Sentiment Analysis

Prateek

6/6/2020

SENTIMENT ANALYSIS

This is a project to understand the basics of R language. I referred to the various websites particulary Datacamp and Data-Flair for getting the most of the codes. From my end I read and understood the working and functioning each of the packages and R functions used in this project.

By end of this project I won't claim I learnt everything about R language, however the self paced learning taught me the art of exploring, understanding and finding my way out when working on R. Although the entire code on Sentiment Analysis is available on many websites, I found most of them failed to give a thorough explanation of:

"why a particular function is used?",

"Role of a particular step in the end result", and

"The various attributes available with a particular function".

In this article I will try to explain the usage of each step of code w.r.t. to the above questions that comes to any first time R language learner.

So, Let's begin

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

First step is to load these 4 packages to the global environment. `tidytext` is an important part of this project. The package and its associated functions lets us handle data comprising of texts. Remember that in tidytext package the table of tidy data is stored in a token format and is in a format of **one token per row**. Token usually means a one single word but it can also be a sentence, paragraph or even one complete chapter.

In our project, we aim to analyse each word in the book and rate those words on a sentiment scale. Hence, we would be tokenizing the tidydata to one word/one token in our case.

`janeaustenr` loads a package containing each word published in 6 books written by Jane Austen. We will be doing sentiment analysis of words in one of the above 6 books.

`stringr` loads a package which lets us use the pipe operator`%>%` in next step and other string functions.

`dplyr` is a package that lets us use the `group_by` function.

```
tidy_data<- austen_books()%>%group_by(book)%>% mutate(linenumber=row_number(),
            chapter=cumsum(str_detect(text,regex("^chapter [\\divxcl]",
            ignore_case = T))))%>%ungroup()%>%unnest_tokens(word,text)
```

The above chunks of code is an important step in this project. We are aiming to create a tibble in which the words in janeausten package are grouped by order of book, provide chapter number against each word

depending upon the chapter it appears in, and tokenize the janeausten package to one word level. In simple terms, we are *tidying* the text data in tidy_data tibble.

Pipe Operator(%>%) - The pipe operator takes the output of one statement and makes it the input of next statement. This is somewhat similar to chaining. e.g. f(g(h(x))) can be piped as `x%>%h()%>%g()%>%f()`. Pipe operator hence allows the chaining, without needing intermediate variables to store the value. Also, it eliminates the use of lots of parenthesis making it *readable* in a code chunk and presents the chained code in a *logically sequenced* format.

`group_by()`- The function groups the austen_books() data frame by order of the books present in data. This is not a visual change i.e. group_by function won't make a readable change to the structure of data.However it changes how th data acts with other dplyr verbs (functions).

`mutate()` - This is an important tool in dplyr package. It adds a new variable to data frame. We will understand the usage with a simple example.

Take the data frame airquality.

```
airquality
```

```
##   Ozone Solar.R Wind Temp Month Day
## 1    41     190  7.4   67     5   1
## 2    36     118  8.0   72     5   2
## 3    12     149 12.6   74     5   3
## 4    18     313 11.5   62     5   4
## 5    NA      NA 14.3   56     5   5
## 6    28      NA 14.9   66     5   6
```

With mutate function we can add a new variable `temperature:wind` to the data frame. Infact we can add any new variable to an existing dataframe using this function.

```
mutate(airquality, "temp/wind" = Temp/Wind)
```

```
##   Ozone Solar.R Wind Temp Month Day temp/wind
## 1    41     190  7.4   67     5   1  9.054054
## 2    36     118  8.0   72     5   2  9.000000
## 3    12     149 12.6   74     5   3  5.873016
## 4    18     313 11.5   62     5   4  5.391304
## 5    NA      NA 14.3   56     5   5  3.916084
## 6    28      NA 14.9   66     5   6  4.429530
```

We can see the mutate function added a new variable `temp/wind` to the existing data frame. This makes the mutate function very useful in data mining and processing.

In our project of sentiment analysis, after grouping the austen_book dataframe in order of books we are adding two new variables (`linenumber` and `chapter`). The line number is the row number corresponding to each line of text. This is important because later we will be tokenizing each word of the data frame and to keep a track of which row it belonged to in the actual data frame, we are assigning the row number from original data frame as the line numbers.

Also we need to add another variable that would tell us the chapter number each word belongs to. For this, as told, we are using mutate function but with an added set of codes. `chapter=cumsum(str_detect(text,regex("^chapter [\\divxcl]", ignore_case=T)))`

`\\divxcl` - \d includes all digits and vxcl will add any roman numerals, if the chapter numbers are marked in roman format, to the count.

`str_detect(text,regex())` - is a regular expression. Regular expressions are concise,flexible tool for describing patterns in strings.

We will learn this with an example:

```
bananas <- c("banana", "Banana", "BANANA")
str_detect(bananas,regex("banana"))
```

```
## [1]  TRUE FALSE FALSE
```

As you can see, the str_detect and regex tool helps us to extract a part of text from a token word and this is useful in identifying the "CHAPTER X" format present in the text variable of the dataframe. The `ignore_case` attribute of str_detect function lets us ignore any case where "chapter" is in small or caps.

Once we identify a Chapter number in the dataframe we need to add any subsequent words appearing in the dataframe to that chapter number till we encounter the next chapter number.

`cumsum()`- We have identified the Chapter number we need to make a cumulative sum of the words that appear in one chapter. For this the `cumsum()` function is used. By the end of this chunk of code we ungroup and unnest the tokens to bring the dataframe to its original format. The new dataframe `tidy_data` is now in a tidy format with each row having one word, the corresponding line number, and the corresponding chapter it appears in. We are now ready to use sentiment tools on our tidy data.

This is how our new dataset looks like:

```
tidy_data
```

```
## # A tibble: 725,055 x 4
##    book                linenumber chapter word
##    <fct>                    <int>   <int> <chr>
##  1 Sense & Sensibility          1       0 sense
##  2 Sense & Sensibility          1       0 and
##  3 Sense & Sensibility          1       0 sensibility
##  4 Sense & Sensibility          3       0 by
##  5 Sense & Sensibility          3       0 jane
##  6 Sense & Sensibility          3       0 austen
##  7 Sense & Sensibility          5       0 1811
##  8 Sense & Sensibility         10       1 chapter
##  9 Sense & Sensibility         10       1 1
## 10 Sense & Sensibility         13       1 the
## # ... with 725,045 more rows
```

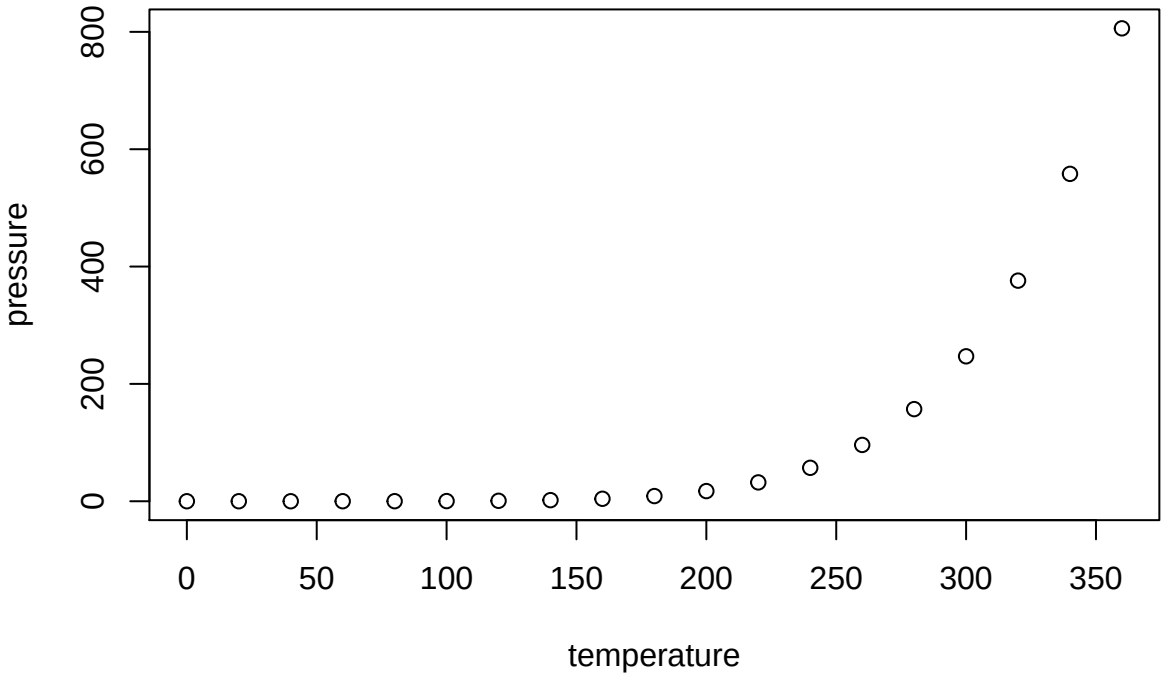
When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.