hillarystats.R

laurajakli

Fri Dec 9 00:21:05 2016

```
###This contains the entire code for data analysis and visualization for Hillary Clinton.

##SET WORKING DIRECTORY##

setwd("/Users/laurajakli/Desktop/231A_data")

####Package installations (for all sections) ######

library(tidyr)
library(viridis)
library(dplyr)
```

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

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

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

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.3.2
```

```
library(scales)
```

```
## Warning: package 'scales' was built under R version 3.3.2
```

```
library(grid)
library(RColorBrewer)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
library(qdap)
```

```
## Loading required package: qdapDictionaries
```

```
## Loading required package: qdapRegex
```

```
##
## Attaching package: 'qdapRegex'
```

```
## The following object is masked from 'package:ggplot2':
##
```

```
##     %+%
## The following objects are masked from 'package:dplyr':
##
##     escape, explain
## Loading required package: qdapTools
##
## This data.table install has not detected OpenMP support. It will work but slower in single threaded m
##
## Attaching package: 'qdapTools'
## The following object is masked from 'package:dplyr':
##
##     id
##
## Attaching package: 'qdap'
## The following object is masked from 'package:dplyr':
##
##     %>%
## The following object is masked from 'package:tidyr':
##
##     %>%
## The following object is masked from 'package:base':
##
##     Filter
library(data.table)
## Warning: package 'data.table' was built under R version 3.3.2
## ------------------------------------------------------------------------------
## data.table + dplyr code now lives in dtplyr.
## Please library(dtplyr)!
## ------------------------------------------------------------------------------
##
## Attaching package: 'data.table'
## The following object is masked from 'package:qdapTools':
##
##     shift
## The following objects are masked from 'package:dplyr':
##
##     between, first, last
library(scales)
library(tm)
## Loading required package: NLP
##
## Attaching package: 'NLP'
```

```
## The following object is masked from 'package:qdap':
##
##     ngrams

## The following object is masked from 'package:ggplot2':
##
##     annotate

##
## Attaching package: 'tm'

## The following objects are masked from 'package:qdap':
##
##     as.DocumentTermMatrix, as.TermDocumentMatrix
```

```
library(SnowballC)
library(wordcloud)

####read in data####

df <- read.csv("hillaryclinton_facebook.csv", fileEncoding="latin1")

###Section 1: Visualizing Facebook Reactions over Time#####

###I am interested in understanding the degree to which Facebook reactions are
###sarcastic versus "genuine." In other words, I want to see if most reactions
###are in a "trolling" style, or if generally, reactions actually translate to
###the actually intended emotion (via the status poster.) This is a difficult
###task and I will not achieve it with this project. But as a sanity check before
###the rest of my analysis, I wanted to see what produced the most anger (i.e.,
#most "anger" reactions towards each candidates' statuses.

#Here, we arrange the dataframe in descending order of num_angrys,
#subsetting to only the date, the status message, and the count of
#angry reactions.

dfangry<-arrange(df, desc(num_angrys))
dfangry<-(dfangry[1:10,])
dfangry<-select(dfangry, status_published, status_message, num_angrys)

#Now I save this as a table to a pdf using the grid.table function.

pdf("top_angrystatus_Clinton.pdf", height=8, width=28)
grid.table(dfangry)
```

```
## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## font width unknown for character 0x89

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## font width unknown for character 0x89

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : font width unknown for character 0x89
```

```
dev.off()
```

```
## pdf
##   2
```

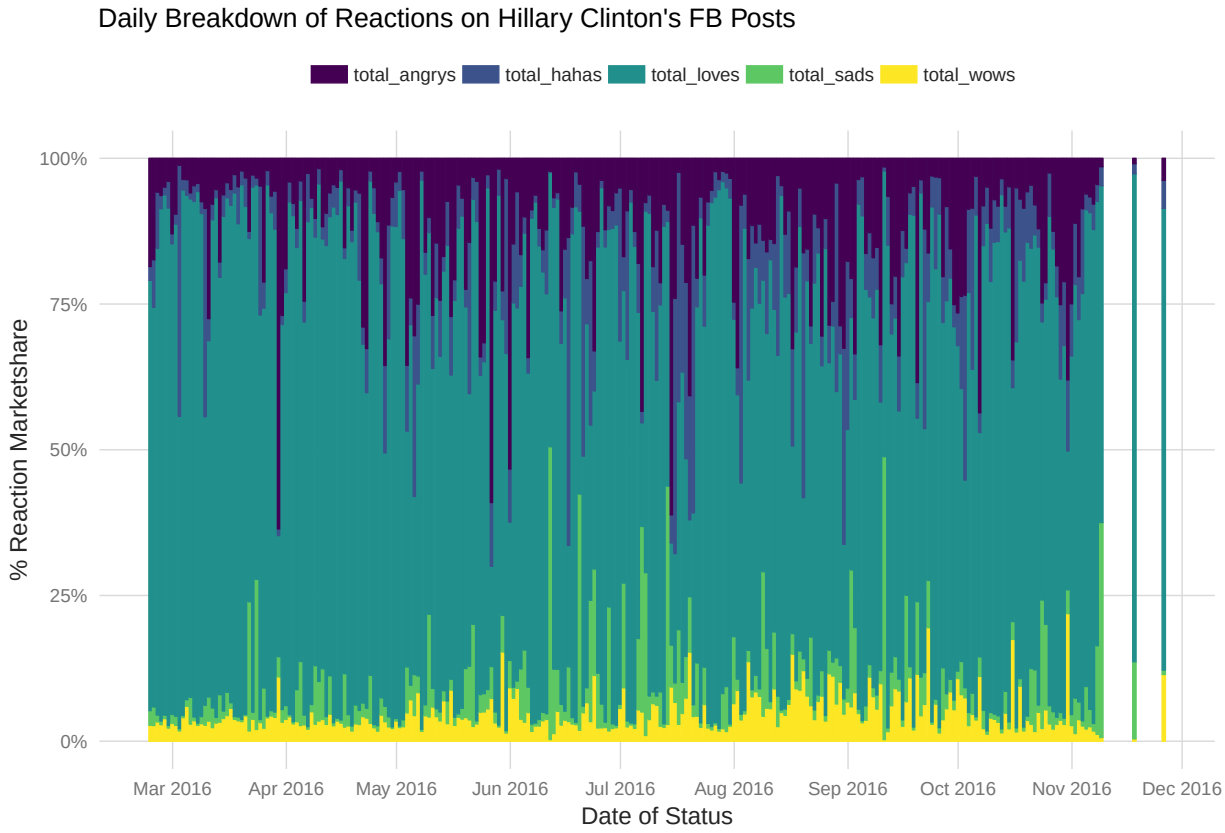
```
##Here, I use the group by function to group by date
##rather than individual status, since there are
##multiple posts per day by different candidates.
##As such, we get the total reactions per day,
##by reaction type.

df_agg <- df %>% group_by(date = as.Date(substr(date, 1, 10))) %>%
  summarize(total_likes=sum(num_likes),
            total_loves=sum(num_loves),
            total_wows=sum(num_wows),
            total_hahas=sum(num_hahas),
            total_sads=sum(num_sads),
            total_angrys=sum(num_angrys)) %>%
  arrange(date)


#Now, let's aggregate across all reaction types.

df_agg_long <- df_agg %>% gather(key=reaction, value=count, total_likes:total_angrys) %>%
  mutate(reaction=factor(reaction))

print(head(df_agg_long,10))
```

```
## # A tibble: 10 × 3
##          date    reaction  count
##        <date>      <fctr>  <int>
## 1  2016-02-24 total_likes  84159
## 2  2016-02-25 total_likes 107735
## 3  2016-02-26 total_likes 158431
## 4  2016-02-27 total_likes 366634
## 5  2016-02-28 total_likes 139146
## 6  2016-02-29 total_likes 174626
## 7  2016-03-01 total_likes 385700
## 8  2016-03-02 total_likes 143293
## 9  2016-03-03 total_likes 211056
## 10 2016-03-04 total_likes  79928
```

```
react_theme <- function() {

  #Here, we're working with the Greys palette from RColorBrewer.
  palette <- brewer.pal("Greys", n=9)
  color.background = palette[1]
  color.grid.major = palette[3]
  color.axis.text = palette[6]
  color.axis.title = palette[8]
  color.title = palette[9]

  theme_bw(base_size=9) +

    #Here, we set the chart region to the background's light grey.
    theme(panel.background=element_rect(fill=color.background, color=color.background)) +
    theme(plot.background=element_rect(fill=color.background, color=color.background)) +
    theme(panel.border=element_rect(color=color.background)) +
```

```
    #The grid is a bit darker.
    theme(panel.grid.major=element_line(color=color.grid.major,size=.25)) +
    theme(panel.grid.minor=element_blank()) +
    theme(axis.ticks=element_blank()) +

    #The legend is hidden.
    theme(legend.position="none") +
    theme(legend.background = element_rect(fill=color.background)) +
    theme(legend.text = element_text(size=7,color=color.axis.title)) +

    #Here, we format the title and axis labels.
    theme(plot.title=element_text(color=color.title, size=10, vjust=1.25)) +
    theme(axis.text.x=element_text(size=7,color=color.axis.text)) +
    theme(axis.text.y=element_text(size=7,color=color.axis.text)) +
    theme(axis.title.x=element_text(size=8.5,color=color.axis.title, vjust=0)) +
    theme(axis.title.y=element_text(size=8.5,color=color.axis.title, vjust=1.25)) +

    #Finally, let's plot the margins
    theme(plot.margin = unit(c(0.35, 0.2, 0.3, 0.35), "cm"))
}



###I am filtering out the "likes" because they would effectively
###"drown out" all of the other reactions visuallt, as "likes" are still by far the
###most  popular reaction.

reactionsplot <- ggplot(df_agg_long %>% filter(reaction!="total_likes"), aes(x=date, y=count, color=rea
  geom_bar(size=0.25, position="fill", stat="identity") +
  react_theme() +
  scale_x_date(breaks = date_breaks("1 month"), labels = date_format("%b %Y")) +
  scale_y_continuous(labels=percent) +
  theme(legend.title = element_blank(),
        legend.position="top",
        legend.direction="horizontal",
        legend.key.width=unit(0.5, "cm"),
        legend.key.height=unit(0.25, "cm"),
        legend.spacing=unit(0,"cm")) +
  scale_color_viridis(discrete=T) +
  scale_fill_viridis(discrete=T) +
  labs(title="Daily Breakdown of Reactions on Hillary Clinton's FB Posts",
       x="Date of Status",
       y="% Reaction Marketshare")

reactionsplot
```

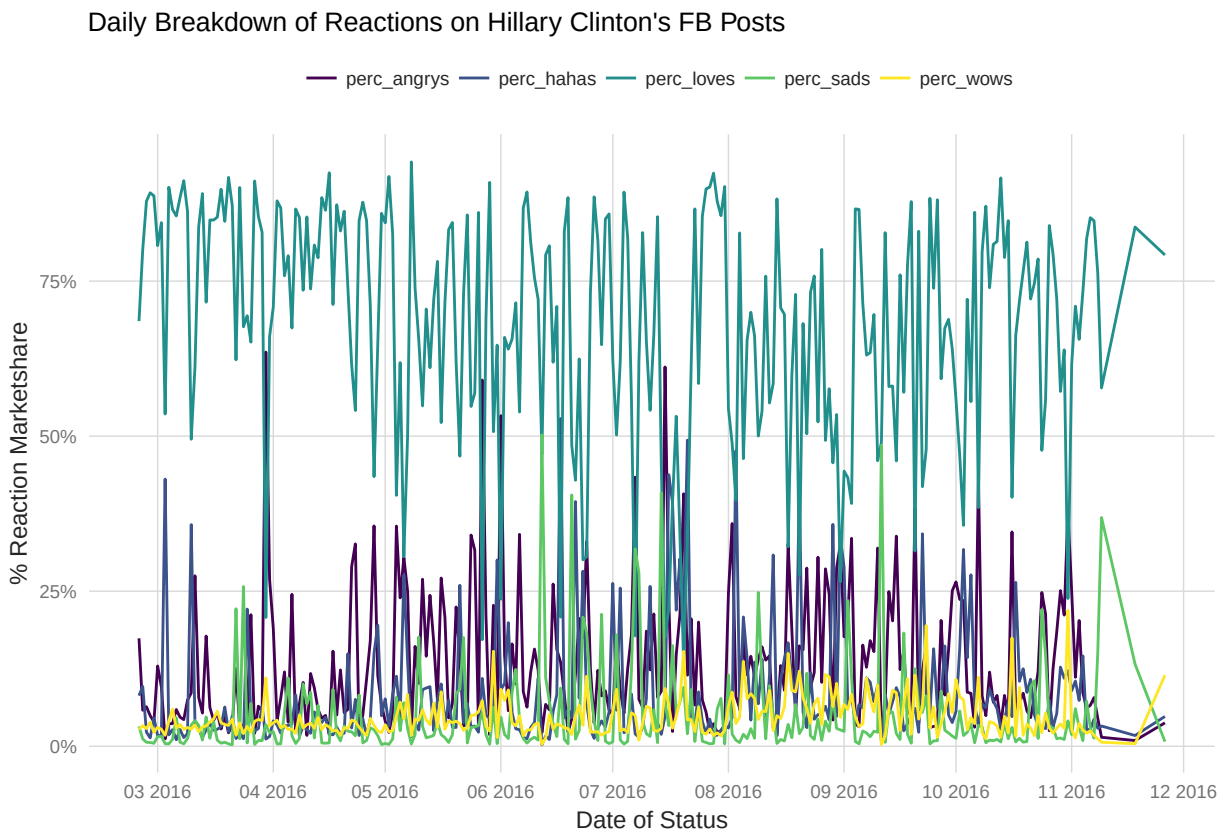
```
## Warning: Removed 5 rows containing missing values (position_stack).
```




```
#Now, let's aggregate but as percentages, not totals.
#I actually prefer the first visualization, but this is
#a slightly different way to help visualize the data.

df_percentagg <- df %>% group_by(date = as.Date(substr(date, 1, 10))) %>%
  summarize(total_reactions=sum(num_loves)+sum(num_wows)+sum(num_hahas)+sum(num_sads)+sum(num_angrys),
            perc_loves=sum(num_loves)/total_reactions,
            perc_wows=sum(num_wows)/total_reactions,
            perc_hahas=sum(num_hahas)/total_reactions,
            perc_sads=sum(num_sads)/total_reactions,
            perc_angrys=sum(num_angrys)/total_reactions) %>%
  select(-total_reactions) %>%
  arrange(date)


df_percentagg<-df_percentagg <- df_percentagg[-c(1), ]
df_percentagg_long <- df_percentagg %>% gather(key=reaction, value=count, perc_loves:perc_angrys) %>%
  mutate(reaction=factor(reaction))


reactionpercents <- ggplot(df_percentagg_long, aes(x=date, y=count, color=reaction)) +
  geom_line(size=0.5, stat="identity") +
  react_theme() +
  scale_x_date(breaks = date_breaks("1 month"), labels = date_format("%m %Y")) +
  scale_y_continuous(labels=percent) +
  theme(legend.title = element_blank(),
        legend.position="top",
```

```
        legend.direction="horizontal",
        legend.key.width=unit(0.5, "cm"),
        legend.key.height=unit(0.25, "cm"),
        legend.spacing=unit(0,"cm")) +
  scale_color_viridis(discrete=T) +
  scale_fill_viridis(discrete=T) +
  labs(title="Daily Breakdown of Reactions on Hillary Clinton's FB Posts",
       x="Date of Status",
       y="% Reaction Marketshare")
reactionpercents
```

```
## Warning: Removed 5 rows containing missing values (geom_path).
```

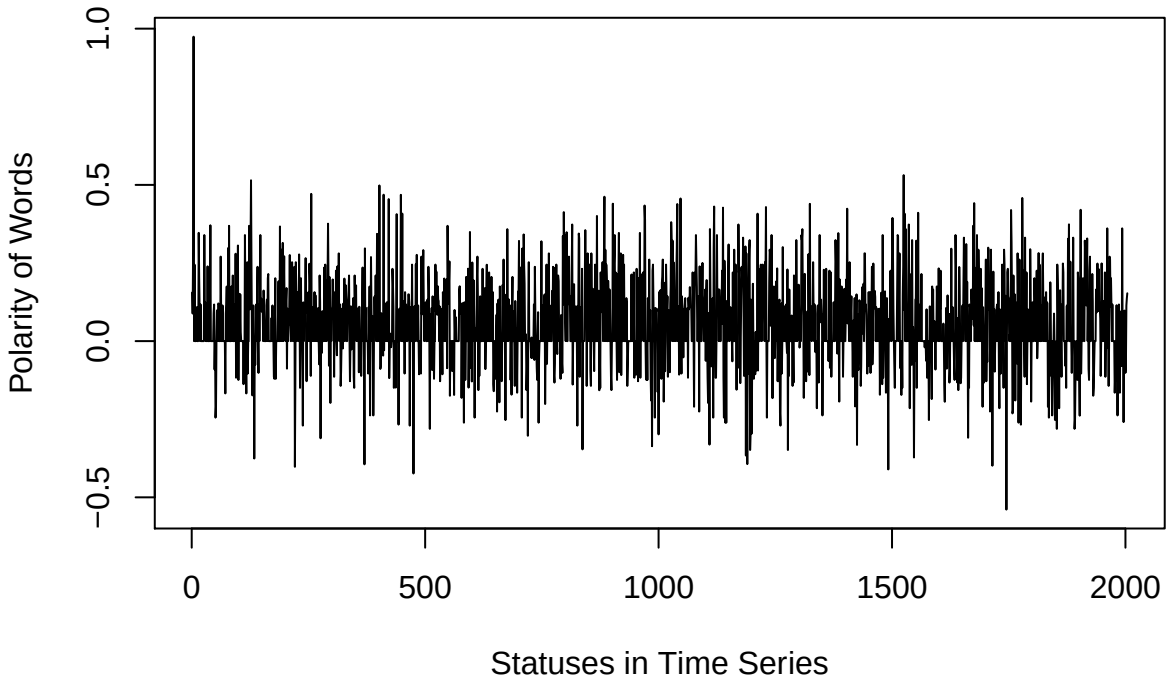



```
####### Section 2. Examining Language Polarity####


##Here, I am tweaking code from the sentiment analysis lecture
##using the `qdap` function.  I am conducting a plot analysis
##of candidates' Facebook statuses using sentiments.
##As Rochelle mentioned, the `qdap` package is great for
##using dictionary methods to analyze text.
##One of the most popular of these methods is sentiment analysis,
##which calculates how "positive" or "negative" text is.
##Here, it's on a -1 (most negative) to 1 (most positive) scale.
##Note that we're not specifying UTF-8 (unicode) encoding here.
```

```
df <- read.csv("hillaryclinton_facebook.csv", fileEncoding="latin1")


# Then put the dataframe into a data.table
df.dat <- data.table(df)

# We now add columns for cumulative word counts and polarity scores,
# so that we measure sentiment over time.

# First, we add word counts
df.dat <-df.dat[, wc := wc(status_message,missing=0)]

# Next, we add cumulative word count and percent
# completes to proxy for progression
df.dat<- df.dat[, cumsum := cumsum(wc)]
df.dat<- df.dat[, pct.complete := df.dat$cumsum / sum(df.dat$wc)]
df.dat<- df.dat[, pct.complete.100 := pct.complete * 100]

# Here, we calculate polarity. We obtain a vector of polarity scores
df.dat <- with(df, polarity(status_message, date, constrain = TRUE))
```

```
## Warning in polarity(status_message, date, constrain = TRUE):
##   Some rows contain double punctuation.  Suggested use of `sentSplit` function.
```

```
polcount.dfdat <- na.omit(counts(df.dat)$polarity)

# Next, we put all of this polarity info into a data frame
len <- length(polcount.dfdat)
pol.df <- data.frame(polarity = polcount.dfdat, Time=1:len)


# Finally, we plot it. ggplot doesn't seem to add much here
# so I'll just use a simple plot.

plot(x = pol.df$Time, y = pol.df$polarity, type="l", xlab="Statuses in Time Series",
     ylab="Polarity of Words")
```



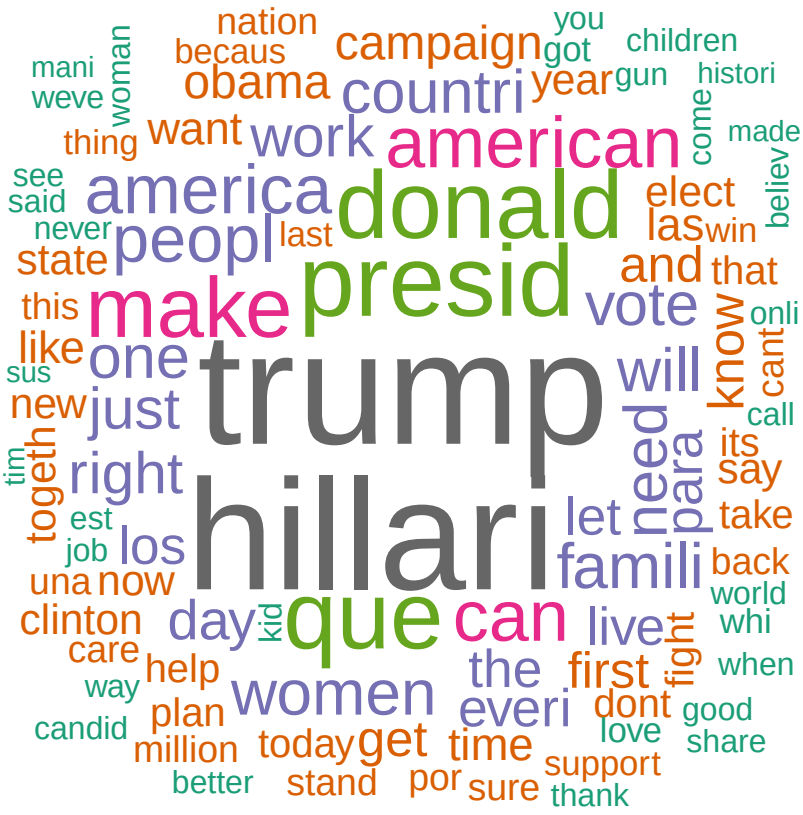

```
#### Section 3: Candidate Status WordCloud ####

hildog <- read.csv('hillaryclinton_facebook.csv', stringsAsFactors = FALSE)

#First, prepare the "corpus."
#As we've discussed in lecture,
#A corpus is a collection of texts,
#usually stored electronically,
#and from which we perform our analysis.
#Here, the corpus is the candidates' status
#messages.

hilCorpus <- Corpus(VectorSource(hildog$status_message))


#As we've noted in lecture, most text analysis
# applications follow a similar
```

recipe' for preprecessing.

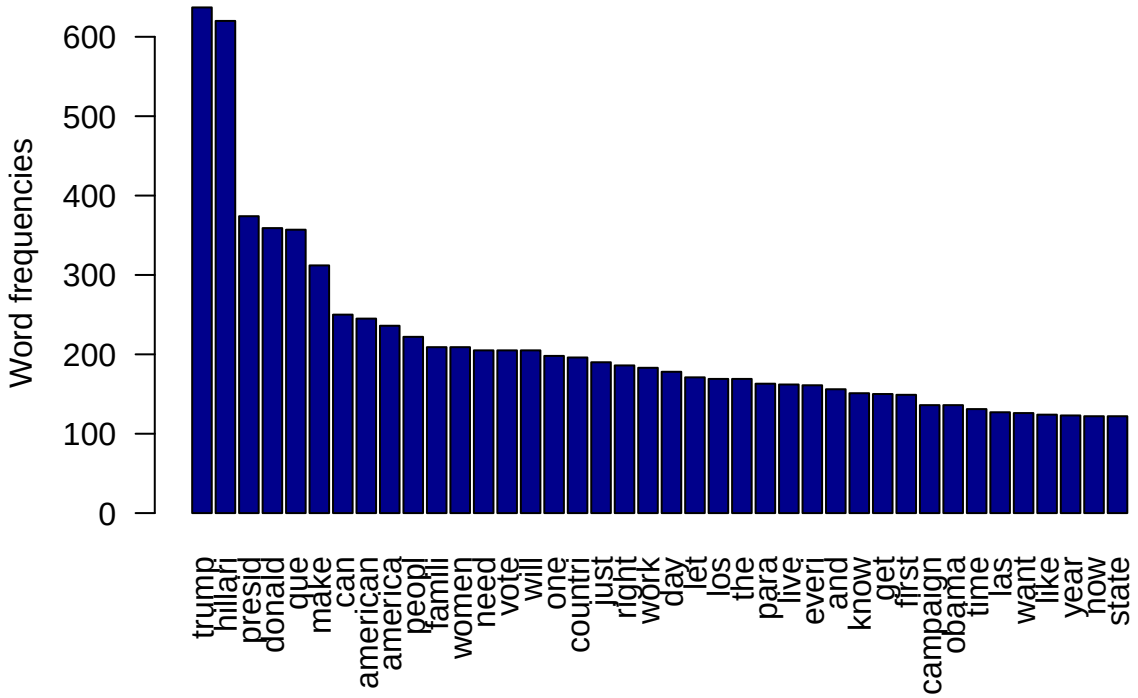
```
#In the following lines of code, we
#convert all characters to lowercase, remove
#punctuation, numbers, and stop words
#(including custom stop words). We also
#"stem" words. I also converted everything
#to utf-8 (unicode), because emoticons
#were giving me trouble in producing a
#wordcloud.


hilCorpus <- tm_map(hilCorpus,
                    content_transformer(function(x) iconv(x,"latin1", "ASCII", sub="")),
                    mc.cores=1)
```

```
hilCorpus <- tm_map(hilCorpus, PlainTextDocument)
hilCorpus <- tm_map(hilCorpus, removePunctuation)
hilCorpus <- tm_map(hilCorpus, removeNumbers)
hilCorpus <- tm_map(hilCorpus, stemDocument)
hilCorpus <- tm_map(hilCorpus, removeWords, c('the', 'this', 'a', stopwords('english')))
wordcloud(hilCorpus,scale=c(5,0.5),  max.words = 100, random.order = FALSE,
          colors=brewer.pal(8, 'Dark2'))
```

```
## Warning in wordcloud(hilCorpus, scale = c(5, 0.5), max.words = 100,
## random.order = FALSE, : republican could not be fit on page. It will not be
## plotted.
```




```
#Here, we create a Document-Term Matrix (DTM)

dtm <- TermDocumentMatrix(hilCorpus)
m <- as.matrix(dtm)
v <- sort(rowSums(m),decreasing=TRUE)
d <- data.frame(word = names(v),freq=v)

#And use this to create a simple bar plot of
#each candidates' 40 most frequent words,
#as a secondary visual.

barplot(d[1:40,]$freq, las = 2, names.arg = d[1:40,]$word,
        col ="darkblue", main ="Most frequent words",
        ylab = "Word frequencies")
```



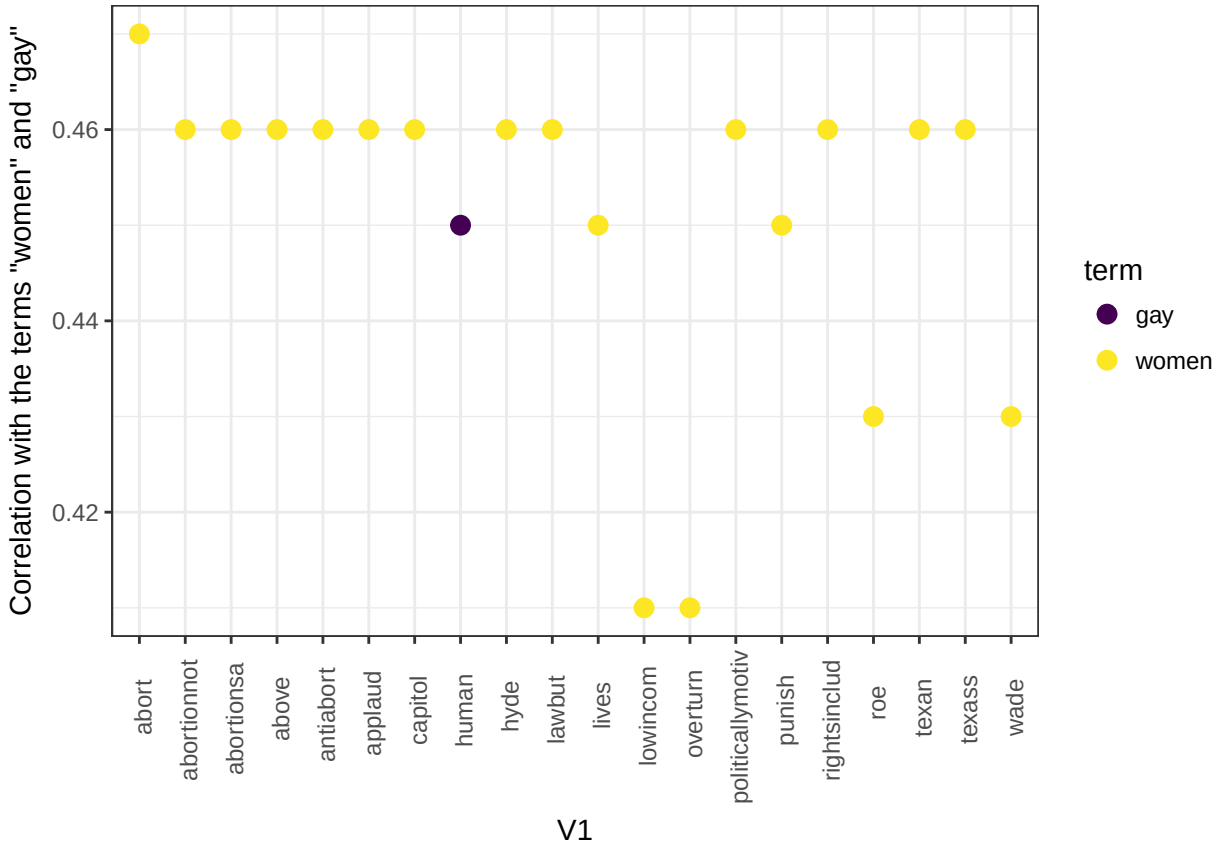

```
#####Section 4: Exploring Word Associations ######

###Although not the most intuitive method,
###one way to visualize word associations is through a
###scatterplot. To visualize multiple themes of
###interest, I plot 2 themes at once. The idea
###is to compute the term correlations and store
###them in a data frame.



######WOMEN/LGBT#######

###"toi" stands for "term of interest" here, and
###the corlimit specifies the lower
###correlation bound limit.

toi1 <- "women"
toi2 <- "gay"
corlimit <- 0.4

corr1 <-  findAssocs(dtm, toi1, corlimit)[[1]]
corr1 <- cbind(read.table(text = names(corr1), stringsAsFactors = FALSE), corr1)
corr2 <- findAssocs(dtm, toi2, corlimit)[[1]]
corr2 <- cbind(read.table(text = names(corr2), stringsAsFactors = FALSE), corr2)

##Here, we join the 2 correlations,
##and then gather them to plot.
```

```
two_terms_corrs <- full_join(corr1, corr2)
```

```
## Joining, by = "V1"
```

```
two_terms_corrs_gathered <- gather(two_terms_corrs, term, correlation, corr1:corr2)

#Here, we construct the legend, and then
#use ggplot2 to plot everything.
two_terms_corrs_gathered$term <- ifelse(two_terms_corrs_gathered$term  == "corr1", toi1, toi2)

ggplot(two_terms_corrs_gathered, aes(x = V1, y = correlation, colour =  term ) ) +
  geom_point(size = 3) +
  ylab(paste0("Correlation with the terms ", "\"", toi1,  "\"", " and ",  "\"", toi2, "\"")) +
  theme_bw() +
  theme(axis.text.x = element_text(angle = 90, hjust = .7, vjust = .7)) + scale_color_viridis(discrete='
```

```
## Warning: Removed 20 rows containing missing values (geom_point).
```



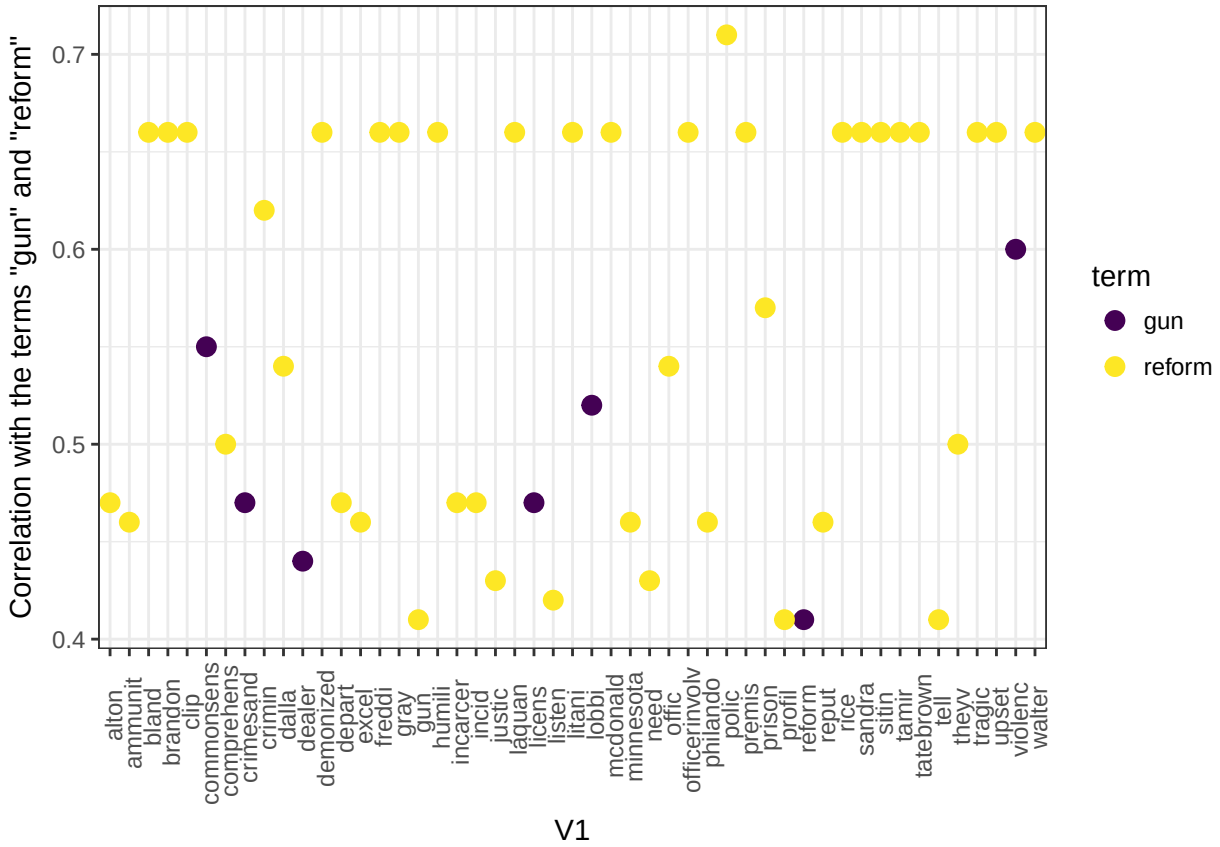

```
######GUN CONTROL & OTHER REFORMS#######


toi1 <- "gun"
toi2 <- "reform"
corlimit <- 0.4

corr1 <-  findAssocs(dtm, toi1, corlimit)[[1]]
corr1 <- cbind(read.table(text = names(corr1), stringsAsFactors = FALSE), corr1)
corr2 <- findAssocs(dtm, toi2, corlimit)[[1]]
```

```
corr2 <- cbind(read.table(text = names(corr2), stringsAsFactors = FALSE), corr2)

##Here, we join the 2 correlations,
##and then gather them to plot.

two_terms_corrs <- full_join(corr1, corr2)
```

```
## Joining, by = "V1"
```

```
two_terms_corrs_gathered <- gather(two_terms_corrs, term, correlation, corr1:corr2)

#Here, we construct the legend, and then
#use ggplot2 to plot everything.
two_terms_corrs_gathered$term <- ifelse(two_terms_corrs_gathered$term  == "corr1", toi1, toi2)

ggplot(two_terms_corrs_gathered, aes(x = V1, y = correlation, colour =  term ) ) +
  geom_point(size = 3) +
  ylab(paste0("Correlation with the terms ", "\"", toi1,  "\"", " and ",  "\"", toi2, "\"")) +
  theme_bw() +
  theme(axis.text.x = element_text(angle = 90, hjust = .7, vjust = .7)) + scale_color_viridis(discrete="
```

```
## Warning: Removed 49 rows containing missing values (geom_point).
```



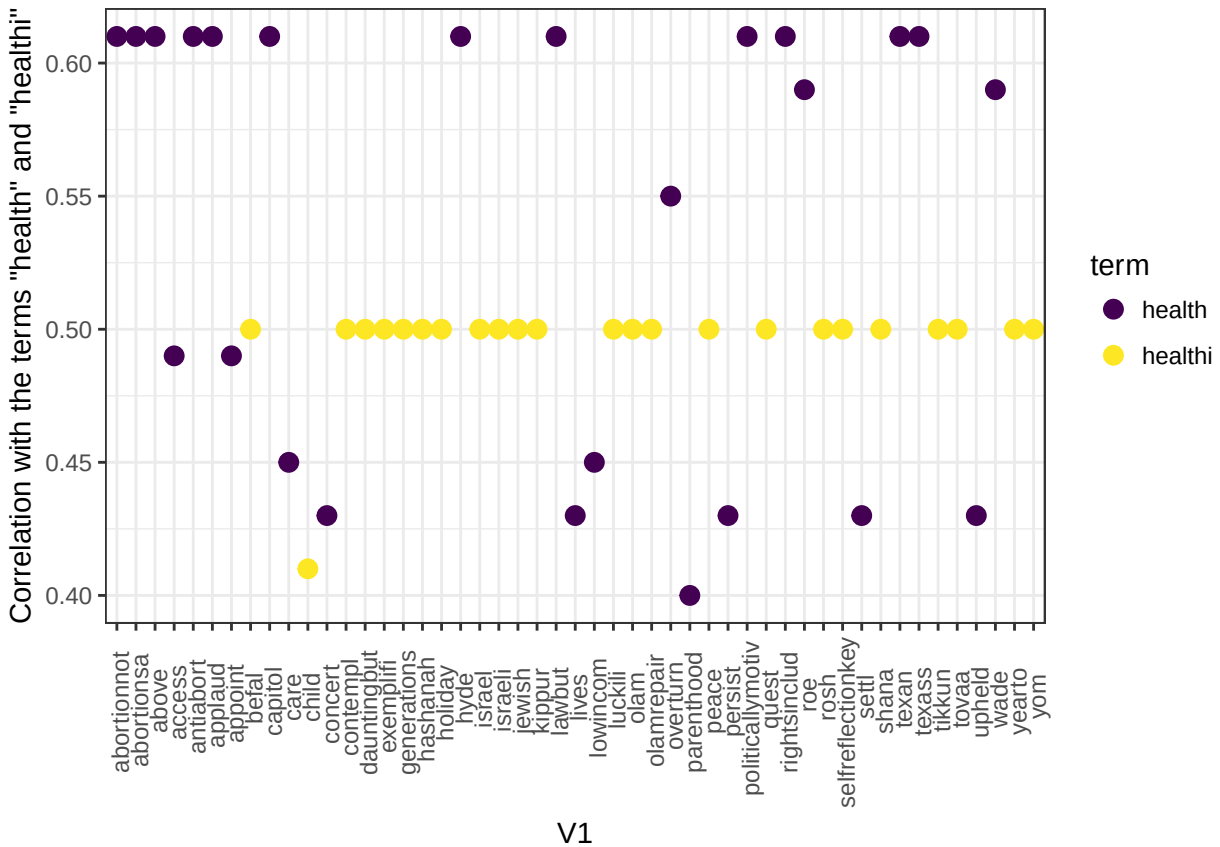

```
######HEALTH#######


toi1 <- "health"
toi2 <- "healthi"
```

```
corlimit <- 0.4

corr1 <-  findAssocs(dtm, toi1, corlimit)[[1]]
corr1 <- cbind(read.table(text = names(corr1), stringsAsFactors = FALSE), corr1)
corr2 <- findAssocs(dtm, toi2, corlimit)[[1]]
corr2 <- cbind(read.table(text = names(corr2), stringsAsFactors = FALSE), corr2)

##Here, we join the 2 correlations,
##and then gather them to plot.

two_terms_corrs <- full_join(corr1, corr2)
```

```
## Joining, by = "V1"
```

```
two_terms_corrs_gathered <- gather(two_terms_corrs, term, correlation, corr1:corr2)

#Here, we construct the legend, and then
#use ggplot2 to plot everything.
two_terms_corrs_gathered$term <- ifelse(two_terms_corrs_gathered$term  == "corr1", toi1, toi2)

ggplot(two_terms_corrs_gathered, aes(x = V1, y = correlation, colour =  term ) ) +
  geom_point(size = 3) +
  ylab(paste0("Correlation with the terms ", "\"", toi1,  "\"", " and ",  "\"", toi2, "\"")) +
  theme_bw() +
  theme(axis.text.x = element_text(angle = 90, hjust = .7, vjust = .7)) + scale_color_viridis(discrete="
```

```
## Warning: Removed 49 rows containing missing values (geom_point).
```

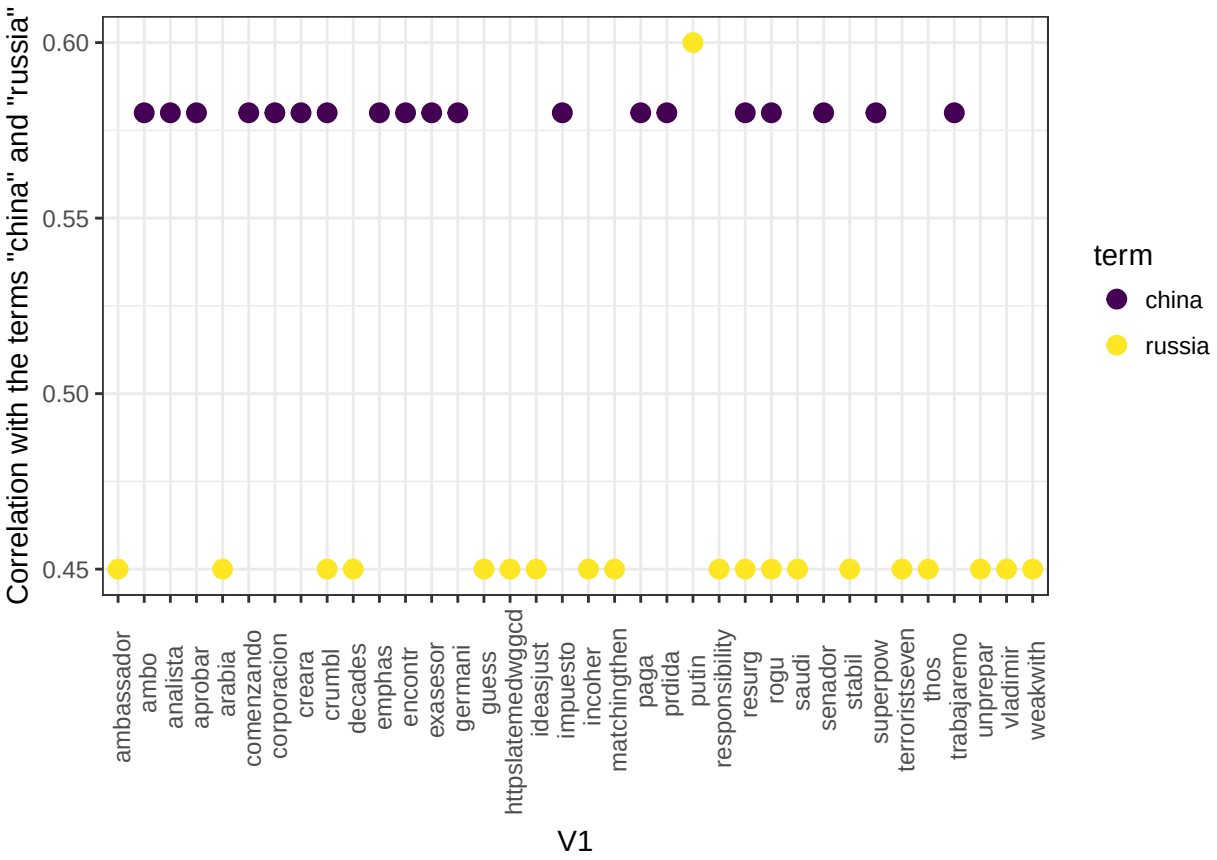


```
######FOREIGN POLICY#######

toi1 <- "china"
toi2 <- "russia"
corlimit <- 0.44

corr1 <-  findAssocs(dtm, toi1, corlimit)[[1]]
corr1 <- cbind(read.table(text = names(corr1), stringsAsFactors = FALSE), corr1)
corr2 <- findAssocs(dtm, toi2, corlimit)[[1]]
corr2 <- cbind(read.table(text = names(corr2), stringsAsFactors = FALSE), corr2)

##Here, we join the 2 correlations,
##and then gather them to plot.

two_terms_corrs <- full_join(corr1, corr2)
```

```
## Joining, by = "V1"
```

```
two_terms_corrs_gathered <- gather(two_terms_corrs, term, correlation, corr1:corr2)

#Here, we construct the legend, and then
#use ggplot2 to plot everything.
two_terms_corrs_gathered$term <- ifelse(two_terms_corrs_gathered$term  == "corr1", toi1, toi2)

ggplot(two_terms_corrs_gathered, aes(x = V1, y = correlation, colour =  term ) ) +
  geom_point(size = 3) +
  ylab(paste0("Correlation with the terms ", "\"", toi1,  "\"", " and ",  "\"", toi2, "\"")) +
  theme_bw() +
  theme(axis.text.x = element_text(angle = 90, hjust = .7, vjust = .7)) + scale_color_viridis(discrete="
```

```
## Warning: Removed 33 rows containing missing values (geom_point).
```


Correlation with the terms "china" and "russia"
0.60
0.55
0.50
0.45
ambassador
ambo
analista
aprobar
arabia
comenzando
corporacion
creara
crumbl
decades
emphas
encontr
exasesor
germani
guess
httpslatemedwggcd
ideasjust
impuesto
incoher
matchingthen
paga
prdida
putin
responsibility
resurg
rogu
saudi
senador
stabil
superpow
terroristseven
thos
trabajaremo
unprepar
vladimir
weakwith
V1
term
china
russia