Time Series Stylometry on the #TravelBan News Writers

Kanishka Misra

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Setup

loading libraries

```
library(tidyverse)
library(jsonlite)
library(tidyjson)
library(widyr)
library(tidytext)
library(ggridges)
library(lubridate)

options(scipen = 99)

source("utils.R")
```

Loading data

```
news_articles <- fromJSON("data/1996_dicts_9_sources.json", simplifyDataFrame = T) %>%
  as.tibble()

news_articles
```

```
## # A tibble: 1,996 x 10
##    title  url   text   top_words summary source publish_date authors id
##  * <chr>  <chr> <chr>  <list>    <chr>   <chr>  <chr>        <list>  <chr>
##  1 Appea~ http~ "The ~ <chr [13~ "The 1~ cnn    2017-05-25   <chr [~ 1
##  2 Elon ~ http~ "Tesl~ <chr [16~ "Tesla~ cnn    2017-01-30   <chr [~ 2
##  3 Donal~ http~ "J.P.~ <chr [14~ "J.P. ~ cnn    2017-01-30   <chr [~ 8
##  4 Donal~ http~ "The ~ <chr [14~ "Meanw~ cnn    2017-02-06   <chr [~ 9
##  5 More ~ http~ "Majo~ <chr [18~ "On Tu~ cnn    2017-02-07   <chr [~ 10
##  6 Presi~ http~ "Pres~ <chr [14~ "Presi~ cnn    2017-02-21   <chr [~ 12
##  7 Eliza~ http~ "Know~ <chr [12~ ""Turn~ cnn    2017-03-16   <chr [~ 13
##  8 Tech ~ http~ "The ~ <chr [14~ "The i~ cnn    2017-01-28   <chr [~ 14
##  9 Here'~ http~ "Afte~ <chr [14~ "After~ cnn    2017-01-28   <chr [~ 15
## 10 GE's ~ http~ "Gene~ <chr [16~ "Gener~ cnn    2017-01-29   <chr [~ 16
## # ... with 1,986 more rows, and 1 more variable: type <chr>
```

Tidying and Nesting

1. Count authors, only keep single author news articles.
2. Remove duplicates, and keep only text based duplicates if source is differenct.
3. Remove columns that are not relevant to the scope of this project.

4. Nest based on author, store article count.
5. Select top 10 (or more if similar number of articles exist) authors based on article count.

```
nested_articles <- news_articles %>%
  distinct(text, source, .keep_all = T) %>%
  mutate(length = map_int(authors, length)) %>%
  filter(length < 2) %>%
  unnest(authors) %>%
  select(text, author = authors, publish_date, source) %>%
  group_by(author) %>%
  nest() %>%
  mutate(article_count = map_int(data, nrow)) %>%
  top_n(10, article_count)

nested_articles
```

```
## # A tibble: 12 x 3
##    author            data              article_count
##    <chr>             <list>                    <int>
##  1 laura jarrett     <tibble [31 x 3]>            31
##  2 ariane de vogue   <tibble [15 x 3]>            15
##  3 mark sherman      <tibble [15 x 3]>            15
##  4 adam liptak       <tibble [26 x 3]>            26
##  5 editorial board   <tibble [23 x 3]>            23
##  6 matt zapotosky    <tibble [17 x 3]>            17
##  7 michael a. memoli <tibble [15 x 3]>            15
##  8 maura dolan       <tibble [15 x 3]>            15
##  9 david savage      <tibble [15 x 3]>            15
## 10 jaweed kaleem     <tibble [62 x 3]>            62
## 11 david g. savage   <tibble [16 x 3]>            16
## 12 brian bennett     <tibble [32 x 3]>            32
```

We now have a tibble of the 12 authors with the most number of articles. We can then write a generic function that maps over each author and then calculates the distances of each authors news articles from their first article during the travel ban proposal.

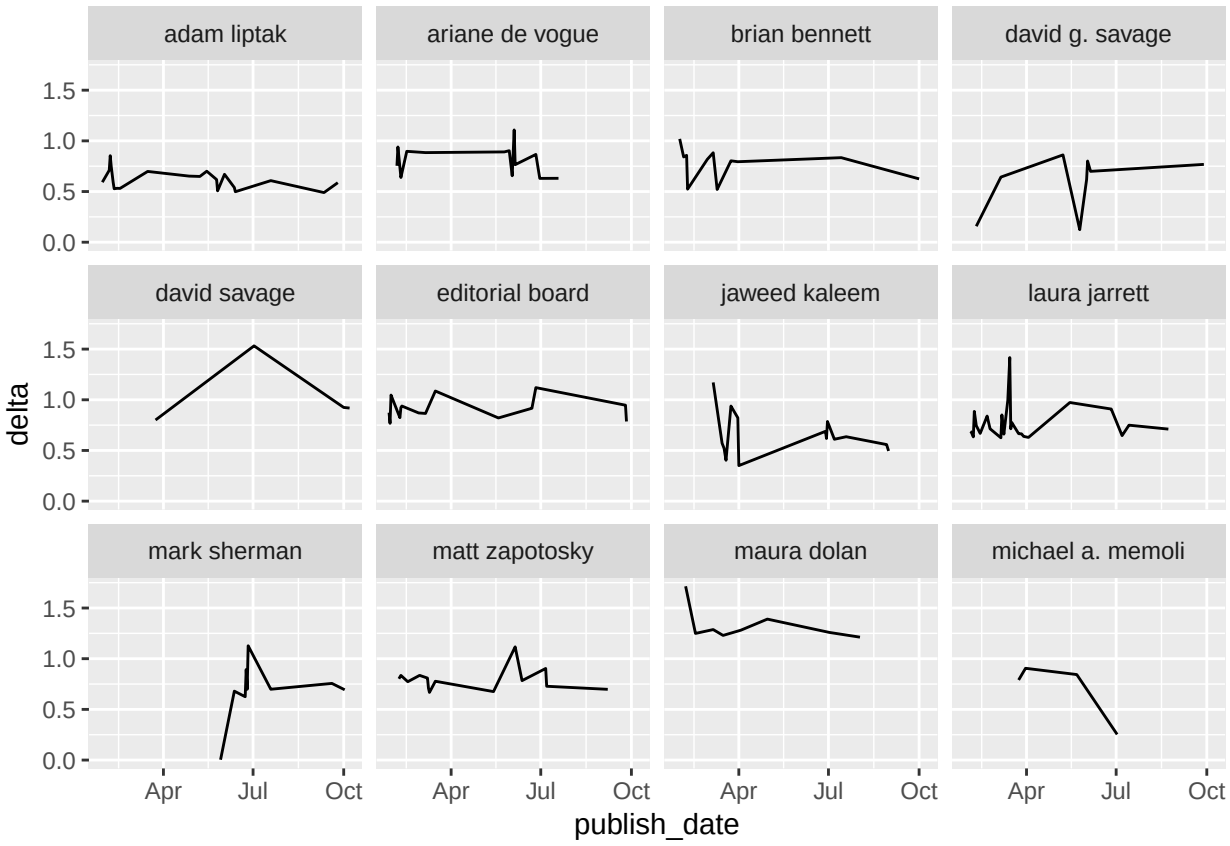
```
temporal_delta <- function(df) {
  df %>%
    mutate(
      text = str_replace_all(tolower(text), paste0(source, "|story highlights"), "")
    ) %>%
    select(-source) %>%
    group_by(publish_date) %>%
    unnest_tokens(word, text) %>%
    count(word) %>%
    ungroup() %>%
    mutate(
      publish_date = lubridate::ymd(publish_date)
    ) %>%
    bind_tf_idf(publish_date, word, n) %>%
    pairwise_delta(publish_date, word, tf_idf, upper = F) %>%
    filter(item1 == min(item1)) %>%
    transmute(
      publish_date = item2,
      delta
    )
```

```
}

temporal_delta(nested_articles[1, ]$data[[1]])
```

```
## # A tibble: 24 x 2
##    publish_date delta
##    <date>       <dbl>
##  1 2017-02-03   0.687
##  2 2017-02-04   0.680
##  3 2017-02-06   0.634
##  4 2017-02-07   0.885
##  5 2017-02-09   0.745
##  6 2017-02-13   0.668
##  7 2017-02-20   0.839
##  8 2017-02-23   0.714
##  9 2017-03-06   0.625
## 10 2017-03-07   0.851
## # ... with 14 more rows
```

If we map this to all writer's data, we get the following plot:

```
author_deltas <- nested_articles %>%
  mutate(ts_delta = map(data, temporal_delta)) %>%
  unnest(ts_delta)

author_deltas %>%
  ggplot(aes(publish_date, delta)) +
  geom_line() +
  facet_wrap(~author)
```

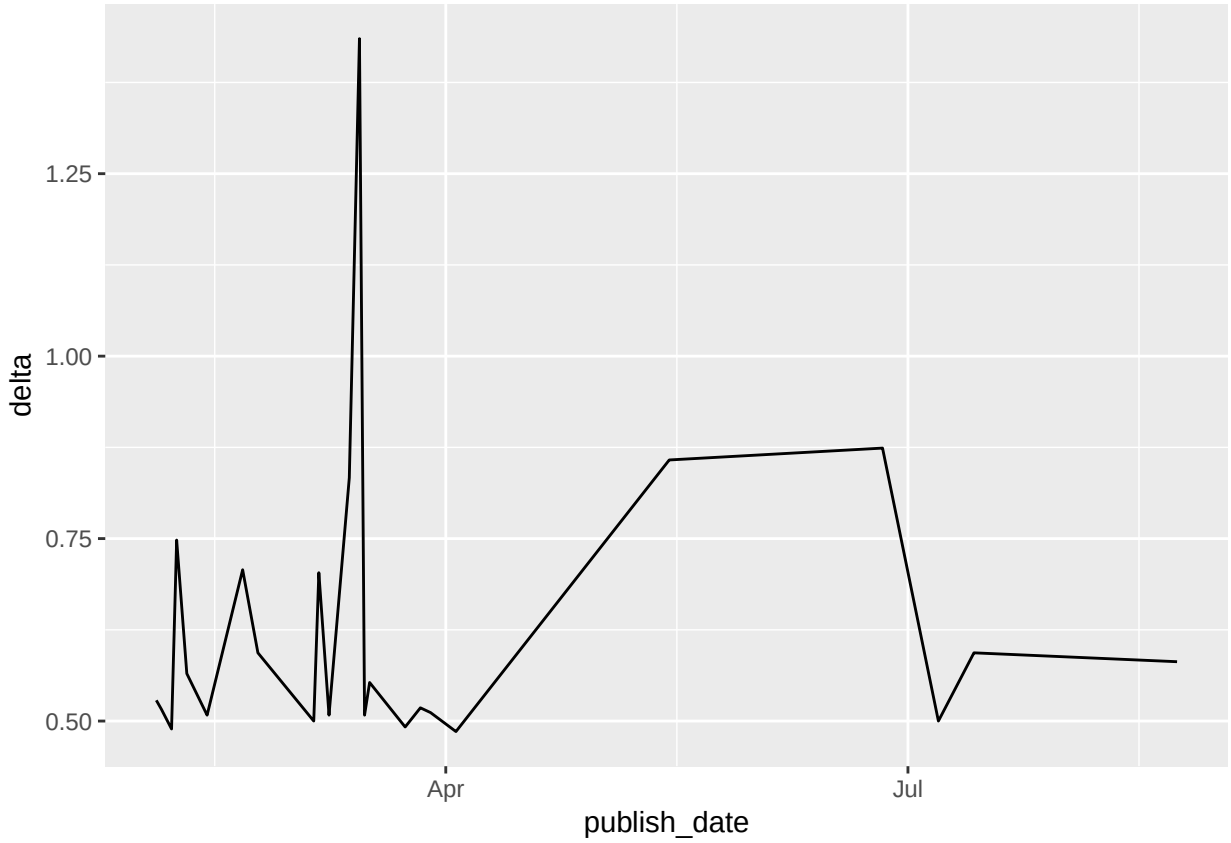


Alternate metric.

Instead of using normalized frequencies, we can consider using the term frequency - inverse document frequency of each word in the document and then select the words with the highest tf-idf with some threshold. The threshold can be derived from...

```
nested_articles[1, ]$data[[1]] %>%
  mutate(
    text = str_replace_all(tolower(text), paste0(source, "|story highlights"), "")
  ) %>%
  select(-source) %>%
  group_by(publish_date) %>%
  unnest_tokens(word, text) %>%
  count(word) %>%
  ungroup() %>%
  mutate(
    publish_date = lubridate::ymd(publish_date)
  ) %>%
  bind_tf_idf(publish_date, word, n) %>%
  group_by(publish_date) %>%
  arrange(publish_date, tf_idf) %>%
  filter(tf_idf >= quantile(tf_idf, 0.9)) %>%
  ungroup() %>%
  arrange(publish_date) %>%
  pairwise_delta(publish_date, word, tf_idf, upper = F) %>%
  filter(item1 == min(item1)) %>%
```

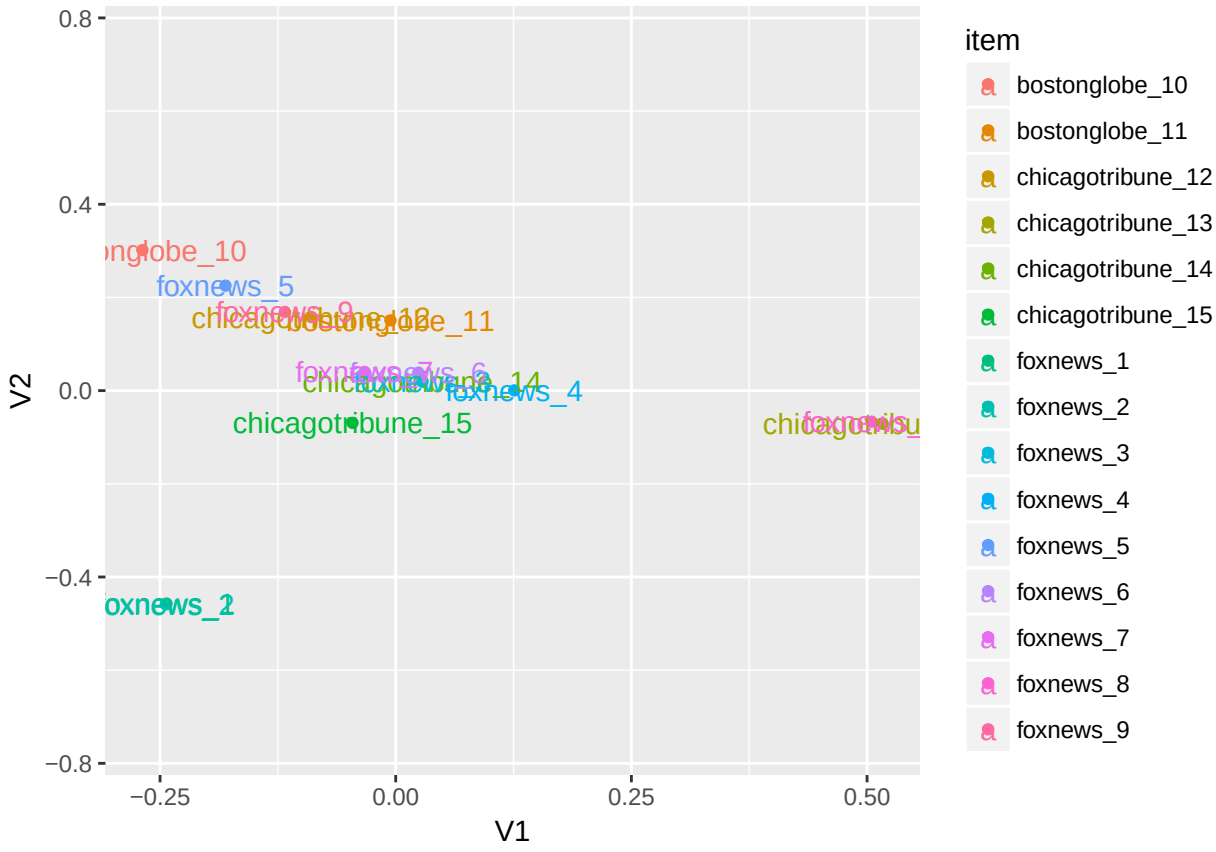
```
  transmute(
    publish_date = item2,
    delta
  ) %>%
  ggplot(aes(publish_date, delta)) +
  geom_line()
```



Same author different sources.

```
source_deltas <- news_articles %>%
  distinct(text, source, .keep_all = T) %>%
  mutate(length = map_int(authors, length)) %>%
  filter(length < 2) %>%
  unnest(authors) %>%
  select(text, author = authors, publish_date, source) %>%
  group_by(author) %>%
  nest() %>%
  mutate(
    sources = map_int(data, function(x) {
      x %>%
        distinct(source) %>%
        pull(source) %>%
        length()
    })
  ) %>%
```

```
  filter(sources > 1) %>%
  mutate(
    data = map(data, add_rowid),
    deltas = map(data, function(x) {
      x %>%
        mutate(article_id = paste(source, article_id, sep = "_")) %>%
        group_by(article_id) %>%
        unnest_tokens(word, text) %>%
        count(article_id, word) %>%
        group_by(article_id) %>%
        mutate(p_word = n/sum(n)) %>%
        ungroup() %>%
        pairwise_delta(article_id, word, p_word)
    })
  )

source_deltas %>%
  select(author, deltas) %>%
  unnest() %>%
  filter(author == "mark sherman") %>%
  select(-author) %>%
  multi_scale(item1, item2, delta) %>%
  # separate(item, into = c("source", "id"), sep = "_") %>%
  ggplot(aes(V1, V2, color = item)) +
  geom_point() +
  geom_text(aes(label = item)) +
  scale_y_continuous(limits = c(-0.75, 0.75))
```


0.8
0.4
0.0
−0.4
−0.8
V2
−0.25
0.00
0.25
0.50
V1
foxnews_5
chicagotribune_15
foxnews_4
item
bostonglobe_10
bostonglobe_11
chicagotribune_12
chicagotribune_13
chicagotribune_14
chicagotribune_15
foxnews_1
foxnews_2
foxnews_3
foxnews_4
foxnews_5
foxnews_6
foxnews_7
foxnews_8
foxnews_9