STA212

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```
rm(list=ls())
setwd(getwd())
library(ggplot2)
set.seed(150)
```

Exercice 1 : Modélisation probabiliste

(a)

(b)

Exercice 2 : Classification multi-classes

(a)

(b)

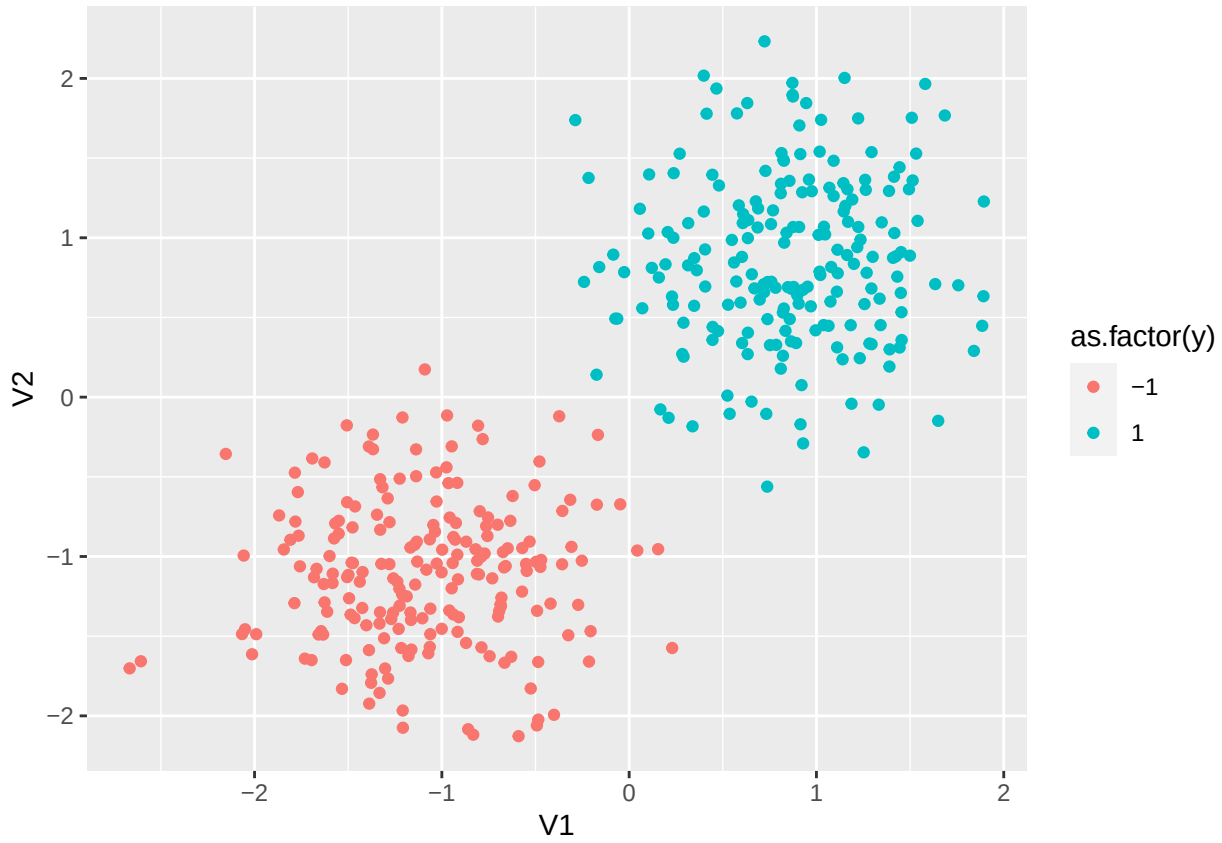
Exercice 3 : Implémentation d'un perceptron (origine des SVM)

(a)

(b)

Importation des données :

```
load(file="X_y.rda")
df <- as.data.frame(cbind(X, y))
names(df) <- c("V1", "V2", "V3", "y")
plt1 <- ggplot(data=df) + aes(x=V1, y=V2, z=y, color=as.factor(y)) + geom_point()
plt1
```



La variable V3 est une variable d'intercept.

Algorithme perceptron

```
perceptron <- function(X, y){
  theta <- c(0, 0, 0)
  n <- nrow(X)
  m <- seq(1, n)
  counter <- 0

  while (length(m) != 0){
    #sample a random item from m
    index = sample(m, 1)

    #update theta
    theta <- theta + y[index]*X[index,]

    #calculate the new m
    temp <- sapply(X=seq(1, n), FUN=function(k) theta%*%X[k,])
    criterion <- y*temp
    m <- which(criterion<0)
    counter <- counter + 1
  }
  return(list(theta=theta, count=counter))
}

res <- perceptron(X, y)
```

```
theta.star <- res$theta
count.star <- res$count

theta.star
```

```
## [1] 3.438710 4.537851 1.000000
```

```
count.star
```

```
## [1] 5
```

L'algorithme converge en 5 itérations, et nous trouve la valeur de $\theta^* = (3.438710, 4.537851, 1.000000)^T$.

plot

```
plt1 + geom_abline(intercept=-theta.star[3]/theta.star[2], slope=-theta.star[1]/theta.star[2])
```