SFDC Topic Modeling and Sentiment

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

```
#Set the working directory and import libraries
#setwd("~/Google Drive KB/Open Source Conf")

dataDir <- if(interactive()) 'data' else '../data'

#libraries
library(tm)
```

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

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

```
## Loading required package: grid
```

```
## Loading required package: lattice
```

```
## Loading required package: nlme
```

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

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

```
## The following objects are masked from 'package:plyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
## 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
```

Set options and defined functions

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

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

```
#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("positive_words.txt")
neg <- readLines("negative_words.txt")

#Simple sentiment subject word counter function, poached online
score.sentiment = function(sentences, pos.words, neg.words, .progress='none')
{
  scores = 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', 'learn
ing 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('LP Spring 2016 Instructor Survey- 3_Free Responses.xls
x')
#Create a clean corpus
# Instructor:
# col1 = "What do you like most about LaunchPad?"
col1 = "How can LaunchPad be improved? Tell us one feature or function that could
be added or improved to make your experience of LaunchPad better."
#Student:
# col1 = "How can LaunchPad be improved? Tell us one feature or function that coul
d be added or improved to make your LaunchPad experience better."
corpus <- Corpus(DataframeSource(data.frame(text[[col1]])))
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               test bank        due date tech support      students see
## 2               due dates  content errors     due date     use launchpad
## 3              grade book       due dates    like able confuses students
## 4             make easier correct answers    due dates   easier navigate
## 5 questions learningcurve easier students  one student       make easier
##                topic5
## 1        make easier
## 2         grade book
## 3           ease use
## 4 graphing questions
## 5       tech support
```

Assign documents to topics

```
#Score each tweet's probability for the topic models then add the topic words to t
he 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) name
s(scores)[which(x==max(x))])))
```

Perform sentiment scoring

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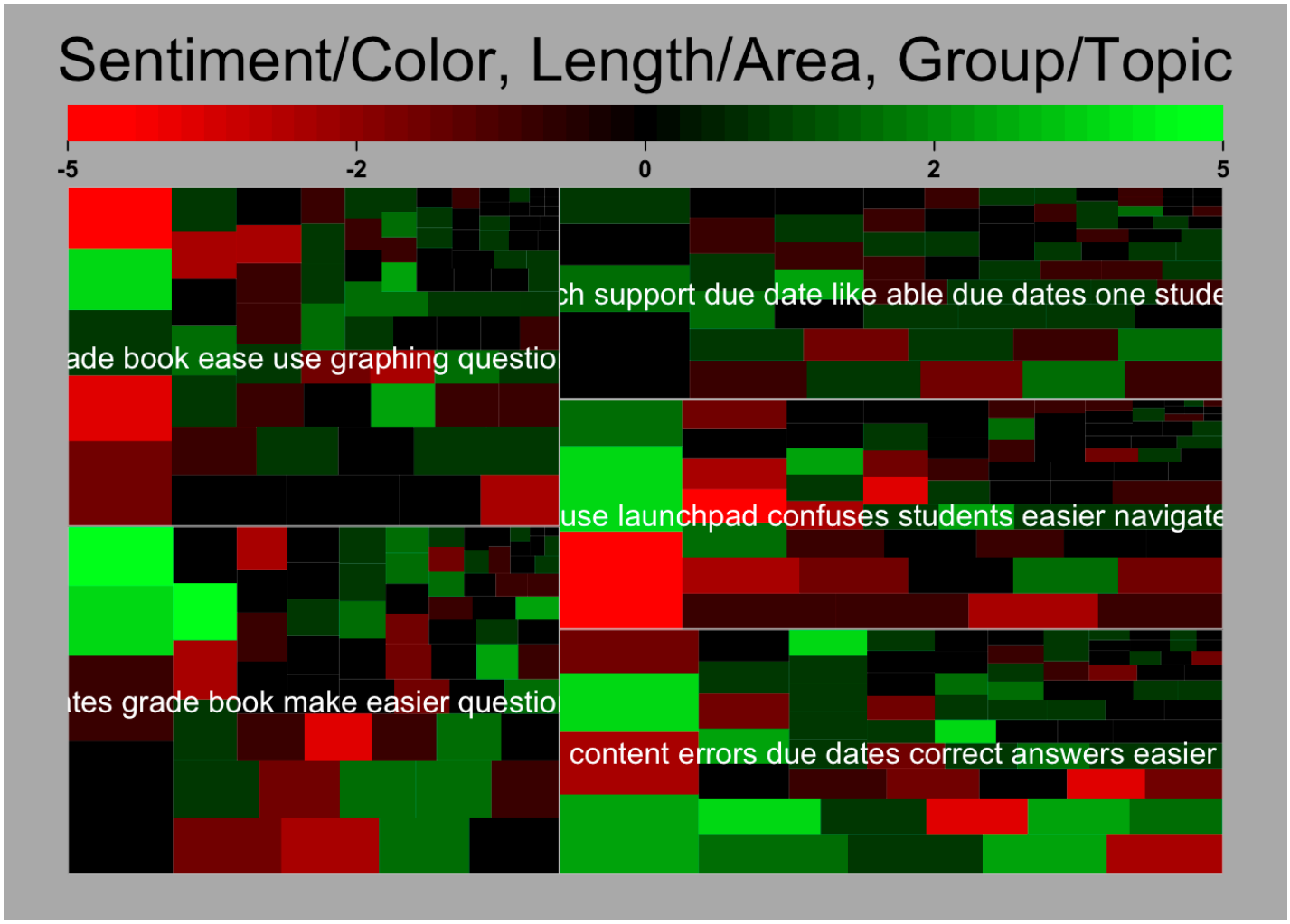
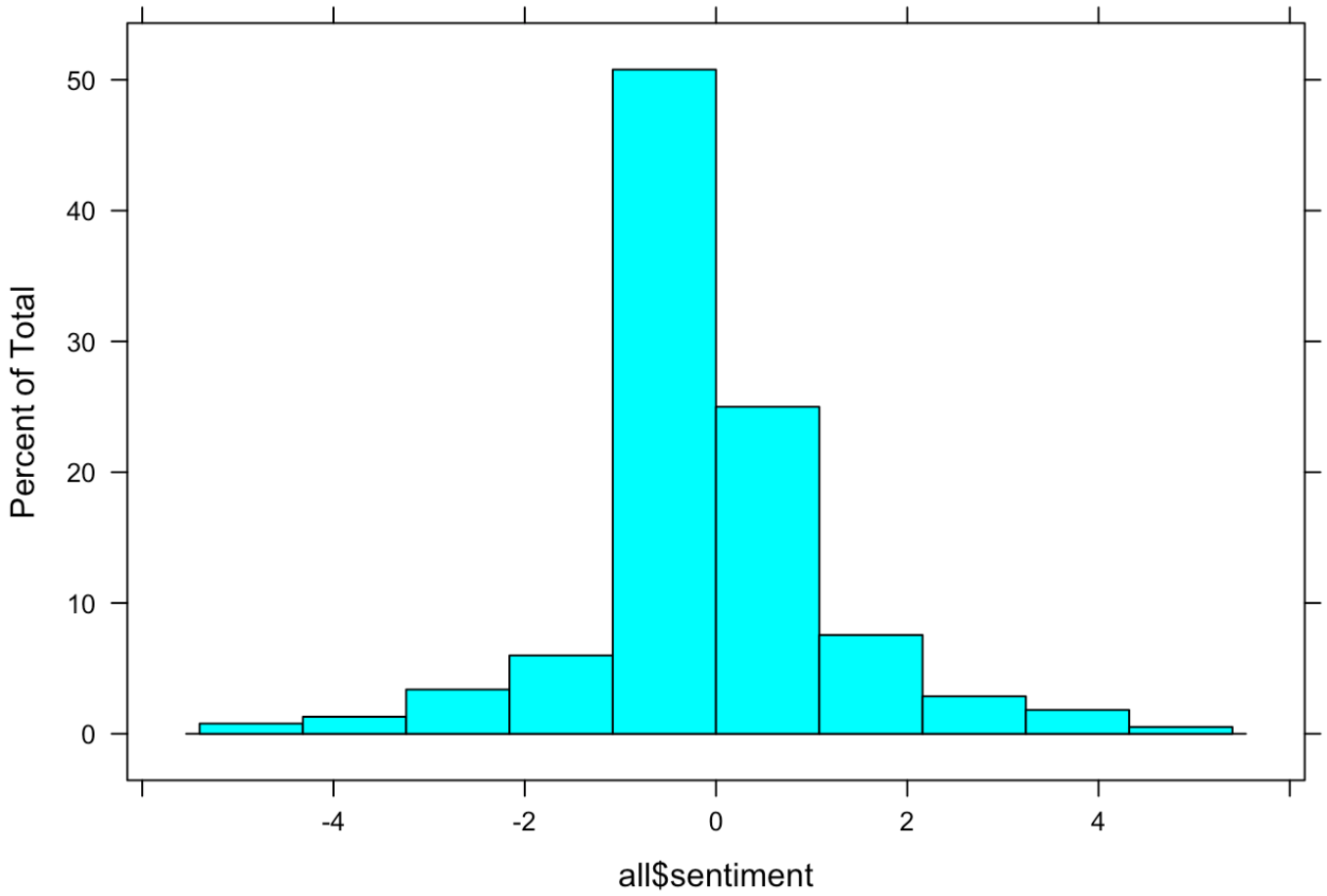


Sort comments with most negative on top and print them

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




```
sent.limit = -5

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

```
##
text
## 1 Some Student complaints of how slow the speed was and took student a long tim
e to do the work. One student was taking 10 hours. Slow speed was the issue and sh
e called IT at least twice and finally got help. Had complaints that it would be g
ood to put two blanks for answers if it is a two word answer. Students take a lot
of time trying to find the exact word or words wanted.  When a student is sick or
I need to extend two or thee students a deadline I have to go through every single
video and learning curve assignment for each specific student to change their subm
ission date. Is there any way to change submission date for the entire chapter on
all assignments. This is time consuming. Sometimes takes students a week or two be
cause they are confused at how to get into mind tap. Is there a video to use to se
nd them in a link instead of the written format?
## 2
Every week I would have a student (or several) have problems with activities.  The
y would freeze up, or would not score the activities correctly.  If the student in
itiated a ticket through the LaunchPad help desk, it was rarely resolved.  And the
n the activity would just hang out there for the student, who would not have the a
bility to complete it.  However, if I initiated the inquiry, it would get resolved
rather quickly.  I am not sure why this occurred, but it put a large burden on my
to either initiate the tickets myself, or just give the students  credit for probl
ematic assignments.
## 3
There were MANY errors in the problem sets.  The person that typed in the answers
to the problems did a poor job.  I am hesitant to use launchpad again.  Please hav
e someone spend the time to go through EVERY SINGLE PROBLEM and make sure the answ
ers are correct.
```

Plot sentiment over time

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