

# REVIEW PAPER ON 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.

**Index Terms-** Call center, customer satisfaction, Sentiment Analysis, Machine Learning, Audio to Text Conversion.

## I. INTRODUCTION

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. 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. Analyzing 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 analyze 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 preprocessed 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.

## II. LITERATURE SURVEY

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 analyzer to analyze text for sentiment [11].

## III. RESEARCH METHODOLOGY

### Naive based classifier is used for text categorization

Naive Bayes classifiers are a collection of classification algorithms based on Bayes' Theorem. Naive Bayes classification algorithm, which is a supervised learning algorithm. It is a family of algorithms where all of them share a common principle, i.e. every pair of features being classified is independent of each other. Naive Bayes classification algorithm is simple to implement.

Bayes' theorem is stated mathematically as the following equation:

$$P(A|B) = \frac{P(B|A) P(A)}{P(B)}$$

### STS (Spring Tool Suit)

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. Spring Tool Suite STS provides a customized all-in-one Eclipse based distribution making 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.

## IV. PROPOSED SYSTEM

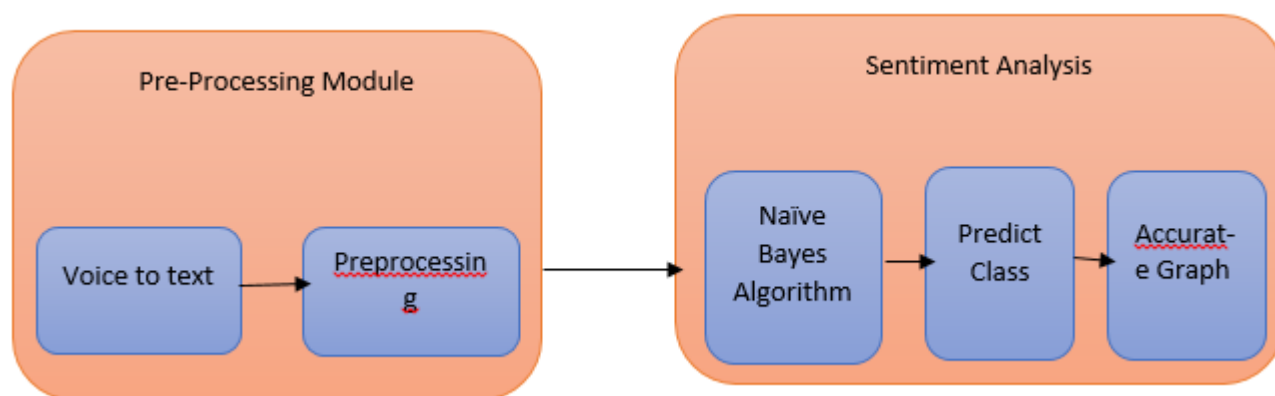


fig. 4.1: Call Center Sentiment Analysis Architecture

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 preprocessing in which stop words are removed and stemming is performed.
- Sentiments in the form of 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.

## V. CONCLUSION

Call analysis done precisely: All the call recordings are analyzed 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 analyzed, 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 take into consideration different languages and not just English. Aspects regarding all the attributes are then mapped and classified under positive or negative class label.

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