Report

Product chosen - Headphones

Total Number of rows for the product -

- Deleted duplicate rows from the review dataset.
- Deleted duplicate rows for the meta dataset.
- Deleted rows with null amazon id ‘asin’ from both dataset.
- Merged both datasets using inner join on ‘asin’ column.

Number of rows for the product - 256176

Descriptive Statistics for the product -

Number of Reviews: 256176

Average Rating Score: 4.071931016176379

Number of Unique Products: 5279

Number of Good Ratings: 218474

Number of Bad Ratings: 37702

Number of Reviews for each rating:
Rating 0: 0
Rating 1: 19683
Rating 2: 18019
Rating 3: 26877
Rating 4: 51206
Rating 5: 140391

Preprocess the Text-

- **remove_html_tags(text):** This function removes HTML tags from the given text using regular expressions.
- pd.isna(text): Checks if the input text is NaN (missing value).
- re.compile('<.*?>'): Compiles a regular expression pattern to match HTML tags.
- re.sub(clean, '', text): Uses re.sub() to substitute (replace) all matches of the pattern (HTML tags) with an empty string, effectively removing them from the text.
- **remove_accented_chars(text):** This function removes accented characters from the given text.
- unidecode(text): Uses the unidecode library to remove accents and other diacritical marks from the text.
- **expand_acronyms(text):** This function expands contractions (e.g., "don't" to "do not") in the given text.
- contractions.fix(text): Uses the contractions library to expand contractions.
- **lemmatize_text(text):** This function lemmatizes the given text (converts words to their base or dictionary form).
- nlp(text): Tokenizes the text and applies part-of-speech tagging and dependency parsing using spaCy.
- token.lemma_: Accesses the lemma (base form) of each token.
- ' '.join(...): Joins the lemmatized tokens back into a string.
- **remove_stopwords(text):** This function removes stopwords (common words like "the", "is", etc.) from the given text.
- word_tokenize(text): Tokenizes the text into words.
- [word for word in tokens if word.lower() not in stop_words]: Filters out stopwords from the tokens, converting each word to lowercase before comparison.
- ' '.join(filtered_tokens): Joins the filtered tokens back into text after removing stopwords.

Exploratory Data Analysis

Top 20 most reviewed brands:

- Sony 21200
- Sennheiser 14340
- Bose 8286

- Audio-Technica 6438
- Bluedio 4934
- Mpow 4907
- Panasonic 4888
- Etre Jeune 4683
- Philips 4658
- Symphonized 4285
- MEE audio 4087
- TaoTronics 4079
- Koss 3845
- Plantronics 3602
- JVC 3521
- Toysdone 3506
- JLAB 3164
- SoundPEATS 2778
- EldHus 2725
- Photive 2495

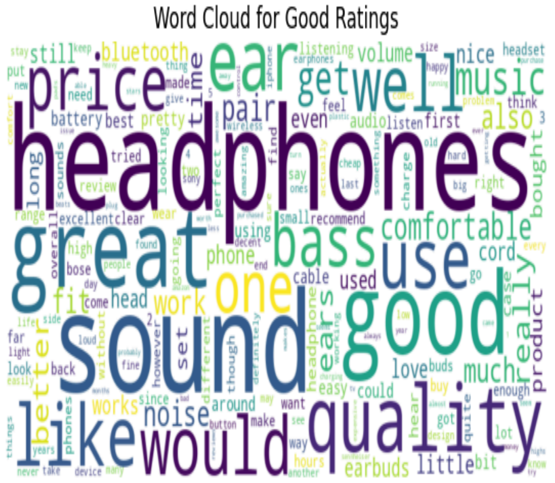
Last 20 reviewed brands:

- Honda 1
- AIRDRIVES 3
- NOIZY Brands 3
- DetectorPro 4
- PopClik 4
- Targus 5
- American Audio 5
- Innovage 5
- TVTimedirect 5
- Amplivox 5
- ZOpid 5
- Rockford Fosgate 5
- Cyber-Blue 5
- SpongeBob SquarePants 5
- Asus 5
- Dr. Mercola 5
- American DJ Supply 5
- Comfort Audio 5

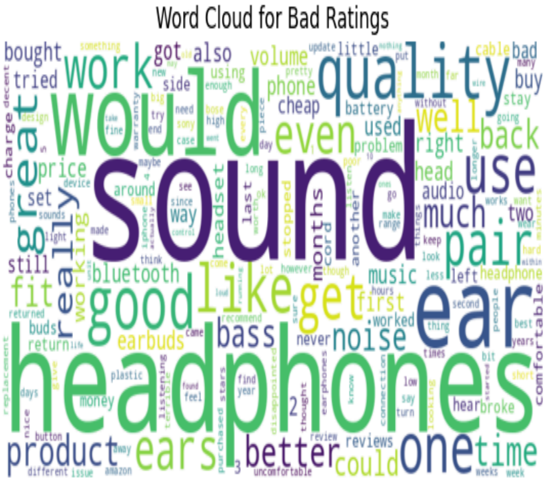
- Gear4 5
- Tt eSPORTS 5

Headphones with the highest average rating: AKG K52 Headphones

Word cloud -



Word Cloud for Good Ratings

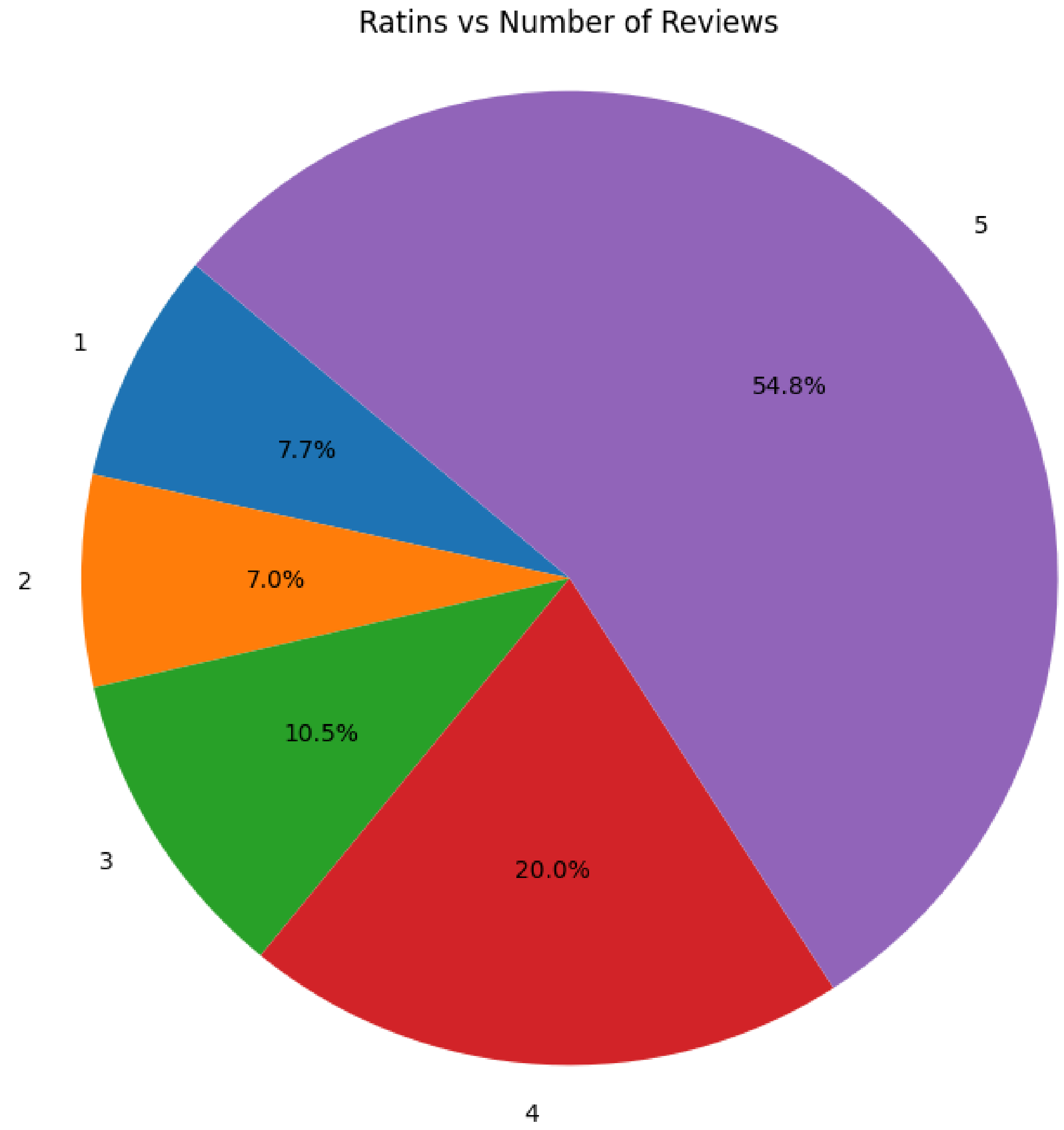


Word Cloud for Bad Ratings

Most commonly used words for positive reviews:
[('headphones', 171390), ('sound', 168004), ('good', 107122), ('great', 103277), ('quality', 80811), ('ear', 69274), ('like', 68344), ('use', 66218), ('would', 63183), ('well', 55910)]

Most commonly used words for negative reviews:
[('sound', 24335), ('headphones', 23459), ('would', 13700), ('ear', 13141), ('quality', 12654), ('good', 11802), ('one', 10508), ('like', 9993), ('use', 9919), ('get', 8669)]

Pie chart for ratings vs number of reviews-



Year with highest customers - 2016

Generate review embeddings -

Used word2vec to generate embeddings for the text.

ML Model Results-

Model: Logistic Regression

```
              precision    recall  f1-score   support

         Bad       0.57      0.53      0.55      6634
     Average       0.73      0.80      0.76      9517
        Good       0.75      0.69      0.72      4782

    accuracy                           0.69     20933
   macro avg       0.68      0.67      0.68     20933
weighted avg       0.68      0.69      0.69     20933
```

Model: Decision Tree

```
              precision    recall  f1-score   support

         Bad       0.44      0.44      0.44      6634
     Average       0.64      0.66      0.65      9517
        Good       0.51      0.49      0.50      4782

    accuracy                           0.55     20933
   macro avg       0.53      0.53      0.53     20933
weighted avg       0.55      0.55      0.55     20933
```

Model: Multinomial Naive Bayes

```
              precision    recall  f1-score   support

         Bad       0.51      0.20      0.28      6634
     Average       0.52      0.97      0.68      9517
        Good       0.91      0.13      0.22      4782

    accuracy                           0.53     20933
   macro avg       0.65      0.43      0.39     20933
weighted avg       0.61      0.53      0.45     20933
```

Model: Gradient Boosting

```
              precision    recall  f1-score   support

         Bad       0.54      0.42      0.48      6634
```

```
     Average       0.63      0.83      0.72      9517
        Good       0.70      0.47      0.56      4782

    accuracy                           0.62     20933
   macro avg       0.63      0.58      0.59     20933
weighted avg       0.62      0.62      0.61     20933
```

Model: K nearest neighbors

```
              precision    recall  f1-score   support

         Bad       0.34      0.90      0.50      6634
     Average       0.67      0.18      0.29      9517
        Good       0.76      0.13      0.23      4782

    accuracy                           0.40     20933
   macro avg       0.59      0.41      0.34     20933
weighted avg       0.59      0.40      0.34     20933
```

Top 10 products by user sum ratings:

1. B003L1ZYYW AmazonBasics High-Speed HDMI Cable - 9.8 Feet (3 Meters) Supports Ethernet, 3D, 4K and Audio Return 41258
2. B0019HL8Q8 Mediabridge HDMI Cable (10 Feet) Supports 4K@60Hz, High Speed, Hand-Tested, HDMI 2.0 Ready - UHD, 18Gbps, Audio Return Channel 38880
3. B0019EHU8G Mediabridge HDMI Cable (6 Feet) Supports 4K@60Hz, High Speed, Hand-Tested, HDMI 2.0 Ready - UHD, 18Gbps, Audio Return Channel 36374
4. B00M55C0NS SanDisk Ultra 32GB UHS-I/Class 10 Micro SDHC Memory Card With Adapter - SDSDQUAN-032G-G4A 29391
5. B000BQ7GW8 SanDisk 2GB Class 4 SD Flash Memory Card- SDSDB-002G-B35 (Label May Change) 28209
6. B00DIF2BO2 Cheetah Mounts APFMSB TV Wall Mount Bracket for 20-55&rdquo; TVs Up To VESA 400 and 115 lbs including a Twisted Veins 10&rsquo; HDMI Cable and a 6&quot; 3-Axis Magnetic Bubble Level 27846
7. B00BWF5U0M Sabrent 4-Port USB 2.0 Hub with Individual Power Switches and LEDs (HB-UMLS) 27802

8. B00IVPU7AO Samsung EVO 64GB 48/MB/s Micro SDXC Memory Card with Adapter up to (MB-MP64DA/AM) 26694
9. B0043T7FXE Logitech M570 Wireless Trackball Mouse &ndash; Ergonomic Design with Sculpted Right-hand Shape, Compatible with Apple Mac and Microsoft Windows Computers, USB Unifying Receiver, Dark Gray 24424
10. B000HPV3RW Belkin 8-Outlet Power Strip Surge Protector with 6-Foot Power Cord and Telephone Protection, BE108200-06 23956