

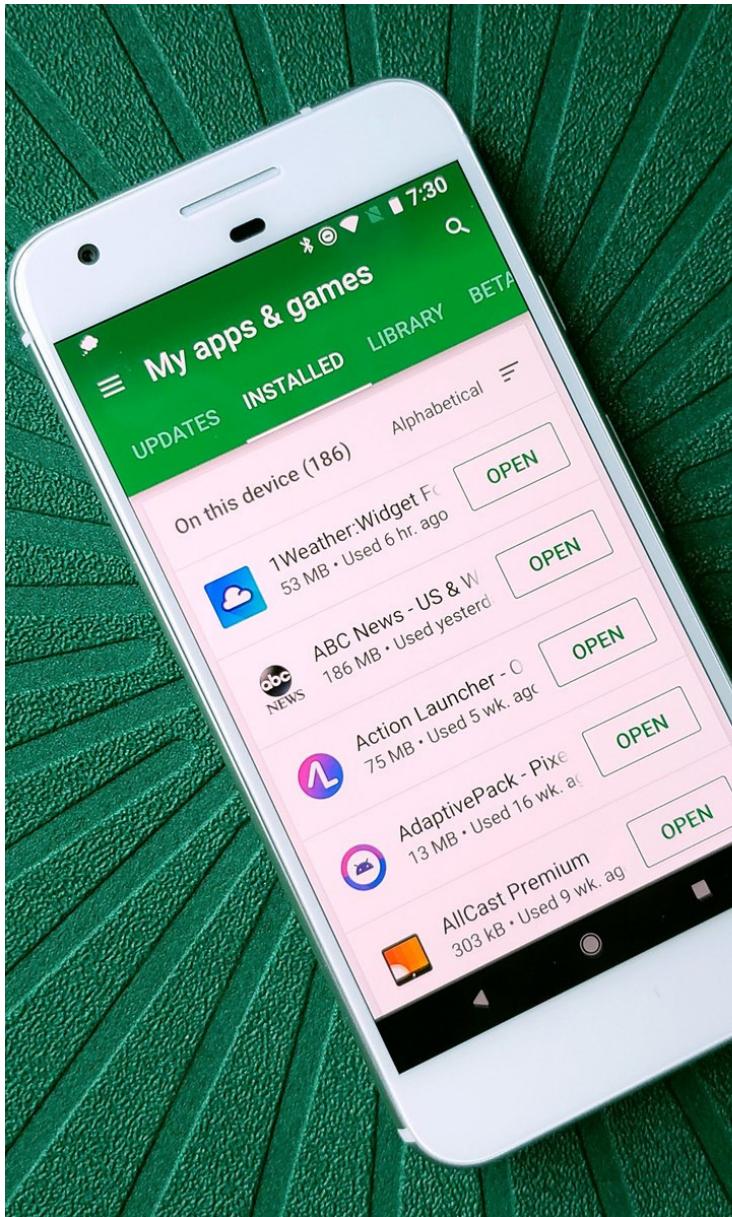
GOOGLE PLAYSTORE



ANALYSIS OF USER RATINGS
TALISH BARMARE

2018

INTRODUCTION



What is the first thing you do when you wake up in the morning? Before even drinking coffee, you more than likely pick up your smartphone to read the notifications emails etc. Surfing from one app to another.

Mobile Apps are now an integral part of our daily life as human beings and customers. Mobile app marketing, thus, becomes fundamental for any mobile app to understand where (and how) to invest to improve customer engagement and boost revenue.

Android is the dominant mobile operating system today with about 85% of all mobile devices running Google's OS. The Google Play Store is the largest and most popular Android app store.

The purpose of this project was to gather and analyze detailed information on apps in the Google Play Store in order to provide insights on the impact of User ratings. Ratings are what customers look at first when they land on your app's app store page, and what they rely on to decide if they want to download it. That's why monitoring and optimizing your ratings is important.

While many public datasets (on Kaggle and the like) provide Apple App Store data, there are not many counterpart datasets available for Google Play Store apps anywhere on the web.

The Play Store apps data has enormous potential to drive app-making businesses to success. Actionable insights can be drawn for developers to work on and capture the Android market!

The data set can be found at

<https://www.kaggle.com/lava18/google-play-store-apps/home>

KAGGLE

The source of the data set



10841

Observations

13

Variables

483

Duplicate Values

DATA SET

Let's start by understanding our dataset. The Data set has 10841 observations with 13 variables. Using a simple command we looked over the structure of our data set. Having this big picture, we realized most of the variables had a format not suitable to conduct analysis. Thus a cleaning procedure had to be conducted to prepare the data set for analysis.

Post cleaning the number of rows dropped to 10356 which suggests that 483 observations were duplicate.

DATA CLEANING

Below are various data cleaning procedures used

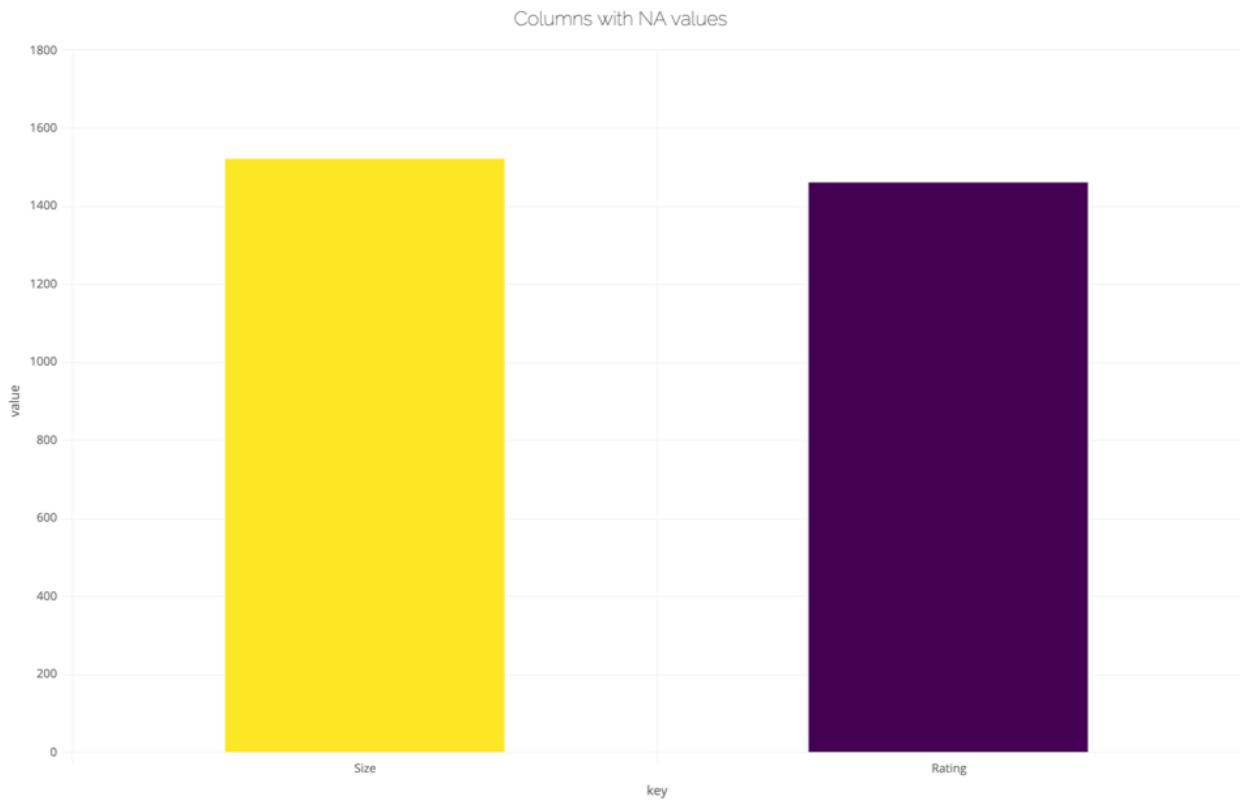
- Eliminate some characters to transform Installs to factors
- Eliminate 'M' to transform Size to numeric
- Replace cells with 'k' to 0 since it is < 1MB
- Transform Reviews to numeric
- Transform Type to Factor
- Transform Genre to Factors
- Remove currency symbol from Price, change it to numeric
- Last Updated to date format
- Replace "Varies with device" to NA since it is unknown
- Keep only version number to 1 decimal
- Drop old Android version column
- Two apps had type as 0 or NA, they will be removed

Statistics

NULL

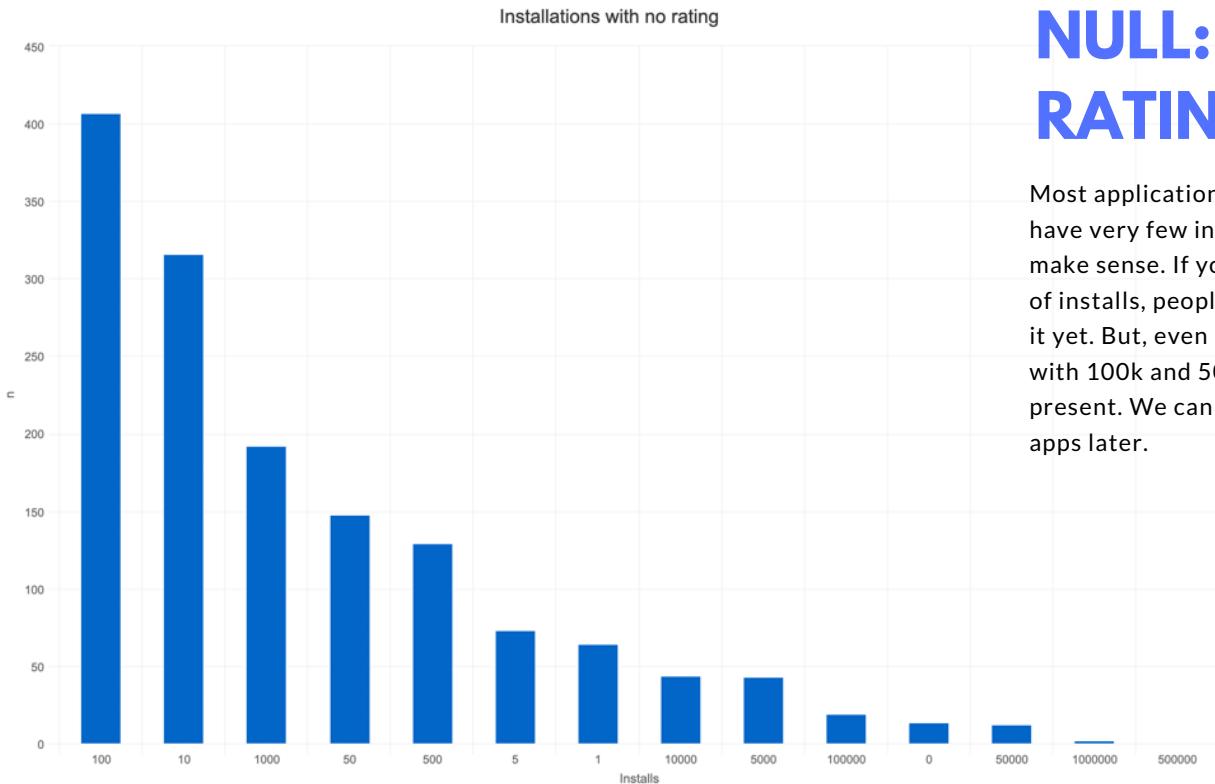
VALUES

To check if the data is complete, we check for any NA values. We have 2 columns with NA values, some of them part of the data cleaning process above (transforming factor variable to numeric). Let's take a closer look at these NAs.



NULL: RATINGS

Most applications without rating have very few installs, which could make sense. If you have low amount of installs, people haven't reviewed it yet. But, even an applications with 100k and 50k installs are present. We can investigate these apps later.



NULL: SIZE

On the data cleaning process above, I saw "Varies with device" was present under "Size". There were a total of 1525 applications with "Varies with device" which we transformed to NA. So, that explains NA in this column.

1525

Varies with Device

EXPLORATORY ANALYSIS

Google play store offers a variety of applications that can serve an almost limitless range of functions, from simple tools to advanced digital assistants. Our analysis aims to provide an understanding of these applications and their categories, to see in detail the impact of User Ratings on an application, to study the most installed applications and to try to know why and how certain applications succeed and others not and finally why Rating is an important key metric for an application to be considered successful. Our Google Play Store Apps dataset containing the application names and their associated information.

We begin with an exploratory analysis of the data for each variable. This step will allow us to answer the first questions concerning the study of the applications and the factors of influences, it is also useful to highlight the missing values and outliers.

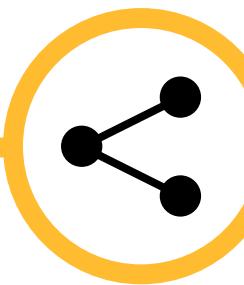
We will use R for all our analysis

PROCESS



UNIVARIATE

Individual analysis of each variable of the data set



BIVARIATE

Pick the ideal variables, analyse their relationship with DV Rating and check for insights



CONCLUSION

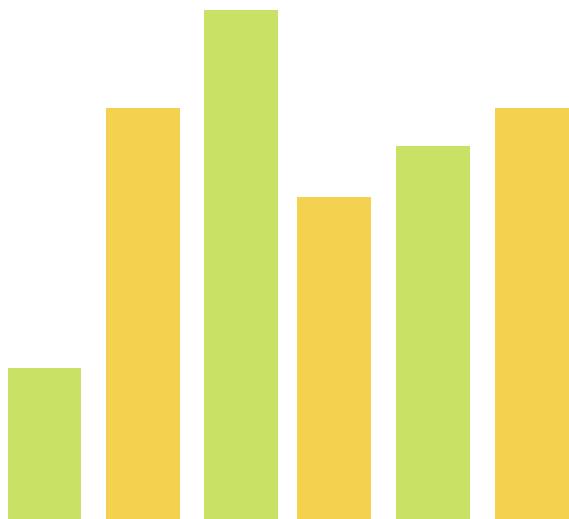
Final conclusion

UNIVARIATE ANALYSIS

Univariate analysis is perhaps the simplest form of statistical analysis. Like other forms of statistics, it can be inferential or descriptive. The key fact is that only one variable is involved.

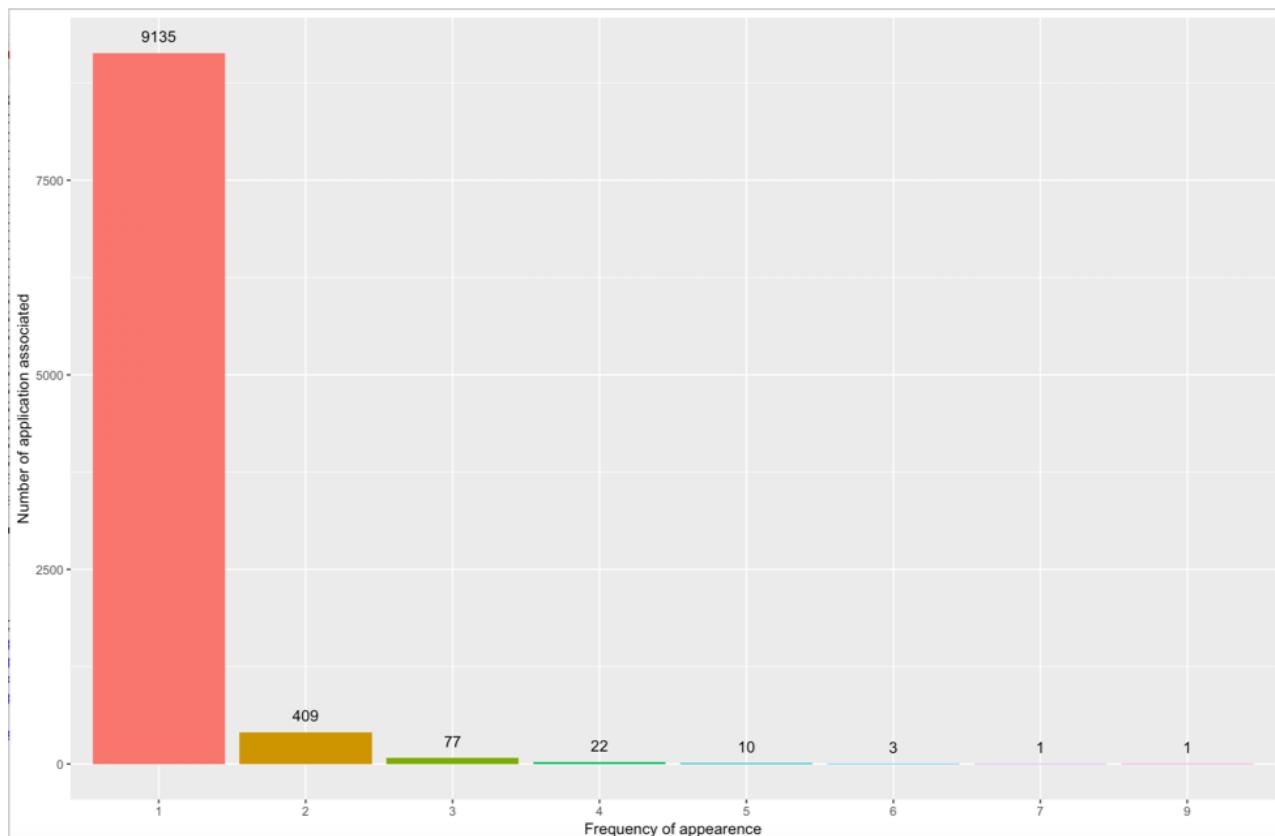
The Variables are:-

- App
- Category
- Installs
- Last Update
- Rating
- Content Rating
- Reviews
- Type
- Genre
- Size
- Android Version



APPLICATIONS

The number of rows in the dataset equals 10356 but the application names column has only 9658 unique values, i.e. there are applications with the same name. The following graph prompts us to ask many questions



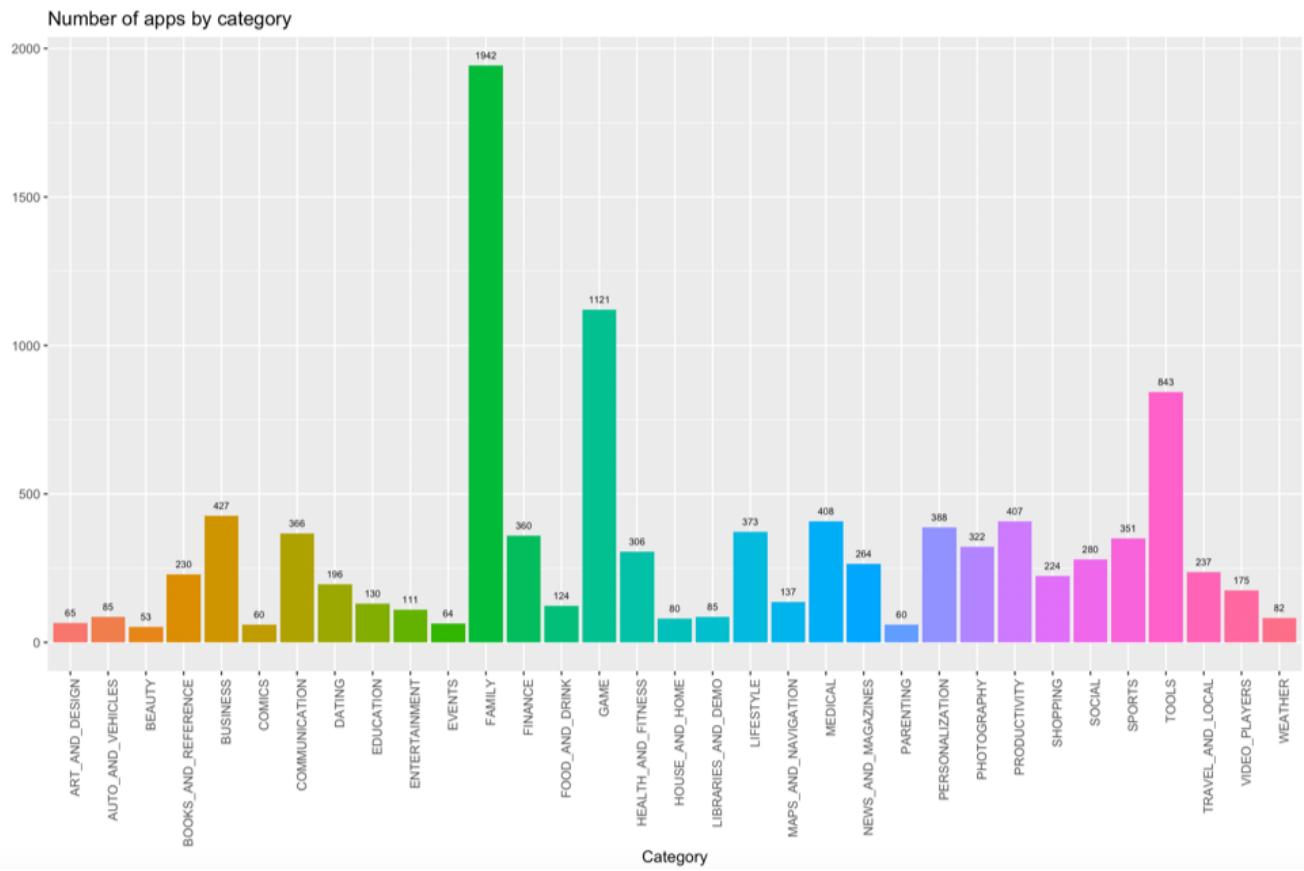
- Is it the same app or different apps with identical name? After inspecting applications with the same names, it was found that these applications had almost the same characteristics, for the majority of them there was a difference in the number of reviews while others had differences in the number of reviews. the size, category and date of last update. This observation has pushed us to deepen our research to see if it is possible to have multiple applications with the same display name, actually this is possible provided you have different package names. It is later considered that these duplicate applications are due to a data collection error for two reasons:
- Duplicate applications are recognized applications like Google Drive, Google Photos and Duolingo having a large number of installation (the same number) and the same evaluation rate. These application names are registered trademarks, so launching apps with these same names can lead to legal problems if there has been a decision to defend this trademark.
- The dataset is published on Kaggle in 5 different versions, with a duration of one month between the first and the last version. It could therefore evolve during this period.

33 Unique Levels

CATEGORY

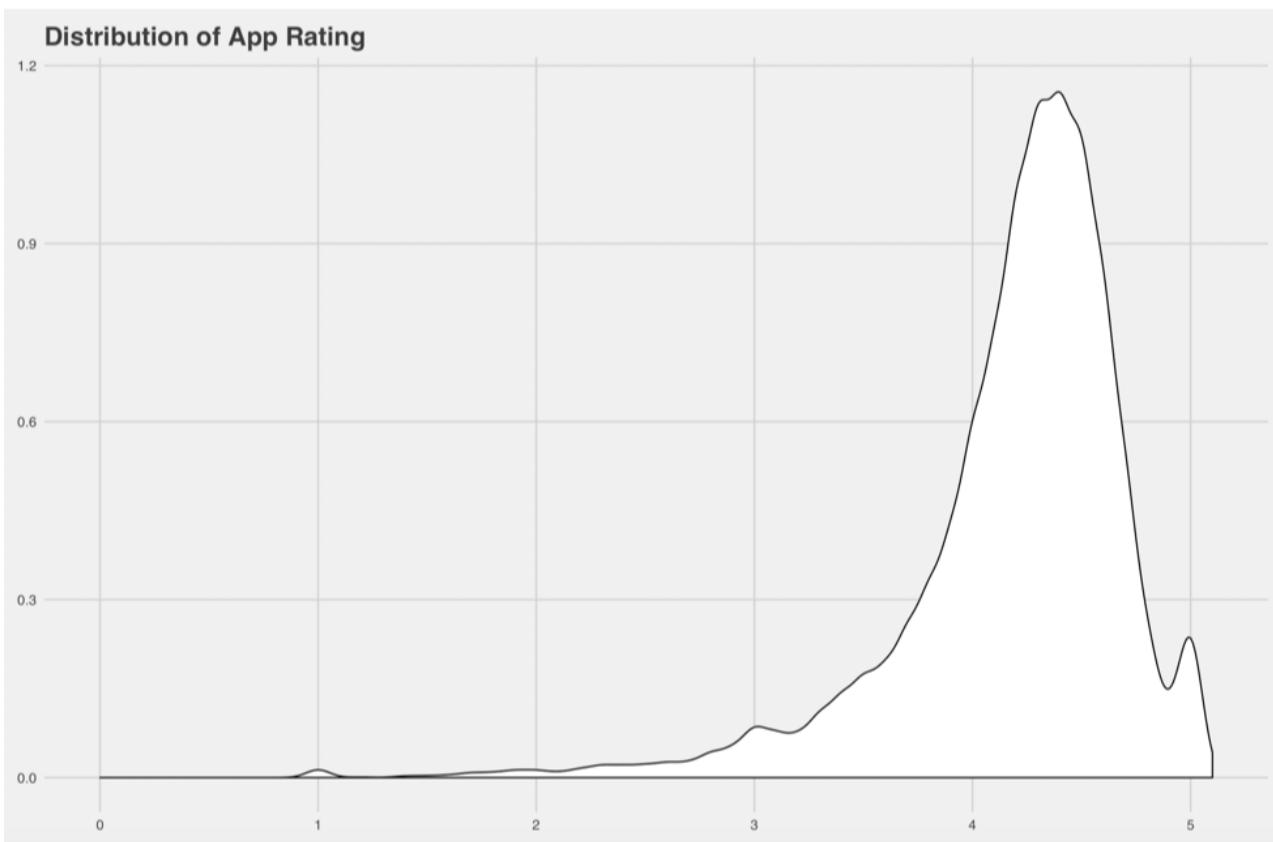
It seems normal that the majority of the applications belong to the categories Family and Game. This is not the case for other types of applications.

We had another category named 1.9 with a single application. Examining this application, we notice that it is an error due to a left shift and fixed it.



RATING

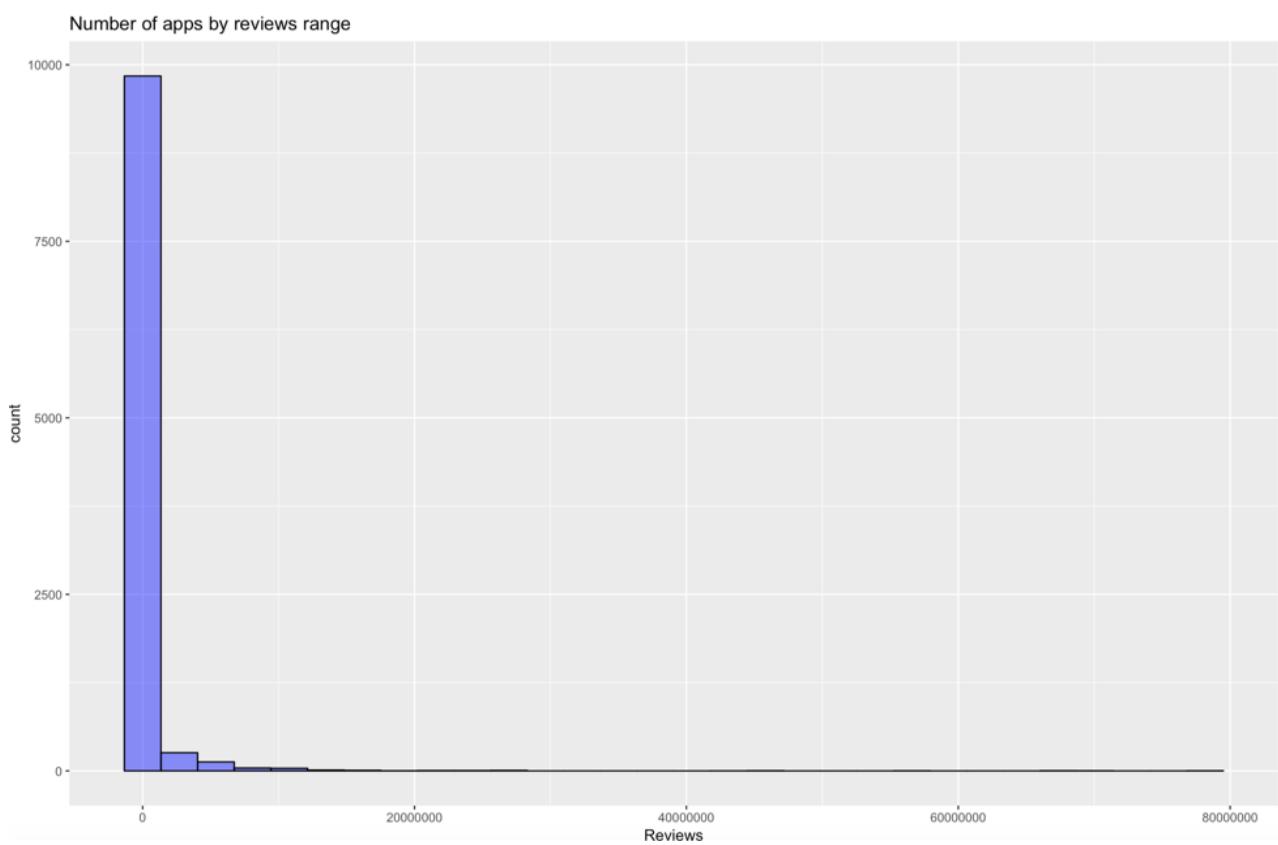
The majority of applications have an evaluation rate between 4 and 4.5 and 1474 applications have a missing evaluation rate. because having a rate equal to 5 means that the application satisfies everyone, which is almost impossible for applications having a large number of installation.



If you look at the summary under Rating, the max Rating was 19. This was an error. Rating is supposed to be out of 5, so I found the error value and set it to NA. Then we can look at the new summary, and see that the max Rating is 5.

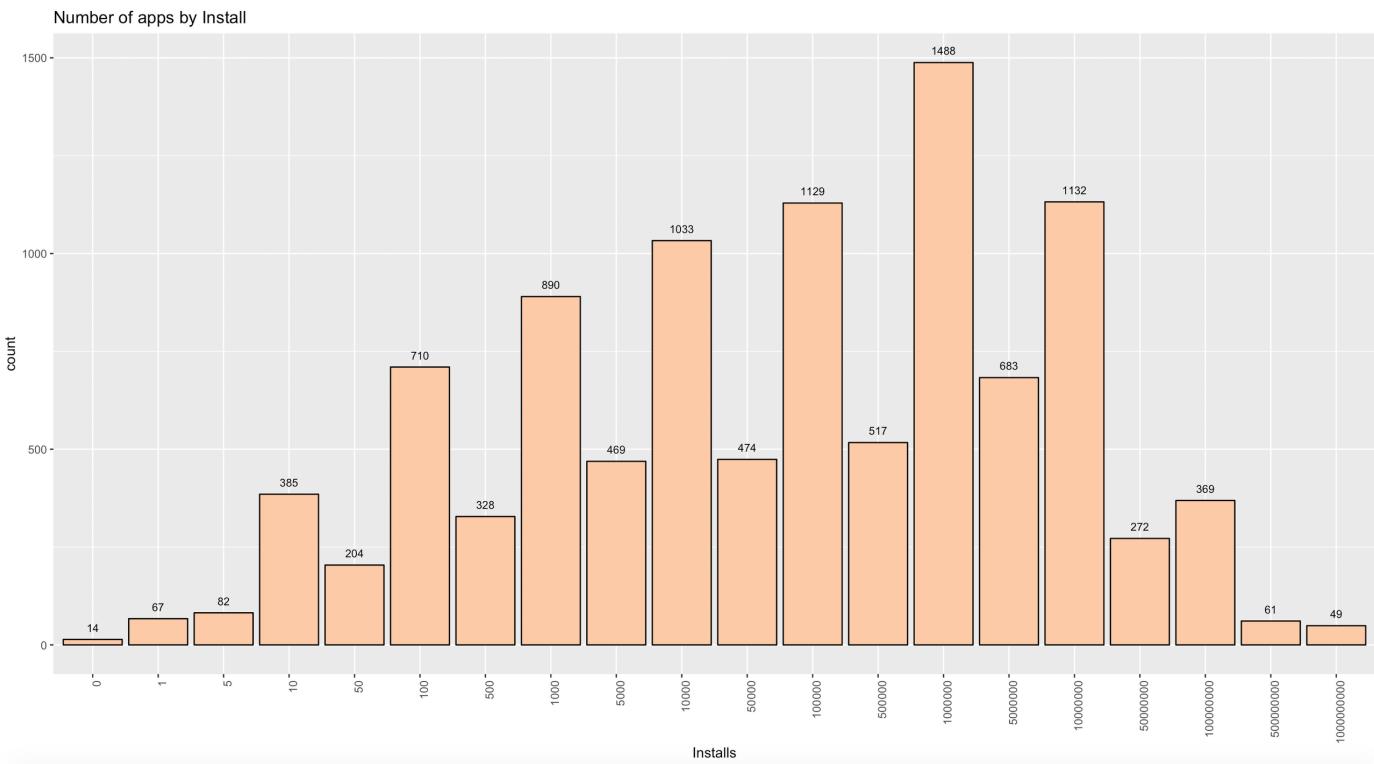
REVIEW

We have a histogram right skewed with 75% of apps having a comment count of less than 46438. This is a highly right skewed graph. The box plot and the central tendency show us that there are outliers with the order of $10e + 07$, these values can be due to data entry errors by adding additional numbers, or natural outliers (ie are really applications with this number of reviews). To check this, we will see later if there are applications with a number of reviews that largely exceeds the number of installations since a user can leave one review on the same application.



INSTALLS

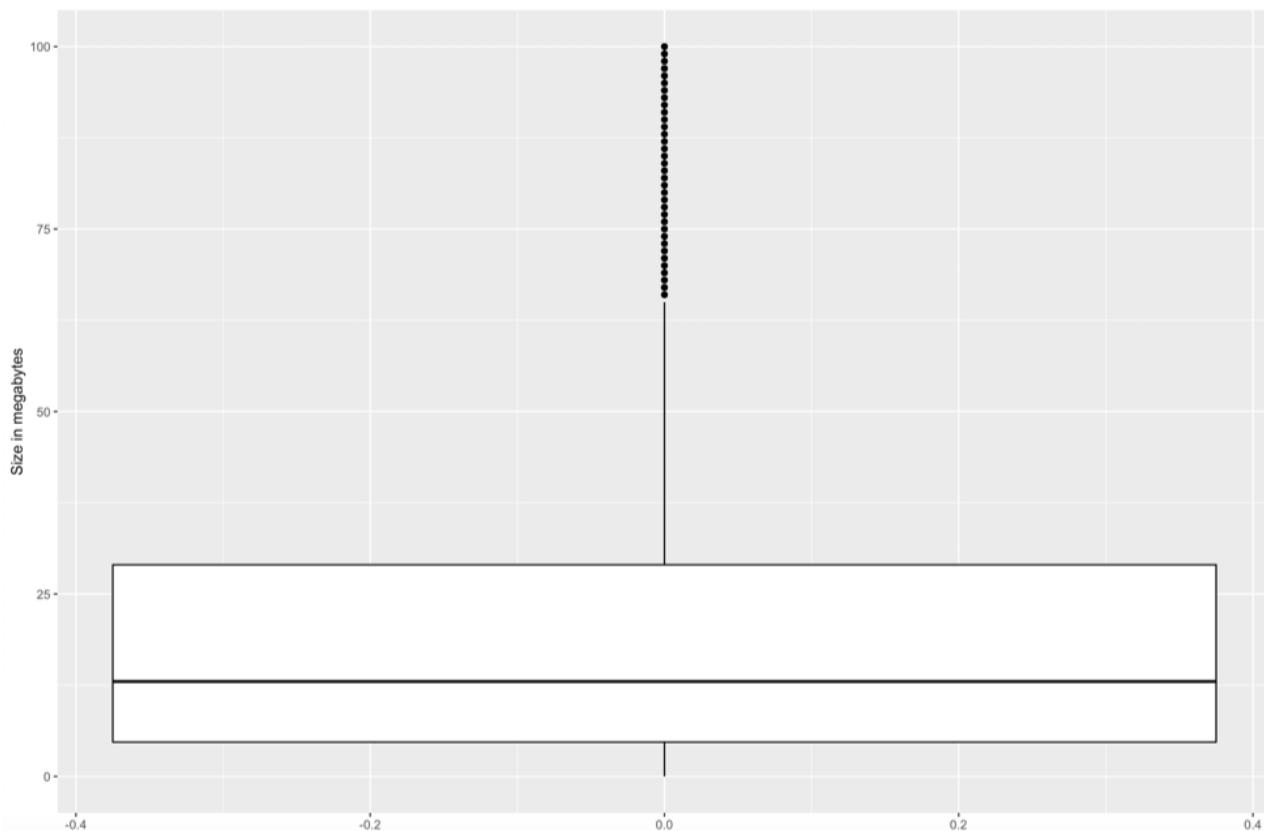
There are 49 applications in our dataset with over a billion installations. After converting Installs to numeric values, the central tendency shows us that the Installs histogram is right skewed, considering that the median value is below average, with almost 70% of applications having an installation number between 1000 and 5000000. There are only 11 applications with the number of installations lower than the number of reviews, knowing that the number of installations is followed by the '+' index and that the number of reviews does not exceed the number of installations. next, then no application has the number of installations less than the number of reviews. Thus, these outliers are natural outliers.



SIZE

There are 462 levels of the factor Size. To have a good visualization, we will convert this column into numerical values representing the size in megabytes. 1525 applications have a size that varies with the device used, 75% of other applications are smaller than 30 MB while 25% of applications have a size that converges to 100 MB. The question here is why are there applications with a size that varies depending on the device used? Because Google Play allows you to publish different APKs for your application. Each targeting a different device configuration. So each APK is an independent version of your app, but they share the same list of apps on Google Play. They must share the same package name and be signed with the same release key.

There are a lot of apps under 10MB, in general applications are between 5 MB to 30 MB. Paid applications are slightly smaller.

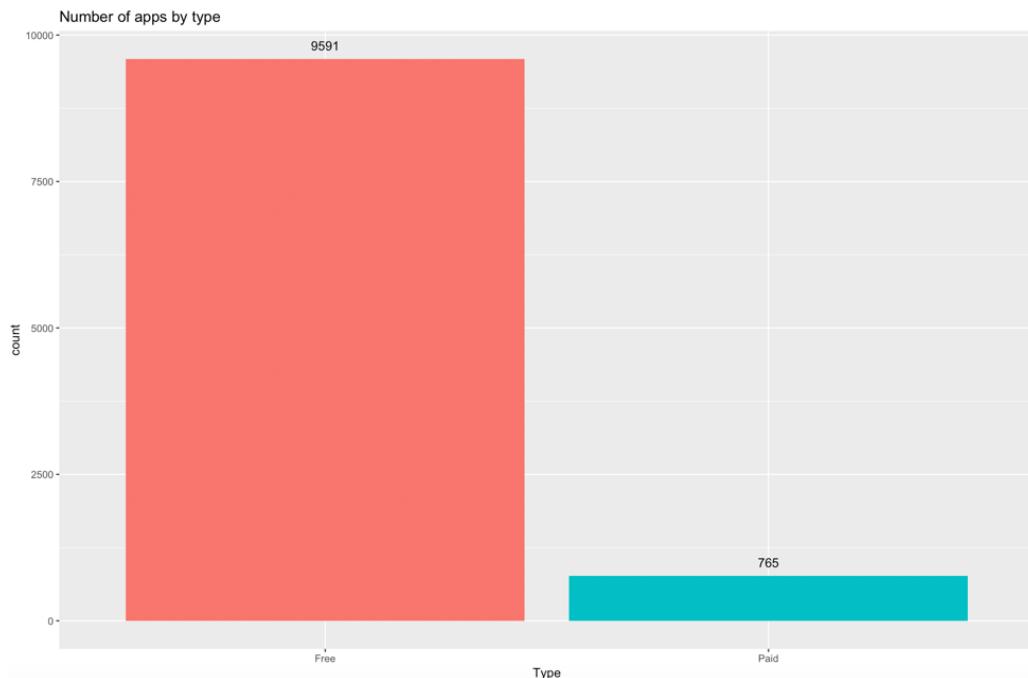


TYPE

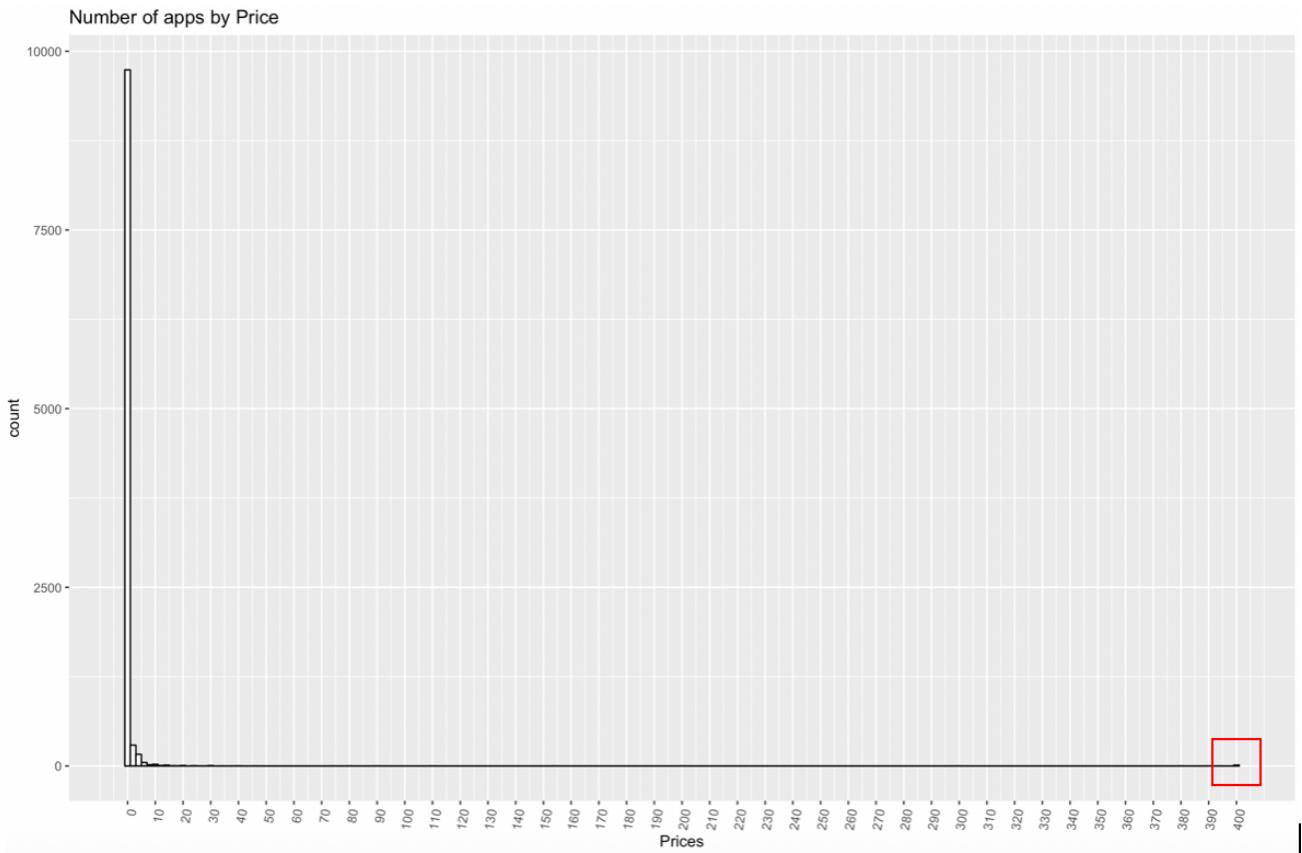
Free applications are very numerous compared to the paid applications, they represent 92,61% of our dataset.

Price Column : We already know that paid apps only account for 7.38% of our dataset.

Therefore, we will only look at the prices of paid applications. To do this, we will eliminate the dollar symbol and convert prices into numerical values.



TYPE- PAID CATEGORY



88.05% of applications have prices less than or equal to 10 while 1.66% have prices in the order of 400\$. What is the purpose of this application with a price too high and to which category do they belong?

On investigation we found the details of this app. It seems like a parody app

App Name: I'm Rich - Trump Edition

Category: LIFESTYLE

Installs: 10000

Rating: 3.6

Price: \$400

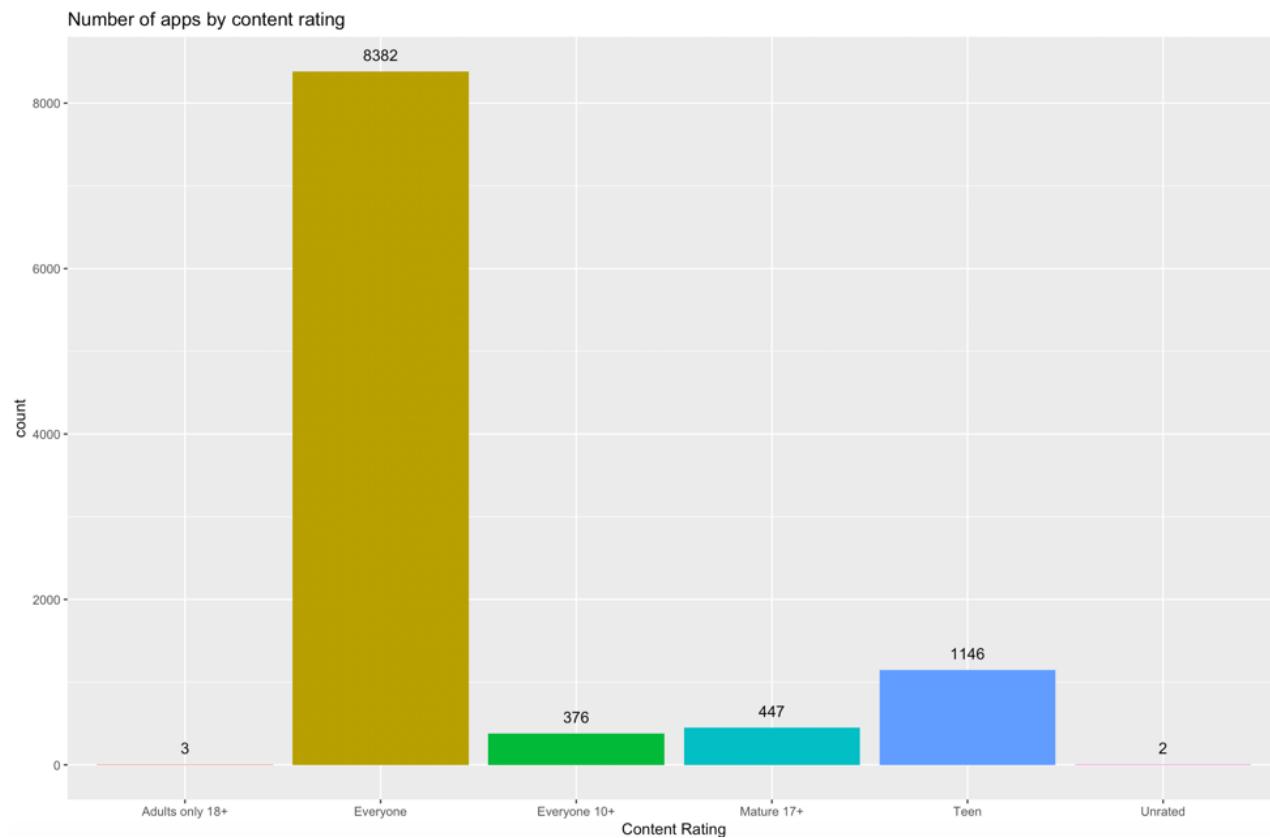
CONTENT RATING

80.3% of applications are dedicated to everyone, but to better understand this distribution we must understand what is the purpose of this content rating and what does it mean. According to Google this ranking is used for:

Inform consumers, especially parents, of potentially objectionable content in an app.

Block or filter your content on certain territories or specific users.

Evaluate the eligibility of your application for special developer programs. It can be concluded that developers tend to develop apps that are generally suitable for all ages, may contain minimal cartoons, fantasy or light-hearted violence, and / or infrequent use of soft language to appeal to consumers and so that their applications will not be blocked.



GENRES

Genres are a very tricky category to analyze. An app can belong to multiple genres (apart from its main category). For eg, a musical family game will belong to Music, Game, Family genres.

It is like a grouping of related categories for an app. Considering this variable has 119 levels , it wont make sense to analyse each and every level. Im analyzing one case for reference purposes.

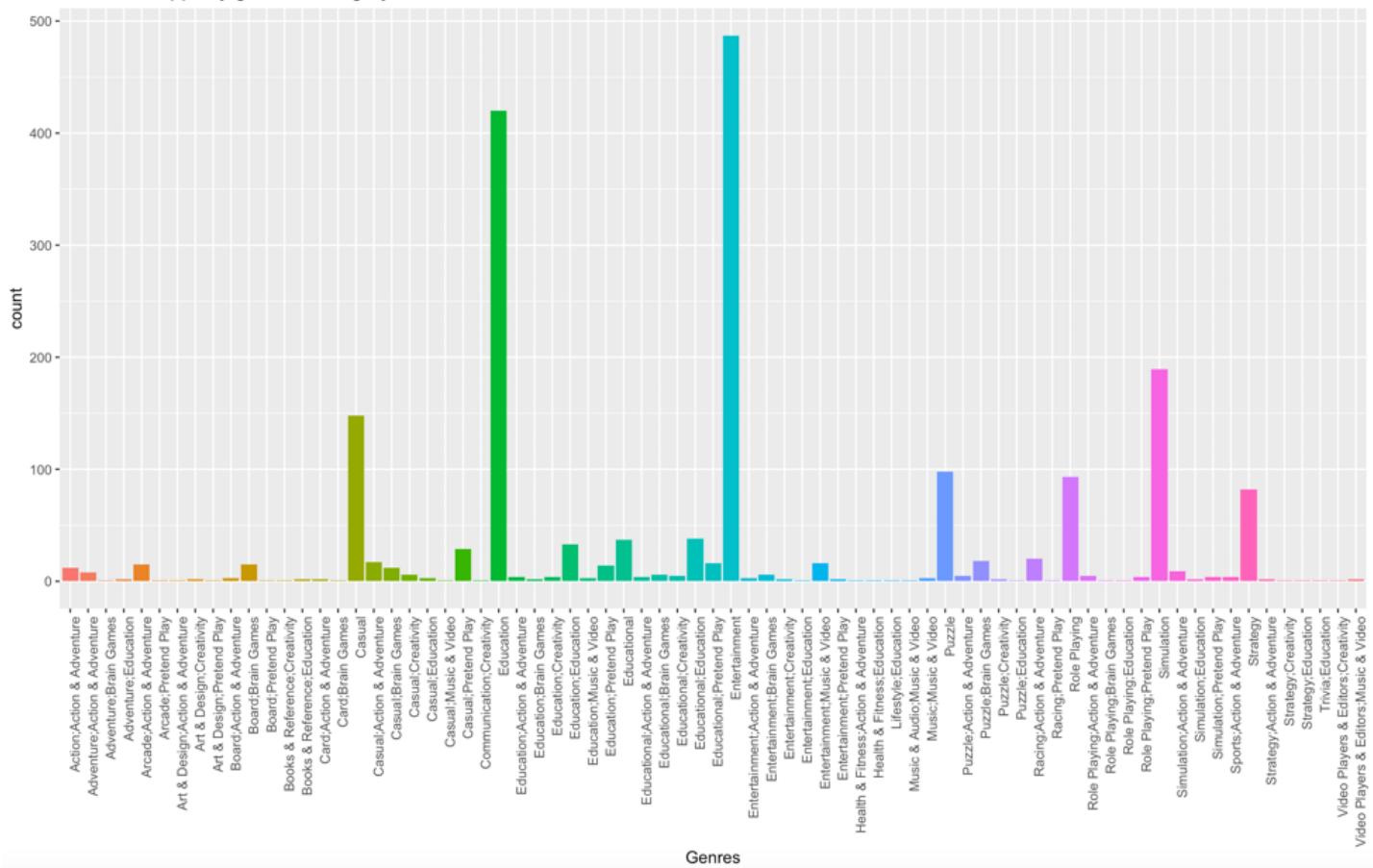
The most common genres in Family Category are:

Entertainment: Streaming video, movies, television, interactive entertainment.

Education: Exam preparation, checklists, vocabulary, educational games, language learning.

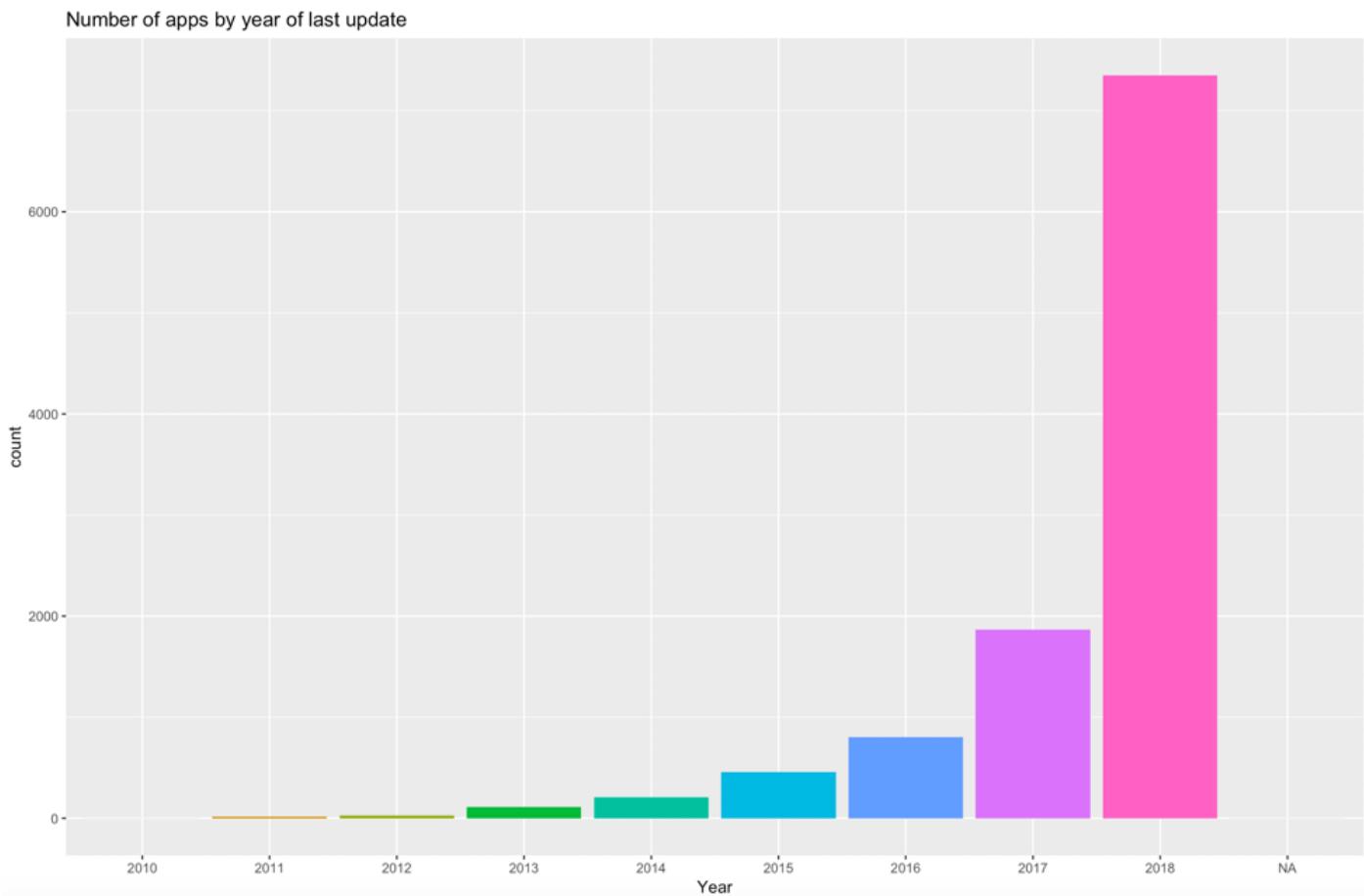
The educational and entertainment apps in the family category have been viewed in the Google Play Store, with the majority of apps being educational games apps for children under 12. This is because today's children spend a lot of time in front of their tablets or a smart device with the tolerance of their parents. According to an article published by CNN in October 2017 outlining a study done by Common Sense Media in the United States, children ages 8 and under spend an average of 2 hours and 19 minutes a day with a screen support and almost half, 49% watch TV or play video games one hour before bedtime. According to the report, overall, 67% of parents whose children use on-screen media say that it makes learning easier for their children. As a result, today the audience targeted by the majority of developers are children under 12 years. This increases the number of applications whose content ranking is everyone (80.3% in our dataset)

Number of apps by genre in category FAMILY



LAST UPDATE

This column is composed of the date in the form of day-month-year, what really interests us, is not the exact day of the last update, but rather, the month and the year. To do this, I took only the year of the last update of each application and visualized them. We can see that majority of the Apps were updated in 2018. This shows a tendency of App developers to keep their apps up-to date or could imply significant technological improvement in Mobile hardware and thus, App developers trying to keep up to date in the market to survive. Further investigation can help find out the exact reasons.

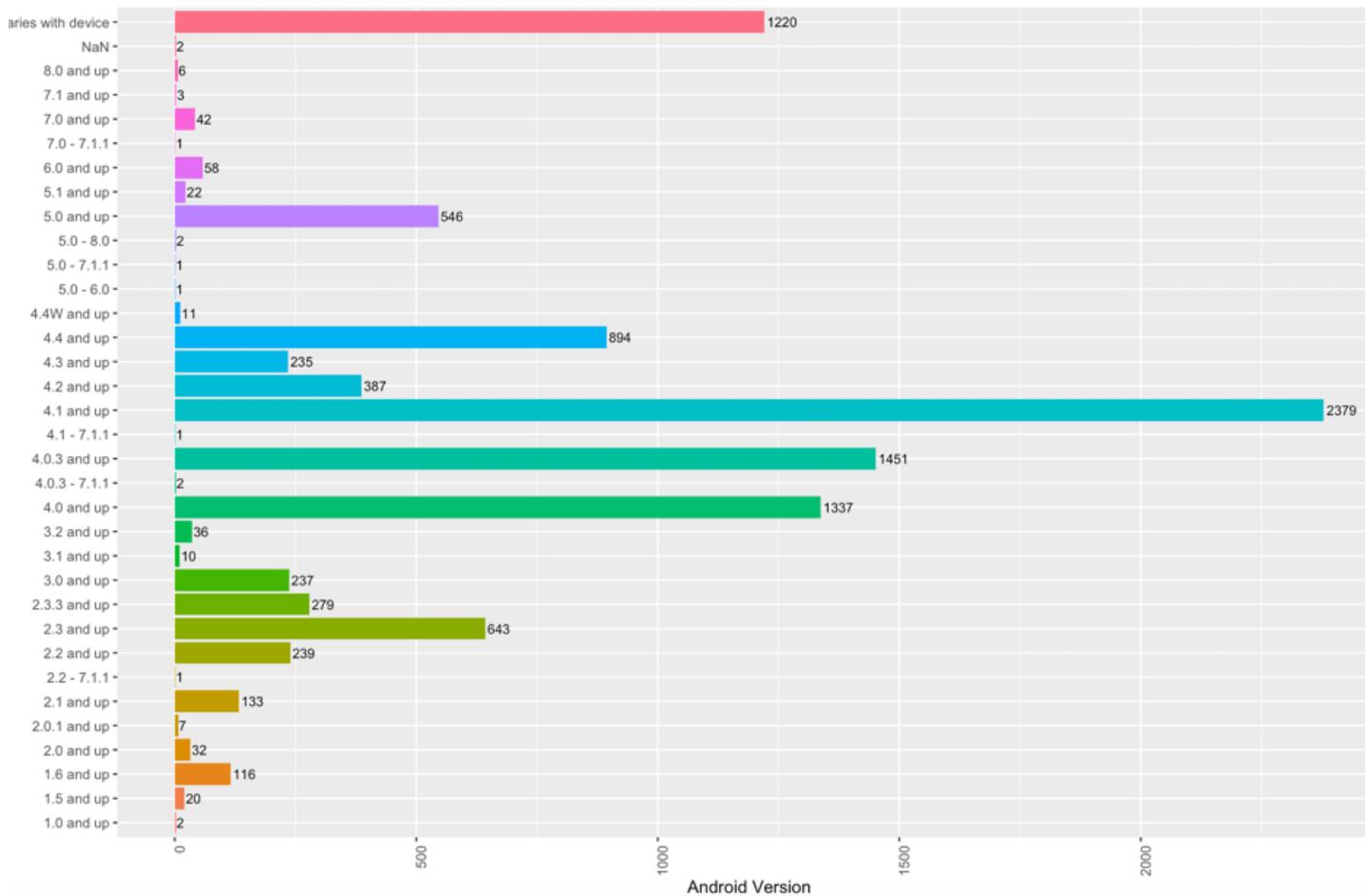


ANDROID VERSION

Android Version

There are two applications with this missing field and 1262 applications with the version varies by device. We looked for both applications on Play store by their full names, and after comparing the features we set up their supported android version. The majority of applications support 4.xx and up versions, and this is because there is still a large number of devices running these versions of the Android platform, a percentage of 10.9% according to the google distribution dashboard. As a result, developers are targeting versions of the android platform devices from 4.xx or higher to gain a huge potential audience for their applications. As for the applications having the version varies with the device, one notices that 91.67% of these applications also have current version and the size varies with the device used. Why are there a large number of applications with this variance feature? And what about that? This effect is explained by the compatibility of an application, we note that it is mainly related to the most installed applications.

Number of apps by supported Android Version

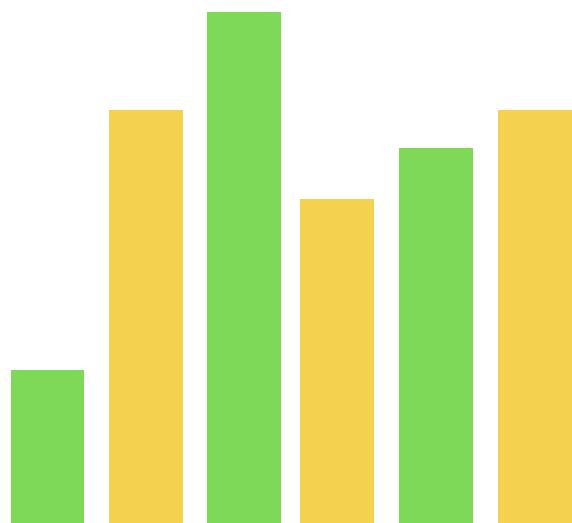


KEY OBSERVATIONS

Univariate analysis of each variable sets up a clear picture of all the variables we shall be dealing with before we start comparing each variable with Ratings.

On the basis of our analysis, we shall select variables such as Category, Size, Installs, Reviews, Content Rating, Last Updated, Type for further investigation. These variables will help us analyze and provide insights related to User engagements, preferences and behavior that contribute to higher Ratings

We shall exclude Genres and Android Version due to its high variability and weird distribution pattern





BIVARIATE ANALYSIS

RATINGS

INSTALLS VS RATING

We can see a clear relationship between Ratings and Installs. Highly rated apps are installed more often. A high rating serves as a badge of honor for an app and it definitely impacts the number of installs.

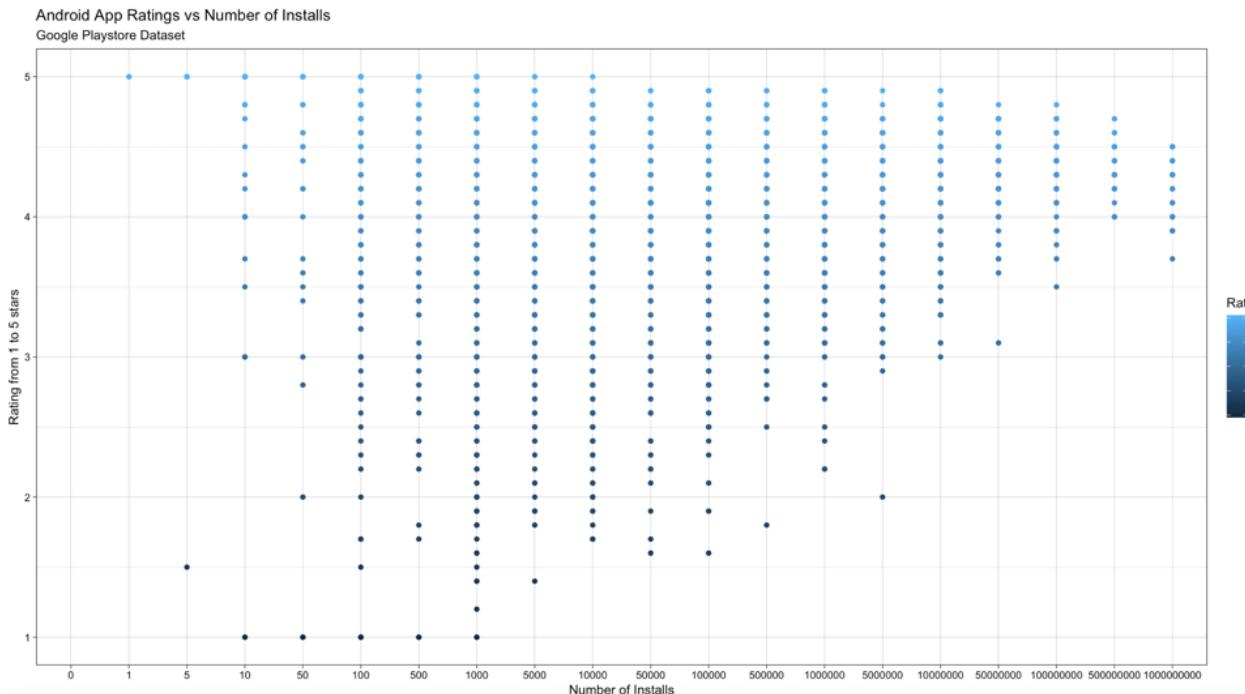
An app's rating also impresses potential users.

According to one survey, 96 percent of users install 4-star apps, compared to only 50 percent of users who admit to downloading a 3-star app, and a mere 15 percent who dare download 2-star apps.

Additionally, over half of app users say they typically check an app's rating before downloading it.

Intertwined with star ratings are reviews. They provide a channel (sometimes the only one) for customers to leave feedback, tell you exactly what they want in an app, and report crashes.

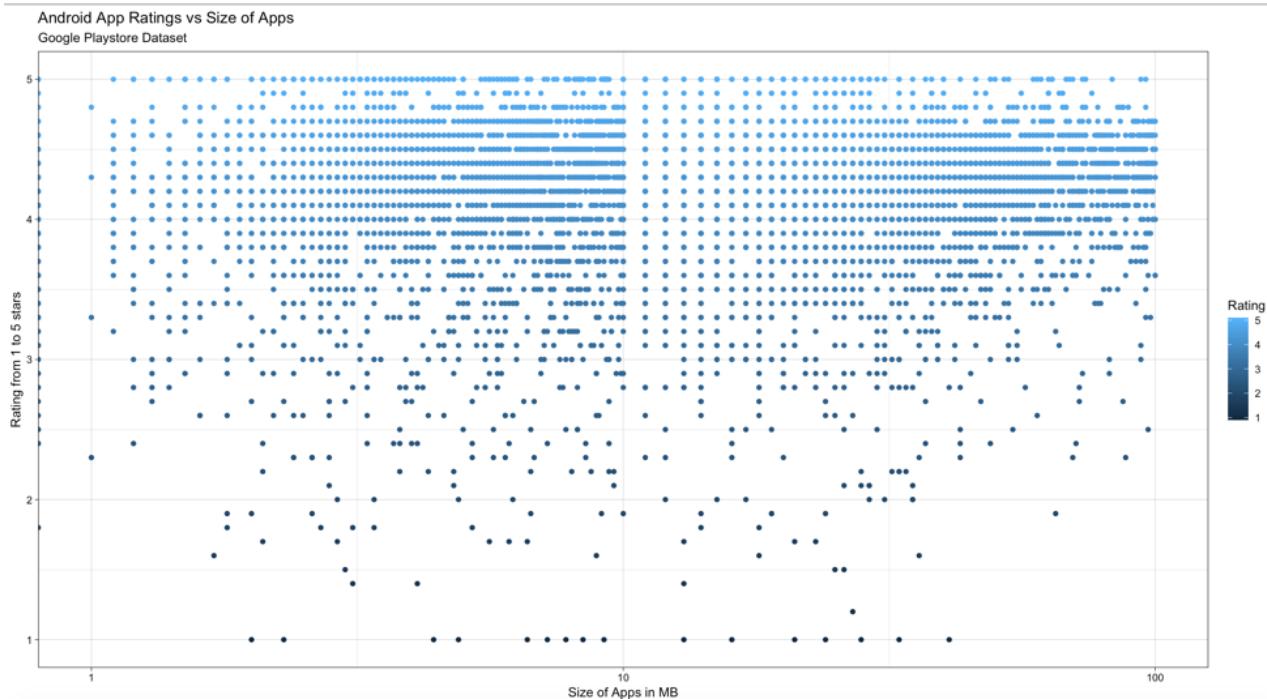
Developers can identify customer pain points as well as use key feedback to design a product users actually want.



SIZE VS RATING

We cannot see a clear relationship between Ratings and Installs.

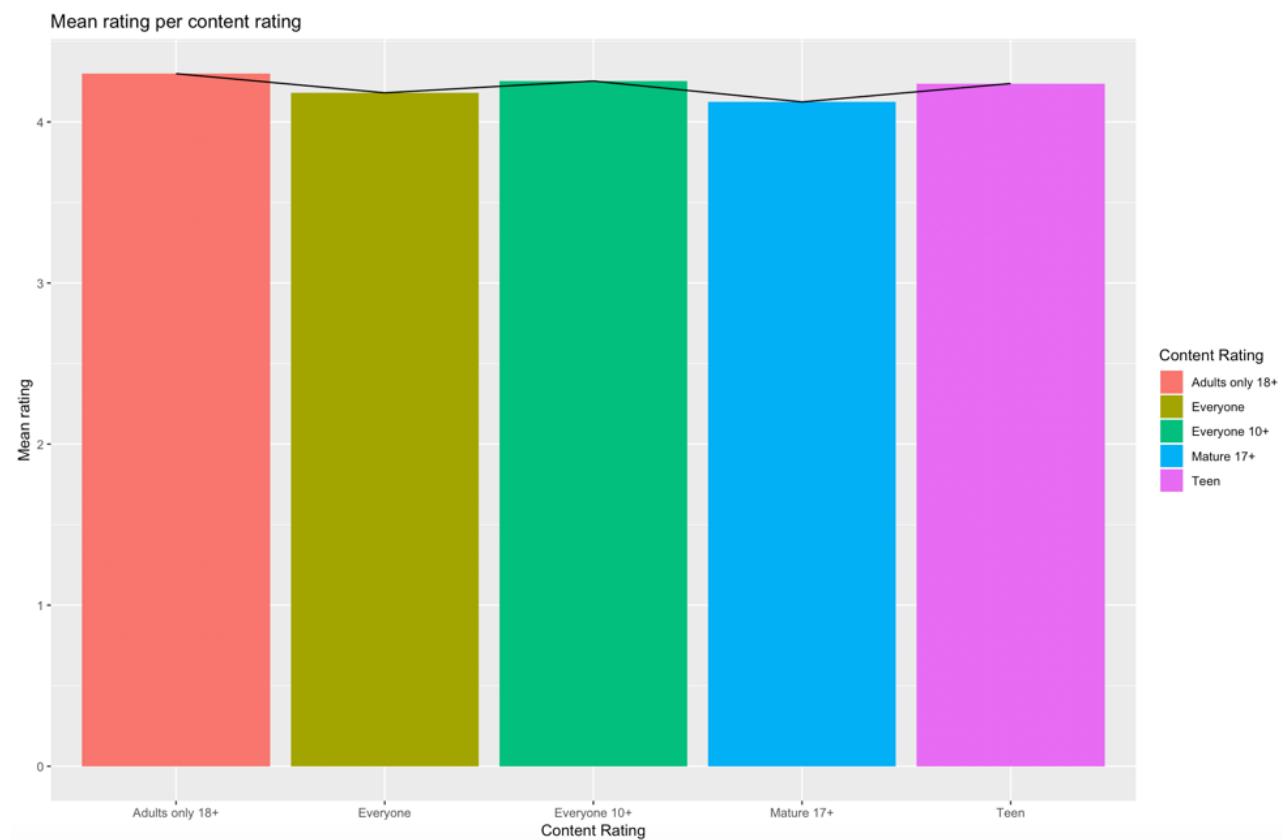
Size of App includes factors that capture the size of an app in various ways. Larger apps might contain more features or better functionality. Thus they might have higher ratings. However, larger volume of code imply higher probability to contain a bug , and hence might lead to lower ratings. Note that, in Android, an APK file contains the code of an app, as well as the resources (e.g., images or other media files) that an app needs, thus install size captures additional information rather than simply the size of the code.



CONTENT RATING VS RATING

The dataset contains the content ratings present for the applications present on the Google Play Store; content ratings like Everyone, Mature, etc. I'd like to see if any one particular category tends to have a higher rating than the rest.

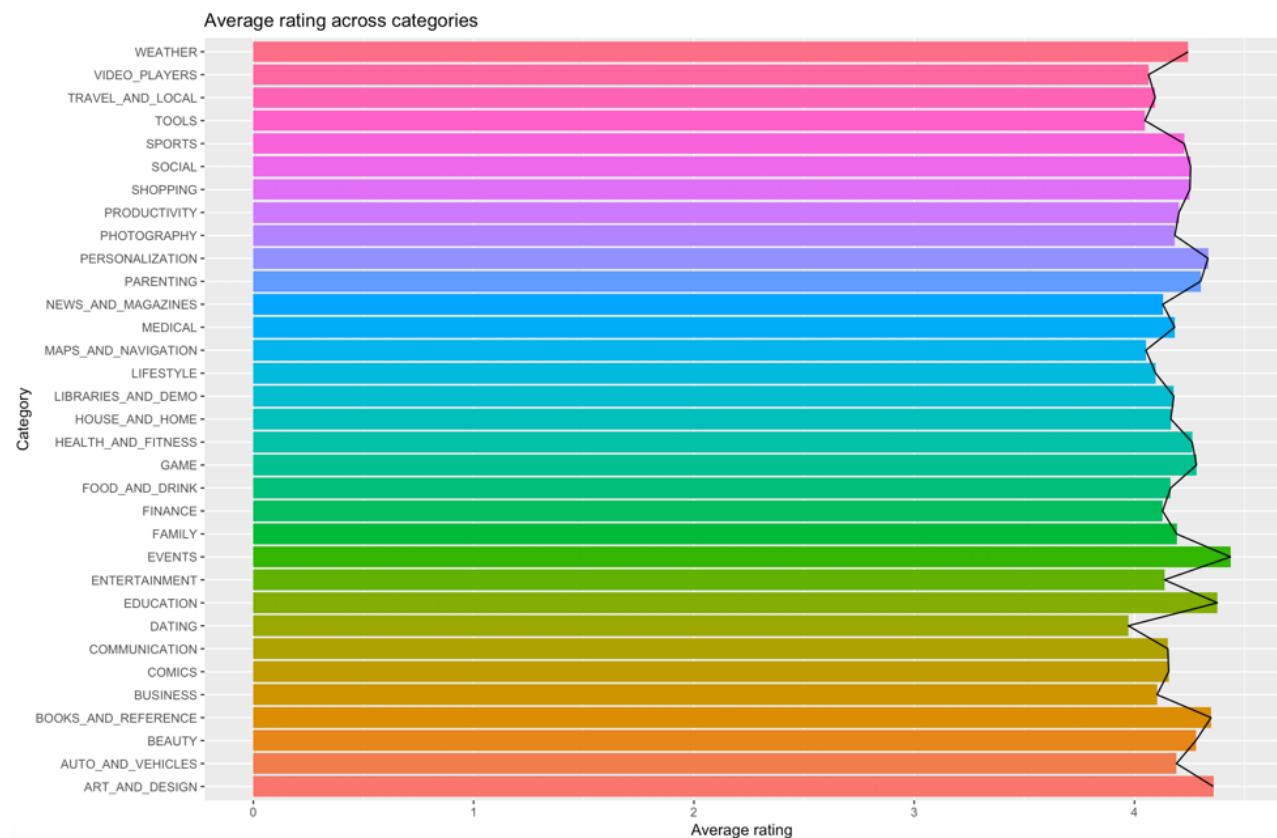
From the plot above, we can see that applications that receive a rating of Mature and Everyone tend to have a lower average rating.



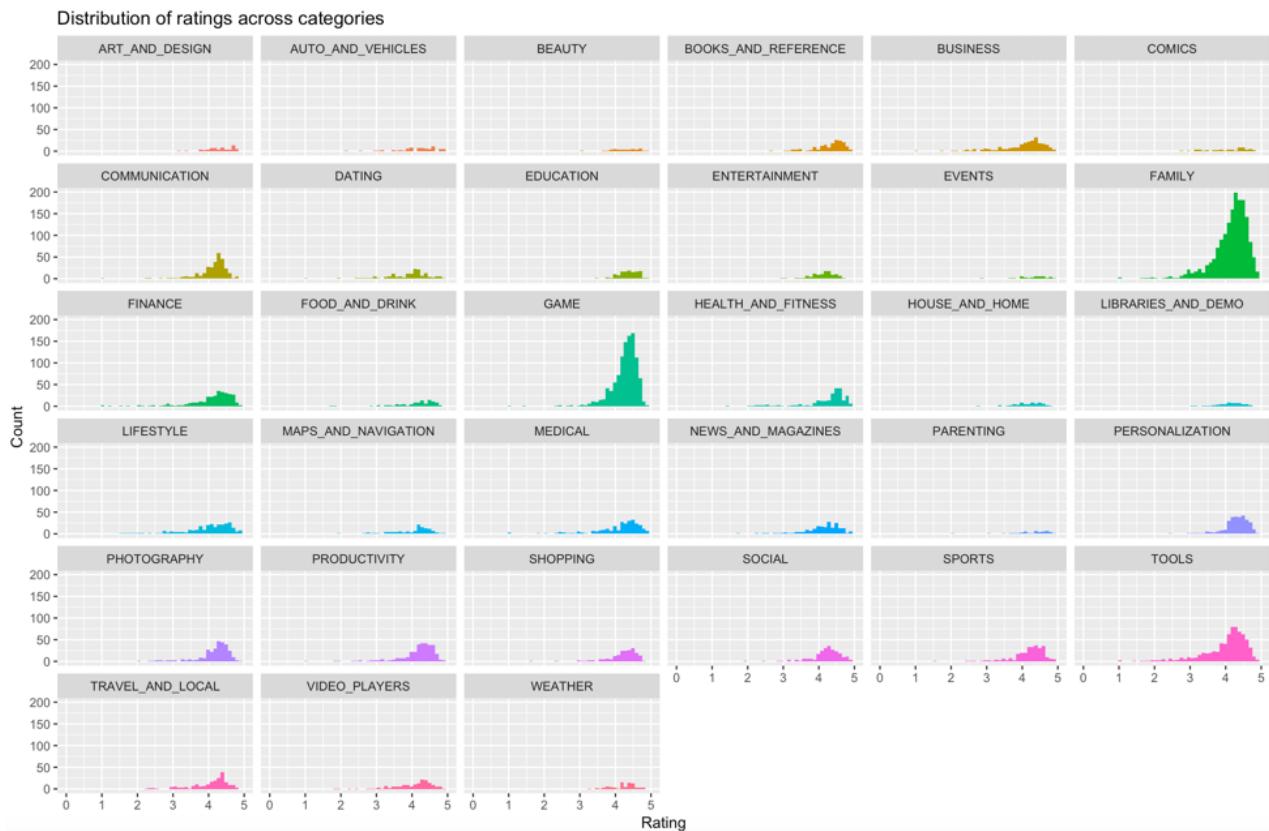
CATEGORY VS RATING

Lets examine the average Rating accross the categories

From the above plot, we can see that categories generally have a similar mean rating, however, Events, personalization, education and art applications all tend to have a minutely higher rating.



CATEGORY VS RATING

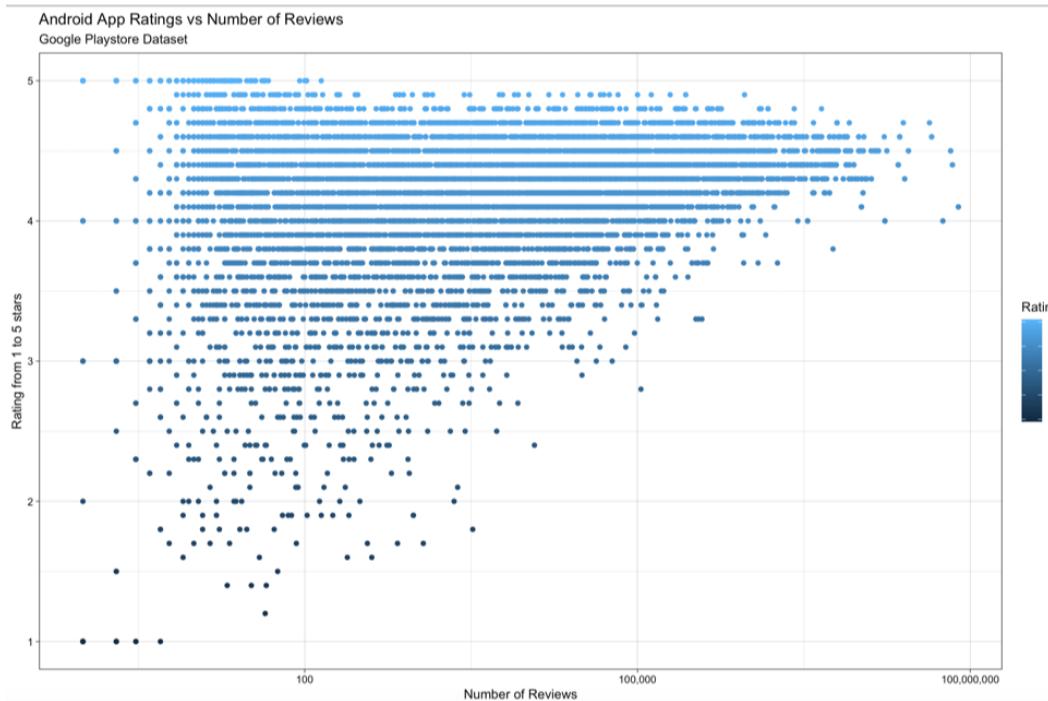


The general distributions of the mean rating across categories do not have any radical differences from one another, with all of them being markedly skewed towards the higher spectrum of ratings. What's interesting is that Games and Family have a narrower, higher distribution than the other categories.

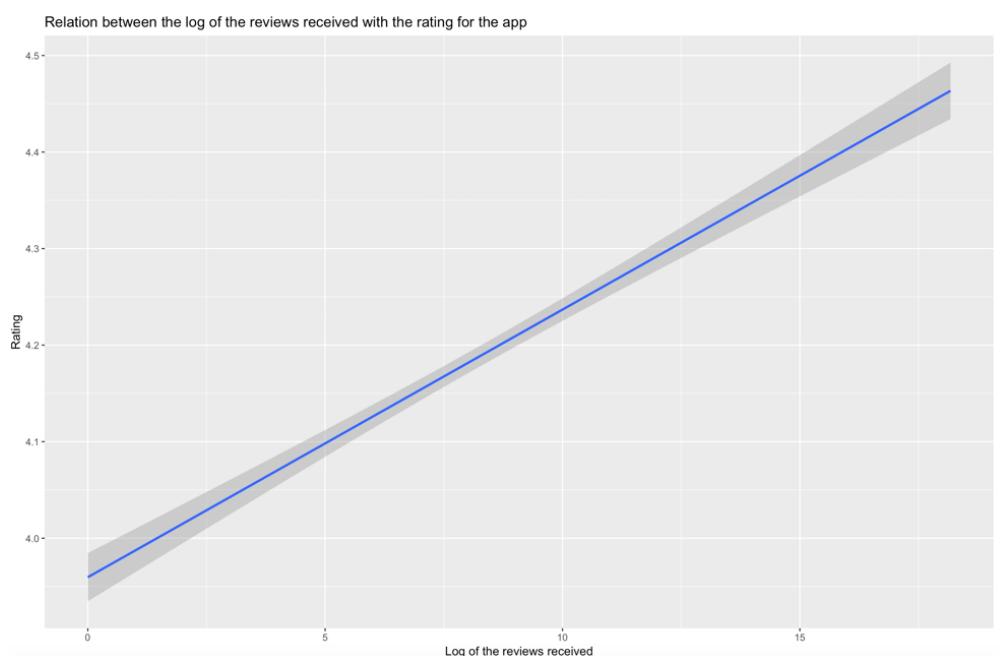
Almost all app categories perform decently. Health and Fitness and Books and Reference produce the highest quality apps with 50% apps having a rating greater than 4.5. This is extremely high! On the contrary, 50% of apps in the Dating category have a rating lesser than the average rating. A few junk apps also exist in the Lifestyle, Family and Finance category.

REVIEWS VS RATING

A positive relationship can be observed. We can see that the number of reviews could boost your app rating, so it might be interesting to see if some other factors might help us get more reviews.



The below line is a regression line. From the graph, it is apparent that there is a linear relationship between the logarithm of the number of reviews for an application to its rating.



LAST UPDATED VS RATING

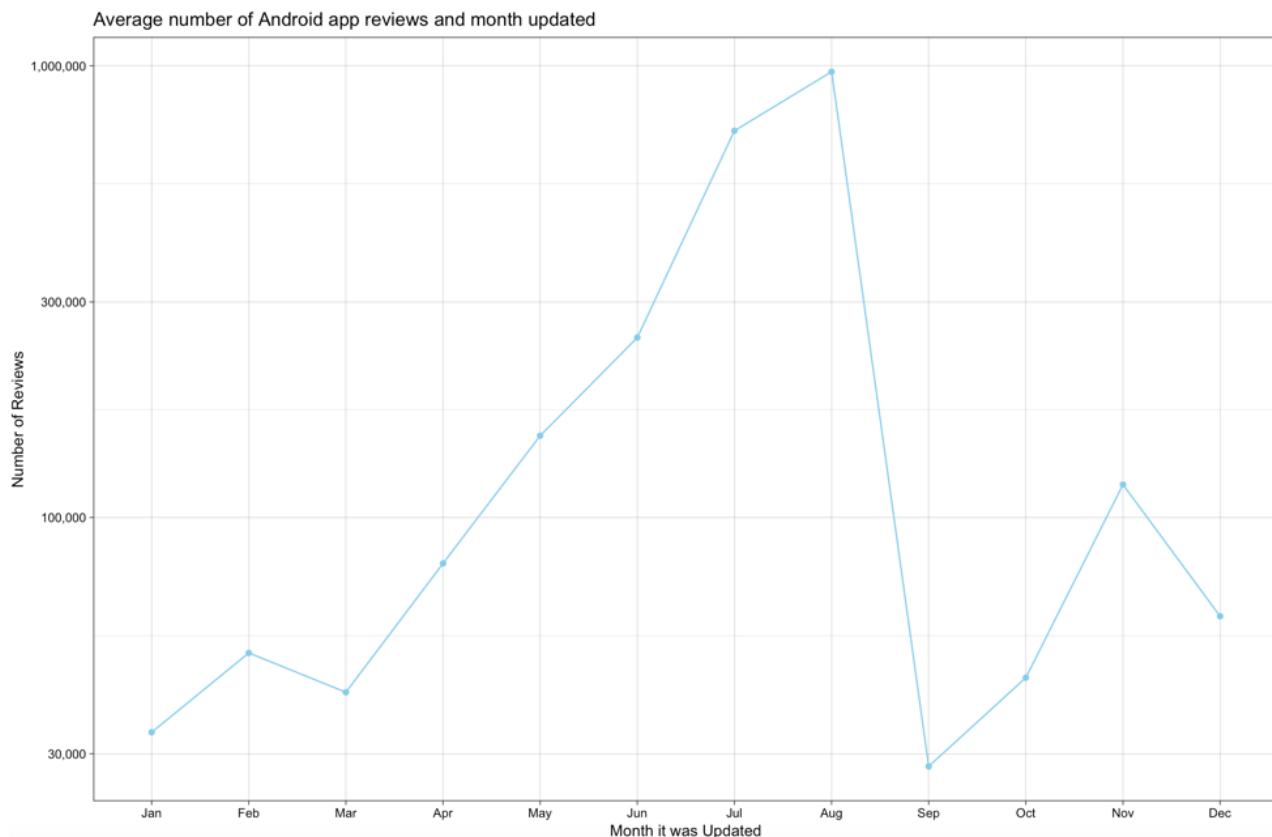
Let's check if the Android application Last Updated date might affect the number of reviews the app receives.

First, I change the Last Updated into a date value, then I created a new column with just the month. I will need the lubridate library for this. The Last Updated column will not appear in this format yyyy-mm-dd, and the new Month column will be abbrev. months.

From these plots, we can see that more reviews often means high ratings. And developers should consider releasing apps and updates in the summer months, preferably August.

MONTHLY REVIEWS

Apr	79135.
Aug	969755.
Dec	60457.
Feb	50146.
Jan	33466.
Jul	717807.
Jun	250159.
Mar	41043.
May	151736.
Nov	118266.
Oct	44198.
Sep	28130.



TOP INSIGHTS

4.17

Average rating of (active) apps on Google Play Store is 4.17.

5MB-30MB

Most of the top rated apps are optimally sized between ~5MB to ~30MB - neither too light nor too heavy.

SUMMER MONTHS

Developers should consider releasing apps and updates in the summer months, preferably August.

\$1-\$30

Most of the top rated apps are optimally priced between ~1\$ to ~30\$ - neither too cheap nor too expensive

INBOUND MARKETING

Onboarding is all about quickly demonstrating the app's core values and what added benefits the app provides. A simple but effective onboarding experience is key to making a great first impression. Create an easy sign up flow that illustrates how to navigate and use your app's main features. By getting users to engage from the start, they're more likely to return.

By driving inbound marketing strategies we can improve customer experience and boost our app Ratings

CONNECT WITH USERS

When asking for reviews and ratings in your app, you should empathize with the user. The best approach is to ask if they are enjoying the app with a simple yes/no response. If yes, ask for a review. If the answer is no, however, give them an opportunity to send feedback. Also, never force a review as this might annoy the user, ultimately leading to a bad review.

IDEAL TIMING

You would never request ratings from a user immediately following a crash or another failure. Instead, ask for ratings after specific usage milestones – such as following regular usage or after they've finished a booking. Doing it this way means you're more likely to contact them when they're happy.

HOW TO IMPROVE AND INCREASE APP STORE RATINGS

USER EXPERIENCE

User experience can make or break ratings. That's why the better your app is the easier it is to gain ratings and reviews. As such, make sure applications are continually updated and optimized.

INCREASE RESPONSIVENESS

Read user feedback regularly and respond accordingly. It's important to craft individual responses that show you are truly listening and generally interested in helping. This is especially critical in the case of a bad review. By doing this, you're showing credibility. Consider having a dedicated team or contact for user criticism. Ratings and reviews are essential to discoverability and installs. With a few easy improvements, you can help increase both.

ASO- APP STORE OPTIMIZATION

ASO is the SEO of the mobile app world. It's important for discoverability in an very crowded app space. There are rules you must follow to boost your ranking in the App store. This can have a significant impact on User Ratings

CONCLUSION

- A key part of growing your app's installed base is knowing more about your users — how they discover your app, what devices they use, what they do when they use your app, and how often they return to it. Understanding your users is extremely important. User Ratings are one such metrics which highlight the affinity of a user towards an app.

Over the short history of app stores, there's been a shift in the perception of high-quality reviews and ratings for apps. Back in the day, having a 5-star app was a badge of honor. However, depending on the circumstances, the highest rating may not mean much. That said, a higher ranking definitely gives your app a competitive advantage. In fact, the average rating of the 100 most downloaded free App Store apps is 4-stars. On the flip side, having a less-than-stellar star rating raises lots of questions about the app's ability to deliver on expectations.

A number of past studies have investigated a few factors that are related to app ratings. However, there exist a slew of other factors that have not been investigated yet due to the limitation of this data set. Moreover, how these factors integrate together to impact the likelihood of an app being a high-rated app is still unknown. We can build many regression models and run some multivariate analysis to check the collective impact of these factors. To fill the gaps in current research, we consider 13 Key variables that could potentially be associated to app ratings. We analyze more than a thousand Android apps and investigate the differences between high-rated and low-rated apps. We find that high-rated apps are statistically significantly different from low-rated apps. We have also only analyzed app ratings and ignored reviews given to these apps; in the future, we plan to analyze the reviews too. We also would like to collect a large number of versions of these apps to apply causality analysis. It would also be interesting to investigate how the app stakeholders' opinions match with the mined data, and thus we plan to survey Android app developers and users for their thoughts on factors that are associated with app success.