# Training in ade4 in R - Module I: Basic methods

## Multiple correspondence analysis

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# Data

We will analyze the `doubs` data set (see `?doubs`)

```
library(ade4)
library(adegraphics)
data(doubs)
names(doubs)
```

```
## [1] "env"     "fish"    "xy"      "species"
```

```
names(doubs$env)
```

```
##  [1] "dfs" "alt" "slo" "flo" "pH"  "har" "pho" "nit" "amm" "oxy" "bdo"
```

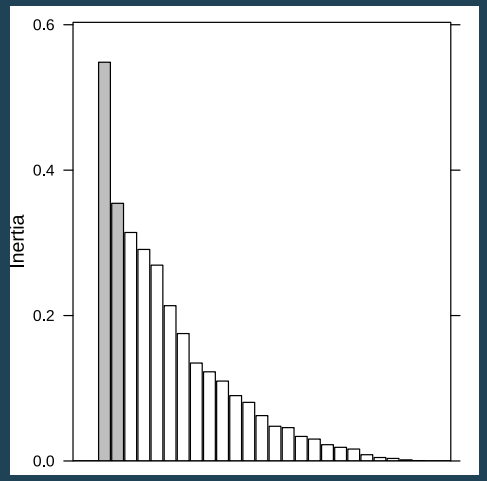
# Tranformation into categorical variables

```
fenv <- apply(doubs$env, 2, cut, breaks = 4, labels = 1:4)
fenv <- as.data.frame(fenv, stringsAsFactors = TRUE)
```

# Multiple Corrsepondence Analysis

- Perform MCA
- Display the barplot of eigenvalues

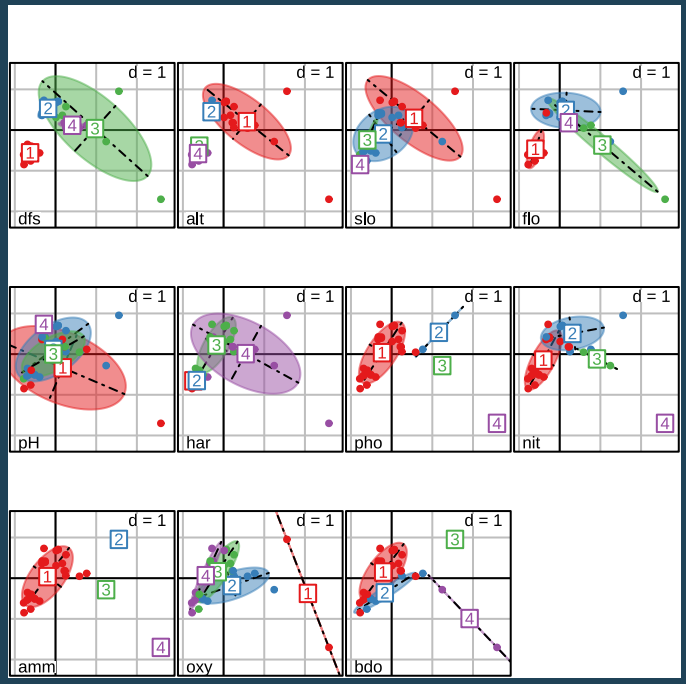
```
acm1 <- dudi.acm(fenv, scannf = FALSE)
screeplot(acm1, main = " ", xlab = " ")
```



# Graphical representation of MCA results

- Plot the results using the `plot` function

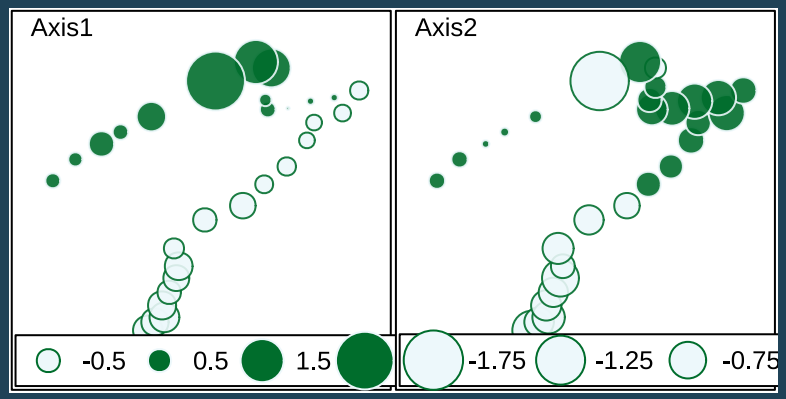
```
plot(acm1, col = TRUE)
```



# PCA scores on the geographical map

- Draw maps of PCA scores on the first two axes
- Interpret the maps to describe the environmental structure of the river

```
mypal <- colorRampPalette(c("#EDF8FB", "#006D2C"))
s.value(doubs$xy, acm1$li[, 1:2], pgrid.draw = FALSE,
    porigin.draw = FALSE, method = "size", symbol = "circle",
    col = mypal(2), ppoints.cex = 1)
```



# A look to variables

- Which variables are the most discriminated by the first axes

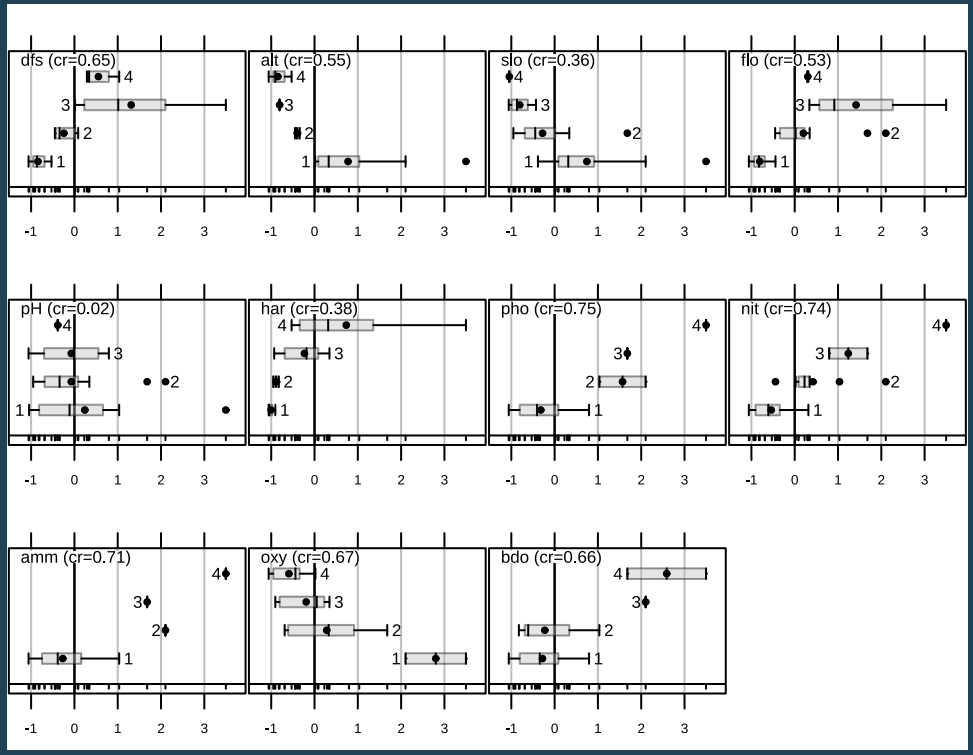
```
acm1$cr
```

```
##             RS1        RS2
## dfs 0.65016681 0.54171843
## alt 0.54859870 0.46823722
## slo 0.36285735 0.18818923
## flo 0.52994726 0.57221033
## pH  0.02395703 0.15608652
## har 0.37615802 0.26756014
## pho 0.75418361 0.33688896
## nit 0.73983937 0.53046062
## amm 0.71443072 0.36912488
## oxy 0.67303617 0.07847305
## bdo 0.65985629 0.38952981
```

# A look to variables

The generic function `score` provides an optimal representation of the maximized criteria

```
score(acm1, type = "boxplot")
```



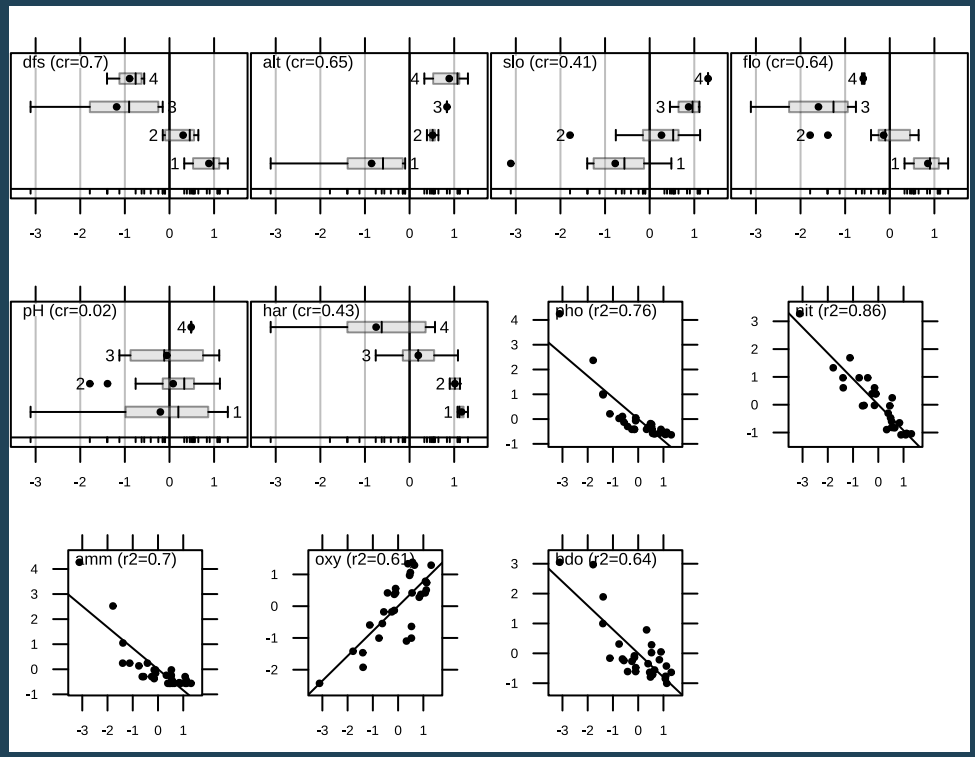
# Hill-Smith analysis

- Build a table mixing quantitative and categorical variables

```
menv <- cbind(fenv[, 1:6], doubs$env[, 7:11])
```

- Perform Hill-Smith analysis

```
hs1 <- dudi.hillsmith(menv, scannf = FALSE)
```

# Graphical representation

```
score(hs1, type = "boxplot")
```