CUSTOMER SENTIMENT ANALYSIS

Objective of the project: *As a Data Analyst at Flipkart, the goal here is to analyze customer sentiment regarding the iPhone 15 128GB model. The primary goal of this project is to analyze public perception and evaluate customer reactions by performing sentiment analysis on product reviews posted by users. By extracting and processing customer reviews, I then derive insights about the overall sentiment (positive or negative) surrounding the product, which can be useful for decision-making, improving customer experience, and identifying key areas for product improvement.*

1. Data Collection (Web Scraping):

Tools used: Selenium and BeautifulSoup

Task: Scrape as many as customer reviews from ***Flipkart's product page for the iPhone 15 128GB model****. Each review should include:*

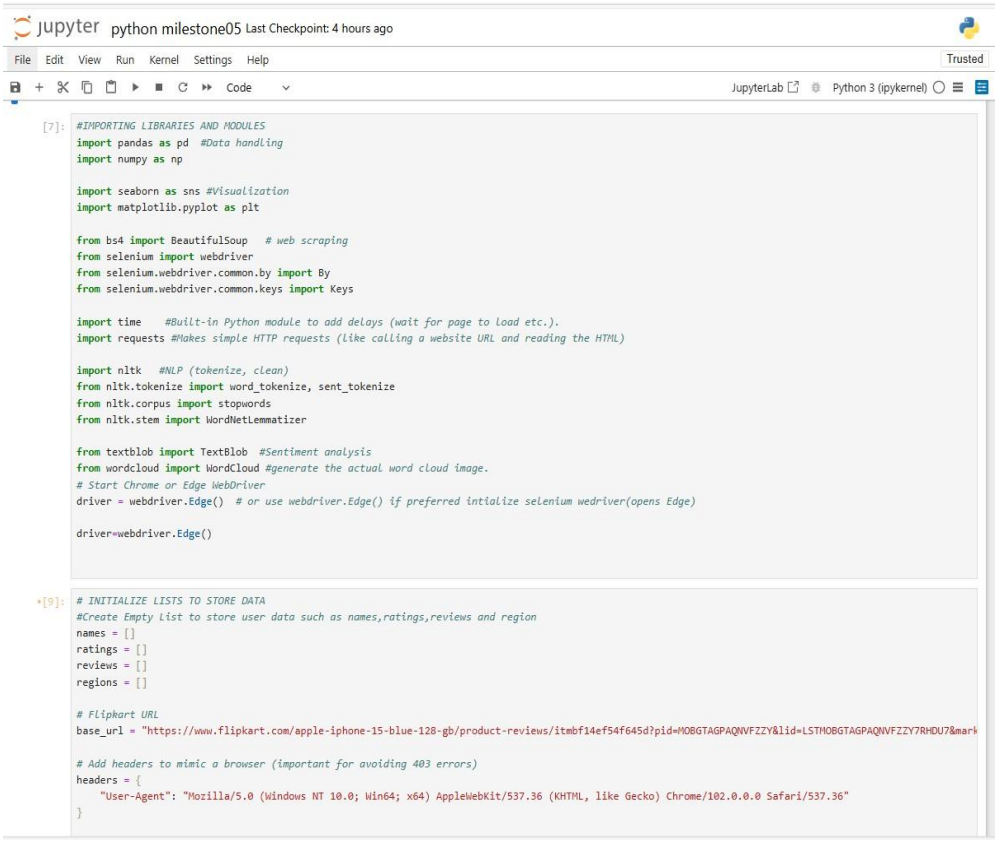
Usernames: The name of the customer.

Ratings: The rating provided by the user (1 to 5 stars).

Reviews: The content of the customer's review, which may contain valuable information regarding their experience with the product.

Region: The place of the customer/user. Install and import all the Python libraries that are required for the task. Such as,

#IMPORTING LIBRARIES AND MODULES



```
[7]: #IMPORTING LIBRARIES AND MODULES
import pandas as pd  #Data handling
import numpy as np

import seaborn as sns #Visualization
import matplotlib.pyplot as plt

from bs4 import BeautifulSoup   # web scraping
from selenium import webdriver
from selenium.webdriver.common.by import By
from selenium.webdriver.common.keys import Keys

import time    #Built-in Python module to add delays (wait for page to load etc.).
import requests #Makes simple HTTP requests (like calling a website URL and reading the HTML)

import nltk   #NLP (tokenize, clean)
from nltk.tokenize import word_tokenize, sent_tokenize
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer

from textblob import TextBlob  #Sentiment analysis
from wordcloud import WordCloud #generate the actual word cloud image.
# Start Chrome or Edge WebDriver
driver = webdriver.Edge()  # or use webdriver.Edge() if preferred intialize selenium wedriver(opens Edge)

driver=webdriver.Edge()
```

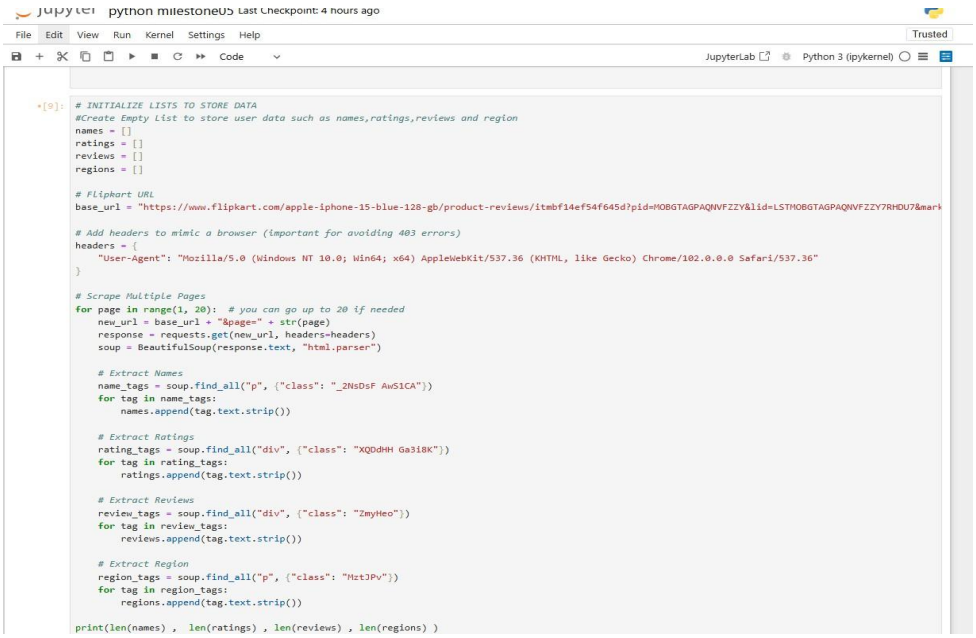
```
*[9]: # INITIALIZE LISTS TO STORE DATA
#Create Empty List to store user data such as names,ratings,reviews and region
names = []
ratings = []
reviews = []
regions = []

# Flipkart URL
base_url = "https://www.flipkart.com/apple-iphone-15-blue-128-gb/product-reviews/itmbf14ef54f645d?pid=MOBGTAGPAQNVFZZY&lid=LSTMOBGTAGPAQNVFZZY7RHDU7&mark

# Add headers to mimic a browser (important for avoiding 403 errors)
headers = {
    "User-Agent": "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/102.0.0.0 Safari/537.36"
}
```

 # INITIALIZE LISTS TO STORE DATA

#Create Empty List to store user data such as names,ratings,reviews and region



```
*[9]: # INITIALIZE LISTS TO STORE DATA
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ratings = []
reviews = []
regions = []

# Flipkart URL
base_url = "https://www.flipkart.com/apple-iphone-15-blue-128-gb/product-reviews/itmbf14ef54f645d?pid=MOBGTAGPAQNVFZZY&lid=LSTMOBGTAGPAQNVFZZY7RHDU7&mark

# Add headers to mimic a browser (important for avoiding 403 errors)
headers = {
    "User-Agent": "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/102.0.0.0 Safari/537.36"
}

# Scrape Multiple Pages
for page in range(1, 20):  # you can go up to 20 if needed
    new_url = base_url + "&page=" + str(page)
    response = requests.get(new_url, headers=headers)
    soup = BeautifulSoup(response.text, "html.parser")

    # Extract Names
    name_tags = soup.find_all("p", {"class": "_2NsDsF AwS1CA"})
    for tag in name_tags:
        names.append(tag.text.strip())

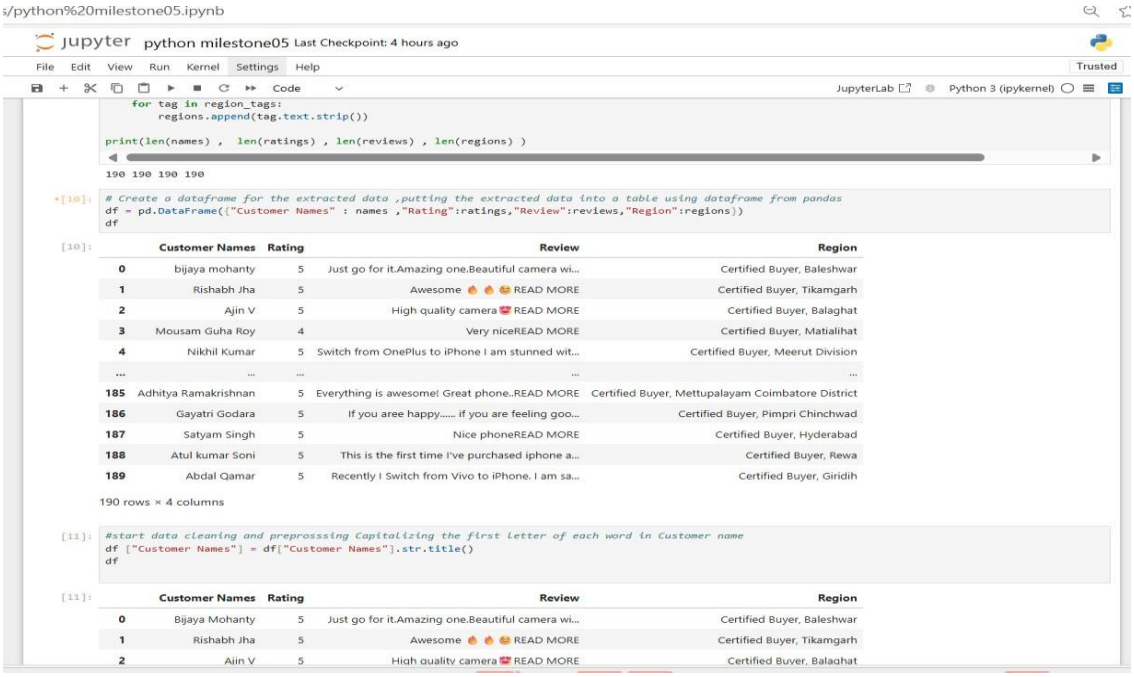
    # Extract Ratings
    rating_tags = soup.find_all("div", {"class": "XQDdHH Ga3i8K"})
    for tag in rating_tags:
        ratings.append(tag.text.strip())

    # Extract Reviews
    review_tags = soup.find_all("div", {"class": "ZmyHeo"})
    for tag in review_tags:
        reviews.append(tag.text.strip())

    # Extract Region
    region_tags = soup.find_all("p", {"class": "MztJPv"})
    for tag in region_tags:
        regions.append(tag.text.strip())

print(len(names) ,  len(ratings) , len(reviews) , len(regions) )
```

 # Create a dataframe for the extracted data ,putting the extracted data into a table using dataframe from pandas



```
for tag in region_tags:
    regions.append(tag.text.strip())

print(len(names) ,  len(ratings) , len(reviews) , len(regions) )
```

```
190 190 190 190
```

```
# Create a dataframe for the extracted data ,putting the extracted data into a table using dataframe from pandas
df = pd.DataFrame({"Customer Names" : names ,"Rating":ratings,"Review":reviews,"Region":regions})
df
```

[10]:

	Customer Names	Rating	Review	Region
0	bijaya mohanty	5	Just go for it.Amazing one.Beautiful camera wi...	Certified Buyer, Baleshwar
1	Rishabh Jha	5	Awesome 🔥 🔥 😍 READ MORE	Certified Buyer, Tikamgarh
2	Ajin V	5	High quality camera 😍 READ MORE	Certified Buyer, Balaghat
3	Mousam Guha Roy	4	Very niceREAD MORE	Certified Buyer, Matialihat
4	Nikhil Kumar	5	Switch from OnePlus to iPhone I am stunned wit...	Certified Buyer, Meerut Division
...	...	...	...	...
185	Adhitya Ramakrishnan	5	Everything is awesome! Great phone..READ MORE	Certified Buyer, Mettupalayam Coimbatore District
186	Gayatri Godara	5	If you aree happy..... if you are feeling goo...	Certified Buyer, Pimpri Chinchwad
187	Satyam Singh	5	Nice phoneREAD MORE	Certified Buyer, Hyderabad
188	Atul kumar Soni	5	This is the first time I've purchased iphone a...	Certified Buyer, Rewa
189	Abdal Qamar	5	Recently I Switch from Vivo to iPhone. I am sa...	Certified Buyer, Giridih

190 rows × 4 columns

```
#start data cleaning and preprosssing Capitalizing the first letter of each word in Customer name
df ["Customer Names"] = df["Customer Names"].str.title()
df
```

[11]:

	Customer Names	Rating	Review	Region
0	Bijaya Mohanty	5	Just go for it.Amazing one.Beautiful camera wi...	Certified Buyer, Baleshwar
1	Rishabh Jha	5	Awesome 🔥 🔥 😍 READ MORE	Certified Buyer, Tikamgarh
2	Ajin V	5	High quality camera 😍 READ MORE	Certified Buyer, Balaghat

2. Data Cleaning and Preprocessing:

Tool used: Pandas Task: Clean and preprocess the scraped data for analysis. Remove duplicates, handle missing values, remove irrelevant characters (e.g., special characters, punctuation, and extra spaces), tokenize the text into individual words, remove stop words (commonly used words that do not add significant meaning to sentiment analysis like "Read More").

3. Sentiment Analysis: Tool: TextBlob Task: Perform sentiment analysis on the review text. Analyze the sentiment of each review to classify them as either positive or negative. Define a threshold to classify the sentiment as Positive sentiment and Negative sentiment based on polarity score. Store the sentiment classification for each review in the dataset.

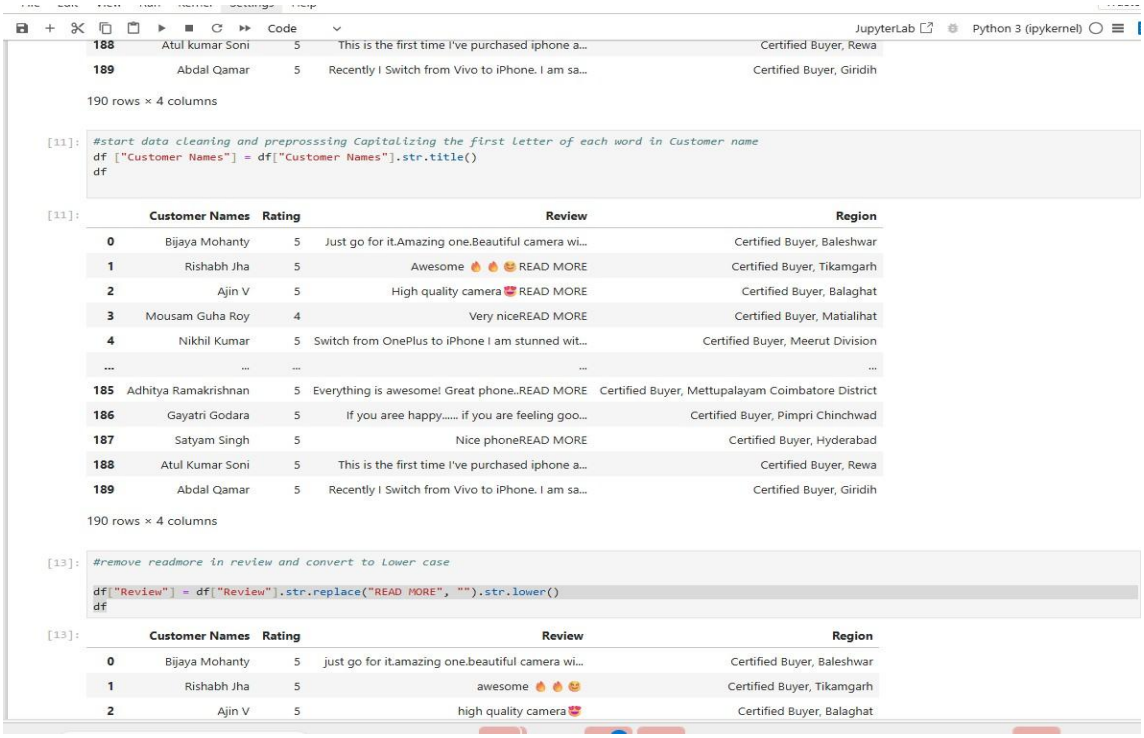
4. Data Analysis and Insights: Tool: Pandas and Matplotlib/Seaborn for visualization. Task: Perform an analysis on the sentiment of reviews and extract actionable insights. ● Sentiment Distribution: Calculate the overall distribution of positive and negative sentiments for all the reviews. ● Review Length Analysis:

Investigate if longer reviews are associated with more detailed sentiments, either positive or negative.

Sentiment Distribution: This bar graph represents the distribution of customer sentiments. The x-axis shows different sentiment categories: Extremely Positive, Positive, Neutral, Negative and Extremely Negative, while the y-axis indicates the count of each sentiment. Positive sentiments are the most frequent (137 counts), followed by Extremely Positive (37), Neutral (13), and Extremely Negative sentiment (3).

This suggests that the majority of customers have expressed positive or favourable feedback for iPhone 15 128 GB mobile phone.

#remove readmore in review and convert to Lower case



Code JupyterLab Python 3 (ipykernel)

188	Atul kumar Soni	5	This is the first time I've purchased iphone a...	Certified Buyer, Rewa
189	Abdal Qamar	5	Recently I Switch from Vivo to iPhone. I am sa...	Certified Buyer, Giridih

190 rows × 4 columns

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2	Ajin V	5	High quality camera😍READ MORE	Certified Buyer, Balaghat
3	Mousam Guha Roy	4	Very niceREAD MORE	Certified Buyer, Matialihat
4	Nikhil Kumar	5	Switch from OnePlus to iPhone I am stunned wit...	Certified Buyer, Meerut Division
...	...	...	...	...
185	Adhitya Ramakrishnan	5	Everything is awesome! Great phone..READ MORE	Certified Buyer, Mettupalayam Coimbatore District
186	Gayatri Godara	5	If you aree happy..... if you are feeling goo...	Certified Buyer, Pimpri Chinchwad
187	Satyam Singh	5	Nice phoneREAD MORE	Certified Buyer, Hyderabad
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189	Abdal Qamar	5	Recently I Switch from Vivo to iPhone. I am sa...	Certified Buyer, Giridih

190 rows × 4 columns

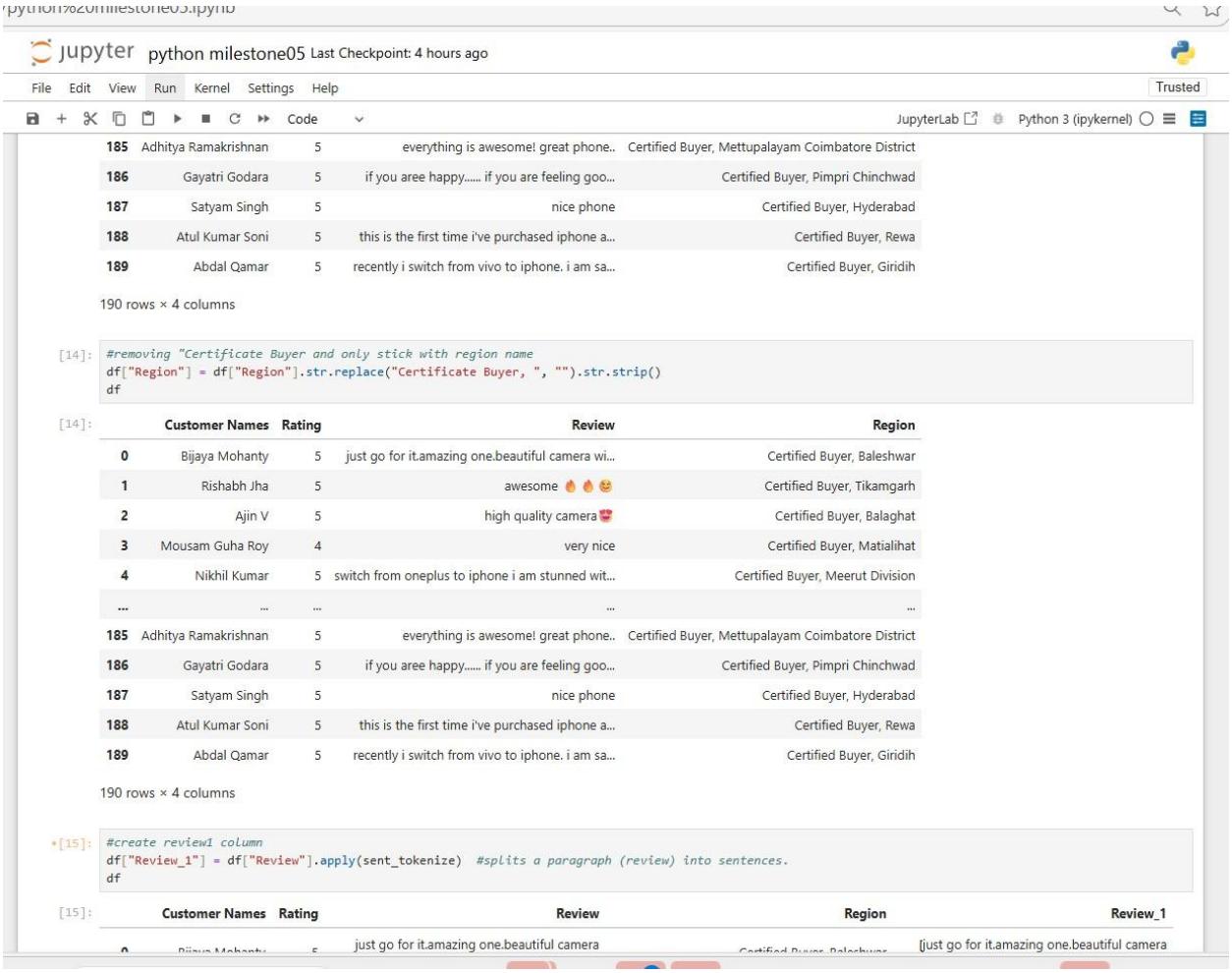
[13]:
```
#remove readmore in review and convert to Lower case

df["Review"] = df["Review"].str.replace("READ MORE", "").str.lower()
df
```

[13]:

	Customer Names	Rating	Review	Region
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera wi...	Certified Buyer, Baleshwar
1	Rishabh Jha	5	awesome 🔥 🔥 😊	Certified Buyer, Tikamgarh
2	Ajin V	5	high quality camera😍	Certified Buyer, Balaghat

#removing "Certificate Buyer and only stick with region name



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Code — JupyterLab — Python 3 (ipykernel)

185	Adhitya Ramakrishnan	5	everything is awesome! great phone..	Certified Buyer, Mettupalayam Coimbatore District
186	Gayatri Godara	5	if you aree happy..... if you are feeling goo...	Certified Buyer, Pimpri Chinchwad
187	Satyam Singh	5	nice phone	Certified Buyer, Hyderabad
188	Atul Kumar Soni	5	this is the first time i've purchased iphone a...	Certified Buyer, Rewa
189	Abdal Qamar	5	recently i switch from vivo to iphone. i am sa...	Certified Buyer, Giridih

190 rows × 4 columns

[14]:
```
#removing "Certificate Buyer and only stick with region name
df["Region"] = df["Region"].str.replace("Certificate Buyer, ", "").str.strip()
df
```

[14]:

	Customer Names	Rating	Review	Region
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera wi...	Certified Buyer, Baleshwar
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3	Mousam Guha Roy	4	very nice	Certified Buyer, Matialihat
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...	...	...	...	...
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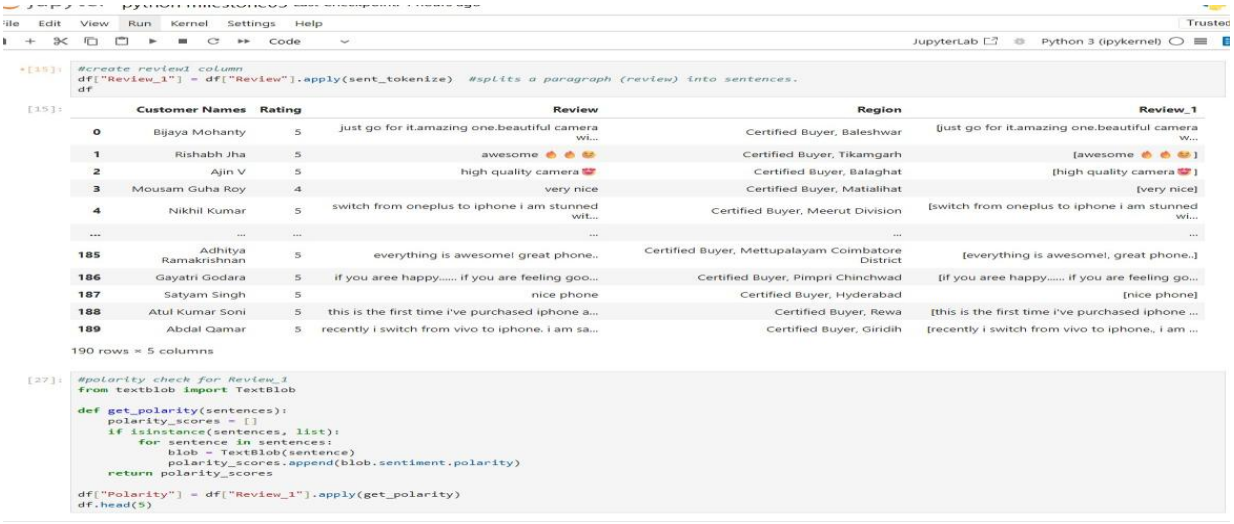
190 rows × 4 columns

*[15]:
```
#create review1 column
df["Review_1"] = df["Review"].apply(sent_tokenize)  #splits a paragraph (review) into sentences.
df
```

[15]:

	Customer Names	Rating	Review	Region	Review_1
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera	Certified Buyer, Baleshwar	[just go for it.amazing one.beautiful camera

#create review1 column



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3	Mousam Guha Roy	4	very nice	Certified Buyer, Matialihat	[very nice]
4	Nikhil Kumar	5	switch from oneplus to iphone i am stunned wit...	Certified Buyer, Meerut Division	[switch from oneplus to iphone i am stunned wi...
...	...	...	...	...	...
185	Adhitya Ramakrishnan	5	everything is awesome! great phone..	Certified Buyer, Mettupalayam Coimbatore District	[everything is awesome!, great phone..]
186	Gayatri Godara	5	if you aree happy..... if you are feeling goo...	Certified Buyer, Pimpri Chinchwad	[if you aree happy..... if you are feeling go...
187	Satyam Singh	5	nice phone	Certified Buyer, Hyderabad	[nice phone]
188	Atul Kumar Soni	5	this is the first time i've purchased iphone a...	Certified Buyer, Rewa	[this is the first time i've purchased iphone ...
189	Abdal Qamar	5	recently i switch from vivo to iphone. i am sa...	Certified Buyer, Giridih	[recently i switch from vivo to iphone., i am ...

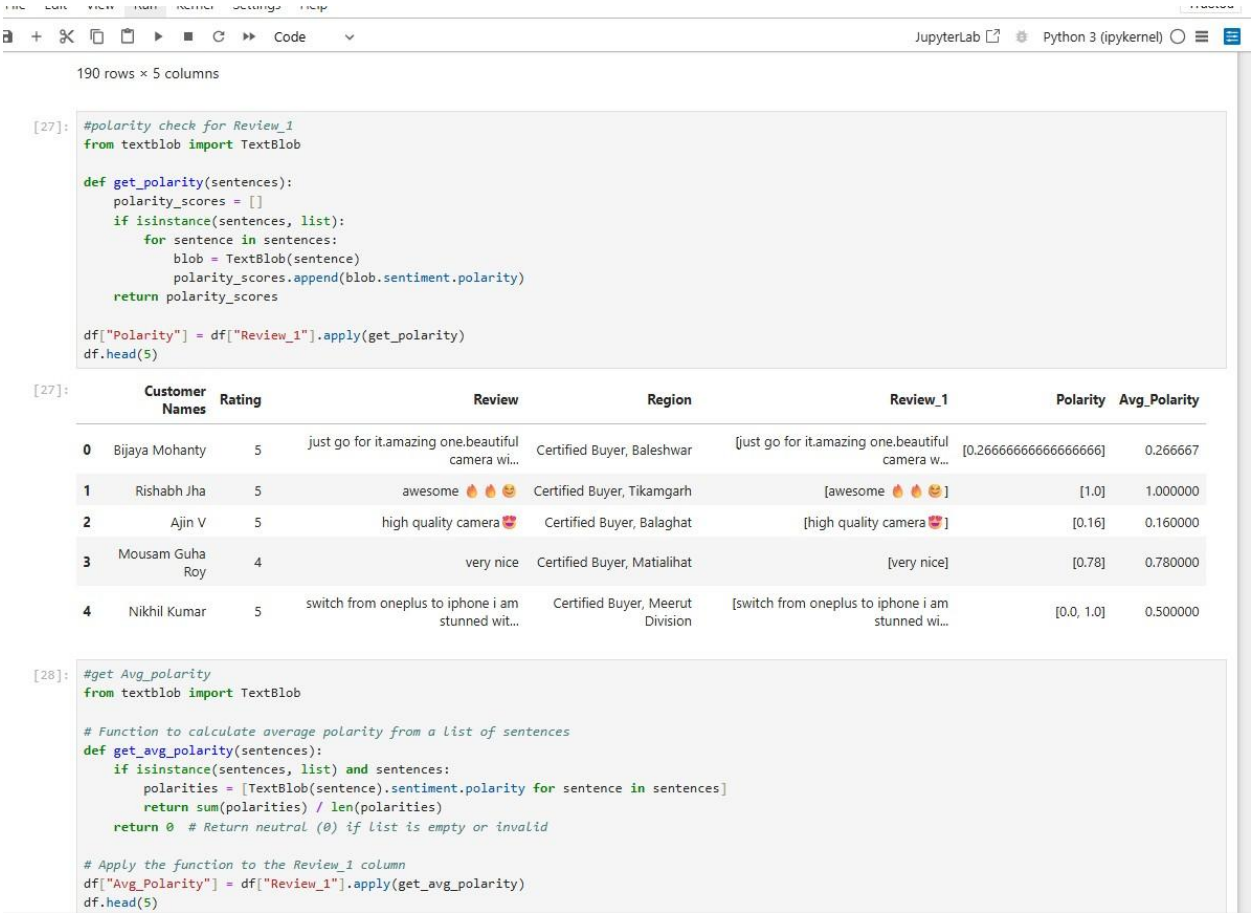
190 rows × 5 columns

[27]:
```
#polarity check for Review_1
from textblob import TextBlob

def get_polarity(sentences):
    polarity_scores = []
    if isinstance(sentences, list):
        for sentence in sentences:
            blob = TextBlob(sentence)
            polarity_scores.append(blob.sentiment.polarity)
    return polarity_scores

df["Polarity"] = df["Review_1"].apply(get_polarity)
df.head(5)
```

#polarity check for Review_1



190 rows × 5 columns

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    return polarity_scores

df["Polarity"] = df["Review_1"].apply(get_polarity)
df.head(5)
```

[27]:

	Customer Names	Rating	Review	Region	Review_1	Polarity	Avg_Polarity
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera wi...	Certified Buyer, Baleshwar	[just go for it.amazing one.beautiful camera w...	[0.26666666666666666]	0.266667
1	Rishabh Jha	5	awesome 🔥🔥😊	Certified Buyer, Tikamgarh	[awesome 🔥🔥😊]	[1.0]	1.000000
2	Ajin V	5	high quality camera😍	Certified Buyer, Balaghat	[high quality camera😍]	[0.16]	0.160000
3	Mousam Guha Roy	4	very nice	Certified Buyer, Matialihat	[very nice]	[0.78]	0.780000
4	Nikhil Kumar	5	switch from oneplus to iphone i am stunned wit...	Certified Buyer, Meerut Division	[switch from oneplus to iphone i am stunned wi...	[0.0, 1.0]	0.500000

[28]:
```
#get Avg_polarity
from textblob import TextBlob

# Function to calculate average polarity from a list of sentences
def get_avg_polarity(sentences):
    if isinstance(sentences, list) and sentences:
        polarities = [TextBlob(sentence).sentiment.polarity for sentence in sentences]
        return sum(polarities) / len(polarities)
    return 0  # Return neutral (0) if list is empty or invalid

# Apply the function to the Review_1 column
df["Avg_Polarity"] = df["Review_1"].apply(get_avg_polarity)
df.head(5)
```

#get Avg_polarity

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Code JupyterLab Python 3 (ipykernel)

4	Nikhil Kumar	5	switch from oneplus to iphone i am stunned wit...	Certified Buyer, Meerut Division	[switch from oneplus to iphone i am stunned wi...	[0.0, 1.0]	0.500000

[28]:
```
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    return 0  # Return neutral (0) if list is empty or invalid

# Apply the function to the Review_1 column
df["Avg_Polarity"] = df["Review_1"].apply(get_avg_polarity)
df.head(5)
```

[28]:

	Customer Names	Rating	Review	Region	Review_1	Polarity	Avg_Polarity
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera wi...	Certified Buyer, Baleshwar	[just go for it.amazing one.beautiful camera w...	[0.26666666666666666]	0.266667
1	Rishabh Jha	5	awesome 🔥🔥😍	Certified Buyer, Tikamgarh	[awesome 🔥🔥😍]	[1.0]	1.000000
2	Ajin V	5	high quality camera😍	Certified Buyer, Balaghat	[high quality camera😍]	[0.16]	0.160000
3	Mousam Guha Roy	4	very nice	Certified Buyer, Matialihat	[very nice]	[0.78]	0.780000
4	Nikhil Kumar	5	switch from oneplus to iphone i am stunned wit...	Certified Buyer, Meerut Division	[switch from oneplus to iphone i am stunned wi...	[0.0, 1.0]	0.500000

[30]:
```
#sentiment of each review to classify them as either positive or negative.

#Extremly Positive , Positive ,Neutral ,Negtive , Extremaly Negative.
def sentiment(pol):
    if pol >= 0.75:
        return "Extremely Positive"
    elif pol > 0:
        return "Positive"
    elif pol == 0:
        return "Neutral"
    elif pol <= -0.75:
        return "Negative"
```

#sentiment of each review to classify them as either positive or negative.#Extremly Positive , Positive ,Neutral ,Negtive , Extremaly Negative.

Code JupyterLab Python 3 (ipykernel)

[30]:
```
#sentiment of each review to classify them as either positive or negative.

#Extremly Positive , Positive ,Neutral ,Negtive , Extremaly Negative.
def sentiment(pol):
    if pol >= 0.75:
        return "Extremely Positive"
    elif pol > 0:
        return "Positive"
    elif pol == 0:
        return "Neutral"
    elif pol <= -0.75:
        return "Negative"
    else :
        return "Extremely Negative"
df["Sentiment"]=df["Avg_Polarity"].apply(sentiment)
df
```

[30]:

	Customer Names	Rating	Review	Region	Review_1	Polarity	Avg_Polarity	Sentiment
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera wi...	Certified Buyer, Baleshwar	[just go for it.amazing one.beautiful camera w...	[0.26666666666666666]	0.266667	Positive
1	Rishabh Jha	5	awesome 🔥🔥😍	Certified Buyer, Tikamgarh	[awesome 🔥🔥😍]	[1.0]	1.000000	Extremely Positive
2	Ajin V	5	high quality camera😍	Certified Buyer, Balaghat	[high quality camera😍]	[0.16]	0.160000	Positive
3	Mousam Guha Roy	4	very nice	Certified Buyer, Matialihat	[very nice]	[0.78]	0.780000	Extremely Positive
4	Nikhil Kumar	5	switch from oneplus to iphone i am stunned wit...	Certified Buyer, Meerut Division	[switch from oneplus to iphone i am stunned wi...	[0.0, 1.0]	0.500000	Positive
...	...	...	...	...	...	...	...	...
185	Adhitya Ramakrishnan	5	everything is awesome! great phone..	Certified Buyer, Mettupalayam Coimbatore District	[everything is awesome!, great phone..]	[1.0, 0.8]	0.900000	Extremely Positive
186	Gayatri Godara	5	if you aree happy..... if you are feeling goo...	Certified Buyer, Pimpri Chinchwad	[if you aree happy..... if you are feeling go...	[0.8]	0.800000	Extremely Positive
187	Satyam Singh	5	nice phone	Certified Buyer, Hyderabad	[nice phone]	[0.6]	0.600000	Positive
188	Atul Kumar Soni	5	this is the first time i've purchased iphone a...	Certified Buyer, Rewa	[this is the first time i've purchased iphone ...	[0.4715909090909091]	0.471591	Positive
			recently i switch from vivo to		[recently i switch from vivo			

#average_mean

 # The reviews are positive overall.iphone 128 GB

 # Plot the sentiment distribution

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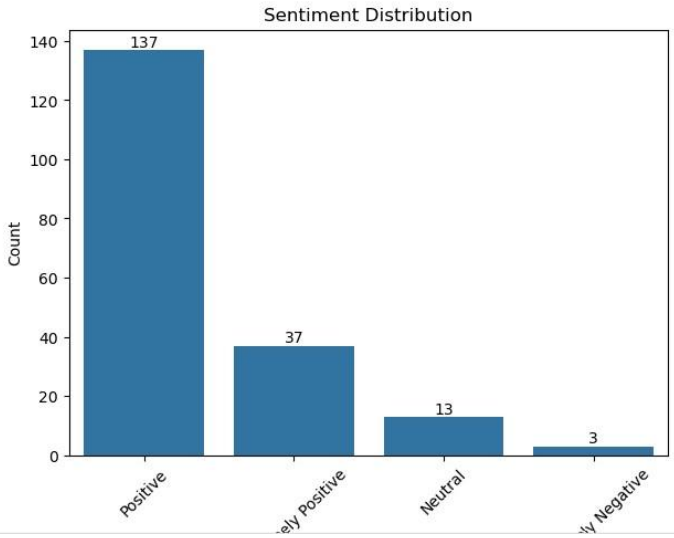
Code JupyterLab Python 3 (ipykernel)

```
[31]: #average_mean
      # The reviews are positive overall.iphone 128 GB
      df['Avg_Polarity'].mean()
```

```
[31]: 0.4776798274094327
```

```
[37]: # Plot the sentiment distribution
      plt.figure(figsize=(7, 5))
      ax=sns.countplot(x= df["Sentiment"])
      ax.bar_label(ax.containers[0])
      plt.title('Sentiment Distribution')
      plt.xlabel('Sentiment Category')
      plt.ylabel('Count')
      plt.xticks(rotation=45)
      plt.show()

      #Insight: This will give you a sense of whether reviews skew more positive or negative.
```



Sentiment Distribution: This bar graph represents the distribution of customer sentiments. The x-axis shows different sentiment categories: Extremely Positive, Positive, Neutral, Negative and Extremely Negative, while the y-axis indicates the count of each sentiment. Positive sentiments are the most frequent (137 counts), followed by Extremely Positive (37), Neutral (13), and Extremely Negative sentiment (3).

'Rating' column is numeric (in case it contains strings)

calculate the average rating

[43]:
```
# Ensure 'Rating' column is numeric (in case it contains strings)
df['Rating'] = pd.to_numeric(df['Rating'], errors='coerce')

# Now calculate the average rating
average_rating = df['Rating'].mean()

# Print result with 2 decimal places
print(f"Average Rating: {average_rating:.2f}")
```

```
Average Rating: 4.82
```

[44]:
```
average_rating_by_sentiment = df.groupby('Sentiment')['Rating'].mean().sort_values(ascending=False)
print(average_rating_by_sentiment)
```

```
Sentiment
Neutral               5.000000
Extremely Positive    4.945946
Positive              4.795620
Extremely Negative    3.666667
Name: Rating, dtype: float64
```

[47]:
```
plt.figure(figsize=(8,5))
sns.barplot(x=average_rating_by_sentiment.index, y=average_rating_by_sentiment.values, palette="viridis")
plt.title("Average Rating by Sentiment")
plt.ylabel("Average Rating")
plt.xlabel("Sentiment")
plt.xticks(rotation=45)
plt.ylim(0, 5)  # Ratings range from 0 to 5
plt.tight_layout()
plt.show()
```

```
C:\Users\Reshmi Bar\AppData\Local\Temp\ipykernel_32852\972868694.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

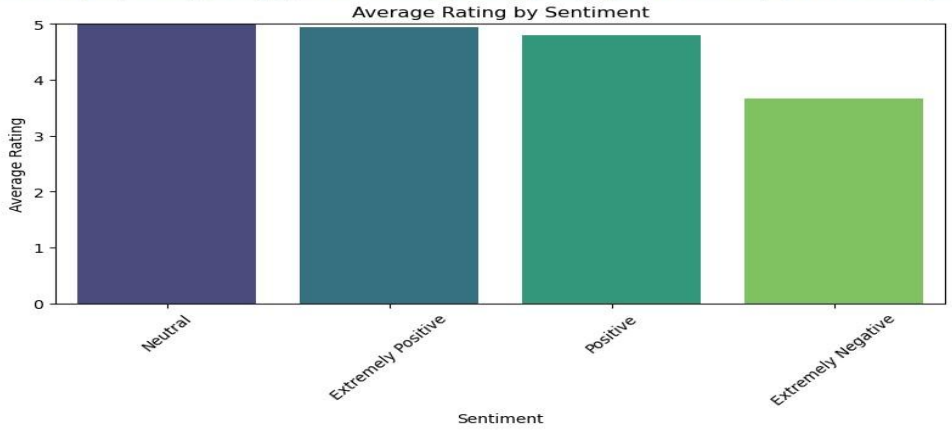
  sns.barplot(x=average_rating_by_sentiment.index, y=average_rating_by_sentiment.values, palette="viridis")
```

```
plt.xlabel("Sentiment")
plt.xticks(rotation=45)
plt.ylim(0, 5)  # Ratings range from 0 to 5
plt.tight_layout()
plt.show()
```

```
C:\Users\Reshmi Bar\AppData\Local\Temp\ipykernel_32852\972868694.py:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `lege
same effect.

  sns.barplot(x=average_rating_by_sentiment.index, y=average_rating_by_sentiment.values, palette="viridis")
```



[49]:
```
pip install wordcloud
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: wordcloud in c:\users\reshmi bar\appdata\roaming\python\python312\site-packages (1.9.4)
Note: you may need to restart the kernel to use updated packages.
```

[51]:
```
from wordcloud import WordCloud
import matplotlib.pyplot as plt

# Step 1: Normalize sentiment labels
df['Sentiment'] = df['Sentiment'].str.lower().str.strip()

# Step 2: Extract text safely
positive_text = ' '.join(df[df['Sentiment'] == 'positive']['Review'].dropna())
extremely_negative_text = ' '.join(df[df['Sentiment'] == 'extremely negative']['Review'].dropna())

# Step 3: Generate word clouds only if text is available
wordcloud_pos = WordCloud(width=800, height=400, background_color='white').generate(positive_text) if positive_text.strip() else None
wordcloud_neg = WordCloud(width=800, height=400, background_color='black', colormap='Reds').generate(extremely_negative_text) if extremely_negative_text.

# Step 4: Plot
plt.figure(figsize=(14, 6))

if wordcloud_pos:
    plt.subplot(1, 2, 1)
    plt.imshow(wordcloud_pos, interpolation='bilinear')
    plt.title('Positive Reviews Word Cloud')
    plt.axis('off')

if wordcloud_neg:
    plt.subplot(1, 2, 2)
    plt.imshow(wordcloud_neg, interpolation='bilinear')
    plt.title('Extremely Negative Reviews Word Cloud')
    plt.axis('off')

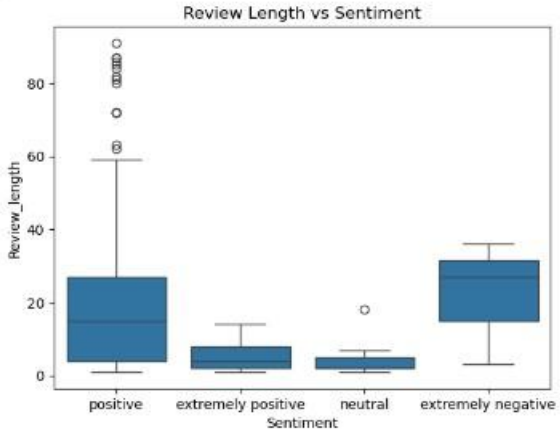
plt.tight_layout()
plt.show()
```

[54]:
```
#Review Length Analysis create a new column the number of words in review
df['Review_length'] = df['Review'].apply(lambda x: len(x.split()))
df.head(5)
```

[54]:

	Customer Names	Rating	Review	Region	Review 1	Polarity	Avg Polarity	Sentiment	Review length
0	Bijaya Mohanty	5	just go for it.amazing one.beautiful camera wi...	Certified Buyer, Baleshwar	[just go for it.amazing one.beautiful camera w...	[0.26666666666666666]	0.266667	positive	10
1	Rishabh Jha	5	awesome 🔥🔥😃	Certified Buyer, Tikamgarh	[awesome 🔥🔥😃]	[1.0]	1.000000	extremely positive	2
2	Ajin V	5	high quality camera💯	Certified Buyer, Balaghat	[high quality camera💯]	[0.16]	0.160000	positive	3
3	Mousam Guha Roy	4	very nice	Certified Buyer, Matialihat	[very nice]	[0.78]	0.780000	extremely positive	2
4	Nikhil Kumar	5	switch from oneplus to iphone i am stunned wit...	Certified Buyer, Meerut Division	[switch from oneplus to iphone i am stunned wi...	[0.0, 1.0]	0.500000	positive	17

[57]:
```
#Review Length Analysis
sns.boxplot(data=df, x='Sentiment', y='Review_length')
plt.title('Review Length vs Sentiment')
plt.xlabel('Sentiment')
plt.ylabel("Review_length")
plt.show()
```



[ ]:

Overall Conclusion:

The Apple iPhone 15 is well-received by users on Flipkart.

Sentiment analysis aligns with numerical ratings, reinforcing the reliability of the review data.

This approach can be extended to other products for automated review monitoring, market analysis, and reputation management.