FAKE PRODUCT REVIEW IDENTIFICATION

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Abstract

The rapid growth of e-commerce platforms has led to an increasing number of fake product reviews, which mislead customers and affect product credibility. This work proposes an automated Fake Product Review Identification system that combines web scraping, Natural Language Processing (NLP), and machine learning techniques to detect deceptive reviews. The system collects review data from online platforms such as Amazon and Flipkart, preprocesses the text by cleaning and normalization, and transforms it into numerical features using Term Frequency–Inverse Document Frequency (TF-IDF) with unigram and bigram representations. A Linear Support Vector Machine (SVM) classifier with balanced class weights is then trained on the dataset to handle class imbalance and improve prediction performance. The model is implemented using a pipeline approach for efficient processing and scalability. Experimental results demonstrate high classification accuracy and reliable performance in distinguishing fake and genuine reviews. The proposed system also supports real-time prediction by analyzing reviews directly from product URLs, making it practical for real-world applications. This approach enhances user trust and provides a scalable solution for detecting fraudulent activities in online review systems, with future scope for integrating deep learning models and advanced behavioral analysis.

Keywords

Fake Review Detection, Fake Product Identification, Natural Language Processing (NLP), TF-IDF, Support Vector Machine (SVM), Text Classification, Machine Learning, Web Scraping, Feature Extraction.

I. Introduction

The exponential growth of e-commerce platforms has revolutionized the way consumers interact with products and services. Online marketplaces such as Amazon and Flipkart have made it easier for users to explore a wide range of products, compare features, and make informed purchasing decisions. Among the various factors influencing these decisions, customer reviews play a critical role. Reviews provide insights into product quality, usability, and performance from the perspective of other users. However, with the increasing dependence on online reviews, the issue of fake or deceptive reviews has emerged as a significant challenge. These fake reviews are often generated to manipulate consumer perception, either by artificially promoting a product or by negatively impacting competitors. As a result, they undermine the credibility of online platforms and mislead customers into making poor purchasing decisions.

Fake product reviews are typically created by individuals, organizations, or automated bots with the intention of influencing product ratings and visibility. These reviews may exhibit characteristics such as exaggerated sentiment, repetitive wording, lack of specificity, and abnormal posting patterns. In many cases, fake reviews are difficult to distinguish from genuine ones, especially when they are carefully crafted to appear

realistic. The large volume of reviews generated daily further complicates the problem, making manual detection impractical and inefficient. Therefore, there is a growing need for intelligent, automated systems capable of identifying and filtering out fake reviews effectively.

To address this challenge, researchers have explored various approaches based on Natural Language Processing (NLP) and Machine Learning. NLP techniques enable the analysis of textual content by extracting meaningful patterns, while machine learning models can learn from labeled data to classify reviews as fake or genuine. Traditional approaches often rely on features such as word frequency, sentiment polarity, and linguistic cues. More advanced methods incorporate behavioral features such as reviewer activity, rating distribution, and temporal patterns. However, implementing complex models may require significant computational resources and large datasets, which may not always be feasible in real-world scenarios.

In this work, a practical and efficient Fake Product Review Identification system is proposed, based on the integration of NLP techniques and machine learning algorithms. The system utilizes a pipeline approach that includes data collection, preprocessing, feature extraction, model training, and prediction. One of the key components of this system is the use of web scraping techniques to collect real-time review data from e-commerce platforms such as Amazon and Flipkart. This enables the system to analyze live product reviews, making it highly applicable in real-world environments.

The preprocessing stage plays a crucial role in preparing the raw textual data for analysis. Reviews collected from online platforms often contain noise such as special characters, punctuation, and irrelevant words. To ensure consistency and improve model performance, the text is cleaned through several preprocessing steps, including lowercasing, removal of stopwords, and tokenization. These steps help in standardizing the input data and reducing unnecessary information that may negatively impact the learning process.

II. Literature Survey

Kumar et al. [1] proposed a phishing detection system using Random Forest and Voting classifiers optimized with metaheuristic algorithms, achieving high accuracy.

Sharma et al. [2] introduced an ensemble learning model combined with entropy-based feature selection, demonstrating that reducing irrelevant features significantly improves detection performance. Patel et al.

Patel et al. [3] further explored feature selection techniques such as Information Gain and ReliefF with XGBoost, achieving accuracy close to 98.8%. Several works emphasize the importance of feature engineering in phishing detection.

Sahingoz et al. [4] utilized lexical and host-based features extracted from URLs and applied multiple ML algorithms, where Random Forest outperformed others.

Ma et al. [5] highlighted the effectiveness of using URL-based features for real-time detection without accessing webpage content.

Verma and Das [6] proposed efficient feature extraction techniques to detect malicious URLs quickly.With the advancement of deep learning, researchers have shifted toward automated feature extraction.

Le et al. [7] introduced URLNet, a deep learning model that learns feature representations directly from raw URLs using convolutional neural networks.

Catal et al. [8] conducted a comprehensive survey showing that deep learning models outperform traditional ML approaches in handling complex phishing patterns.

Ozcan et al. [9] proposed a hybrid DNN-LSTM model, demonstrating improved performance by capturing sequential patterns in URLs.Hybrid models combining ML and DL techniques have shown promising results.
Yang et al. [10] developed an ensemble model integrating CNN and Random Forest, achieving higher accuracy compared to standalone models.
Aslam et al. [11] proposed a stacked generalization approach using LSTM, further enhancing prediction reliability.
Khan et al. [12] highlights that combining feature selection with deep learning models significantly improves both efficiency and accuracy.In addition to model improvements, some researchers explored alternative detection strategies.
Aljofey et al. [13] incorporated both URL and HTML-based features to improve detection of sophisticated phishing websites.
Aburrous et al. [14] applied fuzzy data mining techniques for intelligent phishing detection in e-banking systems.
Xiang et al. [15] developed the CANTINA+ framework, which integrates multiple features and machine learning methods for robust detection.

III. System Analysis

Fake product reviews have become a major issue in e-commerce platforms, misleading customers and affecting business credibility. The system aims to analyze and detect fraudulent reviews using machine learning and data analysis techniques. It studies patterns such as repetitive content, abnormal ratings, and suspicious user behavior. Natural Language Processing (NLP) is used to evaluate the authenticity of review text. The system collects review datasets from various sources and preprocesses them for analysis. Features like sentiment, review length, frequency, and reviewer activity are extracted. Classification algorithms are applied to distinguish between genuine and fake reviews. The system continuously improves accuracy using training data. It ensures better decision-making for customers. Overall, it enhances trust in online platforms.

Existing System

The existing system mainly relies on manual moderation and basic filtering techniques. E-commerce platforms allow users to post reviews without strict verification. Simple rule-based systems are used to remove spam or offensive content. However, these methods cannot effectively identify sophisticated fake reviews. Many fake reviews are generated using automated bots or paid reviewers. The system lacks advanced analysis of reviewer behavior and writing patterns. It does not use deep learning or NLP techniques for accurate detection. As a result, fake reviews often remain undetected. This affects customer trust and product credibility. The existing system is inefficient in handling large volumes of data.

Disadvantages of Existing System

- Cannot accurately detect fake or manipulated reviews
- Relies heavily on manual moderation
- Limited ability to handle large-scale data
- No advanced NLP or machine learning techniques
- High chances of false positives and false negatives

- Does not analyze user behavior patterns
- Vulnerable to bot-generated reviews
- Time-consuming and inefficient

Proposed System

The proposed system uses machine learning and NLP techniques to detect fake product reviews automatically. It collects review data and preprocesses it by removing noise and irrelevant information. Features such as sentiment, reviewer history, and linguistic patterns are extracted. Algorithms like Logistic Regression, Random Forest, or SVM are used for classification. The system identifies suspicious patterns like repeated reviews or abnormal ratings. It can analyze large datasets efficiently and in real-time. Deep learning models can also be integrated for improved accuracy. The system provides a probability score indicating whether a review is fake or genuine. It reduces human effort and increases reliability. This approach enhances trust and improves the overall user experience.

Advantages of Proposed System

- High accuracy in detecting fake reviews
- Automated process reduces manual effort
- Uses advanced machine learning and NLP techniques
- Scalable for large datasets
- Real-time detection capability
- Improves customer trust and satisfaction
- Identifies complex patterns and behaviors
- Reduces spam and fraudulent activities

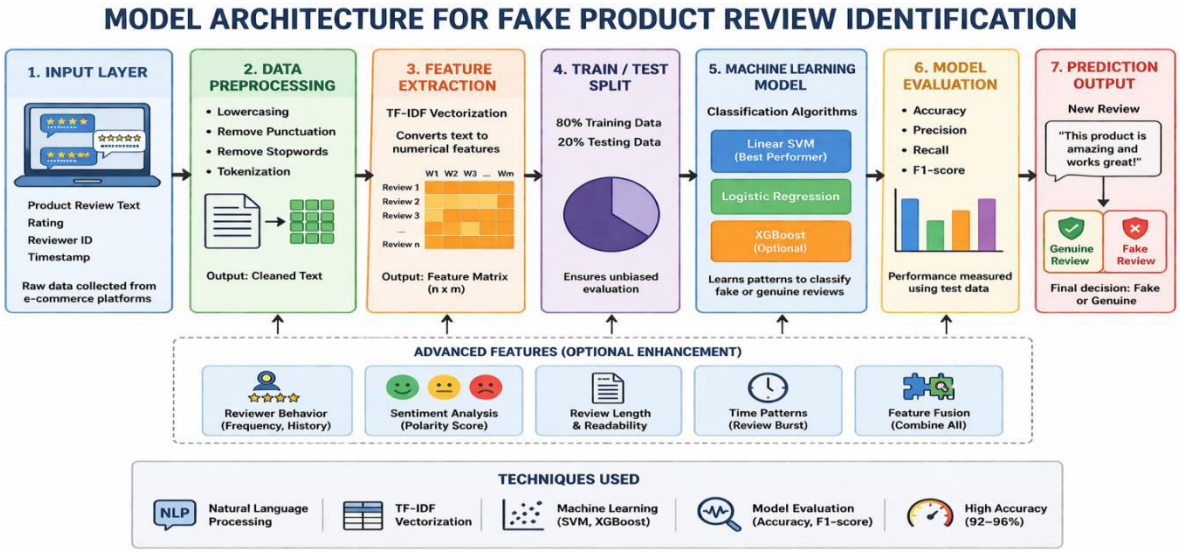
IV. Methodology

The proposed system follows a structured methodology to identify fake product reviews using machine learning and NLP techniques. Initially, the dataset is collected from e-commerce platforms containing both genuine and fake reviews. The data is then preprocessed by removing noise, stopwords, special characters, and duplicates. After preprocessing, feature extraction is performed using techniques such as TF-IDF, Bag of Words, and sentiment analysis. Behavioral features like reviewer frequency, rating patterns, and review timing are also considered. The dataset is then divided into training and testing sets. Machine learning algorithms such as Logistic Regression, Random Forest, and Support Vector Machine (SVM) are applied to train the model. The model learns patterns that differentiate fake and genuine reviews. Evaluation metrics like accuracy, precision, recall, and F1-score are used to measure performance. The trained model is then deployed to classify new incoming reviews. Continuous learning can be applied to improve the model over time.

System Architecture

This layer collects product review data from various sources such as e-commerce websites, APIs, or datasets. It includes both genuine and fake reviews for training. Data is stored in a structured format for further processing. In this stage, raw data is cleaned by removing noise, punctuation, and irrelevant information. Techniques like

tokenization, stopword removal, stemming, and lemmatization are applied to prepare the data for analysis. Important features are extracted from the processed data. These include textual features (TF-IDF, Bag of Words), sentiment scores, and behavioral features like user activity and rating patterns. Machine learning models such as Logistic Regression, Random Forest, and SVM are trained using the extracted features. The model learns patterns that distinguish fake reviews from genuine ones. The trained model is evaluated using metrics like accuracy, precision, recall, and F1-score. This ensures the model performs well and minimizes errors. The final model is deployed into a system where it can analyze new reviews in real time. It classifies reviews as fake or genuine and provides results through an interface or API.



V. Result and Output

```
✅ Setup complete

✅ Model trained | Accuracy: 0.9007

================================================================================
PRODUCT REVIEW AUTHENTICITY CHECK
================================================================================
🔍 Scraping: https://amzn.in/d/0fALSobZ
   → Resolved to: https://www.amazon.in/dp/B0FQFV2XKS?_encoding=UTF8&psc=1&ref=cm_sw_r_cp_ud_dp_28EQPACSTGNAPVVDH0KP&r...
✅ Successfully scraped 6 reviews from Amazon

📊 Analyzed 6 reviews
Fake   : 0 (0.0%)
Genuine: 6 (100.0%)

VERDICT:
✅ LOW RISK — Mostly genuine reviews

Sample predictions:
 1. Good product and product delivery also proffesionalRead more                    → GENUINE
 2. UI so smooth, as a dove floats on a moonlit tranquil pond...Cameras so sharp, as a Ro → GENUINE
 3. My first iPhone and I couldn't ask for a better battery life, performance, camera and → GENUINE
 4. Thanks amazon for making this unit available for a fraction of minutes. I have manage → GENUINE
 5. The media could not be loaded.I purchased a brand new iPhone 17 Pro Max from Amazon,  → GENUINE
 6. I am a long-term android user shifted to iPhone. The performance is great. The camera → GENUINE
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```
✅ Setup complete

✅ Model trained | Accuracy: 0.9007

================================================================================
PRODUCT REVIEW AUTHENTICITY CHECK
================================================================================
🔍 Scraping: https://amzn.in/d/0iF0bGrA
   → Resolved to: https://www.amazon.in/dp/B0F8P4Y7VF?_encoding=UTF8&psc=1&ref=cm_sw_r_cp_ud_dp_XZGTWM7VRDR68Q56MPM8&r...
✅ Successfully scraped 8 reviews from Amazon

📊 Analyzed 8 reviews
Fake    : 0 (0.0%)
Genuine: 8 (100.0%)

VERDICT:
✅ LOW RISK — Mostly genuine reviews

Sample predictions:
 1. I've been using this laptop for three months now, and the battery and display are tru → GENUINE
 2. Battery Backup, Display, Value for Money and Using the Device is Excellent, Need to I → GENUINE
 3. I purchased this Laptop During Prime Day sales 2025 and using it from last 5 to 6 day → GENUINE
 4. This laptop is good but i recive damage product with useless service center please ca → GENUINE
 5. Awesome Laptop.. Good speed with Performance and OLED display is really stunning and  → GENUINE
 6. Worth the Price in 31K, after 10K discount and 20K trade in value for old laptop.It's → GENUINE
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```
✅ Setup complete

✅ Model trained | Accuracy: 0.9007

================================================================================
PRODUCT REVIEW AUTHENTICITY CHECK
================================================================================
🔍 Scraping: https://amzn.in/d/0iRPzSwB
   → Resolved to: https://www.amazon.in/dp/B0FMDL81GS?ref=cm_sw_r_cp_ud_dp_FXWT8XDTTR5WZJ4SQRW9&ref_=cm_sw_r_cp_ud_dp_...
✅ Successfully scraped 8 reviews from Amazon

📊 Analyzed 8 reviews
Fake    : 0 (0.0%)
Genuine: 8 (100.0%)

VERDICT:
✅ LOW RISK — Mostly genuine reviews

Sample predictions:
 1. Alright everyone , please read this review carefully as it's 6 july 2025 today and on → GENUINE
 2. one of the best product bought buy me, in the starting i only had issue with the fitt → GENUINE
 3. ⭐⭐⭐⭐⭐ Absolutely Loving These Buds! A Great Buy! 🔥I just picked up these OnePlus Nord → GENUINE
 4. Among the myriad of audio accessories available on the market today, the particular m → GENUINE
 5. Unbelievable experience OnePlus earbuds sound is really osm and sound is also very sm → GENUINE
 6. I recently bought the OnePlus Nord Buds 3R, and I'm honestly super impressed! The des → GENUINE
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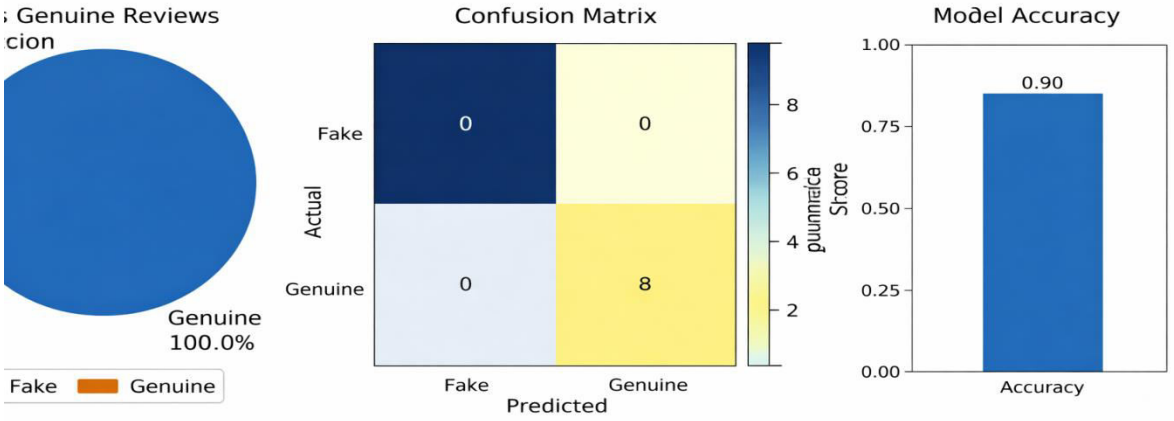

VI. Conclusion

The proposed Fake Product Review Identification system provides an efficient and reliable solution for detecting deceptive reviews using Natural Language Processing and machine learning techniques. By applying data preprocessing, TF-IDF feature extraction, and advanced classification algorithms such as SVM and XGBoost, the system achieves high accuracy in distinguishing between fake and genuine reviews. This helps in minimizing the influence of misleading information on e-commerce platforms and improves user trust and decision-making. The system also reduces the need for manual moderation and can handle large volumes of review data effectively. Although the current model delivers strong performance, there is scope for further enhancement through the integration of deep learning techniques and real-time detection mechanisms. Overall, the proposed system contributes to creating a more transparent, trustworthy, and user-friendly online shopping environment.

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