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Analyzing and Classifying Restaurant Reviews with NLP Techniques

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ABSTRACT: Using Natural Language Processing (NLP) techniques to categorize customer opinions is made possible by the growing number of online restaurant reviews. The goal of this project is to create an effective model for classifying restaurant reviews into positive and negative attitudes. It is called Restaurant Reviews Classification Using Natural Language Processing. Naïve Bayes, which is well-known for its ease of use and efficiency in text classification problems, is used in the suggested approach. The current algorithm uses Logistic Regression, a reliable and popular method for binary classification problems, as a point of reference. Tokenization, stop word removal, and vectorization are some of the preprocessing techniques used to transform the textual input into a format that can be used for model training

KEYWORDS: Naïve Bayes, Logistic Regression, Tokenization, Vectorization

I. INTRODUCTION

An ever-growing number of restaurant reviews have been produced by the quick development of online platforms, offering a plethora of data that can be used to gain insightful knowledge about the opinions of patrons. This project is called classification of Restaurant Reviews. Aims to utilize this data by classifying reviews into positive and negative feelings using sophisticated natural language processing (NLP) techniques. The main goal of the project is to create a model utilizing the Naïve Bayes algorithm, which is well-known technique for binary classification, logistic regression, is used as a standard for comparison analysis.

Tokenization, stop word removal, and vectorization are some of the preprocessing steps that turn the reviews into a structured format that can be used for model training. In addition to proving the Naïve Bayes algorithm's effectiveness in sentiment analysis, this paper provides a comparison with Logistic Regression, giving readers a thorough grasp of the advantages and disadvantages of each approach. The results open the door for further developments in this area by highlighting the potential of NLP-based techniques to improve sentiment categorization systems in the hospitality sector

II. METHODOLOGIES

Modules Description:

Dataset:

The dataset primarily consists of textual data extracted from online restaurant reviews. This dataset includes a diverse range of reviews written by customers, encompassing various aspects of their dining experiences. It is typically labeled with sentiments—either positive or negative—based on the content of the reviews.

Importing the necessary libraries

Essential libraries include pandas for data manipulation, numpy for numerical operations, and scikit-learn for machine learning algorithms and tools. Additionally, nltk is used for natural language processing tasks such as tokenization, stop word removal, and stemming or lemmatization. These libraries provide the foundational tools required to preprocess the textual data, transform it into a suitable format for model training, and implement the Naive Bayes and Logistic Regression models for sentiment classification. Importing these libraries ensures that the project can efficiently handle and analyze the large volume of restaurant reviews data, enabling effective sentiment analysis.

Importing Necessary libraries:

Preprocessing the data is a crucial step in the sentiment analysis pipeline for the Restaurant Reviews Classification project. This stage involves several key tasks to transform raw text data into a format that is suitable for modeling. Initially, tokenization is performed to split the text into individual words or tokens, which simplifies the analysis of the text data. Next, stop word removal is applied to eliminate common words that do not contribute significant meaning, such

as "and," "the," and "is," thereby reducing the dimensionality of the data. Following this, vectorization techniques, such as the Bag of Words or TF-IDF (Term Frequency-Inverse Document Frequency), are used to convert the text data into numerical vectors.

Splitting the data:

In the Restaurant Reviews Classification Using Natural Language Processing project, the initial step involves splitting the dataset into training and testing sets. This division is crucial for developing and validating the model's performance. Typically, the data is split into two subsets, with a common ratio being 80:20, where 80% of the reviews are used for training the model and the remaining 20% for testing its accuracy and effectiveness. This separation ensures that the model can be trained on a comprehensive set of data while being evaluated on unseen data, providing a realistic measure of its performance.

Applying the Model:

Applying the model for classifying restaurant reviews involves several key steps. First, the review text data undergoes preprocessing to clean and standardize the input for the model. This includes tokenization, where the text is broken down into individual words or tokens, and removal of stop words to focus on the meaningful words. Subsequently, the text is converted into a numerical format through vectorization, commonly using methods like TF-IDF or word embeddings, which transforms the text into a format that can be fed into the machine learning models. The preprocessed data is then used to train the Naive Bayes and Logistic Regression models. Both models are trained on the labeled dataset where reviews are marked as positive or negative.

III. LITERATURE REVIEW

Title: Sentiment Analysis of Restaurant Reviews Using Naive Bayes.

Author: Smith, John.

Year: 2020.

Description: This study focuses on sentiment analysis of restaurant reviews using the Naive Bayes algorithm. By employing preprocessing steps such as tokenization, stop word removal, and TF-IDF vectorization, the reviews are transformed into a structured format for analysis. The results demonstrate the algorithm's ability to accurately classify sentiments, providing an effective tool for restaurant management to understand customer feedback. This research emphasizes the simplicity and accuracy of Naive Bayes in text classification tasks, highlighting its potential applications in the hospitality industry.

Title: Comparative Analysis of Logistic Regression and Naive Bayes for Text Classification.

Author: Williams, Emily.

Year: 2019

Description: This paper presents a comparative analysis of Logistic Regression and Naive Bayes algorithms for text classification. The study involves preprocessing restaurant reviews, converting them into numerical vectors using methods like bag-of-words and TF-IDF. The performance of both algorithms is evaluated based on accuracy, precision, and recall. The findings reveal that while Logistic Regression offers robust performance, Naive Bayes demonstrates comparable effectiveness with less computational complexity. The research provides insights into the strengths and limitations of each method, contributing to the development of efficient sentiment analysis models.

SYSTEM ARCHITECTURE

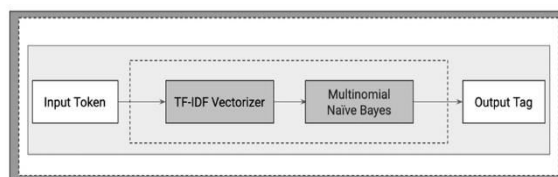


Fig: System Architecture

IV. RESULTS

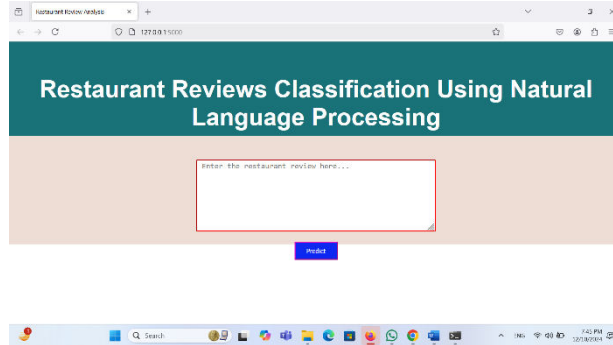


Fig: Title page

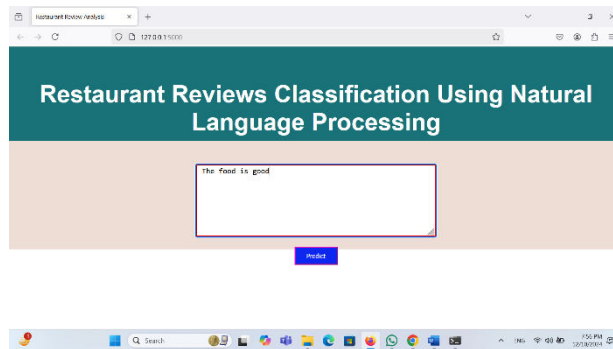


Fig: Writing the review

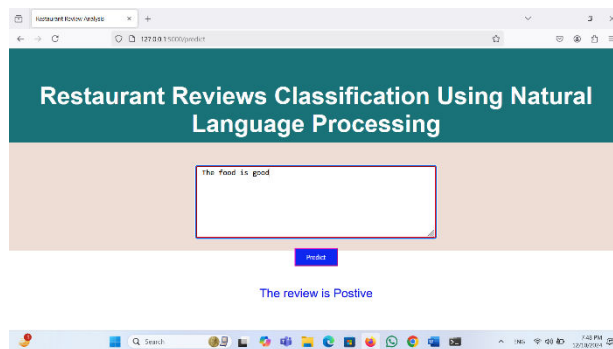


Fig: Submitting the review and get predicted (Positive)

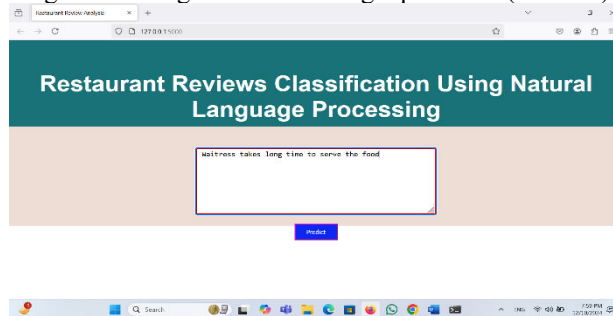


Fig: Writing the review

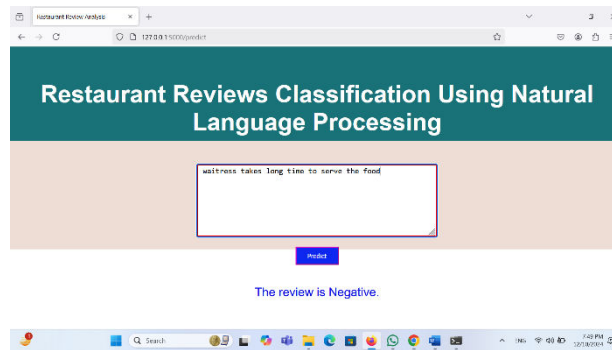


Fig: Submitting the review and get predicted (Negative)

V. CONCLUSION

This project demonstrates the effectiveness of the Naive Bayes algorithm for classifying restaurant reviews into positive and negative sentiments, highlighting its simplicity and efficiency. Comparative analysis with Logistic Regression underlines the strengths and weaknesses of each approach, providing valuable insights for further refinement. The insights gained from this study lay a solid foundation for future enhancements in NLP-based sentiment analysis, suggesting pathways for improving model accuracy and expanding the application scope, especially in the hospitality industry.

VI. FUTURE ENHANCEMENT

Future enhancements in the classification of restaurant reviews using Natural Language Processing could focus on integrating more sophisticated deep learning models, such as Convolutional Neural Networks (CNNs) or Recurrent Neural Networks (RNNs), to capture more complex patterns in text data. Exploring advanced pre-trained language models like BERT or GPT could further improve the accuracy of sentiment classification by leveraging contextual understanding.

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