Twitter Sentiment Streaming Analysis

Website Link: https://agarwal123.shinyapps.io/LiveAnalysisTwitter/

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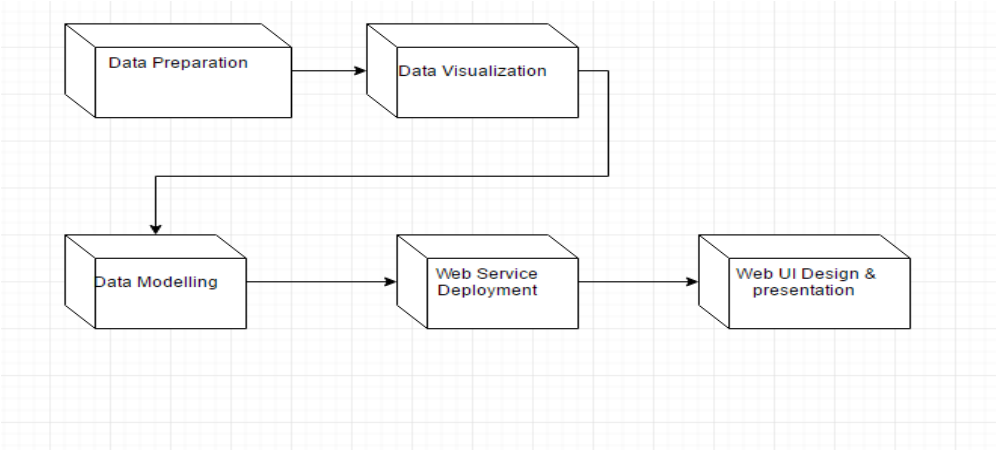
Final Project: Twitter Sentiment Streaming Analysis

Contents

Problem statement: Perform Twitter sentiment live stream analysis and classify the sentiment of a given text further analyzing the sentiments or emotions of people towards the entity.

About Dataset:

The dataset contains static and dynamic tweets, which was collected by using the Twitter Search API and keywords search.
Static Data: Twitter tweets were collected for keywords “iphone” and “ipad”
Live Data: Twitter tweets were continuously collected for dynamic keywords inputted bt user using streaming API
Basic Deployment Pipeline:

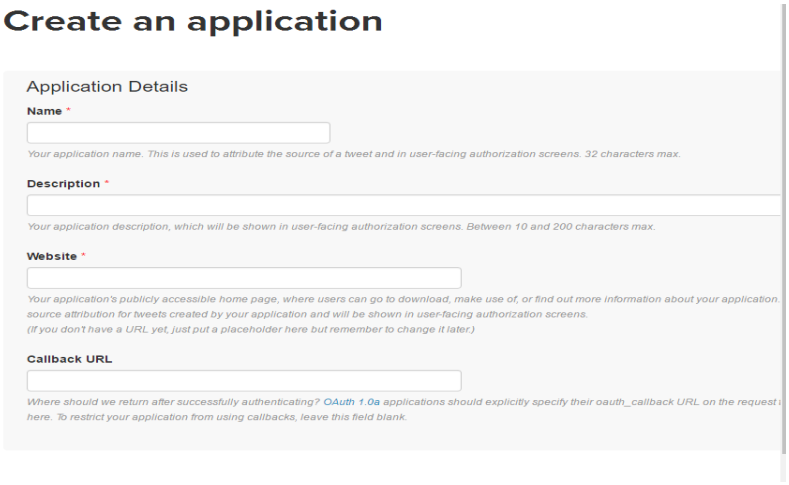


Data Preparation & Cleansing

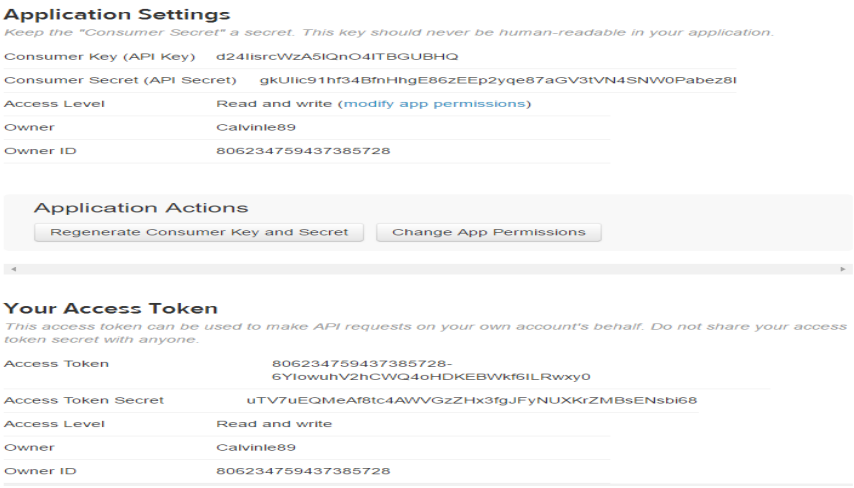
Tools Used: R script was used for preprocessing and cleaning the data.
Steps:

1. Find most popular Key words, and get the static data for training model.
2. Register a Twitter Account at http://twitter.com.

3. Create a Twitter Application at http://apps.twitter.com.



4. Twitter's Streaming API OAuth credentials
   - One the Twitter application page, click one the Kets and Access Tokens tab.
   - Consumer Key(API Key) and Consumer Secret(API Secret) can be found under Application Settings.
   - Under Your Access Token section, click on Create my access token to obtain both Access Token and Access Token Secret.



Building Static data:

5. Using R script to get static data to build model by Key words.

```
library(twitteR)
consumerKey <- "Ev1sh2XxP5gHaKrEEpOlFYi3B"
consumerSecret <- "NmUlPoEbl5zrqBvObJ8ONdRwiGCrRUE4hQ2pwXlMA9KlpXvK8P"
oauth_token <- "806316172996214784-tCXVHP6InzRo3vhfLck2Z5eH3dvKLTw"
oauth_token_secret <- "Oc64vL7zmLFpYzLwakfExfJQTytCi4M65Jrfmd9hUbSBq"

setup_twitter_oauth(consumerKey, consumerSecret, oauth_token, oauth_token_secret)

tweets1 <- searchTwitter('#iPhone',lang="en",n=500000,since='2016-12-01',until = '2016-12-12')
tweets2 <- searchTwitter('#iPad',lang="en",n=500000,since='2016-12-01',until = '2016-12-12')

tweets_df1 <- twListToDF(tweets1)
tweets_df2 <- twListToDF(tweets2)
```

6. Clean the data by using R script to normalize the original data.
    a. Delete needless symbols of “Text” (tweets).
    b. Calculate sentiments by using functions.
    c. Count all mapped positive and negative words and subtract the latter from the former

```
#clean tweets
text = gsub('[^[:graph:]]', ' ', as.character(tweets_df2$text))
text = gsub('^ +', '', text)
text = gsub(' +$', '', text)
text = gsub(' +', ' ', text)
tweets_df2$text = text

#calculate sentiment function
get_sentiment = function(txt) {
  words = strsplit(txt, ' +')
  words = unlist(words)

  pos_matches = match(words, pos)
  neg_matches = match(words, neg)

  #count all the mapped positive and negative words and subtract the latter from the former
  score = sum(!is.na(pos_matches)) - sum(!is.na(neg_matches))
  return(score)
}

#estimate sentiment of the tweets
text = gsub('[^[:alpha:]]', ' ', text)
text = tolower(text)

tweets_df2$sentiment = sapply(text, get_sentiment)

#tweets_df1 <- select(tweets_df1, -score)
tweets_df2 <- tweets_df2 %>% mutate(score = ifelse(sentiment > 2, 4, ifelse(sentiment < -2, 0, 2)))

iphone <- select(tweets_df1, text, score)
ipad <- select(tweets_df2, text, sentiment, score)
write.csv(iphone, "iphone.csv")
write.csv(ipad, "ipad1.csv")
```

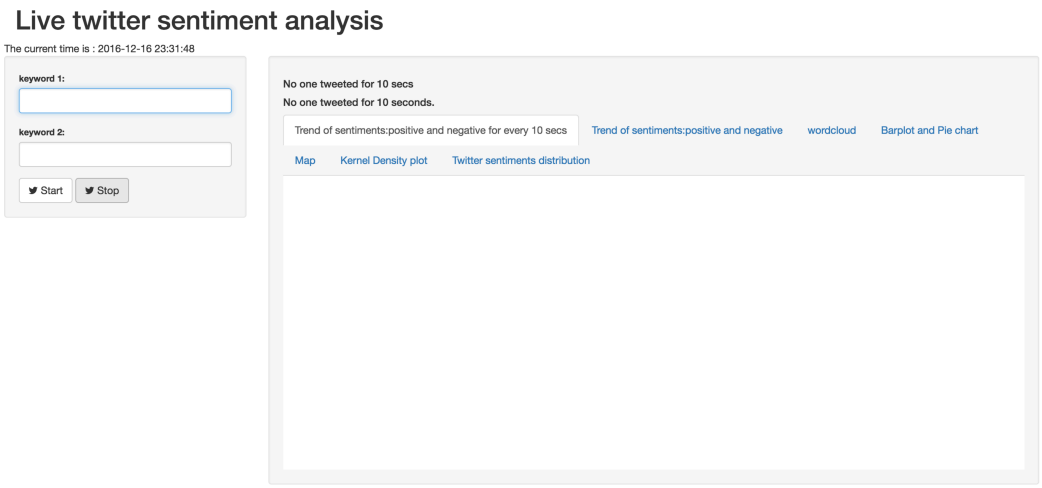
Building Live data:

7. Live data is collected using filterStream giving a timeout = 10sec

```
getAllTweets = function(searchTerm) {


  track    <- searchTerm
  print(track)
  print(searchTerm)
  #new tweets after every 10 sec
  tweets = filterStream(file.name = '', track=track,language = 'en', timeout = 10, oauth = my_oauth)
```

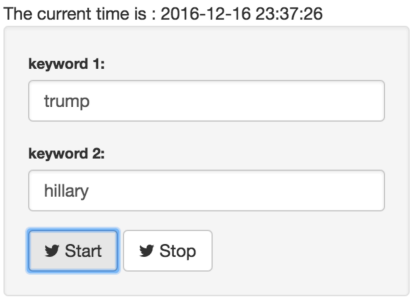
Dashboard 1:

Purpose: Perform LIVE sentiment analysis on two different keywords and perform LIVE visualizations in order to determine negative and positive sentiments across various areas



Description: This can be rather called a product as it accepts two dynamic keywords. Eg: Trump and Hillary. It basically retrieves live tweets and one can determine sentiments and emotions of people regarding the two politicians. Tweet feeds are refreshed every 10 secs and the visualizations are also refreshed every 10 secs.

Enter keywords here: As soon as start button is pressed, live tweets are collected until 10 secs and visualizations are plotted.



Sample positive and negative tweets: Live sample of tweets are displayed. Huge tweets data are analyzed and cleaned. Once cleaning is done, sentiment score is calculated and recognized into: “Positive”, “negative”, “neutral”
From a list of positive and negative tweets, one tweet is chosen at random and displayed on dashboard

```
trump
positive tweet: I love how since Trump lost everyone thinks the election was hacked
negative tweet: Twitter recap: Trump's reckless to deny Russia role. Obama's detached for lack of anger at Russia. HRC can never cite Rus…

hillary
positive tweet: Bill Clinton was called President of U.S.A for he won ELECTORAL VOTES and he sworn in ... according to CONSTITUTION.
negative tweet: You literally had political hacks writing pro hillary propaganda for you! You are a demonic little witc…
```

clean tweets:

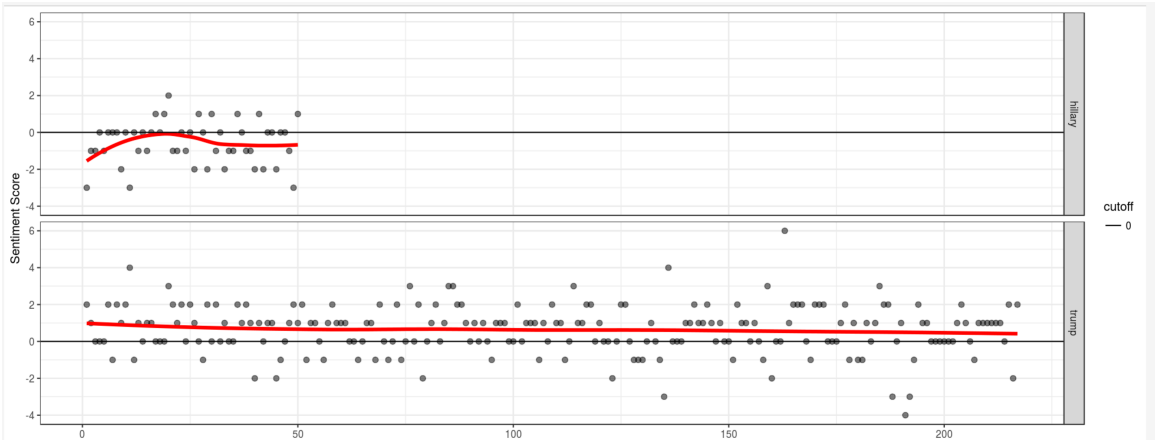
```r
#clean tweets
text = gsub('[^[:graph:]]', ' ', as.character(tweets$text))
text = gsub('^ +', '', text)
text = gsub(' +$', '', text)
text = gsub(' +', ' ', text)
text <- gsub("http://t.co/[a-z,A-Z,0-9]*{8}","",text)
text <- gsub("https://t.co/[a-z,A-Z,0-9]*{8}","",text)
text <- gsub("RT @[a-z,A-Z]*: ","",text)
text <- gsub("#[a-z,A-Z]*","",text)
text <- gsub("@[a-z,A-Z]*","",text)
tweets$text = text
text = gsub('[^[:alpha:]]', ' ', text)
text = tolower(text)

tweets$sentiment = sapply(text, calculateSentiment)
```

Calculate sentiment score:

```r
#calculate sentiment score
calculateSentiment = function(txt) {
  words = strsplit(txt, ' +')
  words = unlist(words)
  positiveWords = match(words, pos)
  negativeWords = match(words, neg)
  score = sum(!is.na(positiveWords)) - sum(!is.na(negativeWords))
  return(score)
}
```

Trend of sentiments - positive and negative for every 10 secs: Every 10 secs, sentiment score for tweets is calculated and displayed as below:

Observation: There are more tweets for Trump as compared to Hillary. Also, Hillary has more tweets with negative sentiments. Trump has received more positive and more number of tweets. This shows that sentiments of people towards Trump is more positive than Hillary



Plot: geom_smooth is used for ggplot. It is called as smoothed conditional means. It helps in viewing the patterns in the presence of overplotting.

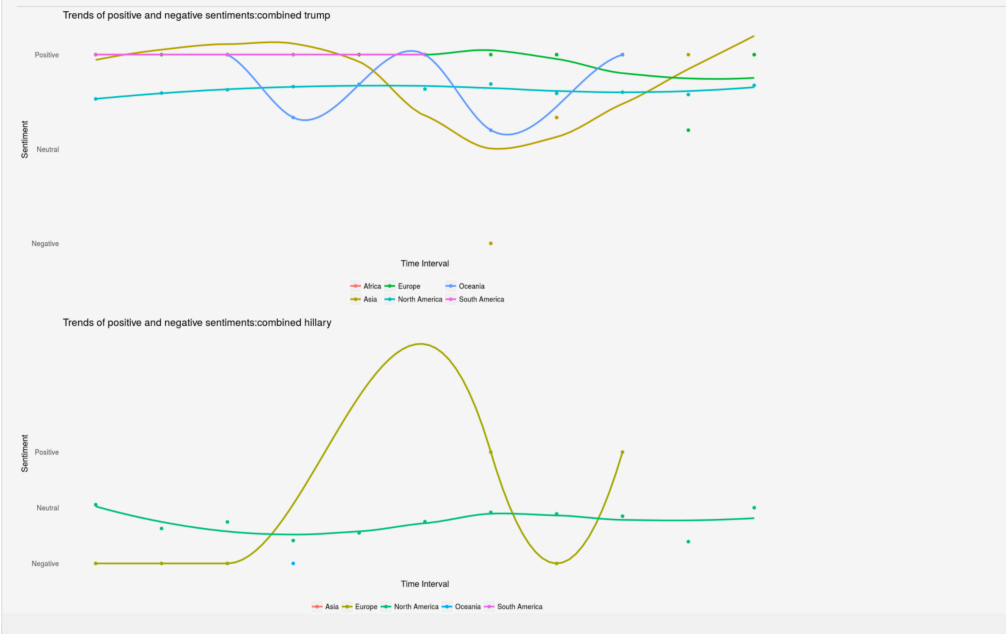
Method:loess – local polynomial regression fitting.

It fits a polynomial surface determined by one or more numerical predictors, using local fitting.

```
cutoff <- data.frame(yintercept=0, cutoff=factor(0))
boxPlot<-ggplot(keywordScore1(),aes(x=size,y=score))+
  facet_grid(entity ~ .)+
  geom_point(color = "black",size = 2, alpha = 1/2)+
  geom_smooth(method = "loess",se=FALSE,col='red',size=1.5, alpha = 0.7)+
  geom_hline(aes(yintercept=yintercept, linetype=cutoff), data=cutoff)+
  xlab('Tweet number')+
  ylab('Sentiment Score')+
  theme_bw()
```

Trends of positive and negative sentiments - combined: Every 10 secs, sentiment score for tweets are calculated. The score is summed up for each 10 secs and plot is displayed from start time till present time. Each line represents the sentiments of people from each continent. Hence, one can understand emotions of people distributed among continents.

Observation: Sentiments of people for trump is more towards positive in each continent, while it keeps fluctuating in case of Asia and Oceania. Sentiments of people for Hillary are mostly negative, then neutral then positive in Europe while neutral in case of North America.



Plot: stat_smooth is used for ggplot. It is called as smoothed conditional means.

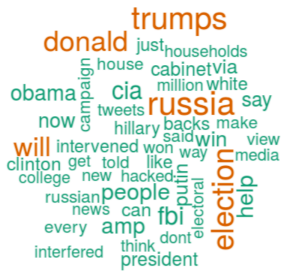
Stat	Description	Default Geom
stat_bin()	Counts the number of observations in bins.	geom_bar()
stat_smooth()	Creates a smooth line.	geom_line()
stat_sum()	Adds values.	geom_point()
stat_identity()	No summary. Plots data as is.	geom_point()
stat_boxplot()	Summarizes data for a box-and-whisker plot.	geom_boxplot()

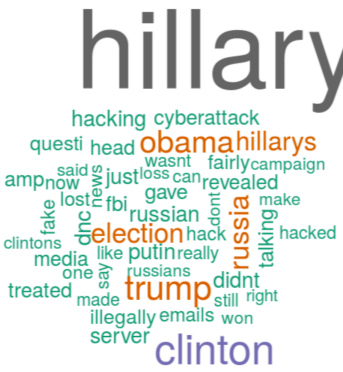
The interesting thing about stat_smooth() is that it makes use of local regression by default. R has several functions that can do this, but ggplot2 uses the loess() function for local regression. This means that if you want to create a linear regression model you have to tell stat_smooth() to use a different smoother function.

```
  dat_all$seq = match(dat_all$ts_r, sort(unique(dat_all$ts_r)))
  dat_all = arrange(dat_all, seq)

  #calculate % of positive sentiment
  sentiment_prop = dat_all %>%
    group_by(continent, seq) %>%
    summarise(sentiment_prc = totalSentiment(sentiment))

  trend_plot = ggplot(sentiment_prop, aes(x = seq, y = sentiment_prc, col = continent)) +
    geom_point() + stat_smooth(method = 'loess', se = F) +
    guides(col = guide_legend(title = NULL)) +
    scale_y_continuous(breaks = seq(0, 1, .25),
                       labels = c('Negative', '', 'Neutral', '', 'Positive')) +
    theme(legend.position = 'bottom', axis.text.x = element_blank(),
          panel.grid = element_blank(), panel.border = element_blank(),
          axis.ticks = element_blank(),
          panel.background = element_blank(), plot.background = element_blank(),
          legend.background = element_blank()) +
    xlab('Time Interval') + ylab('Sentiment') +
    ggtitle(paste0(title,a))

  return(trend_plot)
```

Wordcloud: Word cloud is a text mining method that allows us to highlight the most frequently used keywords in a paragraph of texts. It is also referred to as a text cloud or tag cloud. Word clouds (also known as text clouds or tag clouds) work in a simple way: the more a specific word appears in a source of textual data (such as a speech, blog post, or database), the bigger and bolder it appears in the word cloud.

Observation: For trump, frequently used words are ‘Russia’ and ‘election’. Other words are surrounded around. For Hillary, ‘obama’ is most frequently used.

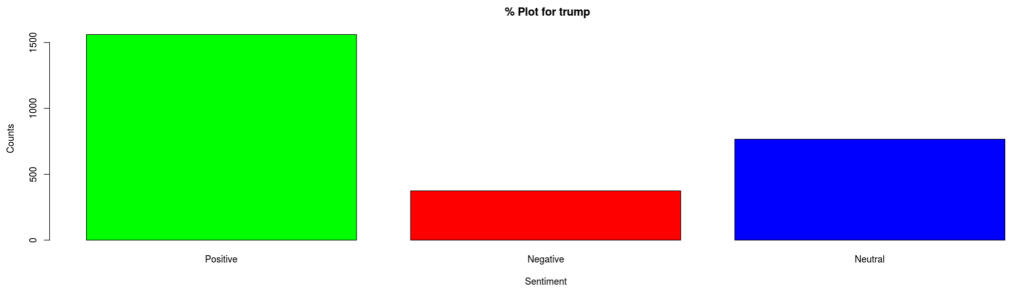


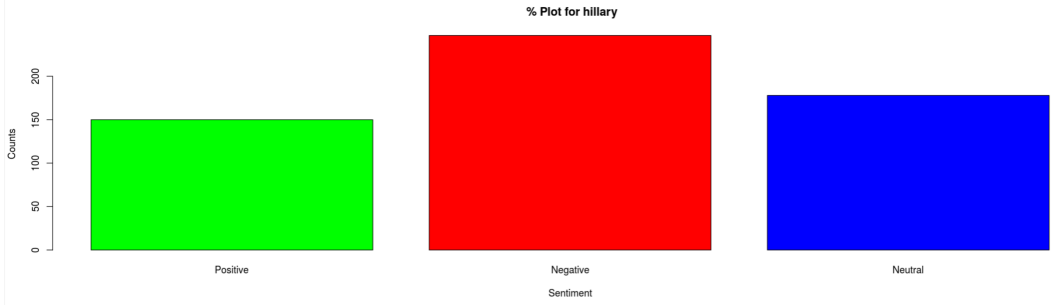


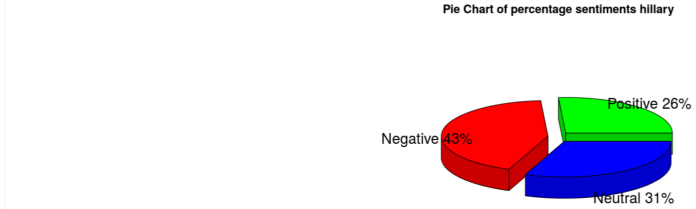

```
wordcloudentity<-function(text,a)
{
  text = gsub('http', ' ', text)
  text = gsub('https',' ',text)
  tweetCorpus<-Corpus(VectorSource(text))
  tweetTDM<-TermDocumentMatrix(tweetCorpus,control=list(removePunctuation=TRUE,
                                                        stopwords=c(stopwords('english')),
                                                        removeNumbers=TRUE,tolower=TRUE))

  tdMatrix <- as.matrix(tweetTDM)
  sortedMatrix<-sort(rowSums(tdMatrix),decreasing=TRUE)
  cloudFrame<-data.frame(word=names(sortedMatrix),freq=sortedMatrix)
  wcloudentity<-wordcloud(cloudFrame$word,cloudFrame$freq,max.words=50, colors=brewer.pal(8,"Dark2"),scale=c(8,1), random.order=TRUE)
  print(wcloudentity)
}
```

Bar Charts and Pie charts: A bar chart or bar graph is a chart or graph that presents grouped data with rectangular bars with lengths proportional to the values that they represent. Pie chart is a type of graph in which a circle is divided into sectors that each represents a proportion of the whole

Observation: For trump, positive percentage of tweets is 58%, negative: 14%, neutral: 28%. For Hillary, positive: 26%, 43%, 31%. Bar graph visualizes the count of type of tweets







Bar graph:

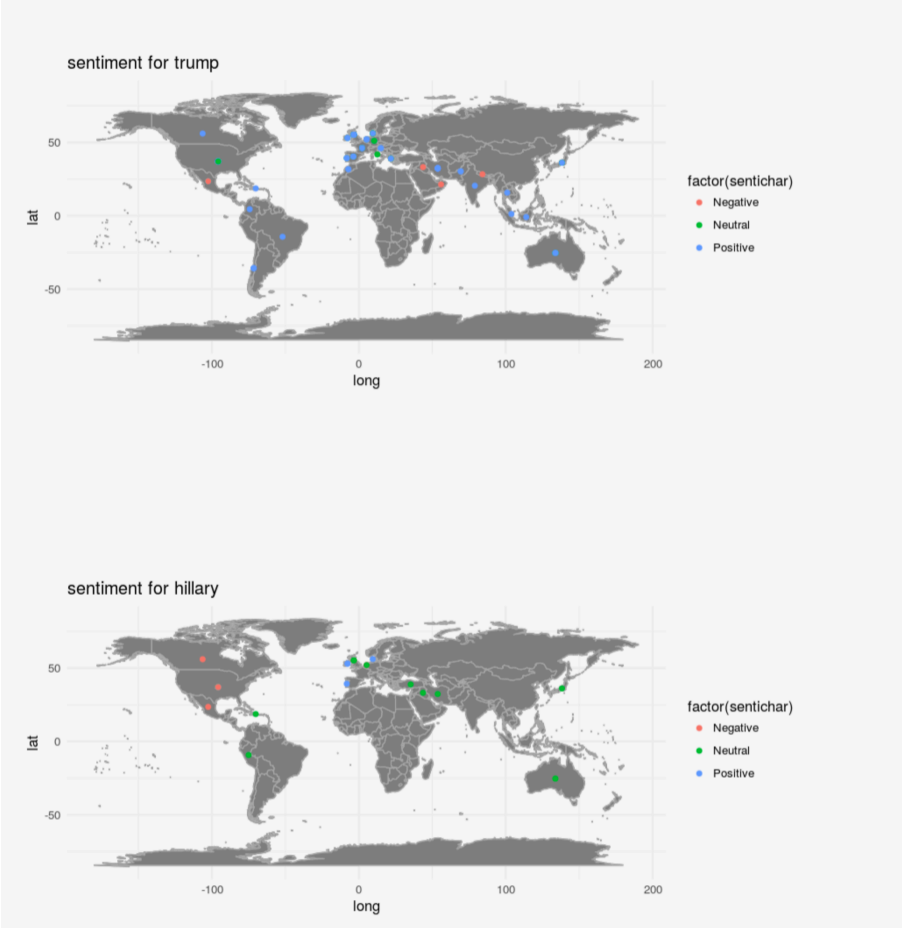
```
results1 = data.frame(tweets = c("Positive", "Negative", "Neutral"), numbers
                      = c(positivecount1,negativecount1,neutralcount1))
barplot(results1$numbers, names =
          results1$tweets, xlab = "Sentiment", ylab = "Counts",
        col = c("Green","Red","Blue"), main = paste0(" % Plot for ",input$keyword1))
```

Pie chart:

```
results2 = data.frame(tweets = c("Positive", "Negative", "Neutral"), numbers = c(positivecount2,negativecount2,neutralcount2))
pct2 <- round(results2$numbers/sum(results2$numbers)*100)
label2 <- paste(results2$tweets,pct2)
label2 <- paste(label2, "%", sep = "")
pie3D(results2$numbers,labels=label2,explode=0.1,col = c("Green","Red","Blue"), main=
       paste0("Pie Chart of percentage sentiments ",input$keyword2))
```

Map: Plots world map and views distribution of tweet sentiments in each continent.

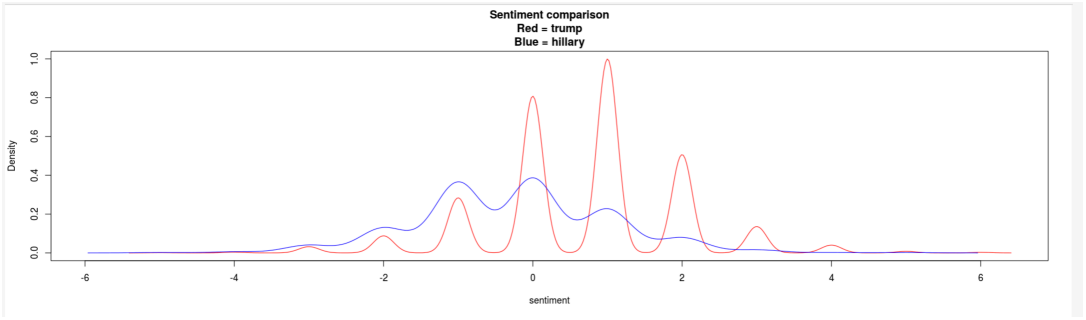
Observation: For trump, there are more positive tweets in North America. For Hillary, there are more negative tweets in North America



ggmap: A collection of functions to visualize spatial data and models on top of static maps from various online sources (e.g Google Maps and Stamen Maps). It includes tools common to those tasks, including functions for geolocation and routing

```
plotworldmap = function(combinedData1, title,a){
  worldMap <- map_data("world")
  map_world <- ggplot(worldMap)
  map_world <- map_world + borders("world", colour="gray50", fill="gray50")
  map_world <- map_world + geom_path(aes(x = long, y = lat, group = group),  # Draw map
                        colour = gray(2/3), lwd = 1/3) +ggtitle(paste0("sentiment for ",a))
  map_world <- map_world + geom_point(data = combinedData1,  # Add points indicating users
                         aes(x = lon, y = lat, colour = factor(sentichar)))
  map_world <- map_world + coord_equal()
  map_world <- map_world + theme_minimal()
  print(map_world)
}
```

Kernel Density plot**:** Technique for visualizing the underlying distribution of a continuous variable. Kernel density plot is a non-parametric way to estimate the probability density function of a random variable. Kernel density estimation is a fundamental data-smoothing problem where inferences about the tweets are made, based on a finite data sample.
Observation: Density of Trumps tweet is more as Hillary's

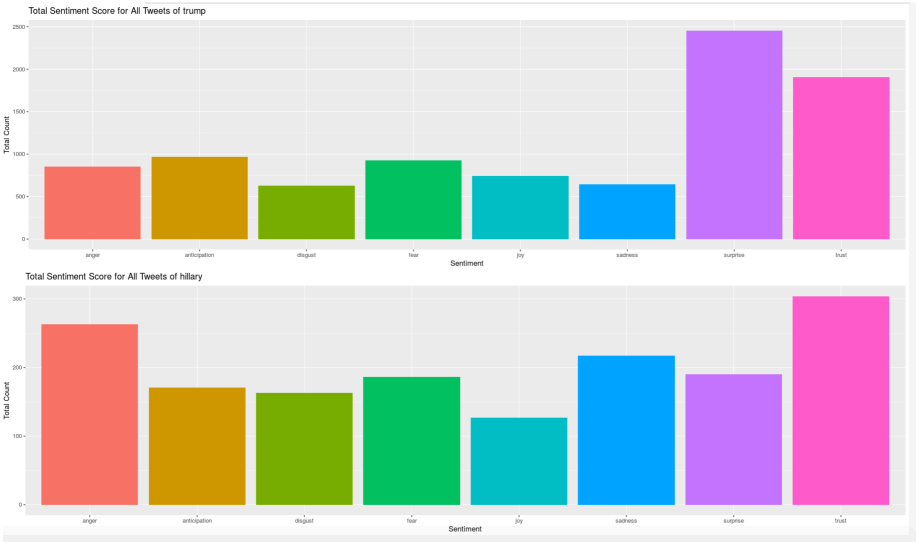


Kernel Density Estimation: The (S3) generic function density computes kernel density estimates. Its default method does so with the given kernel and bandwidth for univariate observations.

```
output$kerneldensityplot <- renderPlot({
  if(countDataEntire2>0 && countDataEntire1>0){
    d1 <- density(combinedData1$sentiment)
    d2 <- density(combinedData2$sentiment)
    plot(range(d1$x, d2$x), range(d1$y, d2$y), type = "n", xlab = "sentiment",
         ylab = "Density")
    lines(d1, col = "red")
    lines(d2, col = "blue")
    title(main= paste0("Sentiment comparison","\n",paste0("Red = ",input$keyword1),"\n",paste0("Blue = ",input$keyword2)))

  }
})
```

Twitter sentiments distribution: Distribute tweet sentiments: **anger**, **anticipation**, **disgust**, **fear**, **joy**, **sadness**, **surprise**, **trust**

Observation: For trump, there is more surprise tweet sentiments than trust. But, the least ones is disgust. For Hillary, there are more trust sentiments but there are anger sentiments after that. The lease ones is joy




```
plotsentiment = function(combinedData, title, a){
  as <- combinedData
  mySentiment <- get_nrc_sentiment(as$text)
  as <- cbind(as, mySentiment)
  sentimentTotals <- data.frame(colSums(as[,c(10:17)]))
  names(sentimentTotals) <- "count"
  sentimentTotals <- cbind("sentiment" = rownames(sentimentTotals), sentimentTotals)
  rownames(sentimentTotals) <- NULL
  ggplot(data = sentimentTotals, aes(x = sentiment, y = count)) +
    geom_bar(aes(fill = sentiment), stat = "identity") +
    theme(legend.position = "none") +
    xlab("Sentiment") + ylab("Total Count") + ggtitle(paste0("Total Sentiment Score for All Tweets of ",a))
```

Dashboard 2:

Purpose: It lets a user enter a text and output if the statement is positive, negative and neutral.

Model is created in azure and service is deployed. API call is made to service to retrive t he data.

Prerequisite:
Services can be called with any programming language and from any device that satisfies three criteria:

- Has a network connection
- Has SSL capabilities to perform HTTPS requests
- Can parse JSON (by hand or support libraries)

Once the experiment has been deployed, there are four pieces of information that we need to call either the RRS or BES service.

a. The service **API key** or **Primary key**
b. The service **request URI**
c. The expected API **request headers** and **body**
d. The expected API **response headers** and **body**

```
library("RCurl")
library("rjson")

# Accept SSL certificates issued by public Certificate Authorities
calculatePre = function(text){
  options(RCurlOptions = list(cainfo = system.file("CurlSSL", "cacert.pem", package = "RCurl")))

  h = basicTextGatherer()
  hdr = basicHeaderGatherer()


  req = list(

    Inputs = list(


      "input1" = list(
        "ColumnNames" = list("text"),
        "Values" = list( list(text),  list(text)  )
      )                 ),
    GlobalParameters = setNames(fromJSON('{}'), character(0))
  )
```

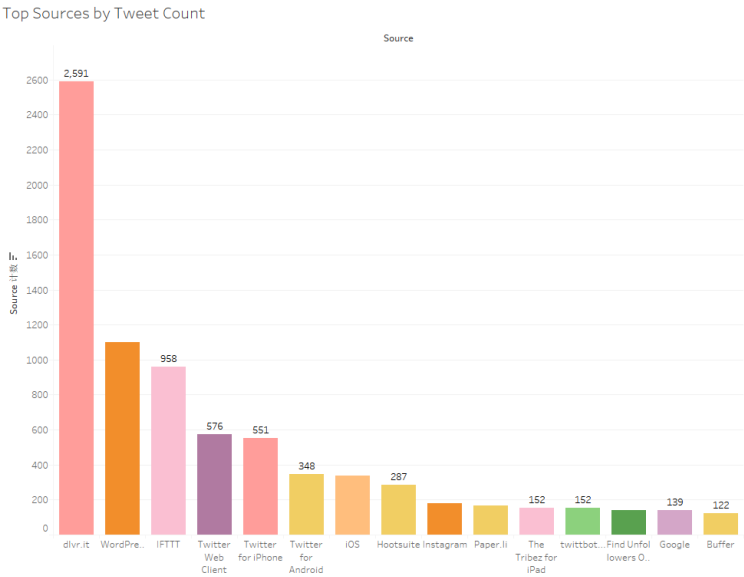
```
  api_key = "i0cQUCIsUBdql5sWXwdRtVPCWP23JhGP4lfmz7INIUK0Wctycg8fej+acSpJC19y9du/NlYFrnppm3EKYzOZgg==" # Replace th
  authz_hdr = paste('Bearer', api_key, sep=' ')

  h$reset()
  curlPerform(url = "https://ussouthcentral.services.azureml.net/workspaces/50a521edc87c4993bebe9c9e147d0c30/servic
              httpheader=c('Content-Type' = "application/json", 'Authorization' = authz_hdr),
              postfields=body,
              writefunction = h$update,
              headerfunction = hdr$update,
              verbose = TRUE
  )

  headers = hdr$value()
  httpStatus = headers["status"]
  if (httpStatus >= 400)
  {
    print(paste("The request failed with status code:", httpStatus, sep=" "))

    # Print the headers - they include the requert ID and the timestamp, which are useful for debugging the failure
    print(headers)
  }
  result = h$value()
  print(fromJSON(result))
result1 <- fromJSON(result)
result1 <- result1$Results$output1$value$Values[[1]][1]
return (result1)
}
```

Dashboard 3:

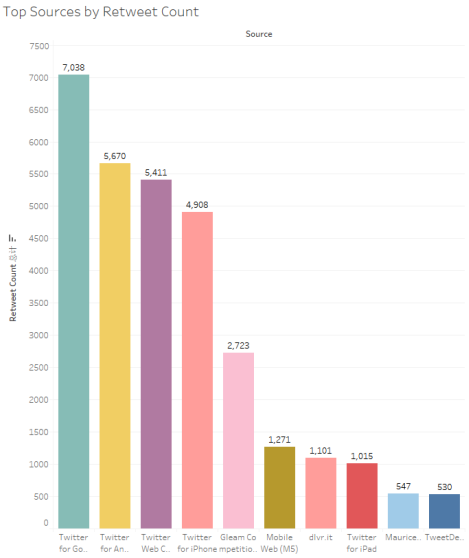
Data Visualization

Tools Used: Tableau with Conduct Exploratory Data Analysis
Tableau Public was used to publish the visualizations on Website.

a) We collected two csv data about 10,000 lines data with key word “iPhone” and “iPad”.
b) Add sentiment and score label in each line of the original data source.
c) Finding the Top 10 Sources by Tweet Count. From the bar chart, most Tweet Count were from “dlvr.it”, and then is “WordPress.com”



a) Finding the Top 10 Sources by Retweet Count. From the bar chart, Twitter for Google TV had 7038 Retweet count, which is the highest, and then, is Twitter for Android.



b) Top 10 Retweets from Data. The top one retweet is “FOLLOW US for a chance to win an iPhone” which had been retweet for 20,043 times. But this tweet is just an advertisement.

Top 10 Retweets

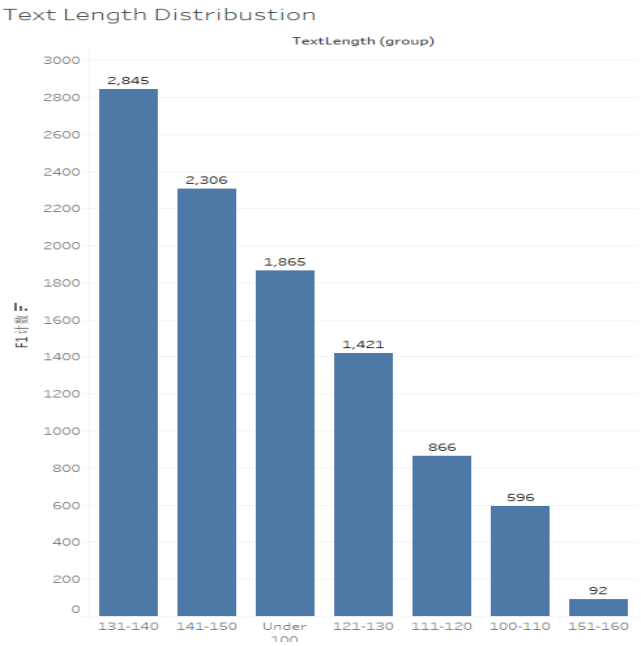
Text	
RT @BloggersVibe: #FOLLOW US and #RT US for a chance to #win an #Iphon..	20,043
RT @TheMisterFavor: Hurry #Signup for #Socialfave! #android #iphone #Bi..	3,509
RT @TechnoAndroid44: Test your luck in this week's Friday #giveaway and y..	2,723
RT @techbeardblog: How to Free Up Tons of Unused Space on iPhone or iPad ..	1,296
RT @Sofie_hans: #GIVEAWAY FINALLY! WIN #IPHONE7 #IPHONE7PLUS YOU..	1,144
RT @beerrightnow: RT if you were absolutely mesmerizing @iphone How ma..	406
RT @macgizmoguy: CHARRGE-IT! RAVPower's Dual Charger - https://t.co/0e..	399
RT @mikeeshift: Get the new #brainwave #meditation #app for #iphone #io..	358
RT @GrantCardone: Success might be the only thing you don't want to do in ..	288
RT @Canoopsy: New video! Secret iPhone Keyboard Trick! https://t.co/8pMF..	240

c) The top 5 favorite count distribution shows most tweet did not have favorite.

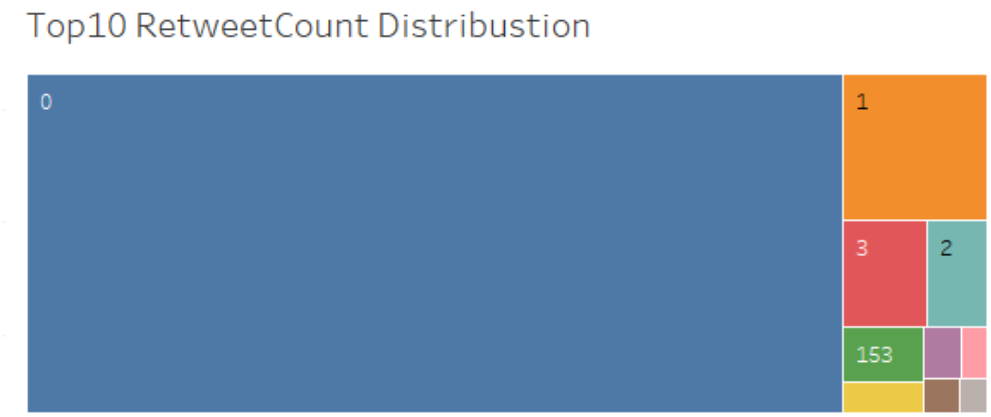
Top 5 FavoriteCount Distribustion

Favorite Count	
0	45,163,541
1	3,671,259
2	504,644
3	226,340
4	113,490

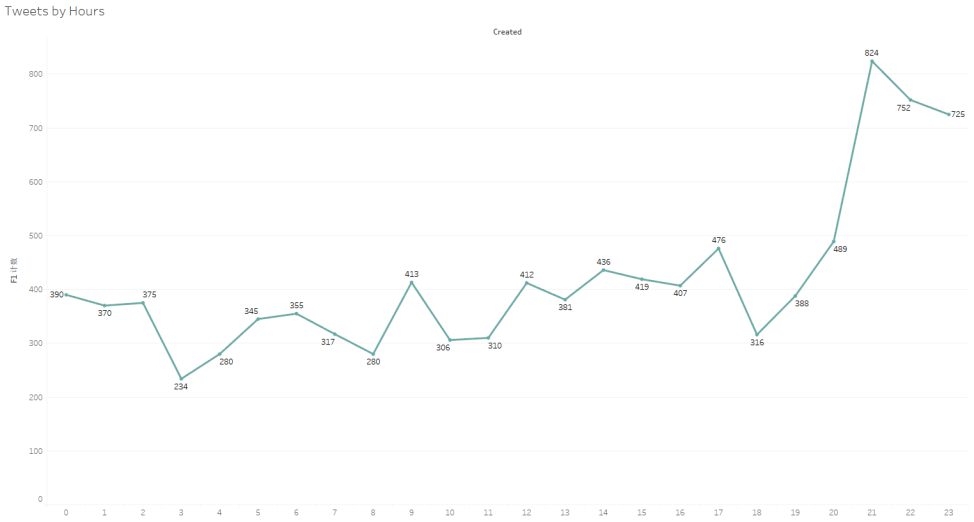
d) The Text Length Distribution shows, most people write 131-140 words by using iPhone, and then is 141 – 150 words.



e) Top 10 Retweet Count Distribution also shows most tweets were not be rewet, which is similar with Favorite Count Distribution.

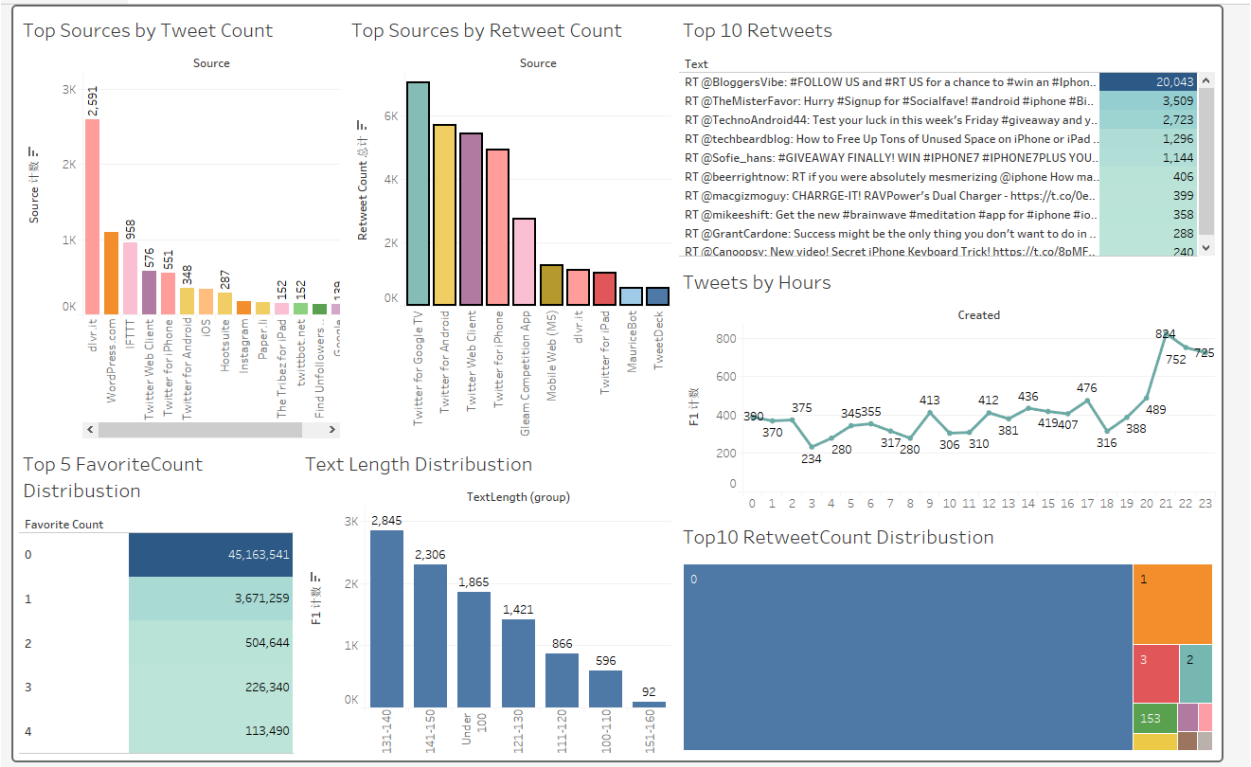


f) Tweets by Hours shows that 9pm is the peak that people use iPhone to write tweets. The lowest time is 6pm.

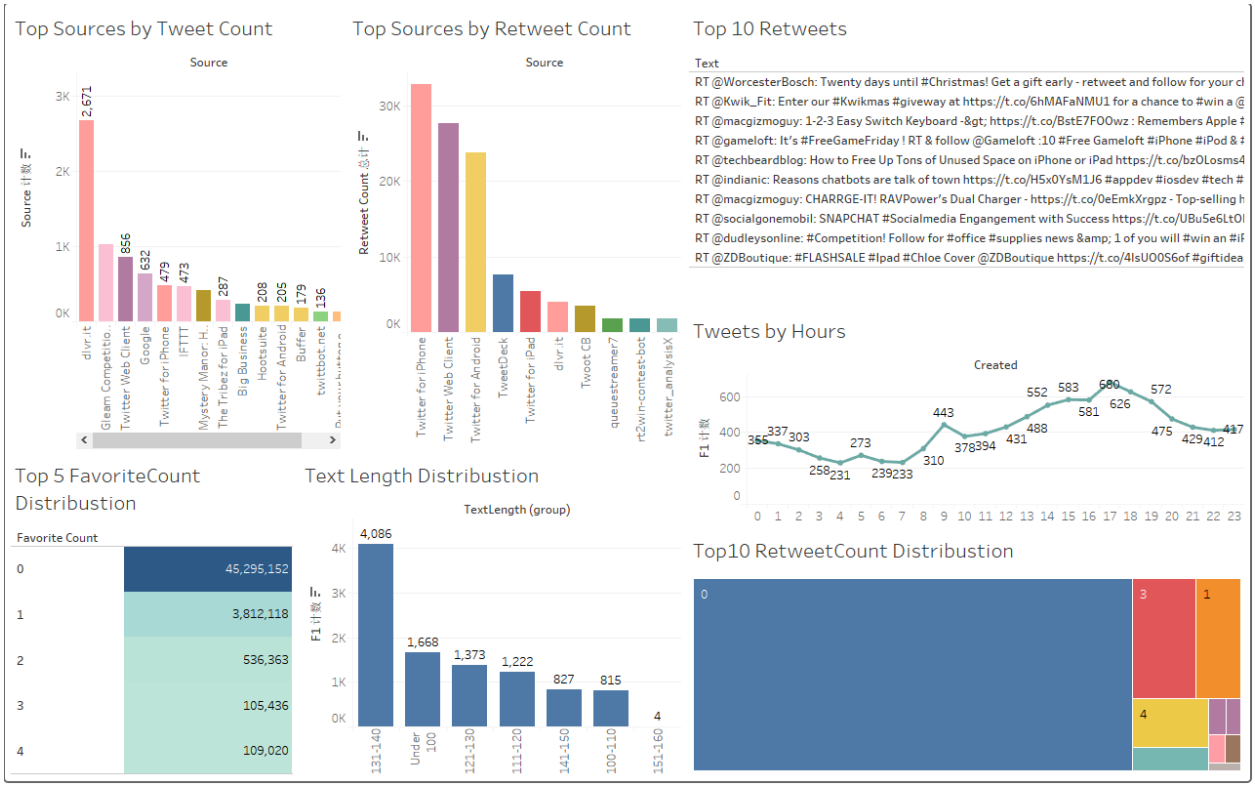


g) Dashboard of iPhone and iPad:

iPhone:



iPad:



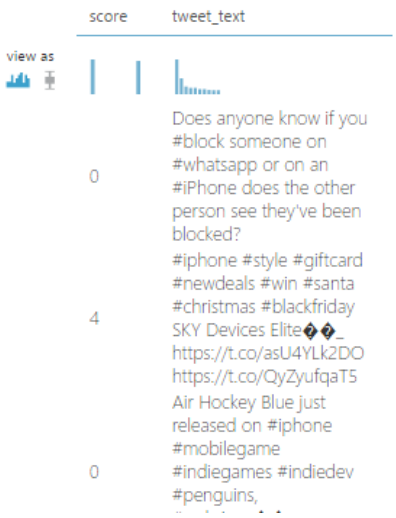
Data Modeling

Tools Used: Microsoft Azure ML Studio

Building the Model

Steps:

1. Get Data by using R script. Dataset has 3 fields:
   - ✓ Sentiment: the polarity of the tweet (0=negative, 2=neutral, 4=positive)
   - ✓ Target: the query.



score	tweet_text
0	Does anyone know if you #block someone on #whatsapp or on an #iPhone does the other person see they've been blocked?
4	#iphone #style #giftcard #newdeals #win #santa #christmas #blackfriday SKY Devices Elite��_ https://t.co/asU4YLk2DO https://t.co/QyZyufqaT5
0	Air Hockey Blue just released on #iphone #mobilegame #indiegames #indiedev #penguins,

- ✓ Tweet_text: the text of the tweet.

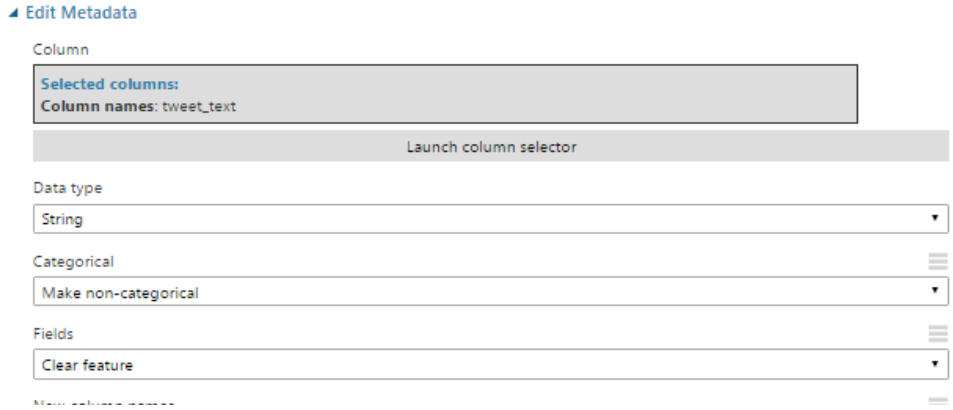
2. Text preprocessing using R script. Tweet usually requires some preprocessing before it can be analyzed. We used the following R code to remove punctuation marks, special character and digits, and then performed case normalization.

Execute R Script

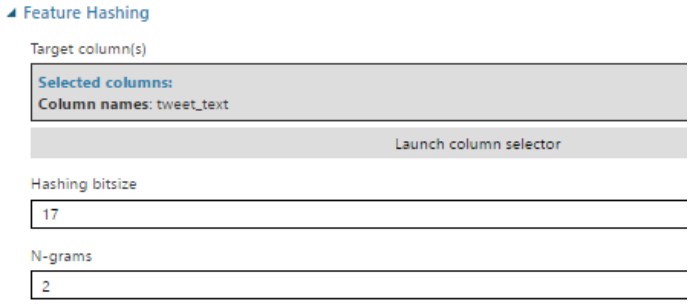
R Script

```r
# Map 1-based optional input ports to variables
dataset <- maml.mapInputPort(1) # class: data.frame

# Separate the label and tweet text
sentiment_label <- dataset[[1]]
tweet_text      <- dataset[[2]]

# Replace punctuation, special characters and digits with space
tweet_text <- gsub("[^a-z]", " ", tweet_text, ignore.case = TRUE)

# Convert to lowercase
tweet_text <- sapply(tweet_text, tolower)

data.set <- as.data.frame(cbind(sentiment_label,tweet_text),
    stringsAsFactors=FALSE)

# Select data.frame to be sent to the output Dataset port
maml.mapOutputPort("data.set")
```

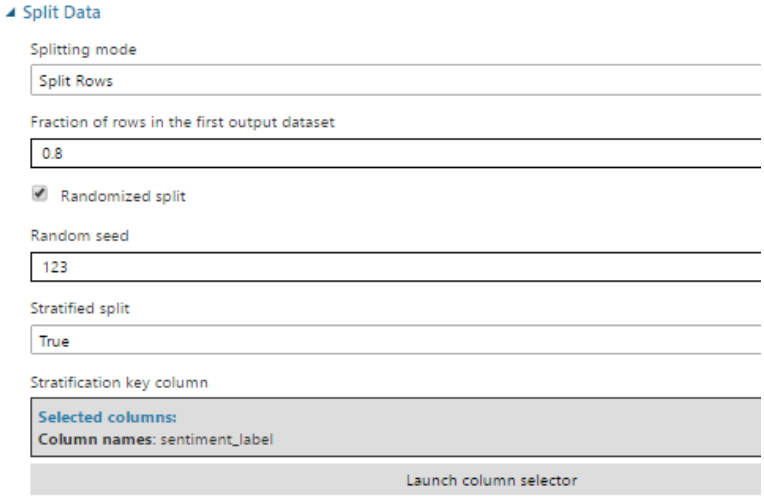
3. Edit Metadata. We used edit metadata to marked the text column as non-categorical column, and marked the text column as a non-feature.



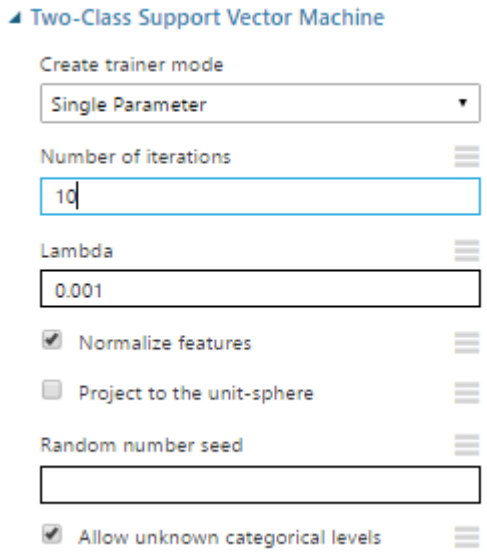
4. Feature Hashing, which can be used to represent variable-length text documents as equal-length numeric feature vectors. We set the number of hashing bits to 17 and the number of N-grams to 2. With these settings, the hash table can hold 2^17 entries in which each hashing feature will represent one or more unigram or bigram features.



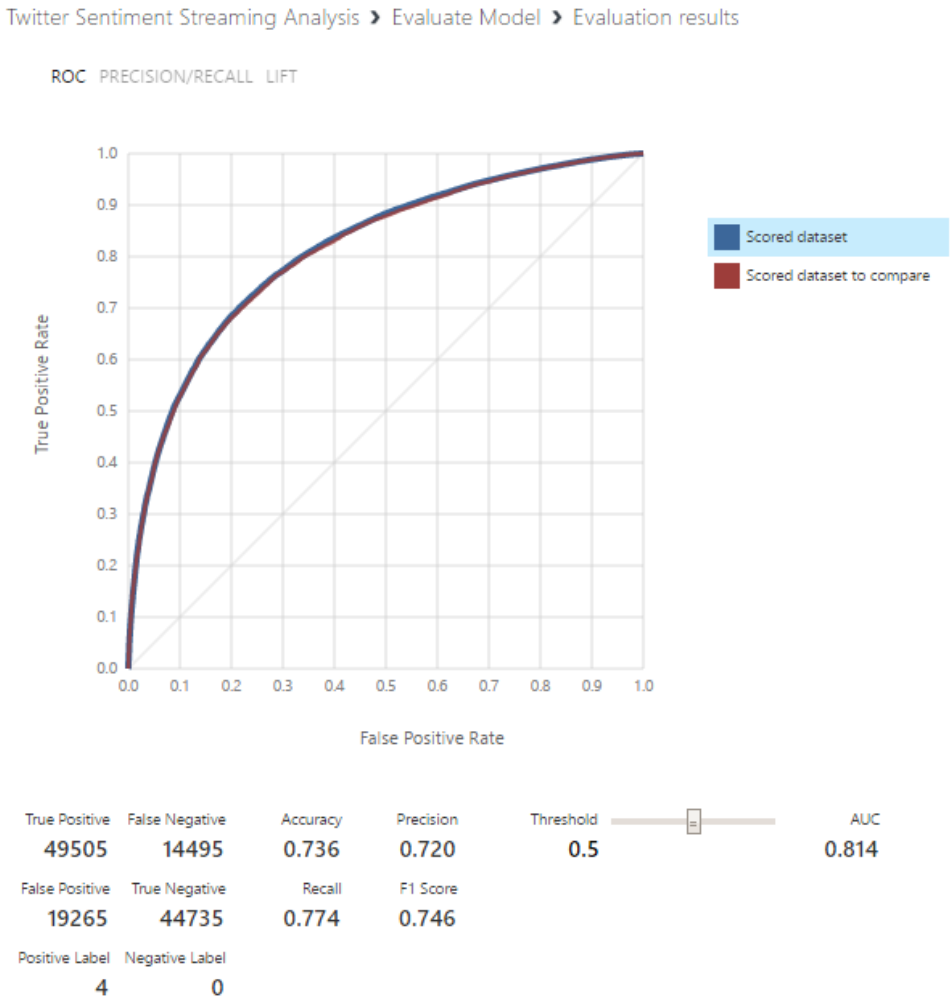
5. Split the data into train and test. We use 80% data for training and 20% for testing.

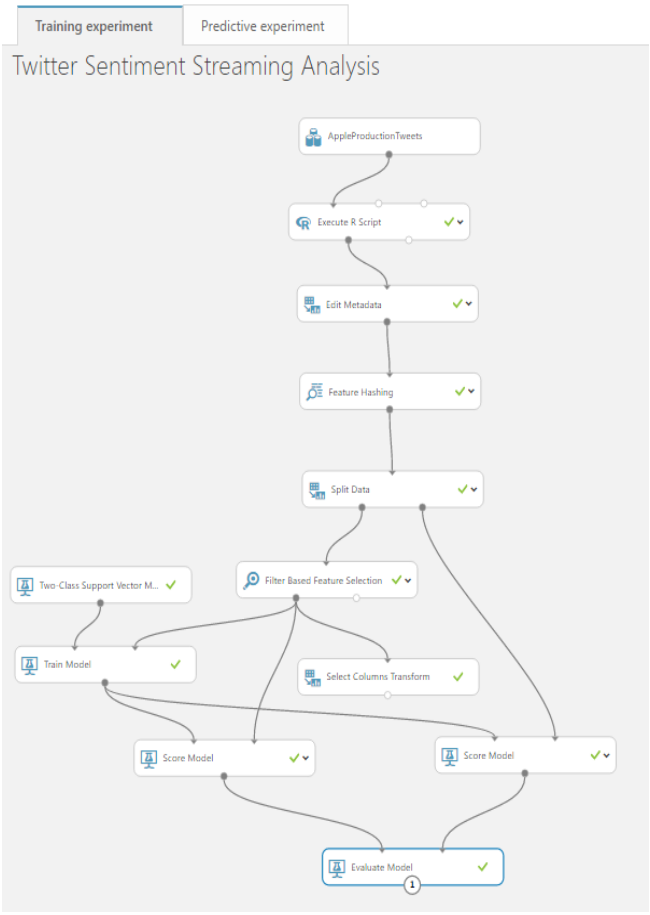


6. Train the model based on the algorithm: Two-Class Support Vector Machine Model



7. Evaluate the model





8. Add Web Service Input and Output.
9. Execute R Script Module:

Execute R Script

R Script

```r
#get the scores returned from the model
dataset1 <- maml.mapInputPort(1) # class: data.frame
#set thresholds for classification
threshold1 <- 0.60
threshold2 <- 0.45
positives <- which(dataset1["Scored Probabilities"] > threshold1)
negatives <- which(dataset1["Scored Probabilities"] < threshold2)
neutrals <- which(dataset1["Scored Probabilities"] <= threshold1 &
    dataset1["Scored Probabilities"] >= threshold2)
new.labels <- matrix(nrow=length(dataset1["Scored Probabilities"]),
                     ncol=1)
new.labels[positives] <- "positive"
new.labels[negatives] <- "negative"
new.labels[neutrals] <- "neutral"

data.set <- data.frame(assigned=new.labels,
    confidence=dataset1["Scored Probabilities"])
colnames(data.set) <- c('Sentiment', 'Score')
# Select data.frame to be sent to the output Dataset port
maml.mapOutputPort("data.set");
```

Deploying the Web Service:

Steps:

1. The Web service is deployed using REST API in the by node.js in HEROKU server, and in the frontend the data is consumed using JQuery AJAX function. The Web Pages are redirected using Flask Framework which is a node.js framework used for request dispatching in the web applications
2. The technologies used for the FrontEnd are: Bootstrap, HTML5, CSS, Javascript, JQuery, Font-Awesome.

Dashboard 4:

Integration of Front end and REST API

Technologies used: Node JS Server, Javascript

```
var Twit = require('twit');
var express = require('express');
var cp = require("child_process");
var http = require('http')
var server = http.createServer(app)
var io = require('socket.io').listen(server);
var app = express();
//
//var http = require("http");
var https = require("https");
var querystring = require("querystring");
var fs = require('fs');

app.listen(3000);
server.listen(4000);
app.use(express.static(__dirname + '/'));
//app.get('/', function(req,res){res.sendFile('/chart.html');});
function getIpadPred(data){
    //print a header
    var host = 'ussouthcentral.services.azureml.net';
    var path = '/workspaces/bd7ad4350c2245faab8796d385b1c5e5/services/e72bbfc04d7d44c69684ec7fe0cc9140/execute?api-version=2.0&details=true';
    var method = 'POST';
    var api_key = 'dVAp//lYFZksMfEW3FhRvbelXbCvDGf7vj/SXKyf6k8gHpBEk/dV53SYODMF+hcxmprXla4KKVN6IcAgRb9l/w==';
    var headers = {'Content-Type':'application/json', 'Authorization':'Bearer ' + api_key};

    var options = {

        host: host,
        port: 443,
        path: path,
        method: method,
        headers: headers

    };

    //console.log('data: ' + data);
    console.log('method: ' + method);
    console.log('api_key: ' + api_key);
    console.log('headers: ' + headers);
    console.log('options: ' + options);

    //POST request model using options of header
    var reqPost = https.request(options, function (res) {
        console.log('===reqPost()===');
        console.log('StatusCode: ', res.statusCode);
        console.log('headers: ', res.headers);

        //response
            res.on('data', function(d) {
            io.sockets.emit('stream', d.toString());
            process.stdout.write(d);
        });

    });

    //request practice
    var dataString = JSON.stringify(data);
    console.log(dataString);
    reqPost.write(dataString);
    reqPost.end();
    reqPost.on('error', function(e){
        console.error(e);
    });
}
```

- Using REST API in the Node js Server
- In the Frontend calling the API using JQuery.

- The Front-End code snippet - Blank.html

- Index.html

```
<!DOCTYPE html>
<html lang="en">
<head>

    <!-- start: Meta -->
    <meta charset="utf-8">
    <title>Home</title>
    <meta name="description" content="Bootstrap Metro Dashboard">
    <meta name="author" content="">
    <meta name="keyword" content="">
    <!-- end: Meta -->

    <!-- start: Mobile Specific -->
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <!-- end: Mobile Specific -->

    <!-- start: CSS -->
    <link id="bootstrap-style" href="css/bootstrap.min.css" rel="stylesheet">
    <link href="css/bootstrap-responsive.min.css" rel="stylesheet">
    <link id="base-style" href="css/style.css" rel="stylesheet">
    <link id="base-style-responsive" href="css/style-responsive.css" rel="stylesheet">
    <link href='http://fonts.googleapis.com/css?family=Open+Sans:300italic,400italic,600italic,700italic,800italic,400,300,600,700,800subset=latin,cyrillic-ext,latin-ext' rel='stylesheet' type='text/css'>

    <link href="css/barchart.css" rel="stylesheet">
    <!-- end: CSS -->


    <!-- start: Favicon -->

    <!-- end: Favicon -->
    <script src="js/excanvas.js"></script>

    <script src="js/retina.js"></script>

    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.1.0/jquery.min.js"></script>
    <script src="js/iphonebar.js"></script>
    <script src="https://cdn.socket.io/socket.io-1.4.5.js"></script>
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/1.7.2/jquery.js"></script>
    <script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.5.7/angular.min.js"></script>
    <script src="../node_modules/chart.js/dist/Chart.js"></script>
    <script src="https://cdn.socket.io/socket.io-1.4.5.js"></script>




</head>

<body>
        <!-- start: Header -->
    <div class="navbar">
        <div class="navbar-inner">
            <div class="container-fluid">
                <a class="btn btn-navbar" data-toggle="collapse" data-target=".top-nav.nav-collapse,.sidebar-nav.nav-collapse">
                    <span class="icon-bar"></span>
                    <span class="icon-bar"></span>
                    <span class="icon-bar"></span>
                </a>
                <a class="brand" href="Introduction.html"><span>Twitter Stream Analysis</span></a>

                <!-- start: Header Menu -->
                <div class="nav-no-collapse header-nav">

                    </ul>
                </div>
                <!-- end: Header Menu -->

            </div>
        </div>
    </div>
```

```
    <div class="container-fluid-full">
    <div class="row-fluid">

        <!-- start: Main Menu -->
        <div id="sidebar-left" class="span2">
            <div class="nav-collapse sidebar-nav">
                <ul class="nav nav-tabs nav-stacked main-menu">
                    <li><a href="Introduction.html"><i class="icon-font"></i><span class="hidden-tablet"> Introduction</span></a></li>
                    <li><a href="Dashboard.html"><i class="icon-list-alt"></i><span class="hidden-tablet"> Dashboard</span></a></li>
                    <li><a href="AppleProduction.html"><i class="icon-bar-chart"></i><span class="hidden-tablet"> AppleProduction</span></a></li>
                    <li><a href="gallery.html"><i class="icon-picture"></i><span class="hidden-tablet"> Gallery</span></a></li>
                    <li><a href="login.html"><i class="icon-lock"></i><span class="hidden-tablet"> Login Page</span></a></li>
                </ul>
            </div>
        </div>
        <!-- end: Main Menu -->



        <!-- start: Content -->
        <div id="content" class="span10">


        <ul class="breadcrumb">
            <li>
                <i class="icon-home"></i>
                <a href="index.html">Home</a>
                <i class="icon-angle-right"></i>
            </li>
            <li><a href="#">AppleProduction</a></li>
        </ul>
```

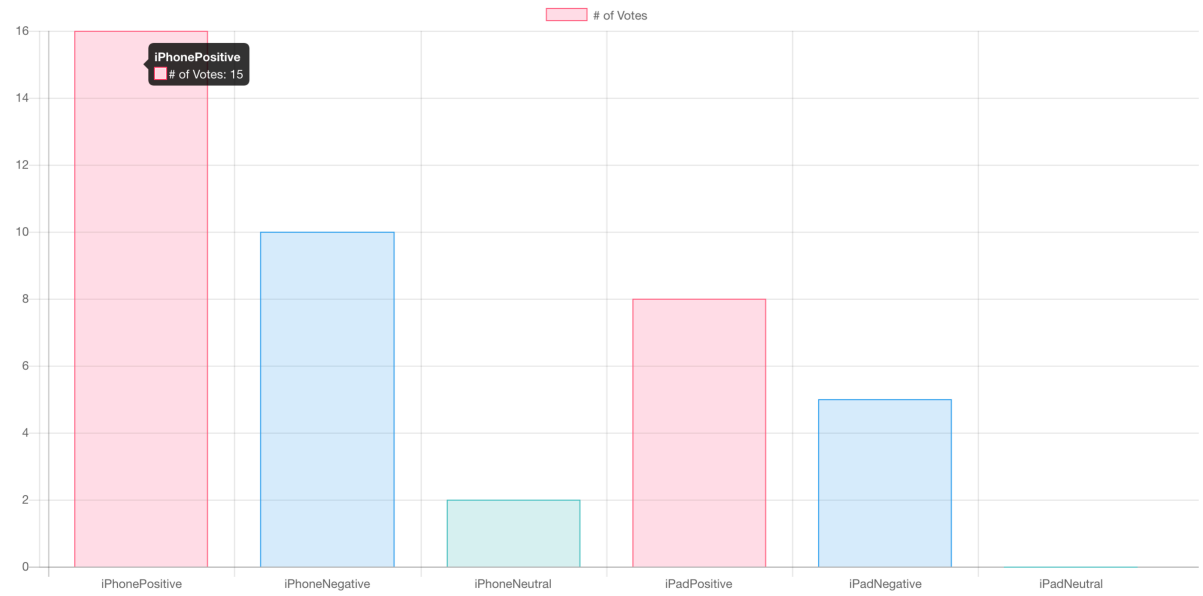
Dynamic Bar Chart:

```
        <div id="content" class="span10">


        <ul class="breadcrumb">
            <li>
                <i class="icon-home"></i>
                <a href="index.html">Home</a>
                <i class="icon-angle-right"></i>
            </li>
            <li><a href="#">AppleProduction</a></li>
        </ul>

        <canvas id = "myChart"></canvas>
<script>
// var data = [0,0,0];
var ctx = document.getElementById("myChart");
function updateChart(data){
    var myChart = new Chart(ctx, {
        type: 'bar',
        data: {
            labels: ["iPhonePositive", "iPhoneNegative", "iPhoneNeutral","iPadPositive", "iPadNegative", "iPadNeutral"],
            datasets: [{
                label: '# of Votes',
                data: data,
                backgroundColor: [
                    'rgba(255, 99, 132, 0.2)',
                    'rgba(54, 162, 235, 0.2)',
                    'rgba(75, 192, 192, 0.2)',
                    'rgba(255, 99, 132, 0.2)',
                    'rgba(54, 162, 235, 0.2)',
                    'rgba(75, 192, 192, 0.2)',

                ],
                borderColor: [
                    'rgba(255,99,132,1)',
                    'rgba(54, 162, 235, 1)',
                    'rgba(75, 192, 192, 1)',
                    'rgba(255,99,132,1)',
                    'rgba(54, 162, 235, 1)',
                    'rgba(75, 192, 192, 1)',

                ],
                borderWidth: 1
            }]
        },
        options: {
            scales: {
                yAxes: [{
                    ticks: {
                        beginAtZero:true
                    }
                }]
            }
        }
    });
}
</script>
```

```
<script>
    var socket = io.connect('http://127.0.0.1:4000');
    var iphonePos = 0;
    var iphoneNeg = 0;
    var iphoneNeutral = 0;
    var ipadPos = 0;
    var ipadNeg = 0;
    var ipadNeutral = 0;
    var none = 0;
    socket.on('ipadStream', function(tweet){
        console.log(tweet)
        // tweet = testData();
        $('#ipadul').append('<li>'+tweet+'</li>');
        if(tweet.includes("negative")){
            ipadNeg++;
            console.log("ipadNeg: "+ipadNeg);
            $('#ipadNeg').html(ipadNeg);
            //data=[ipadPos,ipadNeg,ipadNeutral];
            //$('#ipadul').append('<li>'+"Negative"+'</li>');
        } else if(tweet.includes("positive")) {
            ipadPos++;
            console.log("ipadPos: "+ipadPos);
            $('#ipadPos').html(ipadPos);
            //$('#ipadul').append('<li>'+"Positive"+'</li>');
        } else if(tweet.includes("neutral")) {
            ipadNeutral++;
            console.log("ipadNeutral: "+ipadNeutral);
            $('#ipadNeutral').html(ipadNeutral);
            //$('#ipadul').append('<li>'+"Neutral"+'</li>');
        } else {
            // none++;
            // $('#none').html(none);

        }
        data=[iphonePos,iphoneNeg,iphoneNeutral,ipadPos,ipadNeg,ipadNeutral];
        updateChart(data);
    });
    socket.on('iphoneStream', function(tweet){
        $('#iphoneul').append('<li>'+tweet+'</li>');
        if(tweet.includes("negative")){
            iphoneNeg++;
            console.log("iphoneNeg: "+iphoneNeg);
            $('#iphoneNeg').html(iphoneNeg);
            //$('#ipadul').append('<li>'+"Negative"+'</li>');
        } else if(tweet.includes("positive")) {
            iphonePos++;
            console.log("iphonePos: "+iphonePos);
            $('#iphonePos').html(iphonePos);
            //$('#ipadul').append('<li>'+"Positive"+'</li>');
        } else if(tweet.includes("neutral")) {
            iphoneNeutral++;
            console.log("iphoneNeutral: "+iphoneNeutral);
            $('#iphoneNeutral').html(iphoneNeutral);
            //$('#ipadul').append('<li>'+"Neutral"+'</li>');
        } else {
            // none++;
            // $('#none').html(none);

        }
        data=[iphonePos,iphoneNeg,iphoneNeutral,ipadPos,ipadNeg,ipadNeutral];
        updateChart(data);
    });
```

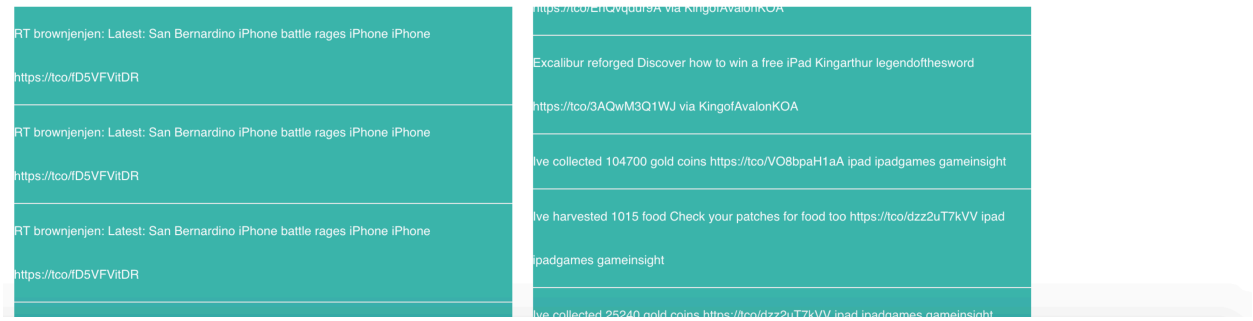
```
<div class="row-fluid">

<div>
<canvas style="margin-bottom: -400px;" id = "myChart" width="400" height="400"></canvas>
<table width="100%" id="sentimentNum" width="60%" border="1" cellspacing="20%" cellpadding="30">
    <tr>
        <td>iPhone Positive:</td>
        <td>iPhone Negative:</td>
        <td>iPhone Neutral:</td>
        <td>iPad Positive:</td>
        <td>iPad Negative:</td>
        <td>iPad Neutral:</td>
        <!-- <td>None above:</td> -->
    </tr>
    <tr>
        <td id = "iphonePos">0</td>
        <td id = "iphoneNeg">0</td>
        <td id = "iphoneNeutral">0</td>
        <td id = "ipadPos">0</td>
        <td id = "ipadNeg">0</td>
        <td id = "ipadNeutral">0</td>
        <!-- <td id = "none">0</td> -->
    </tr>
</table>
</div>


<br><hr>
    <!-- </div> -->

</div>
<!--iPhone Text-->
<div >
<div id="iphoneText" class="sparkLineStats span4 widget green" onTablet="span5" onDesktop="span4" style="height:300px;width:480px;margin-left:0;overflow: auto">
<ul class="dashboard-list metro" id = "iphoneul">


        </ul>
    </div>
```

When you click the “iPhone & iPad” will connect to the AppleProduction:
You will see the dynamic Barchart will show the analysis output from AML Stream Analysis Model to show, how many iPhone and iPad user like or don’t like to use thest two product by analysis their tweets.



The table will colcuate how many people like or don’t like iphone and ipad.
The grean filed shows their streaming tweets.

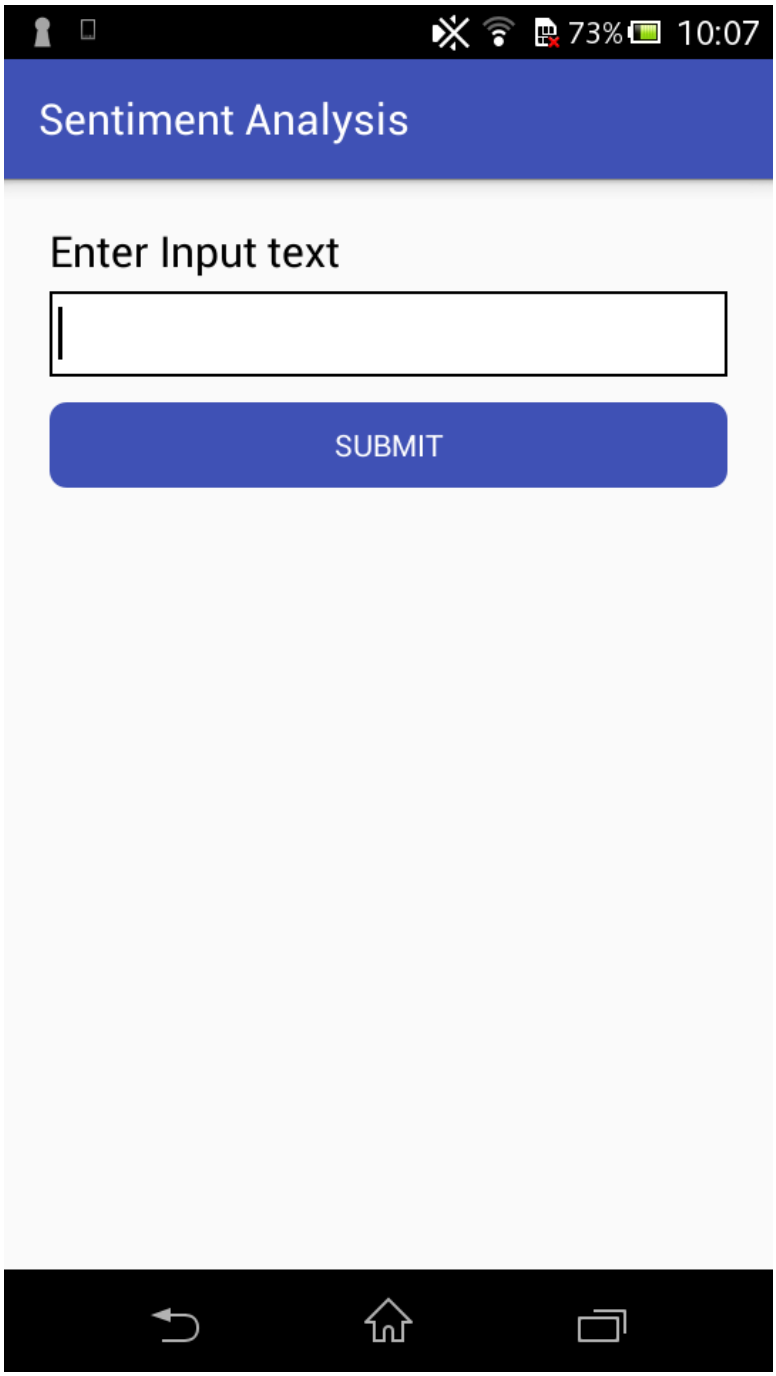
iPhone Positive:	iPhone Negative:	iPhone Neutral:	iPad Positive:	iPad Negative:	iPad Neutral:
32	43	11	20	13	0

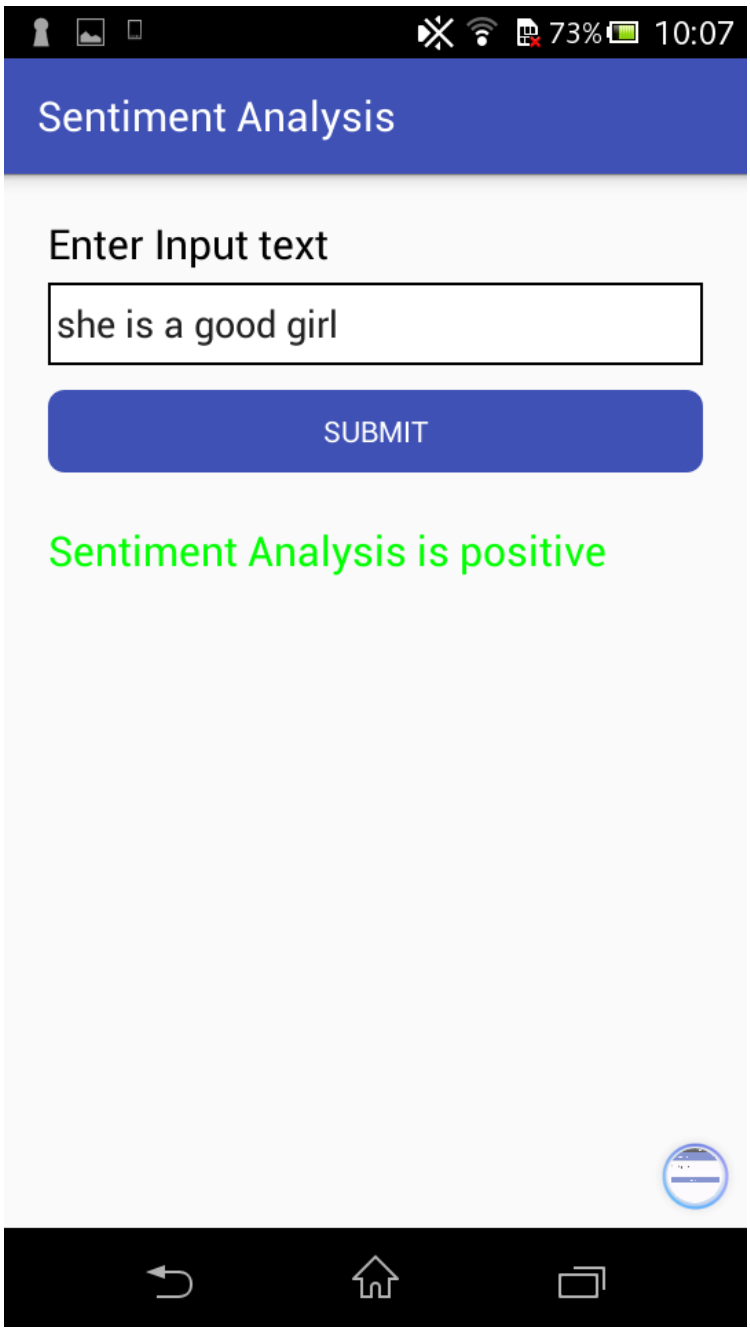


Android App:

We have created an android app that accepts a text and outputs the sentiment of it

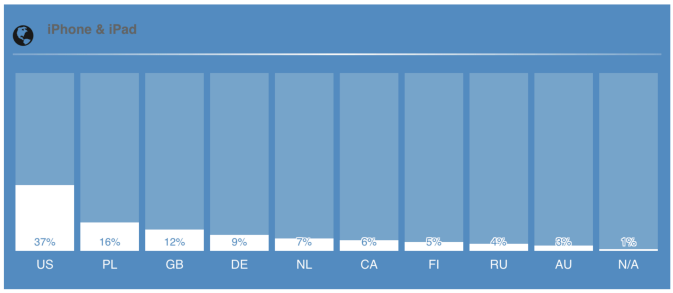
Tool used: Android SDK tool
Language: Java

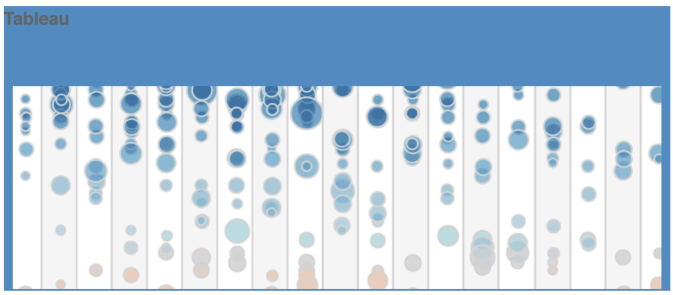



73% 10:07
Sentiment Analysis
Enter Input text
she is a good girl
SUBMIT
Sentiment Analysis is positive

Website:


Twitter Stream Analysis
Dashboard
Live twitter sentiment analysis
100
75
50
25
0
Get the Sentiment Analysis
Text:
This looks very nice!
Sentiment: Positive
Text:
This looks bad!
Sentiment: Negative
Get the Sentiment Analysis
Text:
This looks very nice!
Sentiment: Positive
Text:
This looks bad!
Sentiment: Negative
Text:
This looks okay!
Sentiment: Neutral
iPhone & iPad
37%
16%
12%
9%
7%
6%
5%
4%
3%
1%
US
PL
GB
DE
NL
CA
FI
RU
AU
N/A






```java
package com.example.priti.sentimentanalysis;

import android.app.AlertDialog;
import android.app.ProgressDialog;
import android.content.DialogInterface;
import android.graphics.Color;
import android.os.AsyncTask;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.view.View;
import android.widget.EditText;
import android.widget.TextView;

import org.json.JSONArray;
import org.json.JSONException;
import org.json.JSONObject;

import java.io.IOException;

import okhttp3.MediaType;
import okhttp3.OkHttpClient;
import okhttp3.Request;
import okhttp3.RequestBody;
import okhttp3.Response;

public class MainActivity extends AppCompatActivity {

    String textInput;
    EditText TextInput;
    TextView OutputText;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        OutputText=(TextView)findViewById(R.id.outputText);
        TextInput=(EditText)findViewById(R.id.textInput);
    }

    public void Submit(View view) {
        textInput = TextInput.getText().toString();


        if (textInput.equals("")) {
            AlertDialog.Builder alertDialogBuilder = new AlertDialog.Builder(MainActivity.this);
            alertDialogBuilder.setTitle("Buzzz....");
            alertDialogBuilder
                    .setMessage("Please Enter")
                    .setCancelable(false)
```

```
    public void submit(View view) {
        textInput = TextInput.getText().toString();


        if (textInput.equals("")) {
            AlertDialog.Builder alertDialogBuilder = new AlertDialog.Builder(MainActivity.this);
            alertDialogBuilder.setTitle("Buzzz....");
            alertDialogBuilder
                    .setMessage("Please Enter")
                    .setCancelable(false)
                    .setNegativeButton("Ok", new DialogInterface.OnClickListener() {
                        public void onClick(DialogInterface dialog, int id) {
                            dialog.cancel();
                        }
                    });
            AlertDialog alertDialog = alertDialogBuilder.create();
            alertDialog.show();
        } else {
            String a = "{\n" +
                    "  \"Inputs\": {\n" +
                    "    \"input1\": {\n" +
                    "      \"ColumnNames\": [\n" +
                    "        \"text\"\n" +
                    "      ],\n" +
                    "      \"Values\": [[\""+textInput+"\"],[\""+textInput+"\"]\n" +
                    "      ]}},\n" +
                    "  \"GlobalParameters\": {}\n" +
                    "}";

            new ServiceFeeCall().execute(a);
        }
    }

    public class ServiceFeeCall extends AsyncTask<String, Void, String> {
        String result;
        ProgressDialog pd;
        String outputvalue;
        @Override
        protected void onPreExecute() {
            super.onPreExecute();
            pd = new ProgressDialog(MainActivity.this);
            pd.setMessage("Searching for Result. Please wait...");
            pd.setIndeterminate(false);
            pd.setCancelable(false);
            pd.show();
        }
        @Override
        protected String doInBackground(String... params) {
```

```
            pd.setMessage("Searching for Result. Please wait...");
            pd.setIndeterminate(false);
            pd.setCancelable(false);
            pd.show();
        }
        @Override
        protected String doInBackground(String... params) {
            try {
                String Url = params[0];

                OkHttpClient client = new OkHttpClient();
                MediaType mediaType = MediaType.parse("application/json");
                RequestBody body = RequestBody.create(mediaType, Url);
                Request request = new Request.Builder()
                        .url("https://ussouthcentral.services.azureml.net/workspaces/50a521edc87c4993bebe9c9e147d0c30/services/4ef63f97a4e04f3fa9c0256e98d3e529/execute?api-vers
                        .post(body)
                        .addHeader("authorization", "Bearer i0cQUCIsUBdql5sWXwdRtVPCWP23JhGP4lfmz7INIUK0Wctycg8fej+acSpJC19y9du/NlYFrnppm3EKYzO2gg==")
                        .addHeader("content-type", "application/json")
                        .addHeader("cache-control", "no-cache")
                        .build();

                Response response = client.newCall(request).execute();
                result = response.body().string();

                return result;
            } catch (IOException e) {
                return null;
            }
        }
        @Override
        protected void onPostExecute(String s) {
            super.onPostExecute(s);

            try {
                JSONObject json = new JSONObject(result);
                JSONArray json1 = json.getJSONObject("Results").getJSONObject("output1").getJSONObject("value").getJSONArray("Values");
                for (int i = 0; i < json1.length(); i++) {
                    JSONArray json2 = json1.getJSONArray(0);
                    for (int j = 0; j < json2.length() - 1; j++) {
                        outputvalue = json2.getString(0);

                    }
                }
```

```
                    .post(body)
                    .addHeader("authorization", "Bearer i0cQUCIsUBdql5sWXwdRtVPCWP23JhGP4lfmz7INIUK0Wctycg8fej+acSpJC19y9du/NlYFrnppm3EKYzO
                    .addHeader("content-type", "application/json")
                    .addHeader("cache-control", "no-cache")
                    .build();

            Response response = client.newCall(request).execute();
            result = response.body().string();

            return result;
        } catch (IOException e) {
            return null;
        }
    }
    @Override
    protected void onPostExecute(String s) {
        super.onPostExecute(s);

        try {
            JSONObject json = new JSONObject(result);
            JSONArray json1 = json.getJSONObject("Results").getJSONObject("output1").getJSONObject("value").getJSONArray("Values");
            for (int i = 0; i < json1.length(); i++) {
                JSONArray json2 = json1.getJSONArray(0);
                for (int j = 0; j < json2.length() - 1; j++) {
                    outputvalue = json2.getString(0);

                }
            }
            OutputText.setText("Sentiment Analysis is " + outputvalue);
            if (outputvalue.equals("positive")) {
                OutputText.setTextColor(Color.GREEN);
            } else if (outputvalue.equals("negative")) {
                OutputText.setTextColor(Color.RED);
            } else {
                OutputText.setTextColor(Color.BLUE);
            }
        } catch (JSONException e) {
            e.printStackTrace();
        }
        pd.dismiss();
    }
  }
}
```

References:

- https://plot.ly/ggplot2/stat_smooth/
- https://plot.ly/ggplot2/stat_smooth/#adding-trend-lines-in-r-with-statsmooth
- https://susanejohnston.wordpress.com/2012/08/09/a-quick-and-easy-function-to-plot-lm-results-in-r/
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GITHUB: https://github.com/pagarwal123/Finalproject