textanalysi

June 29, 2025

1 Data importation

1.1 Understanding the Data

[37]:
```
import pandas as pd
# Show all columns
pd.set_option('display.max_columns', None)

# Show all rows (be careful with large data!)
pd.set_option('display.max_rows', None)

# Don't truncate column contents
pd.set_option('display.max_colwidth', None)  # For pandas >= 1.0
# Prevent scientific notation for numbers
pd.set_option('display.float_format', '{:.2f}'.format)
data = pd.read_csv("~/Downloads/week5_customer_reviews.csv")
data.columns
```

[37]:
```
Index(['review_id', 'customer_name', 'raw_review', 'product', 'rating', 'date',
       'cleaned_review', 'review_length'],
      dtype='object')
```

2 What are the main columns in the dataset and what does each represent?

Column Name	Description
review_id	A unique identifier for each review. Useful for referencing or tracking specific reviews.
customer_name	The name of the customer who wrote the review. May be useful for analyzing repeat reviewers or customer behavior.
raw_review	The original review text exactly as written by the customer. May include typos, punctuation, emojis, etc.
product	The name or ID of the product being reviewed. Helps group or compare reviews across different products.
rating	The numerical rating given by the customer (e.g., from 1 to 5). Useful for sentiment analysis or quality scoring.

Column Name	Description
`date`	The date when the review was written. Useful for time-based analysis or trends.
`cleaned_review`	The processed version of `raw_review`, typically cleaned by removing stopwords, punctuation, and applying lowercasing, etc. This is what you'd usually use for NLP or modeling.
`review_length`	The number of words or characters in the cleaned review. Useful for analyzing verbosity or filtering short/long reviews.

2.1 What are some examples of messy elements in the raw_review column?

Row	Messy Elements	Explanation
0	`han\@ ; d`	Emojis (,), special characters (`\@`, `;`), garbled Unicode
1	`emplo\(yee on.`	Escape characters (`\(`), likely a typo or broken word
2	`p~{}#layer`	Mixed special characters (`~`, `{}`, `#`), corrupted text
3	`missi: =" '#__on`	Emojis (,), strange punctuation mix (`:=" '#_`)
4	`m~,(! @!:~y`	Heavy use of punctuation and symbols (`~,(!@!:~`), emoji ( ), broken words

2.2 How many unique products are reviewed in the dataset?

2.2.1 7 unique products:

1. **Toaster**
2. **Smartwatch**
3. **Phone Case**
4. **Headphones**
5. **Shoes**
6. **Blender**
7. **Mug**

[38]:
```
data["product"].unique()
```

[38]:
```
array(['Toaster', 'Smartwatch', 'Phone Case', 'Headphones', 'Shoes',
       'Blender', 'Mug'], dtype=object)
```

3 Cleaning Tasks

3.1 How can you remove all special characters, emojis, and numbers from the raw_review column using Python?

You can clean the `raw_review` column in your DataFrame by **removing all special characters, emojis, and numbers** using **regular expressions** in combination with Python string processing tools like `re`.

Here's a complete example:

3.1.1 Cleaning Function

```
import re

def clean_text(text):
    if pd.isnull(text):
        return ""

    # Remove emojis and non-ASCII characters
    text = text.encode('ascii', 'ignore').decode('ascii')

    # Remove special characters and numbers (keep only letters and spaces)
    text = re.sub(r'[^A-Za-z\s]', '', text)

    # Remove extra spaces and lowercase everything
    text = re.sub(r'\s+', ' ', text).strip().lower()

    return text
```

3.1.2 Apply It to `raw_review` Column

```
data['cleaned_review'] = data['raw_review'].apply(clean_text)
```

3.2 Write a function in Python that strips extra spaces and lowercases the review text.

1. **Removes extra spaces** (leading, trailing, and multiple spaces in between words)
2. **Converts all characters to lowercase**

3.2.1 Function: Strip Extra Spaces & Lowercase

```
def clean_basic(text):
    if pd.isnull(text):
        return ""

    # Remove leading/trailing whitespace and reduce multiple spaces to one
    cleaned = ' '.join(text.strip().split())

    # Convert to lowercase
    return cleaned.lower()
```

3.2.2 Apply to Your DataFrame

```
data['cleaned_review'] = data['raw_review'].apply(clean_basic)
```

3.3 What is the difference between raw_review and cleaned_review after text cleaning? Illustrate with 3 examples

[39]:
```python
import re

def clean_text(text):
    if pd.isnull(text):
        return ""

    # Remove emojis and non-ASCII characters
    text = text.encode('ascii', 'ignore').decode('ascii')

    # Remove special characters and numbers (keep only letters and spaces)
    text = re.sub(r'[^A-Za-z\s]', '', text)

    # Remove extra spaces and lowercase everything
    text = re.sub(r'\s+', ' ', text).strip().lower()

    return text
data['cleaned_review'] = data['raw_review'].apply(clean_text)
```

[40]:
```python
def clean_basic(text):
    if pd.isnull(text):
        return ""

    # Remove leading/trailing whitespace and reduce multiple spaces to one
    cleaned = ' '.join(text.strip().split())

    # Convert to lowercase
    return cleaned.lower()

data['cleaned_review'] =data['cleaned_review'].apply(clean_basic)
```

3.4 1. Compute Number of Words in Each Review

To compute the number of words in each `cleaned_review`:

```python
# Ensure NaNs don't cause errors
data['review_length'] = data['cleaned_review'].fillna('').apply(lambda x: len(x.split()))
```

This counts how many space-separated tokens (words) are in each review.

3.5 2. Categorize Reviews as Positive / Neutral / Negative

You can categorize sentiment based on the `rating` column:

```python
def get_sentiment(rating):
    if rating <= 2:
```

```
        return 'Negative'
    elif rating == 3:
        return 'Neutral'
    else:
        return 'Positive'

data['sentiment'] = data['rating'].apply(get_sentiment)
```

3.6 3. Which Product Got the Most Negative Reviews (rating 2)?

You can filter and then use `value_counts()`:

```
# Filter negative reviews
negative_reviews = data[data['rating'] <= 2]

# Count by product
most_negative_product = negative_reviews['product'].value_counts().idxmax()
count = negative_reviews['product'].value_counts().max()

print(f"The product with the most negative reviews is '{most_negative_product}' with {count} re
```

If you want to see **all products ranked** by number of negative reviews:

```
print(negative_reviews['product'].value_counts())
```

---

[41]:
```
# Ensure NaNs don't cause errors
data['review_length'] = data['cleaned_review'].fillna('').apply(lambda x: len(x.
↪split()))



def get_sentiment(rating):
    if rating <= 2:
        return 'Negative'
    elif rating == 3:
        return 'Neutral'
    else:
        return 'Positive'

data['sentiment'] = data['rating'].apply(get_sentiment)
```

[42]:
```
# Filter negative reviews
negative_reviews = data[data['rating'] <= 2]

# Count by product
most_negative_product = negative_reviews['product'].value_counts().idxmax()
```

```
count = negative_reviews['product'].value_counts().max()

print(f"The product with the most negative reviews is '{most_negative_product}'␣
↪with {count} reviews.")
```

```
The product with the most negative reviews is 'Blender' with 316 reviews.
```

3.7 Bar Chart: Number of Reviews per Product

3.7.1 Insight:

- All products have a **similar number of reviews** (~700 each).
- This balance suggests that the dataset may have been sampled evenly across products, which is good for **unbiased product comparison**.
- Products like **Headphones, Shoes, and Mugs** slightly edge out others in review count, but differences are minor.

3.8 Review Length vs Rating (Boxplot)

3.8.1 Insight:

- The **median review length is nearly identical across all ratings** (centered around 9 words).
- Some 5-star reviews have outliers on the longer end, but overall distribution is **very similar**.
- **Conclusion**: There's **no strong relationship between review length and sentiment/rating**.

3.9 Correlation & Averages

```
Average review lengths:
Negative   9.64
Neutral    9.45
Positive   9.53

Correlation between review length and rating: -0.01
```

3.9.1 Insight:

- The **correlation of -0.01** confirms that **review length and rating are nearly unrelated**.
- Slightly longer reviews appear in negative sentiment, but the difference is marginal.

3.10 Summary

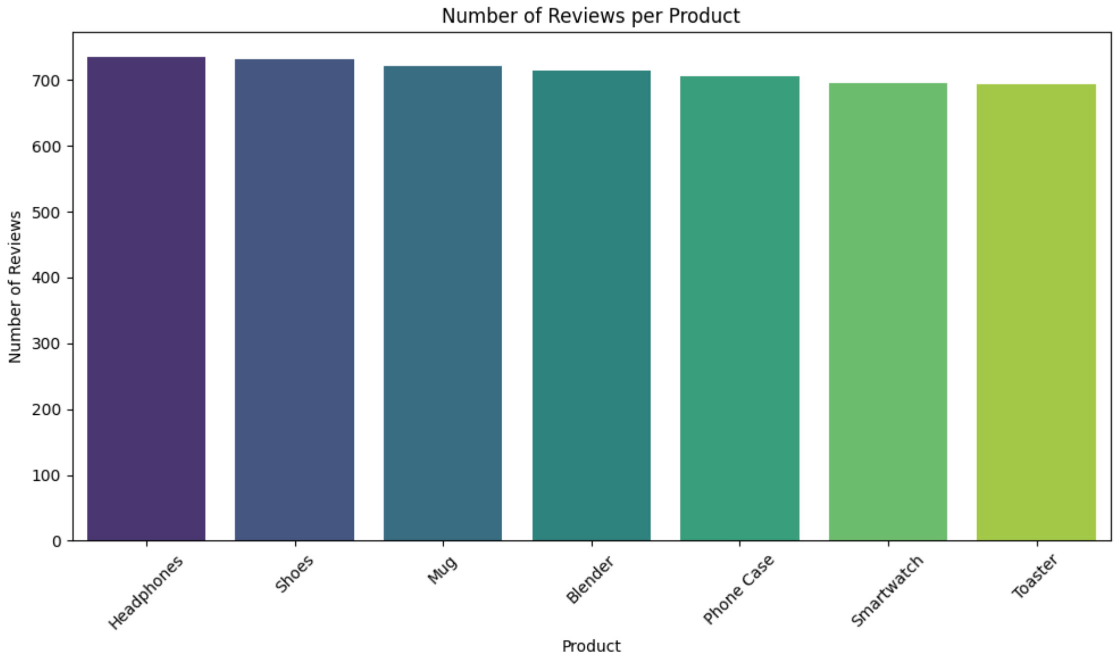
Question	Insight
Average review length by sentiment	Very similar across all: ~9.5 words
Most-reviewed product	Headphones (barely), but all are equally represented
Long reviews = better reviews?	**No.** Review length does **not** predict sentiment or rating

[43]:
```python
avg_length_by_sentiment = data.groupby('sentiment')['review_length'].mean()
print(avg_length_by_sentiment)
```

```
sentiment
Negative   9.64
Neutral    9.45
Positive   9.53
Name: review_length, dtype: float64
```

[44]:
```python
import matplotlib.pyplot as plt
import seaborn as sns

# Count reviews per product
product_counts = data['product'].value_counts()

# Plot
plt.figure(figsize=(10, 6))
sns.barplot(x=product_counts.index, y=product_counts.values, palette='viridis')
plt.title('Number of Reviews per Product')
plt.xlabel('Product')
plt.ylabel('Number of Reviews')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

```
/tmp/ipykernel_73229/2286281743.py:9: 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=product_counts.index, y=product_counts.values,
palette='viridis')
```



[45]:

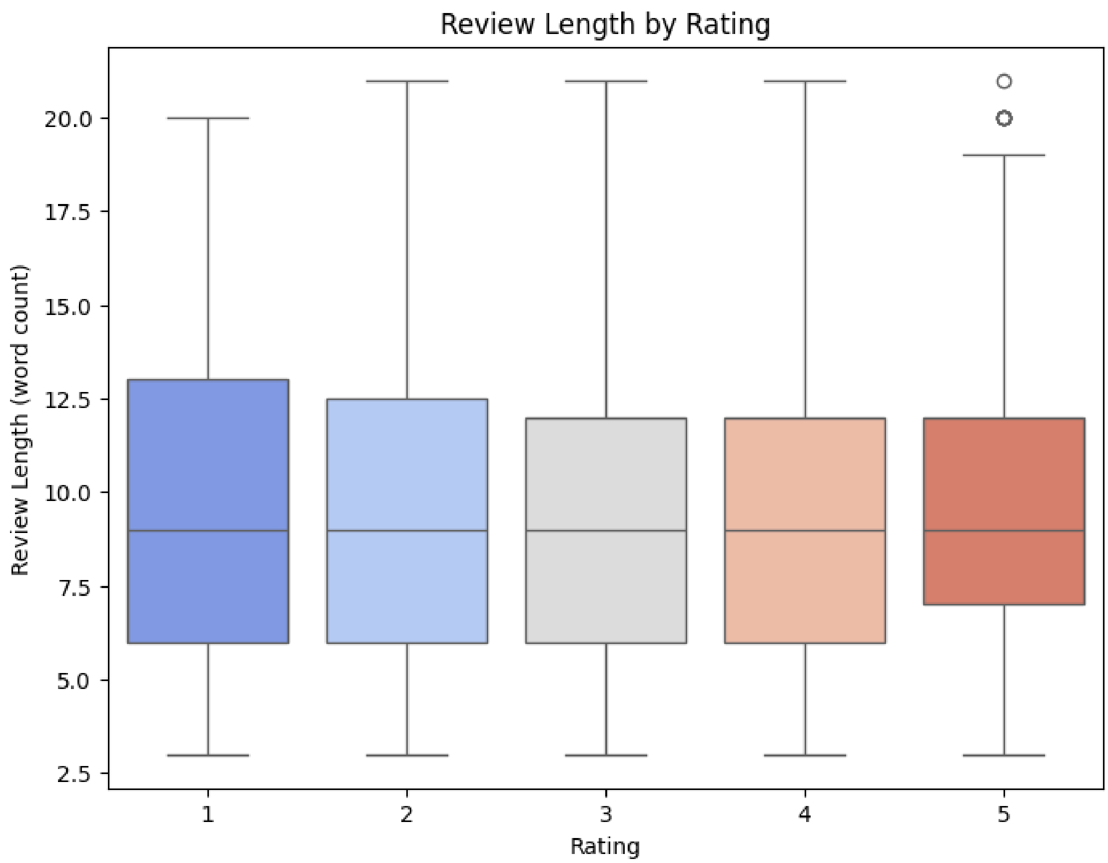
```
correlation = data['review_length'].corr(data['rating'])
print(f"Correlation between review length and rating: {correlation:.2f}")
```

```
Correlation between review length and rating: -0.01
```

[46]:

```
plt.figure(figsize=(8, 6))
sns.boxplot(x='rating', y='review_length', data=data, palette='coolwarm')
plt.title('Review Length by Rating')
plt.xlabel('Rating')
plt.ylabel('Review Length (word count)')
plt.show()
```

```
/tmp/ipykernel_73229/3781088033.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.boxplot(x='rating', y='review_length', data=data, palette='coolwarm')
```


Review Length by Rating
Review Length (word count)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
1
2
3
4
5
Rating

[ ]: