Research Article

# Twitter Sentiment Analysis In Diabetes Domain Using Apache Flume And Hive

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**Abstract:** Twitter is a social media platform used by millions of people around the world. People express their feelings by posting tweets related to various topics and products. Sentiment Analysis on these tweets can be performed to analyse their opinion. This paper endeavours to perform Sentiment Analysis by extracting tweets related to diabetes domain from twitter.com via Apache Flume and store them in JSON format. By using Apache Hive, the tweets are transferred from the text file to a table and are analysed by comparing the sentiments expressed in the tweets with the AFINN dictionary. Each individual tweet is scored based on a scale from -5 to +5, where a score having value less than zero indicates a negative sentiment. This study can benefit the people suffering from diabetes by making them aware about diet, lifestyle and precautionary measures required to manage their condition in a better way. Also the heath care organizations can utilize the results of this research and improve their strategies to benefit the society.

Keywords: AFINN Dictionary, Apache Flume, Diabetes, Hadoop, Hive, Sentiment Analysis, Twitter

#### 1. Introduction

In recent years, millions of users have started using social media platforms such as Twitter, Facebook and Instagram. People express their opinions using these social media websites and these opinions can be analysed to form future policies by different organizations. This paper endeavours to perform Sentiment Analysis by extracting tweets related to diabetes domain from twitter.com via Apache Flume and store them in JSON format. By using Apache Hive, the tweets are transferred from the text file to a table and are analysed by comparing the sentiments expressed in the tweets with the AFINN dictionary.

#### **1.1 Sentiment Analysis**

Sentiments are internal feelings and emotions of a person towards an entity in real world. Sentiment analysis is a process of extracting and stating the opinions from very large files. The major sources include reviews, comments from social networking sites and political judgements made by people. The fields such as natural language processing and data mining handle the process of sentiment analysis by applying various methods and algorithms in sophisticated manner. Sentiment analysis is also referred as opinion mining because data mining is applied to extract and segregate opinions. The sentiments based on the nature of an opinion can express positive, negative or neutral attitude of a person towards an object. The reviews, comments and judgements provided for products and services offered by an organization are valuable assets for future policy formation. Manual reading and extracting useful opinions from large number of reviews and comments seems very tedious and time consuming [1] [2]. The sentiment analysis replaces the process of manual opinion handling with a set of well-defined NLP and data mining algorithmic techniques that work from automatic data collection to presentation of results in efficient and interactive ways. The approach adopted in the analysis is a series of steps to establish the results based on the polarity of opinions provided by contributors. The first step generally specifies identification of sentiments from a given sentence or text. The basic approach stores all or maximum opinion words into a file or database for comparison purpose. The reviews and comments are processed against these database opinion words to determine whether a review or comment contains any opinion or not. Other methods such as dictionary-based and corpus-based use online references such as WordNet to find the polarity of opinion. Polarity states

whether an opinion shows favourable or unfavourable attitude about any object. Polarity can be ranged on a given scale to conclude the overall rating of an object [3] [4].

Dictionary-based methods sometimes appear less effective to categorize the nature of an opinion. For example, the word 'long' has different polarity in a given context. "This cell phone has long battery life" states positive opinion whereas "It takes so long to boot up the system" states negative opinion. The nature of same word can be different on the basis of context. The corpus-based methods are proved to solve this chaos at some level [5] [6].

Sentiment analysis process can be performed at document, sentence and aspect level. At document level multiple lines or paragraphs provided by a single opinion holder are grouped under one entity called document. This document is then processed against sentiment analysis procedures to anticipate the negative, positive or neutral attitude of contributor. The next approach which is sentence level works only on a single sentence. A single sentence may contain both subjective and/or objective information. Subjective information may contain negative, positive or no opinion word [7]. However, objective information just contains facts that doesn't play any vital role to access the sentiments. At the sentence level, subjectivity is to be found to judge the polarity of opinions. The above two levels only state negative or positive attitudes toward an entity. Feature of an entity cannot be determined based on the opinions found in the data. The third level that is aspect level helps to find sentiments about given aspect or feature of a target product or service. At the aspect level, firstly the entity is to be recognized and detected followed by the classification of features of the entity. N-gram modelling techniques can be implemented to classify the sentiments [8]. So, with the tremendous growth in field of data sciences, a number of advanced methods are being implemented to perform sentiment analysis to get accurate results [9].

#### 1.2 Diabetes

Diabetes is related to special hormone called insulin. Insulin is required for distributing and consuming glucose in body for correct functioning of all other body parts such kidneys, heart etc. This insulin is produced by an organ called pancreas. The production level of glucose depends on

what and how much one eats in one's diet plan. Whenever pancreas does not work properly due to sickness or other reasons, it does not produce enough insulin which is necessary to consume glucose in blood. At that time, level of glucose in blood raises abnormally. This unprocessed glucose level crosses its prescribed range, is called diabetes.

Some people call it raising blood sugar in simple ways. The classification on types of diabetes is Type 1, Type 2 and Gestational diabetes. Type 1 diabetes is also named as juvenile onset diabetes. This diabetes is mostly found in young people and children. The insulin is not produced by pancreas in appropriate amount and some time it doesn't produce insulin anymore. This condition can occurs due to autoimmune condition of body. The autoimmune sometimes kills the beta cells in pancreas responsible for producing insulin. Lack of insulin in body raises glucose level due to which a person needs doses of insulin in any form on daily basis. In type 2 diabetes, human body becomes insulin resistant. It means body system doesn't behave properly. This is also called adult onset diabetes. The functioning of insulin which takes glucose from blood into our body cells get affected. In this type of diabetes, the major concern is functioning of insulin system than production of insulin in body. This type of diabetes is usually found in middle and upper age group. Healthy diet plan, physical activity and regular intake of insulin may help to stabilize the blood glucose level in Type 2 diabetes. The gestational diabetes is normally found in pregnant women (during pregnancy) and it automatically disappears after the birth of baby. When a person feels some of the symptoms such as weight loss, fatigue and frequent urination that relates to diabetes, then a person may be suggested to check blood sugar level. Deranged values of glucose level in blood confirm the diabetes in the person. A special test called A1C test is usually prescribed to assess average blood sugar level for 2-3 months. The symptoms of both types of diabetes are almost identical like unexpected weight loss with fatigue, intense thirst and hunger, frequent urination, foot infection, skin and eyes problems etc.

Patient must consult endocrinologist for better treatment of either type of diabetes. Patient has to take regular medicines prescribed by specialist. Diabetes may lead to heart-failure, kidney failure and other complications in body if not treated well. The normal range of blood glucose level is 70 to 130. When level increases to 180 or above, then patient comes under the category of

diabetic patient and he needs to take care. Regular checking of blood glucose level is prescribed to prevent any emergency situation [10].

#### 1.3 Precautionary Measures of Type1 and Type 2 Diabetes.

Prevention is better than cure in all types of diseases. The precautionary measures suggested by different health care institutions in their tweets for the patients of both types of diabetes to reduce the symptoms of diabetes are as follows:

- Regular check-up of blood sugar level and taking appropriate steps accordingly.
- Follow healthy diet plan and increase physical activities. Lower the intake of foods that contain sugar directly or indirectly.
- Regular workout is a key to avoid high glucose level in blood.
- Controlling body weight also helps to maintain required blood sugar level.
- Taking enough sleep and avoiding stress can also help to decrease symptoms of diabetes.
- Always control over blood pressure, cholesterol and cognitive issues.

- Try to prevent skin, foot infection.
- Regular check-up of eyesight because diabetes also affects eyes.

#### 1.4 Diet and lifestyle for Type 1 and Type2 Diabetic patients.

Diet plays very important role to maintain prescribed range of glucose level in blood. Diet for Type 1 and Type 2 diabetic persons is as follows:

- Lessen the intake of carbohydrates, fried and saturated fatty acids.
- The healthy diet for diabetic patients includes fresh fruits, whole grains, high fibres and non-starchy vegetables.
- Take omega-3 fatty acids which are found in flax seeds. Omega 3 fatty acids also improve cardiac health. Cardiac health should be maintained in diabetes to avoid stroke.
- It is also advised to eat into intervals rather than eating too much.

Lifestyle of both types of diabetic patients usually includes weight management, regular workout and limiting intake of sugar. Physical activities also improve blood circulation in diabetic patients. Regular exercises also help to maintain health of other body organs such as heart, lungs,

liver and kidneys. A healthy lifestyle also follows regular walking of 30 minutes post meal. It boosts up pancreatic functioning of body.

#### 1.5 Treatment of Type 1 and Type 2 Diabetes.

In type 1 diabetes, immune system attacks the pancreatic beta cells. Due to this, insulin production in body gets stopped. So, the basic treatment of type 1 diabetes needs regular intake of insulin in body. Various methods for inserting insulin in body are injection, insulin pump, insulin spray etc. Due to advancements in medical science, person can go for other treatments such as islets transplantation, stem cells and gene therapy depending on the severity of diabetes. The treatment of type 2 diabetes highly depends on one's lifestyle. As it does not need any particular treatment if patient follows healthy lifestyle. But, in some cases, medication with supplements of insulin is also adopted by some patients [11].

Diabetes is actually a malfunctioning in body that can be controlled but cannot be cured completely. All precautionary measures can be taken as lifetime treatment for diabetes.

#### 2. Proposed Work

In order to perform Sentiment Analysis on a large dataset, we use Apache Flume, which is a powerful tool that can be used to extract tweets from Twitter.com by configuring the twitter.conf file.



Figure 1: twitter.conf file

We apply for Access token and Consumer key at developer.twitter.com and provide those keys in the configuration file. Apache Hive is used to move the extracted tweets from a text file into a table and then we perform Sentiment Analysis using HiveQL.



Figure 2: Twitter Sentiment Analysis Architecture

#### 3. Methodology

The described methodology is used to perform Sentiment Analysis:

- 1. Initially, we turn on namenode, datanode, yarn node manager and resource manager.
- 2. For extracting tweets from twitter.com, the keywords diabetes, t1d, t2d are used in twitter.conf file.
- 3. Tweets are fetched using Apache Flume which is unstructured data. This format of data is known as JSON format.
- 4. The file containing tweets is downloaded using Web HDFS and stored in a table using Apache Hive.
- 5. By comparing the words in the tweets with AFINN dictionary, the score of individual words mentioned in the tweets is calculated based on a scale from -5 to +5.
- 6. From the score of individual words in a tweet, the final sentiment score of the complete tweet is generated.

#### Starting the Hadoop Ecosystem:

Hadoop Ecosystem is started using the following command:

After the execution of this command, namenode, datanode, yarn resource manager and yarn nodemanager get started as shown in figure 3.

tart-all.cmd	namenode d	atanode yar	m resource manag	ger yarn	node manag
Apache Hadoop Distribution	- hadoop namenode				
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21/02/02 13:49:49	<b>INFO blockmanageme</b> -hadoop datanode	nt.BlockManager	: Number of blo	ocks being w − □ ×	ritten
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(c) 2020 Microsoft Corp	ooration. All rights reserve	ed.	Îlength	5. 10 100 100 1	id 1
C:\WINDOWS\system32>cd	C:\hadoop\hadoop-2.8.0\sbir	1	Ũ	)P-U0 1001	ocks
C:\hadoop\hadoop-2.8.0\	sbin>start-all.cmd		~		
Type here to search	ch C	) 🗄 📑 🚺	PN_	•	

Figure 3: Hadoop Ecosystem

#### **Extracting Twitter Data:**

The tweets are extracted from **Twitter.com** using Apache Flume by executing the following command:

Figure 4 shows the extraction of tweets using Apache Flume.

Flume-ng agent -conf ./conf/ -f conf/twitter.conf -property flume.root.logger = DEBUG,console -n TwitterAgent



Figure 4: Apache Flume extracting Twitter Data

The tweets are stored in a text file as shown in figure 5 and then this file is moved to HDFS in order to perform Sentiment Analysis using Apache Hive.

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84416 {"extended_tweet":{"extended_entities":{"media":[{"display_url":"pic.tuitter.com/TKupqjIUyu","indices":[194,217],"sizes":{"small":{"w":554,"h":3	89,"resize":"fit"},"large":{"w":554,"h":389,"resize":"fit"},"thumb":{"w":150,"h":1
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The image shown in figure 6 shows the details of file containing tweets downloaded via Apache Flume.

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	File name	: FlumeDa	ata.161310	9902706	]		
ectory	File Size: 1	L.13 GB					
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Hadoop, 2017.

🥁 FlumeData	.1613109902706 Properties	×					
General Secu	irity Details Previous Versions						
<b></b>	FumeData.1613109902706						
Type of file:	TMP File (tmp)						
Opens with:	Votepad++ : a free (GN Change						
Location:	C:\Users\HOD\Downloads						
Size:	1.12 GB (1,21,21,96,289 bytes)						
Size on disk:	1.12 GB (1,21,21,98,912 bytes)						
Created:	22 February 2021, 08:45:07	_					
Modified:	22 February 2021, 08:45:29						
Accessed:	22 February 2021, 08:45:31						
Attributes:	Read-only Hidden Advanced						
	OK Cancel Apply						

Figure 7 illustrates the properties of the file downloaded from HDFS.

Figure 7: Properties of the file downloaded from HDFS

#### Creating a table using Apache Hive:

We create an empty table where the tweet Id and text of tweet are stored using the following command as shown in figure 8.

CREATE EXTERNAL TABLE diabetes\_data\_twitter (id BIGINT, text STRING) ROW FORMAT SERDE 'com.cloudera.hive.serde.JSONSerDe' LOCATION '/user';

hive> CREATE EXTERNAL TABLE diabetes\_data\_twitter (id BIGINT,text STRING) ROW FORMAT SERDE 'com.cloudera.hive.serde.JSONSerDe' LOCATION '/user';\_ nK

No rows affected (0.237 seconds) hive>

Figure 8: Creating a table to store downloaded file using Hive QL

#### Moving data into the table:

We move the twitter data into the table **diabetes\_data\_twitter** using the following command:

#### LOAD DATA INPATH '/user/flume/tweets/FlumeData.1613109902706' INTO TABLE

diabetes\_data\_twitter;

#### **Displaying the table in Apache Hive:**

In order to display the data from the table, the following command is executed:

After the execution of above Hive command, the table showing tweet ID and text is displayed on Hive Terminal as shown in figure 9.

≅ Administrator Command Prompt - h hive> select * from OK	
1363556299254988804 1363556322881335297 1363557030179581953 1363560783620276233 13635608221490609368 1363560852318793729 1363557063809400833	RT @incmnszmx: Si tienes #diabetes evita las hipoglucenias haciendo comidas peque?as y frecuentes, consume una colaci?n antes de dormir. ToÓ RT @WrittenByHanna: No but Nick Jonas really had me thinking diabetes was gonna take him out at any second when I was in middle school ?? RT @Dinlbas: B@BoiJoNnano @Deremy_Hum [@MtHinacok,@BBCMews Ratidge @Changlikinport @ZenoCovid [W @ZenoCovid]Linace @Parenty Udd @UKActiontÓ The resverstrol in red wine is one of the polyohenols that is good for your gut and weight-loss#diabetes #foodÓ https://t.co/rJqHoN74HJ Agree with diabetes being a common cause of CKD but not with HTMit is probably vastly overrated as an etiology oó https://t.co/XQUG2E2UX Beans are powerhouse of fiber/portein/complex.crbS/phytonutrientsvery satisfying and still low in caloriesgreaÓ https://t.co/MBMFYYSpgv #diabetes symptoms diabetes type 2 https://t.co/EoTZ6m9rhP type 1 diabetes 31:52
1363557112366981129 1363557132759629831	RT @Fact: Giving up alcohol for just a month can improve liver function, decrease blood pressure and reduce your risk of liver disease andó never seen a man so dramatic
1363557166054055939	So is diabetes now racist too? Or do we have to wait for the news to catch up?
1363557182462132229	RT @American_Heart: February is American Heart Month. There is no better time to evaluate Cardiovascular risk in patients with T2D. Download
1363557255279476736 1363557260467834880	RT@Jazzymykai_: Broooo i stg RT@finite alright: cool. remember when coca-cola exasperated a water shortage by extracting more than 300,000 gallons of water per day forÓ
1363557451782623238	KI prinite_airight: cool. Penember when coca-cola exapprated a water shoring by cratain grane than booked gallons or water per day for We hope that this work will allow us to improve patient care and also to simple for each strain screening tests 0 https://t.co/dfOigBMthr BonisJohnson I would like to see a road map for things such as: Anorexia & as well as obesity and diabetes0 https://t.co/dfOigBMthr Too Selling Diabetes Care-conFordu, Accurchek, FreeStyle and normethus://t.co/XiShNUMi #ebavesilend https://t.co/XiShNUMi #ebavesi
1363557451782623238	We hope that this work will allow us to improve patient care and also to simplify certain screening tests of https://t.co/x101RTVHwc
1363557468991873028	RT @parthaskar: And here is the update from @HHSDigital #GestationalDiabetes #Shielding Thank you from @NHSDiabetesProg to @DHSCgovuk @NiÓ
1363557491347398664	@7VENKMEN omg same here! my grandpa had diabetes, cholesterol and heart problems too?? same here feel free to sendO https://t.co/9xPplN1Mx8
	RT @LEAD_Coalition: Prediabetes linked to worse brain health https://t.co/WW1de7aoy #diabetes #Alzheimers #dementia @LindaLeeKing @Cyclió RT @LEAD Coalition: Prediabetes linked to worse brain health https://t.co/WW1de7aoy #diabetes #Alzheimers #dementia @LindaLeeKing @Cyclió
1363557635602198529	KI @LEAD_COALITION: Prediabetes linked to worse brain nearin netps://t.co/www.berady.#diabetes #AlZneimers #dementia @LindaLeeking @Lycilu Idd cry my veys out during his a little bit longer speech ??
1363557643495874563	an sign what does when a psycholis diabeters
1363557666258358275	Not to be an agent of doom but all I see in this video is Diabetes
1363557670876241922	
	Cant finish them all in one sitting. Sobra yung sugar baka may diabetes na ko bukas. But I love them all kasi laható https://t.co/111hgub08/
1363556351725592577 1363557761045303297	RT @GHangraveWrites: @michelleptweets @WrittenByHanna The fact that she hid her diabetes from Luca in the movie to the point that she almosó #diabetes @AmDiabetesAssn @DiabetesUK
1363557791991033858	#Diabetes @#MLiabeteshSh @DiabeteshK Hi väall- keep on telling the hubby to lose a few pounds- doctors say his BMI is dangerously close to being in the0 https://t.co/onpbMG4zis
1363557805240770560	RT #Olverinaraco: packaging infames El tipo se ocup? de los programas para pacientes de Diabetes y HTV De la prevenci?n del Crocer Graito-Maô
1363557843165732877	Another part of a heart healthy lifestyle that can help you manage your diabetes is to focus on what youare eating.Ó https://t.co/3e1SmhJeF1
1363557871401766912	Nevergetsick World's Greatest Healing Miracle of All Time:100% Scientifically Proven to Cure Cancer, Diabetes TyÓ https://t.co/mzajYETdqO
1363557880620793862	Diabetes is tough @wedsgp1
1363557914892509186 1363557930168176640	RT @MarcLobliner: .@CocaCola helps create an obesity and diabetes epidemic in black communities then rallies against being white.Sounds aÓ Poor countries like ours who have richer countries crappy food foisted on us see the highest growth rates of NCDs lÓ https://t.co/MckoNtvJkK
1363557940972634112	Poor countries like ours who have richer countries crappy tood toisted on us see the highest growth nates of NCUS 10 https://t.co/McKoNtUJKA @CancerWarrior8 Oh. I know she is going to start screaming at people in a few hours. The second someone brings up diabetes.
1363557970882289666	gearcerwanions on, i know she is going to start streaming at people in a new nours. He sector someone oning up diabetes. Hi Darren, youñe speaking to a young adult who got covid just before the first lockdown and now has diabetes becaud https://t.co/Y9noHgp4Lh
1363556434080849927	arobkhenderson All of this coincides with the rise of heart disease, diabetes, and obesitythis sounds like sometô https://t.co/sdQnWUjm7U
1363557986812231680	RT @thewayoftheid: Thereas a character named Suga Feet bc ppl get diabetes every time he hits the floor
1363558012267294721	@WrittenByHanna FR? I was like 9my baby has diabetes?÷ ??

Figure 9: Table showing tweet ID and text

#### Splitting the tweets into separate words:

In the next step, we split the text into separate words using the following command:

create view split_diabetes_data as select id, words from diabetes_data_twitter lateral view	
explode(sentences(lower(text))) dummy as words;	
hive> create view split_diabetes_data as select id, words from diabetes_data_twitter lateral view explode(sentences(lower(text))) dummy as words;	
OK No rows affected (0.219 seconds)	
No tows affected (0.22 seconds) hive select * from split diabetes data;	
ok	
1363556299254988804 ["rt","incmnszmx","si","tienes","diabetes","evita","las","hipoglucemias","haciendo","comidas","peque"]	
1363556299254988804 ["as"_"y", "frecuentes", "consume"_"una", "colaci"]	
13635529925498884 ["n","antes","de","dormin","teo"] 19635529925498884 ["n","antes","de","dormin","teo"] 19635529925498884 ["n","antes","de","dormin", "teo"]	
1363556322881335297 ["rt","writtenbyhanna","no","but","nick","jonas","really","had","me","thinking","diabetes","was","gonna","take","him","out","at","any","second","when","i ","was","in","middle","school"]	
, was , in , microir , school ; [ 1363557030179581953 ["rt", "blah_baa", "borisjohnson", "jeremy_hunt", "matthancock", "bbcnews", "ridge", "changiairport", "zerocovid_uk", "zerocovalliance", "parents_utd", "ukactiontó"	
, 1363560783620276233 ["the","resverstrol","in","red","wine","is","one","of","the","polyohenols","that","is","good","for","your","gut","and","weight-loss","diabetes","foodô"," https","t.co","rjqhon7fmj"]	
nccps, ccco, nyanowiny j 136335682214985838 ["agree", "with", "diabetes", "being", "a", "common", "cause", "of", "ckd", "but", "not", "with", "htn", "it", "is", "probably", "vastly", "overrated", "as", "an", "etiology	
","oô","https","t.co","xjdugze2ux"]	
1363560852318793729 ["beans", "are", "powerhouse", "of", "fiber", "protein", "complex", "carbs", "phytonutrients", "very", "satisfying", "and", "still", "low", "in", "calories", "greaó", "ht	
tps","t.co","bBn6yyspgv"]	
136356089000314369 ["rt", "lchfrd", "fasting", "was", "used", "as", "treatment", "for", "diabetes", "but", "fasts", "including", "protein", "sparing", "modified", "fast", "such", "as", "john ", "rollo", "used", "in", "1797Ó"]	
, 1010, Useu, 11, 17570 ] 1363568987419357191 ["if","you","are","diabetic","or","have","a","friend","with","diabetes","please","go","here","to","learn","more","diabetes","is","what","they","do","dr",	
"ric0","https","t.co","axbnrzu9xj"]	
1363560951954432008 ["diabetes","take","people","out","al1","the","time","insulin","is","a","human","right","and","it","shouldnµt","only","be","easily","accessible","i","ric	
h","p0","https","t.co","q1x46pghpa"]	
1363561051372072969 [] 1363561051372072969 ["diabetes","mellitus"]	
1363561061746582656 ["i","was","looking","for","the","cure","for","that","boy"]	
13633561117583372288 ["the","diabetes","uk","south","east","team","are","running","an","online","event","on","self","management","empowering","people","with","type",2","diab	
6","https","t.co","zipoics29q"]	
1363557663809408833 ["diabetes", "symptoms", "diabetes", "type","2", "https","t.co","eotz6m9rhp","type","1","diabetes","31","52"]	
1363557112366981129 ["rt","fact","giving","up","alcohol","for","just","a","month","can","improve","liver","function","decrease","blood","pressure","and","reduce","your","ris	
k","of","liver","disease","andô"] 1363557132759629831 ["never","seen","a","man","so","dramatic"]	
1033571/22/502605339 ["net"] 50cm") 50 journal jou	
1363557166054055939 ["or","do","we","have","to","wait","for","the","news","to","catch","up"]	
1363557182462132229 ["rt","american_heart","february","is","american","heart","month","there","is","no","better","time","to","evaluate","cardiovascular","risk","in","patient	
s","with","t2d","downloa0"]	
1363557255279476736 ["rt","jazzymykai","brooco","i","stg"] 1363557260467834880 ["rt","finite_alright","cool","remember","when","coca-cola","exasperated","a","water","shortage","by","extracting","more","than","300,000","gallons","of"	
<pre>instant "instant instant inst </pre>	
, mace; per 5 09 ; "100	
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Figure 10: Table showing individual words in the tweets

#### Lateral view of extracted tweets:

To create the lateral view of the tweets, the following command is executed:

create view diabetes\_lateral\_data as select id, word from split\_diabetes\_data lateral view explode(
words ) dummy as word ;

The lateral view of the tweets is shown in figure 11.

E. Select Administrator Command Prompt - hive	- 0 X
hive> create view diabetes_lateral_data as select id, word from split_diabetes_data lateral view explode( words ) dummy as word ;	^
0%	
No rows affected (0.067 seconds)	
hive> select * from diabetes_lateral_data;	
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1363556322881335297 nick	
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Figure 11: Table showing lateral view of individual words in tweets

#### Loading the AFINN dictionary into HDFS:

Now, we move AFINN Dictionary into HDFS by executing the following Hadoop command:

# LOAD DATA INPATH '/user/AFINN.txt' into TABLE dictionary;

In order to view the contents of the dictionary table, we perform the following operation:

# select \* from dictionary;

The contents of the **dictionary** table are as shown in figure 12.

<pre>ive selfs * from dictionary; k andom -2 bardome -2 bardome -2 bardome -2 bardome -2 bardome -2 bdutet - 2 bdutet - 2 bdutet - 2 bdutet - 2 bdutet - 3 bbors -3 bbors -3 bbors -3 bbors -4 b</pre>	Select Administrator. Command Prompt - hive	- 0 X
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Figure 12: Table showing AFINN dictionary

#### Generating Sentiment score of individual words:

In the next step, we compare the words in the text with the dictionary in order to find the sentiment score of each word in a tweet. For this operation, the following command is executed:

### Create table diabetes\_sentiment\_score as select t.id, t.word, d.rating from diabetes\_lateral\_data

## t join dictionary d where t.word = d.word

<pre>iuk Create table diabetes_sentiment_score as select t.id, t.uord, d.reting from diabetes_lateral_data t join dictionary d where t.uord = d.uord; WHOR: Nice-own Ris deprecated in Nive 2 and may not be available in the future versions. Consider using a different execution engine (i.e. spark, tec) or using Nive 1. values. Values to the constraint multiple SiAD bioling: 1430 from binding in [jarrille:/C/hadoon/adoop.2.8.d/har/Madoop/commo/lbio/si46j-ingl:2.4.1.jar//org/siAdj/impl/StaticloggerBinder.class] 1431 from binding in [jarrille:/C/hadoon/adoop.2.8.d/har/Madoop/commo/lbio/si46j-ingl:2.4.1.jar//org/siAdj/impl/StaticloggerBinder.class] 1431 from binding in [jarrille:/C/hadoon/adoop.2.8.d/har/Madoop/commo/lbio/si46j-ingl:2.1.7.10.jarl/org/siAdj/impl/StaticloggerBinder.class] 1431 from binding in [jarrille:/C/hadoon/adoop.2.8.d/har/Madoop/commo/lbio/si46j-ingl:2.1.7.10.jarl/org/si46j/impl/StaticloggerBinder.class] 1432 from binding in [jarrille://was.si46j.com/adoop.jar/jar/Madoop/commo/lbio/si46j.com/adoop/com/a</pre>	🕱 Select Administrator. Command Prompt - Nive	
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<pre>LiF37: Actual bioding is of type [org.apach.logging.Lif3[.log9[loggerFactory]] SERO Status[org.nk blog92] contribution for found. Using derivation contiguation file found. Using derivation control by the set of the</pre>		
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<pre>821-09-01 11:55:46,915 main NUMU Unable to instantiate org_fusesource_jnst_NindowsArSiDurputStream 821-09-01 11:55:46,915 main NUMU Unable to instantiate org_fusesource_jnst_NindowsArSiDurputStream 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:47 821-09-01 11:55:48 821-09-01 11:55:48 821-09-01 11:55:49 821-09-01 11:55:59.157 54ge-4 amp = 40%, reduce = 6% 821-09-01 11:55:59.157 54ge-4 amp = 10%, reduce = 6% 821-09-01 11:55:69.157 10:10:10:10:10:10:10:10:10:10:10:10:10:1</pre>		
<pre>B21-03-01 11:55:46;915 main W400 Unable to instantiate org.fisesource_jnni.Wickowa4e3DCxputStream B201-03-01 11:55:47 Starting to Lawnch Docl 1 task to process may join; maximum memory #7765688 B21-03-01 11:55:48 Dump the side-table for tag: 1 with group count: 2477 into file: file:/C./Users/MCD/ApQData/Local/Temp/HCD/bc12054-32f1-428f-9e31-925903455cdb/hive_2021-03-01_11-55:44_548_2039466c2351370271-1/.bc11-050-04_548_000000000000000000000000000000000</pre>		
<pre>B2E1-03-01 11:55:47 Starting to lawnch local task to process map join, maximum meory = 47765388 B2E1-03-01 11:55:48 Dump the side-table for tag: 1stif group count: 2477 in of file: file:(//Dsers/MOX/ApQDta/Local/Temp/HOQ/bt12a954-32f1-428f-9e31-9259b3455cdb/hiv B2E1-03-01 11:55:44 Dup the side-table for tag: 1stif group count: 2477 in of file: file:(//Dsers/MOX/ApQDta/Local/Temp/HOQ/bt12a954-32f1-428f-9e31-9259b3455cdb/hiv B2E1-03-01 11:55:44 Stag.230349663351370271-1-/Dce1-10080/HebT12e102a//temp/HOQ/bc12a954-32f1-428f-9e31-9259b3455cdb/hive_J821-03-01_11-55-44_548_J83049662351370271- Dce1-10002/HebT12b-Stage-4/MpDion-mapfiled:hashtable (59200 bytes) B2E1-03-01 11:55:48 End of local task; Time Taken: 0.782 sec. Neuroin completed successful) #perdical task succeded auxnching Dob IoSiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707856509 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA5707855809 0112, Tracking URL = http://DESITOP-UCRPD51:8083/proxy/spplication_161457078569_0112/ Sintering Dob = Dob SiA570785589 0112 Sintering Dob = Dob SiA570785589 0112 Sintering Sintering In Sintering In Sintering Dob = Dob SiA570785589 0112 Sintering Sintering In Sintering In Sintering Dob = Dob SiA570785589 0112 Sintering Sintering In Sintering In Sintering Sinter Sinter Sintering Sintering Sin</pre>		
<pre>B21-03-01 11:55:43 Ung the side-table for tag: 1 w(ih group count: 2x77 into file: file/C/Users/NCAPApota/Local/Temp/NCO/bcl2054-32f1-428f-9e31-9259b3455cdb/hive_102395b3555337071-1-1051-14028f-9e31-9259b3455cdb/hive_1021-03-01_11-55-44_548_10094b662351370271-1 local:10003/NeshTable-Stage-4/Mpulcin-mapfile01hasthable (50200 bytes) 801-03-01 11:55:48 Uploaded 1 file to: file/C/Users/NCO/AppOta/Local/Temp/NCO/bcl2054-32f1-428f-9e31-9259b3455cdb/hive_1021-03-01_11-55-44_548_10094b662351370271-1 local:10003/NeshTable-Stage-4/Mpulcin-mapfile01hasthable (50200 bytes) 801-03-01 10:45:48 End of Local task; file Take: 0.782 sc. SecUtion completed successfully genetical tasks is set to 0 since there's no reduce operator Natering 70b 1 out of 1 Amber of reduce tasks is set to 0 since there's no reduce operator Natering 70b = job_1614570786500_0112, Tracking URL = http://DESITOP-US005118088/prosy/application_1614570786500_0112/ 111 Command = C\haddoophadoop-18.8/bin/hadoop.cmd job -kill job_1614570786500_0112 401-03 = job_1614570786500_0112, Tracking URL = http://DESITOP-US005118088/prosy/application_1614570786500_0112/ 111 Command = C\haddoophadoop-18.8/bin/hadoop.cmd job -kill job_1614570786500_012 401-03 = jib_1614570786500_012 401-03 = jib_1614570786500_012 401-03 = jib_1614570786500_012 401-03 = jib_1614570786500_012 401-03 = jib_1614570786500_012 401-03 = jib_1614570786500_012 401-04 = jib_1515570/557 Stage-4 map = 00%, reduce = 0%, com 401 = jib_151559, jib_757 stage 4 map = 00%, reduce = 0%, com 401 = jib_151559, jib_151570765500_012 401 = jib_161570786500_012 401 = jib_161570786500_012 402 = jib_161570786500_012 403 = jib_161570786500_012 404 = jib_1615570786500_012 405 = jib_161570786500_012 405 = jib_161570786500_012 406 = jib_161570786500_012 406 = jib_161570786500_012 407 = jib_161570786500_012 408 = ji</pre>		
<pre>221-03-01 11-55-44_548_2004046623513702711-//ocgl.100804/HsDTAble-Stage-//HspZein-mapFiled1hashtable 201-03-01 11-55-44_548_Uplanded 1 File to: file:(///iser/MC/MC/MpDatu/Local/Temp/HCM/Hc12a954-32f1-428f-9e31-9259b3455cdb/hive_3021-03-01_11-55-44_548_203049662351370271- local-100805/HsbTable-Stage-4/HspZein-mapFile01hashtable (50200 bytes) 201-03-01 11:55:48 End of local task; Jime Taken: 0.782 sec. recution completed successful) aprediced task succeeded auxnching 0b1 cp.614570786500 0112, Tracking URL = http://DESNTOP-UCRPD51:8888/proxy/application_1614570786509_0112/ 111 Commars = C:hadoopthadoop-2.8.0bin/Hadoop.cnd job -kill job 154378786508_012 2010-03 11:55:39,157 Stage-4 map = 08K, reduce = 0K 021-03-01 11:55:39,157 Stage-4 map = 0K, reduce = 0K 021-03-01 11:55:39,157 Stage-4 map = 08K, reduce = 0K 021-03-01 11:55:39,157 Stage-4 map = 08K, reduce = 0K 021-03-01 11:55:39,157 Stage-4 map = 0K, reduce = 0K 021-03-01 11:55:39,157 Stage-4 map = 0K 03: reduce 1:00 Lainete CPU time: 2 seconds 546 msec N NegRING: New 1:1 Camulative CPU: 2.546 sec MoFS Read: 58509 DFS write: 3608 SUCCESS 0:1 MpBRduce CPU Time Spent: 2 seconds 546 msec N NeWRING: New 1:1 Maltive CPU: 2.546 sec MoFS Read: 58509 HDFS write: 3608 SUCCESS 0:1 KapBRduce CPU Time Spent: 2 seconds 546 msec N NeWRING: New 1:1 New 1:1 New -1:1 New 0:1 N</pre>		4285 0-21 025052455-db/bins
<pre>821:00:31:155:48 [Uploaded 1 File to: file:///USAPY.MCD/AppOtat/Local/Temp/HCD/bc12a954-32f1-428f-9031-925903455cdb/hive_3021-03-01_11-55-44_548_203049662351370271- iocal-100092/htest Successed Buil-03-001 11:55:48 End of local task; Time Taken: 0.782 sec. xecution completed successfully apredical tasks in set to 0 since there's no reduce operator tarting 100 = job_j614579786500_0112, Tracking URL = http://DESITOP-LORD51:8888/proxy/application_1614570786500_0112/ ill Command E - 0.8 Buih/Indoor ond job - kill bp.1184570786500_0112/ Buil-0-0-01 11:55:59,157 Stage-4 map = 000%, reduce = 0% 021:0-0-01 11:55:59,157 Stage-4 map = 00%, reduce = 0% 021:0-0-01 11:55:59,157 Stage-4 map = 0%, reduce = 0% 021:0-01 11:55</pre>		-4287-9631-925903455cdb/h1ve
<pre>local.10003/HabiTable_Stage_4/MepJoin_mapfiledhashtable (65000 bytes) Mile304 1155:48 End of Local task; Time Taken: 0.782 sec. xecution completed successfully aprediced tasks is set to 0 since there's no reduce operator tarting Job = job_154570786580 B112, Tracking URL = http://DESITOP-UCRPD5I:8888/proxy/application_1614570786580_8112/ 111 Command = C:hadoophadoop-3.8.0bin/hadoop.cnd job -kill job_1541370786580_8112 111 Command = C:hadoophadoop-3.8.0bin/hadoop.cnd job -kill job_1541370786580_812 120 221-03 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:39,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 map = 058, reduce = 054 221-03 01 11:55:09,157 Stage-4 11:55:09,157 Stage-4 map = 058, reduce = 054 232 234 Stage-4 Nather - NR is deprecated in Hive 2 and may not be available in the future versions. Consider using a different execution engine (i.e. spark, ter) or using Hive 1. 1433: forus binding in [js::::::::::::::::::::::::::::::::::::</pre>		
<pre>821:03:04 Ii155:43 Eff of local task; Time Taken: 0.782 sec. xecution completed successfully peredical task successful sumching lob 1 out of 1 Imber of reduce task is set to 0 since there's no reduce operator tarting lob = job_JSLSF70785500 g112, Tracking URL = http://DESITOP-URPDDI:8888/proxy/application_1614570786500_0112/ III Command = C. Hoakoolthadoo: A.8.0kin/hadooc and job - kill job_JSLSF70786580 g112/ III Command = C. Hoakoolthadoo: A.8.0kin/hadooc and job - kill job_JSLSF70786580 g112/ III Command = C. Hoakoolthadoo: A.8.0kin/hadooc and job - kill job_JSLSF70786580 g112/ III Command = C. Hoakoolthadoo: A.8.0kin/hadooc and job - kill job_JSLSF70786580 g112/ III Command = C. JSLSF70786500 g112 URL-03-01 IIIS5:04,338 Stage-4 map = 80k, reduce = 80k CL-03-01 IIIS5:04,338 Stage-4 map = 100kg, reduce = 80k CL-03-01 INSReduce CPU Time 2 seconds 546 msec rdud lob = job_JSLSF70786500 g112 URL-04 INSReduce CPU Time Spent: 2 seconds 546 msec K ARNING: Hive-on-NR is deprecated in Hive 2 and may not be available in the future versions. Consider using a different execution engine (i.e. spark, tez) or using Hive 1. elasese. LF43: Class path contains multiple SLF43 bindings. LF43: Found binding in [js::File:(:/madoo/hadoop-2.8.0/Nive/apache-hive-2.1.0-bin/lib/logi_j:s1f4j-inpl-2.4.1.jar!/org/s1f4j/impl/StaticloggerBinder.class] LF43: Found binding in [js::File:(:/madoo/hadoop-2.8.0/Nive/apache-hive-2.1.0-bin/lib/logi_j:1.7.10.jar!/org/s1f4j/impl/StaticloggerBinder.class] LF43: Found binding in [js::File:(:/madoo/hadoop-2.8.0/Nive/apache-hive-2.1.0-bin/lib/logi_j:2.1.7.10.jar!/org/s1f4j/impl/StaticloggerBinder.class] LF43: Found binding in [js::File:(:/madoo/hadoop-2.8.0/Nive/apache-hive-2.1.0-bin/lib/logi_j:2.1.7.10.jar!/org/s1f4j/impl/StaticloggerBinder.class] LF43: Found binding in [js::File:(:/madoo/hadoop-2.8.0/Nive/</pre>		-44_548_203049662351370271-1
<pre>xeution completed successfully aproduced task succeeded aprohimal 50 1 out of 1 Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce operator Inder of reduce tasks is set to 8 since there's no reduce 100 164570786580_0112 Ill Commad = C:NadoopInadoop-2.8.0[bin/Nadoop.cnd job -+ill job 164570786580_011 Bit 30 is 10:00000000000000000000000000000000000</pre>		
<pre>auching Job 1 out of 1 muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since there's no reduce operator muther of reduce tasks is set to 0 since tasks muther of reduce tasks muther of reduce tasks muther of reduce tasks muther of reduce task muther of reduce task muther of reduce task muther of reduce task muther muthe</pre>		
<pre>surching lob 1 out of 1 ubter of reduce tasks is as to 0 since there's no reduce operator tarting lob = job_1614570786569_0112, Tracking URL = http://DESNTOP-LORPOS1:8088/proxy/application_1614570786589_0112/ 111 Command = C:hadoop/hadoop-2.8.0/Linhadoop.cmd job -kill job_1614570786589_0112 2110 Command = C:hadoop/hadoop-2.8.0/Linhadoop.cmd job -kill job_1614570786589_012 2110 Command = C:hadoop/hadoop-2.8.0/Linhadoop.2.8.0/Linhadoop</pre>		
<pre>umber of reduce tarks is set to 8 since there's no reduce operator tarting Job = job_161578786569_0112, Tracking URL = http://DESIT09-USRP051:8888/proxy/application_1614578786589_0112/ 111 Command = C:hadoopUhadoop-2.8.0Hin/hadoop.cmd job -Hill job_1614578786589_0112 adoop job information for Stage-4; number of mappers: 1; number of reducers: 0 01:0-00 11155:551,357 Stage-4 map = 80K, reduce = 80K 021:0-01 11155:041,338 Stage-4 map = 60K, reduce = 80K 021:0-01 01155:041,338 Stage-4 Map = 100K, reduce = 80K 021:0-01 01155:051786509_0112 001ng data to directory http://localhost:90000/user/hive/warehouse/diabetes_sentiment_score appleAuce Total unched: tage-Stage-4: Map: 1 Cmulative CPU 2: 546 sec HSUNDS: Hiw-on-MR is deprecated in Hive 2 and may not be available in the future versions. Consider using a different execution engine (i.e. spark, tez) or using Hive 1. leases. LF43: Floand binding in [gr:file://maboop/Madoop-2.8.0/hive/apache-hive-2.1.0-bin/lib/logdj-514j-impl-2.4.1.jarl/org/s14j/impl/StaticLoggerBinder.class] LF43: Fond binding in [gr:file://maboop/Madoop-2.8.0/hive/apache-hive-2.1.0-bin/lib/logdj-514j-impl-2.4.1.jarl/org/s14j/impl/StaticLoggerBinder.class] LF43: Fond binding in [gr:file://maboop/Madoop-2.8.0/hive/apache-hive-2.1.0-bin/lib/logdj-514j-impl-2.4.1.jarl/org/s14j/impl/StaticLoggerBinder.class] LF43: Fond binding in [gr:file://maboop/Madoop-2.8.0/hive/apache-hive-2.1.0-bin/lib/logdj-1.7.18.jarl/org/s14j/impl/StaticLoggerBinder.class] LF43: Fond binding in [gr:file://maboop/Madoop-2.8.0/hive/apache-hive-2.1.0-bin/lib/logdj-1.7.18.jarl/org/s14j/impl/StaticLoggerBinder.class] LF43: Sen thir/Jows.HF43 or optices.html=bindings for an explanation. LF43: Sen thir/Jows.HF43 oreduces.html=bindings for an explanation.</pre>		
<pre>tarting Dob = job _S16457786560 g112, Tracking URL = http://DESUTO-LORDS1:8888/pros/yaplication_1614570786560_0112/ ill Command = C:\hadoop\hado</pre>		
<pre>iii Commard = C.hadoophadoop-3.8.@ibinhadoop.cnd job jiii job jiii737786588_0112 doop job information for Stage-4 maps = dfm, reduce = dfm Cumulter of reducers: 0 821-83-841 11:55:59,157 Stage-4 map = dfm, reduce = dfm Cumulter GFU 2.546 sec applicate Total cumultime (GFU thus: 2 seconds 546 msec nodd Job = job jiiii/StaffStaff 2012 oving data to discussion for the seconds 546 msec Noring data to discussion for the seconds 546 msec implease Jobs Launches: trage-stage-4. Nor: 1 Cumulative CFU: 2.546 sec HDFS Read: 58509 HDFS write: 3608 SUCCESS total MapReduce CFU Time Spent: 2 seconds 546 msec MK MRMINE: Hive-on-MR is deprecated in Hive 2 and may not be available in the future versions. Consider using a different execution engine (i.e. spark, tez) or using Hive 1. elasses. LF43: Class path contains = NuLTiple SL43 bindings. LF43: Class path contains = NuLTiple SL43 bindings. LF43: Found binding in [js::File:(:/hadoop/hadoop-2.8.@/live/apache-hive-2.1.8-bin/lib/log4j:sl4j:impl-2.4.1.jarl/org/sl45j/jmpl/StaticloggerBinder.class] LF43: Sec http://mw.sl4f-jorg/codes.html=Multiple_bindings for an evplanation. LF43: Sec http://mw.sl4f-jorg/codes.html=Multiple_bindings for an evplanation.</pre>		
<pre>adoop job information for Stage-4: number of mappers 1; number of reducers: 0 2010-3011555,50157 Stage-4 map = 80%, reduce = 80% 8010-80-4011555,50157 Stage-4 map = 80%, reduce = 80% 8010-80-4011555,50157 Stage-4 map = 108%, reduce = 80% 8010-80-401155,50157 Stage-4 map = 108%, reduce = 80% 8010-80-40115,50157 Stage-4 map = 80% 8010-80-40115,50157 Stage-400-800, reduce = 80% 8010-80-40015,500-800, reduce = 80% 8010-80-40015,500-800, reduce = 80% 8010-80-40015,500-800, reduce = 80% 8010-80-4000, reduce = 80% 8010-80-400, reduce = 80</pre>		
<pre>821:80:81 11:55:93 JFS Stage-1 map = 80%, reduce = 8%, Cumulative CPU 2.546 sec apReduce Total cumulative CPU time: 2 seconds 546 msec field 3:0 = job_155:4570785509_8112 voing data to directory hdfs://localhost;9000/user/hive/warehouse/diabetes_sentiment_score apReduce Total cumulative CPU time: 2 seconds 546 msec voing data to directory hdfs://localhost;90000/user/hive/warehouse/diabetes_sentiment_score apReduce Total cumulative CPU time: 2 seconds 546 msec voing data to directory hdfs://localhost;90000/user/hive/warehouse/diabetes_sentiment_score apReduce Total cumulative CPU : 2.546 sec HDFS Read: 58509 HDFS Write: 3608 SUCCESS tal MapReduce CPU Time Spent: 2 seconds 546 msec k K MRINE: Hive-on-MR is deprecated in Hive 2 and may not be available in the future versions. Consider using a different execution engine (i.e. spark, tez) or using Hive 1. leases. LF43: Class path contains multiple SLF43 bindings. LF43: Found binding in [gir:File://:hanooy/hadoop/2.88./hive/apache-hive-2.1.8-bin/lib/logdj:slF43-impl-2.4.1.jan!/org/slF4j/impl/StaticLoggerBinder.class] LF43: Found binding in [gir:File://:hanooy/hadoop/2.88./hive/apache-hive-2.1.8-bin/lib/logdj:1-7.7.80.jan!/org/slF4j/impl/StaticLoggerBinder.class] LF43: Found binding is [gir:File://:hanooy/hadoop/2.88./hive/apache-hive-2.1.8-bin/lib/logdj:1-7.7.80.jan!/org/slF4j/impl/StaticLoggerBinder.class] LF43: Found binding is [gir:File://:hanooy/hadoop/2.88./hive/apache-hive-2.1.8-bin/lib/logdj:1-7.7.80.jan!/org/slF4j/impl/StaticLoggerBinder.class] LF43: Found binding is of type [org.apache.logging.slF43/impl/spires.fr43/impl/StaticLoggerBinder.class]</pre>		
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		6-4-221 **

Figure 13: Map Reduce processing to generate sentiment score of individual words

Figure 14 shows the output of the table diabetes\_sentiment\_score:



Figure 14: Table showing sentiment score of each word

Sentiment Analysis of extracted tweets:

Now, the final score of all the tweets is generated using the following command:

# Select id, sum(rating), case when sum(rating)>0 then 'POSITIVE' when sum(rating)<0 then 'NEGATIVE' else 'NEUTRAL' end as sentiment from diabetes\_sentiment\_score GROUP BY id;

The processing of the above command and sentiment score of each tweet is shown in figure 15.



Figure 15: Map Reduce job generating sentiment score of each tweet

Select Administrator: Command Prompt - hive			– 6 X
1363557871401766912 6 POSITIVE			^
1363557914892509186 2 POSITIVE			
1363557930168176640 2 POSITIVE			
1363557940972634112 -2 NEGATIVE			
1363558012267294721 4 POSITIVE			
1363558051983151104 -1 NEGATIVE			
1363558072786984961 -4 NEGATIVE			
1363558099718701056 3 POSITIVE			
1363558127308734465 -3 NEGATIVE			
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1363558343525232644 -1 NEGATIVE			
1363558366791028738 -4 NEGATIVE			
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1363558411128827906 -2 NEGATIVE			
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Figure 16: Table showing the sentiment score of each tweet

#### 4. Conclusion and Future Scope

In the present study, the sentiments in the tweets related to diabetes domain were analysed using Hadoop Ecosystem. The tweets were compared with the AFINN dictionary and Sentiment Analysis was performed. In the whole process it was found that a large data set of the tweets can be classified, categorized and scaled with assistance of Apache Flume and Apache Hive. However the research was limited to the categorization and scaling of tweets based on their polarity related to diabetes. The comparative study of tweets pertaining to type 1 and type 2 diabetes will be pursued in the future. The relevance of the present study lies in its findings as the recognition of sentiments associated with the disease can be used to change the mind-set of the people suffering from diabetes and their families as well as improve public health strategies.

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