```
# Import the required libraries
import requests
import time
import pandas as pd
from bs4 import BeautifulSoup
from selenium import webdriver
from selenium.webdriver.common.by import By
from selenium.webdriver.common.keys import Keys

# Create empty lists to store the user data such as Name, City, Date
of Purchase, Review & Rating
Names = []
Cities = []
Dates = []
Reviews = []
Ratings = []

# url of the flipkart website to scrape data
url = """https://www.flipkart.com/apple-iphone-15-blue-128-gb/product-
reviews/itmbf14ef54f645d?
pid=MOBGTAGPAQNVFZZY&lid=LSTMOBGTAGPAQNVFZZYQRLPCQ&marketplace=FLIPKAR
T"""
driver = webdriver.Chrome()
driver.get(url)


while len(Names) < 320:

    time.sleep(2)
    soup = BeautifulSoup(driver.page_source, "html.parser")

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

    # Extract cities
    city_elements = soup.find_all("p", {"class": "MztJPv"})
    for city in city_elements:
        Cities.append(city.text)

    # Extract dates
    dates_elements = soup.find_all("p", {"class": "_2NsDsF"})
    for date in dates_elements:
        Dates.append(date.text)
    Actual_Dates = Dates[1::2]

    # Extract reviews
    reviews_elements = soup.find_all("div", {"class": "ZmyHeo"})
    for review in reviews_elements:
```

```
        Reviews.append(review.text)

    # Extract ratings
    ratings_elements = soup.find_all("div", class_ = "XQDdHH Ga3i8K")
    for ratings in ratings_elements:
        Ratings.append(ratings.text)

    # Try to click the "Next" button
    try:
        next_button = driver.find_element(By.XPATH,
"//span[text()='Next']")
        next_button.click()
        time.sleep(5)
    except:
        break

# Combine data into a DataFrame
df = pd.DataFrame({
    "Name": Names[:-1],
    "City": Cities[:-1],
    "Date": Actual_Dates[:-1],
    "Review": Reviews[:-1],
    "Ratings": Ratings
})

# Check the basic information
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 323 entries, 0 to 322
Data columns (total 5 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   Name     323 non-null    object
 1   City     323 non-null    object
 2   Date     323 non-null    object
 3   Review   323 non-null    object
 4   Ratings  323 non-null    int64
dtypes: int64(1), object(4)
memory usage: 12.7+ KB
```

```
# Delete the duplicates from the dataframe
df1 = df.copy()
df1 = df1.drop_duplicates()
df1
```

```
                Name                                  City
Date  \
0        Akshay Meena             Certified Buyer, Jaipur      Nov,
2023
1    Mousam  Guha Roy         Certified Buyer, Matialihat      Oct,
```

```
2023
2      bijaya mohanty          Certified Buyer, Baleshwar   6 months
ago
3     Prithivi Boruah            Certified Buyer, Bokajan      Oct,
2023
4              Ajin V           Certified Buyer, Balaghat      Oct,
2023
..                ...                                  ...             .
..
317      aditya verma         Certified Buyer, Khairagarh  10 months
ago
319      Devjyoti Das             Certified Buyer, Dhubri  10 months
ago
320  manish choudhary             Certified Buyer, Udaipur  11 months
ago
321      Rahul  Saini      Certified Buyer, Gangapur City  11 months
ago
322       Prashanth r  Certified Buyer, Chittoor District  11 months
ago

                                                  Review  Ratings
0    So beautiful, so elegant, just a vowww😍❤READ ...         5
1                                 Very niceREAD MORE         4
2    Just go for it.Amazing one.Beautiful camera wi...         5
3        Camera Quality Is Improved Loving ItREAD MORE         5
4                      High quality camera😍READ MORE          5
..                                                  ...       ...
317         Most value for money iPhone ever.READ MORE         5
319  Amazing phone just no words to say...just one ...         5
320  I was sceptical at first about moving form an ...         5
321                               Loved itREAD MORE         5
322                         Awesome picturesREAD MORE         5

[304 rows x 5 columns]
```

```
# Convert the Name column data to Title Case
df1['Name'] = df1['Name'].str.title()
df1.head()
```

```
               Name                           City          Date  \
0      Akshay Meena      Certified Buyer, Jaipur     Nov, 2023
1  Mousam  Guha Roy  Certified Buyer, Matialihat     Oct, 2023
2    Bijaya Mohanty   Certified Buyer, Baleshwar  6 months ago
3   Prithivi Boruah     Certified Buyer, Bokajan     Oct, 2023
4            Ajin V    Certified Buyer, Balaghat     Oct, 2023

                                             Review  Ratings
0  So beautiful, so elegant, just a vowww😍❤READ ...         5
1                               Very niceREAD MORE         4
2  Just go for it.Amazing one.Beautiful camera wi...         5
```

```
3      Camera Quality Is Improved Loving ItREAD MORE        5
4                      High quality camera😍READ MORE        5
```

```
# Cleaning the data of city column by removing unnecessary data
df1['City'] = df1['City'].str.replace("Certified Buyer, ", "",
regex=False).str.strip()
df1.head()
```

```
                Name        City          Date  \
0      Akshay Meena      Jaipur     Nov, 2023
1  Mousam  Guha Roy  Matialihat     Oct, 2023
2    Bijaya Mohanty   Baleshwar  6 months ago
3   Prithivi Boruah     Bokajan     Oct, 2023
4            Ajin V    Balaghat     Oct, 2023

                                              Review  Ratings
0  So beautiful, so elegant, just a vowww😍❤READ ...        5
1                                Very niceREAD MORE        4
2  Just go for it.Amazing one.Beautiful camera wi...        5
3      Camera Quality Is Improved Loving ItREAD MORE        5
4                      High quality camera😍READ MORE        5
```

```
# Cleaning data of Review column by removing unnecessary data &
converting to lowercase
df1['Review'] = df1['Review'].str.lower().str.replace("read more", "",
regex=False)
df1head()
```

```
                Name        City          Date  \
0      Akshay Meena      Jaipur     Nov, 2023
1  Mousam  Guha Roy  Matialihat     Oct, 2023
2    Bijaya Mohanty   Baleshwar  6 months ago
3   Prithivi Boruah     Bokajan     Oct, 2023
4            Ajin V    Balaghat     Oct, 2023

                                              Review  Ratings
0          so beautiful, so elegant, just a vowww😍❤        5
1                                          very nice        4
2  just go for it.amazing one.beautiful camera wi...        5
3              camera quality is improved loving it        5
4                             high quality camera😍        5
```

```
# Import libraries for Sentimental analysis of review sentences
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import sent_tokenize
from nltk.tokenize import word_tokenize
from textblob import TextBlob
import string

nltk.download('stopwords')
```

```
nltk.download('punkt')
nltk.download('wordnet')
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\ethen\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\ethen\AppData\Roaming\nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package wordnet to
[nltk_data]     C:\Users\ethen\AppData\Roaming\nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
```

```
True
```

```
# Create a column called Reviews_t that stores tokenized sentences
from the Review column using the sent_tokenize function.
df1["Reviews_t"] = df1['Review'].apply(sent_tokenize)
df1
```

```
                  Name               City           Date  \
0        Akshay Meena             Jaipur      Nov, 2023
1    Mousam  Guha Roy         Matialihat      Oct, 2023
2      Bijaya Mohanty          Baleshwar   6 months ago
3     Prithivi Boruah            Bokajan      Oct, 2023
4               Ajin V           Balaghat      Oct, 2023
..                 ...                ...            ...
317      Aditya Verma         Khairagarh  10 months ago
319      Devjyoti Das             Dhubri  10 months ago
320  Manish Choudhary            Udaipur  11 months ago
321      Rahul  Saini      Gangapur City  11 months ago
322       Prashanth R  Chittoor District  11 months ago

                                                Review  Ratings  \
0            so beautiful, so elegant, just a vowww😍❤        5
1                                            very nice        4
2    just go for it.amazing one.beautiful camera wi...        5
3                camera quality is improved loving it        5
4                                 high quality camera😍        5
..                                                 ...      ...
317                 most value for money iphone ever.        5
319  amazing phone just no words to say...just one ...        5
320  i was sceptical at first about moving form an ...        5
321                                          loved it        5
322                                   awesome pictures        5

                                          Reviews_t
0          [so beautiful, so elegant, just a vowww😍❤]
1                                        [very nice]
2    [just go for it.amazing one.beautiful camera w...
```

```
3               [camera quality is improved loving it]
4                             [high quality camera😍]
..                                                ...
317               [most value for money iphone ever.]
319  [amazing phone just no words to say...just one...
320  [i was sceptical at first about moving form an...
321                                        [loved it]
322                                [awesome pictures]

[304 rows x 6 columns]
```

```
# Import mean from statistics
from statistics import mean

# Function created for assigning Polarity to the Reviews_t column
def get_polarity(sentences):
    return [TextBlob(sentence).sentiment.polarity for sentence in
sentences]

# Apply the get_polarity function to the Reviews_t column to calculate
and assign polarity values
df1['Polarity'] = df1['Reviews_t'].apply(get_polarity)

#  function is designed to compute the average polarity of each review
by calculating the mean polarity of all sentences within the review
def calculate_average_polarity(polarities):
    return mean(polarities) if polarities else 0

# Calculates and shows the overall average polarity score for all the
reviews in the dataset
df1['Average_Polarity'] =
df1['Polarity'].apply(calculate_average_polarity)
df1['Average_Polarity'] = df1['Average_Polarity'].round(2)
df1.head(10)
```

```
                    Name             City           Date  \
0           Akshay Meena           Jaipur      Nov, 2023
1       Mousam  Guha Roy       Matialihat      Oct, 2023
2         Bijaya Mohanty        Baleshwar   6 months ago
3        Prithivi Boruah          Bokajan      Oct, 2023
4                Ajin V         Balaghat      Oct, 2023
5  Sheetla Prasad Maurya        Sultanpur      Oct, 2023
6         Kriti Customer        Sarkaghat  10 months ago
7      Flipkart Customer           Aizawl  10 months ago
8           Nikhil Kumar  Meerut Division  10 months ago
9           Rahul Shedge           Satara      Oct, 2023

                                          Review  Ratings  \
0         so beautiful, so elegant, just a vowww😍❤        5
1                                     very nice        4
```

```
2  just go for it.amazing one.beautiful camera wi...         5
3               camera quality is improved loving it         5
4                                 high quality camera😍        5
5  best mobile phonecamera quality is very nice b...         4
6  just loved the product , colour , design is wo...         5
7  awesome photography experience. battery backup...         5
8  switch from oneplus to iphone i am stunned wit...         5
9  totally happy!camera 5battery 5 display 5design 5         5

                                                 Reviews_t
Polarity  \
0        [so beautiful, so elegant, just a vowww😍❤]
[0.675]
1                                           [very nice]
[0.78]
2  [just go for it.amazing one.beautiful camera w...
[0.26666666666666666]
3             [camera quality is improved loving it]
[0.6]
4                               [high quality camera😍]
[0.16]
5  [best mobile phonecamera quality is very nice ...
[0.738]
6  [just loved the product , colour , design is w...
[0.4125]
7  [awesome photography experience., battery back...         [1.0, 0.7,
0.5]
8  [switch from oneplus to iphone i am stunned wi...              [0.0,
1.0]
9  [totally happy!camera 5battery 5 display 5desi...
[0.0]

   Average_Polarity
0              0.68
1              0.78
2              0.27
3              0.60
4              0.16
5              0.74
6              0.41
7              0.73
8              0.50
9              0.00
```

```python
# Function to assign the Class to the Polarity
def sentiment_class(polarity):
    if polarity > 0.75:
        return 'extremely positive'
    elif 0 < polarity <= 0.75:
        return 'positive'
```

```
    elif polarity == 0:
        return 'neutral'
    elif -0.75 <= polarity < 0:
        return 'negative'
    else:
        return 'extremely negative'

# Calls sentiment_class function on the Average_Polarit column to
assign the sentiment class
df1['Sentiment_Class'] =
df1['Average_Polarity'].apply(sentiment_class)

df1.head()
```

```
                Name        City          Date  \
0      Akshay Meena      Jaipur     Nov, 2023
1  Mousam  Guha Roy  Matialihat     Oct, 2023
2    Bijaya Mohanty   Baleshwar  6 months ago
3   Prithivi Boruah     Bokajan     Oct, 2023
4            Ajin V    Balaghat     Oct, 2023

                                              Review  Ratings  \
0          so beautiful, so elegant, just a vowww😍❤         5
1                                          very nice         4
2  just go for it.amazing one.beautiful camera wi...         5
3               camera quality is improved loving it         5
4                               high quality camera😍          5

                                             Reviews_t
Polarity  \
0        [so beautiful, so elegant, just a vowww😍❤]
[0.675]
1                                          [very nice]
[0.78]
2  [just go for it.amazing one.beautiful camera w...
[0.26666666666666666]
3            [camera quality is improved loving it]
[0.6]
4                              [high quality camera😍]
[0.16]

   Average_Polarity     Sentiment_Class
0              0.68            positive
1              0.78  extremely positive
2              0.27            positive
3              0.60            positive
4              0.16            positive
```

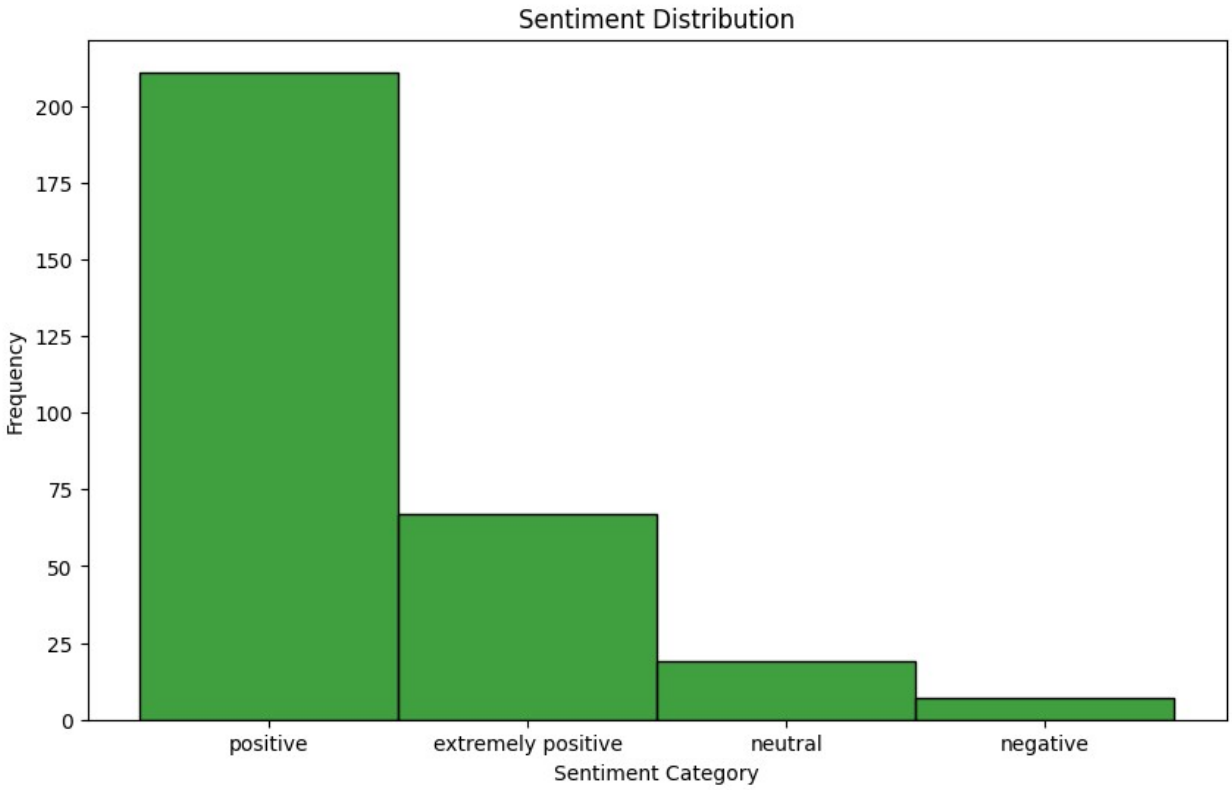
```
# Calculates and prints the overall average polarity score of the
entire dataset of reviews
```

```
polarity_score = df1['Average_Polarity'].mean().round(2)
print(f'Average Polarity Score : {polarity_score}')
if polarity_score > 0.75:
        print('The Average Polarity Score is Extremely Positive')
elif 0 < polarity_score <= 0.75:
    print('The Average Polarity Score is Positive')
elif polarity_score == 0:
    print('The Average Polarity Score is Neutral')
elif -0.75 <= polarity_score < 0:
    print('The Average Polarity Score is Negative')
else:
    print('The Average Polarity Score is Extremely Negative')
```

```
Average Polarity Score : 0.52
The Average Polarity Score is Positive
```

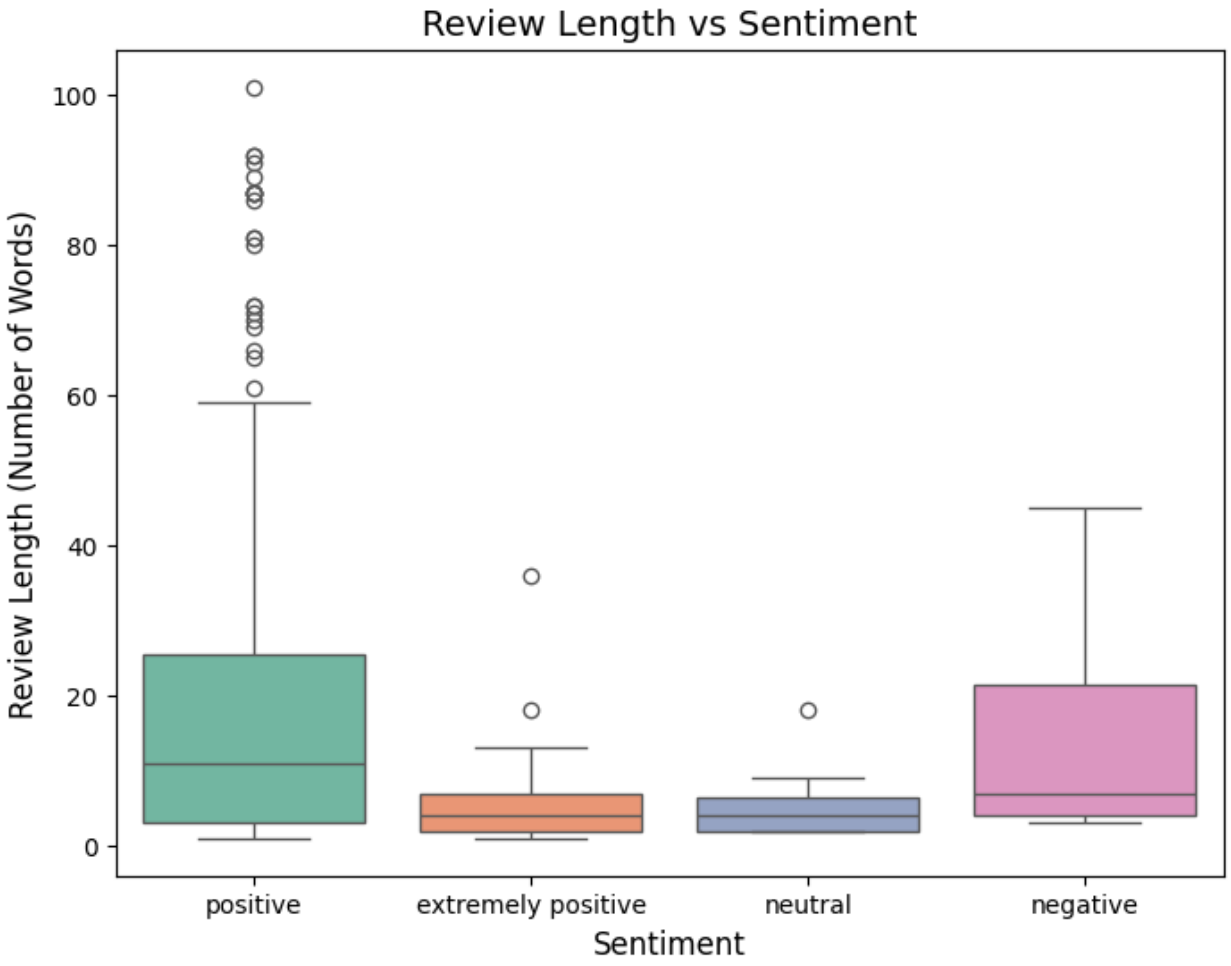
```
# Imports libraries for visualisation
import matplotlib.pyplot as plt
import seaborn as sns

# Plots figure for Sentiment Distribution based on Sentiment Category
plt.figure(figsize=(10, 6))
sns.histplot(x=new_df1.Sentiment_Class, color='green')
plt.title('Sentiment Distribution')
plt.xlabel('Sentiment Category')
plt.ylabel('Frequency')
plt.xticks(rotation=0)
plt.show()
```

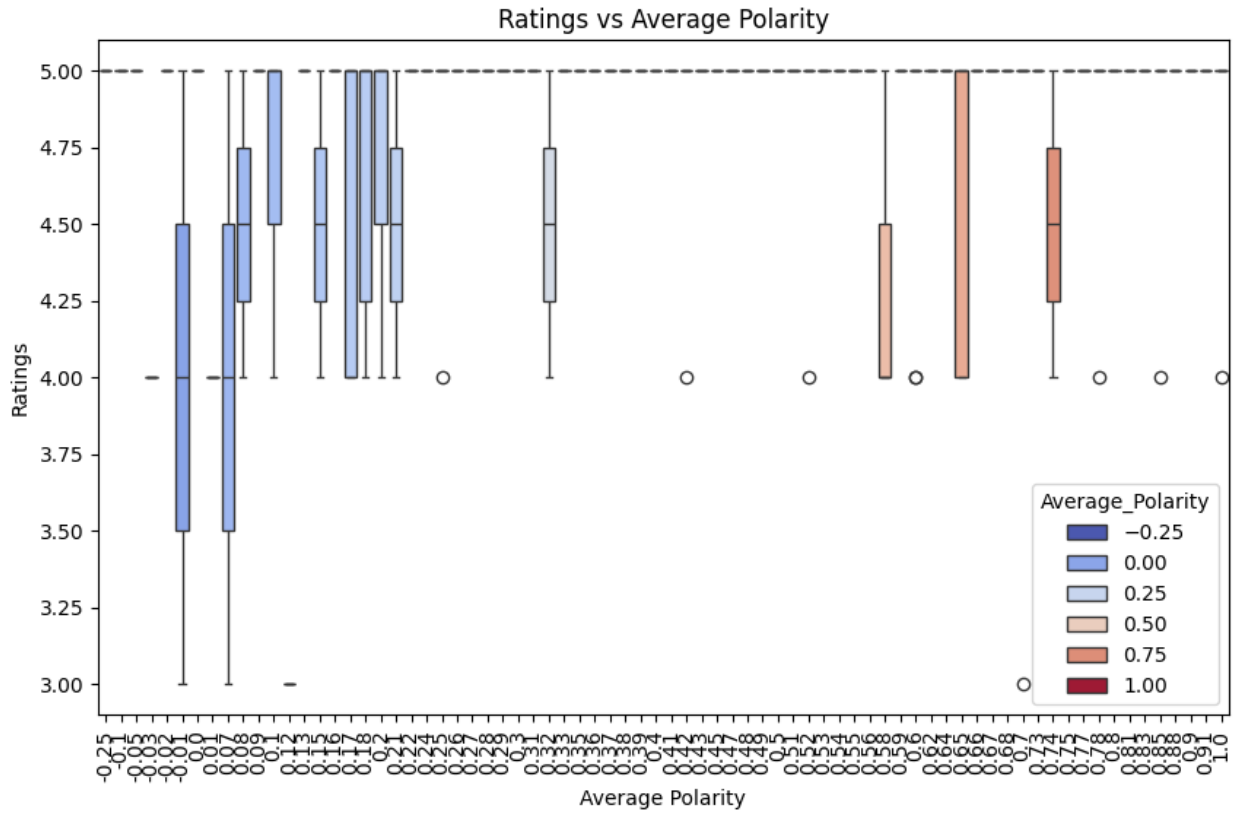



```
df1['Review_Length'] = df1['Review'].apply(lambda x: len(x.split()))

# Box Plot for Review Length by Sentiment
plt.figure(figsize=(8, 6))
sns.boxplot(x='Sentiment_Class', y='Review_Length', data=df1, hue =
'Sentiment_Class', palette='Set2')
plt.title('Review Length vs Sentiment', fontsize=14)
plt.xlabel('Sentiment', fontsize=12)
plt.ylabel('Review Length (Number of Words)', fontsize=12)
plt.show()
```




```
# Plotting ratings vs average polarity
plt.figure(figsize=(10, 6))
sns.boxplot(x='Average_Polarity', y='Ratings', data = df1, hue =
'Average_Polarity', palette='coolwarm')
plt.title('Ratings vs Average Polarity')
plt.xlabel('Average Polarity')
plt.ylabel('Ratings')
plt.xticks(rotation=90)
plt.show()
```


Ratings vs Average Polarity
Ratings
5.00
4.75
4.50
4.25
4.00
3.75
3.50
3.25
3.00
Average Polarity
Average_Polarity
−0.25
0.00
0.25
0.50
0.75
1.00