Sentiment Analysis on Online Product Reviews

Dr. Manisha More[1], Hrutuja Tiple[2], Dipti Bangde[3], Afiya Mohammad[4], Aditi Charlawar[5], Tanzila Sheikh[6]
[1]*Professor, RCERT, Chandrapur*
[2-3-4-5-6]*Student, RCERT, Chandrapur*

Abstract*—Imagine having a direct line to your customers' thoughts, understanding exactly how they feel about your products. That's precisely what our project delivers: a powerful, user-friendly web platform that digs into online product reviews using smart machine learning. We built this to help businesses truly grasp customer opinions, spot what's working well and what needs a tweak, and make decisions based on real data, not guesswork. Whether you're an e-commerce giant improving product quality, a product manager fine-tuning features, a marketing pro sensing brand vibe, or a customer service hero tackling urgent issues, this platform is your secret weapon. Our system is built on a robust architecture, featuring a sleek React frontend, effortless file uploads, cutting-edge ML processing, an intuitive results dashboard, and even an AI Chatbot for deeper insights. Just upload your review data (CSV/JSON), and watch as it's transformed through preprocessing, analyzed by multiple machine learning algorithms simultaneously, and then visualized through interactive charts. The integrated AI Chatbot takes it a step further, offering conversational analysis and helping you uncover hidden gems in your data.

***Index Terms*—Customer Insights, AI-Powered Feedback, Product Intelligence, Machine Learning for Reviews, Interactive Dashboards, Natural Language Processing, Business Growth**

I. INTRODUCTION

In today's digital world, online product reviews are a treasure trove of unfiltered opinions. They hold immense power, shaping brand reputations and influencing purchasing decisions. But sifting through countless reviews to understand what customers really think? That's a monumental task. This project steps in as your guide, offering a comprehensive, web-based sentiment analysis platform designed specifically to make sense of this massive customer feedback. By harnessing the power of machine learning, our platform automates the process of understanding customer sentiment, giving businesses an agile tool to truly connect with their audience and proactively respond to their needs.

The impact of understanding customer sentiment ripples across every part of a business. E-commerce companies can directly boost product quality by listening to what customers are saying. Product managers gain clarity on beloved features and pain points, guiding their development roadmap. Marketing teams can fine-tune their messaging by grasping overall brand sentiment and specific customer concerns. Even customer service departments can prioritize issues more effectively, leading to happier customers. Plus, our platform helps businesses keep an eye on the competition by comparing sentiment across similar products in the market.

This paper isn't just about the technology; it's about the tangible benefits our sentiment analysis platform brings. We'll walk you through its smart architecture, intuitive features, how we brought it to life, and the clever machine learning models working behind the scenes.

II. HELPFUL HINTS

Sentiment Analysis on Online Product Review
AUTHOR: Harshit Gupta, Lokesh kr. Tiwari, Kartik, Lav Agarwal, Atul Kumar
The paper "Sentiment Analysis on Online Product Review"[1] proposes a web application that uses Naive Bayes to classify product reviews from e-commerce sites as positive or negative. It employs the Bag of Words technique for feature extraction and processes reviews to determine sentiment. The system achieved an accuracy of 76.4%, helping users easily understand product sentiment and make informed purchasing decisions.

Sentiment Analysis on Amazon Product Reviews:
AUTHOR: Akanksha Halde, Aditi Uttekar, Amit Vishwakarma

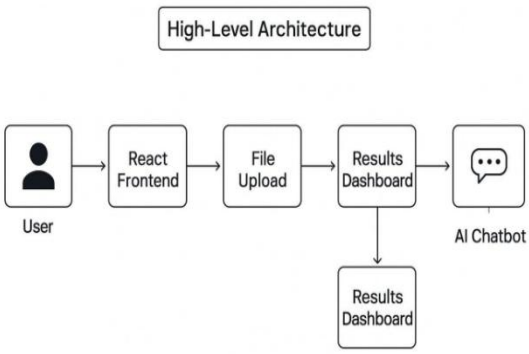
The paper focuses on sentiment analysis of Amazon product reviews [2], comparing machine learning models like Naive Bayes, SVM, and Random Forest. It uses a 2018 dataset of 233 million reviews to classify sentiments into positive, negative, or neutral. The study employs text preprocessing, including stopword removal and lemmatization, and evaluates model performance using metrics like accuracy and F1 score. Key findings include patterns in review length and sentiment-specific phrases.

Sentiment Analysis of Amazon Reviews:
AUTHOR: Sharmin Shaikh, Aniket Navale, Prithvi Sunchu, Deepali Shrikhande
This paper presents sentiment analysis of Amazon reviews [3] using NLP and machine learning. The goal is to classify reviews as positive, negative, or neutral. Using the Multinomial Naïve Bayes and Logistic Regression algorithms, the system analyzes customer feedback, focusing on mobile phone reviews. The analysis reveals trends, such as Samsung being more popular than LG in both positive and negative reviews. The paper suggests future improvements, including creating an interface for displaying the results, to make sentiment analysis more accessible and practical for users.

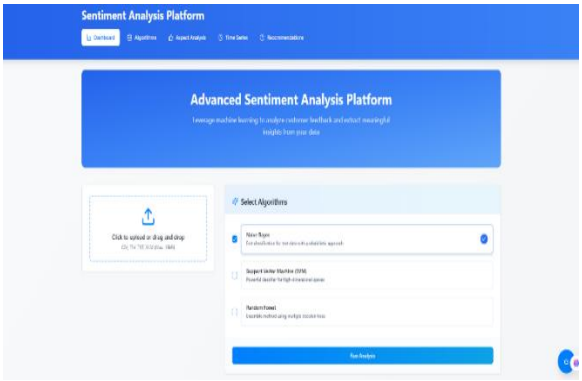
Flipkart Reviews Sentiment Analysis using Python:
AUTHOR: B Mohd Munaf, Reyaj Ansari, Syed Omer Ali Khan
This project analyzes Flipkart customer reviews using Python [4] to classify sentiments (positive, negative, neutral). It involves data collection via web scraping, preprocessing the reviews, extracting features, and applying machine learning models for sentiment classification. The insights help improve business decisions and customer service.

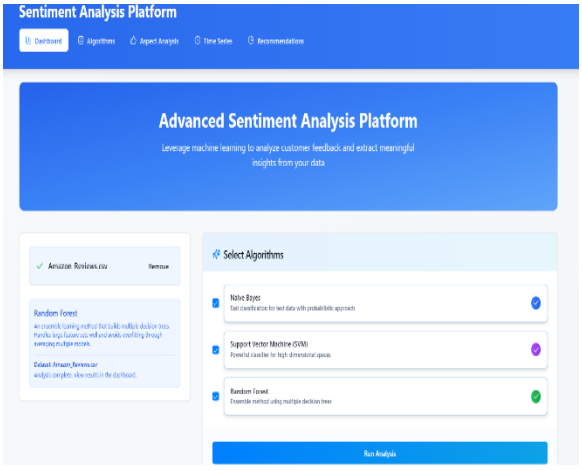
Sentiment Analysis of Product-Based Reviews Using Machine Learning Techniques:
AUTHOR: JitendraSoni, Dr.KirtiMathur, AmanPathan, Pravar More, VaishaliBaghel, Toshi Anand, TushitaThusu
The paper focuses on Sentiment Analysis of Product-Based Reviews Using Machine Learning Techniques [5] using NLP and Machine Learning to classify sentiment in Amazon product reviews as positive, negative, or neutral. It involves collecting data, POS tagging, calculating sentiment scores, and applying sentence-level and review-level classification. The model's performance is evaluated using 10-fold cross-validation and F1-scores. The research addresses challenges in emotional polarity and improves sentiment analysis accuracy.

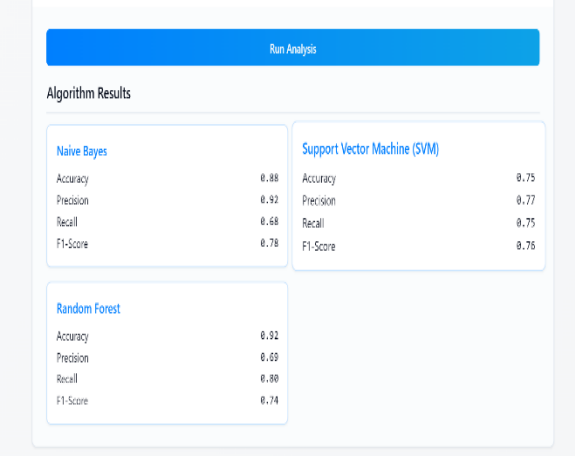
III. ARCHITECTURE



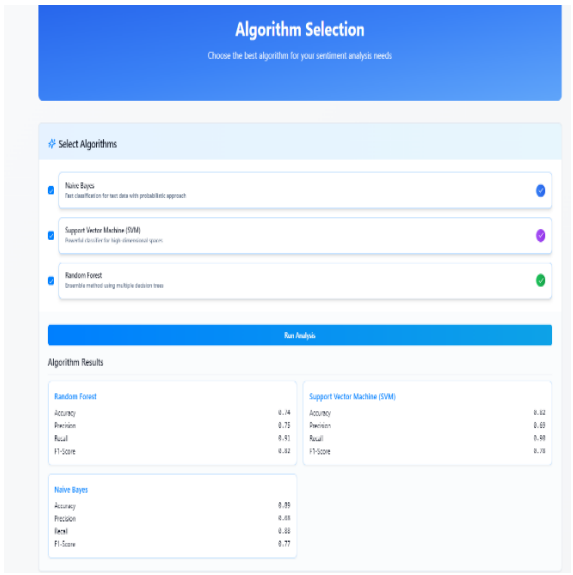
IV. OUTPUTS

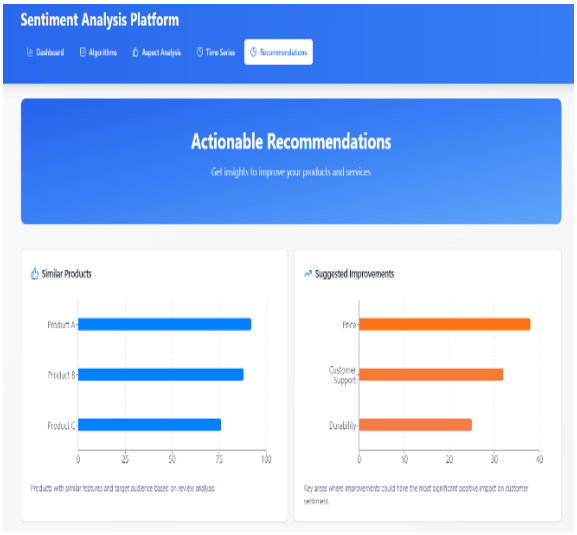


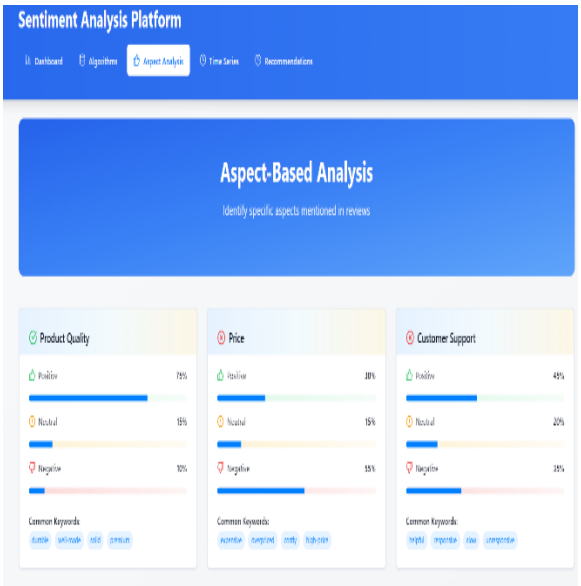


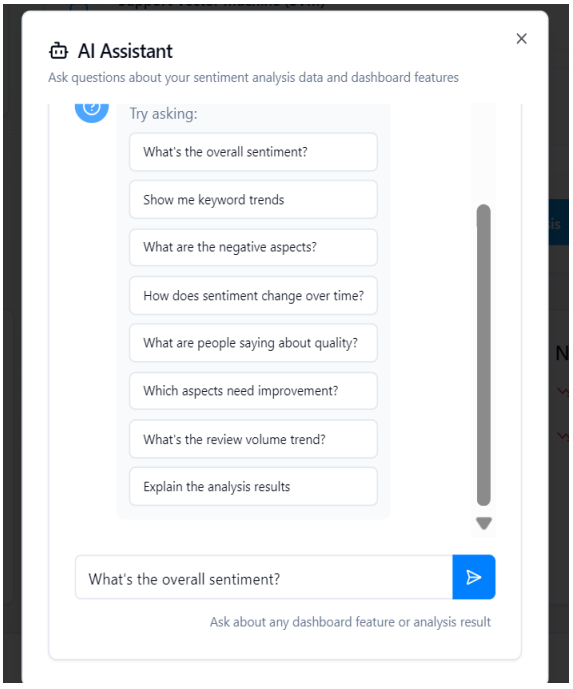

Run Analysis
Algorithm Results
Naive Bayes
Accuracy 0.88
Precision 0.92
Recall 0.68
F1-Score 0.78
Support Vector Machine (SVM)
Accuracy 0.75
Precision 0.77
Recall 0.75
F1-Score 0.76
Random Forest
Accuracy 0.92
Precision 0.69
Recall 0.80
F1-Score 0.74

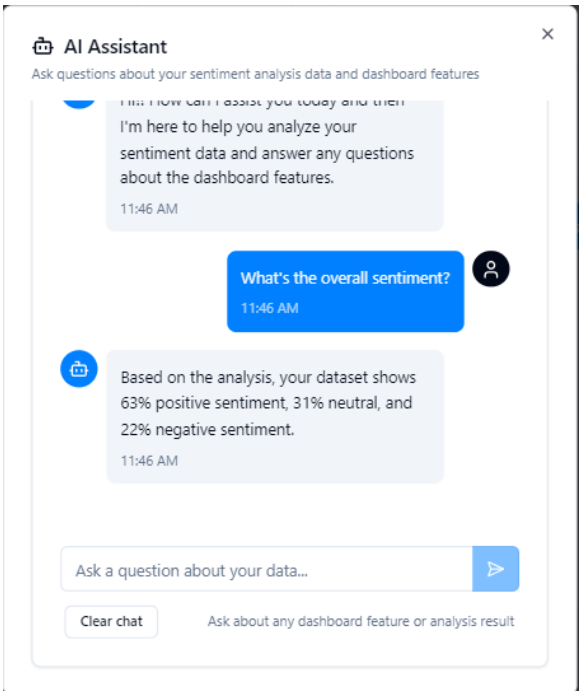

Time Series Analysis
Track sentiment changes over time
Sentiment Trend
Review Volume


Algorithm Selection
Choose the best algorithm for your sentiment analysis needs
Select Algorithms
Run Analysis
Algorithm Results


Sentiment Analysis Platform
Actionable Recommendations
Get insights to improve your products and services
Similar Products
Suggested Improvements


Sentiment Analysis Platform
Aspect-Based Analysis
Identify specific aspects mentioned in reviews
Product Quality
Price
Customer Support


AI Assistant
Ask questions about your sentiment analysis data and dashboard features
Try asking:
What's the overall sentiment?
Show me keyword trends
What are the negative aspects?
How does sentiment change over time?
What are people saying about quality?
Which aspects need improvement?
What's the review volume trend?
Explain the analysis results
What's the overall sentiment?
Ask about any dashboard feature or analysis result



V. CONCLUSION

This paper presents a detailed methodology for analyzing sentiment in online product reviews, leveraging natural language processing and machine learning techniques. By performing comprehensive text preprocessing, including cleaning, tokenization, and stopword removal, we ensure high-quality input data for accurate sentiment classification. Exploratory data analysis provides valuable insights into sentiment patterns, such as the prevalence of positive, neutral, and negative reviews and correlations with specific features like ratings.

Through sentiment classification using supervised machine learning, we identify trends in customer feedback that are critical for understanding user satisfaction and preferences. Additionally, the integration of time series analysis allows us to explore how sentiments evolve over time. By identifying historical patterns and making future predictions, this study provides businesses with the ability to anticipate changes in customer sentiment, address potential challenges proactively, and capitalize on positive trends.

This research highlights the value of combining multiple analytical approaches to generate deeper insights from unstructured textual data. The findings of this study can aid businesses in enhancing their products, improving customer experiences, and devising more effective strategies based on data-driven sentiment trends. Overall, this paper contributes to the growing field of sentiment analysis and its application in the e-commerce domain, showcasing its potential for impactful real-world solutions.

REFERENCE

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[4] Flipkart Reviews Sentiment Analysis Using Python: International Journal of Research Publication and Reviews, Vol (5), Issue (8), August (2024)

[5] Sentiment Analysis of Product-Based Reviews Using Machine Learning Techniques: Journal of Current Research in Engineering and Science, Volume 7, Issue 1, January 2024. https://www.researchgate.net/publication/334033914_Sentiment_Analysis_on_Online_Product_Reviews