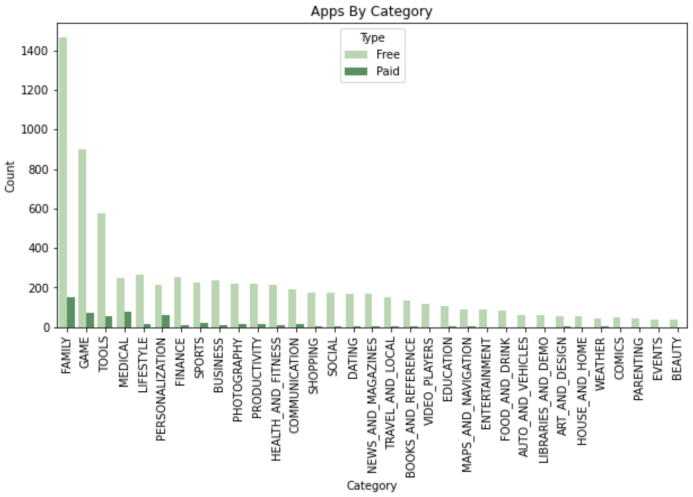
`Team B9 - Executive Summary

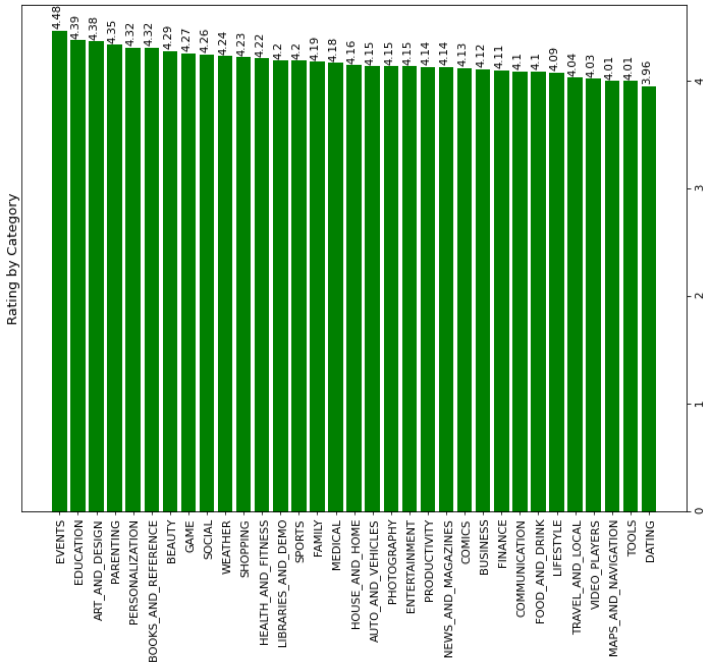
Business Problem:

Our goal is to help guide developers on what apps to create. We will perform textual analysis on Google Play Store apps to identify the most liked apps. The statistics results, such as the number of installed and ratings, provide institutions on which apps are promising to perform well in the Android market will be combined with textual analysis to provide a full scope understanding of app performance. This will enable us to provide to developers the results they can expect (if they have chosen an app to make) or match developers with an app type based on the developers' goals.

Exploratory Data Analysis:

Apps in family, game, and tools categories are the most frequent, as shown in the right bar chart, and most of the apps are free. Apps for family, game, and communication have the most reviews, accounting for 77% of the total reviews.



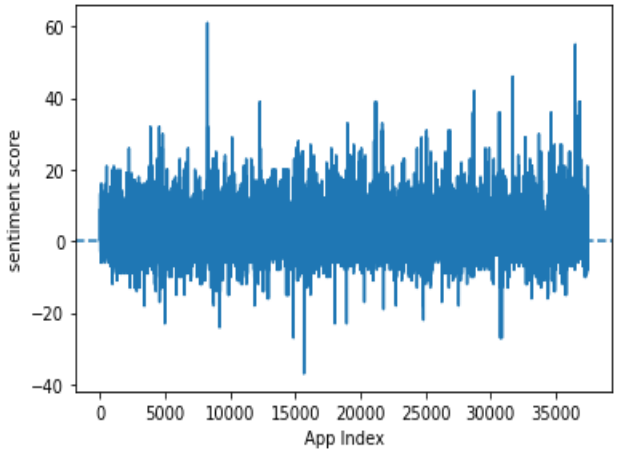


The top six categories with high ratings above 4.32 include: events, education, art, design, parenting, personalization, and books and reference. The lower-rated categories are dating, tools, maps, travel, and video players.

Analytical Findings - Sentiment Analysis on Overall App Reviews:

The attempt of sentiment analysis is to identify and extract subjective information from the text to help a business understand the users' sentiment of their products or service while monitoring online reviews. We

conducted sentiment analysis on the user reviews dataset on different apps from Google Play Platform and observed some patterns from the data. Most apps have sentiment scores from -20 to 20, and few of them have up to 60 and down to -40. The overall sentiment scores are positive, indicating that apps on the Google Play platform gained positive feedback on average.

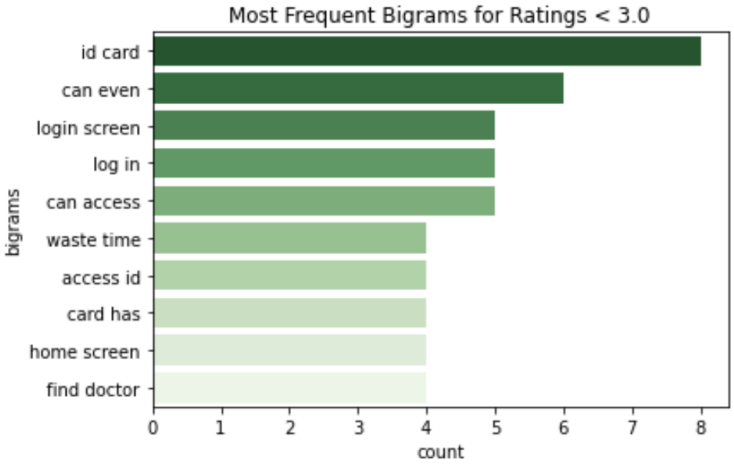


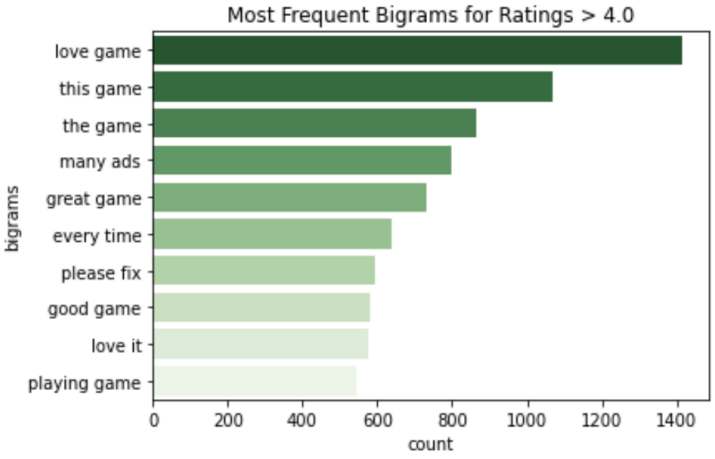
In terms of the analysis of each category, we found that the “Game” category has the most significant number of installs with a relatively high rating and sentiment score of 3.17. However, the second-largest number of installed categories-“News and Magazine” received a lower sentiment score of 1.8 compared to the “Game” category even though it has fewer reviews. Several categories worth mentioning include “Productivity”, “Family”, “Parenting”, and “Health and Fitness”. These types of apps are not only widely downloaded by users but also are favored by users with relatively higher positive sentiment scores of over 3.5. In addition to categories with high sentiment scores, some categories have lower review rates, as well as lower sentiment scores, such as “Beauty”, and “House and Home”.

Analytical Findings - Sentiment Analysis on App Reviews with Word Cloud:

In the interest of having an overview of the total reviews on apps, we generated word clouds from all the app reviews. We also removed stop words to make the word cloud more meaningful. The below word cloud chart shows the top words in all app reviews, from which we can see most reviews are about games. It’s because most apps are in the game categories and users of game apps are more willing to leave a review.

Then we generated bigrams using NLTK to find out the most frequent bigrams in low rating apps and high rating apps. From the below bar charts, we can see that for apps with ratings less than 3.0, most customer complaints are about id cards, login problems, and can't access the apps. It suggested that app developers need to pay high attention to offer users with timely technical support to fix bugs and make sure users can use apps easily. Conversely, reviews for apps with ratings higher than 4.0 received primarily positive reviews like love this game, great game, etc., which indicated that game apps tend to have higher ratings.

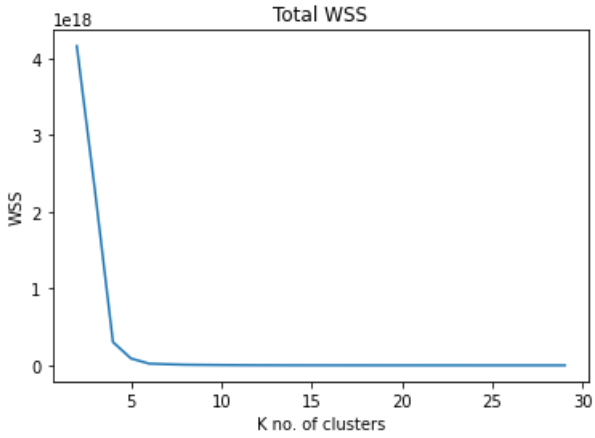




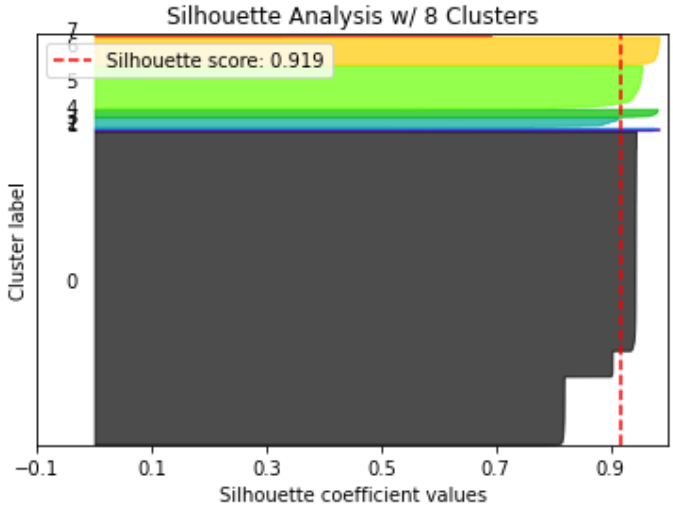
Clustering:

Clustering:

- The initial attempt to cluster the data was conducted using the rating table. The objective was to create clusters based on the numeric data in the ratings table (including dummy variables) and then proceeded to bring the reviews table in to help profile the clusters. The initial attempt indicated that:
    - Hierarchical Clustering was not the most accessible method to identify clusters with this kind of dataset: the use of dummy variables made it more difficult to decipher clean groups in the data
    - K Means provided a better look into potential clusters as we leveraged silhouette scores and total WSS to identify viable options. From the learnings through hierarchical clustering, we proceeded to standardize the data and use dimensionality reduction through PCA. We proceeded to test 8-9 clusters based on these scores, as seen in the charts below.

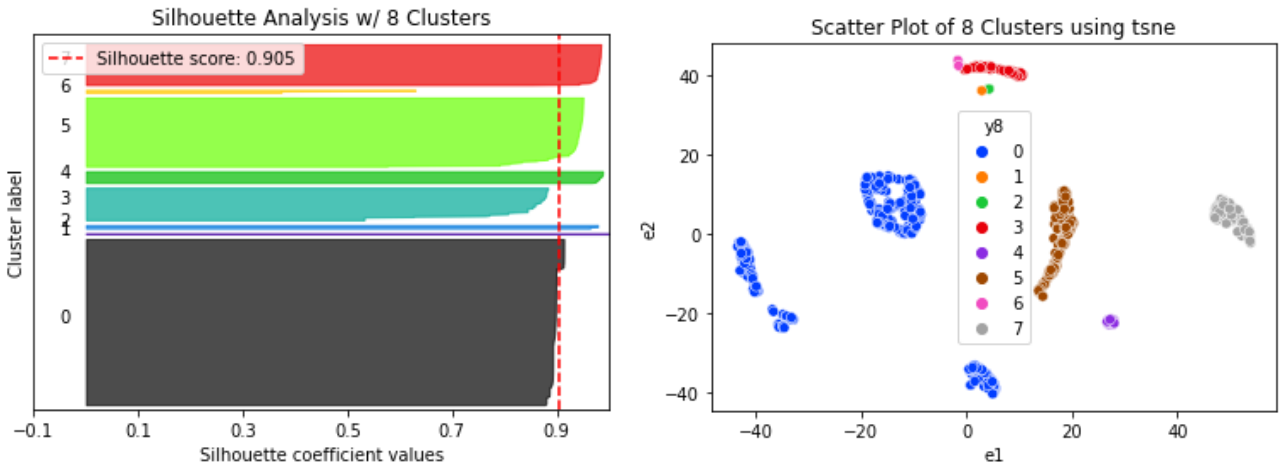


- The apparent obstacle with this approach was that the majority of the data was in one large cluster and potentially indicated that the clustering method could be improved.



Improved Clustering:

- The second approach in an attempt to improve the clustering process was to leverage the sentiment scores from the reviews table to help cluster the apps. This meant that our initial objective was slightly adjusted. Instead of using the sentiment analysis for profiling, we were now leveraging the sentiment analysis in the clustering process, and would then analyze the clusters across all possible variables to try and create meaningful profiles.
- The silhouette scores and total WSS indicated that between 8-9 clusters would be an excellent option to explore. When we plotted the clusters, it was observed that there still was one large cluster; however, it was substantially smaller than it was with the prior method.



Conclusions & Recommendation:

Profiling:

When diving deeper into each of the created clusters it was observed that in the largest cluster there was a reasonable mix of app categories. Given this cluster had the most apps, it also had the most reviews, and the lowest ratings given more exposure could lead to positive and negative ratings. On the other hand, another smaller cluster indicated the highest sentiment scores but only had four apps in the cluster, all in either family or games categories. These results suggest that relying solely on these cluster profiles will not lead to the more accessible data on what drives app performance. Further analysis of the variables without trying to fit the results into clusters might be most insightful for app developers.

Sentiment analysis:

Based on the sentiment analysis on app reviews, the most popular app category, Game, with over 27 million installs, gained comparatively positive feedback and a high rating. The Game category seems promising for developers looking to create competitive apps that access a larger number of users on the Google Play Platform. The word cloud also indicates that users in gaming apps are more likely to leave reviews compared to other categories. At the same time, users expect better login access to the apps, higher efficiency in fixing bugs, and app updated support. On the other hand, other categories including “Productivity”, “Family”, “Parenting”, and “Health and Fitness” are also popular and favored by users, which can be considered a great option to be developed.

Recommendation

Reviewing the app categories and metrics shows that different types can fit best for other goals or objectives of the developers and a company. Our recommendation is to make a productivity/organization app. As public perception is more important than ever, having positive perceptions and reviews of your app is essential for branding and repeat business. Productivity apps rank 5th highest in sentiment score, middle of the pack in several apps, so competition is not too steep, and 3rd in the number of downloads, which shows the limited number of apps in this category have found success. This category ranks 7th in several reviews, so the high positive sentiment cannot be attributed to being so high to a few reviews.

Finding a way to help people improve efficiency will only improve their mood, enable better recommendations, have more word of mouth marketing done for you, and help you quickly show advertisers why it will only help them to pair with your app. Now depending on the goals of the Developer, we can recommend apps to fit their goals:

Most competition and positive reviews: Family or Games
Most use but volatile reviews and low sentiment scores: news and magazine
Few numbers of apps, High sentiment: Parenting
Additional Balanced option with less popularity: Health and fitness