# SMDE First assignement (20% of the final mark, individual)

## Second question: ANOVA (15% of the FIRST ASSIGMENT).

**Generate three populations** that follow your specific distribution, but now change one of the parameters (change it following your criteria). As an example, the first is a population that follows a normal distribution with a parameter λ=0, the second with λ=10, and the third with λ=0.

We want to analyze using an ANOVA if these three populations are different (or not) depending on the parameter selected.

**Analyze and explain the results obtained. Justify your answers.**

Some useful code to do this part of the exercise:

Norm\_v1=rnorm(200, mean=0, sd=1)

Norm\_v2=rnorm(200, mean=10, sd=1)

Norm\_v3=rnorm(200, mean=0, sd=1)

Norm\_v1n=data.frame(x1=Norm\_v1, x2="v1")

Norm\_v2n=data.frame(x1=Norm\_v2, x2="v2")

Norm\_v3n=data.frame(x1=Norm\_v3, x2="v3")

data=mergeRows(Norm\_v1n, Norm\_v2n, common.only=FALSE)

data=mergeRows(as.data.frame(data), Norm\_v3n, common.only=FALSE)

AnovaModel.1 <- aov(x1 ~ x2, data=data)

summary(AnovaModel.1)

Boxplot(x1~x2, data=data, id.method="y")

**Remember to test the ANOVA assumptions. What do you expect on the assumptions?**

Useful code:

library("lmtest", lib.loc="~/R/win-library/3.0")

#The observations within each sample must be independent.

#Durbin Watson

library("lmtest", lib.loc="~/R/win-library/3.0")

dwtest(RegModel.1, alternative ="two.sided")

#The populations from which the samples are selected must be normal.

#Shapiro test

shapiro.test(residuals(RegModel.1))

#The populations from which the samples are selected must have equal variances (homogeneity of variance)

#Breusch Pagan test

lmtest::bptest(RegModel.1)

**Once we are familiar with ANOVA, answer this question:**

On the dataset contained on FactoMiner package named **decathlon**, we want to analyze if both competitions achieve different results in the different disciplines analyzed.

Useful code:

data(decathlon, package="FactoMineR")