Sentiment analysis using live Twitter streaming API and Python

Course: AE-663,Group: P13

Monika Sahai: 133079022 Zeal Sheth: 133079023

Indian Institute Of Technology, Bombay

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Sentiment Analysis

1. What is sentiment analysis?
   Process of identifying and characterizing the opinions expressed in a text to determine if the writer's emotion is positive,negative or neutral.
2. Why is it useful?
   1. Companies use sentiment analysis to improve their business.
      Ex: Customer responses(feedback forms) can be analyzed to calculate the customer satisfaction index.
   2. Powerful method for analysis of business in share market.

Twitter API

1. Steps to connect to API
    I Create a twitter account.
    II Go to https://apps.twitter.com/ and log in with your twitter credentials.
    III Click "Create New App"
    IV Fill out the form, agree to the terms, and click "Create your Twitter application"
    V In the next page, click on "API keys" tab, and copy your "API key" and "API secret".
    VI Scroll down and click "Create my access token", and copy your "Access token" and "Access token secret".
2. These keys and tokens are used for connecting to twitter and streaming live tweets.
3. API returns the result in json format

Twitter API

1. Rest and Streaming API
    1. Search/REST API
        - ★ Search goes back in time (up to a week) to find tweets that have already been sent.
        - ★ HTTP stream is not continous.
    2. Streaming API
        - ★ Stream goes forward in time (starting from when you initiate the call) to capture new tweets in (more or less) real time as they are sent.
        - ★ Requires keeping a persistent HTTP connection open.

REST vs Streaming API

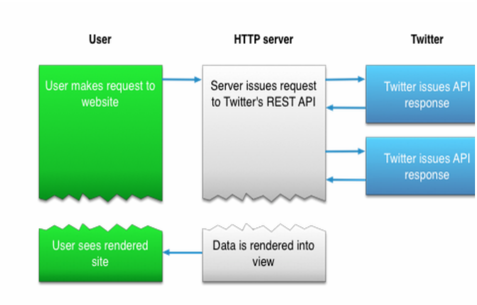

User
HTTP server
Twitter
User makes request to website
Server issues request to Twitter's REST API
Twitter issues API response
Twitter issues API response
User sees rendered site
Data is rendered into view

Figure : REST API

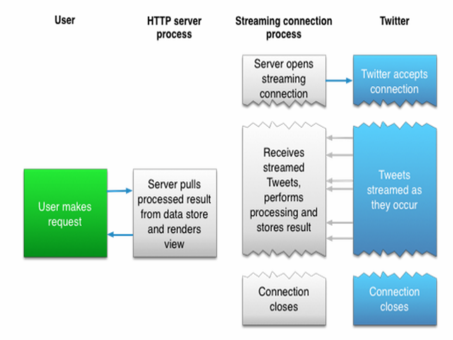

User
HTTP server process
Streaming connection process
Twitter
Server opens streaming connection
Twitter accepts connection
Receives streamed Tweets, performs processing and stores result
Tweets streamed as they occur
User makes request
Server pulls processed result from data store and renders view
Connection closes
Connection closes

Figure : Streaming API

Packages used

1. nltk : used for data mining
2. re : used for filtering tweets
3. tweepy : Python library for twitter API
4. json : for reading the data collected by twitter streaming.
5. matplotlib : Package for visualizing the data in graphical form.
6. Matplotlib Basemap toolkit : Library for geo-plotting

NLTK

1. NLTK: Natural Language Processing Toolkit
2. Phases of classifier:
    1. Phase-I : Training of the classifier
    2. Phase-II : Testing of the classifier
3. We have used a database of 2500 tweets as sample data whose sentiments are known.
4. This data is used to extract features for sentiment analysis.
5. Feature list is then given to classifier for training.
6. Testing of the classifier is done by calling the trained classifier on data to be analysed i.e. tweets.

Sentiment analysis flow

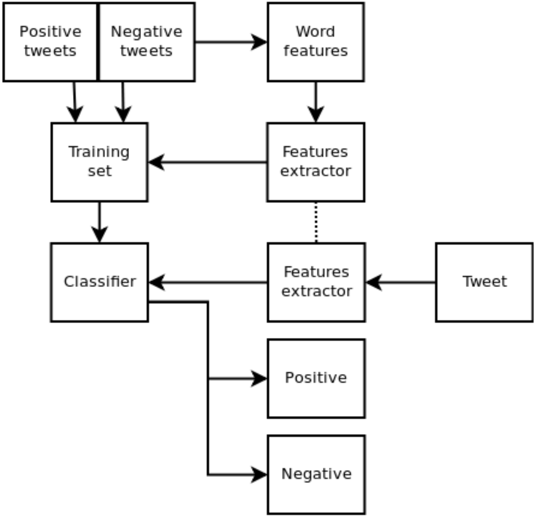
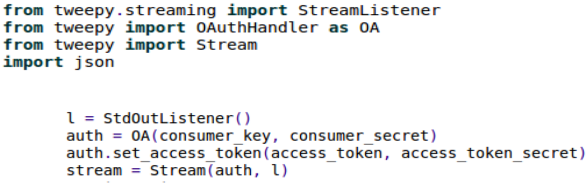


Figure : Training and Testing of Bayes classifier

Tweepy

1. Provides Classes and methods for connecting to API and streaming namely OAuthHandler



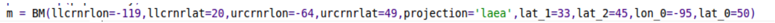
```
from tweepy.streaming import StreamListener
from tweepy import OAuthHandler as OA
from tweepy import Stream
import json


        l = StdOutListener()
        auth = OA(consumer_key, consumer_secret)
        auth.set_access_token(access_token, access_token_secret)
        stream = Stream(auth, l)
```

Figure : Usage of OAuthHandler

Matplotlib

1. Basemap



```
m = BM(llcrnrlon=-119,llcrnrlat=20,urcrnrlon=-64,urcrnrlat=49,projection='laea',lat_1=33,lat_2=45,lon_0=-95,lat_0=50)
```

Figure : Setting the basemap

   1. provides the facilities to transform coordinates to one of 25 different map projections.
2. Shapefiles:
   1. Contains geographical data.
   2. It is developed and regulated by Esri (Environmental Systems Research Institute)
   3. The shapefile format is a digital vector storage format for storing geometric location and associated attribute information.

Matplotlib contd.

1. Matplotlib is then used to plot the points in the transformed coordinates.
   1. Shape file is read and polygons are constructed using the parameters obtained from the shape file.
   2. Polygon library is used to generate polygon from shapefiles.
   3. Used modules colors and patches to fill the polygons states on map with different colors.

Control Flow

1. Streaming
2. Feature extraction
3. Sentiment categorization as positive,negative or neutral
4. Constructing polygons for states using shapefile
5. Assigning colors to polygons based on the happiness score
6. Plotting the map with set properties

Happiness score distribution

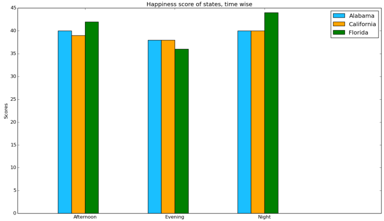


Figure : Happiness score for different times of the day for sample of 50 tweets

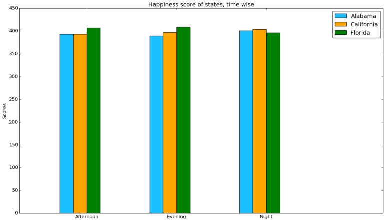


Figure : Happiness score for different times of the day for sample of 500 tweets

Happiness score distribution contd.

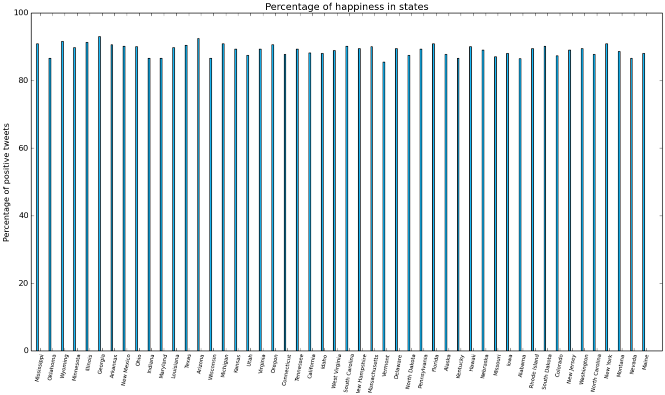


Figure : Percentage of happiness in each state

Happiness score distribution contd.

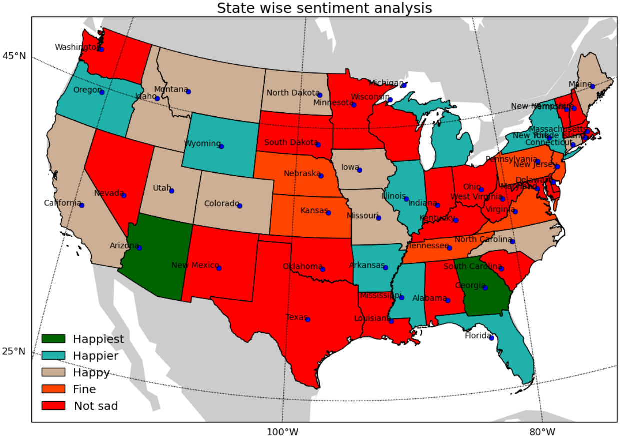


Figure : State wise geo-distribution of the happiness score

Conclusions

1. Happiest states are Arizona and Georgia
2. Almost all states are fairly positive since out of 500 tweets , minimum happy score is 320.
3. States with least scores are maximum.

Bibliography

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4. http://stackoverflow.com
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6. https://class.coursera.org/datasci-001/lecture/55
7. http://matplotlib.org/basemap/