amazon_reviews_eda

March 19, 2021

[1]:
```
from pyspark.sql import SQLContext, SparkSession
from pyspark.sql.types import *
from pyspark.sql.functions import *
from pyspark import SparkContext, SparkConf
```

[2]:
```
spark = SparkSession.builder.getOrCreate()
sc = spark.sparkContext
```

[3]:
```
filename = 'kindle_reduced_clean.csv'
df = spark.read.csv(filename,  inferSchema=True, header = True)
```

[4]:
```
df.select("overall","summary","reviewText").show(5)
```

```
+-------+--------------------+--------------------+
|overall|             summary|          reviewText|
+-------+--------------------+--------------------+
|      5|   A Very Sexy Cruise|ARC provided by a…|
|      5|A Changing Gears …|Wild Ride by Nanc…|
|      5|We don't take kin…|Well thought out …|
|      3|Mediocre Science …|Being autistic, I…|
|      3| I'm losing interest|This is book four…|
+-------+--------------------+--------------------+
only showing top 5 rows
```

[5]:
```
df.select([count(when(col(c).isNull(), c)).alias(c) for c in df.columns]).show()
```

```
+-----+----+-------+-------+----------+----------+----------+------------+------
-+--------------+--------------+----------+--------------+
|index|asin|helpful|overall|reviewText|reviewTime|reviewerID|reviewerName|summar
y|unixReviewTime|HelpfulRecords|HasHelpful|weightedRating|
+-----+----+-------+-------+----------+----------+----------+------------+------
-+--------------+--------------+----------+--------------+
|    0|   0|      0|      0|         1|         0|         0|          24|
0|             0|             0|         0|             0|
+-----+----+-------+-------+----------+----------+----------+------------+------
-+--------------+--------------+----------+--------------+
```

[6]:

```
df = df.dropna(how='any')
```

[7]:

```
df=df.drop("index","reviewerName","unixReviewTime","helpful","HasHelpful")
```

[8]:

```
df = df.withColumn('reviewText', translate('reviewText', '.', ''))
df = df.withColumn('reviewText', translate('reviewText', ',', ''))
df = df.withColumn('reviewText', translate('reviewText', '$', ''))
```

[9]:

```
from pyspark.ml.feature import Tokenizer, StopWordsRemover

#tokenize text (make words into an array)
tokenizer = Tokenizer(inputCol='reviewText', outputCol='reviewText_token')
df_token = tokenizer.transform(df).select('*')

#remove basic words
remover = StopWordsRemover(inputCol='reviewText_token',␣
 ↪outputCol='reviewText_clean')
df_stop=remover.transform(df_token).select('*')
```

[10]:

```
#tokenize summaries (make words into an array)
tokenizer = Tokenizer(inputCol='summary', outputCol='summary_token')
df_token = tokenizer.transform(df_stop).select('*')

#remove basic words
remover = StopWordsRemover(inputCol='summary_token', outputCol='summary_clean')
df_stop=remover.transform(df_token).select('*')
```

[11]:

```
df_stop=df_stop.drop("reviewText", "summary","reviewText_token",␣
 ↪"summary_token")
df_stop.show(5)
```

```
+----------+-------+-----------+--------------+--------------+--------------+---
-----------------+--------------------+
|      asin|overall| reviewTime|    reviewerID|HelpfulRecords|weightedRating|
reviewText_clean|       summary_clean|
+----------+-------+-----------+--------------+--------------+--------------+---
-----------------+--------------------+
|B00J4S6YWC|      5|06 21, 2014| AUSBN91MCI3WM|           0.0|
5.0|[arc, provided, a…|       [sexy, cruise]|
|B00HCZUBH8|      5| 03 3, 2014|A141H51I3H4B1S|           0.5|
5.0|[wild, ride, nanc…|[changing, gears,…|
|B006RZNR3Y|      5|07 10, 2014| AP8TKDM76TROZ|           0.0|
4.0|[well, thought, s…| [take, kindly, no!]|
|B006RZNR3Y|      3| 02 1, 2014|A22GGHISKRVAOX|           0.0|
4.0|[autistic, freque…|[mediocre, scienc…|
|B00J47H8H8|      3|03 21, 2014|A19DWIC1T7127Y|          0.75|
3.0|[book, four, five…|  [losing, interest]|
+----------+-------+-----------+--------------+--------------+--------------+---
-----------------+--------------------+
only showing top 5 rows
```

[12]:

```
display(df_stop.select("reviewText_clean"))
```

```
DataFrame[reviewText_clean: array<string>]
```

[13]:

```
df_stop.printSchema()
```

```
root
 |-- asin: string (nullable = true)
 |-- overall: integer (nullable = true)
 |-- reviewTime: string (nullable = true)
 |-- reviewerID: string (nullable = true)
 |-- HelpfulRecords: double (nullable = true)
 |-- weightedRating: double (nullable = true)
 |-- reviewText_clean: array (nullable = true)
 |    |-- element: string (containsNull = true)
 |-- summary_clean: array (nullable = true)
 |    |-- element: string (containsNull = true)
```

[14]:

```
df_stop.show(5)
```

```
+----------+-------+-----------+--------------+--------------+--------------+---
-----------------+--------------------+
|      asin|overall| reviewTime|    reviewerID|HelpfulRecords|weightedRating|
reviewText_clean|       summary_clean|
+----------+-------+-----------+--------------+--------------+--------------+---
-----------------+--------------------+
|B00J4S6YWC|      5|06 21, 2014| AUSBN91MCI3WM|           0.0|
5.0|[arc, provided, a…|      [sexy, cruise]|
|B00HCZUBH8|      5| 03 3, 2014|A141H51I3H4B1S|           0.5|
5.0|[wild, ride, nanc…|[changing, gears,…|
|B006RZNR3Y|      5|07 10, 2014| AP8TKDM76TROZ|           0.0|
4.0|[well, thought, s…| [take, kindly, no!]|
|B006RZNR3Y|      3| 02 1, 2014|A22GGHISKRVAOX|           0.0|
4.0|[autistic, freque…|[mediocre, scienc…|
|B00J47H8H8|      3|03 21, 2014|A19DWIC1T7127Y|          0.75|
3.0|[book, four, five…|  [losing, interest]|
+----------+-------+-----------+--------------+--------------+--------------+---
-----------------+--------------------+
only showing top 5 rows
```

1 Exploratory Data Analysis

[15]:
```
df_stop.describe().show()
```

```
+-------+----------+-----------------+----------+-------------+-----------------
-+------------------+
|summary|      asin|          overall|reviewTime|   reviewerID|
HelpfulRecords|    weightedRating|
+-------+----------+-----------------+----------+-------------+-----------------
-+------------------+
|  count|      4880|             4880|      4880|         4880|
4880|              4880|
|   mean|      null|4.340573770491804|      null|
null|0.3715991527158007|  4.34097108502769|
| stddev|      null|0.973934363172232|      null|
null|0.4611430329911328|0.9374090879340996|
|    min|B000SRGF2W|                1|01 1, 2011| A0JVIONYIOT2|
0.0|               1.0|
|    max|B00LYPZIXO|                5|12 9, 2013|AZZFLSL2LE4FX|
1.0| 5.000000000000001|
+-------+----------+-----------------+----------+-------------+-----------------
-+------------------+
```

1.1 Word 2 Vec

[23]:
```
word_vec=df_stop.select("reviewText_clean")
```

[32]:
```
word_vec.show(5)
```

```
+--------------------+
|       summary_clean|
+--------------------+
|      [sexy, cruise]|
|[changing, gears,…|
| [take, kindly, no!]|
|[mediocre, scienc…|
|  [losing, interest]|
+--------------------+
only showing top 5 rows
```

[27]:
```
from pyspark.ml.feature import Word2Vec

word2Vec = Word2Vec(vectorSize=5, seed=42, inputCol="reviewText_clean",␣
 ↪outputCol="model")
```

```
word2Vec.setMaxIter(10)
#Word2Vec...
word2Vec.getMaxIter()
10
word2Vec.clear(word2Vec.maxIter)
model = word2Vec.fit(word_vec)
model.getMinCount()
5
model.setInputCol("words_clean")

#Word2VecModel...
model.getVectors().show(10,truncate=False)
```

```
+----------+------------------------------------------------------------------
--------------------------------------+
|word      |vector
|
+----------+------------------------------------------------------------------
--------------------------------------+
|clarissa  |[-0.08527789264917374,-0.061181358993053436,0.04229581356048584,0.13
291782140731812,-0.020387664437294006]|
|incident  |[-0.17075666785240173,0.026323946192860603,-0.06936486065387726,0.02
8995148837566376,-0.1795503944158554] |
|serious   |[-0.17508743703365326,0.12439662963151932,-0.06705012172460556,0.103
28210890293121,-0.18280819058418274]  |
|breaks    |[-0.09439557045698166,0.07781413197517395,-0.15210963785648346,0.061
19786947965622,-0.2311510592699051]   |
|forgotten |[-0.0568401962518692,0.0626450851559639,-0.001981329172849655,-0.034
09483656287193,-0.0365166962146759]   |
|precious  |[-0.15493319928646088,0.09503928571939468,0.053145602345466614,0.047
84063249826431,-0.03783516213297844]  |
|mario     |[-0.12475521117448807,0.09339739382266998,-0.09627118706703186,0.042
47725009918213,0.02714124508202076]   |
|compliment|[0.03079369105398655,0.09589443355798721,-0.04605694115161896,0.0688
2615387439728,-0.06966786086559296]   |
|lover     |[-0.09675610810518265,0.05457765609025955,-0.08897153288125992,0.104
58670556545258,-0.09521284699440002]  |
|terrible  |[-0.15116223692893982,0.0013384217163547873,0.10820884257555008,0.00
8466287516057491,-0.26227179169654846]|
+----------+------------------------------------------------------------------
--------------------------------------+
only showing top 10 rows
```

[28]:
```
word_vec=df_stop.select("summary_clean")
```

[30]:

```
word2Vec = Word2Vec(vectorSize=5, seed=42, inputCol="summary_clean",␣
 ↪outputCol="model")
word2Vec.setMaxIter(10)
#Word2Vec...
word2Vec.getMaxIter()
10
word2Vec.clear(word2Vec.maxIter)
model = word2Vec.fit(word_vec)
model.getMinCount()
5
model.setInputCol("words_clean")

#Word2VecModel...
model.getVectors().show(10,truncate=False)
```

```
+---------+---------------------------------------------------------------------
---------------------------------------+
|word     |vector
|
+---------+---------------------------------------------------------------------
---------------------------------------+
|ideas    |[0.07896555960178375,0.08228708803653717,-0.0314699150621891,-0.05050
545558333397,-0.01455814577639103]     |
|sweet    |[-0.0714794397354126,-0.07245013117790222,-0.008758701384067535,-0.05
772051960229874,0.1064988225698471]    |
|beautiful|[0.016373470425605774,-0.09401625394821167,-0.09978445619344711,0.012
30132207274437,0.010742578655481339]   |
|writing  |[0.1669931560754776,-0.09632845968008041,-0.023153474554419518,-0.050
83288624882698,0.07983992248773575]    |
|funny    |[0.05766937509179115,-0.10599081218242645,-0.0632324367761612,-0.0160
7191003859043,-0.0852198451757431]     |
|weird    |[-0.019863391295075417,0.006063351407647133,-0.0624635666608 8104,-0.0
07803264074027538,0.030566997826099396]|
|wow      |[-0.014897726476192474,0.053794026374816895,-0.10401398688554764,0.05
399356409907341,-0.034788161516189575] |
|series,  |[0.01268547773361206,-0.08342977613210678,0.0755157321691513,0.066184
96030569077,0.0459398478269577]        |
|wanting  |[-0.07497256249189377,0.08413670212030411,-0.018536822870373726,0.008
434544317424297,0.06759133189916611]   |
|please   |[0.0951368510723114,0.02940688654780388,-0.0927429273724556,0.0893965
2889966965,0.0991884097456932]         |
+---------+---------------------------------------------------------------------
---------------------------------------+
only showing top 10 rows
```

1.2 Word Cloud

```
[35]: #!pip install wordcloud
```

```
[101]: from wordcloud import WordCloud, ImageColorGenerator
       from PIL import Image
       import matplotlib.pyplot as plt
       from os import path
```

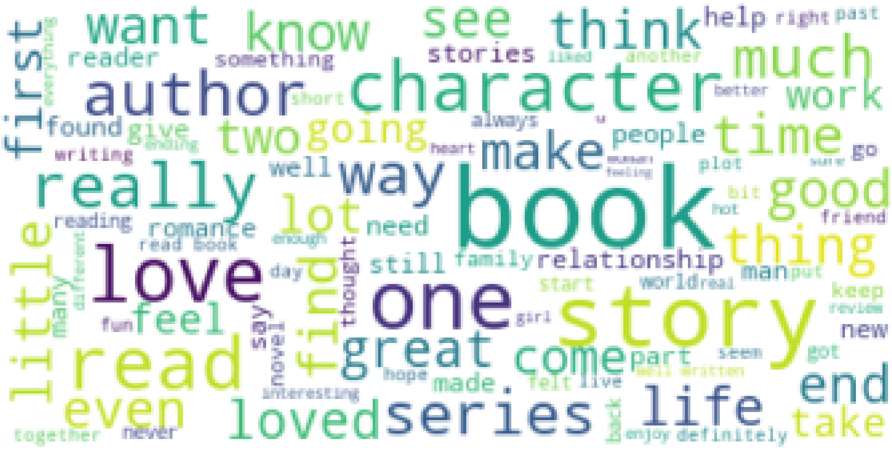
```
[102]: reviews=df_stop.select("reviewText_clean")
       reviews=reviews.toPandas()
```

```
[104]: text=reviews['reviewText_clean'].apply(', '.join)
```

```
[105]: text = ", ".join(review for review in text)
```

```
[106]: wordcloud = WordCloud(max_font_size=50, max_words=100,␣
        ↪background_color="white").generate(text)

       # Display the generated image:
       plt.imshow(wordcloud, interpolation='bilinear')
       plt.axis("off")
       plt.show()
```



```
[109]: wordcloud.to_file("amazon.png")
```

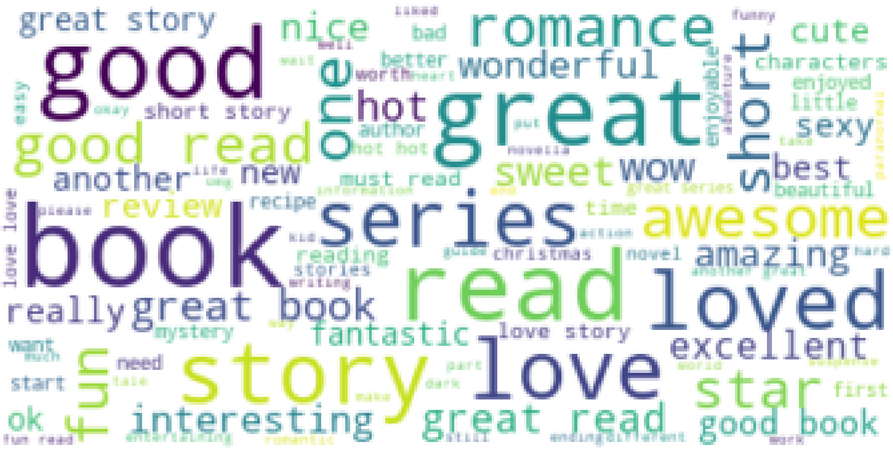
```
[109]: <wordcloud.wordcloud.WordCloud at 0x7f34f7095128>
```

```
[111]: reviews=df_stop.select("summary_clean")
       reviews=reviews.toPandas()
```

```
text=reviews['summary_clean'].apply(', '.join)
text = ", ".join(review for review in text)
```

```
[112]: wordcloud = WordCloud(max_font_size=50, max_words=100,␣
        ↪background_color="white").generate(text)

       # Display the generated image:
       plt.imshow(wordcloud, interpolation='bilinear')
       plt.axis("off")
       plt.show()
```



```
[113]: wordcloud.to_file("summary.png")
```

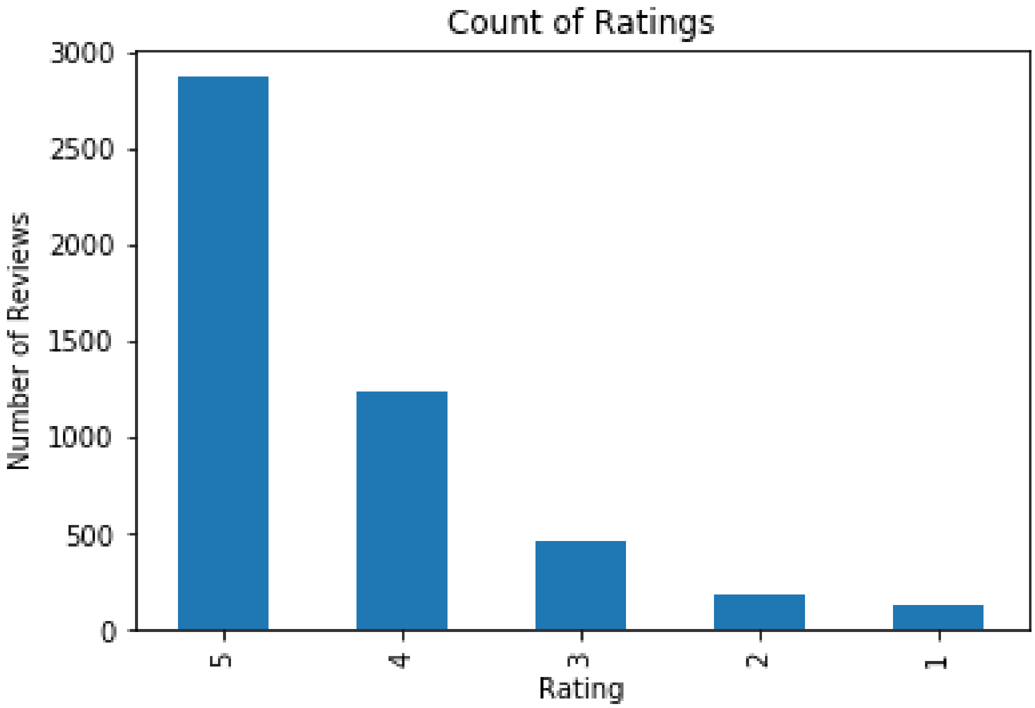
```
[113]: <wordcloud.wordcloud.WordCloud at 0x7f34f6a7a2e8>
```

1.3 Histogram

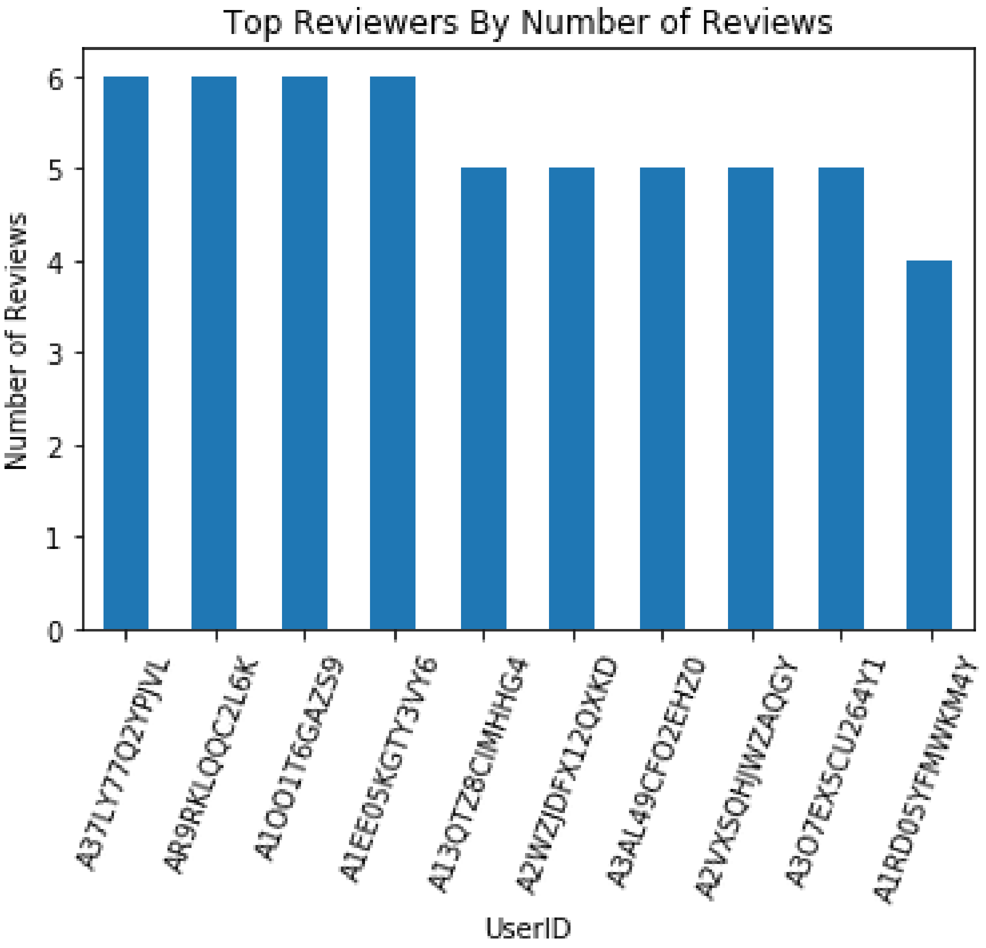
```
[117]: df_pd=df_stop.toPandas()
```

```
[134]: df_pd.overall.value_counts().plot(kind='bar')
       plt.xlabel('Rating')
       plt.ylabel('Number of Reviews')
       plt.title("Count of Ratings")
```

```
[134]: Text(0.5, 1.0, 'Count of Ratings')
```



[138]:
```
df_pd.reviewerID.value_counts().head(10).plot(kind = 'bar')
plt.xticks(rotation = 70)
plt.xlabel('UserID')
plt.ylabel('Number of Reviews')
plt.title("Top Reviewers By Number of Reviews")
plt.show()
```


Top Reviewers By Number of Reviews
Number of Reviews
0
1
2
3
4
5
6
A37LY77O2YPJVL
AR9RKLOQC2L6K
A1OO1T6GAZS9
A1EE05KGTY3VY6
A13OTZ8CIMHHG4
A2WZJDFX12OXKD
A3AL49CFO2EHZ0
A2VXSOHJWZAQGY
A3O7EX5CU264Y1
A1RD05YFMWKM4Y
UserID

```
[ ]:
```