Nettoyage du dataset

Taille du dataset

Nombre de transferts enregistrés

```
nrow(transfers)
```

```
## [1] 4700
```

Le dataset répertorie donc 4700 transferts. Il est sensé contenir les 250 transferts les plus élevés pour chaque saison des dix-neuf dernières saisons :

```
length(unique(transfers$Season))
```

```
## [1] 19
```

Or :

```
19 * 250
```

```
## [1] 4750
```

Nous ne disposons donc pas exactement de 250 transferts par saison :

```
freq <- table(transfers$Season)
sort(freq[freq != 250])
```

```
##
## 2003-2004 2002-2003 2017-2018 2010-2011 2018-2019 2014-2015 2005-2006
##       242       244       244       245       245       246       247
## 2000-2001 2004-2005 2007-2008 2012-2013 2015-2016 2006-2007 2009-2010
##       248       248       248       248       248       249       249
## 2011-2012
##       249
```

Il manque des transferts pour 15 saisons sur 19 mais ce n'est jamais plus de 8 transferts sur 250, ce qui ne devrait pas fausser les mesures de l'influence de la saison que l'on pourra faire par la suite.

Nombre de prédicteurs

```
ncol(transfers)
```

```
## [1] 10
```

```r
colnames(transfers)
```

```
##  [1] "Name"         "Position"     "Age"          "Team_from"
##  [5] "League_from"  "Team_to"      "League_to"    "Season"
##  [9] "Market_value" "Transfer_fee"
```

Vérification des classes des prédicteurs

```r
sapply(transfers, class)
```

```
##         Name     Position          Age    Team_from  League_from
##     "factor"     "factor"    "integer"     "factor"     "factor"
##      Team_to    League_to       Season Market_value Transfer_fee
##     "factor"     "factor"     "factor"    "integer"    "integer"
```

On convertit la variable "Season" en facteur ordonné :

```r
# we use the already alphabetical order of seasons
transfers$Season <- as.ordered(transfers$Season)
```

Vérification cohérence des données

Valeurs manquantes ou nulles

```r
summary(transfers)
```

```
##                 Name                     Position         Age
##  Alex             :   8   Centre-Forward    :1218   Min.   :15.00
##  Fernando         :   7   Centre-Back       : 714   1st Qu.:22.00
##  Peter Crouch     :   7   Central Midfield  : 487   Median :24.00
##  Adriano          :   6   Attacking Midfield: 426   Mean   :24.34
##  Alberto Gilardino:   6   Defensive Midfield: 411   3rd Qu.:27.00
##  Carlos Tévez     :   6   Right Winger      : 305   Max.   :35.00
##  (Other)          :4660   (Other)           :1139   NA's   :1
##      Team_from            League_from        Team_to
##  Inter    :  68   Premier League: 608   Inter    :  97
##  Spurs    :  63   Serie A       : 602   Chelsea  :  96
##  Juventus :  59   Ligue 1       : 428   Man City :  94
##  Chelsea  :  57   LaLiga        : 418   Spurs    :  93
##  FC Porto :  56   1.Bundesliga  : 265   Juventus :  87
##  Liverpool:  56   Série A       : 199   Liverpool:  85
##  (Other)  :4341   (Other)       :2180   (Other)  :4148
##           League_to          Season      Market_value
##  Premier League:1256   2001-2002: 250   Min.   :    50000
##  Serie A       : 739   2008-2009: 250   1st Qu.:  3500000
##  LaLiga        : 525   2013-2014: 250   Median :  6000000
```

```
##  1.Bundesliga  : 422   2016-2017: 250   Mean   :  8622469
##  Ligue 1       : 397   2006-2007: 249   3rd Qu.: 10000000
##  Premier Liga  : 328   2009-2010: 249   Max.   :120000000
##  (Other)       :1033   (Other)  :3202   NA's   :1260
##   Transfer_fee
##  Min.   :   825000
##  1st Qu.:  4000000
##  Median :  6500000
##  Mean   :  9447586
##  3rd Qu.: 10820000
##  Max.   :222000000
##
```

Seule la colonne “Market_value” contient une grande quantité de `NA`, à raison de 1260 sur 4700 soit 27 %.

```
# extract rows where Market_value is na
null_market_value <- transfers[is.na(transfers$Market_value) == T,]

# make a contingency table by season
cont <- table(null_market_value$Season)
cont
```

```
##
## 2000-2001 2001-2002 2002-2003 2003-2004 2004-2005 2005-2006 2006-2007
##       248       250       244       242       189        28        20
## 2007-2008 2008-2009 2009-2010 2010-2011 2011-2012 2012-2013 2013-2014
##        13         7         2         4         1         2         2
## 2014-2015 2015-2016 2016-2017 2017-2018 2018-2019
##         1         0         1         3         3
```

```
# proportion of the first five seasons
sum(cont[1:5])
```

```
## [1] 1173
```

```
sum(cont[1:5]) / sum(cont)
```

```
## [1] 0.9309524
```

Les cinq premières saisons concentrent l’essentiel des valeurs manquantes. On décide de les supprimer.

```
transfers <- transfers[!is.na(transfers$Market_value),]
```

Simplification du dataset

Noms des joueurs

On supprime d’abord la colonne “Name”, qui comporte trop de modalités pour être intéressante.

```r
transfers <- subset(transfers, select = -c(Name))
```

Ligues

On s'intéresse aux ligues :

```r
levels(transfers$League_from)
```

```
##   [1] " Argentina"                    " Australia"
##   [3] " Brazil"                       " Bulgaria"
##   [5] " Canada"                       " Chile"
##   [7] " China"                        " Colombia"
##   [9] " Croatia"                      " Czech Republic"
##  [11] " Denmark"                      " Ecuador"
##  [13] " England"                      " Finland"
##  [15] " France"                       " Ghana"
##  [17] " Iran"                         " Korea, South"
##  [19] " Latvia"                       " Mexico"
##  [21] " Moldova"                      " Paraguay"
##  [23] " Peru"                         " Portugal"
##  [25] " Qatar"                        " Romania"
##  [27] " Russia"                       " Saudi Arabia"
##  [29] " Scotland"                     " Serbia"
##  [31] " Slovakia"                     " South Africa"
##  [33] " Spain"                        " Sweden"
##  [35] " Tunisia"                      " Ukraine"
##  [37] " United Arab Emirates"         " United States"
##  [39] " Uruguay"                      " Venezuela"
##  [41] "1.Bundesliga"                  "1.Division"
##  [43] "1.HNL"                         "1.Lig"
##  [45] "1.Liga gr. 1"                  "2.Bundesliga"
##  [47] "2ª B - Grupo I"                "2ª B - Grupo III"
##  [49] "3.Liga"                        "A Grupa - Championship gr."
##  [51] "Allsvenskan"                   "Auf-/Abstiegsrunde NLA/NLB"
##  [53] "Botola Pro"                    "Bundesliga"
##  [55] "Challenge League"              "Championnat National"
##  [57] "Championship"                  "Ekstraklasa"
##  [59] "Eliteserien"                   "Eredivisie"
##  [61] "First Division"                "HET Liga"
##  [63] "J1 - 2nd Stage"                "J1 League"
##  [65] "J2 League"                     "Jupiler Pro League"
##  [67] "K League 1"                    "Korean FA Cup"
##  [69] "LaLiga"                        "LaLiga2"
##  [71] "League One"                    "Liga 1"
##  [73] "Liga 1 - Championship group"   "Liga Águila II"
##  [75] "Liga MX Apertura"              "Liga MX Clausura"
##  [77] "Liga NOS"                      "Ligat ha'Al"
##  [79] "Ligue 1"                       "Ligue 2"
##  [81] "Ligue I Pro"                   "MLS"
##  [83] "NB I."                         "OBOS-ligaen"
##  [85] "Premier League"                "Premier Liga"
##  [87] "Premiership"                   "Primavera B"
```

```
##  [89] "Primera B Nacional"             "Primera Div. Apertura"
##  [91] "Primera División"               "Professional League"
##  [93] "Proximus League"                "Regionalliga Nord"
##  [95] "Rel. Ligue 1"                   "Second Division (bis 03/04)"
##  [97] "Segunda División"               "Serie A"
##  [99] "Série A"                        "Serie A Segunda Etapa"
## [101] "Serie B"                        "Série B"
## [103] "Serie C - A"                    "Serie C - B"
## [105] "Stars League"                   "Super League"
## [107] "Süper Lig"                      "Superettan"
## [109] "SuperLiga"                      "Superligaen"
## [111] "Superligaen Championship round" "Torneo Final"
## [113] "Torneo Inicial"                 "U18 Premier League"
## [115] "U19 Eredivisie"                 "UAE Gulf League"
## [117] "Virsliga"                       "Vysheyshaya Liga"
```

Exemple des vérifications faites sur les noms de ligue ambigüs : “Série A” correspond à la première division brésilienne et “Serie A” à l’italienne, “Bundesliga” à l’autrichienne et “1. Bundesliga” à l’allemande. On remarque aussi des valeurs de pays. Dans la plupart des cas, ces valeurs correspondent à des divisions inférieures des pays correspondants.

Hypothèse : la plupart des transferts impliquent un des cinq grands championnats : anglais, espagnol, allemand, français et italien :

```
# we define a vector containing the five main leagues names
leagues.main <- ( c("1.Bundesliga", "LaLiga", "Ligue 1", "Premier League", "Serie A"))

# we extract transfers between clubs of the five main leagues
transfers.main <- transfers[transfers$League_from %in% leagues.main & transfers$League_to %in% leagues.m

# proportion
nrow(transfers.main)
```

```
## [1] 1561
```

```
nrow(transfers.main) / nrow(transfers)
```

```
## [1] 0.4537791
```

Positions

On regroupe en quatre catégories : gardiens, défenseurs, milieux, attaquants :

```
levels(transfers$Position)
```

```
##  [1] "Attacking Midfield" "Central Midfield"   "Centre-Back"
##  [4] "Centre-Forward"     "Defender"           "Defensive Midfield"
##  [7] "Forward"            "Goalkeeper"         "Left Midfield"
## [10] "Left Winger"        "Left-Back"          "Midfielder"
## [13] "Right Midfield"     "Right Winger"       "Right-Back"
## [16] "Second Striker"     "Sweeper"
```

```r
levels(transfers$Position) <- gsub(".*Back$|Sweeper", "Defender", levels(transfers$Position))
levels(transfers$Position) <- gsub(".*Forward$|Second Striker|.*Winger$", "Forward",
                                   levels(transfers$Position))
levels(transfers$Position) <- gsub(".*Midfield$", "Midfielder", levels(transfers$Position))
levels(transfers$Position)
```

```
## [1] "Midfielder" "Defender"   "Forward"    "Goalkeeper"
```

Création de variables composites

Plus-value

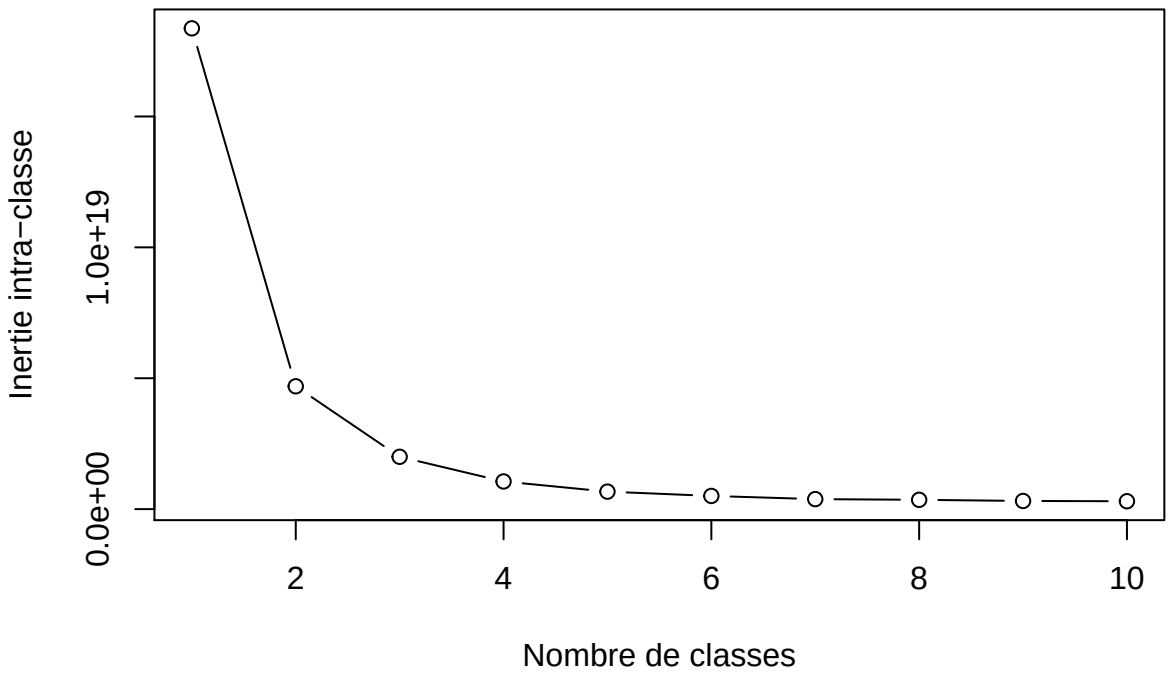
```r
plus_value <- transfers$Transfer_fee - transfers$Market_value
transfers <- cbind(transfers,plus_value)
```

Regroupement des clubs

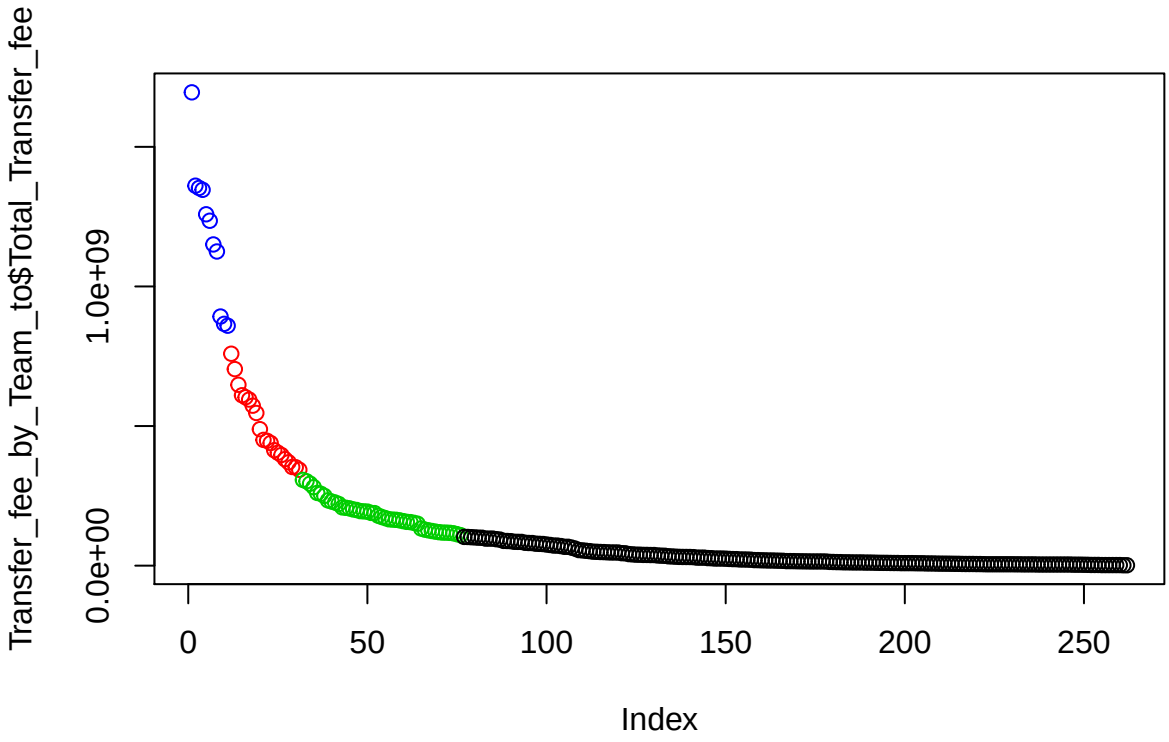
```r
Transfer_fee_by_Team_to <- aggregate(transfers$Transfer_fee ~ transfers$Team_to, transfers, sum)
names(Transfer_fee_by_Team_to) <- c("Team_to","Total_Transfer_fee")
Transfer_fee_by_Team_to <- Transfer_fee_by_Team_to[order(Transfer_fee_by_Team_to$Total_Transfer_fee, de

# méthode du coude pour le nombre de classes optimal
inerties_min = c(1:10)
for (k in 1:10) {
  inerties <- c()
  inerties_min[k] <- kmeans(x = Transfer_fee_by_Team_to$Total_Transfer_fee, centers = k, nstart = 100)$
}

plot(inerties_min, xlab = "Nombre de classes", ylab = "Inertie intra-classe", type = "b")
```




```
# on choisit 4
kmeans <- kmeans(Transfer_fee_by_Team_to$Total_Transfer_fee, 4)
plot(Transfer_fee_by_Team_to$Total_Transfer_fee, col = kmeans$cluster)
```




```
Transfer_fee_by_Team_to <- cbind(Transfer_fee_by_Team_to, kmeans$cluster)
names(Transfer_fee_by_Team_to)[3] <- "Team_to_type"
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == 4] <- "Niveau 1"
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == 2] <- "Niveau 2"
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == 1] <- "Niveau 3"
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == 3] <- "Niveau 4"

Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == "Niveau 1"] <- 1
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == "Niveau 2"] <- 2
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == "Niveau 3"] <- 3
Transfer_fee_by_Team_to$Team_to_type[Transfer_fee_by_Team_to$Team_to_type == "Niveau 4"] <- 4

# on met les étiquettes dans le tableau transfers
Transfer_fee_by_Team_to <- subset(Transfer_fee_by_Team_to, select = -c(Total_Transfer_fee))
transfers <- merge(x = transfers, y = Transfer_fee_by_Team_to, all.x = T)
transfers <- transfers[c("Position", "Age", "Team_from", "League_from", "Team_to", "Team_to_type", "Lea
```

Synthèse

- la variable “Saison” a été convertie en facteur ordonné
- il manque la valeur “Market_value” pour 27 % des transferts et les cinq premières saisons concentrent plus de 90 % de ces valeurs manquantes
- pour les ligues, 41 % des transferts du dataset, soit près de 2000, ont été effectués entre deux clubs des cinq plus grands championnats. Nous avons mis toutes les autres valeurs de ligue à `NA`, pour ne plus

avoir que cinq modalités de ligues.
- nous avons supprimé les colonnes “Name”, “Team_from” et “Team_to”
- les positions ont été regroupées en quatre catégories : gardiens, défenseurs, milieux, attaquants