

Web-based Tourist's Review Platform Employing Sentiment Classification based on Aspect Words

¹Anindita Ghosh and ²Dr. (Mrs.) N. F. Shaikh

¹Student, Department of Computer Engineering, MES College of Engineering, Pune 411001, India
Email: ¹anindita408@gmail.com

²HOD, Department of Computer Engineering, MES College of Engineering, Pune 411001, India,
Email: ²nfshaikh@mescoepune.org

Abstract—Consumer reviews in recent times has gained much popularity since the boom of e-commerce and online services for customers around the globe. Nowadays people want to make the best choice in everything they decide to pay for. In travelling services around the world this is also evident as increasing numbers of online travel websites are posting up reviews about particular places and their related hospitality and other services. These reviews are generally provided by the travelers who have already been there in the past and have considerable experience and knowledge about the place and its services. Essentially traveler surveys are data hotspots for sightseers to know about vacation places in advance.

Travelers express their perspective opinions and views with respect to any place of tourist's interest or service or accessibility of resources there. These reviews are abstract information which speaks about tourists' overall experiences, sentiments or examination with respect to the place or service or accessibility of resources. Sadly some of these provided reviews become superfluous. They do not exactly tell the user if the place is actually good or bad or average. They mostly speak of their own experience in details. This proposed sentiment classification done on aspects words has proved to be promising in crossing out such noise. At the point when the entire information about the places is introduced in the correct manner, broken down into aspects and then classified by efficient classification algorithms, it can derive meaningful information that comes handy to users for arriving at important decisions while planning a trip. Nonetheless, this is comparatively a newer area of research where it has been done on automatic aspect identification, and identification of implicit, infrequent and co-referential aspects, lowering chances of misclassifications. Here we propose a framework that employs Naive Bayes classification algorithm to classify sentiments and opinions in surveys with high exactness compared to other algorithms used before. The system has been actualized as a web application that assists sightseers with finding the best verifiable spots of tourist interest, by finding reviews individually listed wholly and the allover sentiment exuded by each of them. Execution has been assessed by conducting tests on user provided dataset.

Index Terms— Natural Language Processing, Opinion mining, NLP, Classification, Aspect-based Sentiment Analysis, User Reviews, Machine Learning, Data mining.

I. INTRODUCTION

The quick development of the travel industry and its developing achievement and pay rate has made it perhaps the main workers to nations universally. With the simple access of web wherever all throughout the planet and the expanding utilization of advanced mobile phones and PCs, the travelers can in a split second make their

opinions public on various context and topics at websites by providing reviews. The opinions and reviews by persons with firsthand experience provide the tourists with wide range of choices and also some knowledge. This may prompt disarray because of the variety of assessments, in regards to taking the choice of if to visit a spot. The techniques for conclusion order and examination help sort and characterize slants into positive and negative and put together the surveys. Anyway the issue is that each authentic spot has numerous perspectives that can be assessed by clients so a double outcome isn't generally useful.

Sentiment classification of aspect words helps in to a great extent. Suppose we are viewing a user review "Food was delectable but place was unclear", "food" and "place" are the two aspects here about which review has been provided by user. "Delectable" is exuding a positive opinion so food is classified as being a positive trait and "unclear" being a word expressing a negative notion of a place has been classified negative. To reach at our desired result the entire process involves two steps .1) Identification of Aspect, 2) Classification of sentiment into positive and negative.

Our proposed framework contemplates various chips away at estimation order and proposes a definite system of viewpoint-based supposition arrangement by utilizing AI calculations. It utilizes many classifiers one being Naïve Bayes which is our main focus and with which we have replaced Naïve Bayes Multinomial to study the effects on our new user input data. This framework has two levels of tasks. 1) Sentiment classification on aspect words by identifying implicit, explicit aspects but mainly focusing on co-referential aspect words or synonymous aspect words, 2) The aspects will now be categorized into statements of positive or negative allover value by Naïve Bayes algorithms. In the first process tokenization of words and terms are done by POS taggers that detect, filter and tag words or phrases appropriately into either sentiment words or aspects.

II. LITERATURE SURVEY

[1] Presents a novel execution of a programmed labelling procedure, arranged to well-being related Twitter comment for three dialects: English, French, and Arabic. In this way, Sentiment analysis is done. The introduced strategy depends on information pre-processing, taking into account programmed tweets explanation dependent on area information, Natural Language Processing (NLP), and feeling vocabulary word references. To lead the analyses, Deep Learning strategy for assessment forecast has been utilized. Specifically, execution of a Convolutional Neural Network (CNN), Re-current Neural Network (RNN), and Long Short-Term Memory (LSTM) has been finished.

[2] Is the base paper for this framework and focuses on tourist reviews from existing tourism related databases and sources like Trivago for users to know beforehand about tourist places. Sadly, a few surveys are irrelevant and become noisy information. Aspect based opinion classification strategies have shown guarantee in stifling the clamour. In any case, very little examination has been done on programmed viewpoint ID, and recognizable proof of verifiable, rare and co-referential angles, bringing about misclassifications. This paper presents a structure of angle-based conclusion characterization that won't just distinguish the viewpoints productively yet can perform arrangement task with high precision. The system has been executed as a versatile application that aids vacationers and the best café or lodging around there, and execution has been assessed by leading tests on real-world datasets with excellent results (85 percent identification and 90 percent classification).

In the current sentiment analysis studies, distributed word representation is generally used. But the problem is that the distributed word representation system only considers the semantic information of word, but tend to ignore the sentiment value of the word.

In [3], an advanced phrase portrayal approach is proposed, which coordinates the dedication of end records into the normal TF-IDF calculation and produces weighted phrase vectors. The weighted phrase vectors are contribution to bidirectional lengthy temporary memory (BiLSTM) to trap the placing records successfully, and consequently the observation vectors are higher addressed. The estimation propensity of the observation is gotten via way of means of feed ahead neural organisation classifier. Under comparable conditions, the proposed evaluation exam approach is contrasted and consequently the belief research techniques for RNN, CNN, LSTM, and NB. The trial outcomes display that the proposed estimation exam method has better accuracy, review, and F1 score. The approach is locating your self being compelling with excessive precision on remarks.

With the short improvement of the net business, supposition examination has developed into one in all the well-known spaces of common language preparing (NLP). Simultaneously, move learning has arisen as another AI method that uses this information to tackle diverse area issues and creates best at school expectation results. Numerous researchers apply move deciding a way to the sphere of the assessment investigation.

[4] Sums up the important exploration aftereffects of the estimation investigation lately and centres around the calculations and uses of move learning within the slant examination, and that we anticipate the advancement pattern of the conclusion investigation.

[5] This document provides a solution that does not require any additional hardware or human intervention other than AFC frameworks. It extends a probabilistic model that can assess how the travel streams to the various courses are delivered and prepared for the experimental exam. Compilation of the Shenzhen Metro Framework to validate the methodology used. The intended outcomes provide supportive data as we develop the model of choice for the traveller's journey.

[6] Known, unknown collections of information on a city scale (e.g. taxi appointments and GPS directions) provide information about the entire movement of the traffic base, but do not reveal any clear traffic communications (e.g. delays in taxi lines); while adaptive identification information that captures the distinctive individual activities related to driving but finds accuracy and performance from above.

[7] Continuing the latest advances in deep decision making to address these issues, propose a hierarchical collaborative deep learning framework with spatial awareness (SH-CDL) an increasingly aggregated substance mediating learning for individual inclinations that are spatial aware To combat the lack of data on the particular demonstration of the space-conscious customer, applying both the aggregated inclinations of the outdoors in a target district and the nearby inclinations of the customer in neighbouring territories is abused as friendly and spatial regularisation. We combine a late component-mix approach in ours SH-CDL system to address the heterogeneous properties of several POI measures. The evaluation of the sweep test shows that our proposed model, especially in situations outside the city and with cold start ideas, outperforms the current idea models.

[8] The worldview of imaginative administrations has changed with the GPS revolution and better approaches to organizing metropolises. In this way, the abundance of GPS tracking has enabled better approaches to running the taxi business. To increase the likelihood of finding a customer with the shortest driving gap, these frameworks can suggest a number of procurement approaches. However, paying taxi drivers is clearly related to vigorous driving lessons. It is becoming increasingly important for taxi drivers to understand the 000 driving courses in order to minimize travel time before reaching a customer. Until the current end, we recommend that you regulate the rules for taxi drivers in a smart way. In the event that they are following the suggested courses to attract travelers, particularly to determine the potential benefits of driving on the road, we first model a net profit target strategy.

By properly scanning ideal candidate courses, we are building yet another recursion methodology obsessed with the extraordinary nature of web benefits work, rather than suggesting a bunch of procurement approaches and asking the driving force to find a way to get there. Our proposal framework is designed to convey a comprehensive driving style so that drivers can find a customer with the most effective potential benefit by following the suggestions. Finally, we carry out selective observations on a collection of real information obtained in the port of Bay Area and thus the exploratory results clearly show the appropriateness of the proposed framework.

[9] The referral structure is one of the most popular items in information mining that continues to generate excitement in both the academic community and industry. Among them, the guide for POI (Focal Point) is extremely practical, but it proves: It brings the 2 clients and organizations a considerable benefit, taking all aspects into account, but is problematic due to the scarcity of data and the different configuration. While various calculations attempt to ensure accurate information and problem settings for the difficulty level w., They also bomb as circumstances change. Now propose to put together a general framework and principles for SSL (semi-directed learning), to reduce data scarcity by smoothing between neighbouring clients and POIs and also to deal with different environments by regulating the inclination of the owned client with fixed graphics.

III. PROPOSED METHODOLOGY

Data collection – Data sets were created from online user input reviews about tourist places and/or hotels from user inputs. The training data set was taken from Trivago website containing online reviews to train the classifiers. Different types of algorithms from different algorithm families were applied to evaluate the effect of many varied factors like size of data set, size of feature, features number and types of features on the performance metrics of the proposed methodology framework. Naïve Bayes Multinomial was replaced by Naïve Bayes to check the effect on lesser data. Five machine learning algorithms have been compared with implemented Naïve Bayes. These are, 1. Naïve Bayes Multinomial, 2. SVM, 3. Decision Tree, 4. J48, 5. Random Forest. Equivalent number of positive and negative opinions are gathered for training the model.

Data Preprocessing – Extraction of sentences and then phrasing takes place followed by tokenization of words from the phrases by applying POS tagger. We used Stanford POS tagger. Any other could have been chosen according to one's discretion. Then identification of sentiment words and aspect words is done using Natural Language Processing techniques.

Data Classification – The sentiment words are checked and compared based on the aspect words by well-trained Naïve Bayes algorithm. Then classification takes place by weighing the score of sentiment words from SentiWordNet. Then the Naïve Bayes classification algorithm works on the sentiment words to categorize them into positive negative and neutral reviews.

IV. ARCHITECTURE

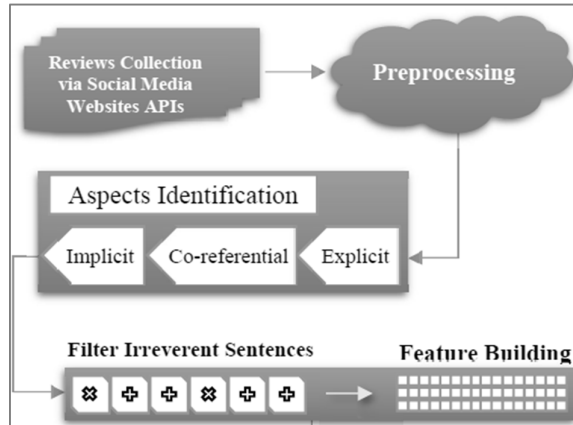


Fig. 1- Architecture of Data Processing System

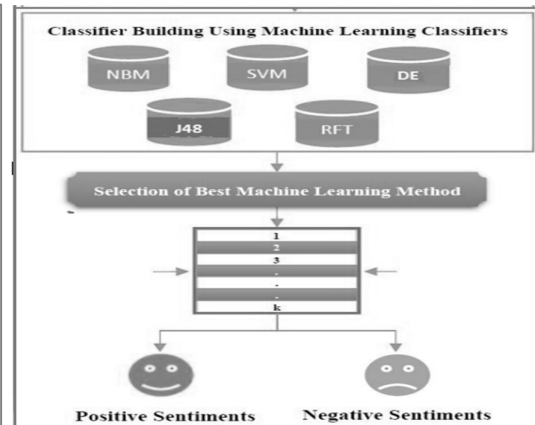


Fig 2: Sentiment Analysis System Architecture

V. EVALUATION METHODOLOGY AND METRICS

- We have used user input reviews in place of existing data set. The results were found to be varying.
- We have used confusion matrix for evaluating our classification algorithms.
- We have used True positive, False positive, True negative and False negative values for evaluation
- The performance of the classification methods can be found out by using some of the following parameters.
- Recall --- Out of the actual total positive classes, the amount we could predict correctly. $\text{Recall} = \frac{\text{True Positive}}{(\text{True Positive} + \text{False Negative})}$.
- Precision --- Out of all the positive classes that we have predicted, the amount that are actually correct. $\text{Precision} = \frac{\text{True Positive}}{(\text{True Positive} + \text{False Positive})}$.
- F-Measure --- F-Measure is a derivative from the combinative measure for precision and recall. $\text{F-Measure} = \frac{2 * \text{Precision} * \text{Recall}}{(\text{Precision} + \text{Recall})}$.
- Both Recall and Precision has to be higher for a good classification algorithm.
- Accuracy --- Out of all the classes, the amount that we could predict correctly. $\frac{(\text{True positive} + \text{True negative})}{\text{Total}}$

VI. RESULTS AND DISCUSSIONS

The results we have found out indicates at Naïve Bayes algorithms family providing the optimal result in this case considering all factors from accuracy to complexity and scalability and time etc. Naïve Bayes algorithm has been applied on both large and small data sets. For large data sets Naïve Bayes Multinomial works best followed by SVM. We have changed the Naïve Bayes Multinomial to simple Naïve Bayes which has given better results that both Naïve Bayes Multinomial and SVM on smaller data sets like individual restaurant and hotel reviews. For bigger data sets though simple Naïve Bayes has been found to give average to fair results.

TABLE -1: ALGORITHM ACCURACY COMPARISON FOR SMALL DATASET

Algorithms		Accuracy Percentage	
1	Naïve Bayes	82	
2	Decision Tree	80	
3	J48	76	
4	SVM	80	
5	Random Forest	76.4	

VII. CONCLUSION LIMITATIONS AND FUTURE WORK

It is an interactive platform where inputs for reviews are asked from experienced users so that these may aid future tourists to help decide about a place or service. On a more extensive note, the proposed system exhibits the plausibility of perceiving and examining various gatherings of public suburbanites, like sightseers, business explorers, neighborhood residents, or even unfamiliar specialists. We accept that numerous different experiences of functional premium (e.g., the diverse travel requests and practices among vacationers and business explorers) can be researched utilizing the proposed system.

Observations

- Classifiers that give excellent results on a particular size of dataset may not be as accurate on another dataset size.
- Classifier can't accurately classify single word reviews.
- Naïve Bayes work best on smaller datasets whereas Naïve Bayes Multinomial works best on larger datasets with discrete features like word count.
- The accuracy of the system increases exponentially as the data set increases.

Limitations

- We have focused on the dataset size dependent accuracy
- Method cannot classify single word reviews accurately
- Method can't classify properly positive adjectives with negation prefix and vice versa

Future Work

Thus, our future work would be to extend the framework to more accurate results in the above cases.

REFERENCES

- [1] Asma Baccouche, Begonya Garcia-Zapirain, Adel Elmaghraby, Annotation Technique for Health-Related Tweets Sentiment Analysis. Computer Engineering and Computer Science University of Louisville, Louisville, KY, USA eVida Lab, University of Deusto, Bilbao, Spain, ES. IEEE 2018
- [2] Muhammad Afzaal, Muhammad Usman, Alvis Fong, Tourism Mobile App with Aspect-Based Sentiment Classification Framework for Tourist Reviews, IEEE Transactions on Consumer Electronics Vol: 65 , May 2019
- [3] GUIXIAN XU, YUETING MENG, XIAOYU QIU, ZIHENG YU, AND XU WU, "Sentiment Analysis of Comment Texts Based on BiLSTM IEEE Access Vol 7, 2019.
- [4] RUIJUN LIU, YUQIAN SHI, CHANGJIANG JI, AND MING JIA, A Survey of Sentiment Analysis Based on Transfer Learning. IEEE Access Vol 7, 2019.
- [5] Juanjuan Zhao, Fan Zhang, Lai Tu, Chengzhong Xu, Dayong Shen: Estimation of Passenger Route Choice Pattern Using Smart Card Data for Complex Metro Systems.
- [6] Yu Lu, Archan Misra, Wen Sun, and Huayu Wu: Smartphone Sensing Meets Transport Data: A Collaborative Framework for Transportation Service Analytics.
- [7] Hongzhi Yin, Weiqing Wang, Hao Wang, Ling Chen and Xiaofang Zhou: Spatial-Aware Hierarchical Collaborative Deep Learning for POI Recommendation
- [8] Meng Qu, Hengshu Zhu, Junming Liu : A Cost-Effective Recommender System for Taxi Drivers.
- [9] Carl Yang, Lanxiao Bai, Chao Zhang, .an Yuan: Bridging Collaborative Filtering and Semi-Supervised Learning: A Neural Approach for POI Recommendation.