Tidying Github DMCA Files

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GitHub DMCA Data Source

Assume the GitHub received DMCA mails repo is cloned in folder `../dmca`.

```
dmca_src <- '../dmca'
```

Tidying the Texts

List DMCA mails in each folder for a quick view. It's not necessary for the next steps, however.

```
dmca_files = list.files(dmca_src, recursive=TRUE, pattern='*/*.md')
head(dmca_files)
```

```
## [1] "2013/2013-03-06-LayerVault-counternotice.md"
## [2] "2013/2013-03-06-LayerVault.md"
## [3] "2013/2013-03-12-DxO-Labs.md"
## [4] "2013/2013-03-14-Electronic-Arts.md"
## [5] "2013/2013-03-21-DxO-Labs-counternotice.md"
## [6] "2013/2013-03-25-Apple-Inc.md"
```

Read content of each mail into a data frame.

```
library(readtext)
dmca_docs <- readtext(paste0(dmca_src, '/*/*.md'))
head(dmca_docs)
```

```
## readtext object consisting of 6 documents and 0 docvars.
## # Description: data.frame [6 x 2]
##   doc_id                                text
## * <chr>                                 <chr>
## 1 2013-03-06-LayerVault-counternotice.md "\"[private]\n\"..."
## 2 2013-03-06-LayerVault.md               "\"Attn: Copy\"..."
## 3 2013-03-12-DxO-Labs.md                 "\"Takedown N\"..."
## 4 2013-03-14-Electronic-Arts.md          "\"I write on\"..."
## 5 2013-03-21-DxO-Labs-counternotice.md   "\"March 21, \"..."
## 6 2013-03-25-Apple-Inc.md                "\"We represe\"..."
```

Tidy documents into sentences first.

```
library(dplyr)
library(tidytext)
library(stringr)

tidy_sentences <- dmca_docs %>%
  unnest_tokens(sentence, text, token='sentences') # by sentence
head(tidy_sentences)
```

```
## readtext object consisting of 6 documents and 0 docvars.
## # Description: data.frame [6 x 3]
##   doc_id           sentence                                          text
## * <chr>            <chr>                                             <chr>
```

```
## 1 20107-05-22-Pea~ 300 hudson street   new york, ny 10013    05/18~ "\"\".~
## 2 20107-05-22-Pea~ pearson holds certain rights in the titles list~ "\"\".~
## 3 20107-05-22-Pea~ we have included below examples of locations on~ "\"\".~
## 4 20107-05-22-Pea~ you are not authorized to host, distribute, or ~ "\"\".~
## 5 20107-05-22-Pea~ pearson demands that you immediately and perman~ "\"\".~
## 6 20107-05-22-Pea~ this includes the copies available at the links~ "\"\".~
```

From the above, we can notice some obvious things to handle.

- Many lines are from the same submission template.
- Numbers are not so useful.
- "___" in words are indication of italic that should be removed.
- In general, stop words are not interesting.
- Words like 'github' are not related to requests.

```
# Apply stop words from tidytext package then customize
data(stop_words)
custom_stop_words = c('github.com', 'www.github.com',
                      'https', 'http',
                      'github', 'github\'s')
for (w in custom_stop_words){
  stop_words <- add_row(stop_words, word = w)
}

tidy_words <- tidy_sentences %>%
  filter(!str_detect(sentence, '^\\*\\*')) %>% # remove lines from template
  mutate(sentence = str_replace_all(sentence, '_', ' ')) %>% # remove all "_"
  unnest_tokens(word, sentence) %>% # by word
  filter(!str_detect(word, '^[0-9\\.\\-]+$')) %>% # remove digit only "words"
  anti_join(stop_words) # remove stop words
head(tidy_words)
```

```
##                   doc_id      word
## 1 20107-05-22-Pearson.md    hudson
## 2 20107-05-22-Pearson.md    street
## 3 20107-05-22-Pearson.md      york
## 4 20107-05-22-Pearson.md        ny
## 5 20107-05-22-Pearson.md attention
## 6 20107-05-22-Pearson.md   writing
```

Samples Using the Tidy Texts

Next we can play with the data. Group the data by year first.

```
year_of_interest = c('2015', '2016', '2017', '2018')
year_words <- tidy_words %>%
  mutate(year = str_sub(doc_id, 0, 4)) %>%
  filter(is.element(year, year_of_interest)) %>%
  count(doc_id, word, year, sort=TRUE) %>%
  ungroup()
total_words <- year_words %>%
  group_by(year) %>%
  summarize(total = sum(n))
year_words <- left_join(year_words, total_words)
head(year_words)
```

```
## # A tibble: 6 x 5
```

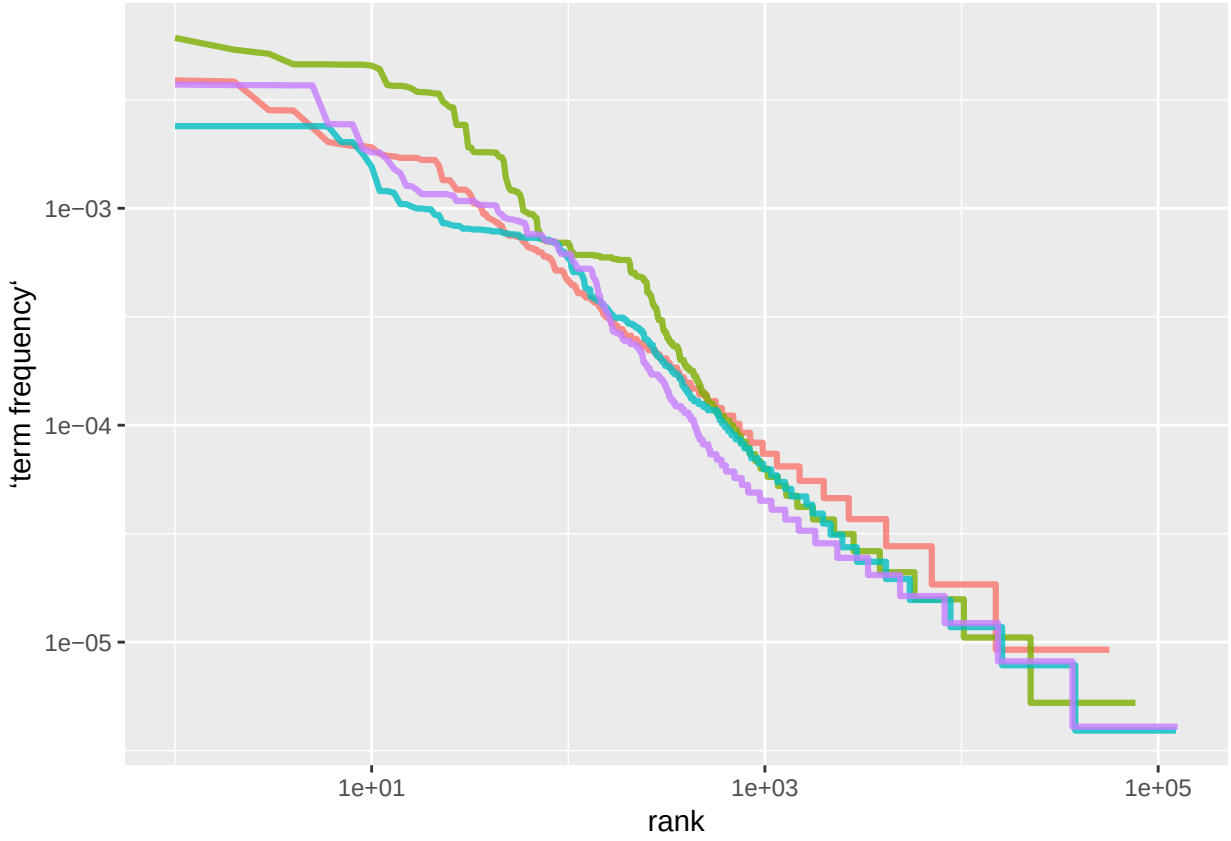
```
##   doc_id                  word      year      n  total
##   <chr>                   <chr>     <chr> <int>  <int>
## 1 2016-08-18-Jetbrains.md quick4j   2016   1161 190392
## 2 2016-06-08-Monotype.md  fonts     2016   1024 190392
## 3 2016-06-08-Monotype.md  helvetica 2016    981 190392
## 4 2018-04-05-HexRays.md   ida       2018    912 245242
## 5 2018-04-05-HexRays.md   dirtbags  2018    906 245242
## 6 2018-04-05-HexRays.md   vera      2018    906 245242
```

Plot the words count. Seems so many words appear just once or very few. Sum of words increases by year.

```
library(ggplot2)
ggplot(year_words, aes(n, fill = year)) +
  geom_histogram(show.legend = FALSE) +
  xlim(0, 20) +
  facet_wrap(~year, ncol = 2, scales = "free_y")
```

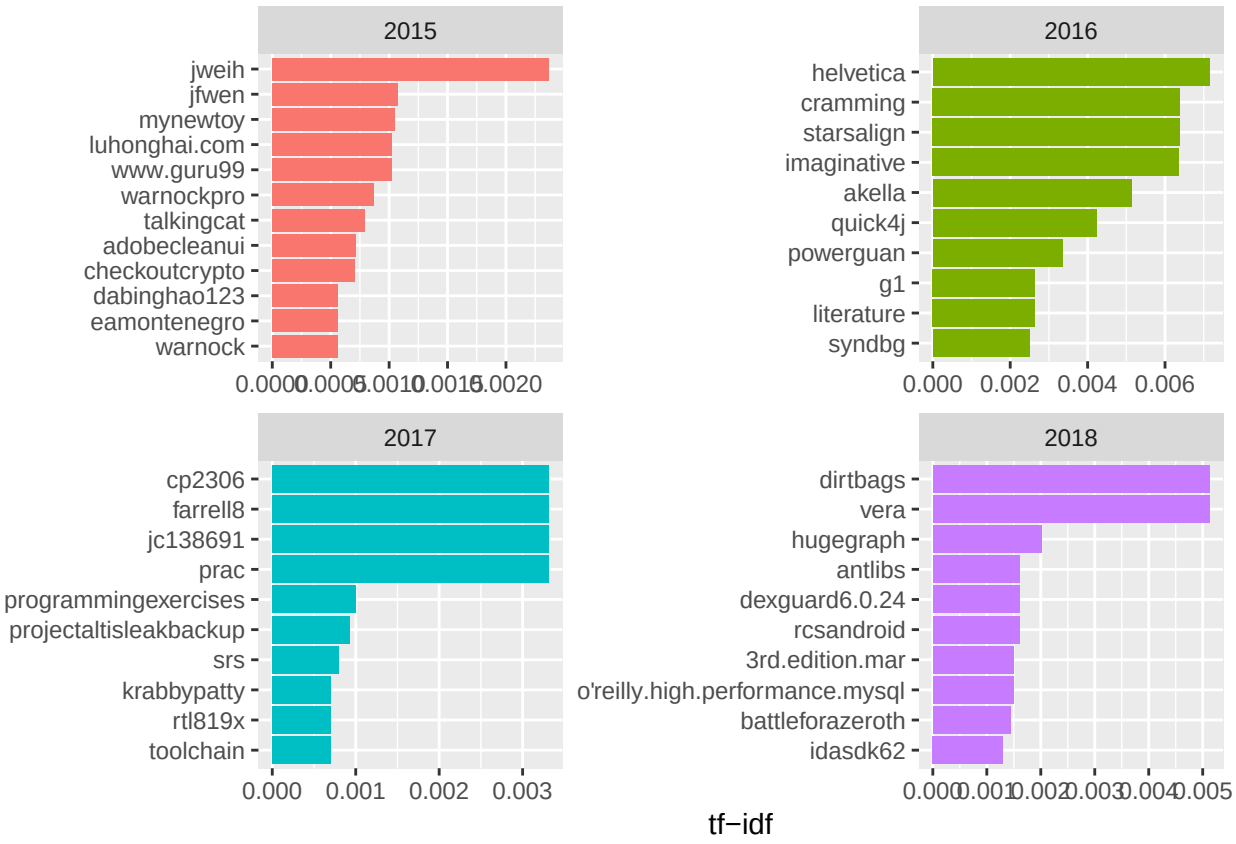
Plot term frequency to show Zipf's law.

```
freq_by_rank <- year_words %>%
  group_by(year) %>%
  mutate(rank = row_number(),
         `term frequency` = n/total)
ggplot(freq_by_rank, aes(rank, `term frequency`, color = year)) +
  geom_line(size = 1.1, alpha = 0.8, show.legend = FALSE) +
  scale_x_log10() +
  scale_y_log10()
```



TF-IDF can show what are the most specific requests in each year. These are not the companies/owners. For example, jetbrains is one of the top frequent terms, but not shown here probably because it is too common among many different requests.

```
year_words %>%
  bind_tf_idf(word, year, n) %>%
  select(-total) %>%
  arrange(desc(tf_idf)) %>%
  mutate(word = factor(word, levels = rev(unique(word)))) %>%
  group_by(year) %>%
  top_n(10) %>%
  ungroup() %>%
  ggplot(aes(word, tf_idf, fill = year)) +
  geom_col(show.legend = FALSE) +
  labs(x = NULL, y = "tf-idf") +
  facet_wrap(~year, ncol = 2, scales = "free") +
  coord_flip()
```



Group the data by owner.

```
owner_words <- tidy_words %>%
  mutate(owner = str_to_lower(str_remove(str_remove(doc_id, '.md'), '^\\d\\d\\d\\d-\\d\\d-\\d\\d-'))) %
  count(doc_id, word, owner, sort=TRUE) %>%
  ungroup()
total_words <- owner_words %>%
  group_by(owner) %>%
  summarize(total = sum(n))
owner_words <- left_join(owner_words, total_words)
head(owner_words)
```

```
## # A tibble: 6 x 5
##   doc_id                          word      owner               n total
##   <chr>                           <chr>     <chr>           <int> <int>
## 1 2014-08-27-Monotype-Imaging.md fonts     monotype-imaging  2655 43236
## 2 2014-08-27-Monotype-Imaging.md helvetica monotype-imaging  2555 43236
## 3 2014-08-27-Monotype-Imaging.md blob      monotype-imaging  2504 43236
## 4 2014-08-27-Monotype-Imaging.md master    monotype-imaging  2504 43236
## 5 2014-08-27-Monotype-Imaging.md font      monotype-imaging  1270 43236
## 6 2014-08-27-Monotype-Imaging.md software  monotype-imaging  1267 43236
```

Further Analysis

- URLs can be removed before segmentation.
- Apply some modeling to classify by different types?
- English writing score? Identify Chinglish perhaps.