NLP Assignment: Kindle Store Reviews Analysis

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Introduction

The Kindle Store is an online e-book e-commerce store operated by Amazon as part of its retail website and can be accessed from any Amazon Kindle, Fire tablet or Kindle mobile app. At the launch of the Kindle in November 2007, the store had more than 88,000 digital titles available in the U.S. store. This number increased to more than 275,000 by late 2008, and exceeded 765,000 by August 2011. In July 2014, there were over 2.7 million titles available. As of March 2018 there are over six million titles available in the U.S.

One of the store's novelties was one-click buying, which allowed consumers to rapidly purchase an e-book. The Kindle Store employs a recommendation system that examines the user's purchase history, browsing history, and reading behavior before recommending stuff it believes the user would enjoy. As a result, it is critical to analyze user reviews in order to promote books and enhance sales.

Data Description

This 5-core dataset of product reviews from Amazon Kindle Store category from May 1996 - July 2014. Contains total of 982619 entries. Each reviewer has at least 5 reviews and each product has at least 5 reviews in this dataset. Each observation contains 10 attributes that include information such as reviewer ID, product ID etc. The table below provides brief descriptions of each attribute and its type.

Variable	Type	Description
X	Long	Index
reviewerID	String	ID of the reviewer, e.g. A2SUAM1J3GNN3B
reviewerName	String	name of the reviewer
asin	String	ID of the product, e.g. 0000013714
helpful	Array	helpfulness rating of the review, e.g. 2/3
reviewText	String	text of the review
overall	Integer	rating of the product
summary	String	summary of the review
unixReviewTime	Timestamp	time of the review (unix time)
reviewTime	Date	time of the review (raw)

This dataset is taken from Amazon product data, Julian McAuley, UCSD website. http://jmcauley.ucsd.edu/data/amazon/

Experiments

0. Load Packages

```
library("tm") # for text mining
library(tidyverse) # for data processing
library(plyr)
library("SnowballC") # for text stemming, reduces words to their root form
library("wordcloud") # word-cloud generator
library("syuzhet") # for sentiment analysis
library(udpipe) # tokenization, Parts of Speech Tagging, Lemmatization and Dependency
library(lattice) # for bar plot etc.
```

1. Data Pre-processing

a. Get samples from raw data

Since there are nearly one million data, limited by local computing power and resources, it was selected a sample of one percent of the total data base on the `overall` rating.

b. Check the most frequent, identical review texts

```
## # A tibble: 9,826 x 3
##    reviewText                                                  n_reviews     pct
##    <chr>                                                           <int>   <dbl>
##  1 ""                                                                  1 1.02e-4
##  2 "-SPOILER FREE REVIEWsteamy, dangerous, passionate,one-in-~         1 1.02e-4
##  3 ",The Basic Recipes Every Kitchen Should Have title caught~         1 1.02e-4
##  4 "!  Unusual, and different, easy and quick, anyone can mak~         1 1.02e-4
##  5 "....because \"Them\", though definitely 50s, was much bet~         1 1.02e-4
##  6 "....Mz. Geary gave me an escape from reality, a tender, l~         1 1.02e-4
##  7 "...about an uptight doctor and a hot boy but it turns out~         1 1.02e-4
##  8 "...Ever since reading The Fire, I never know how John wil~         1 1.02e-4
##  9 "...from laughter.  Brownie is Bubba's nephew, and a more ~         1 1.02e-4
## 10 "..geez, as much as I really, really, hated Nathan..I don'~         1 1.02e-4
## # ... with 9,816 more rows
```

From the output, there are no duplicate reviews, or empty reviews, which means that the raw data has been processed. So those reviews just need to be normalized in the next step.

2. Text Normalization

We normalize text to lessen its unpredictability and bring it closer to a preset "standard." This reduces the quantity of diverse data that the computer has to cope with, resulting in increased efficiency. Normalization procedures such as stemming and lemmatization aim to reduce a word's inflectional and occasionally derivationally related forms to a single base form. We process the text according to the following steps:

a. Load the data as a corpus:

b. Replacing `/`, `@` and `|` with space

c. Convert the text to lower case

d. Remove punctuation

e. Remove numbers

f. Remove extra white spaces

g. Remove English common stop words

h. Text stemming - reduces words to their root form

i. Take a look at the normalized result

Before printing the output, the corpus needs to be parsed to generate a `Dataframe`. The result shows below:

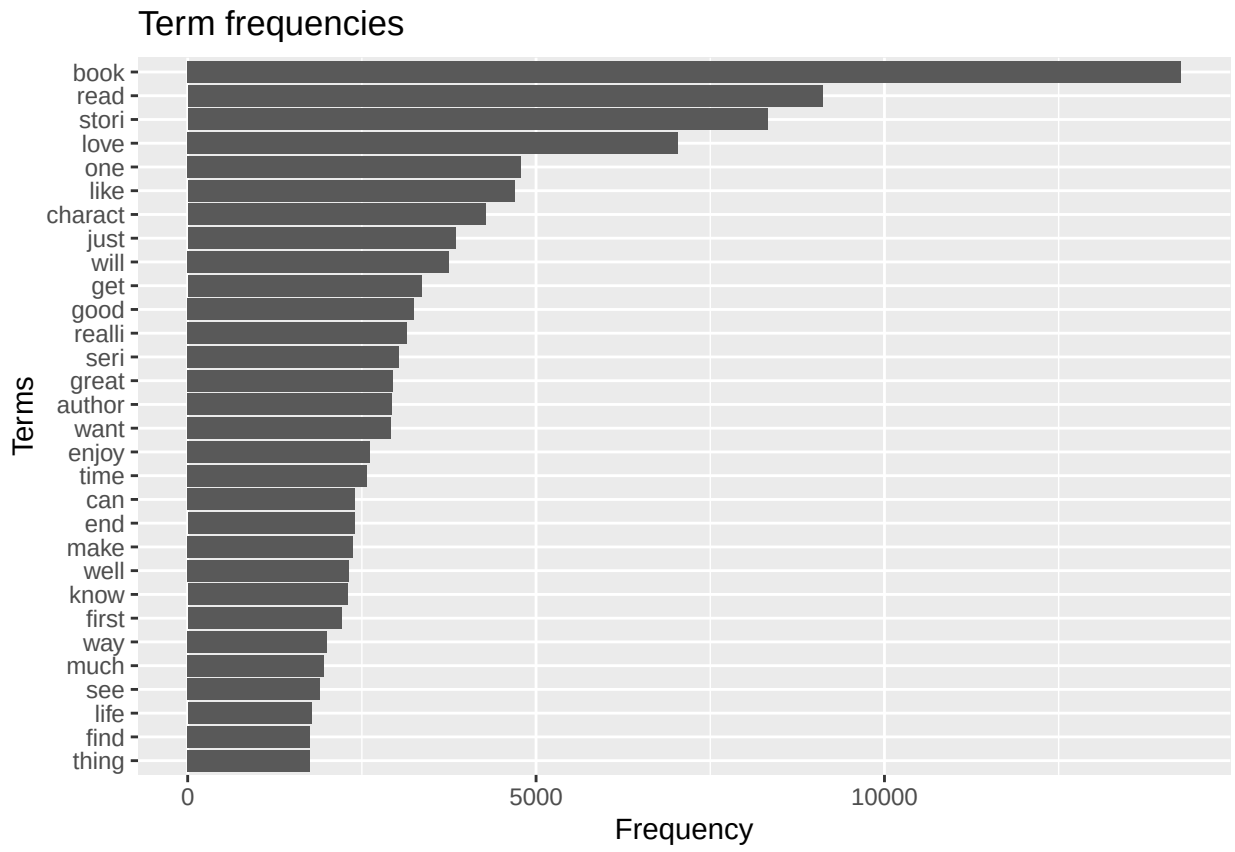
[1] “first chapter seem interest quick devolv silli stori boy acquir god like power effort ownprevi review list mani flaw need restat just look one star ratingscouldnt finish one realli recommend keep look” [2] “disappoint read real meat use kindl fire hd can learn much time”
[3] “didnt like anim talk stori line teenag read chapter couldnt read feel get refund one”
[4] “book noth expect though read somekind code someth”
[5] “poor sens pace english issu particular fun read suggest other”
[6] “never book didnt illustr peopl visual poor done glad free even wasnt worth sorri author next time includ visual”

j. Merge cleaned reviews in raw data

Reviews Analysis

1. The top 30 words

We build a Term Document Matrix(TDM) to represents documents vectors in matrix form in which the rows correspond to the terms in the document, columns correspond to the documents in the corpus and cells correspond to the weights of the terms. So we can easily count out the top 30 most frequently used words in reviews.



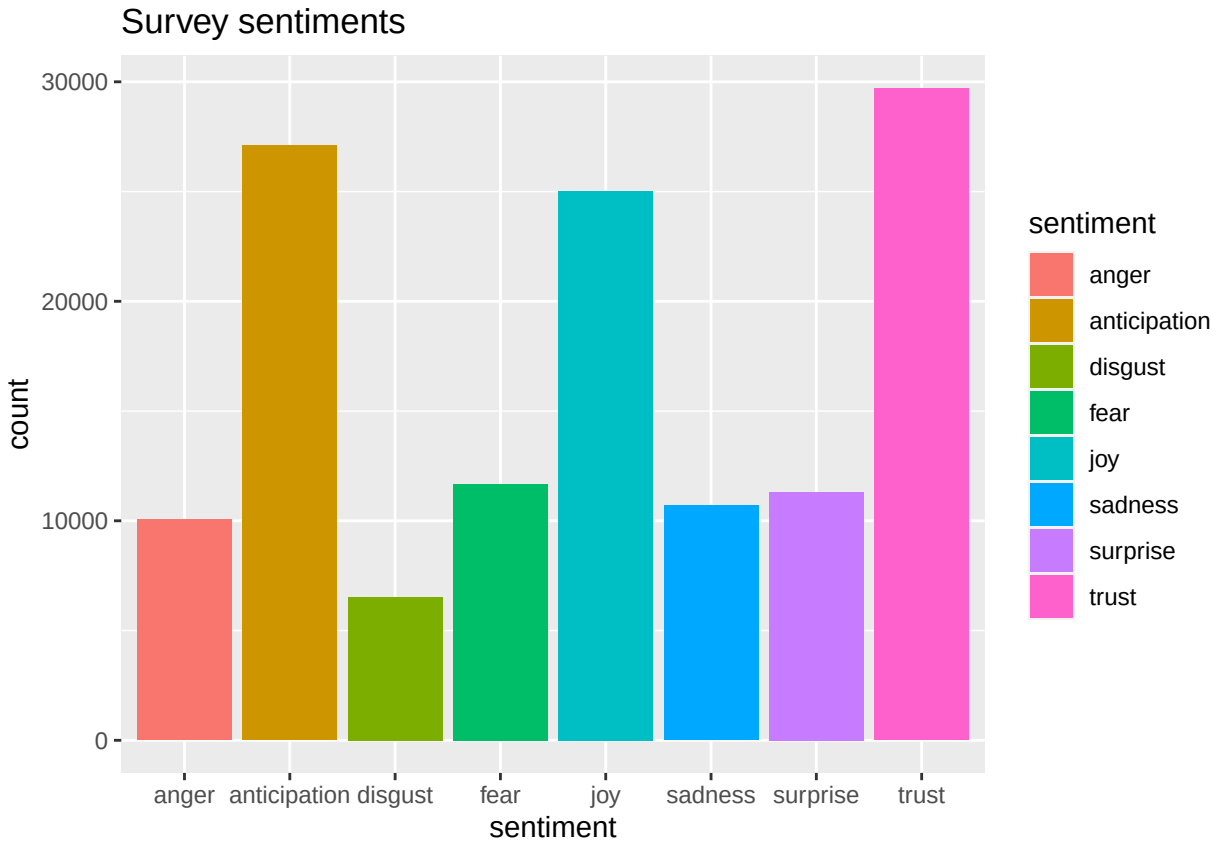
2. Sentiment analysis

The Syuzhet Package comes with four sentiment dictionaries and provides a method for accessing the robust, but computationally expensive, sentiment extraction tool developed in the NLP group at Stanford. We can run nrc sentiment analysis to return data frame with each row classified as one of the following emotions, rather than a score: anger, anticipation, disgust, fear, joy, sadness, surprise, trust It also counts the number of positive and negative emotions found in each row.

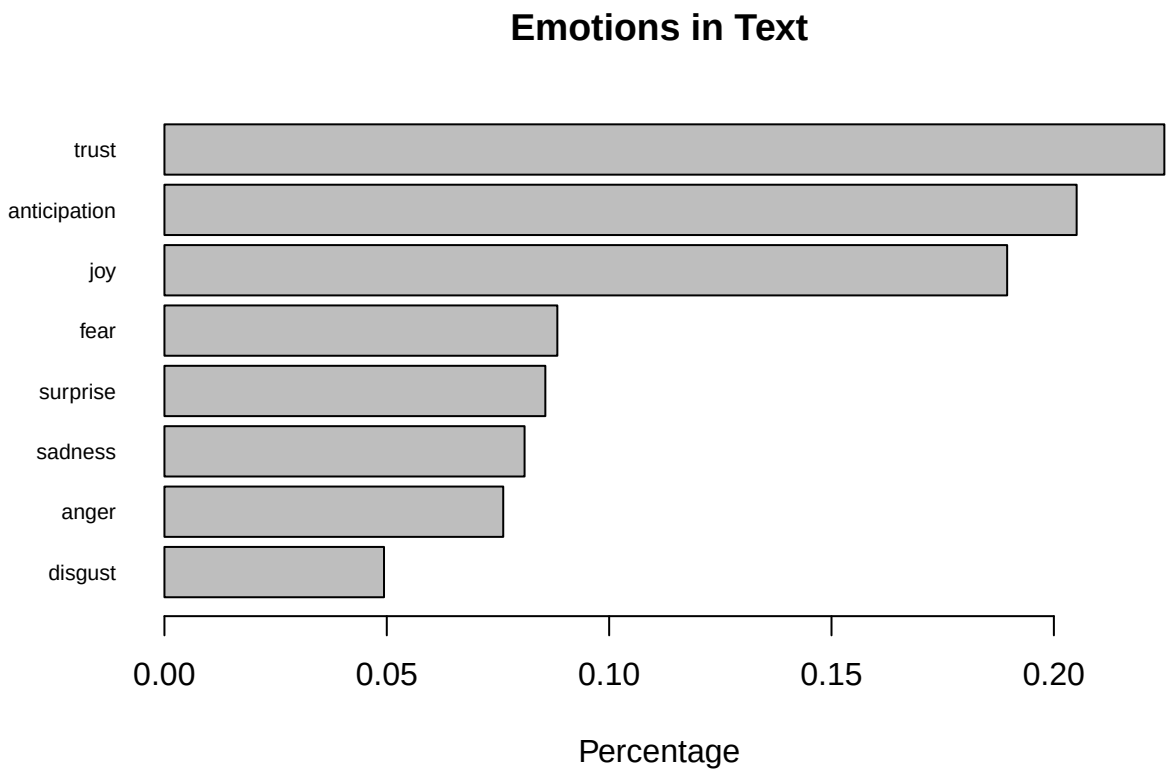
- To see top 10 line sentiments

```
##    anger anticipation disgust fear joy sadness surprise trust negative positive
## 1      0            2       1    1   2       1        0     3        2        5
## 2      0            1       0    0   1       0        0     0        1        1
## 3      0            2       0    0   0       0        0     0        0        2
## 4      1            1       1    1   0       2        0     0        3        1
## 5      0            0       0    0   1       0        0     2        0        3
## 6      0            1       0    0   1       0        0     1        0        2
## 7      0            3       0    0   1       0        0     1        2        2
## 8      0            1       0    0   1       0        1     1        0        1
## 9      0            4       0    0   4       0        1     5        3        7
## 10     0            1       0    0   1       0        0     1        0        3
```

- Count of words associated with each sentiment

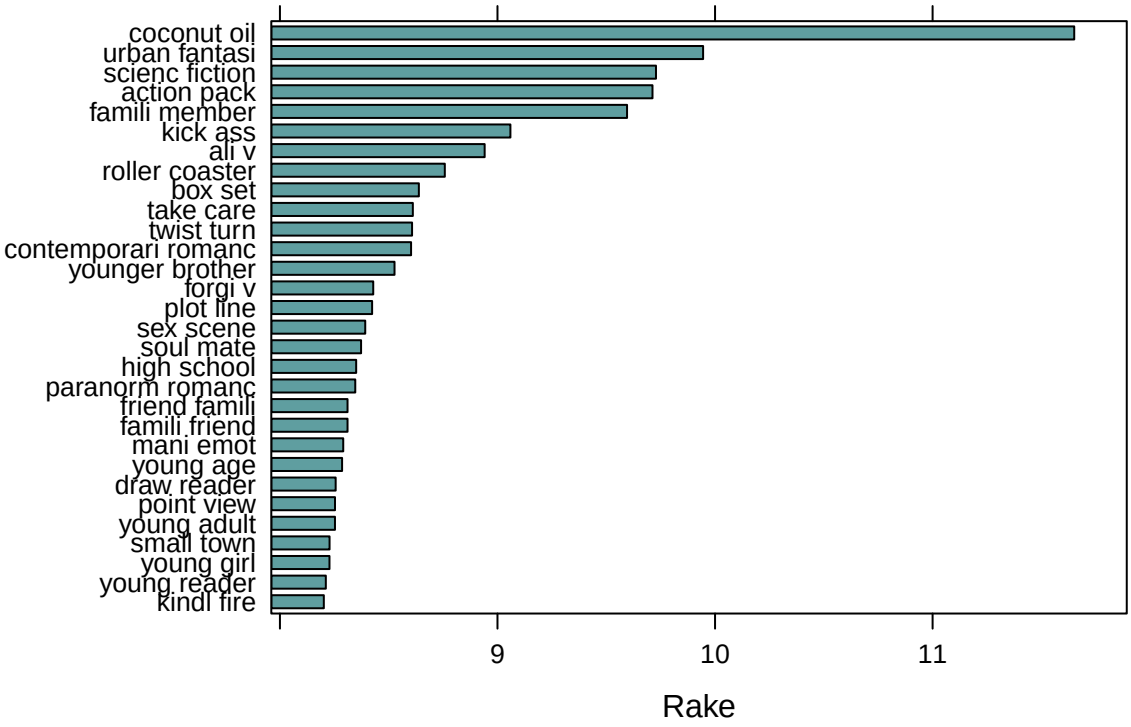


- Count of words associated with each sentiment, expressed as a percentage



3. Top 30 keywords

In addition, we can analyze the keywords of the reviews and then make relevant book recommendations. Here we use the Rapid Automatic Keyword Extraction Algorithm(RAKE), which is contained in the `Udpipe` package. This natural language processing toolkit provides language-agnostic 'tokenization', 'parts of speech tagging', 'lemmatization' and 'dependency parsing' of raw text.


Keywords identified by RAKE
coconut oil
urban fantasi
scienc fiction
action pack
famili member
kick ass
ali v
roller coaster
box set
take care
twist turn
contemporari romanc
younger brother
forgi v
plot line
sex scene
soul mate
high school
paranorm romanc
friend famili
famili friend
mani emot
young age
draw reader
point view
young adult
small town
young girl
young reader
kindl fire
9
10
11
Rake