title: "Twitter Sentiment Analysis"
author: "Pedro Schneider"
date: "24 de novembro de 2017"
output:
word_document: default

Introduction

This is a work of social network analysis - Twitter. The idea was to generate some information from the analysis of sentiments. Sports brands related to Tennis sport (one of the author's hobbies) were used as Twitter search terms. First was generated a visualization through the wordcloud format and then attributed positive and negative scores to the tweets for a classification and comparison between brands.

Packages and Authentication

NOTE: Credentials must be entered according to each user's individual credentials.

```
# Installing and Loading the twitteR Package

#install.packages("twitteR")
#install.packages("httr")
#install.packages("devtools")
library(twitteR)
library(httr)
library(devtools)

## Warning: package 'devtools' was built under R version 3.4.2

# Creating Authentication on Twitter

api_key <- "ryMTtqouq3iDTmwi8saGPKGXX"
api_secret <- "rzTsZULivNYa2UPBcpfAIGNLwEMdBBiCD9B5jYJDzw7JX7e61F"
access_token <- "903682863568171009-Jj3eEwnhjmu51Ubv8p9OYUjrKWxFy7a"
access_token_secret <- "8ZXrpx3bRykhgCU4kGkwRredI5ZL3XGriybpkqb2upEtj"

# Authenticating on Twitter

setup_twitter_oauth(api_key, api_secret, access_token,
access_token_secret)

## [1] "Using direct authentication"
```

Capturing tweets and performing cleanups

```
# Capturing Tweets

wilson_tweets = searchTwitter("Wilson Tennis", n = 500, lang = "en")
```

```
## Warning in doRppAPICall("search/tweets", n, params = params,
## retryOnRateLimit = retryOnRateLimit, : 500 tweets were requested but
the
## API can only return 212

nike_tweets = searchTwitter("NikeCourt", n = 500, lang = "en")

## Warning in doRppAPICall("search/tweets", n, params = params,
## retryOnRateLimit = retryOnRateLimit, : 500 tweets were requested but
the
## API can only return 386

head_tweets = searchTwitter("Head Tennis", n = 500, lang = "en")
babolat_tweets = searchTwitter("Babolat", n = 500, lang = "en")

# Viewing the first lines of the tweets object

head(wilson_tweets)

## [[1]]
## [1] "GibbSelleck: RT @Tennis: Gear of the Year: Racquets, shoes and
more from Wilson, Babolat, Head, Yonex and others. |
https://t.co/CeJOIcTDOd https://t.co "
##
## [[2]]
## [1] "pOshGraham: @ddawkins66 look! RT @MidwestSports: Attention @NFL
fans!!\n\nPut your favorite #NFL team in your #tennis racquet!
https://t.co/gtLQMgIxQr"
##
## [[3]]
## [1] "ALife_of_Tennis: RT @Tennis: Gear of the Year: Racquets, shoes
and more from Wilson, Babolat, Head, Yonex and others. |
https://t.co/CeJOIcTDOd https://t.co "
##
## [[4]]
## [1] "BingosResale: LOOK a #Wilsonrackets #TurboPowerStrings #Tennis
#Racquets in our Bingos Resale eBay Store items start at $.99 + sh
https://t.co/DauwNqeYKZ"
##
## [[5]]
## [1] "Tennis: Gear of the Year: Racquets, shoes and more from Wilson,
Babolat, Head, Yonex and others. | https://t.co/CeJOIcTDOd
https://t.co/DAEJea6uvg"
##
## [[6]]
## [1] "jtorpeyazpiri: RT @MidwestSports: Attention @NFL fans!!\n\nPut
your favorite #NFL team in your #tennis racquet! \n\nCheck out the
@WilsonTennis vibration damp "

head(nike_tweets)
```

```
## [[1]]
## [1] "nikebott: NikeCourt Air on changing direction every minute   I m
too And Time! The clock is the magic of Nike sneakers, all in total,"
##
## [[2]]
## [1] "RootCauseShoes: NIKECOURT ZOOM VAPOR RF X AJ3 Atmos Size 5
https://t.co/WiY3tedd5O"
##
## [[3]]
## [1] "TennisConnected: @usta @ryanharrison92 Looks like he's back with
@Nikecourt as well."
##
## [[4]]
## [1] "gluna2510: RT @CaroGarcia: Forehand, run, backhand, run ...
REPEAT ! \nMy Sunday schedule !
<ed><U+00A0><U+00BD><ed><U+00B2><U+00AA><ed><U+00A0><U+00BC><ed><U+00BF><
U+00BC><ed><U+00A0><U+00BD><ed><U+00B1><U+008A><ed><U+00A0><U+00BC><ed><U
+00BF><U+00BC><ed><U+00A0><U+00BD><ed><U+00B8><U+0085><ed><U+00A0><U+00BC
><ed><U+00BE><U+00BE>
<ed><U+00A0><U+00BD><ed><U+00B3><U+0088>\n#FlyWithCaro #offseason
@yonex_com @Nikecourt http "
##
## [[5]]
## [1] "TennisContact: RT @CaroGarcia: Forehand, run, backhand, run ...
REPEAT ! \nMy Sunday schedule !
<ed><U+00A0><U+00BD><ed><U+00B2><U+00AA><ed><U+00A0><U+00BC><ed><U+00BF><
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<ed><U+00A0><U+00BD><ed><U+00B3><U+0088>\n#FlyWithCaro #offseason
@yonex_com @Nikecourt http "
##
## [[6]]
## [1] "FLondonXO: When fans do a better job than NikeCourt...
https://t.co/l7tHhjT462"
```

```
head(head_tweets)
```

```
## [[1]]
## [1] "c21lowcountry: Check out our #listing in #HiltonHeadIsland #SC
#realestate #realtor https://t.co/ukLyqt0cr9 https://t.co/7tvJkNPdSI"
##
## [[2]]
## [1] "BVBBuzz: 18' Corner to Borussia Dortmund. And after some head
tennis in the box, Aubameyang shoots wide on the volley. #m05bvb #BVB"
##
## [[3]]
## [1] "AjdeeeNole: RT @CristinaNcl: O Shannessy:  I ve been here all
week assisting with the team of Novak Djokovic pre-season training.
Agassi was here with "
```

```
##
## [[4]]
## [1] "Wilson10lax: @LUXEVENTSLLC @CB618444 @hrenee80 It just keeps
getting better....you go tennis head"
##
## [[5]]
## [1] "MattElkington: RT @GranthamTennis: Led by Richard Edgley, our
Head of Disability Tennis, the Christmas Learning Disability Tennis Camp
will prove to be an "
##
## [[6]]
## [1] "rjustins: RT @NYCMayorsOffice: NYC parks now cover the space of
22,000 football fields! In celebration, grab a football (or baseball or
basketball or "
```

```
head(babolat_tweets)
```

```
## [[1]]
## [1] "Stringjob: Babolat Pure Strike Wilson Poly Pro 16 (46lbs) Wilson
Poly Pro 16 (46lbs)"
##
## [[2]]
## [1] "GibbSelleck: RT @Tennis: Gear of the Year: Racquets, shoes and
more from Wilson, Babolat, Head, Yonex and others. |
https://t.co/CeJOIcTDOd https://t.co "
##
## [[3]]
## [1] "ActuSportVideo: #Tennis Raquette de Tennis Babolat PURE STRIKE
100 2017 Neuve en grip 2 https://t.co/63zH9iZ1nm"
##
## [[4]]
## [1] "ALife_of_Tennis: RT @Tennis: Gear of the Year: Racquets, shoes
and more from Wilson, Babolat, Head, Yonex and others. |
https://t.co/CeJOIcTDOd https://t.co "
##
## [[5]]
## [1] "ActuTennis365: #Tennis Raquette de Tennis Babolat PURE STRIKE 100
2017 Neuve en grip 2 https://t.co/Ul6P5gvEPY"
##
## [[6]]
## [1] "Stringjob: Wilson ProStaff 97 Babolat RPM Blast 16 (52lbs)"
```

```
# Installing the package for Text Mining.

#install.packages("tm")
#install.packages("SnowballC")
library(SnowballC)
library(tm)
```

```
## Warning: package 'tm' was built under R version 3.4.2
```

```
## Loading required package: NLP

##
## Attaching package: 'NLP'

## The following object is masked from 'package:httr':
##
##     content

# Treatment (cleaning, organization and transformation) of collected data

wilson_tweetlist <- sapply(wilson_tweets, function(x) x$getText())
wilson_tweetcorpus <- Corpus(VectorSource(wilson_tweetlist))
toSpace <- content_transformer(function(x, pattern) gsub(pattern, " ",
x))
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, toSpace, "/")
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, toSpace, "@")
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, toSpace, "\\|")
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, toSpace, "/|@|\\|")
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, removeNumbers)
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, removePunctuation)
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, toSpace, "\n")
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus,
function(x)removeWords(x, stopwords("english")))
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, removeWords,
c("https","tco"))
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus, stripWhitespace)
#wilson_tweetcorpus <- sapply(wilson_tweetcorpus,function(row) iconv(row,
"latin1", "ASCII", sub=""))
wilson_tweetcorpus <- tm_map(wilson_tweetcorpus,
content_transformer(tolower))

nike_tweetlist <- sapply(nike_tweets, function(x) x$getText())
nike_tweetcorpus <- Corpus(VectorSource(nike_tweetlist))
toSpace <- content_transformer(function(x, pattern) gsub(pattern, " ",
x))
nike_tweetcorpus <- tm_map(nike_tweetcorpus, toSpace, "/")
nike_tweetcorpus <- tm_map(nike_tweetcorpus, toSpace, "@")
nike_tweetcorpus <- tm_map(nike_tweetcorpus, toSpace, "\\|")
nike_tweetcorpus <- tm_map(nike_tweetcorpus, toSpace, "/|@|\\|")
nike_tweetcorpus <- tm_map(nike_tweetcorpus, removeNumbers)
nike_tweetcorpus <- tm_map(nike_tweetcorpus, removePunctuation)
nike_tweetcorpus <- tm_map(nike_tweetcorpus, toSpace, "\n")
nike_tweetcorpus <- tm_map(nike_tweetcorpus, function(x)removeWords(x,
stopwords("portuguese")))
nike_tweetcorpus <- tm_map(nike_tweetcorpus, removeWords,
c("https","tco"))
nike_tweetcorpus <- tm_map(nike_tweetcorpus, stripWhitespace)
nike_tweetcorpus <- sapply(nike_tweetcorpus,function(row) iconv(row,
"latin1", "ASCII", sub=""))
```

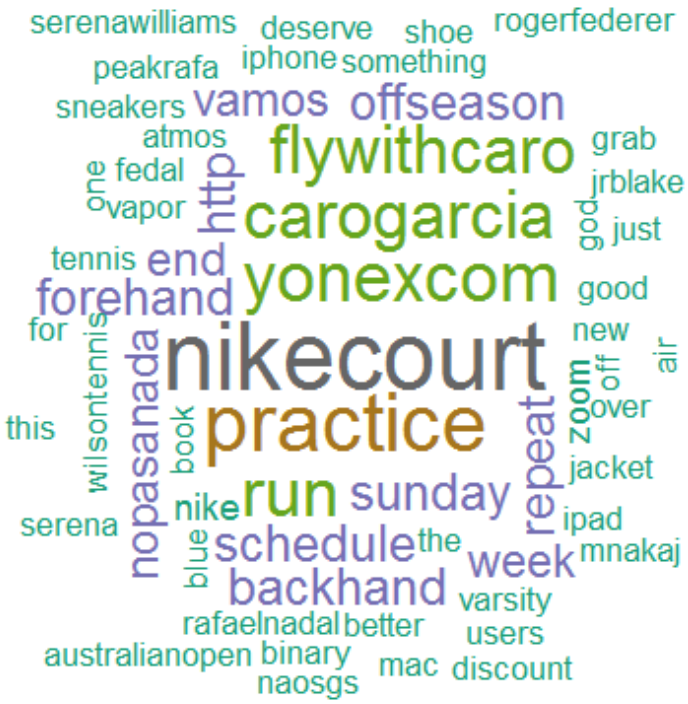
```r
#nike_tweetcorpus <- tm_map(nike_tweetcorpus,
content_transformer(tolower))

head_tweetlist <- sapply(head_tweets, function(x) x$getText())
head_tweetcorpus <- Corpus(VectorSource(head_tweetlist))
toSpace <- content_transformer(function(x, pattern) gsub(pattern, " ",
x))
head_tweetcorpus <- tm_map(head_tweetcorpus, toSpace, "/")
head_tweetcorpus <- tm_map(head_tweetcorpus, toSpace, "@")
head_tweetcorpus <- tm_map(head_tweetcorpus, toSpace, "\\|")
head_tweetcorpus <- tm_map(head_tweetcorpus, toSpace, "/|@|\\|")
head_tweetcorpus <- tm_map(head_tweetcorpus, removeNumbers)
head_tweetcorpus <- tm_map(head_tweetcorpus, removePunctuation)
head_tweetcorpus <- tm_map(head_tweetcorpus, toSpace, "\n")
head_tweetcorpus <- tm_map(head_tweetcorpus, function(x)removeWords(x,
stopwords("portuguese")))
head_tweetcorpus <- tm_map(head_tweetcorpus, removeWords,
c("https","tco"))
head_tweetcorpus <- tm_map(head_tweetcorpus, stripWhitespace)
head_tweetcorpus <- sapply(head_tweetcorpus,function(row) iconv(row,
"latin1", "ASCII", sub=""))
#head_tweetcorpus <- tm_map(head_tweetcorpus,
content_transformer(tolower))

babolat_tweetlist <- sapply(babolat_tweets, function(x) x$getText())
babolat_tweetcorpus <- Corpus(VectorSource(babolat_tweetlist))
toSpace <- content_transformer(function(x, pattern) gsub(pattern, " ",
x))
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, toSpace, "/")
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, toSpace, "@")
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, toSpace, "\\|")
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, toSpace, "/|@|\\|")
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, removeNumbers)
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, removePunctuation)
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, toSpace, "\n")
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus,
function(x)removeWords(x, stopwords("portuguese")))
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, removeWords,
c("https","tco"))
babolat_tweetcorpus <- tm_map(babolat_tweetcorpus, stripWhitespace)
babolat_tweetcorpus <- sapply(babolat_tweetcorpus,function(row)
iconv(row, "latin1", "ASCII", sub=""))
#babolat_tweetcorpus <- tm_map(babolat_tweetcorpus,
content_transformer(tolower))
```

Viewing with WordCloud

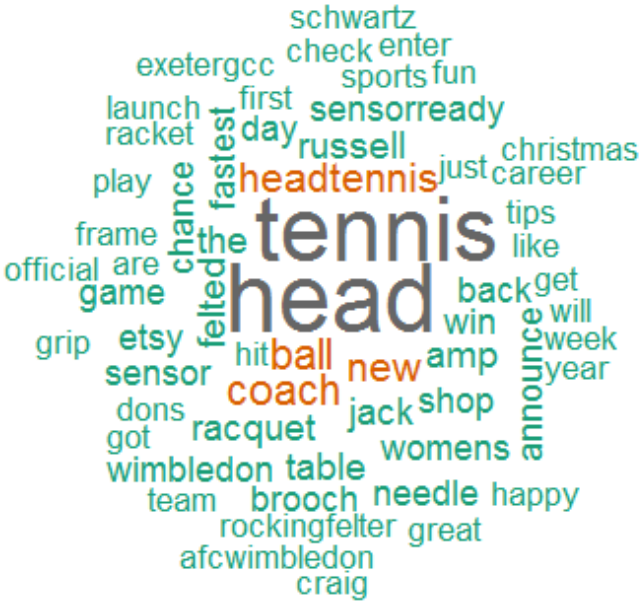
```r
# Installing the wordcloud package

#install.packages("RColorBrewer")
```

```
#install.packages("wordcloud")
library(RColorBrewer)
library(wordcloud)

## Warning: package 'wordcloud' was built under R version 3.4.2

# Generating a cloud words

pal2 <- brewer.pal(8,"Dark2")
wordcloud(wilson_tweetcorpus,
          min.freq = 2,
          scale = c(3,1),
          random.color = F,
          max.word = 60,
          random.order = F,
          colors = pal2)
```

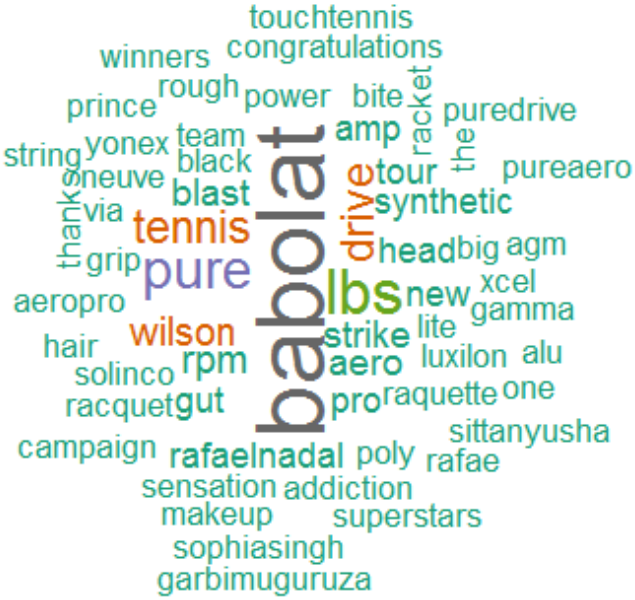
```
pal2 <- brewer.pal(8,"Dark2")
wordcloud(nike_tweetcorpus,
          min.freq = 2,
          scale = c(3,1),
          random.color = F,
          max.word = 60,
          random.order = F,
          colors = pal2)
```




```
pal2 <- brewer.pal(8,"Dark2")
wordcloud(head_tweetcorpus,
          min.freq = 2,
          scale = c(3,1),
          random.color = F,
          max.word = 60,
          random.order = F,
          colors = pal2)
```




```
pal2 <- brewer.pal(8,"Dark2")
wordcloud(babolat_tweetcorpus,
          min.freq = 2,
          scale = c(3,1),
          random.color = F,
          max.word = 60,
          random.order = F,
          colors = pal2)
```



Sentiment Analysis

```
# Customized function for sentiment analysis evaluation

#install.packages("stringr")
#install.packages("plyr")
library(stringr)

## Warning: package 'stringr' was built under R version 3.4.2

library(plyr)

## Warning: package 'plyr' was built under R version 3.4.2

##
## Attaching package: 'plyr'

## The following object is masked from 'package:twitteR':
##
##     id

sentimento.score = function(sentences, pos.words, neg.words, .progress =
'none')
{

  # Criando um array de scores com lapply
  scores = laply(sentences,
                 function(sentence, pos.words, neg.words)
```

```
                  {
                    sentence = gsub("[[:punct:]]", "", sentence)
                    sentence = gsub("[[:cntrl:]]", "", sentence)
                    sentence =gsub('\\d+', '', sentence)
                    tryTolower = function(x)
                    {
                      y = NA
                      try_error = tryCatch(tolower(x), error=function(e)
e)
                      if (!inherits(try_error, "error"))
                        y = tolower(x)
                      return(y)
                    }

                    sentence = sapply(sentence, tryTolower)
                    word.list = str_split(sentence, "\\s+")
                    words = unlist(word.list)
                    pos.matches = match(words, pos.words)
                    neg.matches = match(words, neg.words)
                    pos.matches = !is.na(pos.matches)
                    neg.matches = !is.na(neg.matches)
                    score = sum(pos.matches) - sum(neg.matches)
                    return(score)
                  }, pos.words, neg.words, .progress = .progress )

  scores.df = data.frame(text = sentences, score = scores)
  return(scores.df)
}

# Mapping positive and negative words

pos = readLines("palavras_positivas.txt")
neg = readLines("palavras_negativas.txt")


# Getting text

wilson_txt = sapply(wilson_tweets, function(x) x$getText())
nike_txt = sapply(nike_tweets, function(x) x$getText())
head_txt = sapply(head_tweets, function(x) x$getText())
babolat_txt = sapply(babolat_tweets, function(x) x$getText())

# Trademark tweets vector

nd = c(length(wilson_txt), length(nike_txt), length(head_txt),
length(babolat_txt))


# Gathering the texts
```

```r
brands = c(wilson_txt, nike_txt, head_txt, babolat_txt)

# Applying function to calculate the Sentiment score

scores = sentimento.score(brands, pos, neg, .progress = 'text')
```

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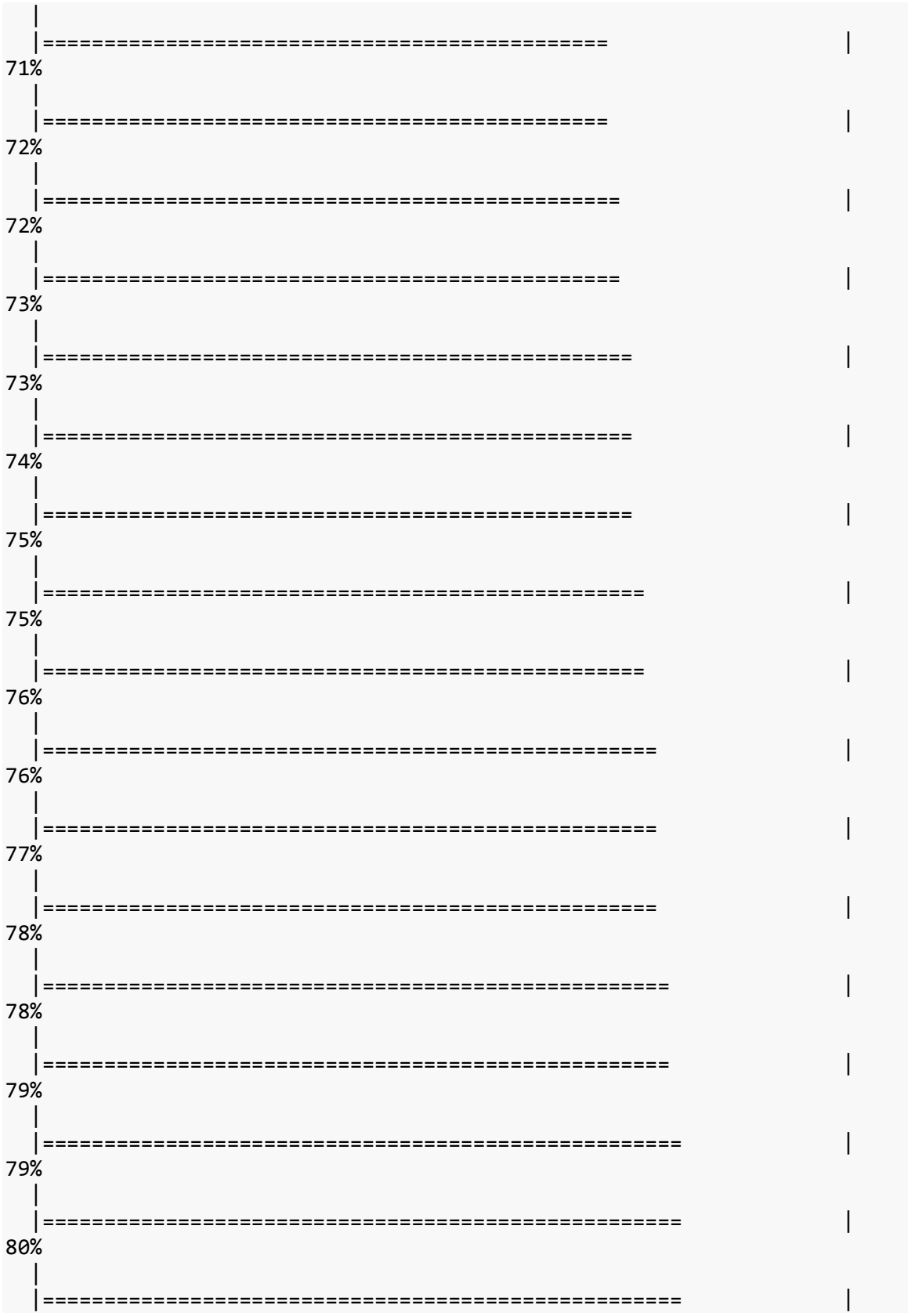
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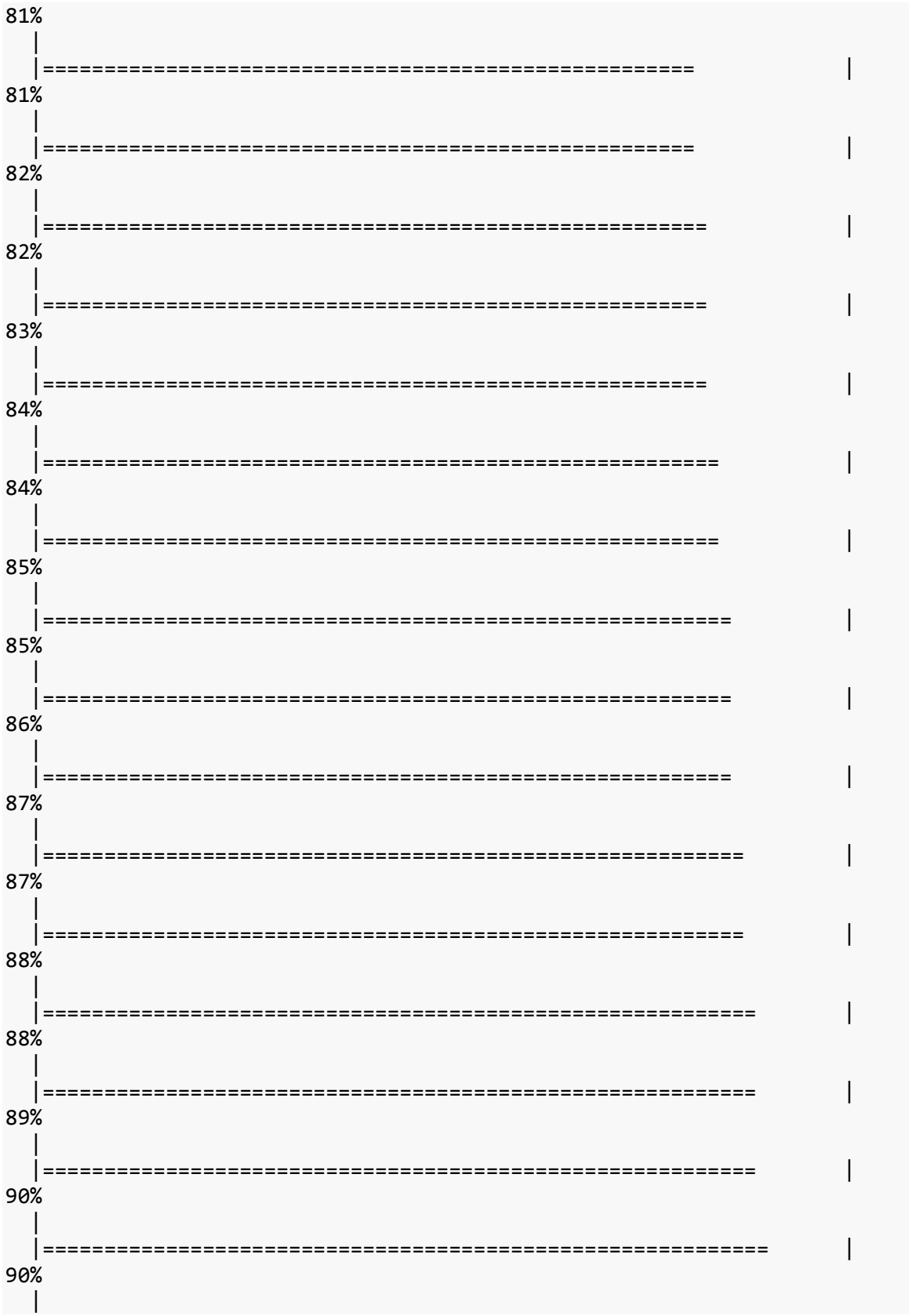

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# Calculating the score by brand

scores$brand = factor(rep(c("wilson", "nike", "head", "babolat"), nd))
scores$muito.pos = as.numeric(scores$score >= 2)
scores$muito.neg = as.numeric(scores$score <= -2)
```

```
# Calculating the total

numpos = sum(scores$muito.pos)
numneg = sum(scores$muito.neg)

# Score global

global_score = round( 100 * numpos / (numpos + numneg) )
```

Sentiment Scores - Visualizations

```
# colors
cols = c("#7CAE00", "#00BFC4", "#F8766D", "#C77CFF")
names(cols) = c("wilson", "nike", "head", "babolat")

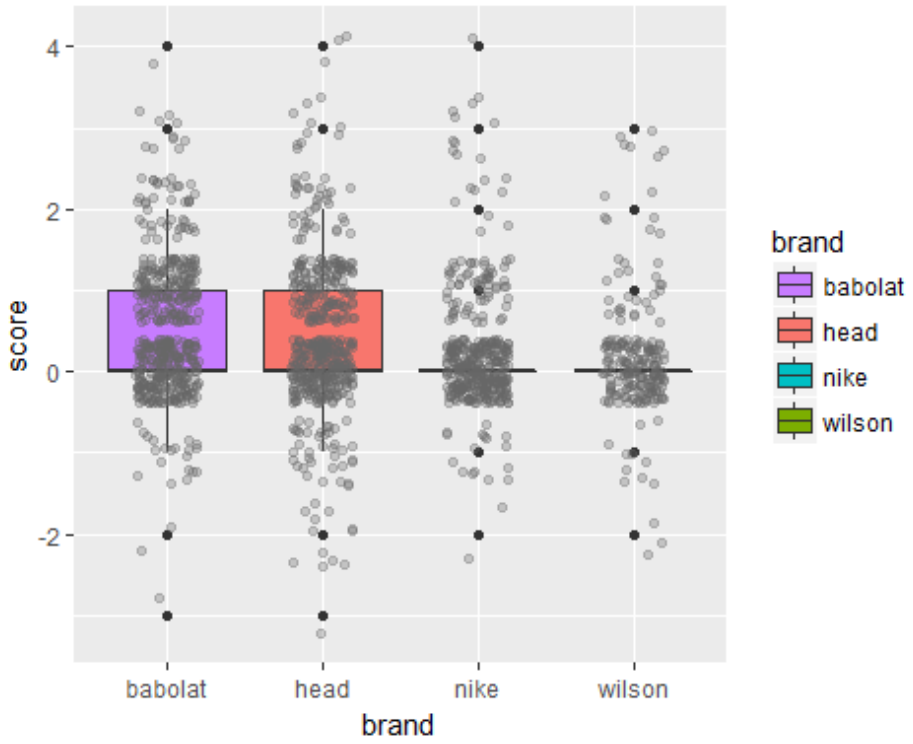
# boxplot

#install.packages("ggplot2")
library(ggplot2)

##
## Attaching package: 'ggplot2'

## The following object is masked from 'package:NLP':
##
##     annotate

ggplot(scores, aes(x=brand, y=score, group=brand)) +
  geom_boxplot(aes(fill=brand)) +
  scale_fill_manual(values=cols) +
  geom_jitter(colour="gray40",
              position=position_jitter(width=0.2), alpha=0.3)
```

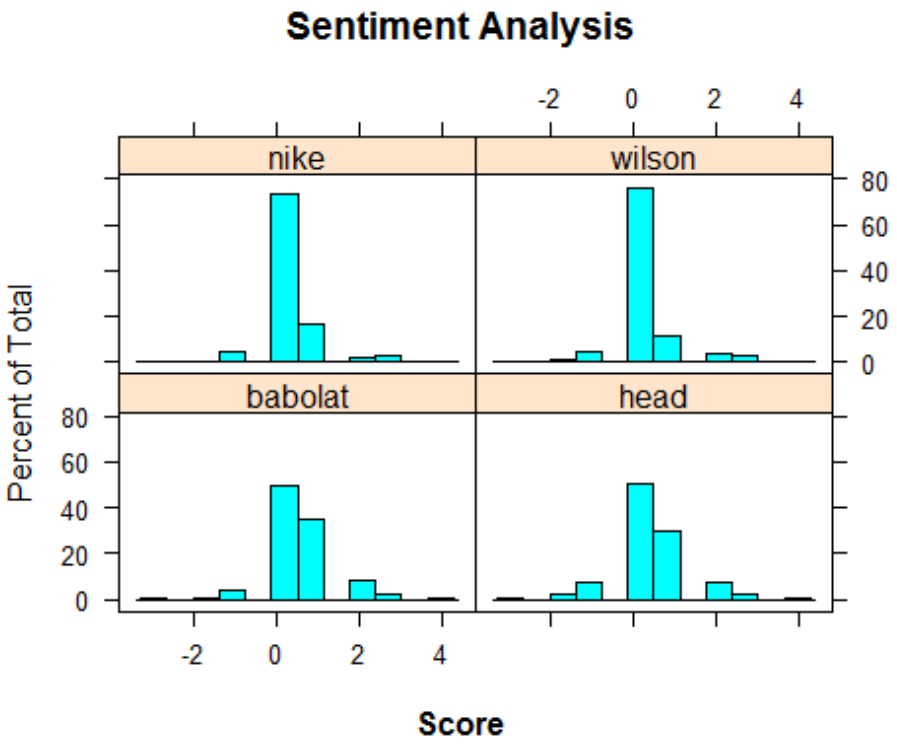



```
#opts(title = "Boxplot - brands Sentiment Scores")

# Generating a histogram with lattice
#install.packages("lattice")
library("lattice")

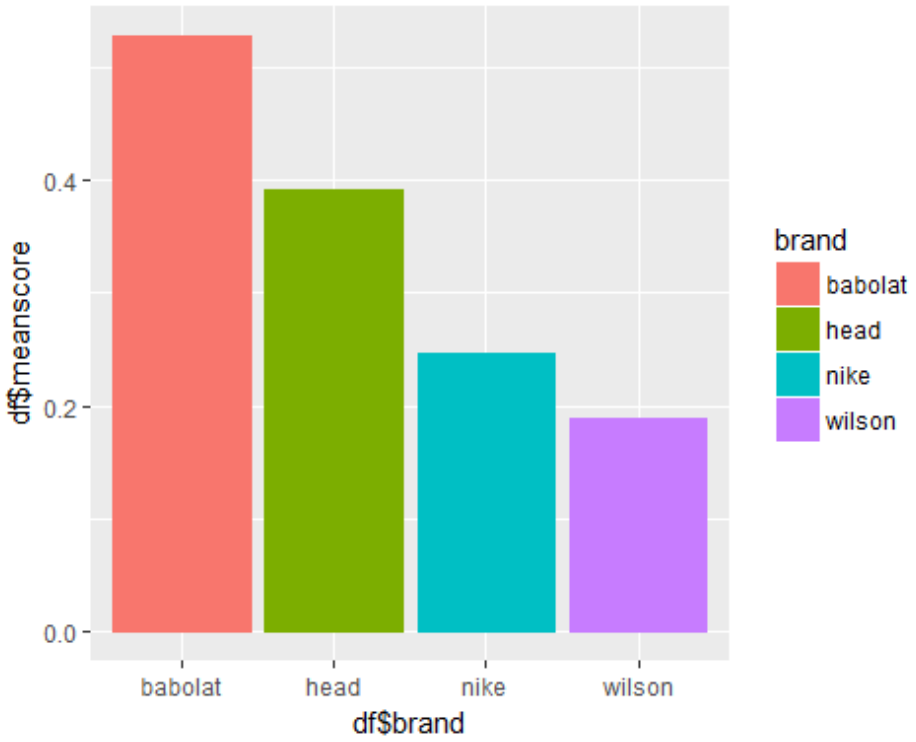
## Warning: package 'lattice' was built under R version 3.4.2

histogram(data = scores, ~score|brand, main = "Sentiment Analysis", xlab
= "", sub = "Score")
```




```
# barplot of average score
meanscore = tapply(scores$score, scores$brand, mean)
df = data.frame(brand=names(meanscore), meanscore=meanscore)
df$brands <- reorder(df$brand, df$meanscore)

f <- ggplot(df, aes(df$brand, df$meanscore))
f + geom_bar(stat= "identity",aes(color=brand,fill=brand))
```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nike
wilson
df$brand
brand
babolat
head
nike
wilson