

# **ASDM Workshop Week 6: Sentiment Analysis with R**

## **- Charith Silva, Dr. Mo Saraee**

### **Introduction :**

The rapid increase in mountains of unstructured textual data accompanied by proliferation of tools to analyse them has opened up great opportunities and challenges for text mining research. The automatic labelling of text data is hard because people often express opinions in complex ways that are sometimes difficult to comprehend.

Sentiment Analysis is the process of identifying sentiment from text written in a natural language. Sentiment lexicons are used to perform this task. Sentiment is often framed as a binary distinction (positive vs. negative), but it can also be a more fine-grained, like identifying the specific emotion an author is expressing (like fear, joy or anger).

Sentiment analysis has many applications and benefits to businesses and organizations. It can be used to give businesses valuable insights into how people feel about their product or service eg: With the Sentiment Analysis report, a hotelier can look at a recent time period and identify topics that were mentioned most frequently with a negative sentiment attached. The topics that came up most frequently are “room odor,” “noise,” and “bathroom condition.” With this information, a hotel would know to evaluate these areas when it comes time to make decisions about property improvements.

Some examples of applications for sentiment analysis include:

- Analyzing the social media discussion around a certain topic
- Evaluating survey responses
- Determining whether product reviews are positive or negative

In some causes sentiment analysis might not give perfect results and as with any automatic analysis of language, you will have errors in your results. It also cannot tell you why a writer is feeling a certain way. However, it can be useful to quickly summarize some qualities of text, especially if you have so much text that a human reader cannot analyze.

Dataset: Dataset contains product reviews from Amazon

Category	name	brand	primaryCategories	reviews.date	reviews.text	reviews.title	reviews.username
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-09-03T00:00:00.000Z	I thought it would be as big as small paper but turn out to be just like my palm. I think it is too small	Too small	llyue
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-06-06T00:00:00.000Z	This Kindle is light and easy to use especially at the beach!!	Great light reader. Easy to use at the beach	Charmi
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-04-20T00:00:00.000Z	Didn't know how much I'd use a Kindle so went for the lower end. I'm happy with it. even if it's a little of Great for the price	Great for the price	johnnyjojo
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-11-02T17:33:31.000Z	I am 100 happy with my purchase. I caught it on sale at a really good price. I am normally a real bookA Great Buy	I am normally a real bookA Great Buy	Kderry
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-04-24T00:00:00.000Z	Solid entry level Kindle. Great for kids. Gifted for a kid of my friend and they love to use it to read moSolid entry-level Kindle. Great for kids	Solid entry-level Kindle. Great for kids	Johnnyblack
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-12-14T00:00:00.000Z	This make an excellent ebook reader. Don't expect much from this device except to read basic eboGood ebook	This make an excellent ebook reader. Don't expect much from this device except to read basic eboGood ebook	rmvarious
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-12-20T17:38:23.000Z	I ordered this for my daughter. as I have the black paperwhite. and I love it. I read quite a bit and the Light Weight. Makes a world of difference when it	Light Weight. Makes a world of difference when it	LexieCrews
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-07-14T00:00:00.000Z	I bought my Kindle about 2 months ago and the battery is already dead and will not charge	not good quality	meny
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-05-23T00:00:00.000Z	amazon kindle is always the best ebook. upgrade every new model	best ebook	STEF
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-01-12T00:00:00.000Z	it's beyond my expectation. and it can even show music score. Not fast turning though.	Great Product	ACEBY
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-09-11T00:00:00.000Z	If you really want to have a good read on something digital this is the item you're looking for. It really	Good price excellent reader	jhippo
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-04-22T00:00:00.000Z	Love my kindle. makes reading at night so easy and it feels like you are reading a real book.	feels like a real book	Sean242
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-02-20T00:00:00.000Z	Good product for child. Who only need to read the books	Great readers	Jackie
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-01-06T00:00:00.000Z	This Kindle is a convenient size yet lettering is easy to read.	Just what my grandson wanted	grandma
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-02-23T00:00:00.000Z	I use this every day on my commute. Great battery life, no backlight but very readable with normal liGreat for reading on the go	I use this every day on my commute. Great battery life, no backlight but very readable with normal liGreat for reading on the go	BeRocke
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-02-25T00:00:00.000Z	It does its job but I would buy one which the screen is brighter. There are times that it's difficult to re	Does its job	Chillygr
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-11-19T00:00:00.000Z	Great product for myself And I bought it when there was great deal on it!	Great!	John
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-12-24T00:00:00.000Z	Item work well and was easy to read from in day light	Work	Bill
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-10-07T00:00:00.000Z	Great product and service will refer to a friend. And the sales man r good	Great product and service	richard
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-11-16T00:00:00.000Z	Everything is great except that I can't read external pdfs properly. Either it zooms too much of too liExternal pdf does not work properly	External pdf does not work properly	Supruser37
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-12-02T00:00:00.000Z	I was looking for a Kindle whitepaper. I saw online for \$90. What a deal. I ordered it on line and pickelTricked into buying	Tricked into buying	Keith
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-03-22T15:18:54.000Z	This is a nice bare-bones reading device. Easy to set up and use. My greatest issue is that it isn't bEasy to use, bare-bones reading device	Easy to use, bare-bones reading device	Nibbler
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-02-13T00:00:00.000Z	Easy to use and navigate, purchasing books is fast and simple and I love the fact that I can passwoGreat e-reader for beginners	Great e-reader for beginners	st2005
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-09-17T00:00:00.000Z	The Amazon Kindle is light weight and easy to use.	Good Deal for the Price	Robe12
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-01-29T00:00:00.000Z	I love hear readers. I had to replace mine because I destroyed the last, but it is awesome	Great	kda
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-02-17T00:00:00.000Z	Love the simplicity. Also love that I use it for reading only and can't download distracting apps.	Easy and simple	Kathy
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-05-01T00:00:00.000Z	My husband loves this Kindle. He has a muscular disease keeping him from being able to handle anCompact and light	Compact and light	Debbie
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-03-15T00:00:00.000Z	I've wanted a Kindle for a while and decided to get it when BB put it on sale. I am not disappointed.	Great product at great price.	Tupman
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-10-01T00:00:00.000Z	I have several Kindles so knew what to expect. It is a great reading device and I keep several in differGreat reading tool	Great reading tool	drd1
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-09-01T00:00:00.000Z	I like this e reader, but wish the screen were higher resolution. It requires decent light to look good.	Great reader but not perfect	MrPhilTX
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-08-26T00:00:00.000Z	My fiancé really enjoys it! I would definitely recommend.	Great product	Jeff
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-12-09T00:00:00.000Z	Simple, great buy for your money if you are an avid reader.	Great Product	flexorist
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2016-10-08T00:00:00.000Z	I like the changes that have been made since my current 4 year old unit was purchased	good design	mother
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-01-05T00:00:00.000Z	Fits nicely in your hand and its touchable. increase the size of the fonts	kindle touch	dk22
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-03-16T00:00:00.000Z	Great buy, do a lot of reading and he no gear screen is awesome while in the sun.	Great	JmJA
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-11-15T00:00:00.000Z	lie the size and weight for the kindle-makes it very convenient to take large books with me in digitalUseful and practical	Useful and practical	yespicklejuiceisgood
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-05-19T00:00:00.000Z	Great price and works great for book reading. Would recommend	Great for book reader	AG79
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-01-28T00:00:00.000Z	Got it when it was on sale. Totally fall in love with it. Bring with it me everywhere.	This is my new baby	Vincent
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-01-20T00:00:00.000Z	I never used Kindle before. My wife gifted me on my birthday. This is the amazing product. I am usinGreat ebook reader	Great ebook reader	Klan
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2018-01-01T00:00:00.000Z	I bought this with paper white and didn't see much of a difference in terms of resolution and use.	Excellent	Faithy
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-10-07T00:00:00.000Z	The sales people are really nice and knowledgeable to me I will come back again	Great product	richard
Kindle	Amazon Kindle E-Reader 6" Wifi (8th Generation, 2016)	Amazon	Electronics	2017-01-30T00:00:00.000Z	I'm a longtime Kindle user and jumped at the opportunity to bring my granddaughter into the fold with aTerrific and Highly Appreciated Gift	A Terrific and Highly Appreciated Gift	Ed5f648

## Exercise

1. Start RStudio.

2. Change working directory.

File → More → Go To Working Directory...

In the Go To Working Directory dialogue, navigate to and select the folder where you saved your data file eg: F:\ASDM\Week10. Click OK.

3. Open a new R script window:

File → New File → R script

4. Download and Read the data file

We will be using `Reviews_of_Amazon_Products.csv` for this workshop. The file can be downloaded from Blackboard.

5. Load necessary packages

```
library(tm) #load tm package
library(wordcloud) #load wordcloud package
```

6. Read the data file

```
Reviews <- read.csv("Reviews_of_Amazon_Products.csv", header= TRUE)
```

7. Inspect the dataset

```
names(Reviews)
head(Reviews)
tail(Reviews)
summary(Reviews)
str(Reviews)
dim(Reviews)
```

8. Filter the products from the main dataset and create 5 separate datasets

```
R_16GB_Blue<-subset(Reviews,
                    name=="Fire HD 8 Tablet, Wi-Fi, 16 GB-Blue")

R_16GB_Magenta<-subset(Reviews,
                      name=="Fire HD 8 Tablet, Wi-Fi, 16 GB-Magenta")

R_32GB_Blue<-subset(Reviews,
                   name=="Fire HD 8 Tablet, Wi-Fi, 32 GB-Blue")

R_32GB_Magenta<-subset(Reviews,
                      name=="Fire HD 8 Tablet, Wi-Fi, 32 GB-Magenta")
```

```
R_32GB_Black<-subset(Reviews,  
                      name=="Fire HD 8 Tablet, Wi-Fi, 32 GB-Black")
```

## 9. Inspect the review column in the datasets

```
head(R_16GB_Blue$reviews.text)  
head(R_16GB_Magenta$reviews.text)  
head(R_32GB_Blue$reviews.text)  
head(R_32GB_Magenta$reviews.text)  
head(R_32GB_Black$reviews.text)
```

```
> head(R_32GB_Black$reviews.text)  
[1] I have had this for several weeks. It works great. I am very satisfied with it so far.  
  
[2] Purchased this for a gift for my mother who is a amazon fanatic she loves it ! Made her christmas this year  
  
[3] My mom loves the kindle fire hd 8. She had the first kindle and it was time for an upgrade! Great buy for her birthday present!!  
  
[4] If you love Amazon, you'll love the Kindle HD8. It's a great size for reading all those books, streaming movies and tv shows, and has great sound for listening to your favorite music. For less than $100, you can't beat the versatility of this little device!  
[5] This works great. I read a LOT and I needed something that would handle all my eBooks. It has all the other bells and whistles as any tablet but I use it for the eBooks and one game. Excellent!  
  
[6] meh. it works. i find it difficult to navigate. i also have an ipad mini. this seems to be less intuitive than the ipad.
```

## 10. Create text vectors

```
review_16GB_Blue<-R_16GB_Blue$reviews.text  
review_16GB_Magenta<-R_16GB_Magenta$reviews.text  
review_32GB_Blue<-R_32GB_Blue$reviews.text  
review_32GB_Magenta<-R_32GB_Magenta$reviews.text  
review_32GB_Black<-R_32GB_Black$reviews.text
```

## 11. Convert all text to lower case

```
review_16GB_Blue<-tolower(review_16GB_Blue)  
review_16GB_Magenta<-tolower(review_16GB_Magenta)  
review_32GB_Blue<-tolower(review_32GB_Blue)  
review_32GB_Magenta<-tolower(review_32GB_Magenta)  
review_32GB_Black<-tolower(review_32GB_Black)
```

#gsub() function replaces all matches of a string, if the parameter is a string vector, returns a string vector of the same length and with the same attributes (after possible coercion to character). Elements of string vectors which are not substituted will be returned unchanged (including any declared encoding).

#Regular expression is a pattern that describes a set of strings. Simply speaking, regular expression is an "instruction" given to a function on what and how to match or replace strings.

## 12. Remove links from the reviews

```
review_16GB_Blue <- gsub("http\\S+\\s*", "", review_16GB_Blue)
review_16GB_Magenta <- gsub("http\\S+\\s*", "", review_16GB_Magenta)
review_32GB_Blue <- gsub("http\\S+\\s*", "", review_32GB_Blue)
review_32GB_Magenta <- gsub("http\\S+\\s*", "", review_32GB_Magenta)
review_32GB_Black <- gsub("http\\S+\\s*", "", review_32GB_Black)
```

## 13. Remove punctuation from the reviews

```
review_16GB_Blue <- gsub("[[:punct:]]", "", review_16GB_Blue)
review_16GB_Magenta <- gsub("[[:punct:]]", "", review_16GB_Magenta)
review_32GB_Blue <- gsub("[[:punct:]]", "", review_32GB_Blue)
review_32GB_Magenta <- gsub("[[:punct:]]", "", review_32GB_Magenta)
review_32GB_Black <- gsub("[[:punct:]]", "", review_32GB_Black)
```

## 14. Remove digits from the reviews

```
review_16GB_Blue <- gsub("[[:digit:]]", "", review_16GB_Blue)
review_16GB_Magenta <- gsub("[[:digit:]]", "", review_16GB_Magenta)
review_32GB_Blue <- gsub("[[:digit:]]", "", review_32GB_Blue)
review_32GB_Magenta <- gsub("[[:digit:]]", "", review_32GB_Magenta)
review_32GB_Black <- gsub("[[:digit:]]", "", review_32GB_Black)
```

## 15. Remove leading blank spaces at the beginning from the reviews

```
review_16GB_Blue <- gsub("^ ", "", review_16GB_Blue)
review_16GB_Magenta <- gsub("^ ", "", review_16GB_Magenta)
review_32GB_Blue <- gsub("^ ", "", review_32GB_Blue)
review_32GB_Magenta <- gsub("^ ", "", review_32GB_Magenta)
review_32GB_Black <- gsub("^ ", "", review_32GB_Black)
```

## 16. Remove blank spaces at the end from the reviews

```
review_16GB_Blue <- gsub(" $", "", review_16GB_Blue)
review_16GB_Magenta <- gsub(" $", "", review_16GB_Magenta)
review_32GB_Blue <- gsub(" $", "", review_32GB_Blue)
review_32GB_Magenta <- gsub(" $", "", review_32GB_Magenta)
review_32GB_Black <- gsub(" $", "", review_32GB_Black)
```

## 17. Remove "tablet" word from the reviews

```
review_16GB_Blue <- gsub("tablet", "", review_16GB_Blue)
review_16GB_Magenta <- gsub("tablet", "", review_16GB_Magenta)
review_32GB_Blue <- gsub("tablet", "", review_32GB_Blue)
review_32GB_Magenta <- gsub("tablet", "", review_32GB_Magenta)
review_32GB_Black <- gsub("tablet", "", review_32GB_Black)
```

## 18. Inspect the vectors after cleaning

```
head(review_16GB_Blue)
head(review_16GB_Magenta)
head(review_32GB_Blue)
head(review_32GB_Magenta)
head(review_32GB_Black)
```

```
> head(review_32GB_Black)
[1] "i have had this for several weeks it works great i am very satisfied with it so far"

[2] "purchased this for a gift for my mother who is a amazon fanatic she loves it made her christmas this year"

[3] "my mom loves the kindle fire hd she had the first kindle and it was time for an upgrade great buy for her birthday present"

[4] "if you love amazon youll love the kindle hd its a great size for reading all those books streaming movies and tv shows and has great sound for listening to your favorite music for less than you cant beat the versatility of this little device"
[5] "this works great i read a lot and i needed something that would handle all my ebooks it has all the other bells and whistles as any but i use it for the ebooks and one game excellent"

[6] "meh it works i find it difficult to navigate i also have an ipad mini this seems to be less intuitive than the ipad"
```

## 19. Converting the text vectors to corpus

```
corpus_16GB_Blue <- Corpus(VectorSource(review_16GB_Blue))
corpus_16GB_Magenta <- Corpus(VectorSource(review_16GB_Magenta))
corpus_32GB_Blue <- Corpus(VectorSource(review_32GB_Blue))
corpus_32GB_Magenta <- Corpus(VectorSource(review_32GB_Magenta))
corpus_32GB_Black <- Corpus(VectorSource(review_32GB_Black))
```

## 20. Use the following commands to inspect the corpus.

```
corpus_16GB_Blue
corpus_16GB_Magenta
corpus_32GB_Blue
corpus_32GB_Magenta
corpus_32GB_Black
```

```
> corpus_16GB_Blue
<<SimpleCorpus>>
Metadata: corpus specific: 1, document level (indexed): 0
Content: documents: 51
> corpus_16GB_Magenta
<<SimpleCorpus>>
Metadata: corpus specific: 1, document level (indexed): 0
Content: documents: 797
> corpus_32GB_Blue
<<SimpleCorpus>>
Metadata: corpus specific: 1, document level (indexed): 0
Content: documents: 70
> corpus_32GB_Magenta
<<SimpleCorpus>>
Metadata: corpus specific: 1, document level (indexed): 0
Content: documents: 40
> corpus_32GB_Black
<<SimpleCorpus>>
Metadata: corpus specific: 1, document level (indexed): 0
Content: documents: 58
```

## 21. Clean up corpus by removing stop words and Whitespace

```
corpus_16GB_Blue <- tm_map(corpus_16GB_Blue, removeWords, stopwords("english"))
corpus_16GB_Blue <- tm_map(corpus_16GB_Blue, stripWhitespace)
inspect(corpus_16GB_Blue)

corpus_16GB_Magenta<-tm_map(corpus_16GB_Magenta, removeWords,stopwords("english"))
corpus_16GB_Magenta <- tm_map(corpus_16GB_Magenta, stripWhitespace)
inspect(corpus_16GB_Magenta)

corpus_32GB_Blue <- tm_map(corpus_32GB_Blue, removeWords,stopwords("english"))
corpus_32GB_Blue <- tm_map(corpus_32GB_Blue, stripWhitespace)
inspect(corpus_32GB_Blue)

corpus_32GB_Magenta<-tm_map(corpus_32GB_Magenta, removeWords,stopwords("english"))
corpus_32GB_Magenta <- tm_map(corpus_32GB_Magenta, stripWhitespace)
inspect(corpus_32GB_Magenta)

corpus_32GB_Black <- tm_map(corpus_32GB_Black, removeWords,stopwords("english"))
corpus_32GB_Black <- tm_map(corpus_32GB_Black, stripWhitespace)
inspect(corpus_32GB_Black)
```

## 22. Stem the words to their root of all reviews present in the corpus

```
stem_corpus_16GB_Blue <- tm_map(corpus_16GB_Blue, stemDocument)
stem_corpus_16GB_Magenta <- tm_map(corpus_16GB_Magenta, stemDocument)
stem_corpus_32GB_Blue <- tm_map(corpus_32GB_Blue, stemDocument)
stem_corpus_32GB_Magenta <- tm_map(corpus_32GB_Magenta, stemDocument)
stem_corpus_32GB_Black <- tm_map(corpus_32GB_Black, stemDocument)
```

#-----

## 23. Load the positive and negative lexicon data

```
positive_lexicon <- read.csv("positive-lexicon.txt")
negative_lexicon <- read.csv("negative-lexicon.txt")
```

## 24. Inspect lexicons

```
#Inspect lexicons
head(positive_lexicon)
tail(positive_lexicon)
```

```
> head(positive_lexicon)
      a.
1    abound
2    abounds
3  abundance
4   abundant
5  accessible
6  accessible
> tail(positive_lexicon)
      a.
2000   yay
2001 youthful
2002    zeal
2003  zenith
2004    zest
2005   zippy
```

```
head(negative_lexicon)
tail(negative_lexicon)
```

```
> head(negative_lexicon)
      X2.faced
1      2-faces
2      abnormal
3      abolish
4      abominable
5      abominably
6      abominate
> tail(negative_lexicon)
      X2.faced
4777      zapped
4778      zaps
4779      zealot
4780      zealous
4781      zealously
4782      zombie
```

## 25. Creating a function for sentimental analysis

```
sentiment <- function(stem_corpus)
{

#generate wordclouds
wordcloud(stem_corpus,
          min.freq = 3,
          colors=brewer.pal(8, "Dark2"),
          random.color = TRUE,
          max.words = 100)

#Calculating the count of total positive and negative words in each review

#Create variables and vectors
total_pos_count <- 0
total_neg_count <- 0
pos_count_vector <- c()
neg_count_vector <- c()

#Calculate the size of the corpus
size <- length(stem_corpus)

for(i in 1:size)
{

#All the words in current review
corpus_words<- list(strsplit(stem_corpus[[i]]$content, split = " "))

#positive words in current review
```



```
pos_count <-length(intersect(unlist(corpus_words), unlist(positive_lexicon)))
```

```
#negative words in current review
neg_count <- length(intersect(unlist(corpus_words), unlist(negative_lexicon)))

total_pos_count <- total_pos_count + pos_count ## overall positive count
total_neg_count <- total_neg_count + neg_count ## overall negative count

}

#Calculating overall percentage of positive and negative words of all the reviews
total_pos_count          ## overall positive count
total_neg_count          ## overall negative count
total_count <- total_pos_count + total_neg_count

overall_positive_percentage <- (total_pos_count*100)/total_count
overall_negative_percentage <- (total_neg_count*100)/total_count
overall_positive_percentage          ## overall positive percentage

#Create a dataframe with all the positive and negative reviews
df<-data.frame(Review_Type=c("Postive","Negative"),
               Count=c(total_pos_count ,total_neg_count ))
print(df) #Print

overall_positive_percentage<-paste("Percentage of Positive Reviews:",
                                   round(overall_positive_percentage,2),"%")

return(overall_positive_percentage)

}
```

26. Use **sentiment()** function and calculate the Percentage of Positive Reviews

```
sentiment(stem_corpus_16GB_Blue)
```



```
> sentiment(stem_corpus_16GB_Blue)
  Review_Type Count
1    Postive   117
2   Negative    13
[1] "Percentage of Positive Reviews: 90 %"
```

```
sentiment(stem_corpus_16GB_Magenta)
```



```
> sentiment(stem_corpus_16GB_Magenta)
  Review_Type Count
1    Positive  1439
2    Negative   201
[1] "Percentage of Positive Reviews: 87.74 %"
```

```
sentiment(stem_corpus_32GB_Blue)
```



```
> sentiment(stem_corpus_32GB_Blue)
  Review_Type Count
1    Postive   136
2   Negative    39
[1] "Percentage of Positive Reviews: 77.71 %"
```

```
sentiment(stem_corpus_32GB_Magenta)
```



```
> sentiment(stem_corpus_32GB_Magenta)
Review_Type Count
1      Postive  101
2     Negative   30
[1] "Percentage of Positive Reviews: 77.1 %"
```

```
sentiment(stem_corpus_32GB_Black)
```



```
> sentiment(stem_corpus_32GB_Black)
Review_Type Count
1      Postive    104
2      Negative    21
[1] "Percentage of Positive Reviews: 83.2 %"
```