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A Comparative Sentiment Engine Dor E-Commerce Product Reviews

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A B S T R A C T :

Pneumonia is a severe respiratory condition that requires timely and accurate diagnosis for effective treatment. This project leverages deep learning and computer vision to develop an automated pneumonia detection system using a Convolutional Neural Network (CNN)-based model, specifically ResNet-50. The system processes chest X-ray images to classify cases as pneumonia-positive or normal, assisting healthcare professionals in early diagnosis. OpenCV is utilized for image preprocessing, ensuring enhanced feature extraction before passing the data to the deep learning model. TensorFlow facilitates model training and inference, optimizing accuracy and efficiency in classification. The system integrates a structured database for storing patient records and predictions, allowing seamless retrieval and analysis. Additionally, a web based interface, developed using Flask, provides an intuitive platform for users to upload X-ray images and obtain real-time diagnostic results. The implementation also includes mechanisms for handling misclassified cases and improving reliability through model fine-tuning. Designed for scalability, this automated pneumonia detection system aims to support hospitals and clinics by enhancing diagnostic accuracy and reducing manual workload.

Keywords: Pneumonia Detection, Deep Learning, CNN, ResNet-50, OpenCV, TensorFlow, Chest X-ray, Medical Imaging, Computer Vision, Flask.

1. Introduction

In the digital age, online shopping has become an integral part of consumer behavior, with ecommerce platforms like Amazon and Flipkart serving millions of users daily. Among the key factors influencing purchasing decisions are customer reviews and product ratings, which offer valuable insights into user satisfaction and product performance. However, due to the overwhelming volume of reviews and the presence of similar products across multiple platforms, it becomes increasingly difficult for consumers to make informed decisions based solely on manual exploration. This challenge highlights theneed for intelligent systems that can automatically analyze, compare, and recommend products based on authentic customer feedbackrevenue losses and increased costs associated with acquiring new customers. Hence, predicting and mitigating customer churn is paramount for telecom companies aiming to maintain their customer base and ensure long-term profitability.

1.1. Research Objectives

Understanding user sentiment and providing accurate product comparisons across platforms are the major thrusts of this research and project. The following objectives summarize the scope of the investigation:

Key goals include:

- To analyze and compare product reviews and ratings from Amazon and Flipkart using web scraping techniques.
- To implement sentiment analysis and Natural Language Processing (NLP) for extracting meaningful insights from customer feedback.
- To develop a visualization dashboard that aids in comparative analysis of products based on customer sentiments and ratings.

2. Literature Survey

Review analysis and sentiment classification have become essential components in understanding customer preferences and improving decision-making in the e-commerce sector. Early approaches to opinion mining relied on rule-based systems and simple lexicon-based techniques to extract sentiment from user-generated content. While these methods provided basic polarity detection (positive, negative, neutral), they were limited in handling complex sentence structures, contextual variations, and implicit sentiment expressions.

With the advancement of Natural Language Processing (NLP), machine learning-based models such as Naive Bayes, Support Vector Machines (SVM), and Logistic Regression were introduced for sentiment classification tasks. These models, when trained on labeled datasets, achieved significantly

better accuracy than traditional rule-based approaches. However, their performance still depended heavily on feature engineering and struggled with generalization across different domains or informal review text.

3. Methodology and Processed Method

The proposed system is designed to perform automated review analysis and product recommendation by extracting and processing user reviews from major e-commerce platforms— Amazon and Flipkart. The method interconnects multiple modules, each responsible for data extraction, processing, analysis, and result presentation through an interactive web interface. The goal is to assist users in making informed buying decisions by analyzing both sentiment and ratings.

Step 1: Data Collection via Web Scraping

The first step in the process is data collection, where real-time product reviews, ratings, and other metadata are dynamically extracted from Amazon and Flipkart. This is accomplished using web scraping tools such as BeautifulSoup and Selenium, which are capable of handling JavaScript loaded content and pagination. By scraping these platforms, the system ensures that up-to-date, user-generated content is collected across a broad range of product categories, including the review text, star ratings, product names, and reviewer metadata.

Step 2: Sentiment Analysis Using NLP Techniques

Once the data is collected, the next step is sentiment analysis using classical Natural Language Processing (NLP) techniques. The system preprocesses the review text by performing tokenization, stopword removal, stemming, and lemmatization. These steps help clean and normalize the text data before passing it through machine learning models like Logistic Regression, Naive Bayes, or Support Vector Machines (SVM) to classify the reviews as positive, negative, or neutral. Each review is assigned a sentiment polarity score, which helps quantify customer opinions and contributes to the overall product sentiment rating

Step 3: Cross-Platform Product Comparison

In the third step, the system compares products across both Amazon and Flipkart using the sentiment scores and numerical star ratings. Reviews from both platforms are aligned for the same product or similar alternatives to identify which product has the best rating overall. An internal scoring algorithm is employed, combining both sentiment polarity and star ratings to produce a unified score, allowing users to make direct comparisons between products from different e-commerce platforms.

Step 4: Interactive Dashboard Development

For the presentation of these results, the system includes an interactive dashboard that is developed using HTML, CSS, and JavaScript, with backend support provided by frameworks like Flask or Django. The dashboard visualizes product sentiment through graphs and charts that represent sentiment distribution and average ratings. It also includes a comparison interface, allowing users to compare the performance of products from Amazon and Flipkart side by side, helping them make informed purchasing decisions.

Step 5: Data Handling and Privacy Management

To ensure privacy and security, the system implements proper data handling and management practices. User searches and review data are processed securely, with temporary review logs that are not stored permanently unless the user opts to save analysis reports. The system focuses solely on publicly available review data, ensuring compliance with privacy regulations and maintaining the confidentiality of user information.

Step 6: Web Application Deployment

Launch the web application on servers, possibly using cloud hosting for easier access. Also remember to make the platform easy to use and compatible with all devices.

4. Implementation

The proposed system implements an automated review analysis and product recommendation framework using web scraping, sentiment analysis, and product comparison techniques. The goal is to provide users with the ability to make informed purchasing decisions based on both sentiment and numerical ratings from e-commerce platforms like Amazon and Flipkart.

Step 1: Visualization of website

The first step of the website visualization, The Review Analyser interface is designed to offer a simple and engaging user experience for comparing product reviews from Amazon and Flipkart. On the left, it introduces the tool with a clear title and tagline, highlighting its ability to extract and analyze customer reviews using automated techniques. A “Check Details” button encourages users to get started. On the right, users can input product URLs

into a clean form labeled “Provide Details,” followed by a “submit” button to begin the analysis. This intuitive layout makes the process easy, interactive, and efficient, helping users make smarter purchase decisions through real-time.

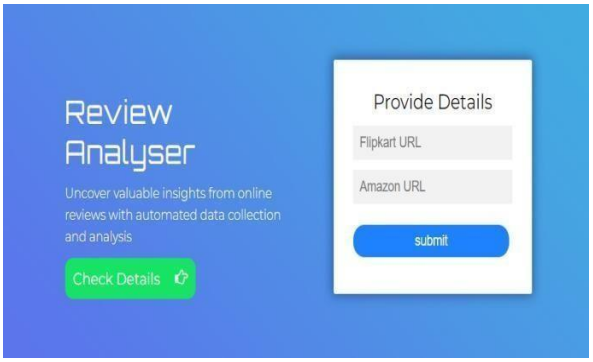

Fig 1: Visualization ofwebsite **Fig 2: Visualization ofwebsite**

Step 2: Product URL Input and Result Generation

The describes how the Review Analyser works after entering product URLs from Flipkart and Amazon. When the user clicks the Submit button, the system starts collecting and analyzing reviews using web scraping and sentiment analysis. It then displays the average product rating out of 5, helping users quickly compare product quality across both platforms.

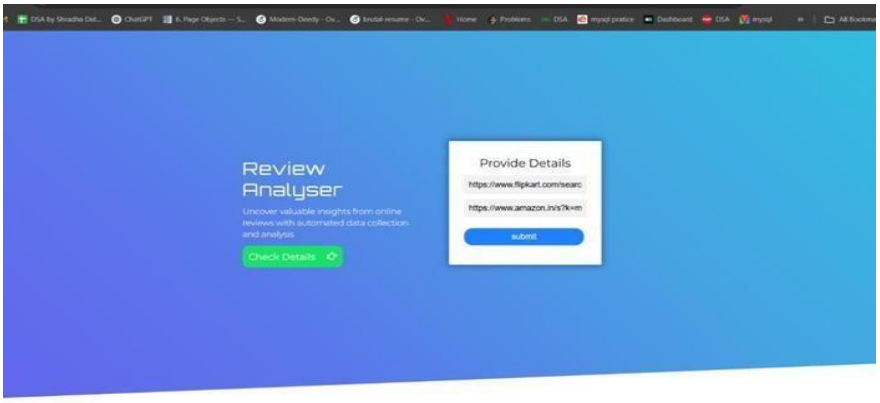

Fig 3 :Product URL Input and Result

Generation Step 3: Final Review Summary and Product Comparison

This image represents the final output of the Review Analyser application after the user submits product URLs. It displays a structured table containing key product details including the title, price, rating out of 5, and a clickable link for each item. This organized view helps users easily compare multiple products across platforms like Amazon and Flipkart, enabling quick and informed purchasing decisions based on real-time review analysis.

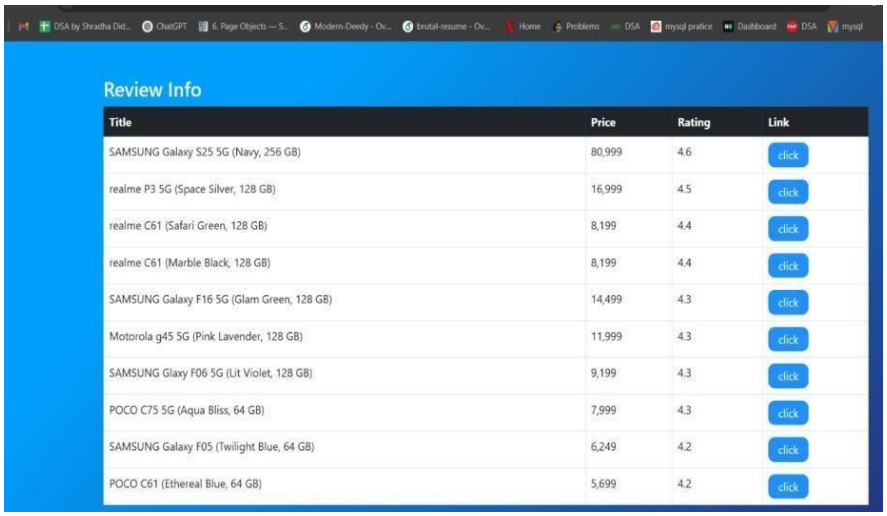

Fig 4 : Final Review Summary and Product Comparison

Conclusion and Future Scope

This project introduces a smart review analysis system that uses web scraping to collect customer reviews from top e- commerce platforms like Amazon and Flipkart. The main aim is to turn these reviews into useful insights using sentiment analysis, helping users understand how good a product really is—based on real opinions. By combining automation with natural language processing, the system filters out noise, reads between the lines, and tells whether reviews are positive, negative, or neutral. It solves common issues like mixed-up wording, inconsistent styles, and personal biases in reviews. Built to be fast, scalable, and easy to use, the system is perfect for tracking customer preferences, recommending products, and studying market trends. Tests show it delivers accurate results, making it a reliable tool for smarter shopping. In the end, we compared categories like mobile phones and electronics from both platforms, and the system highlights the top- rated products—offering users a clear and confident way to pick the best.

Future Scope:

- Expanding to more platforms like Flipkart and eBay.
- Adding aspect-based and multilingual sentiment analysis.
- Building dashboards for easy data visualization.
- Deploying the system as a mobile app for field diagnostics.
- Detecting fake reviews using machine learning.

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