Guide 6.2 Introduction to text mining in R

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1 Guía 6.2: Introducción a la minería de datos textuales en R

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2 Ordenando los datos de Jane Austen

Las novelas de la escritora están en el paquete `janeaustenr` de R. El paquete mantiene el formato de una línea por fila, donde cada línea hace referencia a cada línea literal de un libro impreso. Usemos la función `mutate` para anotar los números de línea para poder guardar las líneas en el formato original y `chapter` (usando regex) para hallar dónde están los capítulos.

```
In [2]: library(janeaustenr)
        library(dplyr)
        library(stringr)

        original_books <- austen_books() %>%
          group_by(book) %>%
          mutate(linenumber = row_number(),
                 chapter = cumsum(str_detect(text, regex("^chapter [\\divxlc]",
                                                         ignore_case = TRUE)))) %>%
          ungroup()

        original_books
```

text	book
<chr>	<fct>
SENSE AND SENSIBILITY	Sense & Ser
	Sense & Ser
by Jane Austen	Sense & Ser
	Sense & Ser
(1811)	Sense & Ser
	Sense & Ser
	Sense & Ser
	Sense & Ser
	Sense & Ser
CHAPTER 1	Sense & Ser
	Sense & Ser
	Sense & Ser
The family of Dashwood had long been settled in Sussex. Their estate	Sense & Ser
was large, and their residence was at Norland Park, in the centre of	Sense & Ser
their property, where, for many generations, they had lived in so	Sense & Ser
respectable a manner as to engage the general good opinion of their	Sense & Ser
surrounding acquaintance. The late owner of this estate was a single	Sense & Ser
man, who lived to a very advanced age, and who for many years of his	Sense & Ser
life, had a constant companion and housekeeper in his sister. But her	Sense & Ser
death, which happened ten years before his own, produced a great	Sense & Ser
alteration in his home; for to supply her loss, he invited and received	Sense & Ser
into his house the family of his nephew Mr. Henry Dashwood, the legal	Sense & Ser
inheritor of the Norland estate, and the person to whom he intended to	Sense & Ser
bequeath it. In the society of his nephew and niece, and their	Sense & Ser
children, the old Gentleman's days were comfortably spent. His	Sense & Ser
attachment to them all increased. The constant attention of Mr. and	Sense & Ser
Mrs. Henry Dashwood to his wishes, which proceeded not merely from	Sense & Ser
interest, but from goodness of heart, gave him every degree of solid	Sense & Ser
comfort which his age could receive; and the cheerfulness of the	Sense & Ser
A tibble: 73422 Œ 4 children added a relish to his existence.	Sense & Ser
	Persuasion
Her recent good offices by Anne had been enough in themselves, and	Persuasion
their marriage, instead of depriving her of one friend, secured her	Persuasion
two. She was their earliest visitor in their settled life; and Captain	Persuasion
Wentworth, by putting her in the way of recovering her husband's	Persuasion
property in the West Indies, by writing for her, acting for her, and	Persuasion
seeing her through all the petty difficulties of the case with the	Persuasion
activity and exertion of a fearless man and a determined friend, fully	Persuasion
requited the services which she had rendered, or ever meant to render,	Persuasion
to his wife.	Persuasion
	Persuasion
Mrs Smith's enjoyments were not spoiled by this improvement of income,	Persuasion
with some improvement of health, and the acquisition of such friends to	Persuasion
be often with, for her cheerfulness and mental alacrity did not fail	Persuasion
her; and while these prime supplies of good remained, she might have	Persuasion
bid defiance even to greater accessions of worldly prosperity. She	Persuasion
might have been absolutely rich and perfectly healthy, and yet be	Persuasion
happy. Her spring of felicity was in the glow of her spirits, as her	Persuasion
friend Anne's was in the warmth of her heart. Anne was tenderness	Persuasion
itself, and she had the full worth of it in Captain Wentworth's	Persuasion

Para trabajar con este dataset ordenado, necesitamos reestructurarlo en el formato *un token por fila*, lo cual se puede hacer con la función `unnest_tokens`:

```
In [4]: library(tidytext)
        tidy_books <- original_books %>%
          unnest_tokens(word, text)

        head(tidy_books)
```

A tibble: 6 Œ 4

book <fct>	linenumber <int>	chapter <int>	word <chr>
Sense & Sensibility	1	0	sense
Sense & Sensibility	1	0	and
Sense & Sensibility	1	0	sensibility
Sense & Sensibility	3	0	by
Sense & Sensibility	3	0	jane
Sense & Sensibility	3	0	austen

Esta función usa el paquete `tokenizers` para separar cada línea de texto en el dataframe original a tokens. La tokenización por defecto es por palabra, pero se pueden incluir opciones que permita hacerlo por sentencia, párrafos, líneas, o separación respecto a un patrón de regex (expresiones regulares).

Ahora que los datos están en el formato *un término por fila*, podemos usar herramientas de manipulación con `dplyr`. Usualmente, en el análisis de texto querremos quitar las palabras vacías; éstas son, palabras que no aportan información. Podemos quitar estas palabras, con un `anti_join`:

```
In [6]: data(stop_words)

        tidy_books <- tidy_books %>%
          anti_join(stop_words)
```

```
Joining, by = "word"
```

Las palabras vacías en el paquete `tidytext` contienen palabras vacías de tres léxicos. Podemos usarlos todo junto, como lo tenemos aquí, o filtrar (`filter()`) para sólo usar un conjunto de palabras vacías si es más apropiado para ciertos análisis.

También podemos usar `count`, de `dplyr` para encontrar las palabras más comunes en todos los libros.

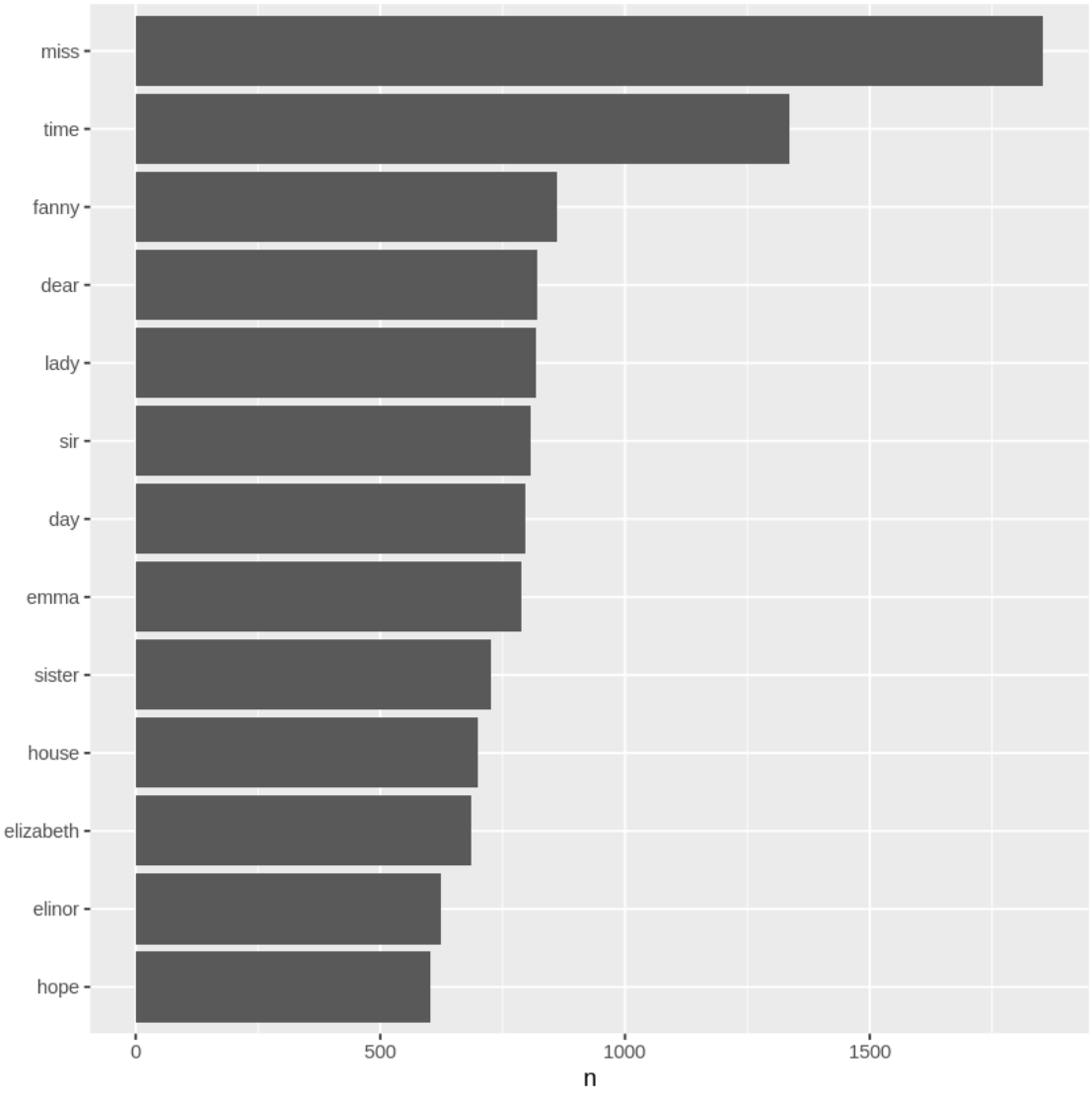
```
In [9]: head(tidy_books %>%  count(word, sort = TRUE) )
```

A tibble: 6 Œ 2

word <chr>	n <int>
miss	1855
time	1337
fanny	862
dear	822
lady	817
sir	806

Ya que usamos herramientas de datos ordenados, nuestro conteo es almacenado como datos ordenados. Esto nos permite ir directamente a `ggplot2`, por ejemplo:

```
In [10]: library(ggplot2)

         tidy_books %>%
           count(word, sort = TRUE) %>%
           filter(n > 600) %>%
           mutate(word = reorder(word, n)) %>%
           ggplot(aes(word, n)) +
           geom_col() +
           xlab(NULL) +
           coord_flip()
```



Note que la función `austen_books()` entregó inmediatamente el texto que queremos analizar, pero para otros casos hay que limpiar el texto lo suficiente. Nota que hay más textos disponibles para análisis en paquetes como `gutenbergr`.

Para obtener la frecuencia de las palabras, podemos usar los principios de los datos ordenados. Usemos algunas colecciones de ciencia ficción y novelas fantasiosas de H.G. Wells: The Time Machine, The War of the Worlds, The Invisible Man, and The Island of Doctor Moreau. Podemos acceder a estos trabajos de la siguiente manera:

```
In [11]: library(gutenbergr)

         hgwells <- gutenberg_download(c(35, 36, 5230, 159))
```

```
Determining mirror for Project Gutenberg from http://www.gutenberg.org/robot/harvest
Using mirror http://aleph.gutenberg.org
```

```
In [12]: tidy_hgwells <- hgwells %>%
           unnest_tokens(word, text) %>%
           anti_join(stop_words)
```

```
Joining, by = "word"
```

3 Actividad:

£Cuáles son las palabras más comunes en las novelas guardadas de H.G. Wells?

```
In [16]: bronte <- gutenberg_download(c(1260, 768, 969, 9182, 767))
         tidy_bronte <- bronte %>%
           unnest_tokens(word, text) %>%
           anti_join(stop_words)
```

```
Joining, by = "word"
```

```
In [ ]:
```

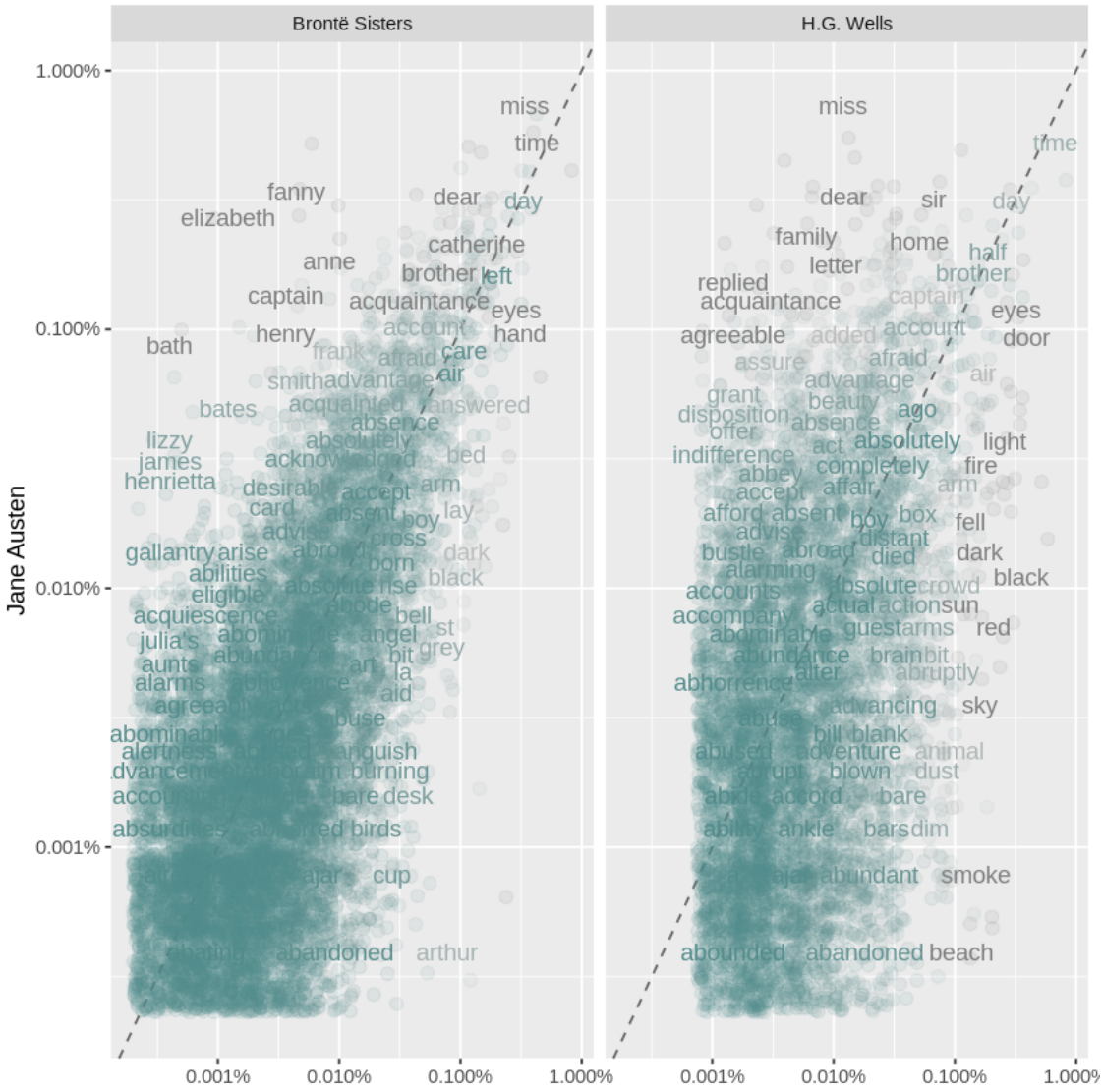
Ahora calculemos la frecuencia para cada palabra de los trabajos de Jane Austen, hermanas Brontë y H.G. Wells, juntando dataframes. Podemos usar `spread` y `gather` de `tidyr` para cambiar la forma nuestro dataframe, y así sólo necesitamos hacer un gráfico para comparar estas tres novelas.

```
In [17]: library(tidyr)

         frequency <- bind_rows(mutate(tidy_bronte, author = "Brontë Sisters"),
                                mutate(tidy_hgwells, author = "H.G. Wells"),
                                mutate(tidy_books, author = "Jane Austen")) %>%
           mutate(word = str_extract(word, "[a-z']+")) %>%
           count(author, word) %>%
           group_by(author) %>%
           mutate(proportion = n / sum(n)) %>%
           select(-n) %>%
           spread(author, proportion) %>%
           gather(author, proportion, `Brontë Sisters`:`H.G. Wells`)
```

Usamos `str_extract()` ya que los textos tienen codificación UTF-8, y hay algunas palabras con guión bajo que indican cierto énfasis (como cursivas). El tokenizador cuenta separadamente las palabras, pero no queremos contar cualquier "*palabra*" de manera separada a "cualquier" otra palabra, como vimos anteriormente, por lo que usaremos `str_extract()`

```
In [18]: library(scales)

         # expect a warning about rows with missing values being removed
         ggplot(frequency, aes(x = proportion, y = `Jane Austen`, color = abs(`Jane Austen` - p
           geom_abline(color = "gray40", lty = 2) +
           geom_jitter(alpha = 0.1, size = 2.5, width = 0.3, height = 0.3) +
           geom_text(aes(label = word), check_overlap = TRUE, vjust = 1.5) +
           scale_x_log10(labels = percent_format()) +
           scale_y_log10(labels = percent_format()) +
           scale_color_gradient(limits = c(0, 0.001), low = "darkslategray4", high = "gray75") +
           facet_wrap(~author, ncol = 2) +
           theme(legend.position="none") +
           labs(y = "Jane Austen", x = NULL)
```

```
Warning message:
Removed 41357 rows containing missing values (geom_point).Warning message:
Removed 41359 rows containing missing values (geom_text).
```


Brontë Sisters
H.G. Wells
Jane Austen
1.000%
0.100%
0.010%
0.001%
0.001%
0.010%
0.100%
1.000%
miss
time
fanny
dear
day
elizabeth
catherine
anne
brother
left
captain
acquaintance
eyes
henry
account
hand
bath
frank
afraid
care
air
smith
advantage
bates
acquainted
answered
absence
lizzy
absolutely
james
bed
henrietta
arm
desirable
accept
card
absent
lay
boy
cross
gallantry
arise
dark
born
abilities
black
eligible
rise
acquiescence
bell
julia's
angel
st
grey
aunts
bit
alarms
la
aid
abuse
anguish
burning
bare
desk
birds
cup
abandoned
arthur
sir
family
home
half
letter
brother
replied
captain
agreeable
added
door
assure
afraid
advantage
grant
beauty
ago
disposition
offer
act
light
indifference
completely
fire
abbey
affair
afford
box
fell
distant
bustle
abroad
died
alarming
accounts
crowd
accompany
actual
actionsun
guestarms
red
abundance
brainbit
alter
abruptly
abhorrence
advancing
sky
bill
blank
adventure
animal
blown
dust
abide
accord
ability
ankle
barsdim
abundant
smoke
abounded
beach

In [ ]: