

```
In [2]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import sqlite3
import nltk
import string
```

The column or features in the dataset:  
Id  
ProductId – unique identifier for the product  
UserId – unqiue identifier for the user  
ProfileName  
HelpfulnessNumerator – number of users who found the review helpful  
HelpfulnessDenominator – number of users who indicated whether they found the review helpful or not  
Score – rating between 1 and 5  
Time – timestamp for the review  
Summary – brief summary of the review  
Text – text of the review

```
In [3]: df = pd.read_csv('Reviews.csv')

print(df.shape)
df.head()
```

(568454, 10)

Out[3]:

		Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
0	1	B001E4KFG0	A3SGXH7AUHU8GW	delmartian		1	1	5	1303862400	Good Quality Dog Food	I have bought several of the Vitality canned d...
1	2	B00813GRG4	A1D87F6ZCVE5NK	dll pa		0	0	1	1346976000	Not as Advertised	Product arrived labeled as Jumbo Salted Peanut...
2	3	B000LQOCH0	ABXLMWJIXXAIN	Natalia Corres "Natalia Corres"		1	1	4	1219017600	"Delight" says it all	This is a confection that has been around a fe...
3	4	B000UA0QIQ	A395BORC6FGVXV	Karl		3	3	2	1307923200	Cough Medicine	If you are looking for the secret ingredient i...
4	5	B006K2ZZ7K	A1UQRSCLF8GW1T	Michael D. Bigham "M. Wassir"		0	0	5	1350777600	Great taffy	Great taffy at a great price. There was a wid...

```
In [4]: df.shape
```

Out[4]: (568454, 10)

What is sentiment analysis?

Sentiment analysis is the computational task of automatically determining what feelings a writer is expressing in text  
Some examples of applications for sentiment analysis include:

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

Sentiment analysis is not perfect.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 it.For this project,the goal is to to classify Food reviews based on customers' text.

```
In [7]: !pip install textblob

Collecting textblob
  Downloading textblob-0.15.3-py2.py3-none-any.whl (636 kB)
    |████████████████████| 636 kB 20 kB/s eta 0:00:013
Requirement already satisfied: nltk>=3.1 in ./anaconda3/lib/python3.8/site-packages (from textblob) (3.6.1)
Requirement already satisfied: regex in ./anaconda3/lib/python3.8/site-packages (from nltk>=3.1->textblob) (2021.4.4)
Requirement already satisfied: tqdm in ./anaconda3/lib/python3.8/site-packages (from nltk>=3.1->textblob) (4.59.0)
Requirement already satisfied: joblib in ./anaconda3/lib/python3.8/site-packages (from nltk>=3.1->textblob) (1.0.1)
Requirement already satisfied: click in ./anaconda3/lib/python3.8/site-packages (from nltk>=3.1->textblob) (7.1.2)
Installing collected packages: textblob
Successfully installed textblob-0.15.3
```

```
In [8]: from textblob import TextBlob
```

```
In [9]: TextBlob(df['Summary'][0]).sentiment.polarity
```

Out[9]: 0.7

```
In [10]: ## takes 3 mins
polarity=[] # list which will contain the polarity of the comments

for i in df['Summary']:
    try:
        polarity.append(TextBlob(i).sentiment.polarity)
    except:
        polarity.append(0)
```

```
In [11]: len(polarity)
```

Out[11]: 568454

```
In [12]: data=df.copy()
```

```
In [13]: data['polarity']=polarity
```

```
In [14]: data.head()
```

Out[14]:

		Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
0	1	B001E4KFG0	A3SGXH7AUHU8GW		delmartian	1	1	5	1303862400	Good Quality Dog Food	I have bought several of the Vitality canned d...
1	2	B00813GRG4	A1D87F6ZCVE5NK		dll pa	0	0	1	1346976000	Not as Advertised	Product arrived labeled as Jumbo Salted Peanut...
2	3	B000LQOCH0	ABXLMWJIXXAIN		Natalia Corres "Natalia Corres"	1	1	4	1219017600	"Delight" says it all	This is a confection that has been around a fe...
3	4	B000UA0QIQ	A395BORC6FGVXV		Karl	3	3	2	1307923200	Cough Medicine	If you are looking for the secret ingredient i...
4	5	B006K2ZZ7K	A1UQRSCLF8GW1T		Michael D. Bigham "M. Wassir"	0	0	5	1350777600	Great taffy	Great taffy at a great price. There was a wid...

```
In [15]: data['polarity'].nunique()
```

Out[15]: 4578

Lets perform EDA for the Positve sentences¶

```
In [16]: data_positive = data[data['polarity']>0]
data_positive.shape
```

```
Out[16]: (331665, 11)
```

```
In [18]: !pip install wordcloud
```

```
Collecting wordcloud
  Downloading wordcloud-1.8.1-cp38-cp38-manylinux1_x86_64.whl (371 kB)
    |████████████████████| 371 kB 16 kB/s eta 0:00:01
Requirement already satisfied: pillow in ./anaconda3/lib/python3.8/site-packages (from wordcloud) (8.2.0)
Requirement already satisfied: matplotlib in ./anaconda3/lib/python3.8/site-packages (from wordcloud) (3.3.4)
Requirement already satisfied: numpy>=1.6.1 in ./anaconda3/lib/python3.8/site-packages (from wordcloud) (1.20.1)
Requirement already satisfied: kiwisolver>=1.0.1 in ./anaconda3/lib/python3.8/site-packages (from matplotlib->wordcloud) (1.3.1)
Requirement already satisfied: cycler>=0.10 in ./anaconda3/lib/python3.8/site-packages (from matplotlib->wordcloud) (0.10.0)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.3 in ./anaconda3/lib/python3.8/site-packages (from matplotlib->wordcloud) (2.4.7)
Requirement already satisfied: python-dateutil>=2.1 in ./anaconda3/lib/python3.8/site-packages (from matplotlib->wordcloud) (2.8.1)
Requirement already satisfied: six in ./anaconda3/lib/python3.8/site-packages (from cycler>=0.10->matplotlib->wordcloud) (1.15.0)
Installing collected packages: wordcloud
Successfully installed wordcloud-1.8.1
```

```
In [19]: from wordcloud import WordCloud, STOPWORDS
```

```
In [20]: stopwords=set(STOPWORDS)
```

```
In [21]: positive=data_positive[0:200000]
```

```
In [22]: total_text= (' '.join(data_positive['Summary']))
```

```
In [23]: len(total_text)
```

```
Out[23]: 8465012
```

In [24]: total\_text[0:10000]

Out[24]: 'Good Quality Dog Food Great taffy Nice Taffy Great! Just as good as the expensive brands! Wonderful, tast  
y taffy Healthy Dog Food The Best Hot Sauce in the World My cats LOVE this "diet" food better than their re  
gular food My Cats Are Not Fans of the New Food fresh and greasy! Love it! GREAT SWEET CANDY! Always fresh  
Delicious product! Great Bargain for the Price The Best Hot Sauce in the World Great machine! Best of the I  
nstant Oatmeals Good Instant Great Irish oatmeal for those in a hurry! satisfying Love Gluten Free Oatmea  
l!!!! GOOD WAY TO START THE DAY.... Wife\'s favorite Breakfast Why wouldn\'t you buy oatmeal from Mcanns? Ta  
stes great! Good Hot Breakfast Great taste and convenience good Very good but next time I won\'t order the  
Variety Pack HOT! And good! Came back for more :) Roasts up a smooth brew Our guests love it! Awesome De  
al! Awsome - Kids in neighborhood loved us! great deal. Better price for this at Target great source of ele  
ctrolytes Great for preventing cramps Taste is not so good. How much would you pay for a bag of chocolate p  
retzels? Great Gummi! Best ever latice tart nothing special Good Taste great this is the best Delicious! Gr  
eat Natural Balance Lamb and Rice Great food! Great for my dogs allergies Great for stomach problems! Bette  
r life for you dog! Great Food Great food for my my dog who has a sensitive stomach. Great dog food Mmmmm  
Mmmmm good. Great Dog Food! Good healthy dog food Great dog food Great allergy sensitive dog food, dogs lov  
e it Perfect for our English Bulldog with Allergies Taste wise it is a 6 star item Great Support Loved thes  
e Tartlets The best My Idea of a Good Diet Food. Delicious tea the best tea ever... freah bright clean Wond  
erful Tea Great cookies Best everyday cookie! So Far So Good Best Cat Food Great food. Perfect Cat Food For  
Older Cats! Good for Feline UTI Palatable and healthy Healthy & They LOVE It! Wonderful food - perfect for  
allergic kitties Tastes great. Love Hot & Spicy. Bad price here. My favorite ramen Amazing to the last bit  
e. Great spicy flavor Great value and convenient ramen great flavor Tastes great, but is cheaper locally. T  
astes awesome & looks beautiful Happy Face Simply the BEST! Excellent Product/Life Saver Nice snack Good Li  
corice I love these!!!!!!! Great for the kids! Sweet with a nice kick! Love the salsa!! awesome cornmeal G  
REAT marinade! Awesome stuff tastes good Great flavor of Jell-o. Great Deal Great tasting sea salt WITH iod  
ine tastes very fresh Simple but good Not the greatest tasting.. Not Bad Right size, taste This stuff is so  
oooo good! Best Stuff Ever Worked great! Delicious! Fluffy, Soft, Delicious and Sugary Sweet Great but not  
as good as it was back in the day as a teen EXCELLENT LEMON JUICE Great Product Handy Never paid that much  
! Great product to help you sleep Perfect for gluten-free chocolate chip cookies Make a fresh fruit tart, l  
ight and beautiful not bad for instant healthy coffee It\'s ok I love it! great taste and has health benefi  
ts! Tastes Great. Arrived in 2 days! Great for after lunch Nice little mints, but pricey. These mints are a  
wesome! Love these! And reusable containers A huge hit at the office! Love \'em, they\'re great! Love thes  
e! fresh! better than average, more expensive than average. Great For Fat Cats and Senior Citizens Best by  
the case More Hot/Spicy than McCormick\'s Brand Ahmad Loose Imperial Blend Tea is great for the price Nice  
tea Best Ahmad Tea My favorite tea Best tea ever! DELICIOUS Best Bloody Mary mixer The Best Love this tea!  
Really Nice Taste! High Quality... But it gave my dog wicked gas.. Great tasting green tea and such a great  
deal. OMG best chocolate jelly belly Excellent loose tea. Good anytime hot tea Wonderful! Best way to buy k  
cups delicious Super! SuperFoods are Super easy! Best Energy Shot For Me Great for Gluten-free lifestyle!!  
Excellent but not perfect Good product Thanks for the review Scott great Awesome Sugar! Great product - wea  
k packaging Excellent! Excellent for G/F Amazing! Very tasty chips! Excellent Taste it\'s fabulous, but \*no  
t\* from amazon! Not mild enough for me lol Great Natural Energy Great Energy The best energy shot out ther  
e, smooth and organic! Fantastic, natural energy Way better than Guayaki! Doesn\'t taste that good but prov  
ides you the energy Favorite energy shot and all natural too! natural energy boost Best energy shot I have  
ever tasted! The Best Good Stuff Great energy drink without artificial ingredients Flavor getting better, e  
nergy is great Fantastic! WOW Very Dissapointed Very Good Coffee Very Tasty Excellent coffee Hot! Hot and d  
elicious ABSOLUTELY DELICIOUS! Great gag gift arrived FAST No broken creamers! Shipped great Better Packagi  
ng Perfect for work Yes, this is real excellent coffee!!! Does not taste very good Love, Love, Love These!  
great for eating whole foods, clean with veggie brush Absolutely LOVE IT!! Only good for ice Great for teet  
hing Wonderful idea-difficult to clean. I wasn\'t that impressed Love the Fresh Food Feeder!! Great Bean  
s!!! Good stuff! excellent - exactly what I expected These are the Best! Love Love Love The product is grea  
t but the price is out of line Perfect! great taste Excellent Everyday Olive Oil Love Weavers, I am a fan.  
Treat yourself to the best coffee! Drinking it now, love the latin america "aroma" GREAT SNACK Best Bar My  
New Granola Bar Another Husband Favorite Very Smooth Coffee - Highly Recommended My favorite Good Coffee Gr  
eatest Oil since slice bread !!!!!!! Best Ever! Deliciously scrumptious This is really good stuff Porcini M  
ushrooms an excellent product Excellent flavor, mostly large pieces The Best Good for the money not the hig  
hest quality, but good for the price. Fresh - Whole.. perfect Fresh and Tasty Cat won\'t go near it! Simply  
WILD Chick & Brown RICE for Cats A Great All Around Mix Great mix Perfect mix for egg-allergic! Arrowhead M  
ills whole grain buttermilk Pancakes are easy! Good for Egg Allergy Great Healthy Snack Sweet and Soothing  
A Fantastic & Healthy Product Great product Excellent tea! best roast ever Franch\'s is the best VERY GOOD!  
Great taste and easy for a single guy! Look elsewhere for your whole grains These are Famous for a reason.  
Wow God, I love these cookies!!! Fresh, Lightly-Spiced, Crunchy Kettle Chips. Good Value, Good Product. gla  
d to find them in 1 oz size pretty good, could be better Best chips ever Kettle potato chips: Sweet onion  
Ridiculously Good Delicious! I love these chips. They are thick and crunchy! Quite good Delicious WOW!!!!  
Best gluten-free dairy-free chips A unique flavor for fans of Thai food Honey Dijon leaves bad aftertaste,  
NY Cheddar are pretty good Very good. Excellent! A delicious, crisp chip with good flavor BEST BUY in BBQ C  
hips Love Them! Best deal ever! Excellent Thai-flavored chip Best Kettle Chips! Delicious as always! Not qu  
ite the best... One of Their Best Flavors Love these chips! Highly addicitive chips These are AWESOME! By f  
ar my favorite chips Good chips, more cheese Pretty good tasting chip Best sour cream & onion chip I\'ve ha  
d Great chips Fabulous! Great Chip! Excellent balance of taste, crunchiness, and moisture Very good chips a  
t a great price. Great chips! Good and tangy the best chips ever I do not even like kettle chips and I love  
these You have to love sea salt and vinegar already amazing chips Best Chip Ever Tangy, spicy, and sweet- o  
h my! The best I\'ve had Excellent chip! Delicious!! Love Kettle Chips Best unsalted chips Love Kettle Chip  
s, but not this flavor! Crisp Delicious, what else did you expect? Great Value I have had better "Jalapeno  
Kettle Chips" Spicy but good boulder salt and malt vinegar chips are way better Lightly Salted, Heavily Del  
icious! Too Much Flavor Love at first bite! Tongue-puckering tang and crunch! The Best Chips...PERIOD! Del  
icious Extra Crunchy Best Salt & Vinegar! Gourmet powerful Salt & Vinegar chips! Great deal Best Chips out  
there!!! Great price, but not as tangy as I expected. Absotively, Posilutely Delicious completely ripped of  
f C H I P.....C H I P.....H O O R A Y.....!!!!!! : ) ( B A C K Y A R D.....B A R B E C U E ) Not the Best  
THESE ARE VERY GOOD USED to be my favorite chips Not as good as the English sell Not so good. delicious Ket  
tle Chips Make Great Mouse Food great (hot) new flavor.... Favorite Kettle flavor and a great value! Kettle  
Brand Potato Chips - New York Cheddar My favorite flavor So much flavor your farts will smell like sweet on  
ions Great Chip! Awesome and delicious! Good chips YUM! If you want a snack, have something REALLY good! a  
good buy Good chips Awesome Great chips with very low sodium My favorite Kettle Chip Best salt & vinegar ch  
ips out there! Amazing Service Pretty tasty and decently spiced. . . . Great Tasting Chips Good deal but cl  
ose expiration date! GREAT TASTING CHIPS Buy These, Eat These, Be Happy! Fantastic Sweet, salty, tangy: the  
way a snack should be Some of the best chips anywhere Delicious! Lightly salted, yet tasty Crunch. Wow! Gre  
at strong flavor Best Chips Out There! These chips tasted good awesome chips Delicious! Tangy and delicious  
snack Best Chip Best Chips I\'ve Ever Tasted Love the smaller bags! Ok but Miss Vickie\'s Are Better These

chips are awesome if not best but.... GREAT DEAL What a great tea at this price delicious Great well balanced Earl Grey Best Earl Grey ever favorite Earl Grey tea Delicious The best A HUGE Success Do not taste from bottle! Mix with vanilla for true flavor. The oldest soft drink is still the best! Caramel flavor, excellent for baking and toppings (tips for using agave, too) Great buy! excellent sweetner Good, but container could be better Great stuff! Healthy Sweetener Great way replacing the sugar Great substitute sweetener The Best Healthy Stuff Sweet success great product Best price on agave nectar that I've found How this could be good? Best tea I ever had Who needs salsa when chips taste this good? Delicious! Organic yummy chips what more can you ask for These are the best widely available bbq chips'

```
In [25]: import re
total_text=re.sub('[^a-zA-Z]', ' ',total_text)
```

```
In [26]: total_text
```

```
Out[26]: 'Good Quality Dog Food Great taffy Nice Taffy Great Just as good as the expensive brands Wonderful tasty taffy Healthy Dog Food The Best Hot Sauce in the World My cats LOVE this diet food better than their regular food My Cats Are Not Fans of the New Food fresh and greasy Love it GREAT SWEET CANDY Always fresh Delicious product Great Bargain for the Price The Best Hot Sauce in the World Great machine Best of the Instant Oatmeals Good Instant Great Irish oatmeal for those in a hurry satisfying Love Gluten Free Oatmeal GOOD WAY TO START THE DAY Wife s favorite Breakfast Why wouldn t you buy oatmeal from Manns Tastes great Good Hot Breakfast Great taste and convenience good Very good but next time I won t order the Variety Pack HOT And good Came back for more Roasts up a smooth brew Our guests love it Awesome Deal Awsome Kids in neighborhood loved us great deal Better price for this at Target great source of electrolytes Great for preventing cramps Taste is not so good How much would you pay for a bag of chocolate pretzels Great Gummi Best ever lattice tart nothing special Good Taste great this is the best Delicious Great Natural Balance Lamb and Rice Great food Great for my dogs allergies Great for stomach problems Better life for you dog Great Food Great food for my my dog who has a sensitive stomach Great dog food Mmmmm Mmmmm good Great Dog Food Good healthy dog food Great dog food Great allergy sensitive dog food dogs love it Perfect for our English Bulldog with Allergies Taste wise it is a star item Great Support Loved these Tartlets The best My Idea of a Good Diet Food Delicious tea the best tea ever fresh bright clean Wonderful Tea Great cookies Best everyday cookie So Far So Good Best Cat Food Great food Perfect Cat Food For Older Cats Good for Feline UTI Palatable and healthy Healthy They LOVE It Wonderful food perfect for allergic kitties Tastes great Love Hot Spicy Bad price here My favorite ramen Amazing to the last bite Great spicy flavor Great value and convenient ramen great flavor Tastes great
```

```
In [27]: ## remove extra spaces
total_text=re.sub(' +', ' ',total_text)
```



In [28]: total\_text[0:10000]

Out[28]: 'Good Quality Dog Food Great taffy Nice Taffy Great Just as good as the expensive brands Wonderful tasty taffy Healthy Dog Food The Best Hot Sauce in the World My cats LOVE this diet food better than their regular food My Cats Are Not Fans of the New Food fresh and greasy Love it GREAT SWEET CANDY Always fresh Delicious product Great Bargain for the Price The Best Hot Sauce in the World Great machine Best of the Instant Oatmeals Good Instant Great Irish oatmeal for those in a hurry satisfying Love Gluten Free Oatmeal GOOD WAY TO START THE DAY Wife s favorite Breakfast Why wouldn t you buy oatmeal from Mcanns Tastes great Good Hot Breakfast Great taste and convenience good Very good but next time I won t order the Variety Pack HOT And good Came back for more Roasts up a smooth brew Our guests love it Awesome Deal Awsome Kids in neighborhood loved us great deal Better price for this at Target great source of electrolytes Great for preventing cramps Taste is not so good How much would you pay for a bag of chocolate pretzels Great Gummi Best ever lattice tart nothing special Good Taste great this is the best Delicious Great Natural Balance Lamb and Rice Great food Great for my dogs allergies Great for stomach problems Better life for you dog Great Food Great food for my my dog who has a sensitive stomach Great dog food Mmmmm Mmmmm good Great Dog Food Good healthy dog food Great dog food Great allergy sensitive dog food dogs love it Perfect for our English Bulldog with Allergies Taste wise it is a star item Great Support Loved these Tartlets The best My Idea of a Good Diet Food Delicious tea the best tea ever fresh bright clean Wonderful Tea Great cookies Best everyday cookie So Far So Good Best Cat Food Great food Perfect Cat Food For Older Cats Good for Feline UTI Palatable and healthy Healthy They LOVE It Wonderful food perfect for allergic kitties Tastes great Love Hot Spicy Bad price here My favorite ramen Amazing to the last bite Great spicy flavor Great value and convenient ramen great flavor Tastes great but is cheaper locally Tastes awesome looks beautiful Happy Face Simply the BEST Excellent Product Life Saver Nice snack Good Licorice I love these Great for the kids Sweet with a nice kick Love the salsa awesome cornmeal GREAT marinade Awesome stuff tastes good Great flavor of Jell o Great Deal Great tasting sea salt WITH iodine tastes very fresh Simple but good Not the greatest tasting Not Bad Right size taste This stuff is sooooo good Best Stuff Ever Worked great Delicious Fluffy Soft Delicious and Sugary Sweet Great but not as good as it was back in the day as a teen EXCELLENT LEMON JUICE Great Product Handy Never paid that much Great product to help you sleep Perfect for gluten free chocolate chip cookies Make a fresh fruit tart light and beautiful not bad for instant healthy coffee It s ok I love it great taste and has health benefits Tastes Great Arrived in days Great for after lunch Nice little mints but pricey These mints are awesome Love these And reusable containers A huge hit at the office Love em they re great Love these fresh better than average more expensive than average Great For Fat Cats and Senior Citizens Best by the case More Hot Spicy than McCormick s Brand Ahmad Loose Imperial Blend Tea is great for the price Nice tea Best Ahmad Tea My favorite tea Best tea ever DELICIOUS Best BloodyMary mixer The Best Love this tea Really Nice Taste High Quality But it gave my dog wicked gas Great tasting green tea and such a great deal OMG best chocolate jelly belly Excellent loose tea Good anytime hot tea Wonderful Best way to buy kcups delicious Super SuperFoods are Super easy Best Energy Shot For Me Great for Gluten free lifestyle Excellent but not perfect Good product Thanks for the review Scott great Awesome Sugar Great product weak packaging Excellent Excellent for G F Amazing Very tasty chips Excellent Taste it s fabulous but not from amazon Not mild enough for me lol Great Natural Energy Great Energy The best energy shot out there smooth and organic Fantastic natural energy Way better than Guayaki Doesn t taste that good but provides you the energy Favorite energy shot and all natural too natural energy boost Best energy shot I have ever tasted The Best Good Stuff Great energy drink without artificial ingredients Flavor getting better energy is great Fantastic WOW Very Dissapointed Very Good Coffee Very Tasty Excellent coffee Hot Hot and delicious ABSOLUTELY DELICIOUS Great gag gift arrived FAST No broken creamers Shipped great Better Packaging Perfect for work Yes this is real excellent coffee Does not taste very good Love Love Love These great for eating whole foods clean with veggie brush Absolutely LOVE IT Only good for ice Great for teething Wonderful idea difficult to clean I wasn t that impressed Love the Fresh Food Feeder Great Beans Good stuff excellent exactly what I expected These are the Best Love Love Love The product is great but the price is out of line Perfect great taste Excellent Everyday Olive Oil Love Weavers I am a fan Treat yourself to the best coffee Drinking it now love the latin america aroma GREAT SNACK Best Bar My New Granola Bar Another Husband Favorite Very Smooth Coffee Highly Recommended My favorite Good Coffee Greatest Oil since slice bread Best Ever Deliciously scrumptious This is really good stuff Porcini Mushrooms an excellent product Excellent flavor mostly large pieces The Best Good for the money not the highest quality but good for the price Fresh Whole perfect Fresh and Tasty Cat won t go near it Simply Wild Chick Brown Rice for Cats A Great All Around Mix Great mix Perfect mix for egg allergic Arrowhead Mills whole grain buttermilk Pancakes are easy Good for Egg Allergy Great Healthy Snack Sweet and Soothing A Fantastic Healthy Product Great product Excellent tea best roast ever Franch s is the best VERY GOOD Great taste and easy for a single guy Look elsewhere for your whole grains These are Famous for a reason Wow God I love these cookies Fresh Lightly Spiced Crunchy Kettle Chips Good Value Good Product glad to find them in oz size pretty good could be better Best chips ever Kettle potato chips Sweet onion Ridiculously Good Delicious I love these chips They are thick and crunchy Quite good Delicious WOW Best gluten free dairy free chips A unique flavor for fans of Thai food Honey Dijon leaves bad aftertaste NY Cheddar are pretty good Very good Excellent A delicious crisp chip with good flavor BEST BUY in BBQ Chips Love Them Best deal ever Excellent Thai flavored chip Best Kettle Chips Delicious as always Not quite the best One of Their Best Flavors Love these chips Highly addictive chips These are AWESOME By far my favorite chips Good chips more cheese Pretty good tasting chip Best sour cream onion chip I ve had Great chips Fabulous Great Chip Excellent balance of taste crunchiness and moisture Very good chips at a great price Great chips Good and tangy the best chips ever I do not even like kettle chips and I love these You have to love sea salt and vinegar already amazing chips Best Chip Ever Tangy spicy and sweet oh my The best I ve had Excellent chip Delicious Love Kettle Chips Best unsalted chips Love Kettle Chips but not this flavor Crisp Delicious what else did you expect Great Value I have had better Jalapeno Kettle Chips Spicy but good boulder salt and malt vinegar chips are way better Lightly Salted Heavily Delicious Too Much Flavor Love at first bite Tongue puckering tang and crunch The Best Chips PERIOD Delicious Extra Crunchy Best Salt Vinegar Gourmet powerful Salt Vinegar chips Great deal Best Chips out there Great price but not as tangy as I expected Absolutely Positively Delicious completely ripped off C H I P C H I P H O O R A Y B A C K Y A R D B A R B E C U E Not the Best THESE ARE VERY GOOD USED to be my favorite chips Not as good as the English sell Not so good delicious Kettle Chips Make Great Mouse Food great hot new flavor Favorite Kettle flavor and a great value Kettle Brand Potato Chips New York Cheddar My favorite flavor So much flavor your farts will smell like sweet onions Great Chip Awesome and delicious Good chips YUM If you want a snack have something REALLY good a good buy Good chips Awesome Great chips with very low sodium My favorite Kettle Chip Best salt vinegar chips out there Amazing Service Pretty tasty and decently spiced Great Tasting Chips Good deal but close expiration date GREAT TASTING CHIPS Buy These Eat These Be Happy Fantastic Sweet salty tangy the way a snack should be Some of the best chips anywhere Delicious Lightly salted yet tasty Crunch Wow Great strong flavor Best Chips Out There These chips tasted good awesome chips Delicious Tangy and delicious snack Best Chip Best Chips I ve Ever Tasted Love the smaller bags Ok but Miss Vickie s Are Better These chips are awesome if not best but GREAT DEAL What a great tea at this price delicious Great well balanced Earl Grey Best Earl Grey ever favorite Earl Grey tea Delicious The best A HUGE Success Do not taste from bot

tle Mix with vanilla for true flavor The oldest soft drink is still the best Caramel flavor excellent for baking and toppings tips for using agave too Great buy excellent sweetner Good but container could be bet ter Great stuff Healthy Sweetener Great way replacing the sugar Great substitute sweetener The Best Healt hy Stuff Sweet success great product Best price on agave nectar that I ve found How this could be good Be st tea I ever had Who needs salsa when chips taste this good Delicious Organic yummy chips what more can you ask for These are the best widely available bbq chips My favorite chips from Kettle Amazing Taste Bes t Chip Ever Plocky s Sweet Smokey Chipotle Whole Grain Tortill The best tortilla chips I have ever eaten Such an excellent chip Great Huge fan of these chips Plocky s tortilla chips tasty and healthy Tasty but make sure you have gum delicious and healthy Unique schrumshist and tasty Tortilla Chips Best kept secret Delicious'

```
In [29]: len(total_text)
```

Out[29]: 8155137

```
In [30]: wordcloud = WordCloud(width = 1000, height = 500,stopwords=stopwords).generate(total_text)
plt.figure(figsize=(15,5))
plt.imshow(wordcloud)
plt.axis('off')
```

Out[30]: (-0.5, 999.5, 499.5, -0.5)



Lets perform EDA for the Neagtive sentences

```
In [31]: data_negative = data[data['polarity']<0]
data_negative.shape
```

Out[31]: (52516, 11)

```
In [32]: data_negative.head()
```

Out[32]:

	Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
16	17	B001GVISJM	A3KLWF6WQ5BNYO	Erica Neathery	0	0	2	1348099200	poor taste	I love eating them and they are good for watch...
26	27	B001GVISJM	A3RXAU2N8KV45G	lady21	0	1	1	1332633600	Nasty No flavor	The candy is just red , No flavor . Just plan...
57	58	B004N5KULM	ASCNNAJU6SXF8	S. Beck	1	1	5	1336176000	How can you go wrong!	It is chocolate, what can I say. Great variet...
61	62	B004N5KULM	A7ZK2A3VIW7X9	Peggy	0	2	5	1319414400	pretty expensive	This bag of candy online is pretty expensive, ...
62	63	B001EO5TPM	A1E09XGZUR78C6	gary sturrock	2	2	1	1215302400	stale product.	Arrived in 6 days and were so stale i could no...

```
In [33]: total_negative= (' '.join(data_negative['Summary']))
```



```
Out[34]: 'poor taste Nasty No flavor How can you go wrong. pretty expensive stale product. Bigger then other brand
s Order only in cold weather Bad disappointing My every day green tea BROKEN BOTTLE BOTTOMS! Tasteless bu
t low calorie Marley\'s Mellow Mood Lite - Half Tea Half Lemonade Nearly killed the cats CHANGED FORMULA
MAKES CATS SICK!!!! Not a real tea McClures bloody Mary mix Not Good Eukanuba puppy small breed dog food
My everyday cup of Tea Disappointed Sad outcome Don\'t Waste Your Money Disappointed! sugar in the raw Go
od product but terrible agricultural practices Sugar in the raw Sugar in the raw too expensive Not sure S
o awful I can barely describe AWFUL Bitter A saving grace for Green Mountain Coffee... Fantastic Chicken
Noodle soup Heinz no more! Disappointing Waste of money Ham Base MSG Ham Base Love the product disappoint
ed in the shipping. poor item packaging Awful disappointing Hard a slight taste of jalapeno Heavy on the
Vinegar These chips make me weak at the knees Not bad but a little hard to get used to Firm quality chip
Not Very Creamy or Chivey... Prefer other flavors Maybe the worst chips ever. They changed the Chips now
they taste horrible Gaaak! An "extreme" potato chip...! Gone down hill STALE. Beware buying these on sp
ecial! Stale, Rancid Oil Taste, And if You Like Even the Tiniest Bit of Salt Flavor on Your Chips... Disg
usting Taste terrible, way too strong VERY DISAPPOINTED Too SOUR! AWFUL TASTE Kettle has sold out, the ch
ips are horrible now HORRIBLE I CANT BELIEVE THIS! The only thing I have ever been addicted too...these c
hips! ONLY awful because SOMETIMES they are awful So Faboo: Dangerous for those prone to Chips Binges!!!
WRONG FLAVOR - got Country BBQ instead of Chili Chipotle Addicted Broken chips but tasty a bit on the sta
le side Disappointed! Perhaps something was wrong with the batch... $4 down the drain Big Disappointment
Worst Frosting Ever worst frosting ever City Steam, not much steam in this brew. great coffee - terrible

```

Out[36]: 1438541

```
Out[37]: 'poor taste Nasty No flavor How can you go wrong pretty expensive stale product Bigger then other brand
s Order only in cold weather Bad disappointing My every day green tea BROKEN BOTTLE BOTTOMS Tasteless bu
t low calorie Marley s Mellow Mood Lite Half Tea Half Lemonade Nearly killed the cats CHANGED FORMULA M
AKES CATS SICK Not a real tea McClures bloody Mary mix Not Good Eukanuba puppy small breed dog food M
y everyday cup of Tea Disappointed Sad outcome Don t Waste Your Money Disappointed sugar in the raw Good
product but terrible agricultural practices Sugar in the raw Sugar in the raw too expensive Not sure So a
wful I can barely describe AWFUL Bitter A saving grace for Green Mountain Coffee Fantastic Chicken Noo
dle soup Heinz no more Disappointing Waste of money Ham Base MSG Ham Base Love the product disappointed
in the shipping poor item packaging Awful disappointing Hard a slight taste of jalapeno Heavy on the Vin
egar These chips make me weak at the knees Not bad but a little hard to get used to Firm quality chip Not
Very Creamy or Chivey Prefer other flavors Maybe the worst chips ever They changed the Chips now they
taste horrible Gaaak An extreme potato chip Gone down hill STALE Beware buying these on special
Stale Rancid Oil Taste And if You Like Even the Tiniest Bit of Salt Flavor on Your Chips Disgusting
Taste terrible way too strong VERY DISAPPOINTED Too SOUR AWFUL TASTE Kettle has sold out the chips are
horrible now HORRIBLE I CANT BELIEVE THIS The only thing I have ever been addicted too these chips ON
LY awful because SOMETIMES they are awful So Faboo Dangerous for those prone to Chips Binges WRONG FL
AVOR got Country BBQ instead of Chili Chipotle Addicted Broken chips but tasty a bit on the stale side
Disappointed Perhaps something was wrong with the batch down the drain Big Disappointment Worst Fr
osting Ever worst frosting ever City Steam not much steam in this brew great coffee terrible price Ho
pible dont buy it Natans but twice some broken disappointment is this serious huhk Even
```

Out[39]: 1386940

```
Out[40]: (-0.5, 999.5, 499.5, -0.5)
```



## Analyse to what User Amazon Can recommend more product



Amazon can recommend more products to only those who are going to buy more or to one who has a better conversion rate,so lets ready data according to this problem statement

In [41]:

df['UserId'].shape

Out[41]: (568454,)

In [42]:

df['UserId'].nunique()

Out[42]: 256059

In [43]:

df.head()

Out[43]:

	Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
0	1	B001E4KFG0	A3SGXH7AUHU8GW	delmartian	1	1	5	1303862400	Good Quality Dog Food	I have bought several of the Vitality canned d...
1	2	B00813GRG4	A1D87F6ZCVE5NK	dll pa	0	0	1	1346976000	Not as Advertised	Product arrived labeled as Jumbo Salted Peanut...
2	3	B000LQOCH0	ABXLMWJIXXAIN	Natalia Corres "Natalia Corres"	1	1	4	1219017600	"Delight" says it all	This is a confection that has been around a fe...
3	4	B000UA0QIQ	A395BORC6FGVXV	Karl	3	3	2	1307923200	Cough Medicine	If you are looking for the secret ingredient i...
4	5	B006K2ZZ7K	A1UQRSCLF8GW1T	Michael D. Bigham "M. Wassir"	0	0	5	1350777600	Great taffy	Great taffy at a great price. There was a wid...

In [44]:

raw=df.groupby(['UserId']).agg({'Summary':'count', 'Text':'count','Score':'mean','ProductId':'count'}).sort\_

raw

Out[44]:

	Summary	Text	Score	ProductId
UserId				
A3OXHLG6DIBRW8	448	448	4.535714	448
A1YUL9PCJR3JTY	421	421	4.494062	421
AY12DBB0U420B	389	389	4.647815	389
A281NPSIMI1C2R	365	365	4.841096	365
A1Z54EM24Y40LL	256	256	4.453125	256
...	...	...	...	...
A2HROKQO0GA5AF	1	1	3.000000	1
A2HROR28DMJV2W	1	1	5.000000	1
A2HRR8CO2Y20G8	1	1	5.000000	1
A2HRSML93IK9TR	1	1	5.000000	1
AZZZOVIBXHGDR	1	1	2.000000	1

256059 rows × 4 columns

```
In [45]: raw.columns=['Number_of_summaries','num_text','Avg_score','Number_of_products_purchased']
raw
```

Out[45]:

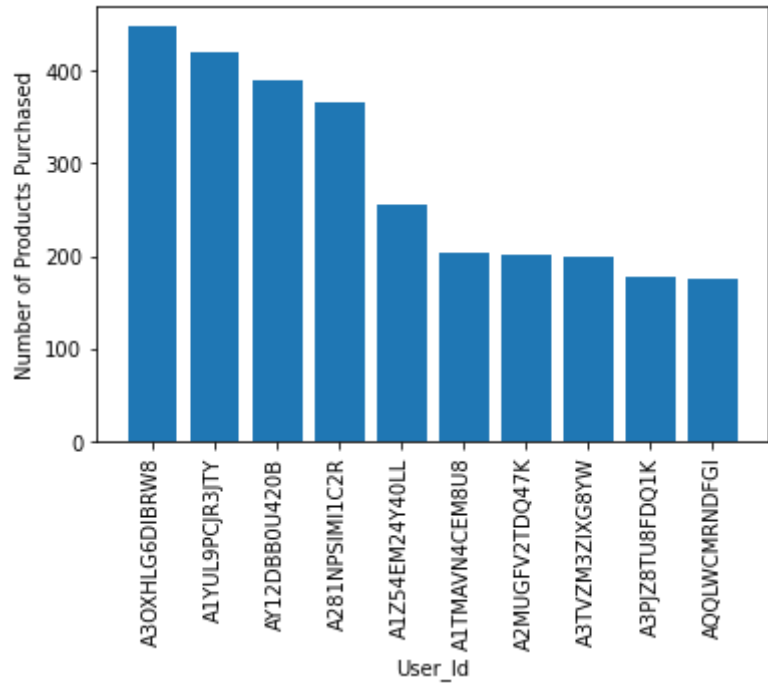
	Number_of_summaries	num_text	Avg_score	Number_of_products_purchased
Userld				
A3OXHLG6DIBRW8	448	448	4.535714	448
A1YUL9PCJR3JTY	421	421	4.494062	421
AY12DBB0U420B	389	389	4.647815	389
A281NPSIMI1C2R	365	365	4.841096	365
A1Z54EM24Y40LL	256	256	4.453125	256
...	...	...	...	...
A2HROKQO0GA5AF	1	1	3.000000	1
A2HROR28DMJV2W	1	1	5.000000	1
A2HRR8CO2Y20G8	1	1	5.000000	1
A2HRSML93IK9TR	1	1	5.000000	1
AZZZOVIBXHGDR	1	1	2.000000	1

256059 rows × 4 columns

```
In [46]: user_10=raw.index[0:10]
number_10=raw['Number_of_products_purchased'][0:10]

plt.bar(user_10, number_10, label='java developer')
plt.xlabel('User_Id')
plt.ylabel('Number of Products Purchased')
plt.xticks(rotation='vertical')
```

Out[46]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9],  
[Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, ''),  
Text(0, 0, '')[0:10]])



These are the Top 10 Users so we can recommend more & more Prodcuts to these Usser Id as there will be a high probability that these person are going to be buy more

as data is so huge,so if your system takes a lot for the execution , u can considered some sample of data from entire data,  
as may be some of you have not that much good specifications in terms of processor ,RAM & HArD Dis k..  
so according to system specifications,u can considered some sample of data,if u have not issue with your specifications,  
u can go ahead with this bulky data

In [47]:

df.head()

Out[47]:

	Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
0	1	B001E4KFG0	A3SGXH7AUHU8GW	delmartian	1	1	5	1303862400	Good Quality Dog Food	I have bought several of the Vitality canned d...
1	2	B00813GRG4	A1D87F6ZCVE5NK	dll pa	0	0	1	1346976000	Not as Advertised	Product arrived labeled as Jumbo Salted Peanut...
2	3	B000LQOCH0	ABXLMWJIXXAIN	Natalia Corres "Natalia Corres"	1	1	4	1219017600	"Delight" says it all	This is a confection that has been around a fe...
3	4	B000UA0QIQ	A395BORC6FGVXV	Karl	3	3	2	1307923200	Cough Medicine	If you are looking for the secret ingredient i...
4	5	B006K2ZZ7K	A1UQRSCLF8GW1T	Michael D. Bigham "M. Wassir"	0	0	5	1350777600	Great taffy	Great taffy at a great price. There was a wid...

In [48]:

*## picking a random sample*  
final=df.sample(n=2000)

In [49]:

final=df[0:2000]

check missing values in dataset

In [50]:

final.isna().sum()

Out[50]:

Id	0
ProductId	0
UserId	0
ProfileName	0
HelpfulnessNumerator	0
HelpfulnessDenominator	0
Score	0
Time	0
Summary	0
Text	0
dtype: int64	

Removing the Duplicates if any

In [51]:

final.duplicated().sum()

Out[51]: 0

Analyse Length of Comments whether Customers are going to give Lengthy comments or short one

In [52]:

final.head()

Out[52]:

	Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
0	1	B001E4KFG0	A3SGXH7AUHU8GW	delmartian	1	1	5	1303862400	Good Quality Dog Food	I have bought several of the Vitality canned d...
1	2	B00813GRG4	A1D87F6ZCVE5NK	dll pa	0	0	1	1346976000	Not as Advertised	Product arrived labeled as Jumbo Salted Peanut...
2	3	B000LQOCH0	ABXLMWJIXXAIN	Natalia Corres "Natalia Corres"	1	1	4	1219017600	"Delight" says it all	This is a confection that has been around a fe...
3	4	B000UA0QIQ	A395BORC6FGVXV	Karl	3	3	2	1307923200	Cough Medicine	If you are looking for the secret ingredient i...
4	5	B006K2ZZ7K	A1UQRSCLF8GW1T	Michael D. Bigham "M. Wassir"	0	0	5	1350777600	Great taffy	Great taffy at a great price. There was a wid...



```
In [53]: final['Text'][0].split(' ')
```

```
Out[53]: ['I',
          'have',
          'bought',
          'several',
          'of',
          'the',
          'Vitality',
          'canned',
          'dog',
          'food',
          'products',
          'and',
          'have',
          'found',
          'them',
          'all',
          'to',
          'be',
          'of',
          'good',
          'quality.',
          'The',
          'product',
          'looks',
          'more',
          'like',
          'a',
          'stew',
          'than',
          'a',
          'processed',
          'meat',
          'and',
          'it',
          'smells',
          'better.',
          'My',
          'Labrador',
          'is',
          'finicky',
          'and',
          'she',
          'appreciates',
          'this',
          'product',
          'better',
          'than',
          '',
          'most.']
```

```
In [54]: len(final['Text'][0].split(' '))
```

```
Out[54]: 49
```

```
In [55]: final['Text'][0]
```

```
Out[55]: 'I have bought several of the Vitality canned dog food products and have found them all to be of good quality. The product looks more like a stew than a processed meat and it smells better. My Labrador is finicky and she appreciates this product better than most.'
```

```
In [56]: def calc_len(text):
          return(len(text.split(' ')))
```

```
In [57]: final['text_lenght']=final['Text'].apply(calc_len)
```

<ipython-input-57-060907e505df>:1: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy) ([https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy))  
final['text\_lenght']=final['Text'].apply(calc\_len)

In [58]:

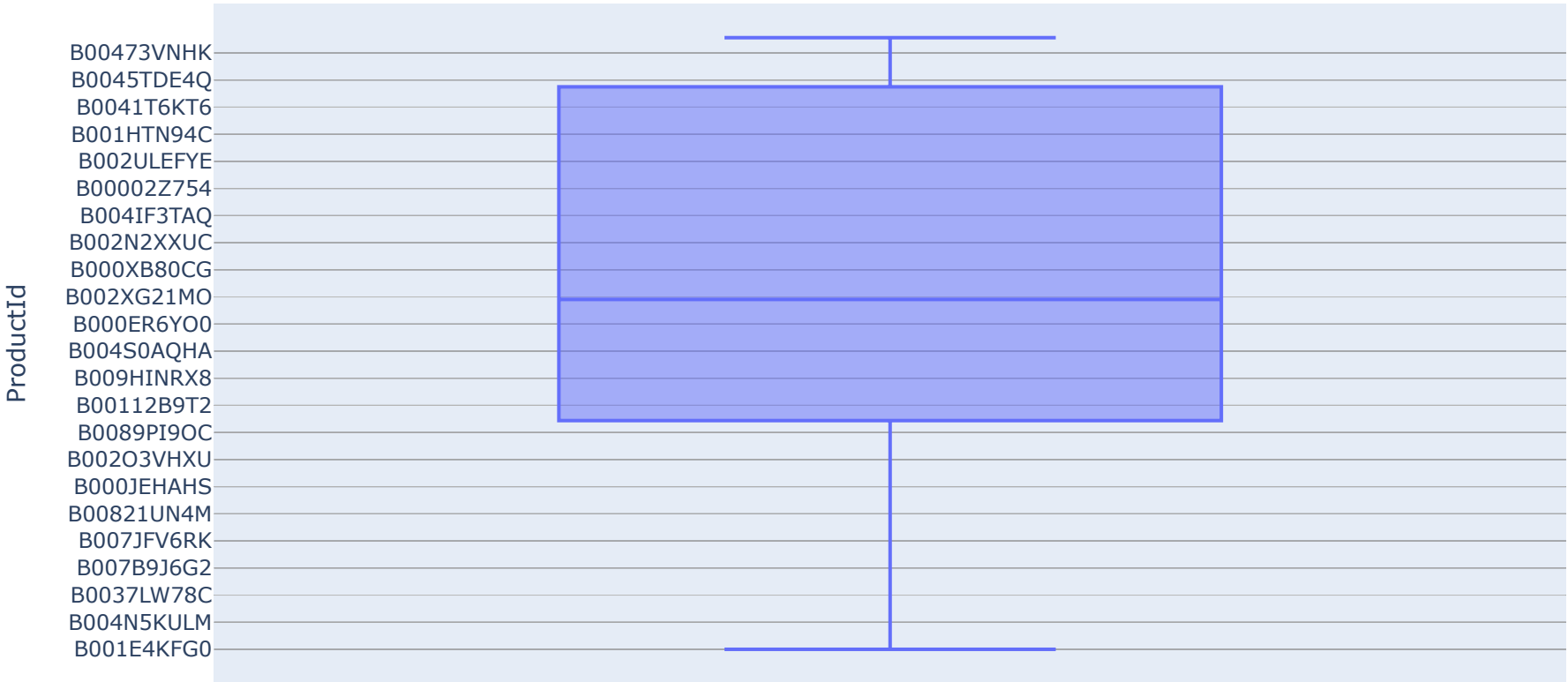
pip install plotly

Collecting plotly  
  Downloading plotly-4.14.3-py2.py3-none-any.whl (13.2 MB)  
  |██| 13.2 MB 24 kB/s eta 0:00:01  
Requirement already satisfied: six in ./anaconda3/lib/python3.8/site-packages (from plotly) (1.15.0)  
Collecting retrying>=1.3.3  
  Downloading retrying-1.3.3.tar.gz (10 kB)  
Building wheels for collected packages: retrying  
  Building wheel for retrying (setup.py) ... done  
  Created wheel for retrying: filename=retrying-1.3.3-py3-none-any.whl size=11429 sha256=301504d477df77c30af60ff734bb9e028d205b0f2d0ef77dbce00d5d39f4240c  
  Stored in directory: /home/islam/.cache/pip/wheels/c4/a7/48/0a434133f6d56e878ca511c0e6c38326907c0792f67b476e56  
Successfully built retrying  
Installing collected packages: retrying, plotly  
Successfully installed plotly-4.14.3 retrying-1.3.3  
Note: you may need to restart the kernel to use updated packages.

## box plot to show customer feedback

In [59]:

import plotly.express as px  
px.box(final, y="ProductId")



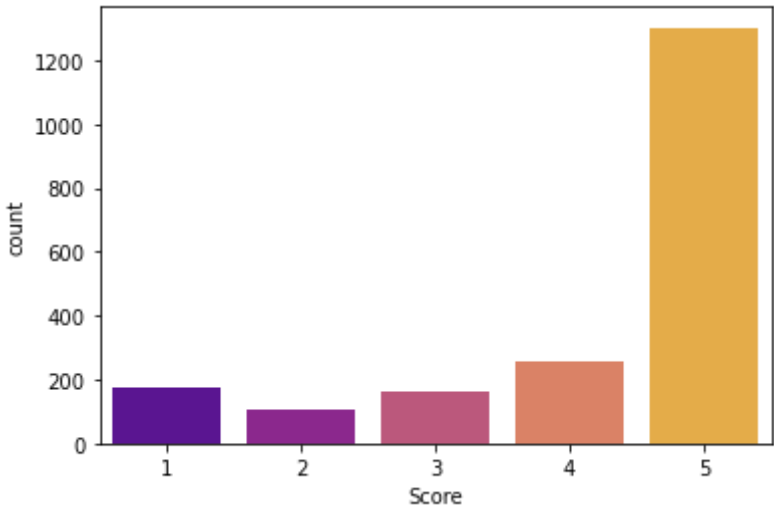
Analyze Score

```
In [60]: sns.countplot(final['Score'],palette='plasma')
```

/home/islam/anaconda3/lib/python3.8/site-packages/seaborn/\_decorators.py:36: FutureWarning:

Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

Out[60]: <AxesSubplot:xlabel='Score', ylabel='count'>



```
In [ ]:
```

## analyse behaviour of customer

```
In [61]: final.head()
```

Out[61]:

	Id	ProductId	UserId	ProfileName	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	Summary	Text
0	1	B001E4KFG0	A3SGXH7AUHU8GW	delmartian	1	1	5	1303862400	Good Quality Dog Food	I have bought several of the Vitality canned d...
1	2	B00813GRG4	A1D87F6ZCVE5NK	dll pa	0	0	1	1346976000	Not as Advertised	Product arrived labeled as Jumbo Salted Peanut...
2	3	B000LQOCH0	ABXLMWJIXXAIN	Natalia Corres "Natalia Corres"	1	1	4	1219017600	"Delight" says it all	This is a confection that has been around a fe...
3	4	B000UA0QIQ	A395BORC6FGVXV	Karl	3	3	2	1307923200	Cough Medicine	If you are looking for the secret ingredient i...
4	5	B006K2ZZ7K	A1UQRSCLF8GW1T	Michael D. Bigham "M. Wassir"	0	0	5	1350777600	Great taffy	Great taffy at a great price. There was a wid...

```
In [62]: final['Text']=final['Text'].str.lower()
```

<ipython-input-62-98d1fdb02b21>:1: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy) ([https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy))

```
final['Text']
```

```
0      i have bought several of the vitality canned d...
1      product arrived labeled as jumbo salted peanut...
2      this is a confection that has been around a fe...
3      if you are looking for the secret ingredient i...
4      great taffy at a great price.  there was a wid...
      ...
1995   i have to laugh at the reviews that said it wa...
1996   i had read some favorable reviews of this panc...
1997   i was expecting great things based on the revi...
1998   i love this pancake mix.  i bought my first ca...
1999   what can i say??  they are wonderful, and the ...
Name: Text, Length: 2000, dtype: object
```

```
from wordcloud import WordCloud, STOPWORDS
```

```
comment_words=' '.join(final['Text'])
```

```
stopwords = set(STOPWORDS)
```

```
wordcloud=WordCloud(width=800 ,height=800 ,stopwords=stopwords).generate(comment_words)
plt.figure(figsize = (8, 8))
plt.imshow(wordcloud)
plt.axis("off")
```

 $(-0.5, 799.5, 799.5, -0.5)$ 

```
final['Text'][34].replace('br', '')
```

"instant oatmeal can become soggy the minute the water hits the bowl. mccann's instant oatmeal holds its texture, has excellent flavor, and is good for you all at the same time. mccann's regular oat meal is excellent, too, but may take a bit longer to prepare than most have time for in the morning. this is the best instant and i've ever eaten, and a very close second to the non-instant variety.< />< />mccann's instant irish oatmeal, variety pack of regular, apples & cinnamon, and maple & own sugar, 10-count boxes (pack of 6)"



