Customer Sentimental Analysis - Iphone 15 128gb

Objective:

As a Data Analyst at Flipkart, analyze customer sentiment towards the iPhone 15 128GB model by evaluating reviews using sentiment analysis. The goal is to gain insights into public perception, identify product strengths and weaknesses, and support decision-making.

Libraries and Tools: • **Selenium:** Web scraping automation. • **BeautifulSoup:** HTML parsing. • **Pandas:** Data cleaning and analysis. • **TextBlob:** Sentiment analysis. • **Matplotlib/Seaborn:** Data visualization.

1. Data Collection (Web Scraping):

- **Tools:** Selenium, BeautifulSoup
- **Steps:**

```
  – Use Selenium to scrape at least 300 reviews from Flipkart's
iPhone 15 128GB
    product page.
  – Extract __Username, Rating,__ and __Review Text.__
  – Handle pagination to collect reviews from multiple pages.
```

```
# Import the necessary 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 = []

# Assign the url of the flipkart website and use selenium to scrape
```

```
data
url= """https://www.flipkart.com/apple-iphone-15-blue-128-gb/product-
reviews/itmbf14ef54f645d?pid=MOBGTAGPAQNVFZZY&lid
=LSTMOBGTAGPAQNVFZZYQRLPCQ&marketplace=FLIPKART"""


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
 })
```

2. Data Cleaning and Preprocessing:

- Tool: Pandas
- Steps:–Remove duplicates and handle missing values.–Text Preprocessing:
- Convert text to lowercase, remove special characters, and extra spaces.
- Tokenize text, remove stop words, and apply lemmatization.

```
# Check the basic info of the dataframe
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 319 entries, 0 to 318
Data columns (total 5 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   Name     319 non-null    object
 1   City     319 non-null    object
 2   Date     319 non-null    object
 3   Review   319 non-null    object
 4   Ratings  319 non-null    object
dtypes: object(5)
memory usage: 12.6+ KB
```

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

```
                    Name                                  City
Date  \
0      CHETAN  TILWALIA              Certified Buyer, Loni  10 months
ago
1                 Ajin V          Certified Buyer, Balaghat      Oct,
2023
2       Mousam  Guha Roy        Certified Buyer, Matialihat      Oct,
2023
3        Prithivi Boruah           Certified Buyer, Bokajan      Oct,
2023
4           Nikhil Kumar   Certified Buyer, Meerut Division      Jan,
```

```
2024
..                    ...                                   ...
...
314  Rohit Kumar Mishra   Certified Buyer, Jodhpur District      Jan,
2024
315        Ajith Perumal      Certified Buyer, Mamallapuram      Feb,
2024
316       Akshat Dwivedi         Certified Buyer, New Delhi      Feb,
2024
317      Leo Jonas Doyom        Certified Buyer, Naharlagun      Feb,
2024
318             Ritu Raj             Certified Buyer, Hisua      Feb,
2024

                                                 Review Ratings
0                                    Nice READ MORE       5
1                        High quality camera😍READ MORE       5
2                                   Very niceREAD MORE       4
3        Camera Quality Is Improved Loving ItREAD MORE       5
4    Switch from OnePlus to iPhone I am stunned wit...       5
..                                                 ...     ...
314                              Nice iPhoneREAD MORE       5
315                  This phone has comfy feelREAD MORE       5
316  Pros of iPhone 15:1. Best camera in the segmen...       5
317  Great device The 60hz is not a big deal like t...       5
318                            Best product...READ MORE       5

[303 rows x 5 columns]
```

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

```
                Name                                 City           Date
\
0  Chetan  Tilwalia              Certified Buyer, Loni  10 months ago

1             Ajin V         Certified Buyer, Balaghat      Oct, 2023

2   Mousam  Guha Roy       Certified Buyer, Matialihat      Oct, 2023

3    Prithivi Boruah          Certified Buyer, Bokajan      Oct, 2023

4       Nikhil Kumar  Certified Buyer, Meerut Division      Jan, 2024


                                             Review Ratings
0                                Nice READ MORE       5
1                    High quality camera😍READ MORE       5
2                               Very niceREAD MORE       4
```

```
3      Camera Quality Is Improved Loving ItREAD MORE       5
4  Switch from OnePlus to iPhone I am stunned wit...       5
```

```
# Clean data of City column by removing unwanted characters/ part of
string
df1['City'] = df1['City'].str.replace("Certified Buyer, ", "",
regex=False).str.strip()
df1.head()
```

```
                Name             City           Date  \
0  Chetan  Tilwalia              Loni  10 months ago
1            Ajin V         Balaghat      Oct, 2023
2   Mousam  Guha Roy       Matialihat      Oct, 2023
3    Prithivi Boruah          Bokajan      Oct, 2023
4       Nikhil Kumar  Meerut Division      Jan, 2024

                                          Review Ratings
0                                Nice READ MORE       5
1                     High quality camera😍READ MORE       5
2                                Very niceREAD MORE       4
3      Camera Quality Is Improved Loving ItREAD MORE       5
4  Switch from OnePlus to iPhone I am stunned wit...       5
```

```
# Clean data of Review column by removing unwanted characters/ part of
string and converting to lowercase
df1['Review'] = df1['Review'].str.lower().str.replace("read more", "",

regex=False)
df1.head()
```

```
                Name             City           Date  \
0  Chetan  Tilwalia              Loni  10 months ago
1            Ajin V         Balaghat      Oct, 2023
2   Mousam  Guha Roy       Matialihat      Oct, 2023
3    Prithivi Boruah          Bokajan      Oct, 2023
4       Nikhil Kumar  Meerut Division      Jan, 2024

                                        Review Ratings
0                                        nice       5
1                             high quality camera😍       5
2                                        very nice       4
3                camera quality is improved loving it       5
4  switch from oneplus to iphone i am stunned wit...       5
```

3. Sentiment Analysis:

- Tool: TextBlob
- Steps:

```
– Analyze sentiment using TextBlob’s polarity score (-1 to +1).
– Classify sentiment:
    - Positive: Polarity ≥ 0.1
    - Negative: Polarity < 0.1
– Store sentiment classification in the dataset.
```

```
# 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')


# 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
```

```
[nltk_data] Downloading package stopwords to C:\Users\RAHUL
[nltk_data]     NAGRA\AppData\Roaming\nltk_data...
[nltk_data]   Unzipping corpora\stopwords.zip.
[nltk_data] Downloading package punkt to C:\Users\RAHUL
[nltk_data]     NAGRA\AppData\Roaming\nltk_data...
[nltk_data]   Unzipping tokenizers\punkt.zip.
[nltk_data] Downloading package wordnet to C:\Users\RAHUL
[nltk_data]     NAGRA\AppData\Roaming\nltk_data...
```

```
                    Name              City           Date  \
0      Chetan  Tilwalia              Loni  10 months ago
1                 Ajin V          Balaghat      Oct, 2023
2       Mousam  Guha Roy        Matialihat      Oct, 2023
3        Prithivi Boruah           Bokajan      Oct, 2023
4           Nikhil Kumar   Meerut Division      Jan, 2024
..                    ...               ...            ...
314  Rohit Kumar Mishra   Jodhpur District      Jan, 2024
315        Ajith Perumal      Mamallapuram      Feb, 2024
316       Akshat Dwivedi         New Delhi      Feb, 2024
317      Leo Jonas Doyom        Naharlagun      Feb, 2024
318             Ritu Raj             Hisua      Feb, 2024

                                          Review Ratings  \
0                                          nice        5
1                            high quality camera😍       5
2                                      very nice       4
```

```
3                  camera quality is improved loving it       5
4    switch from oneplus to iphone i am stunned wit...       5
..                                                 ...     ...
314                                        nice iphone       5
315                          this phone has comfy feel       5
316  pros of iphone 15:1. best camera in the segmen...       5
317  great device the 60hz is not a big deal like t...       5
318                                     best product...       5

                                             Reviews_t
0                                             [nice ]
1                                [high quality camera]
2                                            [very nice]
3                [camera quality is improved loving it]
4    [switch from oneplus to iphone i am stunned wi...
..                                                 ...
314                                      [nice iphone]
315                          [this phone has comfy feel]
316  [pros of iphone 15:1. best camera in the segme...
317  [great device the 60hz is not a big deal like ...
318                                   [best product...]

[303 rows x 6 columns]
```

```
# Import mean from statistics for basic 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]

# Calls get_polarity function on the Reviews_t column to assign
polarity
df1['Polarity'] = df1['Reviews_t'].apply(get_polarity)

# Function created to calculate the average polarity of each review
(Average of polarity for each sentences in a review)
def calculate_average_polarity(polarities):
    return mean(polarities) if polarities else 0

# Calls calculate_average_polarity function on the Polarity column to
assign the average polarity for each review
df1['Average_Polarity'] =
df1['Polarity'].apply(calculate_average_polarity)
df1['Average_Polarity'] = df1['Average_Polarity'].round(2)
df1.head(10)
```

```
                    Name             City           Date  \
0      Chetan  Tilwalia              Loni  10 months ago
```

```
1                 Ajin V         Balaghat      Oct, 2023
2       Mousam  Guha Roy       Matialihat      Oct, 2023
3        Prithivi Boruah          Bokajan      Oct, 2023
4           Nikhil Kumar  Meerut Division      Jan, 2024
5         Bijaya Mohanty        Baleshwar   9 months ago
6      Flipkart Customer           Aizawl      Jan, 2024
7  Sheetla Prasad Maurya        Sultanpur      Oct, 2023
8      Flipkart Customer         Agartala  10 months ago
9     Arunji Govindaraju          Chennai      Feb, 2024

                                                Review Ratings  \
0                                               nice □       5
1                                high quality camera😍       5
2                                             very nice       4
3                  camera quality is improved loving it       5
4  switch from oneplus to iphone i am stunned wit...       5
5  just go for it.amazing one.beautiful camera wi...       5
6  awesome photography experience. battery backup...       5
7  best mobile phonecamera quality is very nice b...       4
8  using this iphone 15 from 1month and it has be...       5
9  awesome product very happy to hold this. bette...       5

                                             Reviews_t  \
0                                            [nice □]
1                               [high quality camera😍]
2                                           [very nice]
3              [camera quality is improved loving it]
4  [switch from oneplus to iphone i am stunned wi...
5  [just go for it.amazing one.beautiful camera w...
6  [awesome photography experience., battery back...
7  [best mobile phonecamera quality is very nice ...
8  [using this iphone 15 from 1month and it has b...
9  [awesome product very happy to hold this., bet...

                          Polarity  Average_Polarity
0                            [0.6]              0.60
1                           [0.16]              0.16
2                           [0.78]              0.78
3                            [0.6]              0.60
4                       [0.0, 1.0]              0.50
5            [0.26666666666666666]              0.27
6                  [1.0, 0.7, 0.5]              0.73
7                           [0.738]              0.74
8                             [1.0]              1.00
9  [1.0, 0.5, 0.45555555555555555]              0.65
```

```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  Chetan  Tilwalia             Loni  10 months ago
1            Ajin V        Balaghat      Oct, 2023
2   Mousam  Guha Roy      Matialihat      Oct, 2023
3    Prithivi Boruah         Bokajan      Oct, 2023
4       Nikhil Kumar  Meerut Division      Jan, 2024

                                              Review Ratings  \
0                                              nice □       5
1                                high quality camera😍       5
2                                          very nice        4
3                 camera quality is improved loving it       5
4  switch from oneplus to iphone i am stunned wit...       5

                                            Reviews_t    Polarity  \
0                                           [nice □]       [0.6]
1                               [high quality camera😍]      [0.16]
2                                         [very nice]      [0.78]
3                 [camera quality is improved loving it]       [0.6]
4  [switch from oneplus to iphone i am stunned wi...  [0.0, 1.0]

   Average_Polarity     Sentiment_Class  Review_Length
0              0.60            positive              2
1              0.16            positive              3
2              0.78  extremely positive              2
3              0.60            positive              6
4              0.50            positive             17
```

```
# 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 : 0.51
The Average Polarity Score is Positive
```

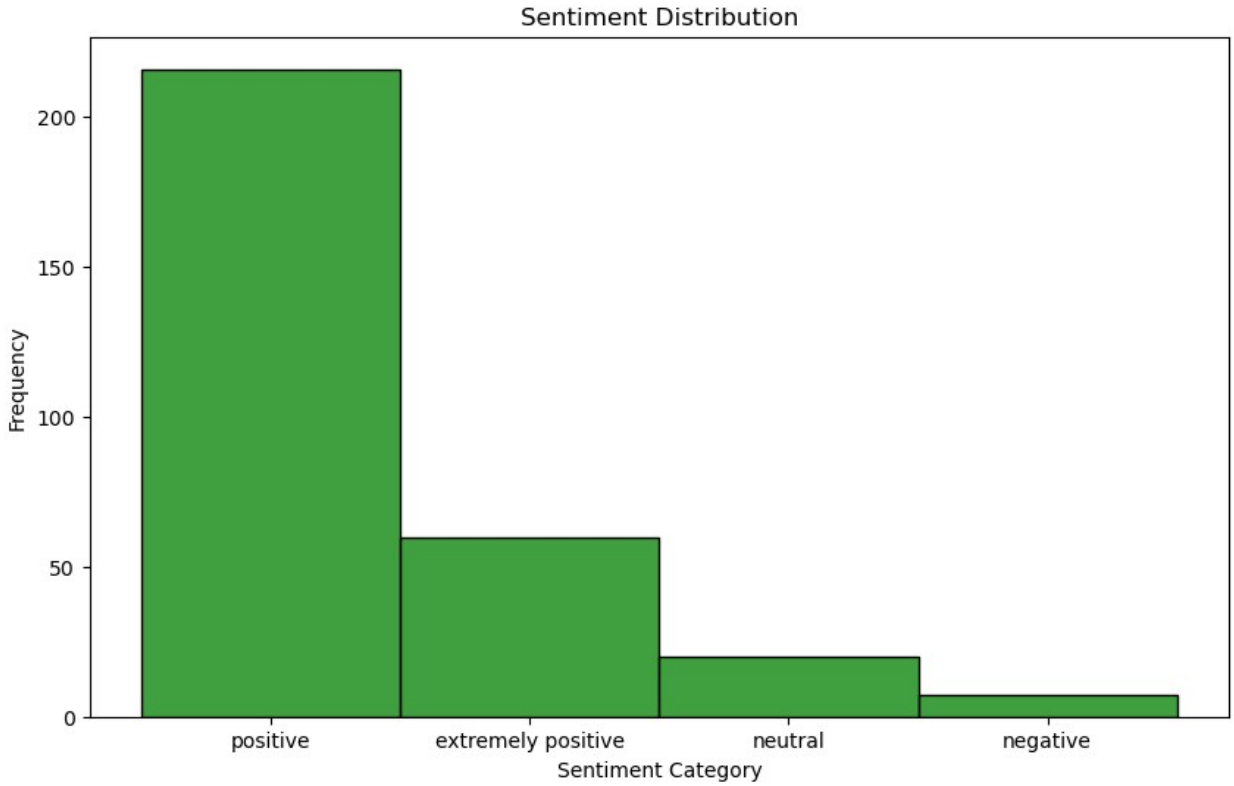
4. Data Analysis and Insights:

- Tools: Pandas, Matplotlib/Seaborn
- Steps:

```
 – Sentiment Distribution: Calculate positive and negative
sentiment proportions.
 – Average Rating vs Sentiment: Analyze correlation between
numeric ratings (1-5 stars) and sentiment.
 – Word Cloud: Generate a word cloud for frequently mentioned
words in positive/negative reviews.
 – Review Length Analysis: Investigate the relationship between
review length and sentiment.
```

```
# 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=df1.Sentiment_Class, color='green')
plt.title('Sentiment Distribution')
plt.xlabel('Sentiment Category')
plt.ylabel('Frequency')
plt.xticks(rotation=0)
plt.show()
```



Sentiment Distribution

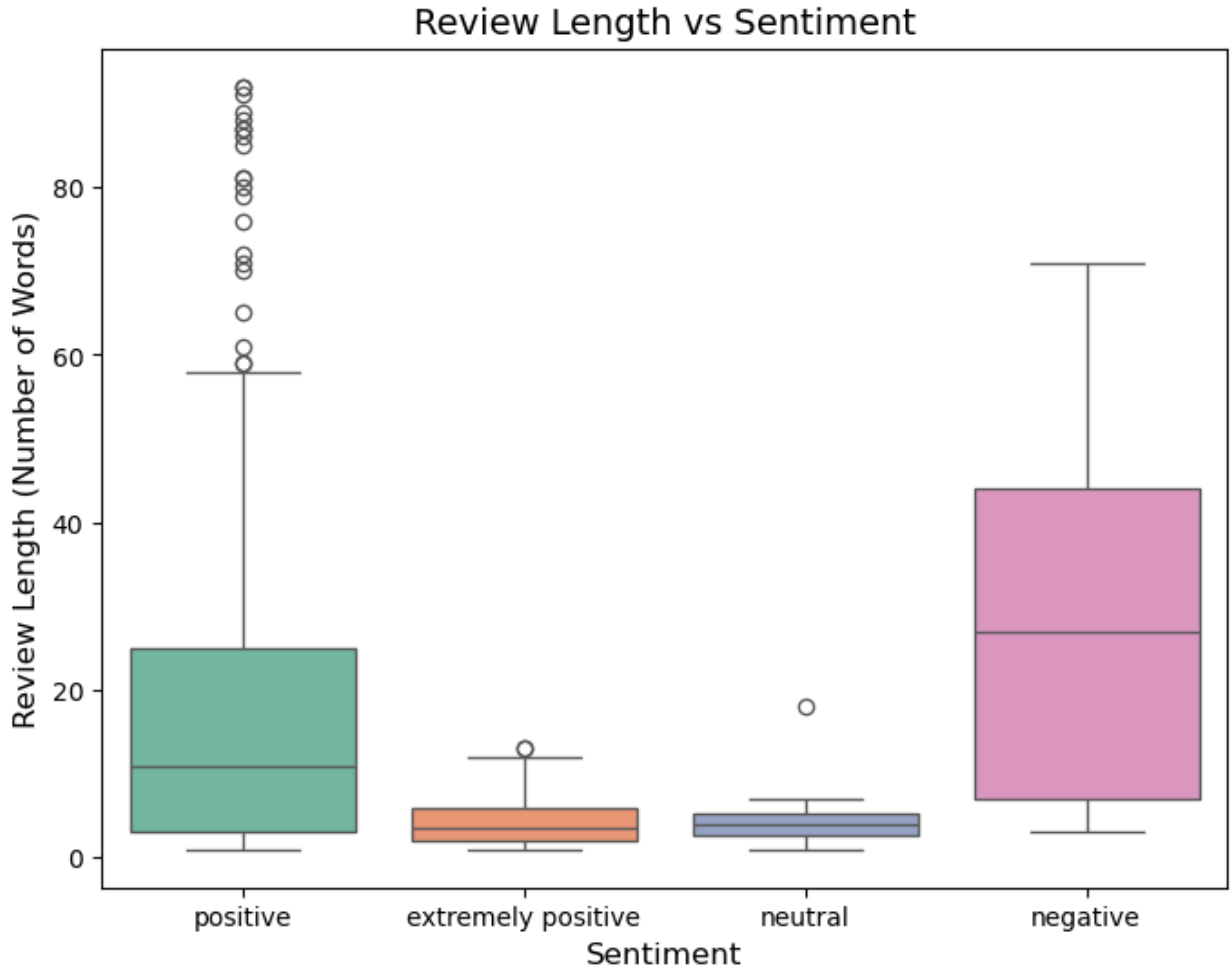
The bar chart visualizes the distribution of sentiment categories in the dataset. The x-axis represents various sentiment categories, and the y-axis shows the frequency of occurrences in each category. The categories are as follows:

1. Positive: The most frequent sentiment, with over 200 instances.
2. Extremely Positive: This category follows, though it appears much less frequently than "Positive".
3. Neutral: Appears less often than both positive categories.
4. Negative: The least frequent sentiment in the dataset.

The chart clearly demonstrates a strong inclination towards positive sentiments, with "Positive" being the predominant category, followed by "Extremely Positive". Both neutral and negative sentiments occur much less frequently

```
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()
```



Review Length Vs Sentiment

Correlation:

```
      • Reviews with more positive sentiment tend to align with
higher ratings (e.g., 4.5–5
        stars), as demonstrated by the clustering and color gradient.
```

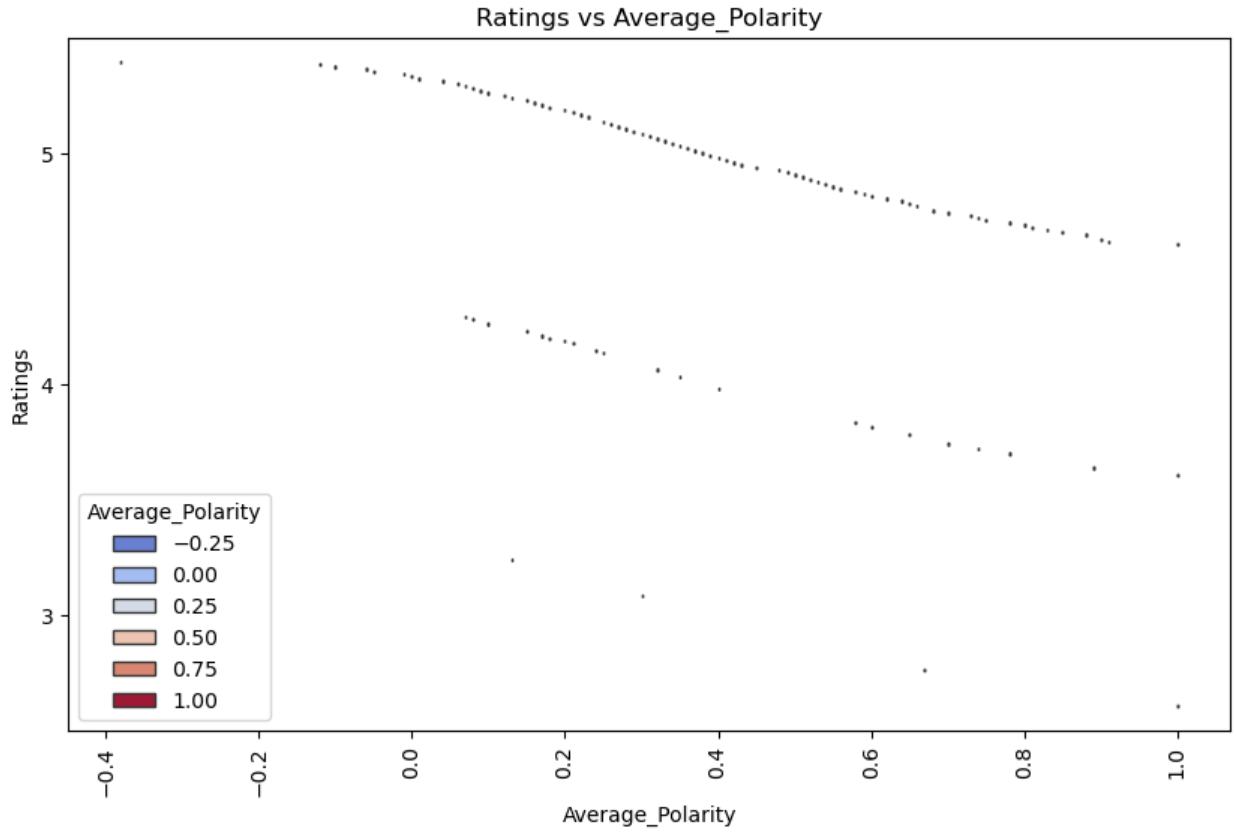
Neutral Reviews:

```
     • Neutral reviews are spread across various ratings, suggesting
that sentiment does not
       always align with the assigned star rating.
```

Negative Reviews:

```
     • Negative and extremely negative reviews typically receive lower
ratings, but they can
       still vary due to individual reviewer perspectives and
subjective interpretation.

# 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:

Positive Sentiment:

```
    • Shows the widest variation in review length, with a few notable
outliers.
    • The median review length is higher than that of other sentiment
categories.
```

Extremely Positive Sentiment:

```
    • Has the shortest overall review lengths, with a tighter
distribution and fewer outliers.
```

Neutral Sentiment:

```
    • Displays a narrower range of review lengths, similar to the
"Extremely Positive"
      sentiment group.
```

Negative Sentiment:

```
    • Exhibits a moderate range of review lengths.
    • The median length is shorter than "Positive" but longer than
both "Extremely Positive"
      and "Neutral."
```

Interpretation:

```
    • Positive reviews are generally more detailed (longer) compared
to other sentiment
      categories.
    • Extremely positive and neutral reviews are typically short.
    • Negative reviews vary in length but tend to be more concise than
positive ones.
```

5. Reporting:

• Summarize findings, including:

```
- Overview of data collection and cleaning.
- Sentiment Analysis Results: Distribution of sentiments, average
sentiment per rating.
- Insights: Key trends, issues, and positive highlights.
- Recommendations: Based on sentiment, suggest areas for product
improvement or marketing.
```

Sentiment Analysis Report: Customer Reviews of the iPhone 15 128GB on Flipkart

1. Data Collection and Cleaning Process

• Data Source: Customer reviews for the iPhone 15 128GB were gathered from Flipkart using web scraping techniques with tools such as Selenium and BeautifulSoup.

• Data Preparation:

```
- The reviews were preprocessed by removing unnecessary characters,
   standardizing text formatting, and eliminating excess spaces.——
- Text data was tokenized to prepare it for further analysis.
- Sentiments were categorized into different labels (e.g., positive,
extremely
  positive, neutral, negative, extremely negative) using sentiment
analysis methods.
```

1. Sentiment Analysis Findings

• Sentiment Breakdown:

```
- A majority of the reviews expressed positive sentiment, followed by
a smaller
  share of extremely positive feedback, as shown in the sentiment
distribution chart.
- Neutral and negative reviews represented a much smaller percentage
of the total feedback.
```

• Sentiment by Rating:

```
- Higher star ratings were generally associated with positive or
extremely positive sentiments.
- Lower star ratings tended to correspond with more neutral or
negative feedback,
  signaling dissatisfaction among those customers.
```

1. Key Insights

• Positive Aspects:

```
    - Customers frequently praised the design, camera quality, and
overall
      performance of the iPhone 15.
    - Many reviews highlighted improvements in battery life as a
notable positive feature.
```

• Common Complaints*:

```
    - Neutral and negative reviews often pointed to pricing issues and
occasional
      problems with delivery or packaging.
    - A few customers mentioned compatibility problems with certain
accessories and
      minor software glitches.
```

1. Recommendations

• Product Enhancements

```
    - Address minor software glitches mentioned by users to improve
overall experience.
    - Look into compatibility issues with accessories to ensure that
users have a
      smooth and hassle-free experience.
```

• Marketing Suggestions

```
    - Emphasize the camera quality, battery life, and sleek design in
future marketing campaigns.
    - Mitigate pricing concerns by offering EMI options, exchange
offers, or time
      limited discounts to make the product more accessible.
```

• Operational Improvements

```
    - Focus on enhancing delivery services to reduce complaints
related to packaging
      or shipping delays.
    - Keep a close eye on customer feedback to swiftly identify and
resolve any new
      issues that arise.
```