ETC3250 Lab 7

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Week 7

Purpose

This lab will be on wrangling and plotting data.

Reading

- David Robinson's blog post
- Tidy data
- Split-apply-combine strategy: dplyr vignette, JSS paper

Trump's tweets

David Robinson wrote a post describing his analysis of the tweets coming from @realDonaldTrump. There was rumour that his staff also tweeted from this account. His analysis suggests that tweets come from two different phones and the sentiment from each is different. Let's take a look at the data:

```
library(dplyr)
library(purrr)
load(url("http://varianceexplained.org/files/trump_tweets_df.rda"))
library(tidyr)
```

Question 1

Explain what this code does.

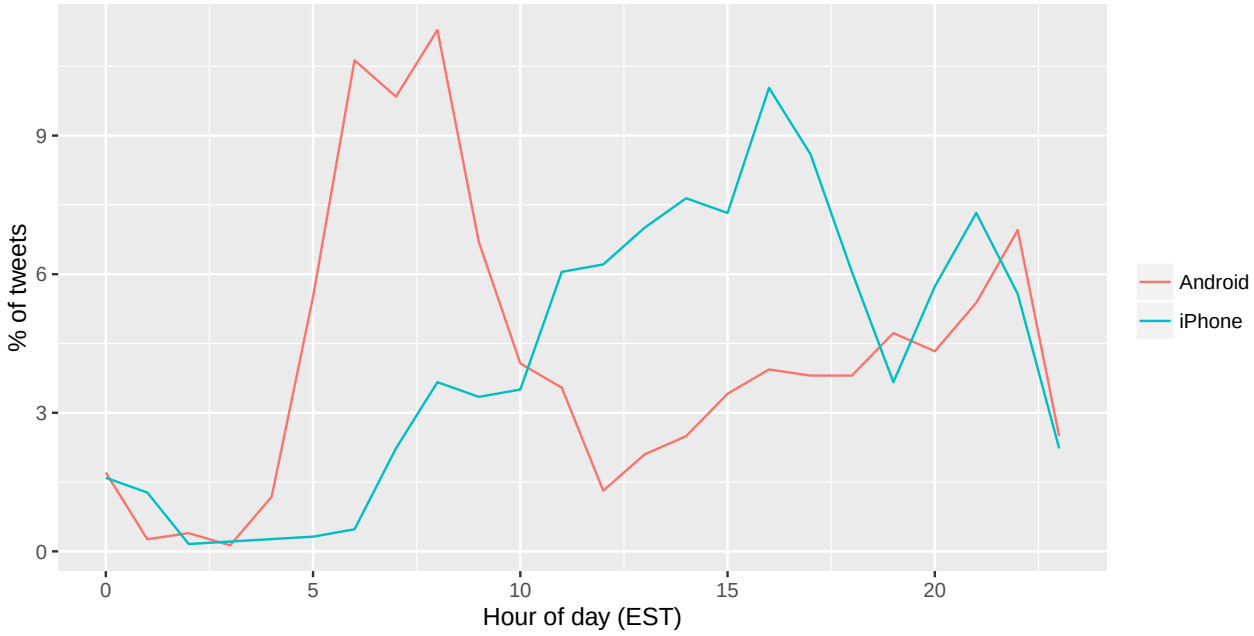
```
tweets <- trump_tweets_df %>%
  select(id, statusSource, text, created) %>%
  extract(statusSource, "source", "Twitter for (.*?)<") %>%
  filter(source %in% c("iPhone", "Android"))
```

This code takes 4 of the 16 columns of the tweet data, and from the statusSource column it extracts a shorted text string summary of the source of the tweet, and then only keeps rows that are either iphone or Android.

Question 2

a. Explain what this code does. Computes the number of tweets per hour by source, turns it into a percentage and then makes the line plots.

```
library(lubridate)
library(scales)
library(ggplot2)

tweets %>%
  count(source, hour = hour(with_tz(created, "EST"))) %>%
  mutate(percent = n / sum(n)*100) %>%
  ggplot(aes(hour, percent, color = source)) +
  geom_line() +
  labs(x = "Hour of day (EST)",
       y = "% of tweets",
       color = "")
```



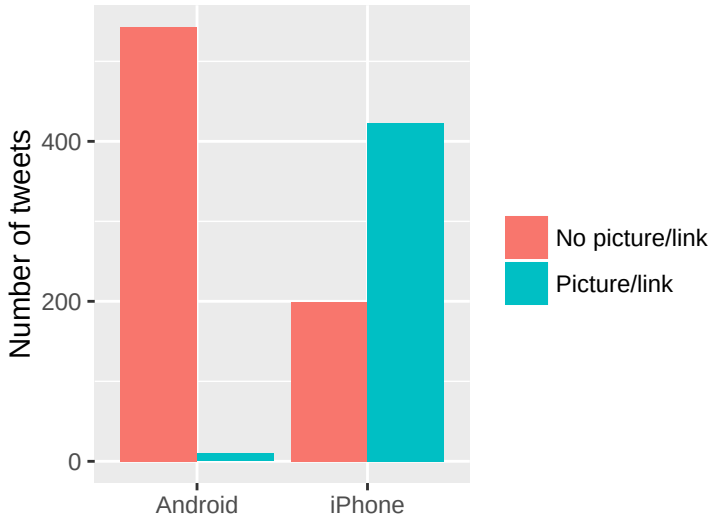
b. What do we learn from this plot? `Tweets from the Android peak between 5-9am, with a secondary peak in the evening hours. Tweets from the iphone peaks during business hours, and drops off at 4pm, wiht another peak at 8pm.`

Question 3

Is there a difference between the two devices in terms of including a picture? `Yes, the Android tends not to include a picture.`

```
library(stringr)
tweet_picture_counts <- tweets %>%
  filter(!str_detect(text, '^"')) %>%
  count(source,
        picture = ifelse(str_detect(text, "t.co"),
                         "Picture/link", "No picture/link"))

ggplot(tweet_picture_counts, aes(source, n, fill = picture)) +
```

```
  geom_bar(stat = "identity", position = "dodge") +
  labs(x = "", y = "Number of tweets", fill = "")
```



Question 4

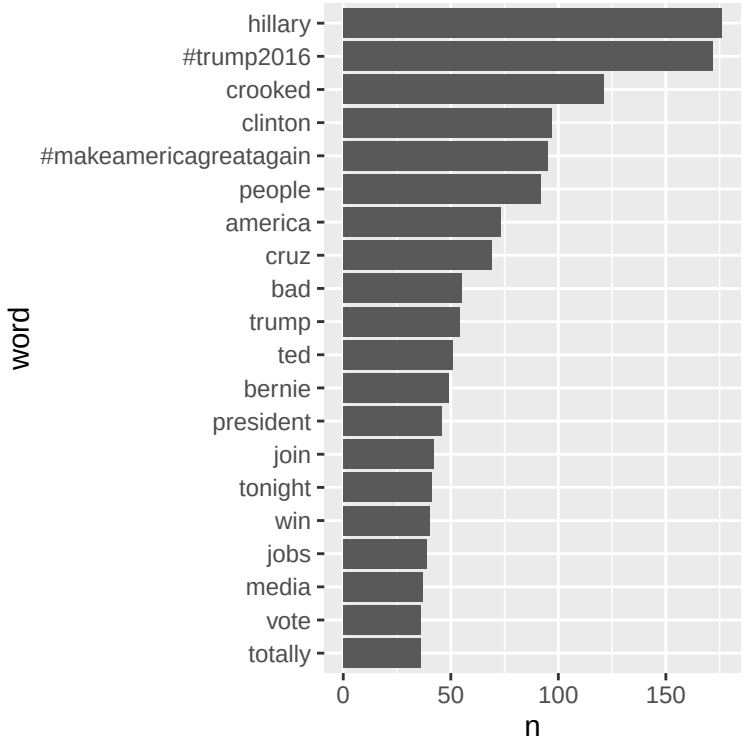
The following code does text analysis of the tweets, pulling the major words used in each teet.

a. How many tweet words are produced? `8,753` How many unique words are there? `2,560`

```
library(tidytext)

reg <- "([^A-Za-z\\d#@']|'(?![A-Za-z\\d#@]))"
tweet_words <- tweets %>%
  filter(!str_detect(text, '^"')) %>%
  mutate(text = str_replace_all(text, "https://t.co/[A-Za-z\\d]+|&amp;", "")) %>%
  unnest_tokens(word, text, token = "regex", pattern = reg) %>%
  filter(!word %in% stop_words$word,
         str_detect(word, "[a-z]"))
tweet_words
```

b. Write the code to make the plot in Figure 1, make the plot, and explain it.

```
tweet_words %>% select(word) %>%
  group_by(word) %>%
  tally() %>%
  arrange(desc(n)) %>% top_n(20) %>%
  mutate(word = reorder(word, n)) %>%
  ggplot(aes(x=word, y=n)) + geom_bar(stat="identity") + coord_flip()
```



This displays the top 20 words tweeted under Trumps account. "hillary", interestingly enough, is the top word tweeted!

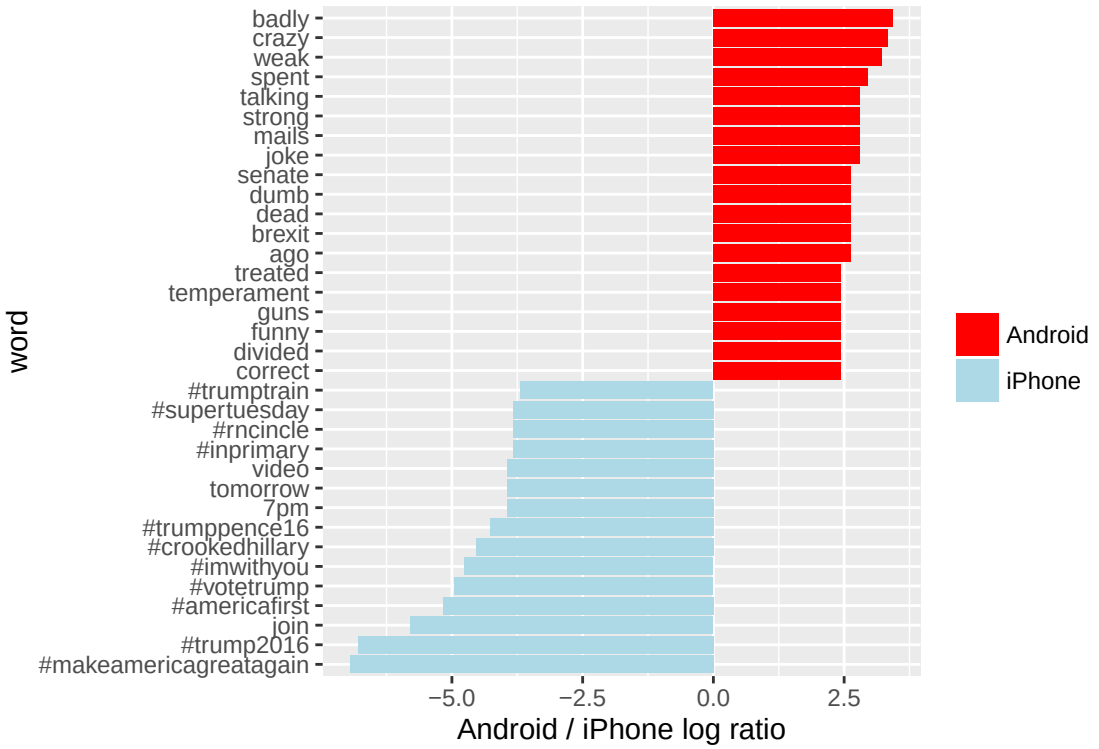
Question 5

The following code compute the log odds ratio for the source of the word.

```
android_iphone_ratios <- tweet_words %>%
  count(word, source) %>%
  filter(sum(n) >= 5) %>%
  spread(source, n, fill = 0) %>%
  ungroup() %>%
  mutate_each(funs((. + 1) / sum(. + 1)), -word) %>%
  mutate(logratio = log2(Android / iPhone)) %>%
  arrange(desc(logratio))
```

a. Write the code to produce the plot in Figure 2.

```
android_iphone_ratios %>%
  group_by(logratio > 0) %>%
  top_n(15, abs(logratio)) %>%
  ungroup() %>%
  mutate(word = reorder(word, logratio)) %>%
  ggplot(aes(word, logratio, fill = logratio < 0)) +
  geom_bar(stat = "identity") +
  coord_flip() +
  ylab("Android / iPhone log ratio") +
  scale_fill_manual(name = "", labels = c("Android", "iPhone"),
                    values = c("red", "lightblue"))
```



b. What do you learn from the plot?

The hashtags tend to come from the iphone. The words "crazy", "dumb" are more likely to come from the Android. There appears to be some difference in the type of words tweeted from each source.

Question 6

The following code tags a word with a sentiment.

```
nrc <- sentiments %>%
  filter(lexicon == "nrc") %>%
  dplyr::select(word, sentiment)

nrc
```

How many words fall into the `fear` sentiment? `1,476` What proportion of the total number of words is this? `10.6%`

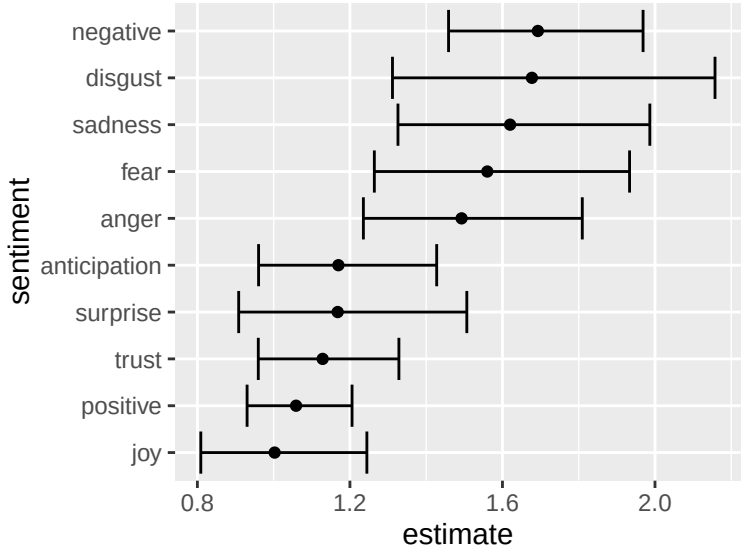
Question 7

Here is the final critical analysis of David Robinson's analysis, for each sentiment a Poisson test of the differences between whether it is mode likely to emerge from the Android or iphone is conducted. This is the code.

```
sources <- tweet_words %>%
  group_by(source) %>%
  mutate(total_words = n()) %>%
  ungroup() %>%
  distinct(id, source, total_words)

by_source_sentiment <- tweet_words %>%
  inner_join(nrc, by = "word") %>%
  count(sentiment, id) %>%
  ungroup() %>%
  complete(sentiment, id, fill = list(n = 0)) %>%
  inner_join(sources) %>%
  group_by(source, sentiment, total_words) %>%
  summarize(words = sum(n)) %>%
  ungroup()

library(broom)
sentiment_differences <- by_source_sentiment %>%
  group_by(sentiment) %>%
  do(tidy(poisson.test(.$words, .$total_words)))

sentiment_differences
```

The following code produces the plot of the confidence intervals, from David's blog post, almost:

```
sentiment_differences <- sentiment_differences %>%
    ungroup() %>%
    mutate(sentiment = reorder(sentiment, estimate))
ggplot(sentiment_differences, aes(x=sentiment, y=estimate)) +
  geom_point() +
  geom_errorbar(aes(x=sentiment, ymin=conf.low, ymax=conf.high)) +
  coord_flip()
```



Fix it so that the sentiments are ordered from highest estimated rate to lowest. Explain why ordering makes the plot easier to read. `Ordering code added above plotting code.`

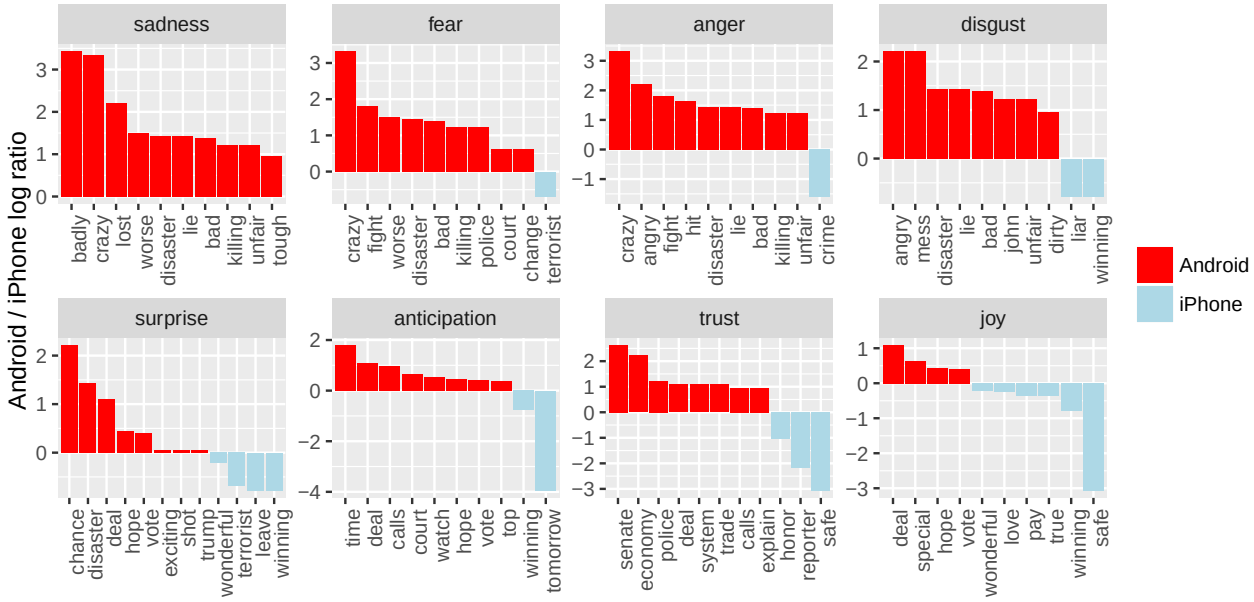
Question 8

The following code makes David's final plot, and he makes this claim:

`This confirms that lots of words annotated as negative sentiments (with a few exceptions like "crime" and "terrorist") are more common in Trump's Android tweets than the campaign's iPhone tweets.`

Explain what is plotted. How does the plot support this claim? `Separately by the sentiments, the counts for the top 10 words that differ most between the sources are displayed. It suggests words belonging to "sadness", "fear", "anger" and "disgust" almost exclusively come from the Android. Words with more positive sentiments like "trust", "joy" more commonly come from the iphone. This is consistent with David's claim.`

```
android_iphone_ratios %>%
  inner_join(nrc, by = "word") %>%
  filter(!sentiment %in% c("positive", "negative")) %>%
  mutate(sentiment = reorder(sentiment, -logratio),
         word = reorder(word, -logratio)) %>%
  group_by(sentiment) %>%
  top_n(10, abs(logratio)) %>%
  ungroup() %>%
  ggplot(aes(word, logratio, fill = logratio < 0)) +
  facet_wrap(~ sentiment, scales = "free", nrow = 2) +
  geom_bar(stat = "identity") +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  labs(x = "", y = "Android / iPhone log ratio") +
  scale_fill_manual(name = "", labels = c("Android", "iPhone"),
                    values = c("red", "lightblue"))
```



Question 9

Take a look at the tweet data. Find something else to examine. Make a plot to communicate what you have learned.

WHAT TO TURN IN

Turn in two items: a `.Rmd` document, and the output `.pdf` or `.docx` from running it. Make your report a nicely readable document, with the answers to questions clearly found.

Resources

- RStudio cheat sheets