

SOCIAL MEDIA ANALYTICS

UNVEILING CUSTOMER INSIGHTS: ENHANCING IPHONE 14 THROUGH DATA ANALYSIS



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Introduction

In today's digital age, smartphones have become an indispensable part of our lives, enabling us to connect, communicate, and access information with unprecedented ease. Apple Inc. has consistently delivered innovative and groundbreaking devices that have reshaped the industry. With each new product release, Apple continues to push the boundaries of technology, captivating consumers with its iconic iPhone series (Clear Wireless Blog, 2023).

The purpose of this analysis is to develop a Social Media Analytics project focused on extracting and analyzing review data about the iPhone 14. The project involves collecting data from various sources, including Brandwatch, Reddit, and web scraping the Best Buy website, with the ultimate goal of understanding customer comments and providing insights to enhance the next iteration of Apple's device.

The following sections of this report will outline the methodology employed for data collection and analysis, presenting the key findings derived from the analysis of iPhone 14 reviews. In addition, it includes the utilization of network analysis in Gephi to identify keywords with the most frequency. In the end of the analysis, there are actionable recommendations to enhance the product and optimize customer satisfaction.

Business Context

In the highly competitive smartphone market, companies must continuously enhance their products based on customer feedback and preferences. Apple has firmly established itself as a leading player in this market, renowned for its innovative and cutting-edge products. Over the years, Apple has experienced significant growth and solidified its position as a key industry player. However, its competitors are not falling behind and consistently introduce new devices with the aim of surpassing the iPhone. Therefore, it is crucial for Apple to continuously release new iterations of its most popular devices to meet user expectations and stay ahead of the competition. With this in mind, the objective of this analysis is to analyze iPhone 14 reviews within the broader context of Apple's presence in the smartphone market to find out what are its users' main pain points and complaints.

Apple's growth trajectory has been remarkable, with the company consistently expanding its market share and customer base. Its commitment to innovation, coupled with effective marketing strategies, has allowed Apple to carve out a significant presence in the smartphone market. Furthermore, Apple's consistent emphasis on customer satisfaction and user-centric design has contributed to its growth. By closely monitoring customer feedback, engaging with the user community, and continuously improving its product based on user insights, it has successfully nurtured a dedicated customer base. By leveraging the insights gained during the data analysis

stage, the company can further enhance its offerings, strengthen customer satisfaction and solidify its position as a market leader in the smartphone industry (Livescault, 2023).

Data Collection

Three data sources were utilized to gather the required information for assessing the strengths and weaknesses of the iPhone 14 based on user feedback:

- **Brandwatch:** Brandwatch is a social media listening tool employed to collect user-generated content from Twitter and Facebook. This data enables the analysis of discussions on popular social media platforms related to the iPhone 14. It provides insights into people's positive and negative experiences with the device. A total of 559 million posts were analyzed using this platform.
- **Best Buy:** By employing web scraping techniques, user reviews regarding different models of the iPhone 14 (including color variations and storage sizes) can be extracted from Best Buy. Users often leave reviews on this platform to share their experiences with the devices they have purchased. This data offers an unbiased perspective on users' general perception of the iPhone 14. In total, 373 reviews were obtained from this data source.
- **Reddit:** Leveraging the Reddit API, it becomes possible to gather the latest posts and comments mentioning the iPhone 14 from the iPhone subreddit. Reddit is a platform where users seek solutions to their problems. Analyzing user posts and comments helps identify the most common issues customers encounter while using their iPhones. Only posts mentioning the regular version of the iPhone 14 are considered for extraction, as the focus is not on the iPhone 14 Pro, Pro Max, or Plus models. 783 comments and posts were gathered from this social media platform.

Ethical guidelines and user privacy were strictly adhered to during the data collection process, ensuring anonymization and aggregation to maintain confidentiality and comply with relevant data protection regulations. The aggregated and anonymized data presented in this report ensures privacy and confidentiality.

By combining data from multiple channels, a comprehensive understanding of user feedback is achieved, leading to more accurate recommendations for enhancing the iPhone 14. Access to a diverse range of opinions, sentiments, and experiences is crucial to ensure objective analysis. Python is utilized in various stages of the data analysis process, including data understanding, preparation, and analysis. Additionally, Gephi is employed to visualize networks derived from the data.

Data Preparation

Working with raw text data presents unique challenges that require proper data preparation. Data preprocessing involves transforming raw text into a structured format that can be effectively analyzed and leveraged for extracting meaningful patterns, sentiment analysis, topic modeling, and other natural language processing (NLP) tasks. For this project, data preparation is vital for the text data using the following processes:

- **Noise Reduction:** Many reviews and posts contain noise in the form of irrelevant characters, punctuation marks, special characters, and links. By removing or cleaning such noise, data preparation ensures that the subsequent analysis is not influenced by irrelevant information, leading to more accurate and reliable results.
- **Text Normalization:** The two main processes carried out in this stage are removing capital letters and using "stemming" to make sure that all the different variations of the same word are aggregated regardless of their tense. This will help standardize the text, reducing variations and enabling better pattern identification.
- **Tokenization:** Text data needs to be split into meaningful units to facilitate the analysis. In this project, the texts have been split into words. This is a crucial step of the analysis because it breaks down the text into manageable units, which in turn results in easier identification of patterns, such as frequency analysis, and the application of various NLP techniques.
- **Stop Word Removal:** Words, such as "and," "the," or "a" are commonly used and carry little meaning. Removing stop words during data preparation can reduce the noise in the text, improve computational efficiency, and help bring to the surface more significant words and phrases.

Data Analysis

Once the data is ready for analysis, there are several text mining techniques that can be used to gain insights. In this stage, the main tasks carried out to better understand user feedback are: keyword extraction, frequency analysis, named entity recognition, topic modeling, text annotation, and network analysis.

Keyword Extraction

Keyword extraction is crucial to identify general topics mentioned in the reviews as well as get a big picture of user experiences rather than specific features of the iPhone 14. Some interesting keywords are 'color', 'exchange', 'first phone', 'second one'.

The mention of 'color' suggests that users are interested in the available color options for the iPhone 14. This indicates that the aesthetic appeal and personalization options related to color choice are factors that users consider when purchasing the device.

The keywords 'exchange' and 'second phone' probably relate to users who are upgrading from a previous iteration of the iPhone. Apple offers a popular exchange program in which users can give up their old phone and pay a reduced fee for the newest iPhone model. However, 'first phone' indicates that there is a sizable number of users who may be new to the iPhone ecosystem, potentially considering the iPhone 14 as their first iPhone.

Moving to more negative terms that are found, such as 'spend a lot of money', 'new phone box', 'bothered send a charger' and 'irritating phone'. They show that one concern is the cost of buying a new iPhone. On a related note, some users are complaining about how much they pay for their phone to come without accessories, like a charger.

To get more specific feedback about the main features of this device, a filter is implemented to show keywords related to 'camera', 'display', 'battery', 'performance', 'storage', 'design', 'processor', and 'RAM'. Feedback on the camera performance is particularly positive, with users describing it as amazing and highlighting its ability to produce high-quality photos quickly. Improved features compared to previous models, such as a better camera, increased battery life, improved storage, and a faster processor, are also mentioned. Overall, users express satisfaction with the iPhone 14, noting its smooth transition from previous iPhone models, clean screen, and excellent cameras.

Frequency Analysis

The frequency analysis using Best Buy data further supports the findings obtained during keyword extraction. Trigrams, or three-word phrases, reveal additional insights into the user experiences related to battery life, the camera, and overall user experience. Terms like 'great battery life,' 'long battery life,' 'easy battery life,' 'good battery life,' and 'time iPhone user' consistently appear, emphasizing the significance of battery life as a crucial aspect.

Additionally, trigrams highlight the importance of the camera, with phrases like 'great camera quality' indicating users' appreciation for this feature. Furthermore, phrases like 'phone works great' and 'phone upgrades iPhone' emphasize the importance of a seamless user experience, while trigrams such as 'easy setup transfer' and 'iPhone happy service' reinforce this notion.



Figure 1: Word Cloud (Best Buy)

The frequency analysis conducted on Reddit discussions also provides insights into different topics that are of importance to users. Notably, the absence of a physical SIM card in the iPhone 14 is a significant concern. Terms such as 'physical SIM,' 'SIM card,' and 'new eSIM' are frequently mentioned, indicating users' interest in this feature. Another topic that is mentioned recurrently and that is related is 'qr code', since the new eSIM activation process involves scanning a QR code.

The frequency analysis also highlights the importance of battery life. Terms like 'new battery original,' 'way apple charger,' and 'day heavy usage' indicated potential issues and users' experiences related to battery performance. Additionally, the term 'ambient temps high' suggest users' concerns about battery heating in high ambient temperatures.

Storage emerges as another significant topic in Reddit discussions. Phrases like 'optimize iPhone storage' indicate users' desire for efficient storage management. Tri-grams like 'however may optimized,' 'may optimized apple,' and 'optimized apple devices' further support this theme. The mention of 'google photos' is also likely related to the issue of storage optimization, since that is the name of the service that Google offers to store photos on the cloud as an alternative to iCloud.

Named Entity Recognition

Another useful text mining technique used to get insights from the data is Named Entity Recognition. This technique reveals information on customer feedback as regards topics like comparisons with previous models and other brands, rankings of the iPhone 14, and different features.

The most frequently identified entity for both Best Buy and Reddit is CARDINAL, which occurs 191 times in the Best Buy dataset and 318 times in Reddit, indicating a significant presence of numerical information in the discussions. Organizations (ORG), dates (DATE), and times (TIME) also manifest frequently in the dataset.

Going deeper into the analysis, specific trigger words like "14," "13," and "11" are associated with the CARDINAL entity, indicating discussions involving the comparison of iPhone 14 with 13 or 11. However, "14" is the most commonly occurring trigger in the Best Buy dataset and this is understandable since this is what the analysis is about. It is clear that people are comparing a lot of different models of iPhones with the iPhone 14 (such as iPhone 14 with iPhone 11).

Triggers like "at&t," "samsung," and "apple" are associated with the ORG entity, suggesting discussions related to specific organizations or brands. It can be inferred that customers are also engaged in comparing 'iPhone' with other brands like 'Samsung'. As regards "at&t," this popular American phone carrier could be mentioned because of service issues (such as having problems connecting to the network). Phone carriers also tend to subsidize phone prices in exchange for a fidelity contract, so pricing could be another reason why this topic comes up. Furthermore, triggers

like "first," "second," and "third" are associated with the ORDINAL entity, indicating discussions involving scoring and ranking these brands based on their user experience.

In the Date entity, triggers such as "years," "week," and "4 days" serve as indicators for the duration of customers' iPhone 14 usage or their usage of iPhones in general. These triggers offer valuable insights into the length of time individuals have been using iPhones, their upgrade history to the iPhone 14, and the feedback they provide regarding their user experiences and service-related aspects over time. The presence of triggers like "upgrade," "years," "iPhone," and "Androids" provides further evidence supporting the observation that individuals who have used previous iPhone models, and sometimes even Android devices, for an extended period tend to express higher satisfaction with the iPhone 14. Conversely, new users who have owned the iPhone 14 for only a short time often display heightened excitement about the device's performance. For instance, feedback such as "My wife and I like the phone; we like Apple products because they work well. We upgraded from an 8 Plus that we had for over four years," "My first iPhone was an iPhone 4. I've been upgrading every few years. This is the best yet, and it comes at a reasonable cash price. Great cameras and overall responsiveness. It's been almost a month, and I haven't even cleaned the screen. The battery easily lasts for two days. Love it," and "Good product. This replaced my iPhone 7 Plus that I had for years" exemplify this trend, highlighting the positive impact of previous iPhone usage and the excitement associated with upgrading to the iPhone 14.

Simultaneously, phrases such as "15 minutes," "30 minutes," "about two hours," and "3 hours" are linked to the TIME entity. These terms indicate customer feedback regarding the speed of charging the iPhone 14, file transfer rates, download speeds, and other related activities. Additionally, the TIME entity can provide insights into waiting times for iPhone 14-related services, such as in-store purchases, connecting with customer service online, or through phone calls.

Lastly, the PERSON entity is associated with triggers such as "imei," "safari," and "apps," and points to conversations about specific apps or software. The use of the term "imei" could potentially be related to the previous point of phone carriers, since IMEI numbers are essential for device unlocking. As regards "safari" and "apps", it is evident that customers are providing feedback on iPhones default web browsers and available apps.

Topic Modeling

Topic modeling has been employed to analyze the discussions surrounding the iPhone 14 in order to identify the predominant themes and subjects of interest. By examining the text data, topic modeling enables the extraction of key aspects related to the iPhone 14, including user experiences, device functionality, opinions, comparisons with other devices, and factors influencing purchasing decisions.

The application of the Latent Dirichlet Allocation (LDA) model, utilizing eight topics with top 30 most salient terms for both Best Buy and Reddit allows for the identification and categorization

of key themes and subject areas within the analyzed dataset, specifically pertaining to the iPhone 14. Through the assignment of weights to keywords, the model effectively highlights the most significant and prevalent words associated with each topic.

The following are the topics identified in the Best Buy reviews:

- **Topic 1 - General Features:** This topic is the largest one and it encompasses the general features of the iPhone, such as 'camera', 'battery', 'charge', 'color' and 'feature'. Plus, there are several descriptive words that reflect user sentiment, like 'fast', 'great', 'love', 'new', 'upgrade', 'good', 'amazing', 'really', 'last', 'long', and 'definitely'. This indicates a high level of user satisfaction with the device as a whole.
- **Topic 2 - Camera:** Though the 'camera' also emerged in the first topic, it seems to be such an important aspect for users that there is a specific topic with information about how users feel about this. Words like 'camera' and 'picture' are very important in this topic, and they are accompanied by adverbs and adjectives such as 'great', 'easy', 'love', 'nice', 'best', 'good', 'better', 'upgraded', 'really', 'like', 'ever', and 'excellent'.
- **Topic 3 - Design:** A recurrent topic in the Best Buy reviews is the appearance of the iPhone 14, indicated by the presence of words like 'design' and 'screen'. Though attitudes towards these aspects are mostly positive, which can be seen in words like 'good', 'great', 'recommend', 'better', and 'awesome', there are some words with a negative connotation that did not come up in the previous topics, like 'though' and 'issue'.
- **Topic 4 - Upgrading:** This topic focuses on users who are upgrading from a different phone, like the iPhone X ('x' is one of the most recurrent words in this topic), or 'android'. Words like 'upgraded', 'improvement', 'updated', 'replaced', 'old', 'first', 'upgrading', and 'previous' further reinforce the topic of this cluster.
- **Topic 5 - Upgrading Experience:** This topic is related to the previous one, but the focus is users' experiences with some of the new features, such as the new eSIM, expressed through the use of the terms 'sim', 'card', 'transferred', and 'data'. There are also words suggesting that the reviewers were helping another person adapt to the new iPhone, such as 'mom', 'wife', and 'helped'. Difficulties may arise during this process, which is expressed by the recurrent appearance of "n't".
- **Topic 6 - Buying Experience:** Words like 'employee', 'best', 'buy', and 'bestbuy' are very prevalent in this cluster, which indicates that it is related to users' experience buying from this platform. Terms like 'issue', and 'wrong' indicate that the buying experience may not have been the best. However, there are also some positive terms like 'simple' that suggest that the experience may vary from user to user.
- **Topic 7 - Customer Support:** Words like 'purchase', 'staff', 'info' and 'support' indicate that this topic is about users' experience interacting with sellers or representatives. However, the mention of the word 'store' and 'physical' suggests that these interactions

took place face-to-face rather than online. Customers use words like 'knowledgeable', and 'friendly' to describe the staff. Other recurrent terms that describe the service are 'fast', 'speed' and 'enjoying'.

- **Topic 8 - Accessories:** This is the smallest topic by far. It refers mostly to accessories which can be used to improve or personalize the iPhone 14, which can be inferred from the words 'case', 'color', and even 'battery', which could refer to external batteries. Though the word 'chip' is not an accessory, it is an external device, which may be why it is grouped in this category.

The following are the topics identified in the Reddit reviews:

- **Topic 1 - Usage and Functionality:** This topic, which is the largest one, seems to revolve around various aspects related to the iPhone and its functionality. Some keywords, such as 'iPhone', 'new', 'phone' indicate discussions about iPhones in general, including new models or the concept of a phone in the context of iPhones. Words such as 'work', 'apple', 'esim', 'store', 'charge', 'time', 'download', 'transfer', 'app' suggest discussions about how the iPhone works, including its features, usage, and functionalities such as eSIM, app downloads, data transfers, and battery charging. In addition, the words 'old', 'way', 'like', 'still', 'also', 'year', 'turn', 'probably' may refer to discussions comparing older iPhone models to the new ones, user preferences, and potential actions or decisions users are considering.
- **Topic 2 - User Experience and Durability:** This topic focuses on user experiences with the iPhone, particularly related to usability, durability, and overall satisfaction. Discussions revolve around navigating screens, using buttons, and differences compared to other devices ('go', 'iphone', 'screen', 'different', 'using', 'button'). Also, the words, such as 'gb', 'use', 'case', 'really', 'sure', 'time', 'would' indicate discussions related to the practical usage of the iPhone, including the amount of storage (GB) users require, the use of protective cases, uncertainties or questions about certain features or actions, and the overall user experience over time. 'Phone', 'last', 'always', 'much' are keywords that may refer to discussions about the phone's longevity, whether it lasts a long time, or if users have experienced issues related to its performance or durability.
- **Topic 3 - Data Management and Troubleshooting:** This topic is about data management on the iPhone, issue resolution, and seeking assistance. Keywords like 'phone', 'need', 'use', 'use', 'iphone', 'want', 'get' suggest discussions related to users' needs, desires, and usage of the iPhone, including seeking guidance or solutions for specific tasks. Keywords like 'apps', 'got', 'backup', 'update', 'keep', 'tried', 'another' relate to managing apps, backups, updates, and exploring alternative solutions. Issues with storage space, verification codes, QR codes are identified by words like 'space', 'code', 'enough', 'never', 'qr', 'know', 'everything', 'longer'. Keywords like 'remove', 'info', 'ago', 'dont', 'possible',

- 'minute', 'help' point to the lack of information or data, seeking assistance, and time-sensitive situations requiring quick solutions or help.
- **Topic 4 - Activation and SIM Card:** Topic 4 discusses the iPhone activation, SIM card issues, and seeking support or guidance. The relevant words are 'carrier', 'sim', 'esim', 'phone', which are related to carrier services, SIM cards (both physical and eSIM), and their connection to the iPhone. Also, keywords such as 'know', 'apple', 'support', 'take', 'physical', 'message' may be related to users who are seeking information, support, or advice from Apple or other users regarding SIM card-related matters.
 - **Topic 5 - Photo and Video Management:** This topic is associated with managing photos and videos on the iPhone, including various considerations and actions related to storage, organization, and sharing. The keywords 'photo', 'video' indicates discussions about capturing and managing photos and videos on the iPhone. Then, terms such as 'device', 'think', 'right', 'like' express thoughts, preferences, or considerations of people about the features or functionalities related to photo and video management.
 - **Topic 6 - Comparisons with other devices:** This topic revolves around comparisons of the iPhone with Samsung devices or other competing brands, as well as expressing opinions, experiences, and potential issues. More specifically, terms like 'sice', 'problem', 'case', 'thanks', 'http', 'review' can connect to various aspects, such as sharing problems or issues encountered, expressing gratitude or thanks, providing reviews (potentially via HTTP links), or discussing specific cases or scenarios. Furthermore, 'battery', 'thing', 'good', 'samsung', 'life' can be associated with specific features or qualities, such as battery performance, positive attributes, comparisons with Samsung devices, or overall device lifespan.
 - **Topic 7 - Communication Experience:** This topic is linked to making and receiving calls, communication features, and experiences associated with using the iPhone for various communication purposes. Words such as 'call', 'someone', 'sound', 'ring' indicate discussions about the process of making calls, interacting with others, the quality of sound during calls, and the ringing sound of the phone. Also, there are some terms such as 'depends', 'two', 'pay', 'switch', 'pro', 'safari', 'tap' which are related to considerations or factors that influence communication choices or actions, for example, dependency on certain factors, switching between different communication options, payment-related aspects, specific features (such as Safari browser), and actions like tapping or interacting with the device.
 - **Topic 8 - Technical Issues and Support:** This last topic is related to technical problems, seeking assistance, and participating in online communities focused on iPhone-related topics. The main words are 'looking', 'issue', 'said', 'version', 'link', 'send', 'running', 'contact', 'please', 'look', 'noise', 'chat', 'find', 'recommend', 'concern', 'search', 'action', 'known' which

can be connected to different aspect including searching for solutions, identifying problems or concerns, contacting support or moderators, sharing links or versions, running software or updates, and seeking recommendations or advice.

Text Annotation

Additional insights are revealed through the text annotation analysis of the iPhone 14. The algorithms utilized in this process can accurately identify verbs, adjectives, and nouns. However, as text annotation solely focuses on these aspects, sentiment analysis has been conducted specifically on adjectives. This analysis aims to determine whether the adjectives lean towards a positive, negative, or neutral sentiment.

The analysis of adjectives associated with the iPhone 14 uncovers a highly positive reception, with 608 instances expressing overwhelming satisfaction, excitement, and admiration for the exceptional qualities and features of the device. Additionally, there are 210 adjectives classified as neutral, indicating a lack of strong sentiment. Interestingly, the presence of only 29 negative adjectives suggests minimal criticism or concerns, indicating that the product largely meets expectations and addresses potential issues effectively.

Similarly, when analyzing the Reddit dataset with text annotation, it is found that the majority of adjectives convey a positive sentiment. Positive adjectives are the most frequent, occurring 561 times, demonstrating a strong inclination towards positivity. The neutral category falls in between, with 304 occurrences, reflecting a moderate sentiment. On the other hand, the negative category has a lower count of 152 instances, indicating a relatively smaller proportion and emphasizing the using positive adjectives among the Reddit discussions.

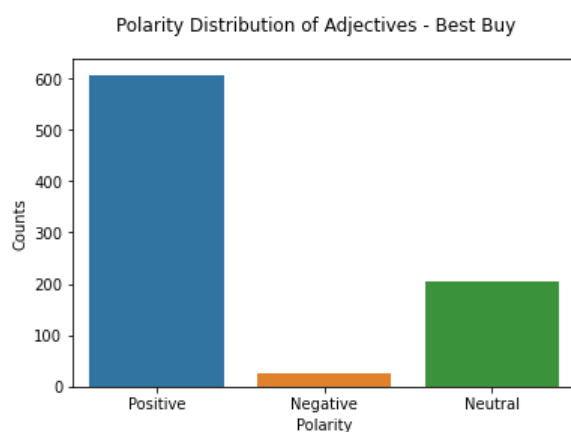


Figure 2 Polarity Distribution of adjectives Best Buy

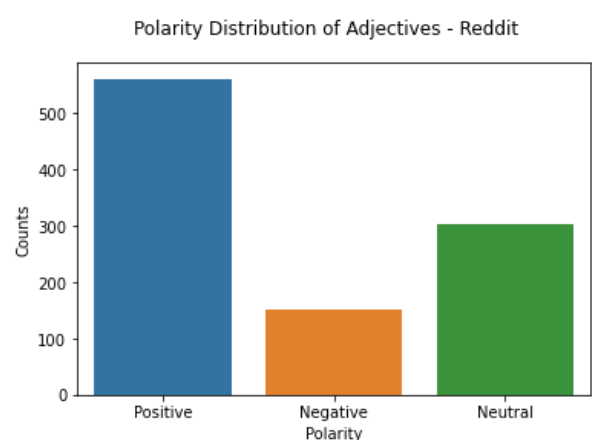


Figure 3 Polarity Distribution of adjectives Reddit

Sentiment Analysis

Sentiment analysis is carried out on all the comments, posts and reviews obtained from Reddit and Best Buy. This analysis has the purpose of classifying the whole text into positive, negative, or neutral sentiments, providing important insights to Apple as regards public opinion, customer feedback, brand perception, and market trends.

The analysis of sentiment categories in the available data yields interesting findings regarding iPhone 14 reviews. The majority of the reviews from Best Buy are classified as "Neutral," indicating a balanced sentiment among the reviewers. Additionally, there are few reviews falling into the "Positive" category and even fewer into the "Negative" one, showcasing a diverse range of sentiments expressed by customers with a slight inclination towards positivity.

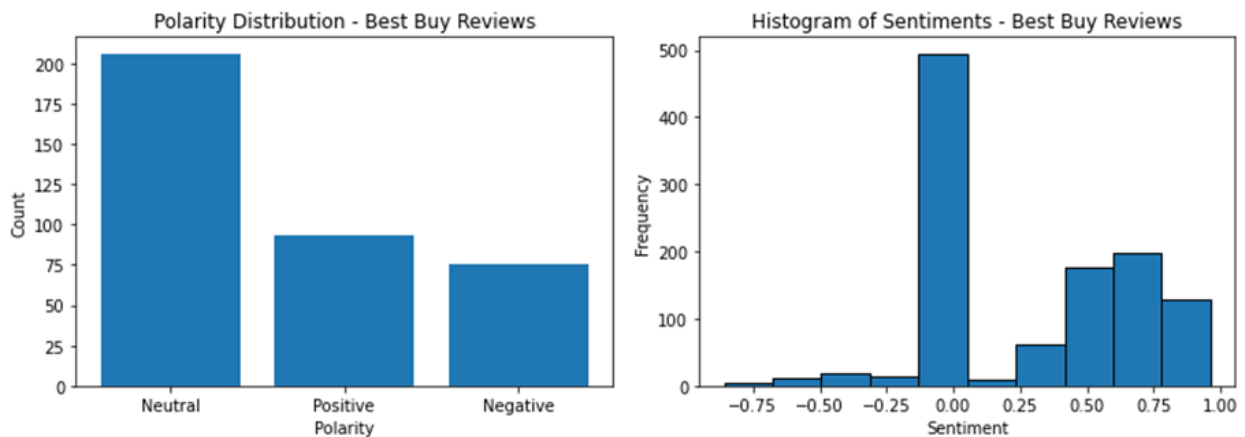


Figure 4 Polarity Distribution and Histogram of Sentiments (Best Buy)

Sentiment scores are utilized to gain a deeper understanding of sentiment in iPhone 14 reviews. These scores represent the sentiment expressed in reviews and titles. Positive scores indicate positive sentiment, negative scores reflect negative sentiment, and scores close to 0 suggest a neutral sentiment or a mix of opinions. Analyzing these scores allows for evaluating sentiment distribution across different titles, reviews, posts and comments.

The sentiment scores further highlight that, on average, sentiment expressed in iPhone 14 product reviews tends to be neutral. However, it is important to consider the specific sentiment analysis method used and the contextual relevance of the data when interpreting these scores.

In the case of Reddit, the distribution of polarity categories provides an overview of the sentiment expressed in the reviews. It reveals that the majority of reviews are categorized as "Neutral," while a smaller number of reviews fall into the "Negative" and a bit smaller in the "Positive" categories. This distribution suggests a relatively balanced sentiment among the reviewers, with a slight inclination towards negativity.

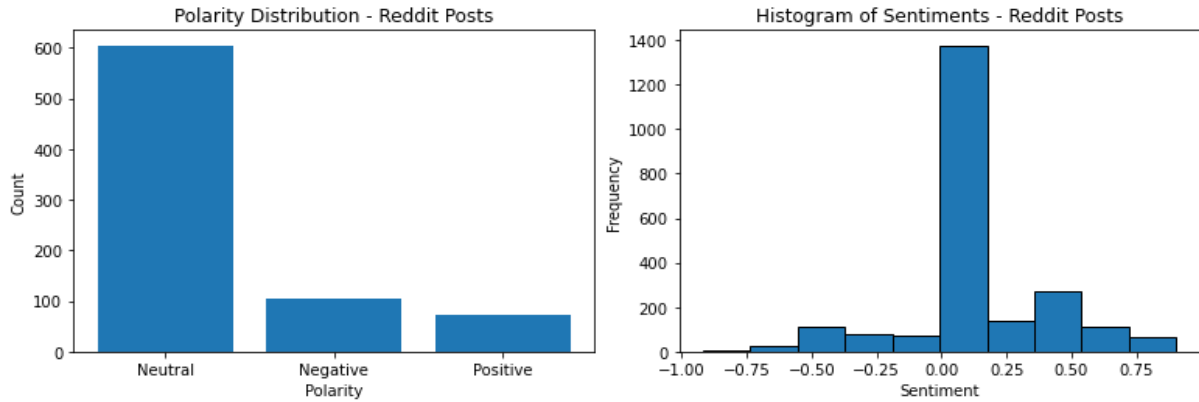


Figure 5 Polarity Distribution and Histogram of Sentiments (Reddit)

The sentiment analysis of both Best Buy and Reddit data for iPhone 14 reviews yield interesting findings. In both cases, the majority of reviews were categorized as "Neutral," indicating a balanced sentiment among the reviewers. However, there are differences in the distribution of sentiments, with Best Buy reviews showing a higher number of reviews classified as "Positive" or "Negative" compared to Reddit and a higher number of positive reviews overall. Reddit, on the other hand, has more negative than positive sentiment in its posts.

Brandwatch: Sentiment and Emotion Analysis

To gain a comprehensive understanding of the sentiments surrounding the iPhone 14, the analysis expands beyond the 783 reviews from Reddit and the 373 reviews from Best Buy. Additional data from Brandwatch is incorporated in order to obtain a more extensive and inclusive perspective. This allows for the analysis of a larger sample size and provides a broader picture of people's sentiments toward the iPhone 14.

The initial dashboard provides a comprehensive overview of the newly released iPhone 14. It analyzes 559 million reviews from various online platforms, collected between September 1st, 2022, and May 1st, 2023. The analysis reveals that most reviewers are males (73%) with a keen interest in technology, mainly from executive and artistic professions. These findings are crucial for understanding the target audience and their preferences.

Customer feedback indicates that the majority of reviews expressed a neutral sentiment (95%), with negative feedback accounting for 3% and positive feedback only 2% (Figure 8). Neutral reviews cover different categories, such as seeking assistance, suggesting new features, and discussing changes made

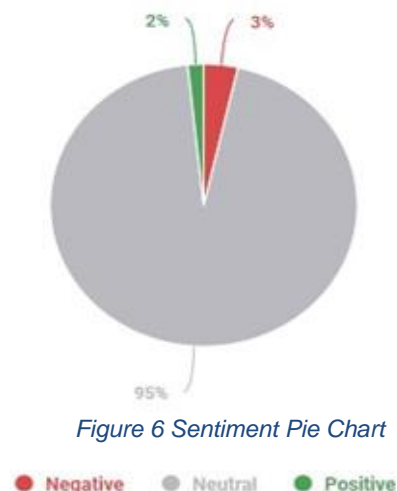


Figure 6 Sentiment Pie Chart

to the product. Negative reviews focus on issues like short battery life, camera bugs, low storage capacity, and phone overheating. Positive reviews highlight impressive camera features and modern software development practices.

Furthermore, emotions are extracted and analyzed based on the positive and negative sentiments (only 5%) identified through sentiment analysis. Going deeper into the evaluation of them shows that 18% of reviews expressed joy, particularly regarding the camera quality and

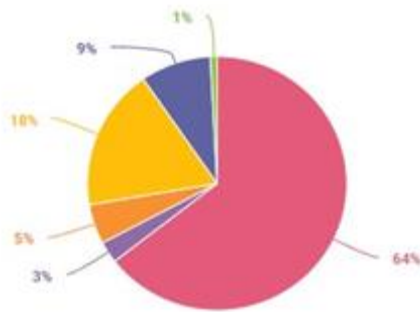


Figure 7 Emotions Pie Chart

Apple's design choices. However, anger is the most predominant emotion expressed, with a significant 64% of reviews expressing discontent. This indicates that consumers are experiencing issues with the new iPhone 14 that are negatively impacting the satisfaction with the product. The most frequently mentioned issues include a short battery life and a bug that causes the camera hardware to shake and make a buzzing noise when using popular social media applications such as TikTok, Instagram, and Snapchat. In addition, another frequently mentioned topic found in the analysis of consumer reviews was "iOS." It appears that the solution for the

camera bug mentioned earlier was an iOS update. However, many consumers reported that the update did not fix the issue, leading to further frustration and dissatisfaction.

The analysis emphasizes the importance of addressing negative feedback and leveraging positive reviews in marketing campaigns to enhance customer satisfaction and attract more customers. Apple's customers have high expectations, and failure to meet them can lead to dissatisfaction and decreased market share.

These comparisons show that Best Buy, Brandwatch, and Reddit reviews have a similar distribution of sentiments, with a majority of "Neutral" reviews. This suggests a large representation of a neutral sentiment within the three samples taken for the analysis. It's important to consider that sentiment analysis results can vary depending on the data sources and methodologies used. Nonetheless, all these sources provide valuable perspectives on customer sentiment, which can help Apple gain insights into public opinion, customer feedback, and brand perception related to the iPhone 14.

Network Analysis

In the network analysis stage, Gephi is utilized to analyze and visualize the collected data. Gephi is a network visualization software that aids in comprehending complex relationships and patterns within the data. By importing the collected user feedback data into Gephi, it facilitated the

creation of visual representations such as network graphs, which helped identify connections, clusters, and trends within the data.

The combination of data from API and web scraping, along with the use of Gephi, allows for a comprehensive understanding of user feedback. This approach provides a diverse range of opinions, sentiments, and experiences, forming the foundation for accurate analysis and more precise recommendations to enhance the iPhone 14.

To be able to carry out the analysis in Gephi, Python is utilized to create a GEXF file with words (such as adjectives, verbs, and nouns) sourced from Best Buy and Reddit reviews of the iPhone 14. The data was imported and used to construct an undirected graph. Given the graph's significant size, filters are applied to focus on specific aspects. These filters aim to identify the most frequently encountered words within the graph and examine their connections with other words.

Additionally, various statistical metrics are then applied to gain insights of the networks. More specifically, the graphs of Best Buy and Reddit display an average degree of 42.5 and 51.5 respectively, representing the average number of connections per node. The average weighted degree, which is considered the strength of connections, measures 249.1 for Best Buy and 350.2 for Reddit. A network diameter of 2 indicates that the graphs are relatively compact with short paths between any two nodes.

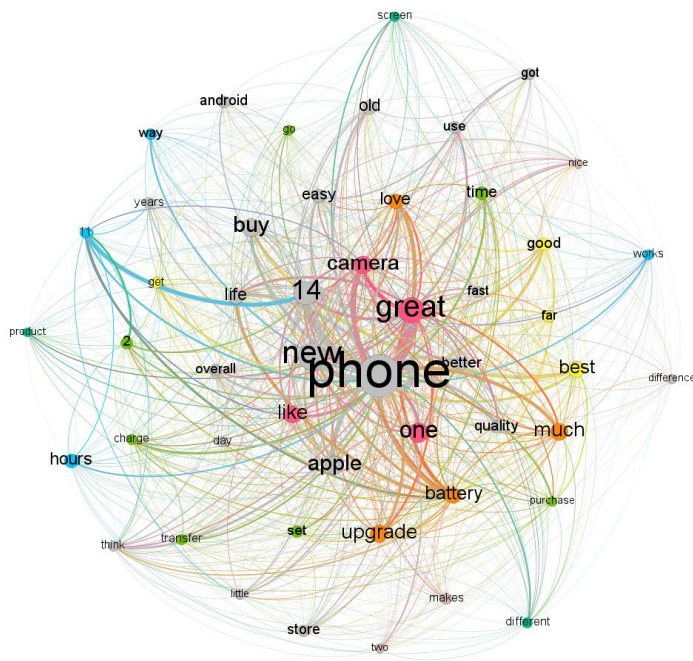
The density of the graph is calculated at 0.868 for Best Buy and 0.971 for Reddit, suggesting a high level of interconnectedness among the nodes. It is observed that both graphs consist of a single connected component, indicating that all nodes were directly or indirectly linked. The modularity score is 0.034 and 0.055, with two communities identified for both networks, implying the presence of distinct groups of words that exhibit stronger connections within themselves compared to the rest of the network.

Furthermore, the statistical inference is performed, yielding a value of 1168.2 for Best Buy and 1300.9 for Reddit. This measure assesses the statistical significance of the observed network structures. Lastly, the average path length between nodes is determined almost the same for both networks (Best Buy 1.162 and Reddit 1.064), indicating the average number of edges traversed.

For improved visualization, node size and color are adjusted to enhance clarity and facilitate the interpretation of the graph. These customizations aim to aid in the identification of patterns and relationships among the words.

Analysis of the nodes

In analyzing the reviews of the iPhone 14 product, several recurring words and connections emerge as significant indicators of customer sentiments and experiences. The most frequent words mentioned by the customers included "phone", "great", "Apple", "new", "battery", "14", "love", "best", "good", "life", "time", "camera", and "quality" among others.



The prominence of words like "great", "best", and "good" suggests a generally positive sentiment expressed by the customers. This indicates that a substantial number of users are highly satisfied with the iPhone 14. The mention of "battery", "life", "charge", and "hours" highlights the importance of battery performance and longevity in the users' feedback, indicating that the battery life of the iPhone 14 is an essential consideration for customers.

The connections between words also provide valuable insights into the key features and experiences associated with the iPhone 14. The most frequent connections observed are "great phone", "phone 14", "phone new", "phone camera", "battery phone", "love phone", and "great camera", among others. These connections emphasize the significance of camera quality, the newness of the phone model, and the overall positive experience of owning and using the iPhone 14.

In general, the analysis of the comments reflects the positive view of the iPhone 14 product. The overall view derived from these comments suggests that the iPhone 14 has garnered positive feedback for its overall performance, camera capabilities, and battery life, making it a highly regarded choice among customers. It is important to note, however, that this analysis is based on the provided dataset of reviews, and individual experiences may vary.

Recommendations

While the overall sentiment surrounding the iPhone 14 is positive, it is important to acknowledge the presence of user complaints. Through analysis, certain areas have surfaced where consumers have expressed their concerns. By attentively listening to these complaints and taking appropriate action, Apple can further improve future generations of their phones. The following list highlights key areas that the company must address to maintain its position as a leading manufacturer in the industry.

- **Enhanced Battery Life:** Apple should address the concerns raised regarding battery performance, including optimizing battery usage in high ambient temperatures. Further improvements to extend battery life would enhance user satisfaction.
- **Education Campaigns About the New eSIM:** Users have expressed some concerns and complaints about the new eSIM introduced in the latest iteration of the iPhone. Apple should allocate part of its marketing budget to more content marketing campaigns. One of them should be aimed at users in the consideration stage of the marketing funnel who may prefer to use a phone with a more traditional SIM setup and show them the benefits of the new configuration. Another content marketing campaign should be aimed at users who have already bought the phone and may have problems setting it up. This will help to reduce churn and increase brand loyalty.
- **Position About Accessories:** Apple decided to stop including accessories out of the box for environmental reasons. As many users complain about this, they may consider educating their audience further about the impact that reducing the waste generated by including accessories in every box has on the environment. At the same time, they may want to consider discounts for first-time users who may not have an iPhone charger at home. On the other hand, Apple can also start using environmentally friendly materials to produce its accessories. By utilizing sustainable materials, such as recycled plastics or biodegradable alternatives, Apple can demonstrate its commitment to environmental responsibility throughout the entire product lifecycle. This approach would align with their overall environmental objectives and provide users with accessories that have a reduced ecological footprint.

- **Increase Base Cloud Storage:** As apps, media, photo quality, and file sizes continue to grow, users often find themselves running out of storage quickly. Offering a higher base storage option can alleviate this issue and provide users with more flexibility. In addition, Apple can increase the cloud storage capacity of the iPhone models, enhancing the size to back up and store user data, photos, and files. This provides an alternative storage solution while freeing up local device storage.
- **Camera Enhancements:** The positive feedback regarding the camera capabilities of the iPhone 14 presents an opportunity for Apple to capitalize on this strength. To leverage this advantage, Apple can consider organizing "photography competitions" that encourage users to capture and share photos taken with their iPhone devices on social media platforms. This approach would generate user-generated content highlighting the powerful features of the brand, ultimately attracting more potential customers and expanding the reach of the iPhone's reputation. Furthermore, Apple should continue to enhance the camera performance in subsequent generations of their phones. This could involve improvements such as faster image processing and enhanced low-light capabilities. It is also key to avoid software glitches that impair camera performance. Though they can be fixed with software updates, as it happened with the iPhone 14, these errors negatively influence user experience and brand perception. By consistently pushing the boundaries of camera technology, Apple can solidify the iPhone's position as a leading smartphone camera, further establishing its brand as the go-to choice for photography enthusiasts.
- **Keep On Expanding the Color Palette:** Device color and cases are topics that emerged frequently in our analysis. To cater to the diverse preferences and individuality of consumers, Apple could consider expanding the color options and making them more unique and special for its iPhone models, such as shades of purple or blue, escaping from the usual colors, such as black and white. Offering a wider palette of colors allows users to select a device that reflects their personal style and taste. By introducing a broader range of vibrant and unique color options, Apple can appeal to a larger customer base and provide a more personalized experience. This approach not only enhances the aesthetics of the iPhone but also enables users to express their personality through their device choice. Additionally, promoting the availability of various color options through marketing campaigns can create excitement and further differentiate Apple's products from competitors.
- **User Experience Focus:** The overall satisfaction expressed by users with the iPhone 14's transition from previous iPhone models should be maintained. Continuously refining the user interface, streamlining setup and transfer processes, and ensuring reliable and responsive performance will contribute to a positive user experience.

- **Pricing:** While some users have expressed concerns about the price of the iPhone, it is essential to note that the device is positioned as a luxury product. Lowering the price may not align with its premium positioning. Instead, Apple can focus on investing in brand positioning campaigns to reinforce and enhance its reputation as a top-tier brand. By emphasizing the exclusivity, quality, and status associated with owning an iPhone, users may perceive the cost as an investment or a statement of their social standing, reducing complaints about the price and strengthening their loyalty to the brand.
- **Antenna Design and Software Updates:** To address the reported complaints regarding the signal reception of the iPhone 14, Apple should invest in research and development to improve the antenna design and placement in future iPhone models. By optimizing the antenna system, Apple can enhance signal reception and minimize call dropouts or connectivity issues. Furthermore, it can regularly release software updates that focus on improving network connectivity, call stability, and overall performance. These updates can address any signal issues, enhance network compatibility, and introduce optimizations to improve the user experience.
- **Improving Shipping and Delivery:** Apple should emphasize to the delivery services the importance of accurate and careful handling of packages during the delivery process. This can include conducting regular audits or quality checks to monitor the performance of local delivery services and address any issues or concerns promptly. This approach can help minimize instances of wrong shipping, wrong delivery, and wrong orders, ultimately enhancing the overall customer experience and satisfaction with Apple's products.

Results And Their Discussion

An in-depth analysis of various iPhone features is conducted using data gathered from different social media platforms, such as Brandwatch, Reddit, and Best Buy. Through techniques such as Keyword Extraction, Frequency Analysis, Named Entity Recognition, Topic Modeling, Text Annotation, Sentiment Analysis, and Network Analysis, Apple can gain valuable insights into consumer sentiments and opinions regarding the camera, battery life, accessories, memory, operating system, colors, and price of iPhones. The analysis aimed to understand the overall perception of iPhone features among consumers.

Upon analyzing the data from these platforms, it becomes evident that the majority of consumers who purchase iPhones express high levels of satisfaction with various features. The analysis reveals positive sentiments and pleasant experiences related to the camera, battery life, screen, memory, iOS, and security. Consumers consistently highlighted the superior quality of the camera, praising its performance and image quality. The battery life was frequently commended,

with users expressing satisfaction with its longevity and reliability. The screen quality was widely appreciated, particularly for its vibrant colors and clarity.

Furthermore, the analysis shows that consumers value the memory capacity of iPhones, allowing them to store a significant amount of data and media. The iOS operating system receives positive feedback for its user-friendly interface and seamless performance.

However, it is worth noting that while the majority of consumers are pleased with iPhone features, there were a few notable concerns raised by users. One recurring complaint among customers is the lack of accessories included with each purchase. Users expressed disappointment over the diminishing number of accessories provided with iPhones, which they perceived as a reduction in value for their money. Additionally, the issue of pricing emerges as a common concern among users.

Therefore it is crucial for the company to take serious consideration of the customer's feedback and enhance the next-generation iPhone products. Apple should consider implementing the above recommendations in order to keep having the competitor's advantage. Customers always create more and more needs nowadays and their standards for the luxury brands, like Apple, are extremely high. By identifying and analyzing the feedback, as well as implementing effective solutions Apple can be a leading and powerful company in the industry.

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Appendix

	Entity	Description	Count
0	ORG	Companies, agencies, institutions, etc.	20
1	CARDINAL	Numerals that do not fall under another type	191
2	PERCENT	Percentage, including "%"	5
3	DATE	Absolute or relative dates or periods	48
4	TIME	Times smaller than a day	16
5	MONEY	Monetary values, including unit	7
6	ORDINAL	"first", "second", etc.	20
7	QUANTITY	Measurements, as of weight or distance	2
8	PERSON	People, including fictional	13
9	GPE	Countries, cities, states	6
10	PRODUCT	Objects, vehicles, foods, etc. (not services)	1

Figure 10 Entities in Best Buy Data

	Entity	Description	Count
0	DATE	Absolute or relative dates or periods	111
1	GPE	Countries, cities, states	72
2	LOC	Non-GPE locations, mountain ranges, bodies of ...	4
3	TIME	Times smaller than a day	42
4	PERSON	People, including fictional	59
5	ORDINAL	"first", "second", etc.	24
6	QUANTITY	Measurements, as of weight or distance	12
7	CARDINAL	Numerals that do not fall under another type	318
8	NORP	Nationalities or religious or political groups	19
9	ORG	Companies, agencies, institutions, etc.	33
10	MONEY	Monetary values, including unit	17
11	PERCENT	Percentage, including "%"	13
12	PRODUCT	Objects, vehicles, foods, etc. (not services)	1
13	LANGUAGE	Any named language	1

Figure 11 Entities in Reddit Data



Figure 12 Topics (Best Buy)

Wordcloud - Reddit



Figure 15 Stemmed Wordcloud - Reddit Posts

Top 20 Bigrams - Best Buy

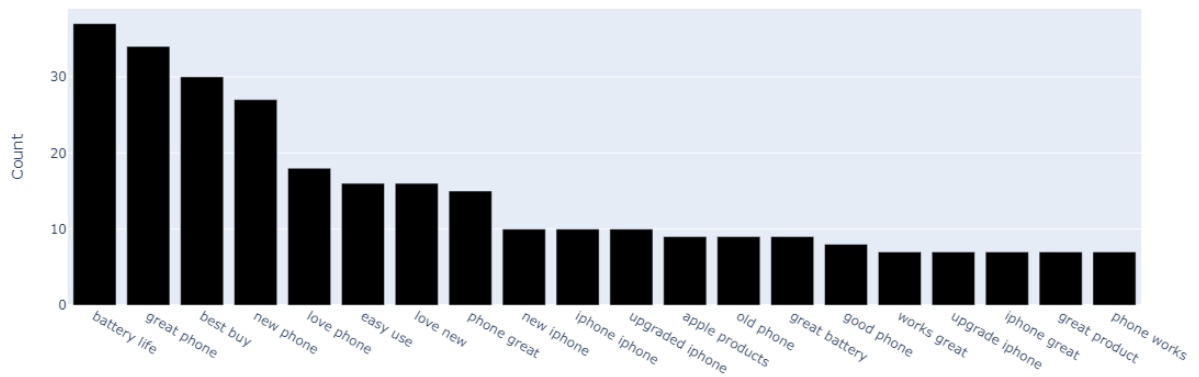


Figure 16 Top 20 Bigrams - Best Buy Reviews

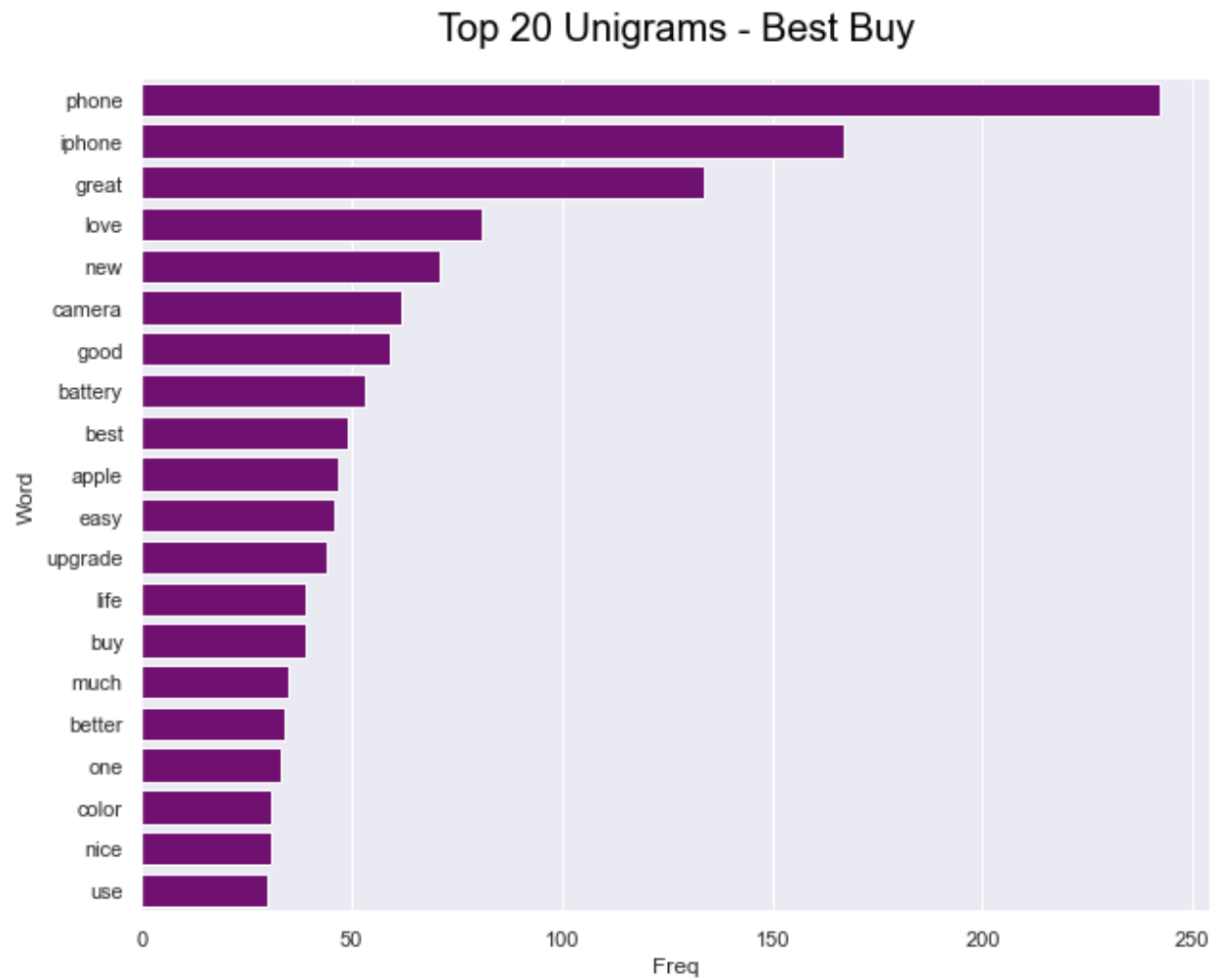


Figure 17 Top 20 Unigrams - Best Buy Reviews

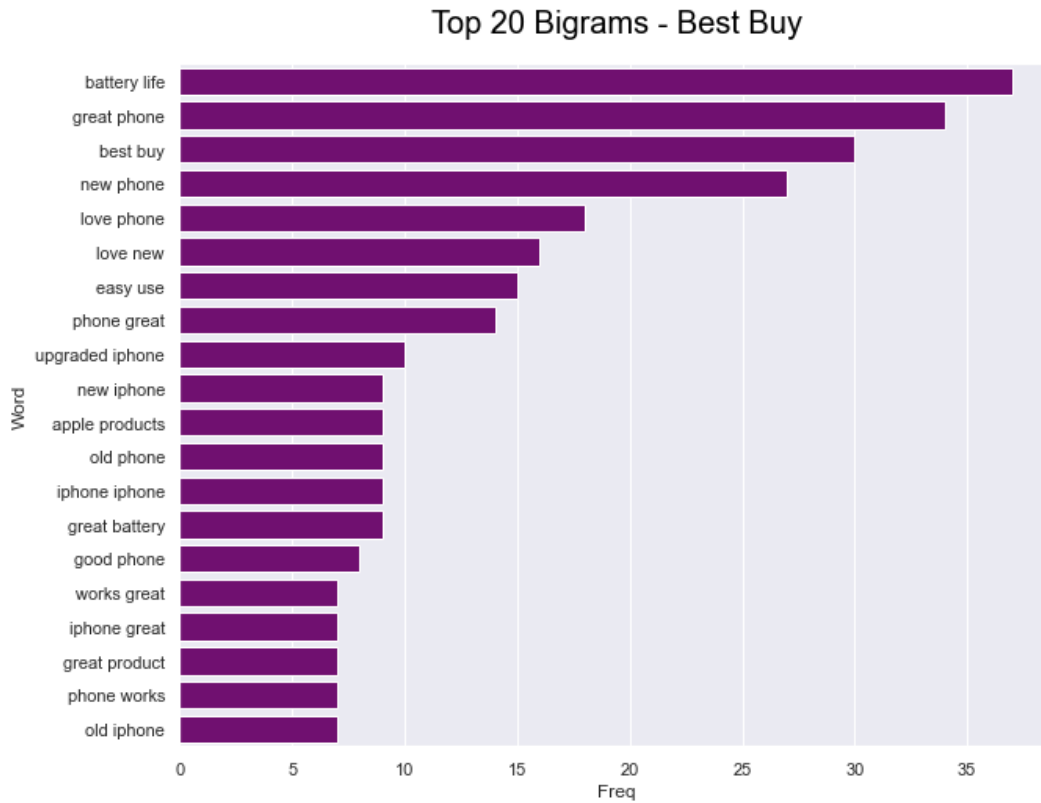


Figure 18 Top 20 Bigrams - Best Buy Reviews

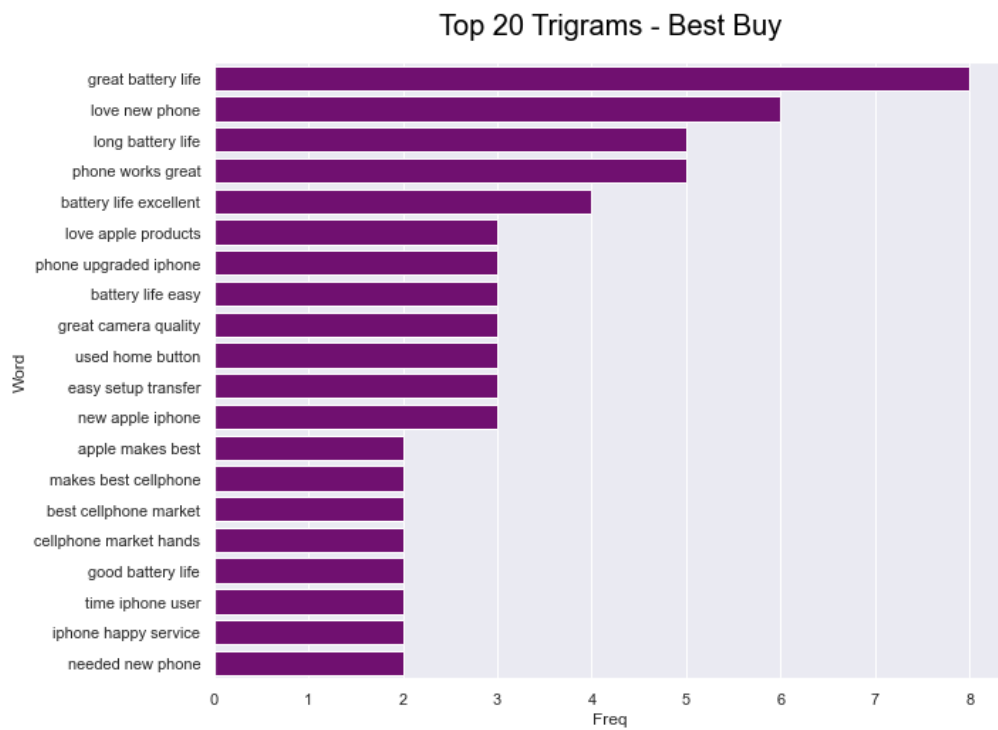


Figure 19 Top 20 Trigrams - Best Buy Reviews

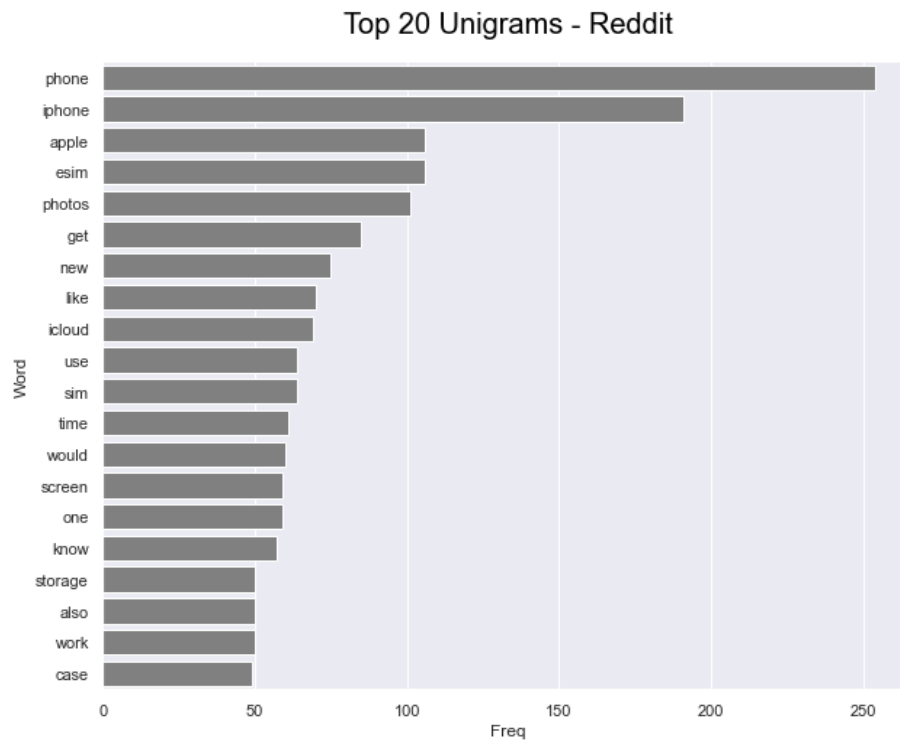


Figure 20 Unigrams - Reddit Posts

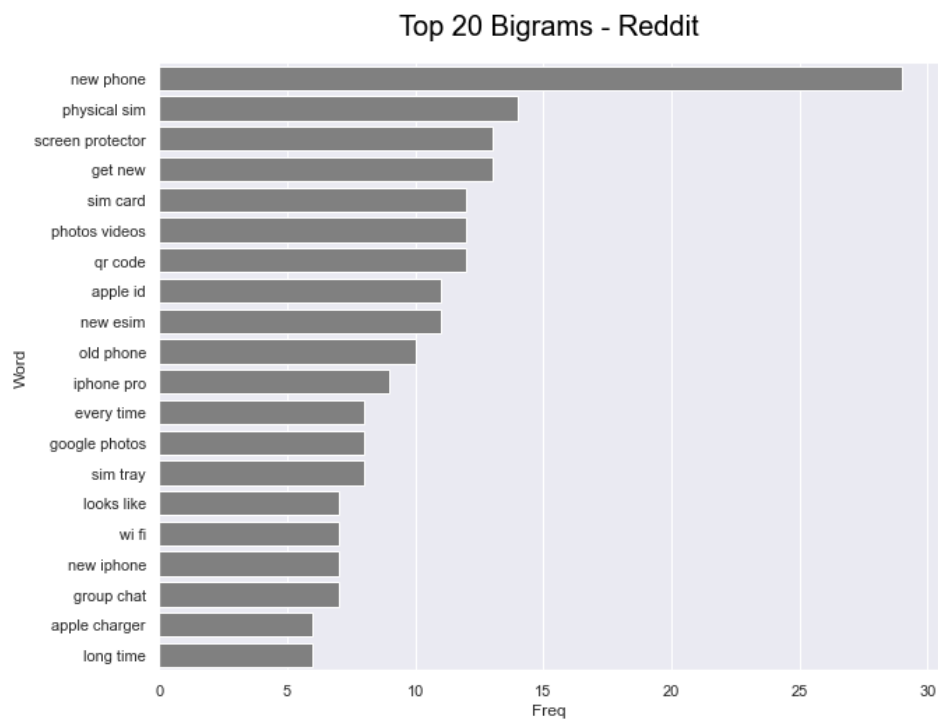


Figure 21 Bigrams - Reddit Posts

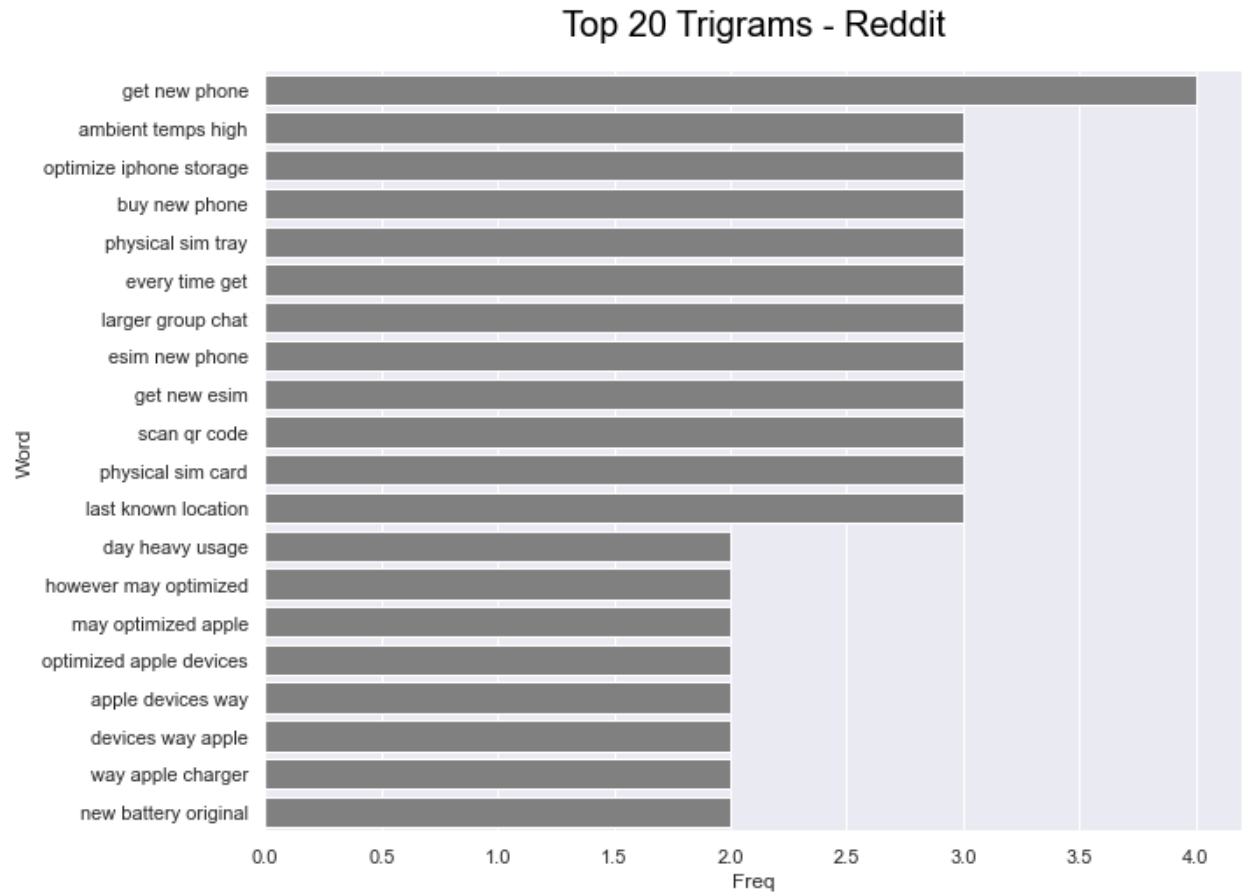


Figure 22 Trigrams - Reddit Posts

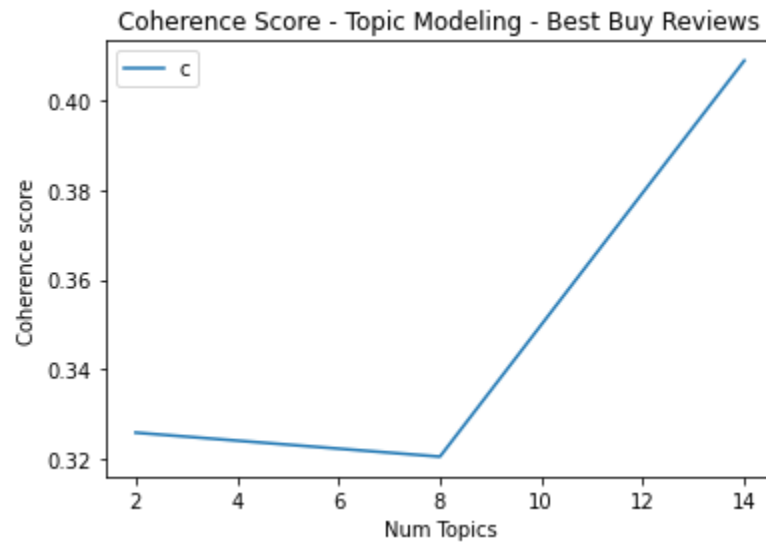


Figure 23 Coherence Score - Best Buy

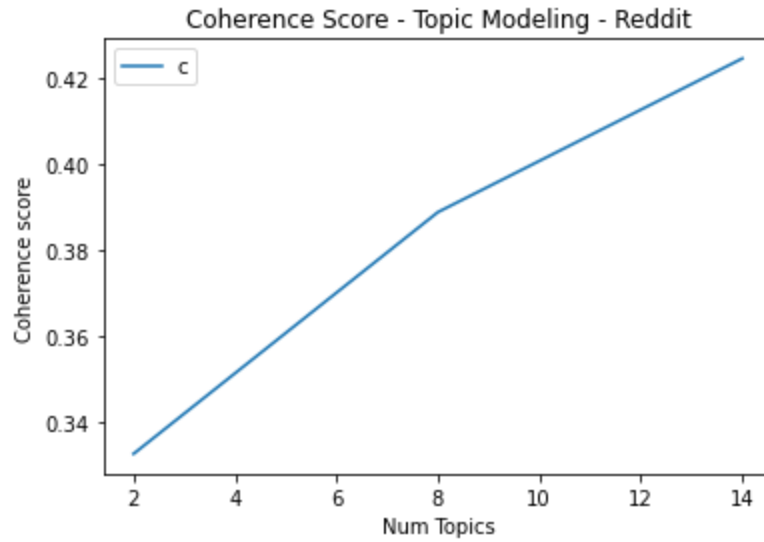


Figure 24 Coherence Score - Reddit

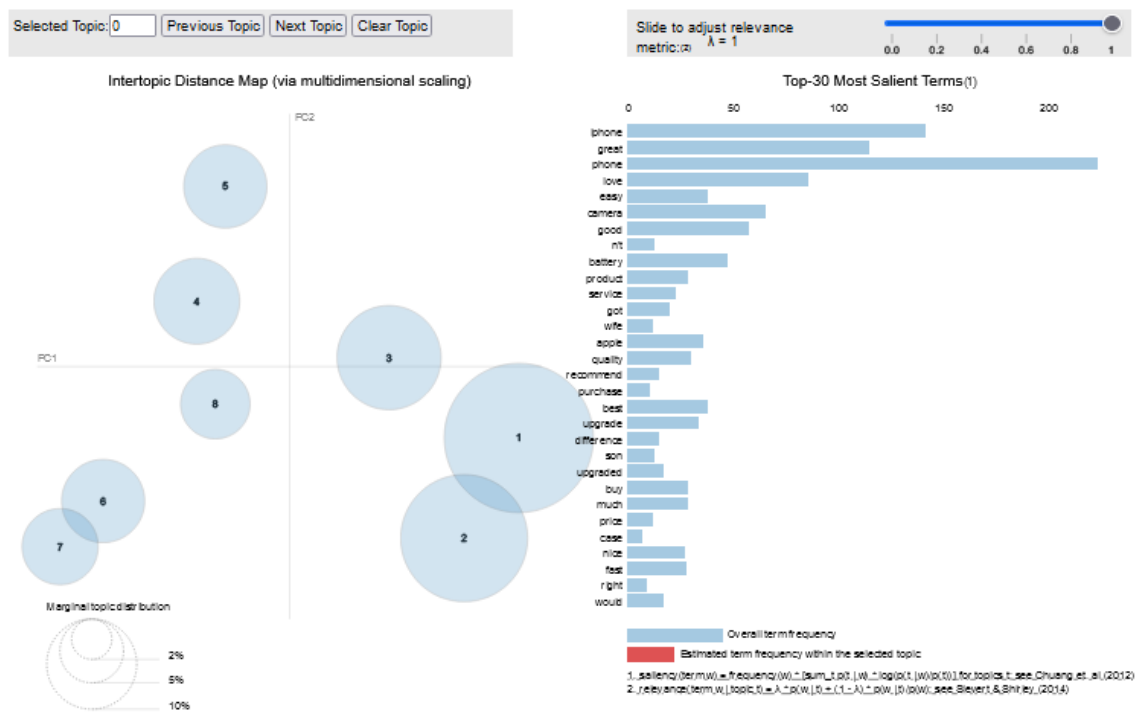


Figure 25 Latent Dirichlet Allocation model - Best Buy

	Sentiment		text	ID	Sentiment
text					
100% love I love my item. THANKS BEST BUY!!!!!!...	0.576833	0	100% love I love my item. THANKS BEST BUY!!!!!!...	302.0	0.576833
A fantastic phone! Purchase and transfer was a...	0.432900	1	A fantastic phone! Purchase and transfer was a...	158.0	0.432900
A must have for an upgrade. Bestbuy always has...	0.212300	2	A must have for an upgrade. Bestbuy always has...	132.0	0.212300
A++++ love the camera and the sleek design. Fi...	0.473800	3	A++++ love the camera and the sleek design. Fi...	227.0	0.473800
Absolutely love it, took a bit of setup out of...	0.453050	4	Absolutely love it, took a bit of setup out of...	34.0	0.453050
...
new to Iphone - had a droid - so trying to nav...	0.077200	364	new to Iphone - had a droid - so trying to nav...	11.0	0.077200
overall a good phone. battery life is great an...	0.532650	365	overall a good phone. battery life is great an...	340.0	0.532650
the phone is pretty - I just don't like when s...	0.199900	366	the phone is pretty - I just don't like when s...	8.0	0.199900
updated from a 6s -- while the 6s was still pe...	0.440400	367	updated from a 6s -- while the 6s was still pe...	217.0	0.440400
works like any other phone, i upgraded from 6s...	0.124983	368	works like any other phone, i upgraded from 6s...	264.0	0.124983

369 rows × 1 columns

369 rows × 3 columns

Figure 26 Sentiment Score Tables (Best Buy)

Source	Target	Type	Id	Label	Interval	Weight
great	phone	Undirected	2303		144.0	
phone	phone	Undirected	3350		93.0	
phone	14	Undirected	3369		91.0	
phone	new	Undirected	3355		71.0	
phone	camera	Undirected	3436		61.0	
apple	phone	Undirected	7		59.0	
battery	phone	Undirected	1304		55.0	
14	11	Undirected	9542		52.0	
love	phone	Undirected	1881		50.0	
best	buy	Undirected	533		46.0	
great	camera	Undirected	2361		44.0	
phone	much	Undirected	3326		43.0	
phone	buy	Undirected	3454		41.0	
battery	life	Undirected	1301		41.0	
good	phone	Undirected	1097		40.0	
battery	great	Undirected	1305		40.0	
phone	one	Undirected	3345		39.0	
phone	like	Undirected	3337		38.0	
phone	quality	Undirected	3449		38.0	
life	phone	Undirected	1600		38.0	
great	14	Undirected	2372		37.0	
phone	upgrade	Undirected	3366		34.0	
battery	14	Undirected	1354		34.0	
phone	easy	Undirected	3396		33.0	
phone	better	Undirected	3429		33.0	
phone	old	Undirected	3417		32.0	
phone	think	Undirected	3651		32.0	
life	great	Undirected	1595		32.0	
phone	overall	Undirected	3577		31.0	

Figure 27 Best Buy: Neighborhood words of the most frequent words

Source	Target	Type	Id	Label	Interval	Weight
problem	price	Undirected	7896		1.0	
problem	phones	Undirected	7897		1.0	
problem	overpriced	Undirected	7898		1.0	
problem	deal	Undirected	7899		1.0	
problem	trade	Undirected	7900		1.0	
problem	find	Undirected	7901		1.0	
problem	functions	Undirected	7902		1.0	
problem	expect	Undirected	7903		1.0	
problem	activate	Undirected	7904		1.0	
problem	loved	Undirected	7905		1.0	
problem	customer	Undirected	7906		1.0	
problem	service	Undirected	7907		1.0	
problem	young	Undirected	7908		1.0	
problem	lady	Undirected	7909		1.0	
problem	remember	Undirected	7910		1.0	
problem	able	Undirected	7911		1.0	
problem	see	Undirected	7912		1.0	
problem	name	Undirected	7913		1.0	
problem	tag	Undirected	7914		1.0	
problem	month	Undirected	7915		1.0	
problem	single	Undirected	7916		1.0	
problem	lasts	Undirected	7917		1.0	
problem	day	Undirected	7918		1.0	
problem	camera	Undirected	7919		1.0	
problem	despite	Undirected	7920		1.0	
problem	bionic	Undirected	7921		1.0	
problem	chip	Undirected	7922		1.0	
problem	last	Undirected	7923		1.0	

Figure 28 Best Buy: Neighborhood words of the word problem

Workspace 1 x Workspace 5 x Workspace 7 x Workspace 8 x

Data Table x

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: miss Source

Source	Target	Type	Id	Label	Interval	Weight
miss	theories	Undirected	83424			1.0
miss	cutting	Undirected	83425			1.0
miss	accessing	Undirected	83426			1.0
miss	speakers	Undirected	83427			1.0
miss	melody	Undirected	83428			1.0
miss	cuts	Undirected	83429			1.0
miss	spent	Undirected	83430			1.0
miss	reinstalled	Undirected	83431			1.0
miss	managing	Undirected	83432			1.0
miss	awareness	Undirected	83433			1.0
miss	reseting	Undirected	83434			1.0
missed	wondering	Undirected	32691			1.0
missed	worth	Undirected	32692			1.0
missed	switching	Undirected	32693			1.0
missed	kidding	Undirected	32694			1.0
missed	none	Undirected	32695			1.0
missed	control	Undirected	32696			1.0
missed	social	Undirected	32697			1.0
missed	media	Undirected	32698			1.0
missed	sickness	Undirected	32699			1.0
missed	charging	Undirected	32700			1.0
missed	high	Undirected	32702			1.0
missed	thanks	Undirected	32703			1.0
missing	music	Undirected	69567			3.0
missing	hearing	Undirected	69571			2.0
missing	hidden	Undirected	69564			1.0
missing	holders	Undirected	69565			1.0
missing	apples	Undirected	69566			1.0
missing	equaliser	Undirected	69568			1.0

Figure 29 Best Buy: Neighborhood words of the word miss and missing

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: blamed Source

Source	Target	Type	Id	Label	Interval	Weight
blamed	mobile	Undirected	17462			2.0
blamed	two	Undirected	17483			2.0
blamed	resolve	Undirected	17486			2.0
blamed	poor	Undirected	17463			1.0
blamed	reception	Undirected	17464			1.0
blamed	area	Undirected	17465			1.0
blamed	live	Undirected	17466			1.0
blamed	solve	Undirected	17467			1.0
blamed	tired	Undirected	17468			1.0
blamed	friends	Undirected	17469			1.0
blamed	businesses	Undirected	17470			1.0
blamed	telling	Undirected	17471			1.0
blamed	understand	Undirected	17472			1.0
blamed	breaking	Undirected	17473			1.0
blamed	made	Undirected	17474			1.0
blamed	least	Undirected	17475			1.0
blamed	half	Undirected	17476			1.0
blamed	dozen	Undirected	17477			1.0
blamed	calls	Undirected	17478			1.0
blamed	drove	Undirected	17479			1.0
blamed	40	Undirected	17480			1.0
blamed	60	Undirected	17481			1.0
blamed	miller	Undirected	17482			1.0

Figure 30 Best Buy: Neighborhood words of the word blamed

Data Table x

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Source

Source	Target	Type	Id	Label	Interval	Weight
phone	phone	Undirected	4117			149.0
phone	new	Undirected	4421			117.0
photos	photos	Undirected	59590			77.0
phone	get	Undirected	4123			76.0
storage	photos	Undirected	31511			72.0
screen	screen	Undirected	8336			58.0
phone	photos	Undirected	4277			56.0
phone	apple	Undirected	4172			55.0
phone	back	Undirected	4130			52.0
phone	screen	Undirected	4292			51.0
phone	14	Undirected	4624			51.0
phone	time	Undirected	4145			50.0
use	phone	Undirected	2882			49.0
get	new	Undirected	12645			45.0
want	photos	Undirected	59327			45.0
like	phone	Undirected	1816			44.0
phone	even	Undirected	4344			44.0
phone	old	Undirected	4411			43.0
phone	2	Undirected	4462			42.0
phone	using	Undirected	4481			42.0
phone	one	Undirected	4165			41.0
phone	got	Undirected	4111			39.0
phone	find	Undirected	4264			39.0
device	photos	Undirected	56567			39.0
apple	apple	Undirected	35796			37.0
phone	years	Undirected	4369			36.0
apple	https	Undirected	35778			36.0
phone	different	Undirected	4575			35.0
phone	need	Undirected	4333			33.0

Figure 31 Reddit: Neighborhood words of the most frequent words

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: problem Source							
Source	Target	Type	Id	Label	Interval	Weight	
problem	battery	Undirected	15641			12.0	
problem	water	Undirected	15694			10.0	
problem	adapter	Undirected	15634			9.0	
problem	normal	Undirected	15636			9.0	
problem	messages	Undirected	15607			6.0	
problem	original	Undirected	15632			6.0	
problem	carrier	Undirected	15849			4.0	
problem	chance	Undirected	15662			4.0	
problem	charging	Undirected	15638			4.0	
problem	draining	Undirected	15654			4.0	
problem	fix	Undirected	15658			4.0	
problem	heat	Undirected	15637			4.0	
problem	hot	Undirected	15626			4.0	
problem	year	Undirected	15652			4.0	
problem	carriers	Undirected	15871			3.0	

Figure 32 Reddit: Neighborhood words of the word problem

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: bad Source							
Source	Target	Type	Id	Label	Interval	Weight	
bad	space	Undirected	19024			3.0	
bad	things	Undirected	19042			3.0	
bad	normal	Undirected	19061			3.0	
bad	adapter	Undirected	19073			3.0	
bad	8	Undirected	19092			3.0	
bad	photographer	Undirected	19093			3.0	
bad	worse	Undirected	19095			3.0	
bad	close	Undirected	19096			3.0	
bad	subjects	Undirected	19097			3.0	
bad	settings	Undirected	19098			3.0	
bad	seems	Undirected	19099			3.0	
bad	sorry	Undirected	19100			3.0	
bad	terms	Undirected	19101			3.0	
bad	evangelizing	Undirected	19102			3.0	
bad	yes	Undirected	19103			3.0	
bad	disappointed	Undirected	19104			3.0	
bad	bad	Undirected	19105			3.0	
bad	return	Undirected	19106			3.0	
bad	confused	Undirected	19107			3.0	
bad	cost	Undirected	19108			3.0	
bad	sample	Undirected	19109			3.0	
bad	took	Undirected	19110			3.0	
bad	processing	Undirected	19112			3.0	
bad	split	Undirected	19113			3.0	
bad	second	Undirected	19114			3.0	
bad	highlights	Undirected	19117			3.0	
bad	places	Undirected	19118			3.0	
bad	murkly	Undirected	19119			3.0	

Figure 33 Reddit: Neighborhood words of the word bad

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: bad Source							
Source	Target	Type	Id	Label	Interval	Weight	
bad	heat	Undirected	19062			2.0	
bad	charging	Undirected	19063			2.0	
bad	draining	Undirected	19076			2.0	
bad	original	Undirected	19078			2.0	
bad	chance	Undirected	19085			2.0	
bad	sell	Undirected	19141			2.0	
bad	sounds	Undirected	19018			1.0	
bad	fine	Undirected	19019			1.0	
bad	scared	Undirected	19021			1.0	
bad	charger	Undirected	19023			1.0	
bad	plug	Undirected	19024			1.0	
bad	20	Undirected	19028			1.0	
bad	30	Undirected	19029			1.0	
bad	seconds	Undirected	19030			1.0	
bad	eternity	Undirected	19031			1.0	
bad	amount	Undirected	19035			1.0	
bad	pay	Undirected	19036			1.0	
bad	needed	Undirected	19038			1.0	
bad	worry	Undirected	19039			1.0	
bad	load	Undirected	19043			1.0	
bad	costing	Undirected	19045			1.0	
bad	storing	Undirected	19046			1.0	
bad	cloud	Undirected	19047			1.0	
bad	full	Undirected	19048			1.0	
bad	resolution	Undirected	19049			1.0	
bad	country	Undirected	19053			1.0	
bad	getting	Undirected	19054			1.0	
bad	delete	Undirected	19056			1.0	
bad	comments	Undirected	19057			1.0	

Figure 34 Reddit: Neighborhood words of the word bad