



MINOR PROJECT

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Of

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In

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Of

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MINOR PROJECT

SENTIMENT ANALYSIS OF U.S. TELECOM COMPANIES

A. DESCRIPTION

Sentiment Analysis: Sentiment analysis is contextual mining of text which identifies and extracts subjective information in source material, and helping a business to understand the social sentiment of their brand, product or service while monitoring online conversations.

Understanding people's emotions is essential for businesses since customers are able to express their thoughts and feelings more openly than ever before. By automatically analyzing customer feedback, from survey responses to social media conversations, brands are able to listen attentively to their customers, and tailor products and services to meet their needs.

Example: Using sentiment analysis to automatically analyze 4,000+ reviews about your product could help you discover if customers are happy about your pricing plans and customer service.

Applications of Sentiment Analysis

- ✓ Sentiment analysis helps businesses process huge amounts of data in an efficient and cost-effective way.
- ✓ Sentiment analysis models can identify critical issues in real time i.e. Real Time Analysis.
- ✓ By using a centralized Sentiment analysis system, companies can apply the same criteria to all of their data, helping them improve accuracy and gain better insights.

Stock Market Analysis: Stock Market Analysis enables investors to identify the intrinsic worth of a security even before investing in it. By using Stock Analysis, investors and traders arrive at equity buying and selling decisions. On studying and evaluating past and current data, helps investors and traders to gain an edge in the markets to make informed (buying and selling) decisions.

Stock Market Analysis or opinion mining makes use of *text mining*, in order to identify and extract the subjective content by analysing user's opinion, evaluation, sentiments, attitudes and emotions.

The objectives of Stock Market Analysis are:

- To *mine* the public opinion.
- To find the correlation between the moods of public.
- To help the investors to identify the intrinsic worth of a security even before investing in it.
- To show that it is indeed *possible* to have a sense of where the market will go.

B. PROJECT DETAILS

Telecom Companies

Followings are the U.S. Telecom Companies with having the Stock under Newyork Stock Exchange (NYSE).

- 1) AT&T
- 2) Avaya
- 3) CenturyLink
- 4) Sparklight
- 5) Sprint Corp.
- 6) U.S. Cellular
- 7) Verizon

Tools & Techniques

Followings are the *necessary* tools and techniques used for the purpose of sentiment analysis of the twitter feedback.

- Twitter (Social Network Company)
- Python (Programming Language)
- Jupyter Notebook (Software)
- Microsoft Excel (Software)
- Tweepy (Python Library for fetching tweets)
- TextBlob (Python Library for Text Analysis)
- csv (Python Library for csv data format)

C. PROCESS OF SENTIMENT ANALYSIS

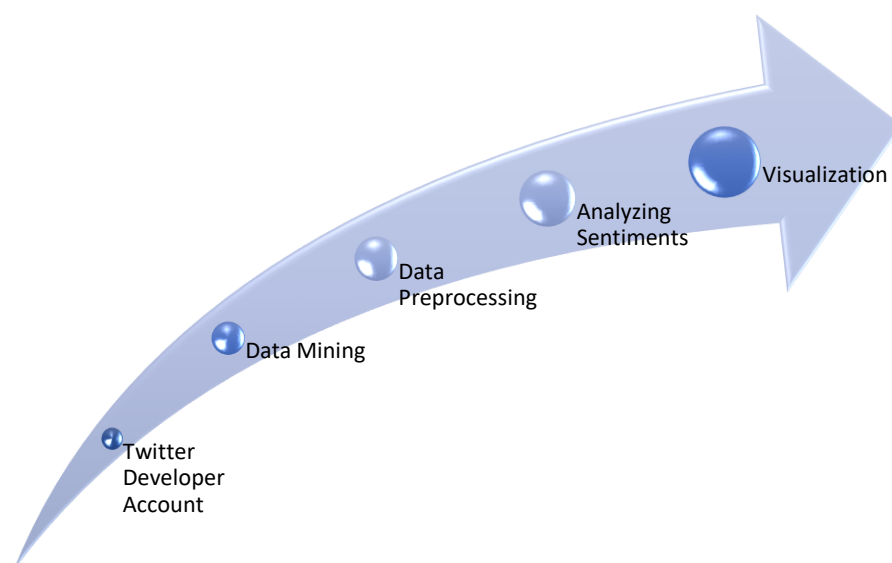


Figure 1: Process for the Sentiment Analysis of Twitter Feedback

Step 1: Twitter Developer Account

To have access to the Twitter API, you'll need to login the Twitter Developer website and create an application.

Followings are the steps to generate your Keys and Tokens:

1. Create a Twitter Developer account.
2. Create an app with your project name.
3. Go to the Keys and Tokens tab and generate your Keys and Tokens.

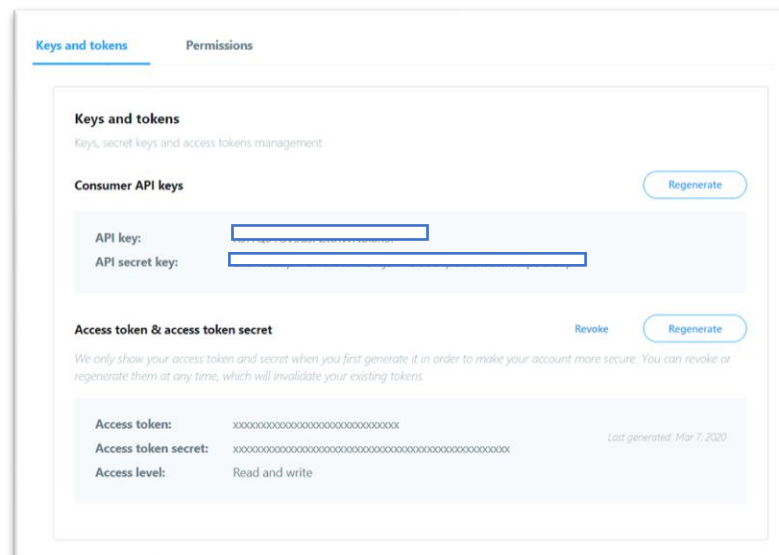


Figure 2: Twitter Access keys & Tokens

Step 2: Data Mining

1. Write a Python Script to mine the tweets using the Twitter Credentials against the desired hashtags.
2. Download the results in a '.csv' file.
3. Open the files using 'Microsoft Excel'.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	05-03-2020 04:44	b'Ahhh yes...	haven't had a chance to see the requirements with my own eyes until now. I read it wrong.																
2																			
3	05-03-2020 04:44	b'RT @jadewangji:	Seokjin took the director's mic one day and announced to the entire crew that they could sue them if they didn't break for																
4																			
5	05-03-2020 04:44	b'Aye bro see at yo ex if she ain't atleast threaten to kill u a good couple times or tell u we ain't done or pull up																	
6																			
7	05-03-2020 04:44	b'you either say what you gotta say to nme or don't say nun10 to me at all ...'																	
8																			
9	05-03-2020 04:44	b'RT @download:	If you weren't told this is not a beauty salon by a teacher at least once, you're not a bad bitch'																
10																			
11	05-03-2020 04:44	b'RT @ekfxodif:	taeil saying johmy exposed his calves for the mv and cracking himself up and couldn't stop laughing at his own joke																
12																			
13	05-03-2020 04:44	b'RT @Amy_Siskind:	I just can't get excited about two old white men. I'll dutifully show up at the NY primary, and of course the election																
14																			
15	05-03-2020 04:44	b'RT @GreggJarrett:	Schumer should face censure/expulsion for his threats directed at Justices Gorsuch & Kavanaugh. Chief Roberts correctly c																
16																			
17	05-03-2020 04:44	b'RT @RealJamesWoods:	Every DEMOCRAT must be asked: Do you agree with Chuck Schumer that Supreme Court Justices Gorsuch and Kavanaugh must kn																
18																			
19	05-03-2020 04:44	b'RT @susgconso:	Get #Ready2Commune this Saturday at the East Quadangle. Don't forget to bring your friends (and your I.D.) and let's end th																
20																			
21	05-03-2020 04:44	b'At a restaurant	happily used Resy since it opened but doesn't take American Express. Wonder if that can last.'																
22																			
23	05-03-2020 04:44	b'RT @VancityReynolds:	It's the 25th anniversary of John Candy's passing. We cooked up a small tribute to a comedic genius and Canadian hero.																
24																			
25	05-03-2020 04:44	b'RT @emykat03:	Most young voters couldn't find their voter info on the new system. They showed up with the affidavit printed out but yet the																
26																			
27	05-03-2020 04:44	b'RT @RealJamesWoods:	Every DEMOCRAT must be asked: Do you agree with Chuck Schumer that Supreme Court Justices Gorsuch and Kavanaugh must kn																
28																			
29	05-03-2020 04:44	b'sar_bear77 @JackElgin7	@chrisjollyhale @BernieSanders I get that, I think it will happen, I really think a lot of																

Figure 3: Tweets mined using Python

Step 3: Data Pre-Processing

Followings are the steps for text pre-processing to be followed before analyzing the sentiment score for each tweet.

Remove Duplicates

1. Go to the database stored in Microsoft Excel.
2. Click on the Data tab placed at the top of Microsoft Excel.
3. Select the Remove Duplicates option.
4. Select Ok.
5. You'll get the duplicate values eliminated from the database.

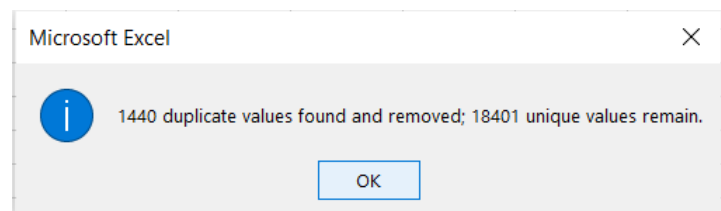


Figure 4: Removal of Duplicate values

Text Pre-processing

Write a Python script to remove un-necessary information like emoji, uniform resource locators (URL) and non-English characters using the python libraries i.e. 'TextBlob'.

1	clean_tweet
2	Ahhh haven chance requirements with eyes until read wrong been https iLBrfwK
3	
4	Seokjin took director announced entire crew that they could them they didn break
5	atleast threaten kill good couple times tell done pull https NSjElh
6	either what gotta
7	weren told cthis beauty salon teacher least once bitch
8	taeil saying johnny exposed calves cracking himself couldn stop laughing joke Kick
9	just excited about white dutifully show primary course election
10	Schumer should face censure expulsion threats directed Justices Gorsuch Kavanaugh Chief Roberts correctly
11	Every DEMOCRAT must asked agree with Chuck Schumer that Supreme Court Justices Gorsuch Kavanaugh must
12	Ready Commune this Saturday East Quadrangle forget bring your friends your
13	restaurant that happily used Resy since opened doesn take American Express Wonder that last
14	anniversary John Candy passing cooked small tribute comedic genius Canadian hero
15	Most young voters couldn find their voter info system They showed with affidavit printed
16	that think will happen really think https MZITFhCCPS
17	Having preference fine What being argued here that preference doesn have
18	talk today featured https wdyDVvAiYN ReTweet chance FREE https beXk
19	this holding hands rest your life want walk hand hand forever Dongpyo
20	Guys vote IDOL CHAMP they triple crown this time beat record That need
21	wish some would understand that these closures cancellations aren because they think everyone going
22	only struggling with think been there guess Chesterfield maybe
23	just bill Gates walked right into that pedi https bqCMQP
24	Marlborough diffrent kettle fish deny fool hardy braver https ePmJsi
25	Good morning Please watch this video shouldn home with random meet bars https beYGE
26	only problem with void season that signing death warrant clubs wouldn allowe https gFKkuVAEQv
27	take responsibility nFiled bankruptcy protection over times nSee
28	This stunning description what China about Covid what probably have state capacity

Figure 5: Cleaned Tweets using Python

Step 4. Analyze Sentiment

Python NLTK and TextBlob libraries were employed to perform sentiment analysis on the mined dataset. The sentiment function returns a tuple of properties as follows:

- 1) **Polarity:** Polarity is a floating-point number that lies in the range of [-1,1] where 1 means positive statement and -1 means a negative statement.
- 2) **Subjectivity:** The subjectivity is a float within the range [0.0, 1.0] where 0.0 is very objective and 1.0 is very subjective.

Sentiment Property	Range
Polarity	-1 to +1
Subjectivity	0.0 to 1.0

Table 1: Range for Sentiment Properties

1. Write a python script for analyzing the sentiments using python libraries and download the results in a '.csv' file.

	A	B	C	D	E	F
1		Tweets	clean_tweet	polarity	subjectivity	
2	05-03-2020 04:44	b'Ahhh yes... haven't	clean_tweet	-0.5	0.9	
3				0	0	
4	05-03-2020 04:44	b'RT @jadewangji: Seokjin took	Seokjin took director announc	0	0.625	
5				0	0	
6	05-03-2020 04:44	b'Aye bro see at yo ex if she air	atleast threaten kill good coup	0.7	0.6	
7				0	0	
8	05-03-2020 04:44	b'you either say what you gotta	either what gotta	0	0	
9				0	0	
10	05-03-2020 04:44	b'RT @drownload: If you were w	eren told cthis beauty salon	-0.3	0.4	
11				0	0	
12	05-03-2020 04:44	b'RT @ekfxodlf: taeil saying jo	taeil saying johnny exposed ca	0	0	
13				0	0	
14	05-03-2020 04:44	b'RT @Amy_Siskind: I just can't	just excited about white dutifu	0.258333333	0.416666667	
15				0	0	
16	05-03-2020 04:44	b'RT @GreggJarrett: Schumer s	Schumer should face censure	0	0	
17				0	0	
18	05-03-2020 04:44	b'RT @RealJamesWoods: Ever	Every DEMOCRAT must asked	0	0	
19				0	0	
20	05-03-2020 04:44	b'RT @susgcomso: Get #Ready	Ready Commune this Saturday	0.2	0.5	
21				0	0	
22	05-03-2020 04:44	b'At a restaurant that's	restaurant that happily used R	0.266666667	0.355555556	
23				0	0	
24	05-03-2020 04:44	b'RT @VancityReynolds: It's	2 anniversary John Candy passin	-0.25	0.4	
25				0	0	
26	05-03-2020 04:44	b'RT @emykat03: Most young	Most young voters couldn find	0.3	0.45	
27				0	0	
28	05-03-2020 04:44	b'RT @RealJamesWoods: Ever	Every DEMOCRAT must asked	0	0	
29				0	0	

Figure 6: Results of Sentiment Analysis

2. Analyze the results by calculating the sentiment score of each company.

$$\text{Sentiment Score} = \text{Polarity} * \text{Subjectivity}$$

3. Compare the total sentiment score for each selected company.

Sr. No.	Telecom Company	Sentiment Score
1	AT&T	4.32%
2	Avaya	4.32%
3	CenturyLink	6.30%
4	Sparklight	4.68%
5	Sprint Corp.	2.28%
6	U.S. Cellular	5.34%
7	Verizon	5.06%

Table 2: Resulted Sentiment Score

Step 5: Visualization

Create an Excel Dashboard representing the collected no. of tweets, cleaned tweets and the comparison for results of Sentiment Score.

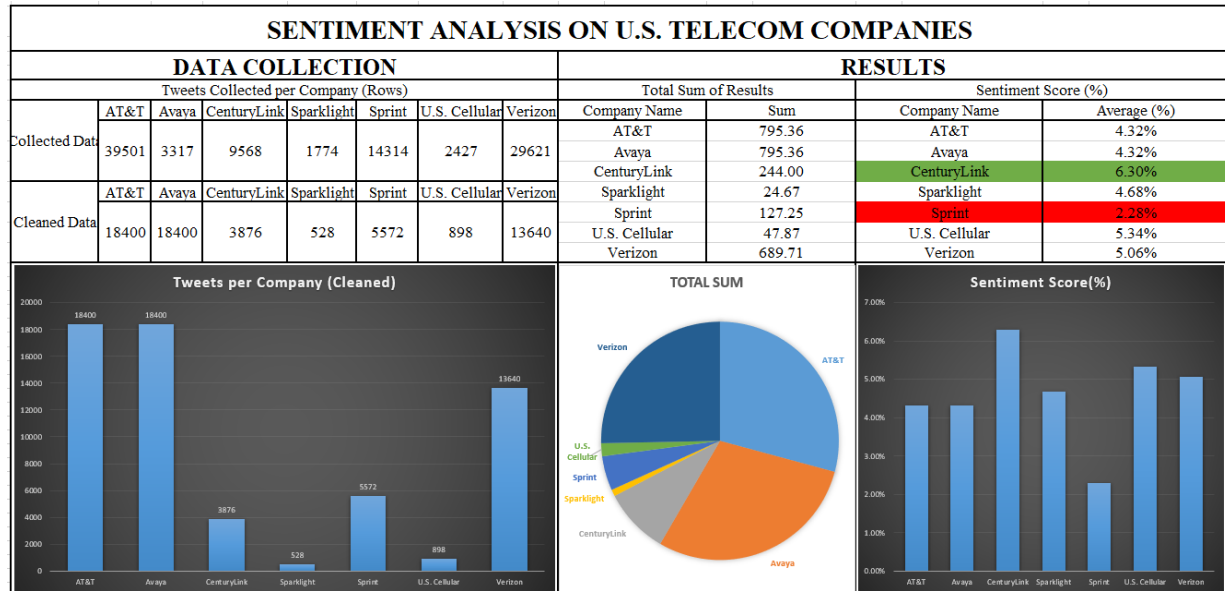


Figure 7: Excel Dashboard representing Results

D. CONCLUSION

On analyzing sentiments from people's real-time reviews, and by visualizing the whole results, we get the conclusion that U.S. Telecom Company i.e. **CenturyLink** is most liked by the users as it gets the maximum positive reviews i.e. average (%) of the Sentiment score (from Dashboard).

Based on the Sentiment Analysis results for each selected company, we can conclude the following:

- ✓ **Most Liked Company:** CenturyLink
- ✓ **Least Liked Company:** Sprint Corp.