Is a Restaurant Good or Bad??
What do the people say on Twitter?

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Abstract

Sentiment Analysis is the process of computationally identifying and categorizing opinions expressed in a piece of text in order to determine whether the attitude of mass is positive, negative or neutral towards the subject of interest. Using Social media platforms such as Twitter, Instagram, Facebook etc., one can gauge into the sentiments of people in real time.

Social Media has been adopted by millions for expressing their sentiments on various things like movies, food, politics etc. These sentiments can be collected in the form of tweets/feeds/posts and analyzed by sentiment analysis to see what people are expressing.

Twitter, being a real-time platform where people express their emotions and opinions, is used for our analysis. Twitter is a massive social networking site where more than 140 million active users publish over 400 million 140 character "Tweets" every day. Twitter's speed and ease of publication has made it an important medium for people to express their views from all walks of life.

It is a common trend for people to post pictures of their meal with an opinion of the meal. With our research, one can determine whether a restaurant is good or bad by collecting and analyzing all this free data that is coming out of Twitter.

Keywords: Twitter, Social Media, Sentiment Analysis, AFINN, Lexicons, Natural Language Processing.

1. Introduction

Generally, people rely on popular websites like Yelp, Zomato or TripAdvisor for reviews on Restaurants or Pubs. But most of these sites have only a few users who actually leave a review which makes these sites not that accurate for restaurant recommendations. According to a case study, for every seven tweets about a restaurant there is only one review on traditional review sites. This research uses the tweets by Twitter users as the source for our Analysis. Twitter, as a social network provides a real-time platform for expressing opinions widely. Analyzing the tweets related to various restaurants can provide clean and accurate reviews of the restaurant which a user can rely on.

In this research, we will be showing in detail how it is possible to examine social media data for different Restaurants in Chicago and calculating the sentiment score based on the tweets where the restaurant has been mentioned. This score would tell whether the restaurant is good or bad.

This paper is organized as follows. Section 2 describes the Background of this research. Section 3 would describe the Data Source and the process of Data Collection. Section 3 would describe the Method used for the Analysis of Twitter Data. Section 4 describes the Observations, Visualizations and Results.

2. Background

- **Text Mining**

Text mining is the process of analyzing data consisting of text containing natural language. Text mining can be used in various applications in industries for decision making. This process is called text analytics. Because of the huge amount of unstructured data these days, Text mining has been adapted by many industries. These days many important information can be retrieved from postings on social media sites like Facebook, Twitter and Instagram. Mining such data can be difficult since there is so much data which is ambiguous and irrelevant. These

ambiguities can be caused by text which is hard to analyze such as intense words, slangs and sarcasm.

- **Natural Language Processing**

Natural language processing is the process of understanding human language by a computer program. With Natural Language processing one can identify how a human speaks a language. This can be useful in understanding the emotions and sentiments of the highly ambiguous and unstructured data that is available. The Natural Language Toolkit is used in our research for the sentiment analysis of tweets.

- **Twitter and its APIs**

Twitter is the most widely used social media website by people for expressing their opinions and sentiments. Twitter is widely used for the data analysis because of the access of its data to the user as well as its short text format (140 characters). So we can get more amount of information with less amount of data. Twitter lets its users get access to the user tweets for development and data analysis. There are various APIs such as, REST, Streaming, and AdsApi etc. which can be used for accessing the data on twitter. These data can be accessed by creating an application on the Twitter's development site. Twitter provides access keys which are used to collect the data via APIs. We would be using the Tweepy Library for accessing the Twitter Streaming API to collect the data from twitter. These APIs also have a rate limit on the data that can be collected.

- **Sentiment Analysis**

Sentiment Analysis is the process of identifying and categorizing opinions expressed in the tweets in order to determine whether the attitude of user is positive, negative or neutral towards the Restaurant queried. Sentiments can be classified into the following:

- ✓ Feelings
- ✓ Opinions
- ✓ Attitude
- ✓ Emotions

These sentiments is categorized into positive and negative by assigning each word in the tweet with a score based on how positive or negative the word is. Each word is checked with a List of terms with positive/negative/neutral sentiment (Lexicons) and a score is assigned.

3. Data Collection

- **Restaurant Data**

We collected a list of all the Restaurants in Chicago from the Chicago Data Portal. We took the Food Inspections list (https://data.cityofchicago.org/Health-Human-Services/Food-Inspections/4ijn-s7e5) in the city which had the list of all the restaurants, bars and grocery stores in Chicago.

The data consisted of 111k such facilities. This was then filtered based on the facility type. All the facilities under the type "Restaurants" were filtered. We got a list of 69k restaurants in Chicago after filtering. This data was again filtered by removing the duplicates and we got a list of 8654 restaurants.

- **Tweets Collection**

We used the Tweepy Library for accessing the Twitter Streaming API to collect the data from twitter. Tweets can be collected based on the keyword given by the User. Keyword is the name of the restaurant, the user wants check if it is good or bad. We gave a limit of 5000 tweets for each keyword.

First we created a function which takes the keyword from the Restaurant List (Each Restaurant name in the list is a keyword) and gets the tweets from Twitter. Since there are 8654 restaurants, it takes a long time to get the data individually.

So we created an interface where the user can enter the name of the restaurant as raw input and this automatically checks the user input in the list of restaurants and if it exists, all the tweets for that restaurant are collected.

- **Lexicons**

Lexicons is the list of terms with positive/ negative/ neutral sentiments. We used AFINN for that purpose. It's a list of words created by Finn Arup Nielsen. This was downloaded in the program itself from http://www2.compute.dtu.dk/~faan/data/AFINN.zip.

4. Approach

We followed the following Steps for our Analysis:

Input (Keyword)

→Data Collection

→Data Preprocessing

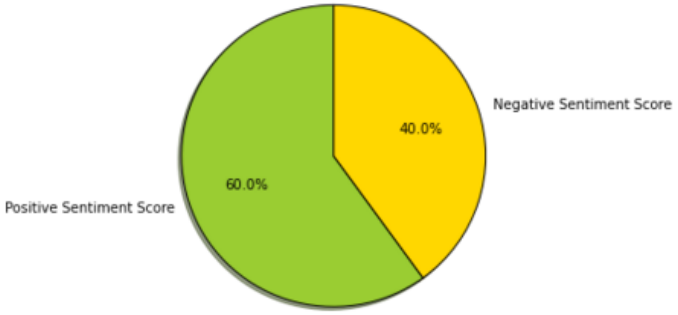
→Sentiment Analysis

→Sentiment Score

→Visualization

- **Keywords**: Tweets are extracted based on Keywords. Keywords are names of the restaurants given by the user. The keywords entered by user are first checked in the Restaurant list and if present, the keyword is then used for Tweets Collection.
- **Tweets Retrieval**: Tweets are extracted based on the keywords using the twitter Streaming API. We use the Tweepy library to access the API.
- **Data Preprocessing**: The tweets are tokenized by taking all the tweets in lower case and splitting each word with a whitespace. Each tweet is stored in a list in the form of tokens for the sentiment analysis on each token.
- **Sentiment Analysis**: The tokens generated are then classified as positive, negative or neutral based on their sentiment score. This is done using 2 methods in our research:
  - **Lexicons:** Here each of the token in a tweet is checked in a list of previously generated word List i.e. AFINN and assigned a score based on how positive or negative the word is.
  - **SentiWordNet:** This is a database of words and their relations. We use the NLTK (Natural Language Processing Toolkit) library to score the tokens in this approach. Here each token was tagged **(Part-of-Speech Tagging)** by checking if it was a noun or a verb or an adjective or an adverb. These tagged tokens were then scored based their tags respectively.
- **Graphical Representations:** After getting the positive and negative score of a restaurant, we visualize the sentiments in the form of a pie chart where the user can see the percentage of good and bad reviews in tweets in real time.

```
Enter the name of the Restaurant in Chicago: cemitas puebla
fetching the Scores:
{'cemitas puebla': ['1.5', '1.0']}
```



4. Accuracy

Sentimental Analysis of the tweets gave accurate score for most of the tweets. Although there were a lot of tweets which were scored wrong because of the data being ambiguous and irrelevant. These ambiguities were caused by highly intense words, slangs and sarcasm.

Certain positive comments like “F***ing love Giordano’s” was analyzed as negative because of the slang “F***ing” which has a negative score of -4. Also some of the negative comments like “Pizza was not that great” was analyzed as positive because of the word “great” in has a higher positive score.

Lot of tweets were advertisements due to the holiday season. These tweets were highly irrelevant and gave a high positive score since restaurants were advertising about their good food.

To tackle this problem we used the SentiWordNet where each token was tagged by checking if it was a noun, verb, adjective or an adverb and then scored respectively. The Score was more accurate because the words were classified based on their parts of speech and labeled accordingly.

5. Results

The project was successfully querying the tweets based on the restaurant name and was able to predict the positive and negative score of each tweet to give the user an accurate positive and negative score of the restaurant based on user reviews and preferences. While checking out the reviews on popular sites like Yelp and Zomato we were able to validate the accuracy of our ratings. We were able to portray the result in a proper pie chart which shows the positive and negative ratings of the restaurant. The graphical representation makes it easier for a user to see and judge the restaurant. We have also printed the top positive and negative tweets about the restaurant so that the user can read the latest comments about the restaurant, both in the positive and negative front. This gives the user an idea of the kind of opinion the customers have about the restaurant.

6. Related Work

Twizoo – Twizoo is an app that has been recently launched which uses our same concept and rates restaurants based on Tweets. Twizoo shows you all the trending restaurants on the front page and shows color codes the restaurants based on the most trending, average places and places to avoid. They show the trending tweets about the restaurants. Even though the app shows the top contenders in a location they do not individually rate the restaurants and provide the user with a positive and negative score for the user to make a choice. Our project individually rates each tweet and calculates the positive and negative scores based one each tweet and displays that score along with the positive and negative tweets which are the most recent. This helps the user make a better decision on whether to dine at that particular restaurant or not. Twizoo is also continuously storing all the tweets to score the restaurants whereas our project is live and queries the latest 5000 tweets and scores based on that. This makes sure that the score is accurate and recent.

7. Conclusion

AFINN approach was not suitable to detect sarcasm. Certain negative keywords used to make a positive statement was still given a negative score by AFINN and vice-versa. The percentage of people posting negative reviews were comparatively less based on our observations. This gives a higher positive score for each review. We can conclude that people generally tweet when they are happy about a restaurant. Negative comments are posted mostly in cases where the customer was either very disappointed or frustrated with the restaurant and their services.

8. Future Work

Although by using NLTK we were able to get accurate ratings, the NLTK still cannot identify sarcasm perfectly. This has affected the result. Even though this doesn't affect the accuracy too much, there is still room to improve on the current accuracy if the toolkit can be expanded to identify sarcasm. The AFINN approach which scores words based on their scores which are predefined has a very small database of under 3000 words which is very limited. The database of AFINN needs to be expanded to accommodate the ever expanding vocabulary. AFINN can also be improved by scoring positive and negative words based on some phrases in certain cases rather than just scoring based on each individual word. This can help in proper identification of a positive comment and negative comment when certain exclamatory comments are used.