



Sentiment Analysis

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ABSTRACT :

The Sentiment Analysis-based Android application aims to analyze and classify user opinions from text data such as reviews, feedback, and social media comments. In today's digital world, understanding customer sentiment plays a crucial role in improving services and decision-making. This project leverages Natural Language Processing (NLP) and machine learning techniques, including deep learning models like BERT and LSTM, to enhance the accuracy of sentiment classification. The application provides a user-friendly interface, making it easy for users to input text and receive sentiment analysis results in real-time. The system integrates both cloud-based and on-device processing to ensure efficiency and scalability. The project also incorporates multilingual support to cater to diverse users. By implementing this application, businesses and individuals can gain valuable insights into customer opinions, helping them improve products and services. Additionally, the system includes a feedback mechanism, enabling users to refine sentiment predictions over time. One of the major advantages of this project is the reduction of manual effort in analyzing large volumes of text data. The proposed system enhances decision-making by providing automated sentiment insights, contributing to fields like customer service, social media monitoring, and market analysis. The user-friendly design ensures easy accessibility, making sentiment analysis available to a broader audience. The Sentiment Analysis-based Android application aims to reduce manual effort in analyzing large volumes of text data, making opinion mining faster and more efficient. The result is that businesses and individuals can gain valuable insights into customer feedback, improving services and decision-making. One of the main goals of this project is to make sentiment analysis accessible to a broader audience and help organizations understand user emotions better. By implementing this project, there is a direct connection between customer opinions and actionable insights. One of the advantages is that businesses can respond to customer sentiments in real-time, enhancing user satisfaction. The platform contributes to improving customer experience and brand reputation. The way of using this platform includes user registration, logging in, entering text for analysis, and receiving classified sentiment results. The platform is also helpful in generating valuable analytical reports for businesses to understand customer trends. The project helps organizations monitor customer sentiment across multiple channels, improving service quality. The sentiment analysis application will have a significant positive impact on industries like e-commerce, social media monitoring, and customer support. As analyzing feedback manually is time-consuming, after implementing this platform, businesses can process sentiments anytime and anywhere. The design and user interface of this project are simple and easy to use for all users. The challenges faced in traditional sentiment analysis methods, such as time consumption and inefficiency, are reduced after the implementation of this project.

Keywords: Sentiment Analysis, Natural Language Processing (NLP), Machine Learning, Deep Learning challenges, purchase, paper work, impact.

Introduction

In today's digital era, vast amounts of textual data are generated daily through social media, product reviews, customer feedback, and online discussions. Understanding and analyzing this data to extract meaningful insights has become crucial for businesses and organizations. Sentiment Analysis, also known as Opinion Mining, is a branch of Natural Language Processing (NLP) that focuses on determining the sentiment or emotional tone expressed in a piece of text. It classifies text as positive, negative, or neutral, enabling businesses to understand customer satisfaction, improve services, and make data-driven decisions.

This research focuses on the development of a Sentiment Analysis-based Android application that provides users with real-time sentiment classification. The proposed system leverages machine learning and deep learning techniques, including models such as BERT (Bidirectional Encoder Representations from Transformers) and LSTM (Long Short-Term Memory), to enhance accuracy in sentiment detection. The application is designed to process user reviews, social media comments, and feedback efficiently, offering valuable insights to businesses, organizations, and individuals.

The project aims to bridge the gap between businesses and customer opinions by providing an automated and scalable solution. Unlike traditional manual sentiment analysis, which is time-consuming and inefficient, this application ensures quick and accurate classification of sentiments. It also integrates multilingual support to make sentiment analysis accessible to a diverse range of users.

Additionally, the application features a user-friendly interface, making it easy for users to input text and receive sentiment results in a structured manner. The system also includes cloud-based and on-device processing to optimize performance and scalability. By implementing this project, businesses can improve customer engagement, monitor brand reputation, and enhance decision-making based on sentiment trends.

This research explores various challenges in sentiment analysis, such as detecting sarcasm, handling ambiguous statements, and processing multilingual content. The study also discusses future advancements, including integrating Explainable AI (XAI) to improve interpretability and incorporating voice-based sentiment detection for broader applications.

The proposed Sentiment Analysis application is expected to play a significant role in various industries, including e-commerce, customer support, healthcare, and social media monitoring. By offering an automated, efficient, and scalable sentiment analysis solution, this project contributes to the growing field of AI-driven text analytics and enhances the way businesses and individuals understand and respond to textual data.

Literature Review

Currently available sentiment analysis tools and applications focus primarily on analyzing text data from social media, customer reviews, and feedback forums. However, many existing platforms provide only basic sentiment classification (positive, negative, or neutral) without offering deeper insights such as emotion detection, aspect-based sentiment analysis (ABSA), or sarcasm identification. This limits businesses and organizations from obtaining meaningful and accurate customer feedback. Additionally, most sentiment analysis tools lack real-time processing and multilingual support, making it difficult for users from diverse backgrounds to access sentiment insights effectively. Despite the increasing demand for sentiment analysis, many mobile-based applications fail to offer on-device processing, requiring constant internet connectivity. This creates challenges in data privacy, latency, and computational efficiency. Moreover, traditional sentiment analysis models struggle with contextual understanding, often leading to misclassifications in cases involving sarcasm, slang, or domain-specific jargon. Since businesses heavily rely on customer feedback to improve their services, a more accurate, real-time, and AI-driven sentiment analysis tool is required. All tables should be numbered with Arabic numerals. Every table should have a caption. Headings should be placed above tables, left justified. Only horizontal lines should be used within a table, to distinguish the column headings from the body of the table, and immediately above and below the table. Tables must be embedded into the text and not supplied separately. Below is an example which the authors may find useful.

Methodology

Data Processing Using Advanced NLP Models – The proposed system will utilize deep learning techniques, including BERT, LSTM, and CNN, to analyze text efficiently.

Reduction in Manual Effort – The automated sentiment analysis system eliminates the need for businesses to manually process customer feedback, leading to faster decision-making.

Multilingual Sentiment Classification – The system will support multiple languages to ensure accessibility for diverse users.

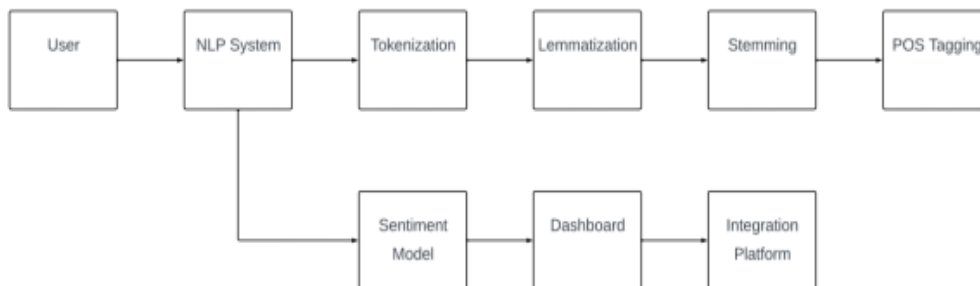
On-Device and Cloud-Based Processing – The app will include a hybrid approach, allowing sentiment analysis to run both locally (for privacy-focused users) and on the cloud (for large-scale analysis).

Real-Time Sentiment Insights – The system will provide instant sentiment classification, helping businesses respond quickly to customer opinions.

User-Friendly Interface – The application will be designed with an intuitive UI to ensure easy access to sentiment analysis results.

Scalability for Various Industries – The proposed platform can be applied in e-commerce, healthcare, social media monitoring, and customer service

1.1. Diagram



1.2. Description

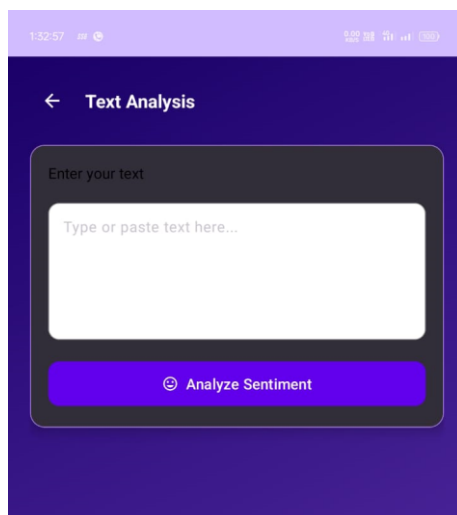
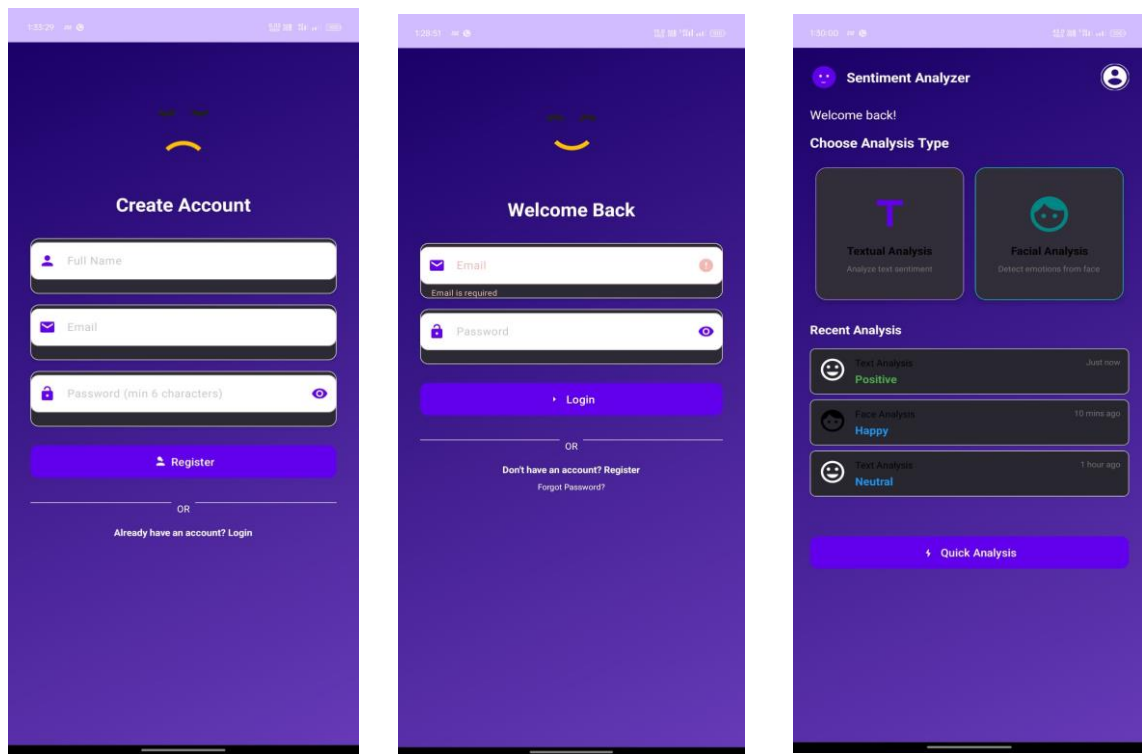
- **User Input:** The user provides text input (e.g., a review, comment, or feedback) for sentiment analysis. This input is processed by the NLP system.
- **NLP System:** The input text is preprocessed using various NLP techniques to prepare it for sentiment classification.
- **Tokenization:** The text is broken down into individual words or tokens. This helps in understanding the structure of the input text and enables further analysis.

- **Lemmatization:** Lemmatization reduces words to their root form while preserving their meaning. For example, "running" becomes "run," helping the sentiment model generalize better.
- **Stemming:** Similar to lemmatization, stemming reduces words to their base form by removing prefixes or suffixes. For instance, "happily" might be reduced to "happi".
- **POS (Part-of-Speech) Tagging:** Each word in the text is tagged with its grammatical role (e.g., noun, verb, adjective). This helps the sentiment model understand the context in which words are used.
- **Sentiment Model:** After preprocessing, the refined text data is passed to a sentiment analysis model (e.g., a machine learning or deep learning model such as BERT, LSTM, or a rule-based classifier).
- The model classifies the sentiment as positive, negative, or neutral, or it can provide a more detailed sentiment score.

Contribution

- **Enhanced Text Preprocessing Pipeline:** Implements tokenization, lemmatization, stemming, and POS tagging, ensuring high-quality text preprocessing for better sentiment classification accuracy.
- **Reduces noise and redundancy in textual data,** improving model efficiency.
- **Advanced Sentiment Analysis Model:** Uses state-of-the-art machine learning and deep learning models such as LSTM, BERT, or CNN to classify sentiments more accurately.
- **Supports aspect-based sentiment analysis (ABSA),** allowing businesses to extract opinions on specific topics rather than overall sentiment.
- **Multilingual and Domain-Specific Support:** Supports multiple languages, enabling users from different linguistic backgrounds to analyze sentiments effectively

Screenshots



Conclusion

The proposed Sentiment Analysis System effectively utilizes Natural Language Processing (NLP) and Machine Learning to analyze and classify user sentiments with high accuracy. By implementing tokenization, lemmatization, stemming, and POS tagging, the system ensures efficient text preprocessing, leading to better sentiment prediction. The integration of advanced sentiment models such as LSTM, BERT, or CNN enhances the system's ability to detect contextual emotions, sarcasm, and aspect-based sentiments.

One of the key advantages of this system is its real-time sentiment monitoring, providing businesses and users with instant feedback insights through an interactive dashboard. The system also offers multilingual support and domain-specific adaptability, making it suitable for various industries like e-commerce, healthcare, education, and customer service. Additionally, its seamless integration with external platforms such as social media, chatbots, and business intelligence tools ensures wider applicability and usability.

By automating sentiment extraction and reducing manual effort, the system enhances user experience and enables businesses to make data-driven decisions. The on-device and cloud-based hybrid processing further ensures efficiency, scalability, and privacy compliance.

Overall, this Android-based Sentiment Analysis System is a powerful tool for organizations looking to understand customer emotions, improve engagement, and drive business growth through AI-driven sentiment insights.

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