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CALL CENTER SENTIMENT ANALYSIS

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ABSTRACT

Call centers are service centers that act as a bridge between enterprise and customers. Importance is being given to customer satisfaction and also to performance of call center agents. However, few researches are being done by taking both the customers and the call center agents as the end users. A system performing aspect-based sentiment analysis is being designed and implemented. The proposed system incorporates audio to text conversion, sentiment analysis and a separate customer-login module. It is able to represent sentiments of customers regarding any particular aspect using joint bar graphs.

Keywords— Call center, customer satisfaction, Sentiment Analysis, Machine Learning, Audio to Text Conversion.

INTRODUCTION

"We live LESS in real and MORE in virtual, this statement is turning out to be a reality with the rapid development of the Internet and Social media platforms and the ultimate increase in the number of social media users. This research work presents a web application that is created to solve the problem of losing valuable information from all the calls at the call center using aspect-based sentiment analysis on call center data. Sentiment analysis is also called as opinion mining, which makes system to gather opinion about product by obtaining important information from review it helps user while buying any product, and also helps best product between two. Many different techniques or approaches have been presented for analysis of sentiments in product reviews. Some of the methods are discussed in this paper. These approaches are basically categorised into machine learning based approaches. Approaches based on machine learning include some supervised and unsupervised classification algorithms. Classification lies at the heart of both human intelligence and machine intelligence. With the rapid growth of call center data, there are more valuable information of the customers' opinions derived from the call center. Analysing the opinions effectively could help the enterprises to improve the customer satisfaction and loyalty [1]. There have been many researches about customer satisfaction, but as far as we know, few researches actually analyse the call center data from the mining standpoint like detecting the sentiments or the intention of the caller, etc. We are making use of Naive Bayes classifier, which is a popular method for text categorization. The Bayesian Classification represents a supervised learning method for classification. The audio recordings are converted into text format using IBM Watson Speech API. Text is further pre-processed over which sentiment analysis is performed using Naive Bayes classifier. The results of aspect-based sentiment analysis showing whether customer is satisfied with the service or not in the form of bar graphs representing positive and negative sentiments. In this research work, we are creating a web application, targeting call center agents as well as the customers as our end user. Call center managers and agents would be able to effectively get all the important information just with the help of a click.

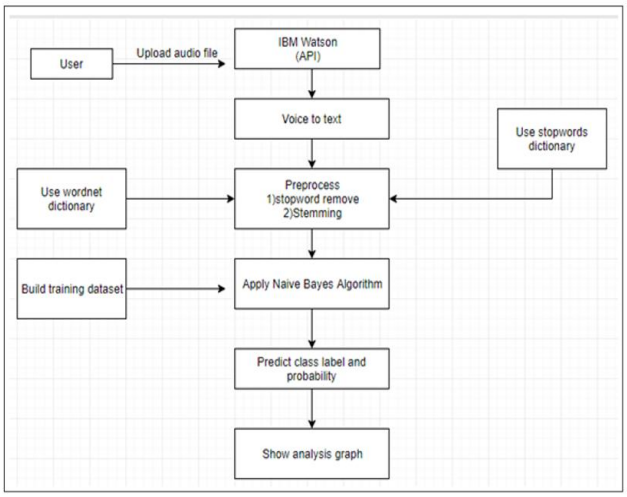


Fig.1. System Architecture

RELATED WORK

Sentiment Analysis aims to determine the attitude of a speaker whether the customer is satisfied with the service and whether the service works with negative emotions [1].

Sentence Compression attempts to remove the unnecessary information for sentiment analysis [2]. Toolkit facilitates sentiment analysis for extracting the positive, negative and neutral aspects of the tweets [3]. Naive Bayesian Classifier is used to set label to text data [8]. Speech Recognition technology is used for generating texts and analyzing them using different text mining technologies [9]. Audio calls are converted into text files over which Naive Bayes classifier algorithm is implemented.

System consists of one more module which generates suggestions based on top features selected by customer. The frequencies of words in the feeling index occurring in the calls to and responses from the call center were assessed both before and after the instructions about the method were given [6].

Call Center conversations would be ranked automatically on the basis of the extent of anger each conversation contains in order to classify if the speech contains anger or not [7]. Stanford -corenlp API can also be used as sentiment analyser to analyze text for sentiment [11]

THE PROPOSED METHOD

In our proposed system there will be mainly two phase. Pre-processing, feature extraction, classification phases and suggestion phase.

- First user provides audio file as an input to the application
- The audio recordings are converted into text format using IBM Watson Speech API.
- The next phase is pre-processing in which stop words are removed and stemming is performed.
- Sentiments in the form if features are then extracted in the next phase.
- The extracted features then classified using Naive Bayes algorithm.

In the suggestion phase, user can select 2 features of top most priority according to which the user would get the appropriate suggestion.

METHODOLOGY

We propose the above methodology for solving the problem. First we perform voice to text conversion which includes removal of slang, removal of stop words, fetch text doc and word stemming. Once we are done with pre-processing, then perform aspect-based sentiment analysis on the pre-processed text. Then we use Naïve Bayes classification algorithms to display joint bar graphs.

Naive Bayes

It is a classification technique based on Bayes Theorem. Naive Bayes classifier assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature. It is easy to predict class of test data set.

$$P(c \mid x) = P(x \mid c)\, P(c) / P(x) \qquad (2)$$

P(c | x) = posterior probability of the target class

P(c) = prior probability of class

P (x | c) = likelihood which is the probability of predicator class

P(x) = prior probability of predicator

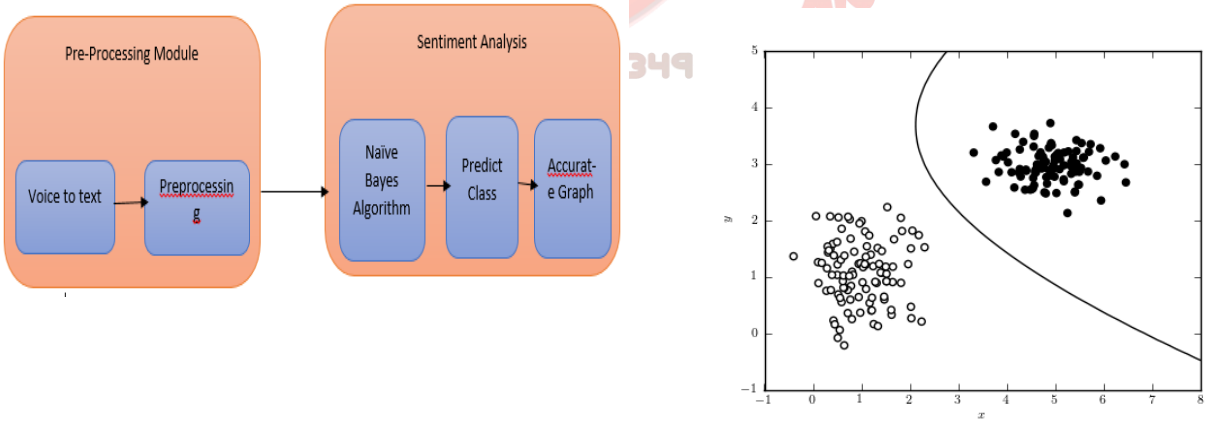


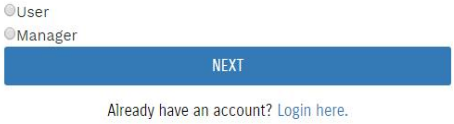
Fig. 3. Naive Bayes

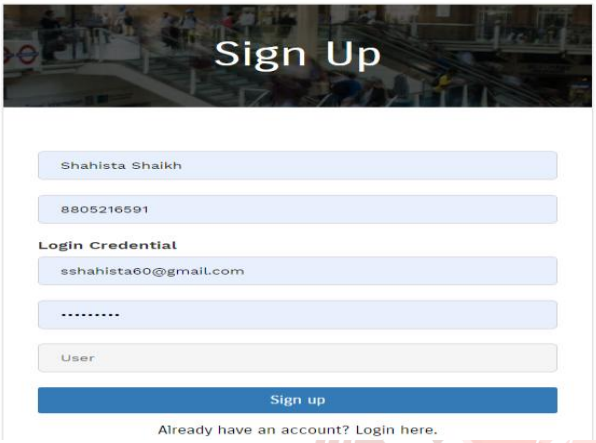
STS(Spring Tool Suite)

STS provides a customized all-in-one Eclipse based distribution that makes development of application convenient. The tool provides ready-to-use combinations of language support, also supports framework as well as runtime, and hence combine them with the existing Java, Web and Java EE tools from Eclipse. STS-Tool is the modelling and analysis support tool and is freely available for download for multiple operative systems.

RESULTS AND ANALYSIS

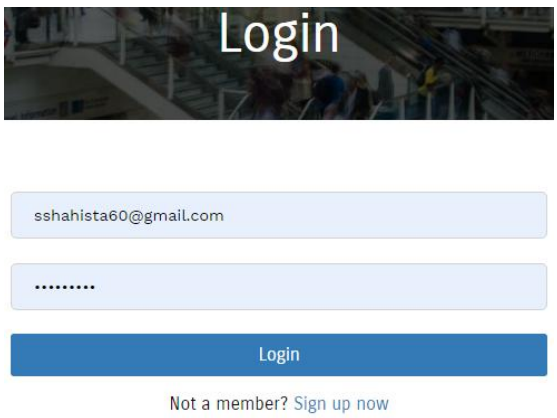
Select user





Signup

Login



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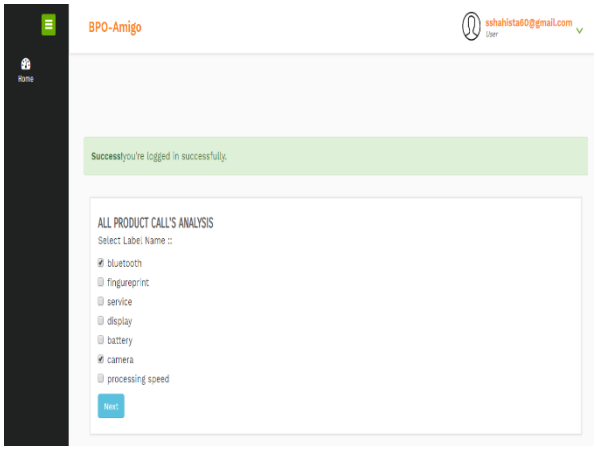
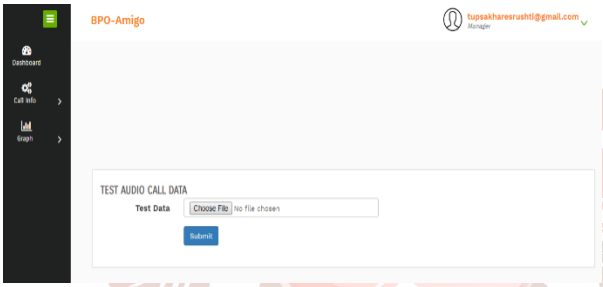
Select Aspects





Browse Data

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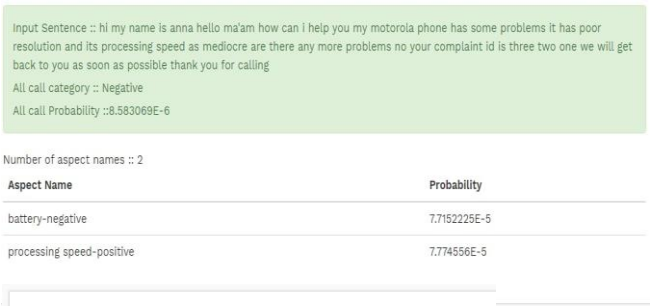
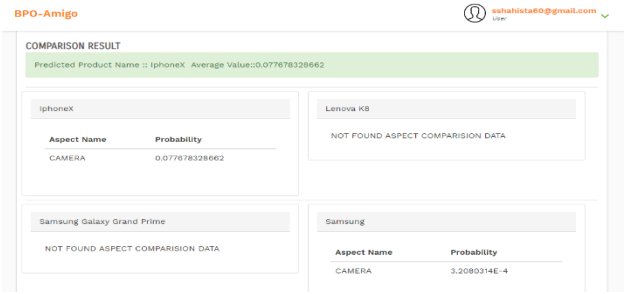
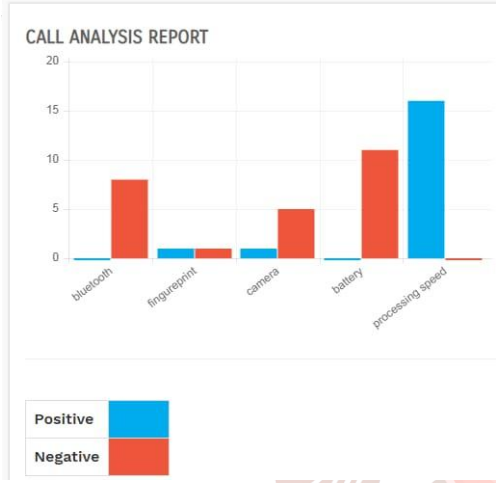
Product Name	Aspect Name	Probability
iPhone X	Camera	0.077678328662
iPhone X	Battery	0.012283805
Samsung	Fingerprint	0.014473745
Samsung	Camera	3.2080314E-4
Samsung Galaxy Grand Prime	Service	0.00517137
Samsung Galaxy Grand Prime	Processing Speed	5.0788767E-6

Chart







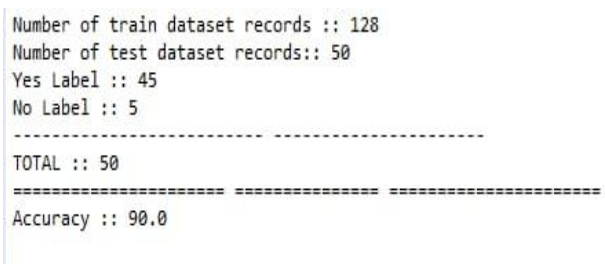
Positive-Negative

Analysis Graph

Accuracy of Project

CONCLUSION

Call analysis done precisely: All the call recordings are analysed properly. Issues of customers seen at a glance: The output is in visualized in a graphical form, therefore issues are addressed at a glance. Saves call center agents time: All call recordings can be converted into its equivalent text form very quickly and classified automatically which saves a lot of time. Valuable data for companies not missed: Since all call recordings are converted and analysed, no information is missed. The audio recordings are converted into text format using IBM Watson Speech API. The results of aspect-based sentiment analysis performed would be displayed using joint bar graphs. Positive and negative bars will be two types which will be shown. Future Scope can be that in the future, proposed system would taken into consideration different languages and not just English.



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