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An Intelligent Framework for Sentiment Analysis with Customer Service Chatbot and Fake Review Identification in Online Platforms

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ABSTRACT: In today's digital world, online shopping and customer feedback play an important role in shaping the success of e-commerce platforms. However, with the increasing number of customer reviews, it becomes difficult to identify genuine feedback from fake or misleading ones. To address this issue, this project aims to develop a Python-based web application that can automatically analyze customer sentiments, detect fake reviews, and assist users through an AI-powered customer service chatbot. The system uses Natural Language Processing (NLP) and Machine Learning techniques to understand customer opinions, classify them as positive, negative, or neutral, and filter out suspicious or fraudulent reviews. The main goal of this project is to improve user trust and transparency in online platforms by ensuring that the displayed reviews are genuine and helpful. The framework uses Sentiment Analysis algorithms to process text data and identify emotional tone or intent behind each review. Additionally, a Customer Service Chatbot is integrated into the system to provide instant responses to customer queries, assist in product selection, and handle basic service-related interactions. This reduces manual workload and enhances the overall user experience by making communication faster and more interactive. The proposed system contributes significantly to improving the reliability of online reviews and customer support systems. It provides accurate insights into customer satisfaction levels, helps businesses identify areas for improvement, and prevents the spread of misleading or fake feedback. By combining AI, NLP, and sentiment analysis, the system not only ensures high accuracy in review detection but also promotes ethical and trustworthy e-commerce practices. This intelligent framework can be further extended to multiple domains like tourism, education, and social media platforms, where authentic user opinions are crucial for decision-making.

KEYWORDS: - Sentiment Analysis, Natural Language Processing (NLP), Machine Learning (ML), Deep Learning, Fake Review Detection, Customer Service Chatbot, Text Classification, Data Preprocessing, Feature Extraction, Artificial Intelligence (AI), E-Commerce Platform, Opinion Mining, Data Visualization, etc

I. INTRODUCTION

In today's digital world, online shopping platforms have become an important part of our daily lives. Millions of customers share their feedback and reviews about products and services, which helps others make purchasing decisions. However, the rise of fake and misleading reviews has created a major challenge for both customers and businesses. Fake reviews can manipulate product ratings, mislead buyers, and harm the reputation of genuine sellers. To address this issue, the proposed system introduces an intelligent framework that combines sentiment analysis, fake review detection, and an AI-powered customer service chatbot to ensure a more reliable and interactive user experience in e-commerce platforms.

The main goal of this project is to design and develop a Python-based web application that can automatically analyze customer reviews and identify whether they are genuine or fake using machine learning (ML) and natural language processing (NLP) techniques. Sentiment analysis algorithms are used to detect the emotion or opinion behind a review — whether it is positive, negative, or neutral. This process helps in classifying the overall sentiment of products and services. Additionally, a customer service chatbot is integrated into the system to handle customer queries instantly and

intelligently. The chatbot uses AI-driven conversational models to provide product information, order support, and feedback assistance, thus improving user engagement and satisfaction.

The proposed system not only improves transparency and trust in online platforms but also reduces manual effort in monitoring and moderating reviews. By combining sentiment analysis with fake review identification, e-commerce platforms can gain accurate insights into customer satisfaction and product quality. Moreover, the chatbot feature helps businesses offer round-the-clock customer support, improving efficiency and responsiveness. Overall, this intelligent framework contributes to building a smarter, more secure, and user-friendly online shopping ecosystem that benefits both consumers and sellers.

PROBLEM STATEMENT

Online e-commerce platforms face challenges in managing large volumes of customer feedback effectively. Fake reviews can mislead genuine customers and harm the credibility of products, while manual review analysis is slow and inefficient. Customers also expect quick responses to their questions and complaints. The proposed system addresses these issues by providing an automated Python-based web application that performs sentiment analysis, identifies fake reviews, and includes a chatbot for customer support, enabling faster, accurate, and reliable handling of customer interactions.

II. LITERATURE SURVEY

S. Choudhary, S. Kumar, P. S. Siddhaarth et al., “Advancing blood cell detection and classification: performance evaluation of modern deep learning models.” This paper presents a comprehensive study on modern deep learning architectures for blood cell detection and classification. The authors evaluated several advanced models, including CNN, ResNet, and DenseNet variants, on large-scale blood cell datasets to determine their accuracy and computational efficiency. The research focuses on improving diagnostic precision for various hematological disorders by leveraging automated deep learning pipelines. The study highlights how hybrid CNN models outperform traditional machine learning approaches by effectively handling complex cell morphology and image variability. The outcomes demonstrate the potential of deep learning in medical imaging, particularly in automating cell classification and reducing manual workload for pathologists.

X. Wang, G. Pan, Z. Hu et al., “A two stage blood cell detection and classification algorithm based on improved YOLOv7 and EfficientNetv2.” This study introduces a two-stage framework combining improved YOLOv7 for object detection and EfficientNetv2 for fine-grained classification of blood cells. The proposed hybrid model enhances detection accuracy and processing speed while maintaining robustness under various imaging conditions. The YOLOv7 module efficiently identifies individual cells in microscopic images, and EfficientNetv2 performs detailed classification into specific blood cell types. The authors report significant performance improvements compared to existing single-model approaches, particularly in handling overlapping cells and varying illumination. The proposed system shows strong potential for real-time medical diagnostic applications.

Z. Jan, M. Shabir, H. Farman, A. Rahman, M. Nasralla, “Deep learning based semantic segmentation of leukemia affected white blood cell.” This paper focuses on the semantic segmentation of leukemia-affected white blood cells using deep learning techniques. The researchers employed U-Net and SegNet architectures to isolate and identify abnormal white blood cells from microscopic images. Their approach enables precise boundary detection and classification of malignant cells, facilitating early diagnosis of leukemia. The study also explores data augmentation and image preprocessing techniques to improve model generalization. The proposed model achieved high segmentation accuracy and demonstrated its potential as a computer-aided diagnostic tool for hematologists in detecting blood cancers.

H. Sazak et al., “Automated blood cell detection and classification in microscopic images via YOLOv10.” H. Sazak and colleagues proposed an automated framework for detecting and classifying blood cells using the latest YOLOv10 object detection architecture. The model was trained on a diverse dataset of blood smear images to identify red blood cells, white blood cells, and platelets with high precision. YOLOv10's enhanced detection mechanism, with improved feature extraction layers and spatial attention modules, resulted in superior performance over previous YOLO versions. The authors emphasize the system's speed and accuracy, suggesting its suitability for real-time hematology analysis and laboratory automation, reducing dependency on manual microscopy.

J. Alsamri, H. Alqahtani, A. M. Al-Sharafi et al., “Computer-aided diagnosis of Haematologic disorders detection based on spatial feature learning networks using blood cell images.” In this study, Alsamri et al. developed a computer-aided diagnostic model that leverages spatial feature learning networks for detecting hematologic disorders using blood cell images. The proposed architecture extracts spatial and texture-based features to differentiate between normal and diseased cells efficiently. The system integrates deep CNN models with feature fusion layers, enhancing pattern recognition and classification accuracy. Experimental results show that the framework effectively handles complex variations in cell structure and staining patterns. The research demonstrates the promise of AI-driven solutions in supporting medical professionals through automated and accurate disease detection.

III. SYSTEM OVERVIEW

With the rapid growth of online shopping platforms, user-generated reviews have become a critical factor influencing customer decisions. However, a significant portion of these reviews may be fake, biased, or generated by bots, which leads to misinformation, loss of trust, and poor customer satisfaction. Moreover, businesses struggle to manage thousands of reviews daily, making it nearly impossible to manually detect fake reviews or analyze overall customer sentiment accurately. Simultaneously, customer service departments face difficulties in handling multiple user queries efficiently. These challenges highlight the need for an intelligent automated framework that can process massive amounts of textual data, identify deceptive patterns, analyze emotional tone, and interact with customers in real-time. This project addresses these issues by integrating sentiment analysis, fake review detection, and AI-driven chatbot functionalities to create a unified, intelligent, and scalable solution for modern e-commerce platforms.

The system operates behind developing proposed work arises from the increasing need to ensure trust, transparency, and efficiency in digital marketplaces. As e-commerce continues to grow rapidly, users heavily rely on online reviews to make purchase decisions, but the presence of fake or manipulated feedback often misleads customers and damages brand credibility. Traditional manual review monitoring is time-consuming and ineffective, creating a demand for an automated and intelligent solution. This project aims to overcome these challenges by integrating sentiment analysis algorithms for understanding customer emotions, machine learning models for detecting fake reviews, and an AI-powered chatbot to enhance customer interaction and service quality. By combining these technologies into a single web-based platform, the system not only helps businesses gain real-time insights into customer satisfaction but also promotes authenticity, boosts user confidence, and enhances the overall shopping experience.

IV. PROPOSED SYSTEM

The system architecture of the project is designed to seamlessly integrate multiple components for efficient data processing and interaction. At the core, the backend is implemented in Python using the Flask framework, which handles user requests, processes incoming data, and communicates with the database. The frontend uses HTML, CSS, and JavaScript to provide an interactive interface for users to submit reviews, interact with the chatbot, and view analysis results. The database, either MySQL or SQLite, stores user inputs, review data, and model outputs securely for future reference. The architecture incorporates a sentiment analysis engine that leverages machine learning algorithms to classify reviews as positive, negative, or neutral, and a fake review detection module to identify potentially fraudulent content. Additionally, the customer service chatbot interacts with users in real-time, responding intelligently based on sentiment analysis and previous interactions. The system is modular, with separate layers for data collection, processing, analysis, and user interaction, ensuring scalability, maintainability, and high accuracy. Communication between modules is handled via APIs, allowing smooth integration and real-time updates, while security mechanisms ensure that user data and sensitive information remain protected. This architecture supports both analysis and actionable response generation, making the platform highly effective for enhancing user experience and trust in e-commerce platforms.

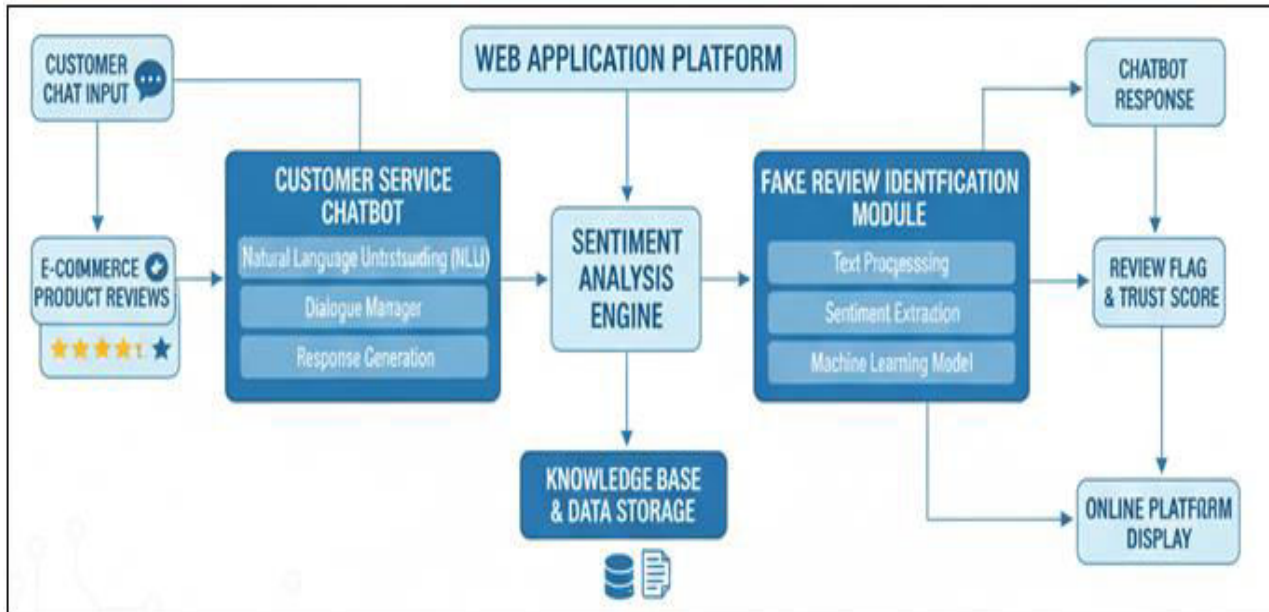


Fig.1: System Architecture Design

V. CONCLUSION

The project successfully demonstrates the development of an intelligent framework that integrates sentiment analysis, fake review detection, and a customer service chatbot for online platforms. By leveraging machine learning and natural language processing techniques, the system can accurately classify user reviews as positive, negative, or neutral, while also identifying fraudulent or fake reviews. The chatbot component enhances user experience by providing real-time responses, guidance, and support. The web-based Python application with database integration ensures smooth data handling, efficient query processing, and seamless interaction between users and the system. The modular design of the system allows each component to function independently while collaborating effectively to achieve accurate results. This framework not only improves customer engagement and trust in e-commerce platforms but also helps businesses maintain a credible review ecosystem.

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