

# Report of Twitter Brand Perception

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## Introduction

The global smart home market is growing at a fast pace, with an expected value of USD 53.45 billion in 2022. Amazon Alexa, Google Home, and Apple HomePod are the most famous smart home devices. They are getting popular and changing our daily life.

Amazon released Alexa, a 9-inch tall cylinder speaker controlled by a cloud-base voice assistant in Nov 2014. Following the Amazon Alexa's popularity, Alphabet released the Google Home in late 2016. At the end of December 2017, Apple will also be joining the fray with the Siri-powered HomePod.

They are similar products that serve as intelligent personal assistant and could be used as a home automation system. Therefore, I am motivated to study how people comment them on Twitter.

The goal of this project is to study the brand perception of Amazon Alexa, Google Home and Apple Home using Twitter data. Through the text mining of twitter data, we can know how people perceive these similar products, assess the efficiency of companies' marketing strategy and help these three companies to improve their marketing strategy.

## Set up Twitter

The codes below enable us to set up Twitter, which will be used to get tweets.

```
-api_key <- "RrPTCIryCswqP35AFeanh73cV"  
-api_secret <- "w4JEhIMHsEArgaandqAtTqhc610kRvenP8e8fdXfSRCnuLVsn9"  
-access_token <- "927638841925742593-3NjhdKxNIJRbGQ8PPDIMIpFskIMFpPd"  
-access_token_secret <- "Qfd1mKMPbi0E6O6cmbVG4Fmi6CQceG1CtbyQKR28nAAY"  
-setup_twitter_oauth(api_key, api_secret, access_token, access_token_secret)
```

## Get tweets that contain our key words

The codes below extract 3000 tweets for each product, and transform the tweets into data frame work.

```
-Alexatweet <- searchTwitter("Amazon Alexa", n=3000, lang="en", since="2014-01-01")
-Alexatweetdf <- twListToDF(Alexatweet)
-GoogleHometweet <- searchTwitter("Google Home", n=3000, lang="en", since="2014-01-01")
-GoogleHometweetdf <- twListToDF(GoogleHometweet)
-AppleHometweet <- searchTwitter("Apple HomePod", n=3000, lang="en", since="2014-01-01")
-AppleHometweetdf <- twListToDF(AppleHometweet)
```

## Store the tweets data

The codes below store our extracted tweets in csv files, which facilitate us to run our text analysis without running the code above every time.

```
-write.csv(Alexatweetdf, "Alexa.csv")
-write.csv(GoogleHometweetdf, "GoogleHome.csv")
-write.csv(AppleHometweetdf, "AppleHome.csv")
```

## Text Analysis

### 1) Import the stored data and unnest tokens the tweets texts

The codes below help us to break the tweets texts into words.

```
Alexadf<-read.csv("Alexa.csv")
GHdf<-read.csv("GoogleHome.csv")
AHdf<-read.csv("AppleHome.csv")

Alexatext<-select(Alexadf, text)
Alexatext$text<-as.character(Alexatext$text)
Alexatext<- Alexatext %>%
  unnest_tokens(word, text)

GHtext<-select(GHdf, text)
GHtext$text<-as.character(GHtext$text)
GHtext<- GHtext %>%
  unnest_tokens(word, text)

AHtext<-select(AHdf, text)
AHtext$text<-as.character(AHtext$text)
AHtext<- AHtext %>%
  unnest_tokens(word, text)
```

## 2) remove stop words

The stop words package enables us to remove no-meaning or conjunction words, I also created my own stop words.

```
mystopwords<-c("https","rt","htt","votedougjones")
```

```
mystopwords<-as.data.frame(mystopwords)
colnames(mystopwords)<-"word"
mystopwords$word<-as.character(mystopwords$word)
```

```
Alexa<-Alexatext %>%
  anti_join(stop_words) %>%
  anti_join(mystopwords) %>%
  count(word, sort = TRUE) %>%
  filter(str_detect(word,"^[a-z']+$"))
```

```
## Joining, by = "word"
## Joining, by = "word"
```

```
GH<-GHtext %>%
  anti_join(stop_words) %>%
  anti_join(mystopwords) %>%
  count(word, sort = TRUE) %>%
  filter(str_detect(word,"^[a-z']+$"))
```

```
## Joining, by = "word"
## Joining, by = "word"
```

```
AH<-AHtext %>%
  anti_join(stop_words) %>%
  anti_join(mystopwords) %>%
  count(word, sort = TRUE) %>%
  filter(str_detect(word,"^[a-z']+$"))
```

```
## Joining, by = "word"
## Joining, by = "word"
```

amazon  
alexa  
wake  
win  
follow  
chance  
echo  
music  
fire  
play  
giveaway  
doris  
christmas  
alarms  
monday  
motivation  
gallagher  
seattle  
textanywhere  
noel  
gift  
michaelschaub  
home  
drive  
crying  
lying  
connected  
adds  
smart  
hard  
amp  
tech  
jones  
cia  
hit  
tablet  
finally  
fire  
enabled  
alex  
enter  
amazon's  
christmas  
change  
giving  
tim  
run  
shismouth  
kindle  
seateca  
play  
win  
follow  
chance  
amazon  
alexa

Keyword	Count
alexa	2350
amazon	1900
music	850
wake	750
echo	650
win	600
chance	550
amp	500
follow	480
dorischristmas	450
mondaymotivation	450
alarms	350
gift	300
noel	250
gallagher	250
giving	250
michaelschaub	250
alex	250
jones	250
fire	250
amazon's	250
cia	250
connected	250

These words reflect the main features of Alexa perceived by customers:

Second, people use it to play music and also use as the alarm to wake them up;

Besides, we also found the words like, Alex, Jones, and CIA. As Alexa Jones grilled an Amazon Echo on his show, asking Alexa — the device’s personal assistant — about its connections to the CIA.

[illegible]

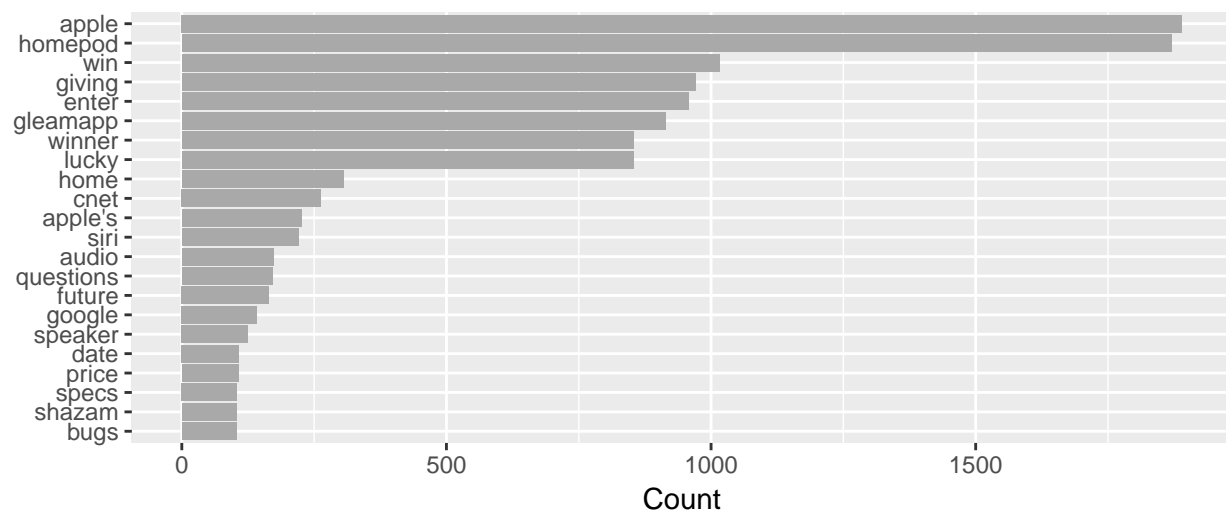
Word	Count
home	2400
google	2300
max	1050
smart	650
speaker	400
mini	300
follow	280
sign	250
volume	220
incredible	210
mkbhd	200
features	200
loud	200
sounds	200
coming	200
impression	200
demitridawson	200
damn	200
tomorrow	200
response	200

Besides, incredible implies that people have a positive impression of Google Home.

## Apple Home EDA



Apple Home Words Frequency



As we can see, the top words of Apple Home are apple, homepod, win, giving, enter, gleamapp, winner, lucky home, cnet, siri, audio. From these top words we can see how customers perceive Apple HomePod:

First, Gleam is doing Apple HomePod Giveaway campaign, where people can win Apple HomePod;

Second, cnet published a news that Apple HomePod is delayed until early 2018;

Third, Apple HomePod is powered by Siri and allows multi-speaker audio streaming;

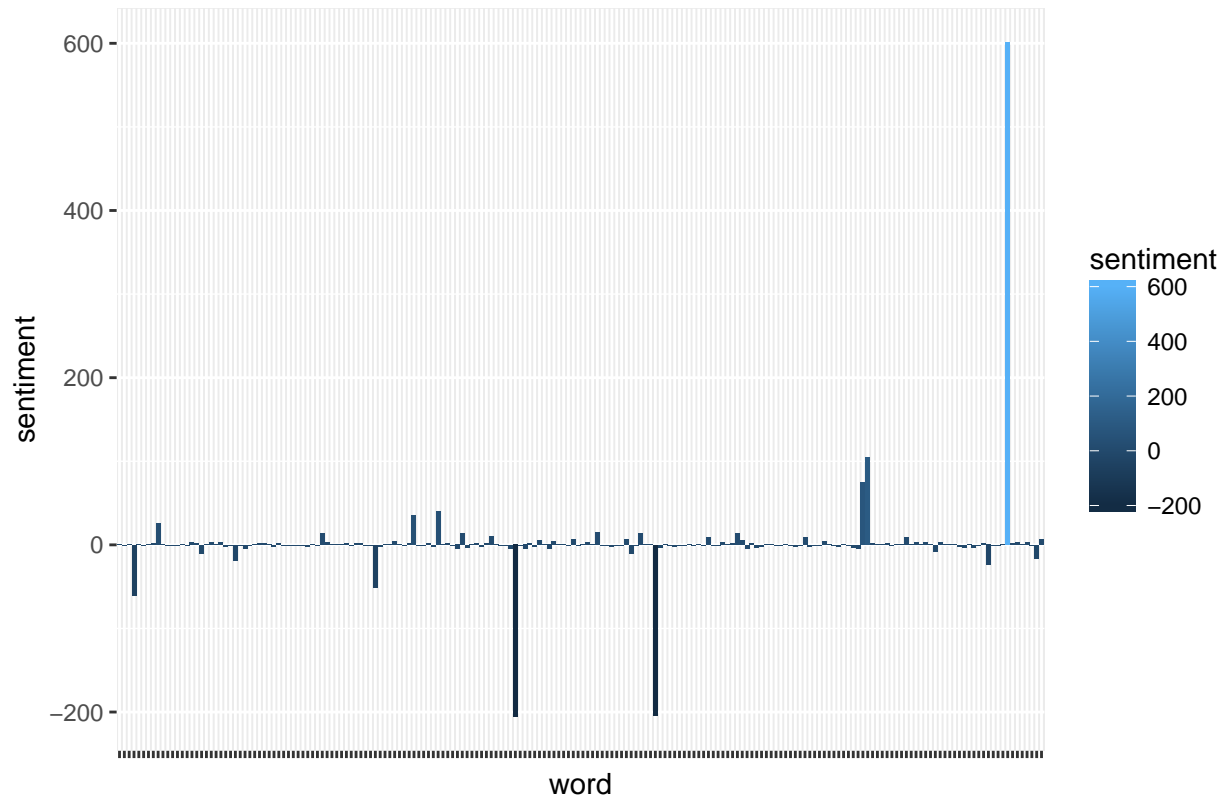
Besides, we can see people are comparing Apple HomePod with Google Home.

People are also discussing the price of Apple HomePod, as it has a higher price compared with Alexa and Google Home.

## Sentiment analysis

```
## Joining, by = "word"
```

### Alexa Sentiment Analysis



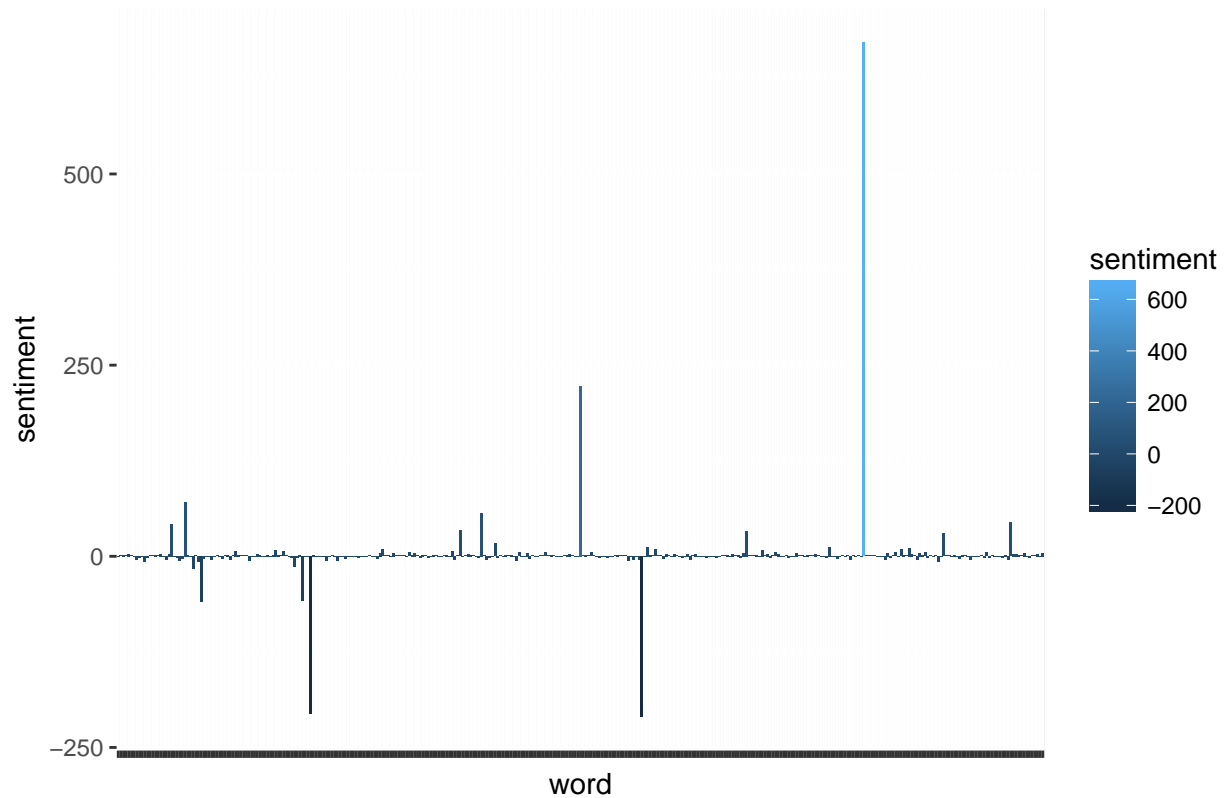
We did sentiment analysis to see how people's comment on Alexa. Overall, there are more positive words about Alexa.

We can see there are some negative words with high frequency, such as hard and lying, which may indicate people have some difficulties of properly using Alexa.

While win is a positive word with very high frequency related to Alexa, we can see people are interested in the marketing campaign of Alexa.

```
## Joining, by = "word"
```

## GoogleHome Sentiment Analysis



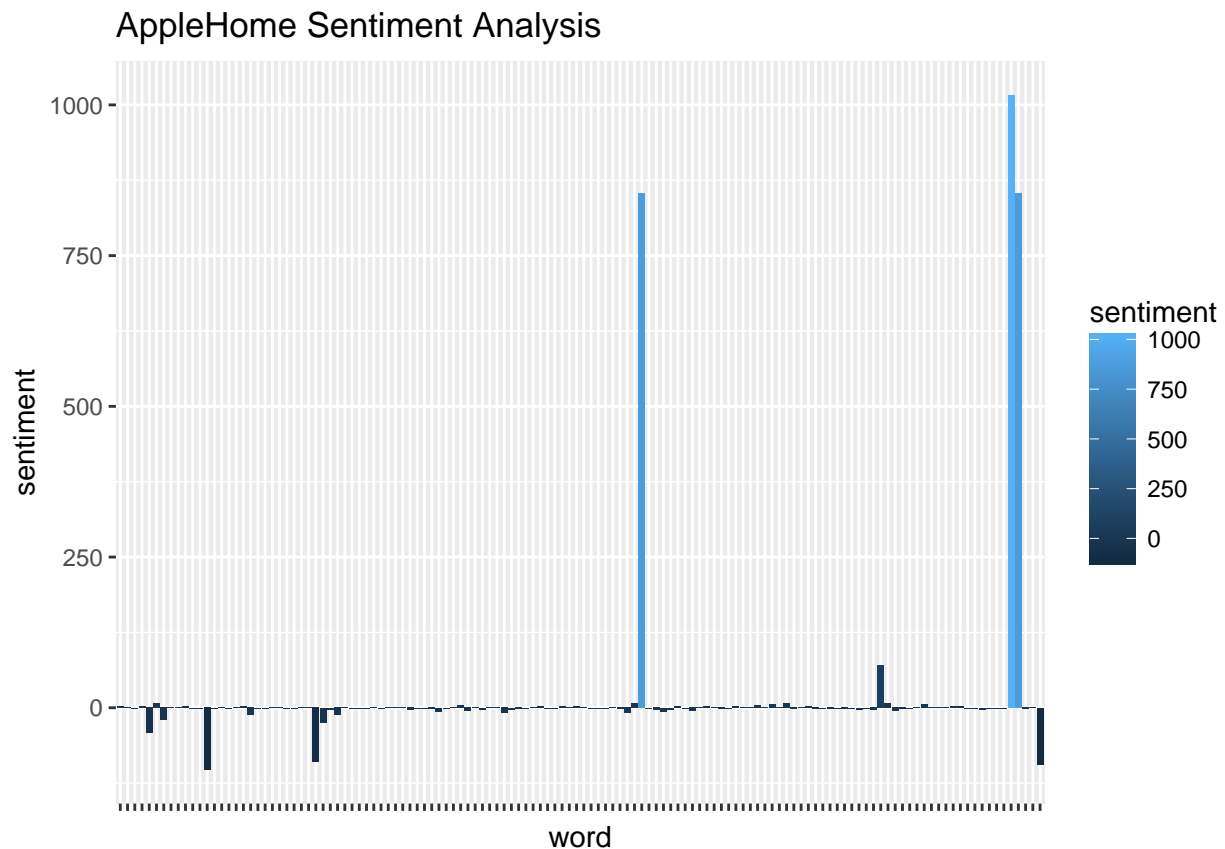
Overall, there are more positive words about Google Home.

We can see there are some negative words, such as damn and loud, indicating people feel google home is loud.

While smart and incredible are positive words with high frequency, we can see more people think Google Home is smart and incredible

```
## Joining, by = "word"
```





Unlike Amazon Alexa and Google Home, Apple HomePod has more positive words, such as lucky, win and winner, which is related to the marketing campaign.

Still, there are some negative words but with lower frequency like bugs, delay and wrong.

## Correlation analysis

```
allproduct<- bind_rows(mutate(GH, product = "GoogleHome"),
                        mutate(AH, product = "AppleHome"),
                        mutate(Alexa, product = "Alexa"))

allpro <- allproduct %>%
  mutate(proportion = round(n / sum(n),5)) %>%
  select(-n) %>%
  spread(product, proportion) %>%
  gather(product, proportion, "GoogleHome":"AppleHome") %>%
  na.omit(proportion)

cor.test(data = allpro[allpro$product == "GoogleHome",],
          ~ proportion + Alexa)

##
## Pearson's product-moment correlation
##
```

```
## data: proportion and Alexa
## t = 2.1505, df = 852, p-value = 0.0318
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## 0.006420462 0.139870952
## sample estimates:
## cor
## 0.0734746
```

```
cor.test(data = allpro[allpro$product == "AppleHome",],
         ~ proportion + Alexa)
```

```
##
## Pearson's product-moment correlation
##
## data: proportion and Alexa
## t = 1.696, df = 396, p-value = 0.09067
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.0134912 0.1817008
## sample estimates:
## cor
## 0.08491946
```

```
allpro2 <- allproduct %>%
  mutate(proportion = round(n / sum(n),5)) %>%
  select(-n) %>%
  spread(product, proportion) %>%
  gather(product, proportion, "AppleHome":"Alexa") %>%
  na.omit(proportion)
```

```
cor.test(data = allpro2[allpro2$product == "AppleHome",],
         ~ proportion + GoogleHome)
```

```
##
## Pearson's product-moment correlation
##
## data: proportion and GoogleHome
## t = 2.3107, df = 564, p-value = 0.02121
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## 0.01454096 0.17783612
## sample estimates:
## cor
## 0.09684018
```

As they are similar products, we did correlation analysis.

Our null hypothesis test: there is no correlation between the sentiment of two products.

The significance level is 0.05.

We found there is small positive correlation between the sentiment of Alexa and apple home.

No significant correlation between Alexa and Google Home nor between Google Home and Apple Home.



Figure 1: Alexa, Apple Home, Google Home

## Conclusion

We can see there are both similarity and difference in people's perception to Alexa, Google Home, and Apple Home.

The features of alarm and music player of Alexa are perceived by the customer, while there are a lot of other features that Amazon can put efforts to promote among customers, such as controlling smart home devices, read news and audiobooks, and make calls. There are some negative aspects of Alexa, like a connection with CIA. Amazon could clarify on public and build a good image of Alexa.

While Google Home has a better reputation in the market, people recognize it as a smart and incredible home device. But people are also complaining the loud volume of Google Home. Google could improve the volume control and solve some technical bugs of google home. There are not many discussions about the specific features of Google Home. Google could make some efforts to promote the specific features of Google Home.

Apple Home hasn't been launched yet, but people are discussing it a lot, such as the delay of its release, the price and the techniques including Siri and audio streaming. And People are comparing it with Google Home. So it's import for Apple to promote some special features that separate Apple Home from Google Home and Alexa.

All these three products have online marketing campaigns which attract customers. Christmas would be a good opportunity to promote these products.