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Analyzing Customer Feedback using NLP

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Abstract: Customer feedback analysis plays a crucial role in helping organizations improve their products and services. Using Natural Language Processing (NLP) techniques, this project converts unstructured customer feedback into meaningful insights. The analysis utilizes tools such as NLTK, along with models like Bag of Words (BoW) and advanced deep learning frameworks such as Transformers. The process starts with data preprocessing steps like tokenization, removal of stop words, and lemmatization, efficiently handled by the NLTK library. The Bag of Words model transforms text into numerical data for sentiment classification and topic identification, though it lacks the ability to grasp context. To overcome this, Transformers are employed, offering contextual understanding and accurate sentiment detection. By combining traditional methods like BoW with the sophisticated capabilities of Transformers, this project ensures precise and scalable analysis of customer feedback. This integration enables companies to address user concerns promptly and enhance customer satisfaction.

Keywords: Automated Review System, Semantic Analysis, Natural Language Processing (NLP), NLTK (Natural Language Toolkit), Bag of Words (BoW), Transformers, Tokenization

I. INTRODUCTION

In the digital era, customer reviews significantly influence consumer decisions and business strategies. Manual analysis of large volumes of reviews is inefficient, making automated sentiment analysis essential. This project aims to develop an automated sentiment analysis system to classify customer reviews as positive, negative, or neutral, integrating rule-based and deep learning- based Natural Language Processing (NLP) techniques for enhanced accuracy and contextual understanding.

The system processes user-input text through various NLP techniques, including tokenization, stop-word removal, stemming/lemmatization, and part-of-speech tagging. Sentiment analysis is performed using VADER (Valence Aware Dictionary and Sentiment Reasoner) and RoBERTa (Robustly Optimized BERT Pretraining Approach). VADER, a lexicon-based model, is efficient for short, informal text, while RoBERTa, a transformer-based model, excels in capturing nuanced sentiment in complex textual data. Data visualization tools like Seaborn and Matplotlib illustrate sentiment trends. The comparative analysis highlights that while VADER offers quick, interpretable results, RoBERTa provides superior contextual sentiment detection. This system benefits various domains such as e-commerce, customer feedback monitoring, and brand reputation management by providing actionable insights and improving decision-making.

II. METHODOLOGY

This project adopts a structured research methodology integrating traditional and advanced NLP techniques. Amazon reviews serve as the primary dataset, undergoing preprocessing steps such as tokenization, stop- word removal, stemming/lemmatization, and POS tagging for effective analysis. Sentiment classification employs rule-based (VADER) and deep learning-based (RoBERTa) approaches.

VADER assigns polarity scores using a predefined lexicon, while RoBERTa, trained on large datasets, offers nuanced sentiment classification.User input is processed through both models, with sentiment scores compared for effectiveness. Data visualization presents sentiment trends, and the evaluation compares predicted sentiment with actual review ratings using accuracy, precision, recall, and F1-score metrics. The study reveals that VADER is efficient for short texts but struggles with context-heavy content, while RoBERTa excels in complex text analysis, ensuring a comprehensive sentiment analysis framework for various applications.

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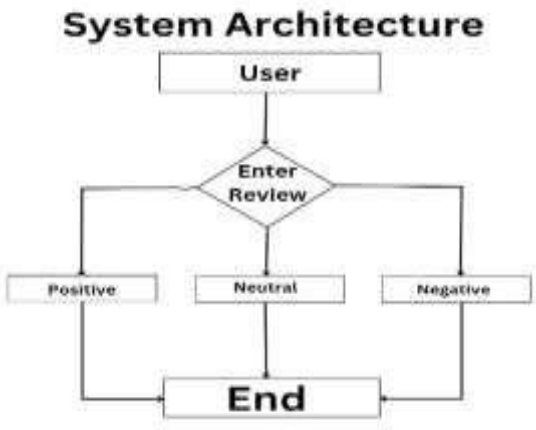

III. MODELING AND ANALYSIS

The accuracy of VADER and RoBERTa is evaluated by comparing predicted sentiment scores with actual review ratings. VADER is effective for short texts but less accurate for context-heavy content, while RoBERTa provides nuanced sentiment analysis in longer reviews. Accuracy metrics such as precision, recall, and F1-score are used for evaluation, highlighting RoBERTa's superior performance in complex sentiment classification.

IV. RESULTS AND DISCUSSION

The analysis will tells us that while VADER is effective for straightforward reviews, it struggles with context, whereas RoBERTa excels in sentiment detection. Sentiment trends align with review ratings, with RoBERTa providing balanced sentiment distribution. Combining both models enhances accuracy, making the system suitable for real-world applications like customer feedback monitoring and business intelligence.

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V. RESULTS

Our model receives the example review and uses Robertta and Vader sentiment scoring to determine whether our product is good, awful, or neutral.

Website Interface

- Our model takes the user's sample review from any e-commerce website as input .

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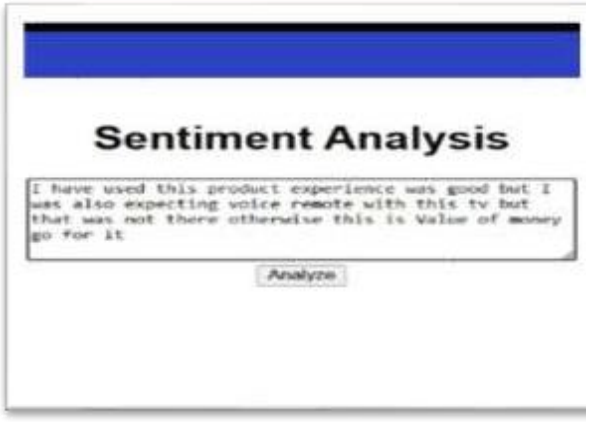

- The model will gives you all the positive,neutral and negative scores

VI. CONCLUSION

Sentiment analysis classifies text as positive, negative, or neutral by analyzing linguistic patterns and contextual meanings. VADER uses a predefined lexicon for quick sentiment detection, while RoBERTa leverages deep learning for nuanced classification. Integrating both models balances speed and accuracy, providing comprehensive sentiment analysis. Future work may include fine-tuning RoBERTa with domain-specific data and developing hybrid models for dynamic sentiment analysis.

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