SFDC Topic Modeling and Sentiment

Ken Brooks

June 3, 2015

Adapted from Ted Kwartler (Ted@sportsanalytics.org), Open Data Science Conference Workshop: Intro to Text Mining using R, 5-30-2015, v7.0 Topic Modeling and simple sentiment

```r
dataDir <- if(interactive()) 'data' else 'data'
#libraries
library(tm)
```

```
## Loading required package: NLP
```

```r
library(topicmodels)
#install.packages('topicmodels')
library(portfolio)
```

```
## Loading required package: grid

## Loading required package: lattice

## Loading required package: nlme
```

```r
#install.packages("portfolio")
#library(ggplot2)
#library(ggthemes)
library(stringr)

library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following object is masked from 'package:nlme':
##
##     collapse

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(readxl)
```

Set options and defined functions

```r
#options, functions
options(stringsAsFactors = FALSE)
Sys.setlocale('LC_ALL','C')
```

```
## [1] "C/C/C/C/C/en_US.UTF-8"
```

```r
#try to lower function
tryTolower <- function(x){
  # return NA when there is an error
  y = NA
  # tryCatch error
  try_error = tryCatch(tolower(x), error = function(e) e)
  # if not an error
  if (!inherits(try_error, 'error'))
    y = tolower(x)
  return(y)
}

clean.corpus<-function(corpus){
  corpus <- tm_map(corpus, removePunctuation)
  corpus <- tm_map(corpus, stripWhitespace)
  corpus <- tm_map(corpus, removeNumbers)
  corpus <- tm_map(corpus, content_transformer(tryTolower))
  corpus <- tm_map(corpus, removeWords, custom.stopwords)
  return(corpus)
}

#Bigram token maker
bigram.tokenizer <-function(x)
  unlist(lapply(ngrams(words(x), 2), paste, collapse = " "), use.names = FALSE)

#Bring in subjective lexicons
pos <- readLines(file.path(dataDir, "positive_words.txt"))
neg <-readLines(file.path(dataDir, "negative_words.txt"))

#Simple sentiment subject word counter function, poached online
score.sentiment = function(sentences, pos.words, neg.words, .progress='none')
{
  scores = plyr::laply(sentences, function(sentence, pos.words, neg.words) {
    word.list = str_split(sentence, '\\s+')
    words = unlist(word.list)
    # compare our words to the dictionaries of positive & negative terms
    pos.matches = match(words, pos.words)
    neg.matches = match(words, neg.words)
    pos.matches = !is.na(pos.matches)
    neg.matches = !is.na(neg.matches)
    #TRUE/FALSE will be treated as 1/0 by sum():
```

```
    score = sum(pos.matches) - sum(neg.matches)
    return(score)
  }, pos.words, neg.words, .progress=.progress )
  scores.df = data.frame(score=scores, text=sentences)
  return(scores.df)
}
```

Create custom stop words

```
#Create custom stop words

custom.stopwords <- c(stopwords('english'), 'lol', 'smh', 'learning curve', 'learning curves')
```

Import and clean text, build dtm

```
#bring in some text
# text<-read.csv(file.path(dataDir,'SFDC_Survey.csv'), header=TRUE)
text <- readxl::read_excel(file.path(dataDir, 'LP Spring 2016 Instructor Survey- 3_Free Responses.xlsx'

#Create a clean corpus
colOfInterest = "What do you like most about LaunchPad?"
# colOfInterest = "How can LaunchPad be improved? Tell us one feature or function that could be added o
corpus <- Corpus(DataframeSource(data.frame(text[[colOfInterest]])))
corpus <- clean.corpus(corpus)

#Make a DTM
dtm<-DocumentTermMatrix(corpus, control=list(tokenize=bigram.tokenizer))
```

Perform topic modeling

```
#In Topic Modeling, remove any docs with all zeros after removing stopwords
rowTotals <- apply(dtm , 1, sum)
dtm.new   <- dtm[rowTotals> 0, ]

#In Sentiment, to ensure the number of rows in the dtm.new and the sentiment data frame equal
text <-cbind(text,rowTotals)
text <- text[rowTotals> 0, ]

#Begin Topic Modeling; can use CTM or LDA
topic.model <- LDA(dtm.new, control = list(alpha = 0.1), k = 5)

#Topic Extraction
topics<-get_terms(topic.model, 5)
colnames(topics)<-c("topic1","topic2","topic3","topic4","topic5")
topics<-as.data.frame(topics)
t1<-paste(topics$topic1,collapse=' ')
t2<-paste(topics$topic2,collapse=' ')
```

```
t3<-paste(topics$topic3,collapse=' ')
t4<-paste(topics$topic4,collapse=' ')
t5<-paste(topics$topic5,collapse=' ')
topics
```

```
##              topic1               topic2        topic3               topic4
## 1          easy use          assign work      easy use           can assign
## 2 visual synthesis          auto grading  students can homework assignments
## 3          easy set automatically graded       can use         students use
## 4      students use       data provided   able assign        user friendly
## 5     synthesis map        easy navigate allows assign    activities videos
##              topic5
## 1          ease use
## 2      like ability
## 3     students work
## 4    ability access
## 5      access ebook
```

Assign documents to topics

```
#Score each tweet's probability for the topic models then add the topic words to the df as headers
scoring<-posterior(topic.model)
scores<-scoring$topics
scores<-as.data.frame(scores)
colnames(scores)<-c(t1,t2,t3,t4,t5)

#The max probability of each tweet classifies the tweet document
topics.text<-as.data.frame(cbind(row.names(scores),apply(scores,1,function(x) names(scores)[which(x==ma
```

Perform sentiment scoring

```
#Apply the subjective lexicon scoring function

sentiment.score<-score.sentiment(text[[colOfInterest]], pos, neg, .progress='text')
```

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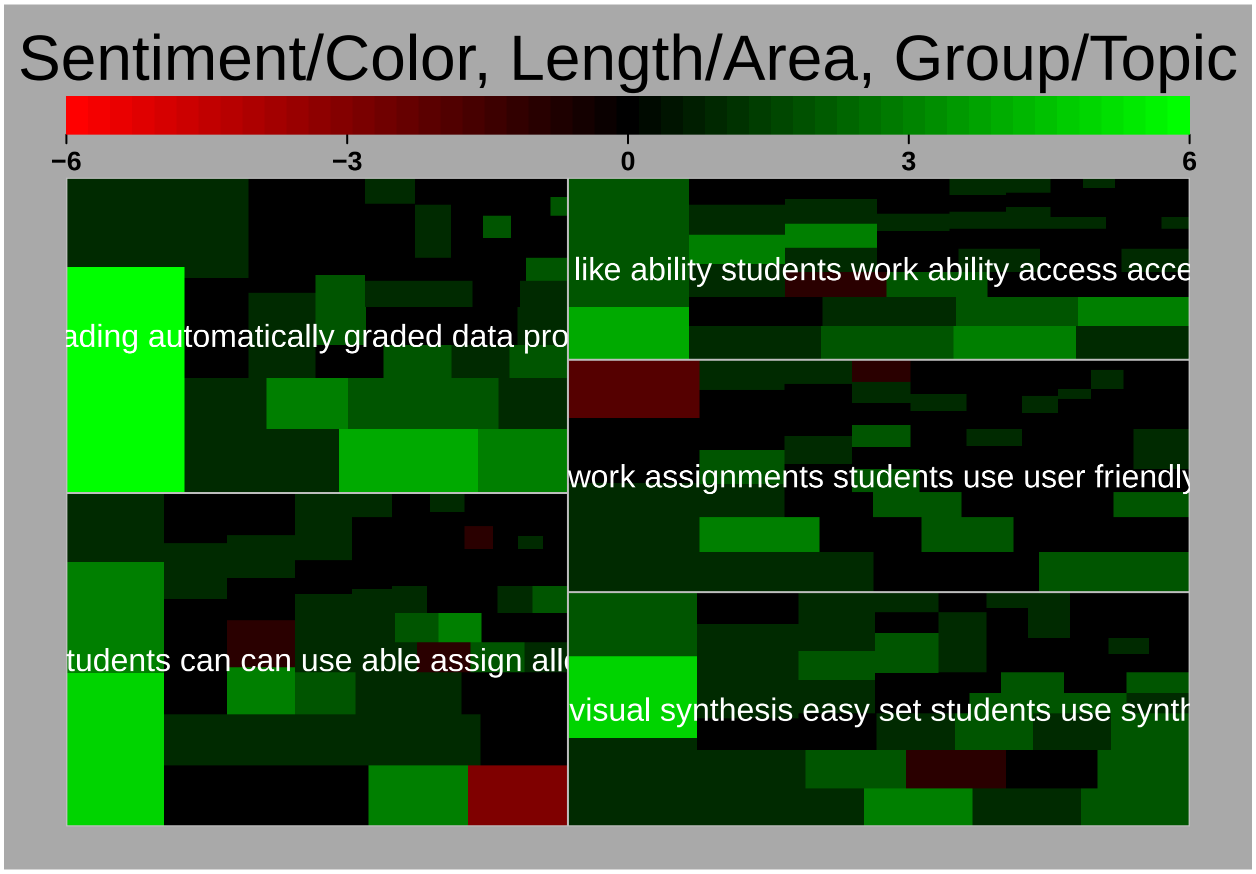
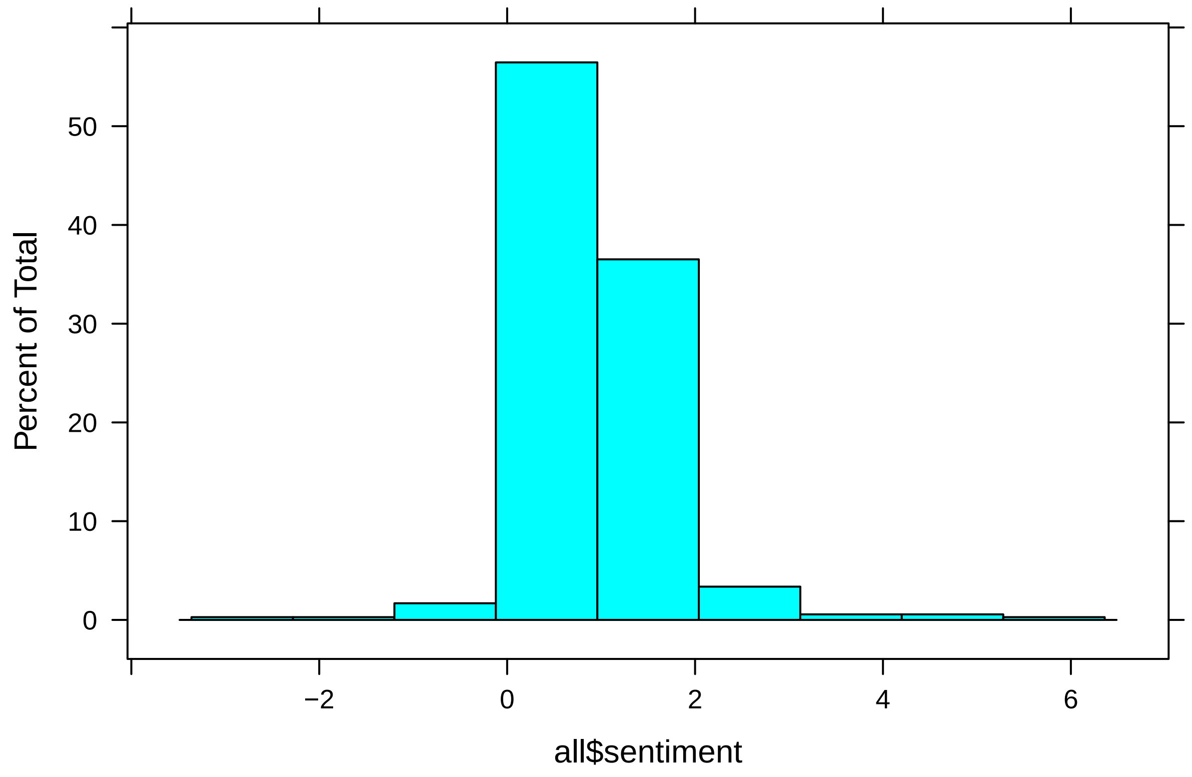
```
#Get the length of each doc by number of words not characters
doc.length<-rowSums(as.matrix(dtm.new))

#Create a unified data frame
all<-cbind(topics.text,scores,sentiment.score, doc.length)
names(all)[2]<-paste("topic")
names(all)[8]<-paste("sentiment")
names(all)[10]<-paste("length")
all[all == ""] <- NA

#Make the treemap
map.market(id=all$V1, area=all$length, group=all$topic, color=all$sentiment, main="Sentiment/Color, Leng
```



```
#End
```

Sort comments with most negative on top and print them

```
histogram(all$sentiment)
```



```
sent.limit = -5

all %>% filter(sentiment <= sent.limit) %>% arrange(desc(sentiment)) %>% select(text)
```

```
## [1] text
## <0 rows> (or 0-length row.names)
```

Plot sentiment over time

- Make sure data frame is in date order
- aggregate by week?
- plot time series
- add a loess trend line