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Research Paper

# CONVERASATIONAL AI FOR CUSTOMER FEEDBACK ANALYSIS

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## Abstract

Conversational Artificial Intelligence systems are designed to simulate human-like communication using Natural Language Processing and Machine Learning techniques. These systems enable computers to understand, interpret, and respond to human language in an intelligent and meaningful manner. This project focuses on developing a Conversational AI-based customer feedback analysis system that collects user feedback through an interactive chatbot interface and automatically analyzes customer opinions using AI technologies.

Traditional feedback collection methods such as forms, surveys, and manual interviews are often time-consuming and may not encourage detailed user responses. In contrast, conversational AI systems provide a more natural and interactive communication environment where users can share their opinions, experiences, and suggestions freely. This approach improves customer engagement and helps organizations gather more authentic and detailed feedback data.

The collected feedback is processed using various NLP techniques such as text preprocessing, tokenization, feature extraction, and sentiment analysis. The system classifies customer feedback into positive, negative, or neutral sentiments and identifies meaningful insights such as common customer complaints, frequently requested features, and areas requiring improvement. Machine learning models are used to analyze textual data accurately and generate real-time analytical results.

## I. Introduction

In today's digital era, customer feedback plays a vital role in improving business performance, customer satisfaction, and service quality. Organizations continuously seek efficient methods to collect and analyze customer opinions in order to understand user expectations and make better business decisions. Traditional feedback collection methods such as manual surveys, feedback forms, and review analysis are often time-consuming, less interactive, and difficult to manage when dealing with large volumes of data. These limitations create the need for intelligent and automated systems capable of processing customer interactions more effectively. Conversational Artificial Intelligence has emerged as a powerful solution for enabling automated and human-like communication between users and computer systems. Conversational AI systems use Natural Language Processing and Machine Learning techniques to

understand, interpret, and respond to human language naturally. These systems are commonly implemented through chatbots and virtual assistants that allow users to communicate in a conversational manner without requiring technical knowledge or complex interfaces.

The primary objective of this project is to develop a Conversational AI-based customer feedback analysis system that collects feedback through an interactive chatbot interface and automatically analyzes customer opinions. Unlike traditional methods, the chatbot enables users to provide detailed and natural responses, improving customer engagement and data quality. The collected feedback is processed using NLP techniques such as text preprocessing, tokenization, sentiment analysis, and feature extraction to identify emotions, opinions, and meaningful insights from unstructured textual data.

The system classifies customer feedback into categories such as positive, negative, or neutral sentiments and identifies common issues, suggestions, and customer expectations. Machine learning algorithms are used to improve the accuracy of sentiment prediction and analytical performance. By automating tasks such as data collection, sorting, and analysis, the system significantly reduces manual effort and improves operational efficiency.

Another important advantage of the proposed system is its ability to perform real-time analysis and handle large volumes of customer interactions efficiently. This enables organizations to respond quickly to customer concerns, improve services, and make data-driven decisions. The system is scalable and suitable for applications in e-commerce, customer support, healthcare, education, banking, and other industries where customer feedback is essential.

## II. Literature Survey

The fields of Conversational Artificial Intelligence and sentiment analysis have gained significant importance in recent years due to their wide range of applications in customer service, business intelligence, healthcare, e-commerce, and user interaction systems. Researchers have explored various methodologies and technologies to improve the ability of machines to understand and analyze human language effectively. Existing studies provide a strong foundation for developing intelligent customer feedback analysis systems using conversational AI and machine learning techniques.

Early research on chatbot systems explains that chatbots are intelligent applications developed to simulate human-like conversations using Natural Language Processing and Machine Learning algorithms. These systems are widely used to automate customer support, improve communication efficiency, and enhance user engagement. Traditional chatbot systems mainly relied on rule-based approaches where predefined responses were triggered based on keywords or patterns. Although these systems were simple to implement, they lacked contextual understanding and struggled to handle complex or unexpected user queries effectively.

Sentiment analysis, also known as opinion mining, has become an important component in analyzing customer feedback and textual data. Research studies show that sentiment analysis techniques are used to identify emotions, opinions, attitudes, and satisfaction levels expressed in customer reviews, surveys, and social media posts. Earlier sentiment analysis systems focused mainly on keyword matching and rule-based classification. However, advancements in AI and machine learning have enabled systems to understand semantic meaning, context, and emotional tone more accurately. These developments have made sentiment analysis highly useful for evaluating customer satisfaction, monitoring market trends, and supporting business decision-making.

Several literature surveys classify sentiment analysis techniques into rule-based, machine learning-based, and hybrid approaches. Traditional machine learning algorithms such as Naive Bayes, Support Vector Machines (SVM), and Logistic Regression have been widely used for sentiment classification tasks. These models improved classification accuracy compared to rule-based systems and were successfully applied in customer feedback systems, product review analysis, and social media monitoring. However, they often required manual feature extraction and large labeled datasets, increasing system complexity.

Recent research highlights the effectiveness of deep learning approaches such as Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), and Transformer-based models in sentiment analysis. These models can process sequential text data and understand contextual relationships between words more effectively than traditional methods. The integration of conversational AI with advanced sentiment analysis models has enabled the development of intelligent systems capable of collecting user feedback through chatbot interfaces and analyzing sentiments in real time.

Studies also emphasize the importance of handling large volumes of customer-generated data efficiently. With the rapid growth of digital platforms and online communication, organizations receive massive amounts of customer feedback daily. Automated sentiment analysis systems help businesses extract meaningful insights from this unstructured data quickly and accurately. These systems support faster decision-making, improved service quality, and enhanced customer experience.

In recent years, researchers have focused on combining conversational AI with sentiment analysis to create intelligent customer feedback systems. These systems allow users to communicate naturally with chatbots while simultaneously performing real-time sentiment analysis on collected responses. Such integration improves user interaction, increases customer engagement, and enables organizations to respond quickly to customer needs and concerns.

Despite these advancements, existing literature also identifies several challenges in conversational AI and sentiment analysis systems. Common challenges include language ambiguity, sarcasm detection, domain dependency, multilingual support, and the requirement for high-quality training datasets. Handling informal language, mixed emotions, and context-dependent expressions also remains difficult for many existing systems. Addressing these limitations continues to be an important research area in AI and NLP.

Overall, the literature survey demonstrates that integrating conversational AI with sentiment analysis provides an effective approach for automating customer feedback analysis. The existing research supports the development of intelligent, scalable, and real-time systems capable of improving operational efficiency, customer satisfaction, and data-driven business decision-making.

### III. System Analysis

The Conversational AI for Customer Feedback Analysis system is designed to automate the collection and analysis of customer feedback using intelligent chatbot technology and sentiment analysis techniques. The system combines Conversational Artificial Intelligence, Natural Language Processing, and Machine Learning algorithms to provide real-time interaction and feedback evaluation. The primary objective of the system is to enable businesses to collect customer opinions efficiently and analyze sentiments automatically without requiring manual processing. Traditional feedback collection methods are often slow, less interactive, and difficult to scale for large organizations. The proposed system overcomes these limitations by providing a chatbot interface that allows users to communicate naturally and conveniently. Customer responses are processed using NLP techniques such as text preprocessing, tokenization, feature extraction, and sentiment classification. The system identifies positive, negative, and neutral sentiments while extracting meaningful insights from user feedback. Real-time processing improves decision-making speed and operational efficiency. The system also helps businesses identify common customer concerns, service issues, and improvement opportunities. Performance evaluation metrics such as accuracy, precision, recall, and F1-score are used to measure system effectiveness. Overall, the system provides an intelligent, scalable, and automated solution for customer feedback management and analysis.

#### Existing System

Traditional customer feedback systems mainly rely on manual surveys, forms, email responses, and review analysis to collect customer opinions. These methods often require significant human effort for data collection, sorting, and interpretation. Existing systems are generally time-consuming and may fail to encourage detailed customer responses due to limited interaction and poor user engagement. Earlier chatbot systems were mainly rule-based and depended on predefined responses triggered by keywords or simple patterns. These systems lacked contextual understanding and could not handle complex or unexpected customer queries effectively. Traditional sentiment analysis methods used basic machine learning algorithms such as Naive Bayes and Support Vector Machines, which focused mainly on keyword matching rather than semantic understanding. As a result, existing systems often failed to interpret sarcasm, emotional tone, and contextual meaning accurately. Many traditional systems also struggled with processing large volumes of unstructured textual data efficiently. Manual feature engineering and labeled dataset preparation further increased implementation complexity. Existing feedback systems lacked real-time analytical capabilities and scalability for modern business environments. These limitations reduced accuracy, operational efficiency, and customer satisfaction in feedback analysis processes.

## Disadvantages of Existing System

- Requires extensive manual effort for feedback analysis
- Limited interaction and customer engagement
- Inaccurate understanding of context and semantics
- Difficulty in detecting sarcasm and emotional tone
- Slow processing and delayed decision-making
- Rule-based chatbots cannot handle complex queries
- Poor scalability for large datasets
- Requires manual feature engineering
- Limited real-time analysis capabilities
- Reduced accuracy in sentiment classification

## Proposed System

The proposed Conversational AI for Customer Feedback Analysis system introduces an intelligent chatbot-based platform that automates customer feedback collection and sentiment analysis. The system uses advanced NLP and Machine Learning techniques to understand customer responses and analyze sentiments accurately. Users interact with the chatbot naturally through conversational interfaces, improving engagement and response quality. The collected feedback undergoes preprocessing operations such as text cleaning, tokenization, normalization, and feature extraction to prepare data for analysis. Machine learning and deep learning models classify customer feedback into positive, negative, and neutral sentiment categories. The system can also identify frequently mentioned issues, customer expectations, and service improvement suggestions. Unlike traditional methods, the proposed system performs real-time sentiment analysis, allowing businesses to respond quickly to customer concerns. The chatbot can handle multiple user interactions simultaneously, making the system scalable and efficient for large-scale applications. Automated feedback processing reduces manual workload and improves operational efficiency significantly. The system also provides analytical reports, visualizations, and dashboards for business intelligence and decision-making purposes. The proposed solution can be applied in industries such as e-commerce, healthcare, banking, education, and customer support services. Overall, the system demonstrates the effectiveness of conversational AI in improving customer feedback management and organizational decision-making.

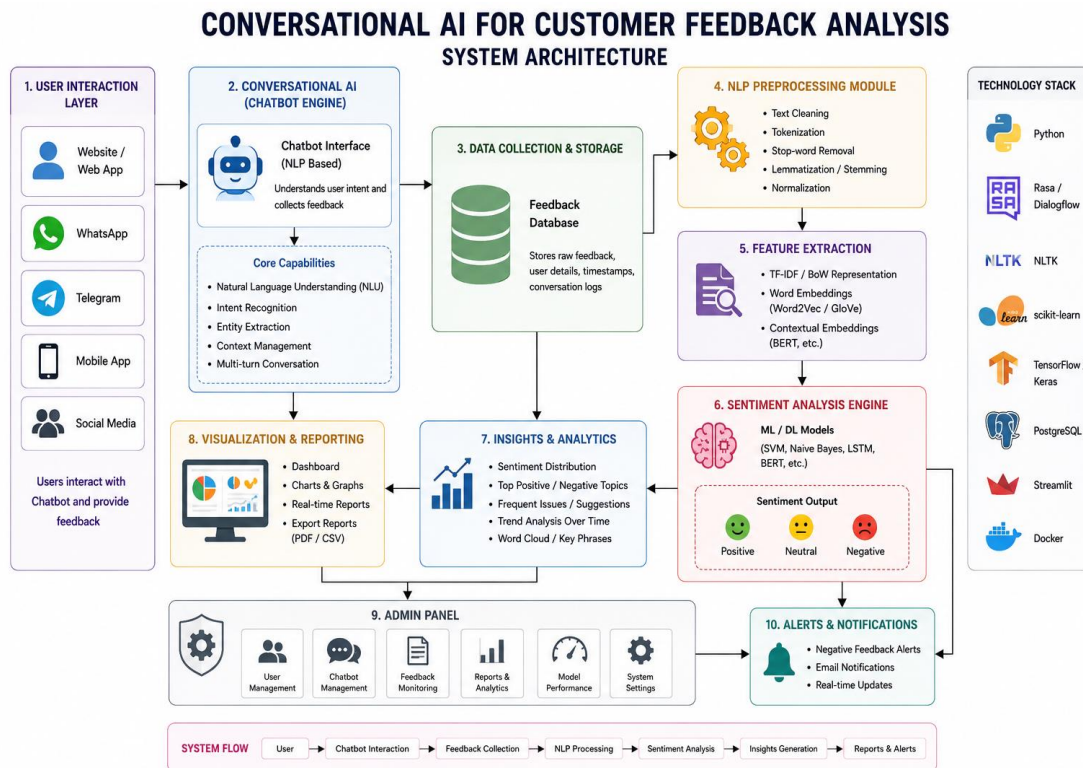
## Advantages of Proposed System

- Provides automated customer feedback analysis
- Supports real-time sentiment classification
- Improves customer interaction and engagement
- Reduces manual effort and operational cost
- Accurately understands context and emotional tone
- Scalable for handling large volumes of feedback
- Faster response and decision-making process
- Generates analytical reports and business insights
- Improves customer satisfaction and service quality
- Suitable for multiple business domains

### IV. Methodology

The methodology of the proposed system begins with collecting customer feedback through an interactive chatbot interface. Users communicate naturally with the chatbot, and the responses are stored for processing and analysis. The collected text data undergoes preprocessing operations such as text cleaning, tokenization, stop-word removal, normalization, and stemming to improve data quality. After preprocessing, feature extraction techniques convert textual information into numerical representations suitable for machine learning models. The processed data is then analyzed using NLP-based sentiment classification models trained on customer feedback datasets. Machine learning or deep learning algorithms classify the feedback into positive, negative, or neutral sentiments. The system also extracts important keywords, customer concerns, and frequently mentioned topics from the feedback. Real-time processing enables instant analysis and quick response generation for business applications. The analyzed results are stored in a database and displayed using dashboards, charts, and reports for management analysis. Performance evaluation is carried out using metrics such as accuracy, precision, recall, and F1-score. The implementation uses Python programming language along with NLP and machine learning libraries such as NLTK, TensorFlow, and Scikit-learn. This methodology ensures efficient, accurate, and scalable customer feedback analysis using conversational AI technologies.

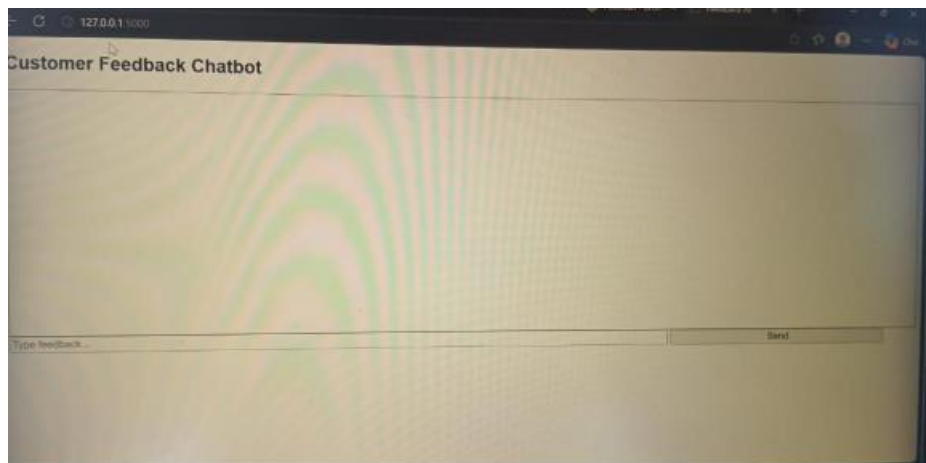
### System Architecture



The system architecture of the Conversational AI for Customer Feedback Analysis system consists of multiple interconnected modules that work together to provide

automated sentiment analysis and intelligent feedback management. The process begins with the chatbot interface module, where users interact with the system and provide feedback through natural language conversations. The input data is forwarded to the preprocessing module, which performs cleaning, tokenization, normalization, and stop-word removal operations on the text. The processed data is then passed to the feature extraction module, where important textual patterns and features are identified. The sentiment analysis engine uses machine learning and NLP models to classify customer feedback into positive, negative, or neutral categories. The system also includes a keyword extraction module that identifies frequently mentioned issues and customer concerns. The analyzed results are stored in a centralized database for future reference and reporting. A visualization module generates charts, dashboards, and analytical reports to support business intelligence and decision-making. The system includes an admin module for monitoring user interactions, managing chatbot responses, and viewing analysis reports. Real-time processing ensures quick feedback evaluation and response generation. All modules interact efficiently to provide a scalable, intelligent, and automated customer feedback analysis system using conversational AI technologies.

## V. Result and Output



## VI. Conclusion

The Conversational AI for Customer Feedback Analysis system successfully demonstrates the integration of Conversational Artificial Intelligence, Natural Language Processing, and Machine Learning techniques for automating customer feedback management and sentiment analysis. The project was developed to overcome the limitations of traditional feedback collection methods by providing an intelligent chatbot-based platform that enables users to share opinions and experiences in a natural conversational manner.

The system effectively collects customer feedback through interactive chatbot communication and processes the textual data using NLP techniques such as preprocessing, tokenization, feature extraction, and sentiment classification. By automatically identifying positive, negative, and neutral sentiments, the system helps organizations understand customer satisfaction levels, common concerns, and areas requiring improvement. The use of machine learning and deep learning models

improved the accuracy and efficiency of sentiment analysis compared to conventional rule-based methods.

The implementation of real-time feedback analysis significantly reduced manual effort and enabled faster decision-making for businesses. The system also demonstrated scalability by efficiently handling large volumes of customer interactions without affecting performance. Features such as analytical dashboards, reports, and visualization tools further enhanced the usefulness of the system for business intelligence and operational monitoring.

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