `...1`
```

```
str(universite)
```

```
## tibble [10 × 13] (S3: tbl_df/tbl/data.frame)
##  $ ...1      : chr [1:10] "Droit, sciences politiques" "Sciences économiques, gestion" "Ad
ministration économique et sociale" "Lettres, sciences du langage, arts" ...
##  $ Licence-F : num [1:10] 69373 38387 18574 48691 62736 ...
##  $ Licence-H : num [1:10] 37317 37157 12388 17850 21291 ...
##  $ Master-F  : num [1:10] 42371 29466 4183 17672 13186 ...
##  $ Master-H  : num [1:10] 21693 26929 2884 5853 3874 ...
##  $ Doctorat-F: num [1:10] 4029 1983 0 4531 1839 ...
##  $ Doctorat-H: num [1:10] 4342 2552 0 2401 907 ...
##  $ Total-F   : num [1:10] 115773 69836 22757 70894 77761 ...
##  $ Total-H   : num [1:10] 63352 66638 15272 26104 26072 ...
##  $ Licence   : num [1:10] 106690 75544 30962 66541 84027 ...
##  $ Master    : num [1:10] 64064 56395 7067 23525 17060 ...
##  $ Doctorat  : num [1:10] 8371 4535 0 6932 2746 ...
##  $ Total     : num [1:10] 179125 136474 38029 96998 103833 ...
```

Les statistiques descriptives

```
summary(universite)
```

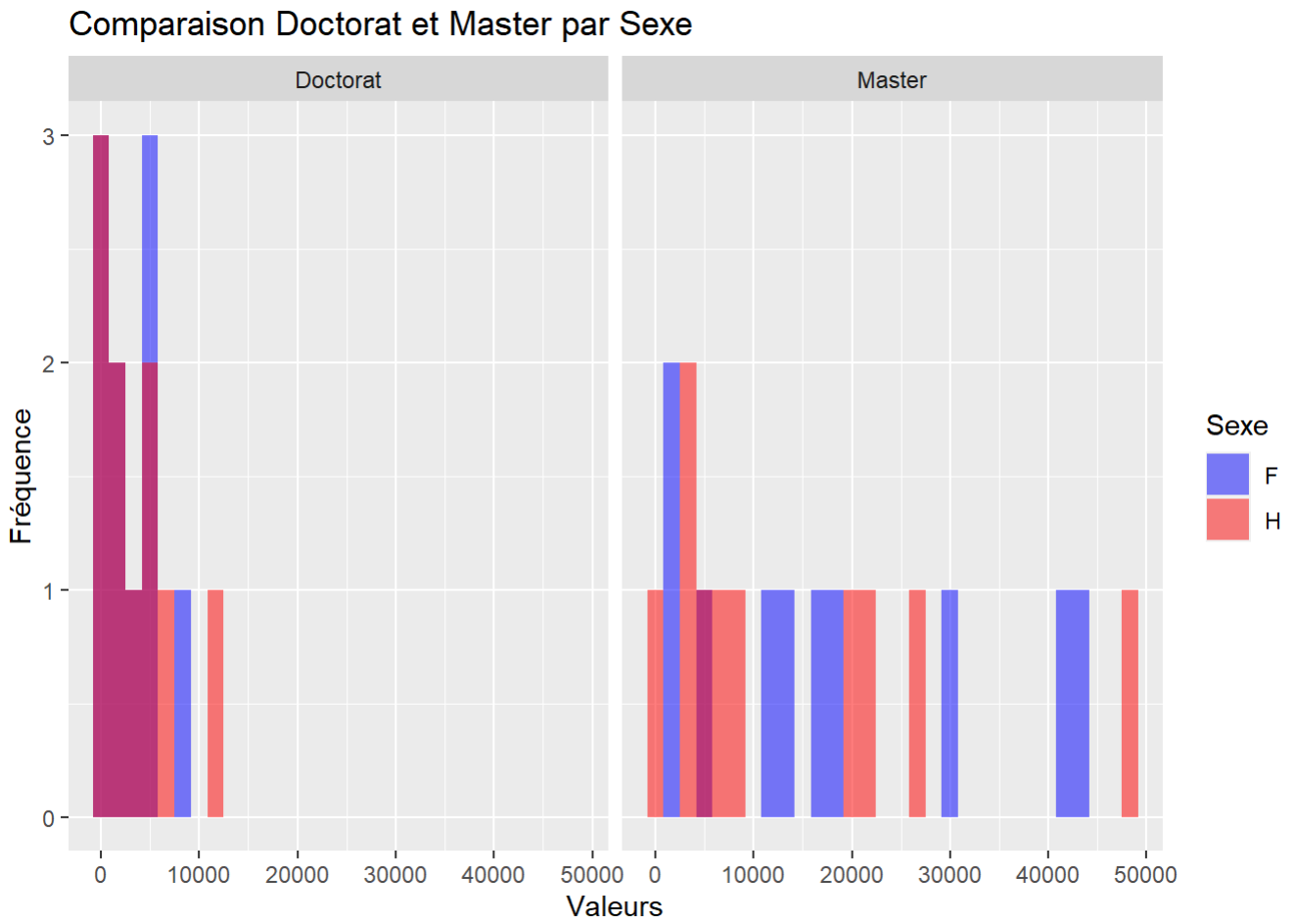
```
##      ...1             Licence-F       Licence-H        Master-F
##  Length:10          Min.   : 1779   Min.   :  726   Min.   : 1963
##  Class :character   1st Qu.:19570   1st Qu.:15566   1st Qu.: 5910
##  Mode  :character   Median :31353   Median :19571   Median :15132
##                     Mean   :38901   Mean   :25490   Mean   :18238
##                     3rd Qu.:59225   3rd Qu.:37277   3rd Qu.:26518
##                     Max.   :94346   Max.   :54861   Max.   :43016
##     Master-H       Doctorat-F       Doctorat-H         Total-F
##  Min.   :  811   Min.   :   0.0   Min.   :    0.0   Min.   :  4148
##  1st Qu.: 3948   1st Qu.: 600.8   1st Qu.:  472.8   1st Qu.: 27330
##  Median : 7155   Median :3006.0   Median : 2476.5   Median : 56940
##  Mean   :14341   Mean   :3041.8   Mean   : 3424.0   Mean   : 60181
##  3rd Qu.:21382   3rd Qu.:4500.0   3rd Qu.: 5009.5   3rd Qu.: 76044
##  Max.   :48293   Max.   :7787.0   Max.   :11491.0   Max.   :145149
##     Total-H          Licence           Master         Doctorat
##  Min.   :  1552   Min.   :  2505   Min.   : 3167   Min.   :    0
##  1st Qu.: 22833   1st Qu.: 33052   1st Qu.: 9565   1st Qu.: 1074
##  Median : 27399   Median : 71043   Median :21536   Median : 5734
##  Mean   : 43255   Mean   : 64391   Mean   :32579   Mean   : 6466
##  3rd Qu.: 65817   3rd Qu.: 82375   3rd Qu.:61696   3rd Qu.:10248
##  Max.   :114645   Max.   :135396   Max.   :65371   Max.   :15898
##      Total
##  Min.   :  5700
##  1st Qu.: 45957
##  Median :100416
##  Mean   :103436
##  3rd Qu.:153135
##  Max.   :213618
```

```
aggregate(Master~Doctorat, data = universite, FUN = mean)
```

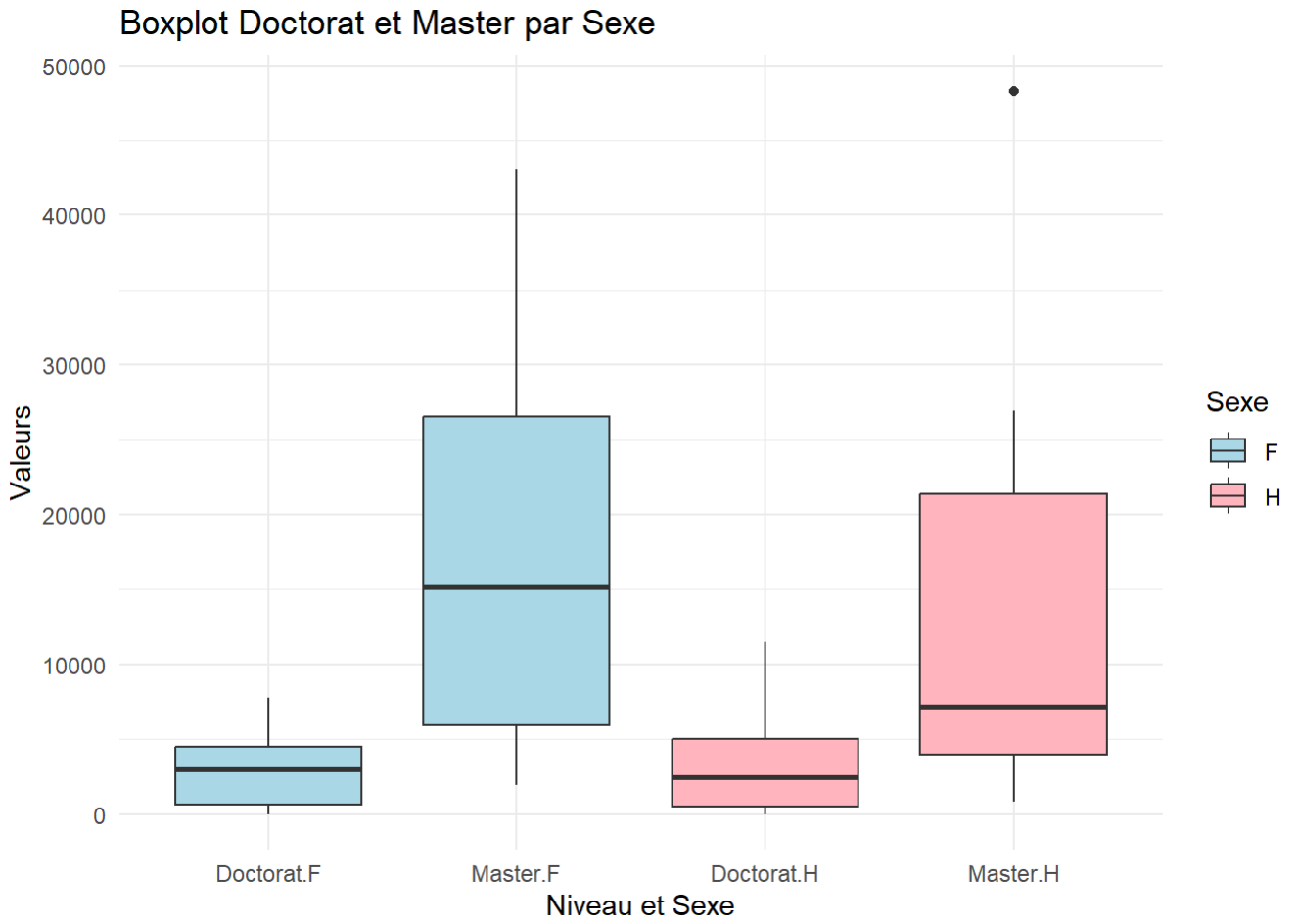
```
##    Doctorat Master
## 1         0   7067
## 2        28   3167
## 3       516   6135
## 4      2746  17060
## 5      4535  56395
## 6      6932  23525
## 7      8371  64064
## 8     10873  19547
## 9     14759  63463
## 10    15898  65371
```

```r
library(ggplot2)

# Préparer les données pour ggplot
universite_long <- tidyr::pivot_longer(universite, cols = c(`Doctorat-F`, `Doctorat-H`, `Mast
er-F`, `Master-H`),
                                       names_to = c("Niveau", "Sexe"), names_sep = "-", value
s_to = "Valeurs")

# Créer l'histogramme avec ggplot pour Doctorat et Master
ggplot(universite_long, aes(x = Valeurs, fill = Sexe)) +
  geom_histogram(alpha = 0.5, position = "identity") +
  facet_wrap(~Niveau) +
  labs(title = "Comparaison Doctorat et Master par Sexe", x = "Valeurs", y = "Fréquence") +
  scale_fill_manual(values = c("blue", "red", "green", "orange"))
```

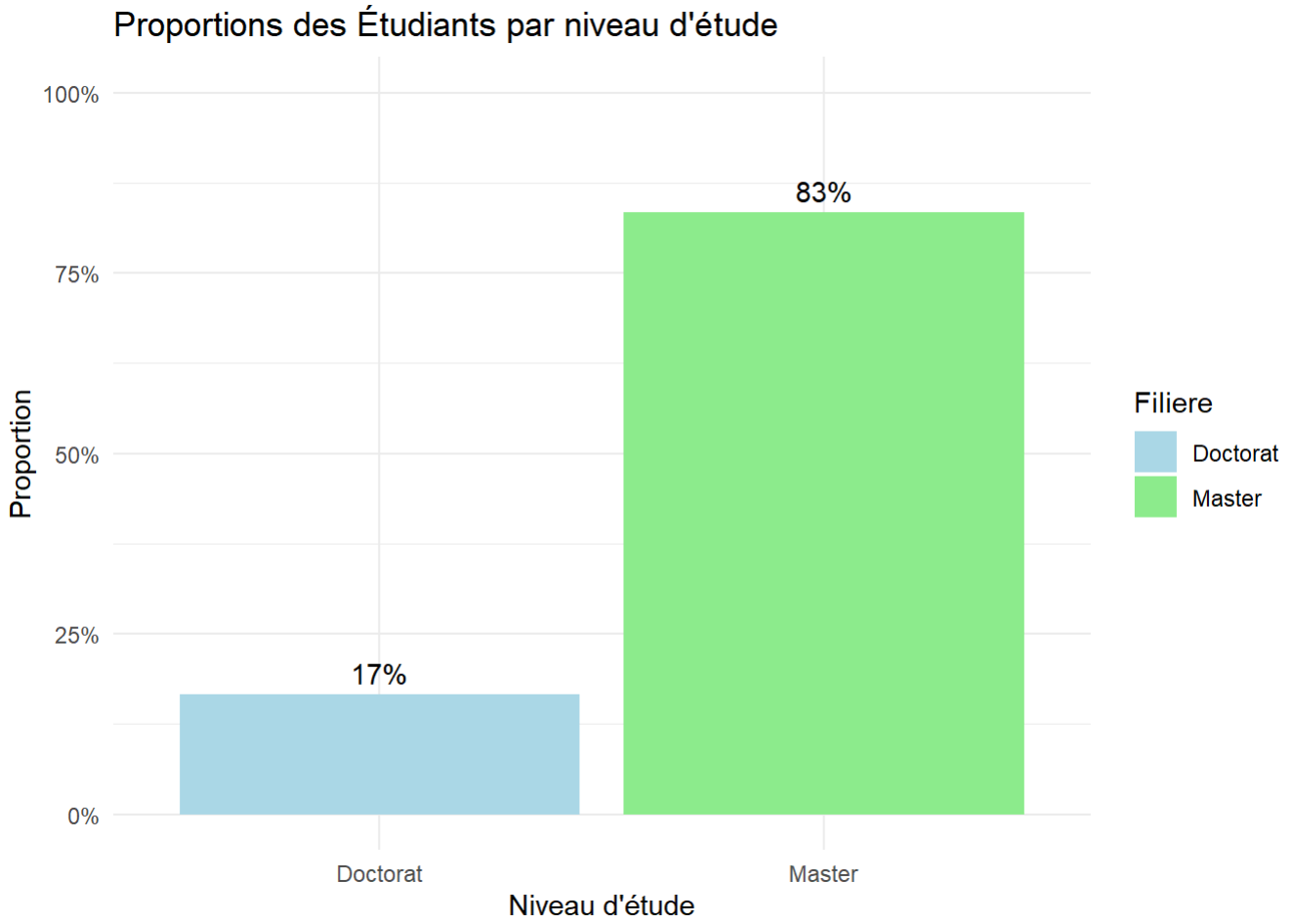
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



```r
library(ggplot2)

# Préparer les données au format long
universite_long <- tidyr::pivot_longer(universite, cols = c(`Doctorat-F`, `Doctorat-H`, `Master-F`, `Master-H`),
                                       names_to = c("Niveau", "Sexe"), names_sep = "-", values_to = "Valeurs")

# Créer le boxplot avec ggplot
ggplot(universite_long, aes(x = interaction(Niveau, Sexe), y = Valeurs, fill = Sexe)) +
  geom_boxplot() +
  labs(title = "Boxplot Doctorat et Master par Sexe", x = "Niveau et Sexe", y = "Valeurs") +
  scale_fill_manual(values = c("lightblue", "lightpink")) +
  theme_minimal()
```



```r
# Calculer le total pour chaque filière
total_doctorat <- sum(universite$`Doctorat-F`) + sum(universite$`Doctorat-H`)
total_master <- sum(universite$`Master-F`) + sum(universite$`Master-H`)

# Calculer le total général
total_global <- total_doctorat + total_master

# Calculer les proportions
proportion_doctorat <- total_doctorat / total_global
proportion_master <- total_master / total_global

# Créer un vecteur des proportions
proportions <- c(proportion_doctorat, proportion_master)

# Créer un vecteur des noms des filières
filieres <- c("Doctorat", "Master")
library(ggplot2)

# Préparer les données dans un data frame
proportions_df <- data.frame(
  Filiere = filieres,
  Proportion = proportions
)

# Créer le barplot avec ggplot2
ggplot(proportions_df, aes(x = Filiere, y = Proportion, fill = Filiere)) +
  geom_bar(stat = "identity") +
  scale_y_continuous(labels = scales::percent, limits = c(0, 1)) +
  labs(title = "Proportions des Étudiants par niveau d'étude", x = "Niveau d'étude", y = "Pro
portion") +
  scale_fill_manual(values = c("lightblue", "lightgreen")) +
  theme_minimal() +
  geom_text(aes(label = scales::percent(Proportion)), vjust = -0.5)
```



ACP via FactomineR

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

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

```
# Sélectionner uniquement les colonnes numériques
numerical_vars <- sapply(universite, is.numeric)

# Créer un sous-data frame avec uniquement les colonnes numériques
universite_numeric <- universite[, numerical_vars]
```

```
resultat_ACP<-PCA(universite_numeric, graph = FALSE)
print(resultat_ACP)
```

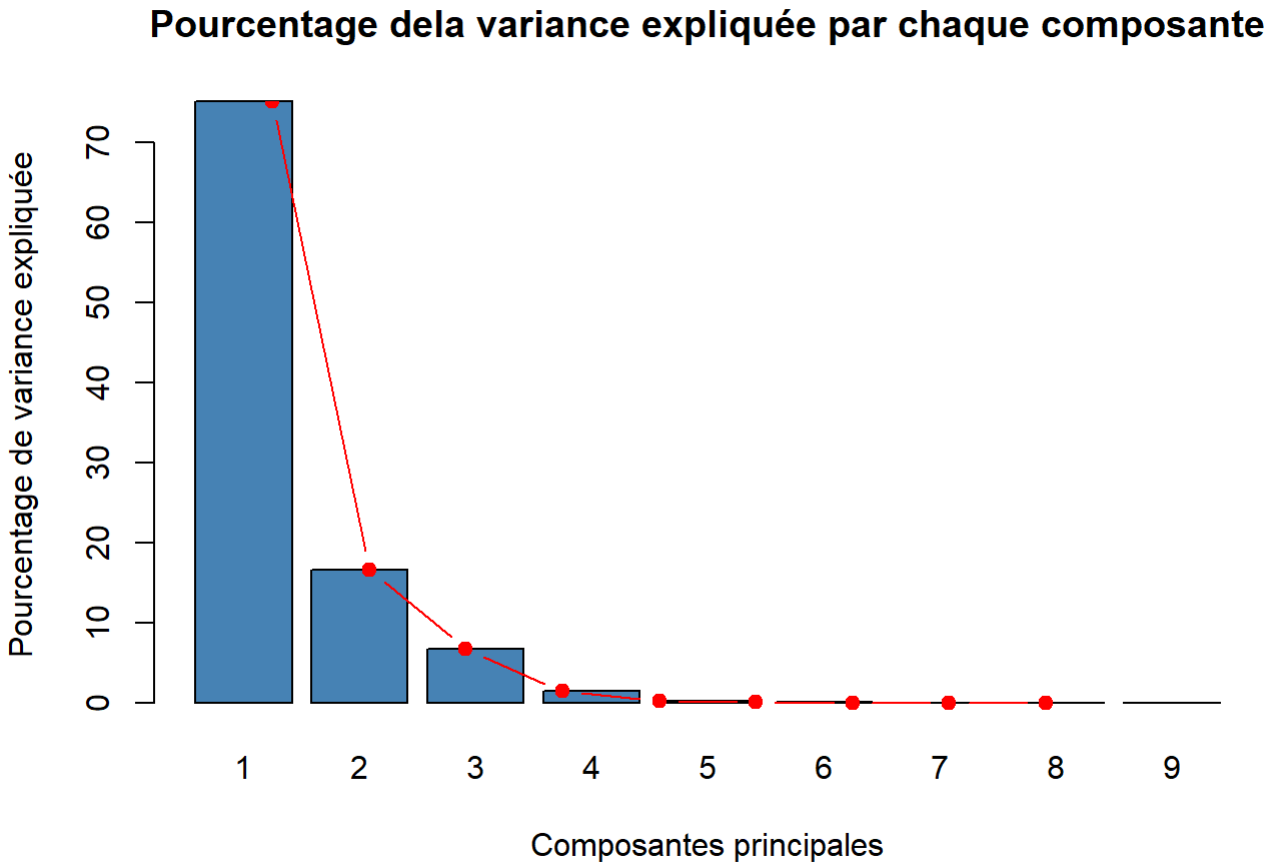
```
## **Results for the Principal Component Analysis (PCA)**
## The analysis was performed on 10 individuals, described by 12 variables
## *The results are available in the following objects:
##
##    name               description
## 1  "$eig"             "eigenvalues"
## 2  "$var"             "results for the variables"
## 3  "$var$coord"       "coord. for the variables"
## 4  "$var$cor"         "correlations variables - dimensions"
## 5  "$var$cos2"        "cos2 for the variables"
## 6  "$var$contrib"     "contributions of the variables"
## 7  "$ind"             "results for the individuals"
## 8  "$ind$coord"       "coord. for the individuals"
## 9  "$ind$cos2"        "cos2 for the individuals"
## 10 "$ind$contrib"     "contributions of the individuals"
## 11 "$call"            "summary statistics"
## 12 "$call$centre"     "mean of the variables"
## 13 "$call$ecart.type" "standard error of the variables"
## 14 "$call$row.w"      "weights for the individuals"
## 15 "$call$col.w"      "weights for the variables"
```

Le choix de l'axe ou de dimension

```
valeurspropes<-resultat_ACP$eig
valeurspropes
```

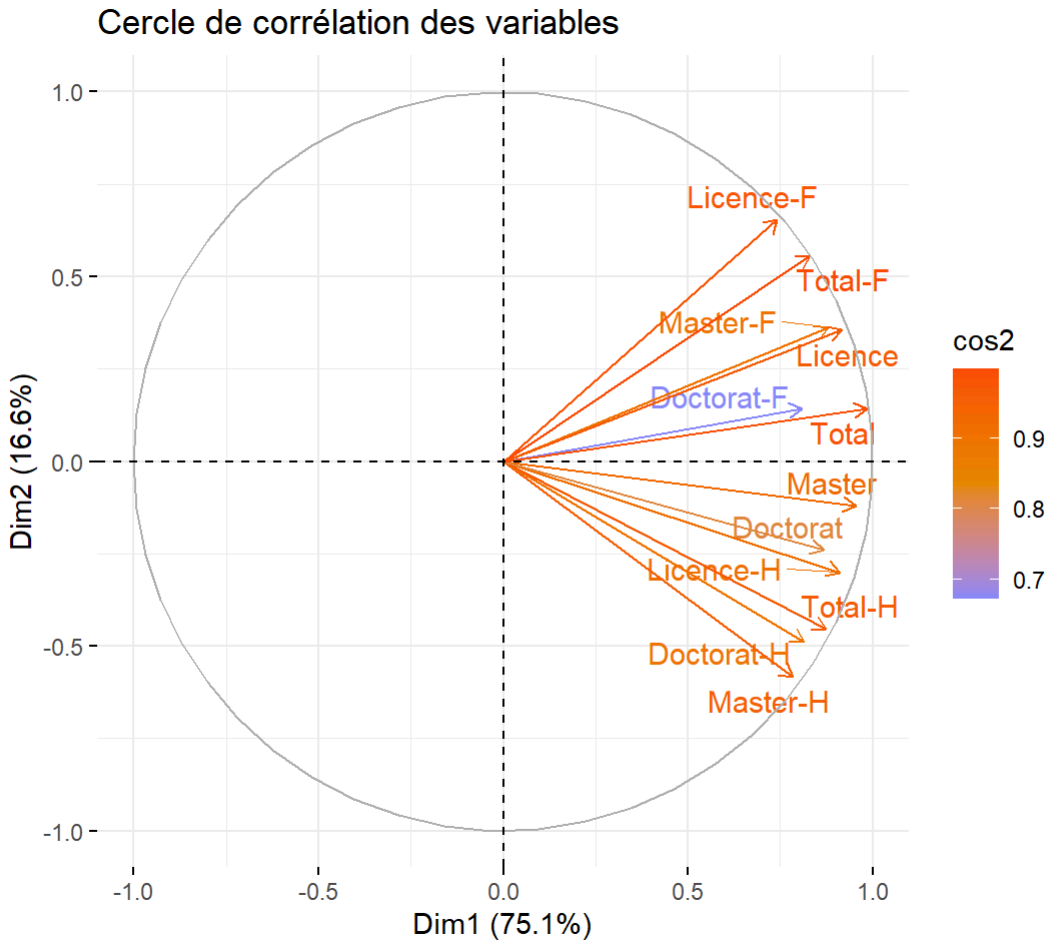
```
##          eigenvalue percentage of variance cumulative percentage of variance
## comp 1 9.008252e+00           7.506876e+01                          75.06876
## comp 2 1.988651e+00           1.657209e+01                          91.64086
## comp 3 8.032154e-01           6.693461e+00                          98.33432
## comp 4 1.680335e-01           1.400279e+00                          99.73460
## comp 5 2.304292e-02           1.920243e-01                          99.92662
## comp 6 8.805451e-03           7.337875e-02                         100.00000
## comp 7 1.985892e-31           1.654910e-30                         100.00000
## comp 8 1.112184e-32           9.268203e-32                         100.00000
## comp 9 2.901728e-33           2.418106e-32                         100.00000
```

```
barplot(valeurspropes[,2],names.arg = 1:nrow(valeurspropes),
        main = "Pourcentage dela variance expliquée par chaque composante",
        xlab = "Composantes principales",
        ylab = "Pourcentage de variance expliquée",
        col = "steelblue")
lines(x=1:nrow(valeurspropes),valeurspropes[,2],
      type = "b",pch=19,col="red")
```



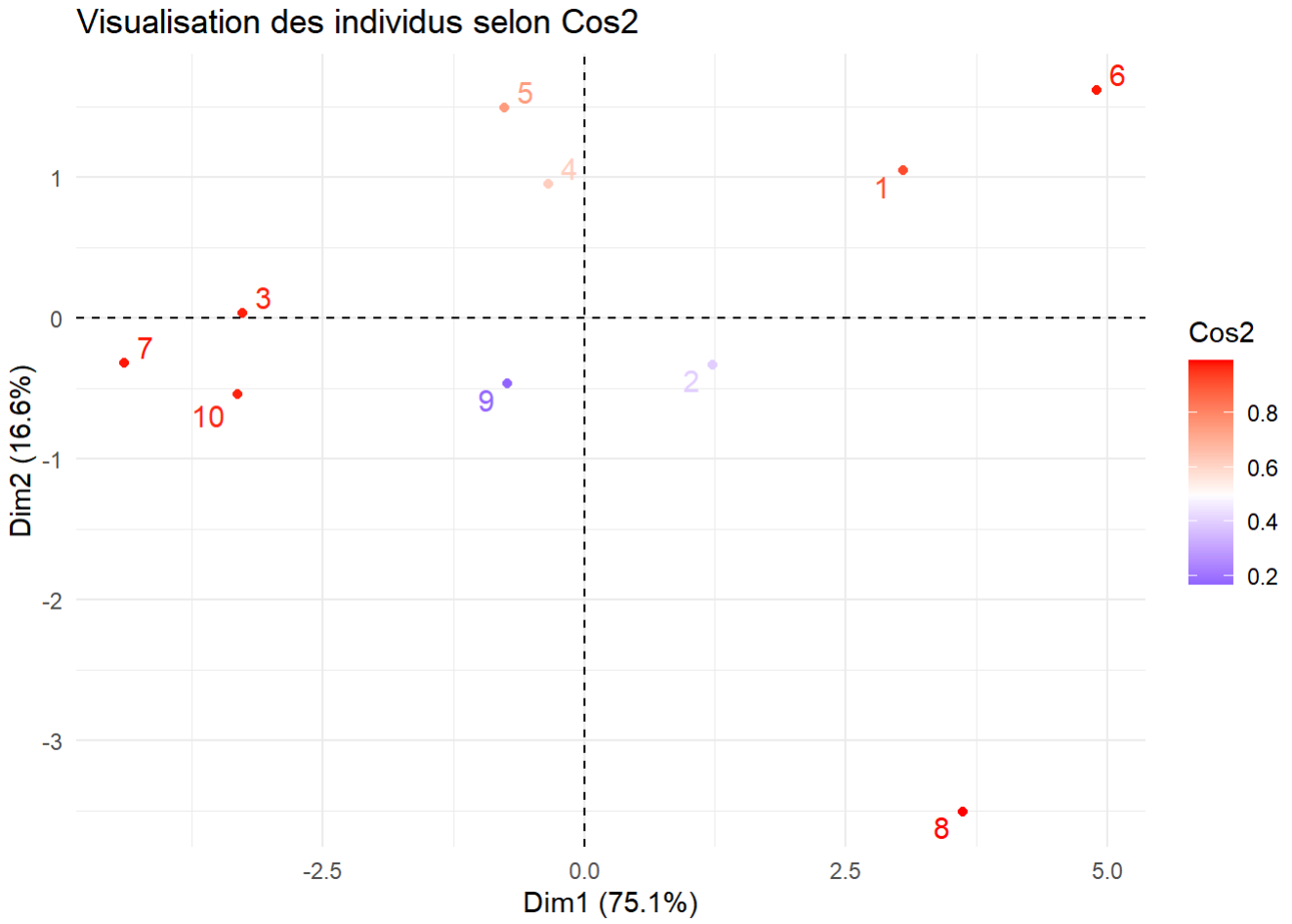
Le cercle de corrélation ou il exite un effet de taille

```
fviz_pca_var(resultat_ACP,
             col.var = "cos2", # Coloration par le cosinus carré
             gradient.cols = c("#888AFB","#E78800","#FC4E07"), # Définir les couleurs du grad
ient
             repel = TRUE, # Éviter le chevauchement des étiquettes
             title = "Cercle de corrélation des variables") # Titre du graphique
```




```
fviz_pca_ind(resultat_ACP,
             col.ind = "cos2",  # Coloration en fonction du cos2
             gradient.cols = c("blue", "white", "red"),  # Palette de couleurs
             repel = TRUE) +  # Éviter le chevauchement des étiquettes
  scale_color_gradient2(low = "blue", mid = "white", high = "red", midpoint = 0.50) +
  theme_minimal() +
  labs(title = "Visualisation des individus selon Cos2",
       color = "Cos2")
```

```
## Scale for colour is already present.
## Adding another scale for colour, which will replace the existing scale.
```


Visualisation des individus selon Cos2
6
5
4
1
3
7
10
9
2
8
1
0
-1
-2
-3
-2.5
0.0
2.5
5.0
Dim2 (16.6%)
Dim1 (75.1%)
Cos2
0.8
0.6
0.4
0.2