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Fake Review Detection System

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Abstract: ***In today's business landscape, online reviews play a crucial role in shaping commerce. A large portion of purchase decisions for online products is driven by customer feedback. Consequently, some individuals or groups try to manipulate product reviews to their advantage. Fake online reviews have a considerable effect on the experiences of online consumers, sellers, and e-commerce platforms. Although there has been academic research focused on identifying fake reviews, there is still a need for studies that thoroughly examine and summarize their origins and impacts. This work introduces a combination of semi-supervised and supervised text mining models to detect fake reviews, comparing their performance using datasets from reviews.***

General Terms: Machine Learning, Fake Review Detection, Natural Language Processing, Text Classification,
Keywords: Online Reviews, Fake Reviews, Semi-supervised Learning, Supervised Learning, Review Datasets, machine learning.

I. INTRODUCTION

When making a purchase online, it is common to first examine the ratings and reviews left by previous buyers. If the ratings are high and the reviews align with your expectations, it can encourage a quick decision to buy. However, the issue arises when the authenticity of the reviewer is unclear. Determining whether a review comes from a genuine buyer is nearly impossible. Some reviews may be paid promotions, or posted by acquaintances of the seller to artificially boost the product's reputation. This increases the risk of misunderstanding product quality and being misled by deceptive advertising. Customers often rely on seller descriptions and user reviews on e-commerce platforms, but false reviews can skew purchasing decisions. Fraudulent reviews can significantly impact consumers' choices, as studies suggest that buyers are highly sensitive to both positive and negative feedback**[1],[2]**. Reviews not only shape sales, but can also create considerable financial benefits, which in turn fuels the spread of fake reviews. Given the massive volume of review data, manually identifying fake reviews is impractical, making automated detection a valuable research area. With millions of online users, it is important to develop methods to identify and classify fake and genuine reviews, ensuring that consumers can make well-informed decisions and choose quality products.

As the internet economy grows, new forms of online deception continue to evolve, with fraudulent verification techniques becoming more sophisticated. Research in detecting fake reviews must therefore continue to advance. Genuine reviews tend to include a mix of nouns, adjectives, prepositions, determiners, and coordinating conjunctions to describe clear, sensory attributes. On the other hand, fake reviews often feature more verbs, adverbs, and pronouns**[5]**. By analyzing the distribution of parts of speech in review texts, it becomes possible to identify fraudulent reviews. Many fake reviewers engage in "brushing" practices, where they provide false ratings, whether positive or negative, for products they haven’t used. As such, their reviews often have distinctive traits. Reviewer behavior can be analyzed based on factors such as activity patterns, the maximum number of reviews in a day, total number of reviews, and the proportion of positive or misleading reviews**[2],[6]**. All of this information, derived from metadata, can help identify patterns indicative of fake reviews after careful analysis.

II. RELATED WORK

Several studies have explored fake review detection using machine learning and natural language processing techniques. Ott et al. (2011) introduced a dataset of truthful and deceptive hotel reviews and applied models like Support Vector Machines (SVM) and Naive Bayes using n-gram and syntactic features. Their work demonstrated that linguistic patterns can be effective in identifying deceptive content[3]. Mukherjee et al. (2013) focused on reviewer behavior and metadata, analyzing aspects such as review burstiness and rating deviations. They found that combining textual and behavioral features improved the detection of opinion spam[2]. Recent work has explored the use of deep learning models, such as Long Short-Term Memory (LSTM) networks, which can better understand the context and flow of language in reviews[6].

Our project builds upon these foundations by combining traditional machine learning classifiers with natural language processing techniques to enhance fake review detection accuracy. We aim to create a model that performs well on both review text and behavioral features, using publicly available datasets.

III. PROPOSED WORK

A. Implementation

This project aims to detect fake movie reviews using machine learning. The system will follow these steps:
Collect movie reviews from platforms like IMDb or Kaggle, including both real and fake ones.
Preprocess the text by cleaning and normalizing the reviews (removing stopwords, special characters, etc.).
Extract features such as TF-IDF, sentiment scores, review length, and word patterns.
Train machine learning models like Logistic Regression, SVM, and Random Forest to classify reviews.
Evaluate performance using accuracy, precision, recall, F1-score, and confusion matrix.
Analyze and visualize results to understand how well the system detects fake reviews.
The goal is to build an accurate and reliable model to identify fake movie reviews and improve trust in online review platforms.

B. Technologies Used

1) Front-End

Streamlit: Used to build an interactive and user-friendly interface for submitting reviews and displaying predictions.

2) Back-End

Python 3.x: Primary programming language for model development, data processing, and server-side logic.
FastAPI: Lightweight and high-performance web framework for building APIs to serve the machine learning model.
SQLite: Lightweight relational database used to store user inputs and review data.

3) Machine Learning and Data Processing

scikit-learn: Core library for implementing machine learning models such as Logistic Regression, SVM, and Random Forest.
joblib: Used for model serialization and saving/loading trained models efficiently.
pandas: For data manipulation, cleaning, and preprocessing.
numpy: For efficient numerical operations and array-based computations.

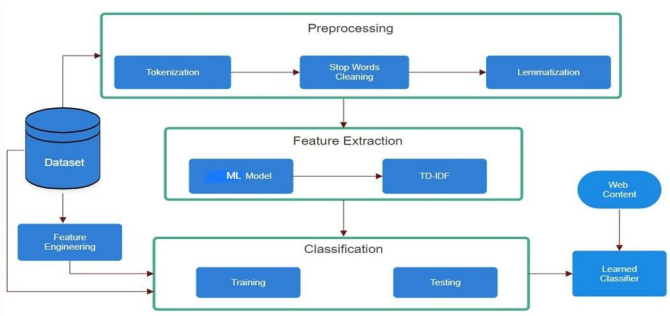
4) Development Tools

Visual Studio Code: Local development environment for coding and testing.
Google Colab: Cloud-based platform used for model training and experimentation with GPU support.

C. System Architecture

1) Dataset: Movie reviews are collected and labeled as real or fake.
2) Preprocessing: Reviews are cleaned through tokenization, stop words removal, and lemmatization.
3) Feature Extraction: Important features like TF-IDF are extracted from the text to convert it into numerical form.
4) Classification: Machine learning models (Logistic Regression, SVM, Naïve Bayes) are trained using these features. The data is split into training and testing sets.
5) Output: The trained model (learned classifier) can predict if a review is real or fake.

This architecture ensures efficient detection of fake reviews using text processing and machine learning.



Fig(1): System Architecture

IV. RESULTS

The proposed Fake Review Detection system was successfully implemented using machine learning techniques and deployed via a web interface built with Streamlit. The system allows users to input a movie review and receive a prediction indicating whether the review is genuine or fake.

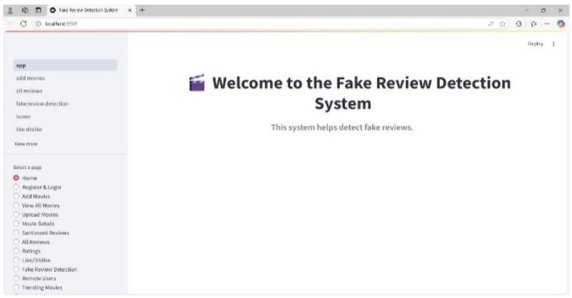


Fig. 2 Home Page

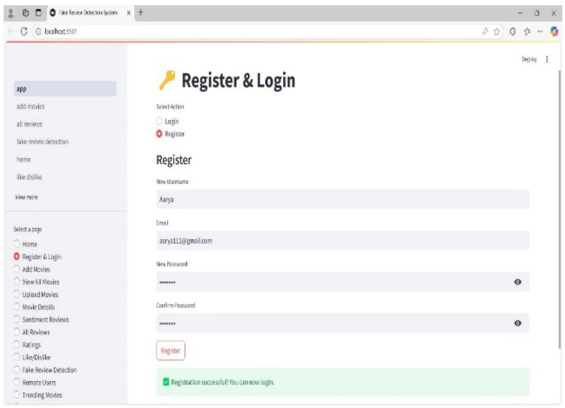


Fig. 3 Register and Login Page

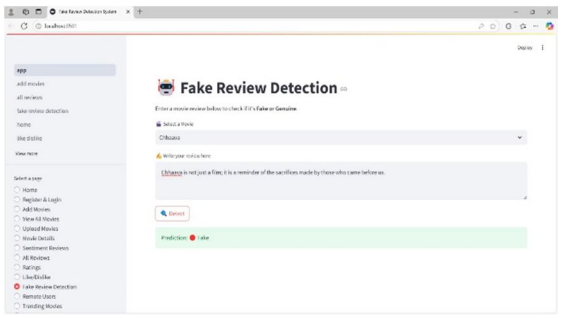


Fig. 4 Detection Result Page1

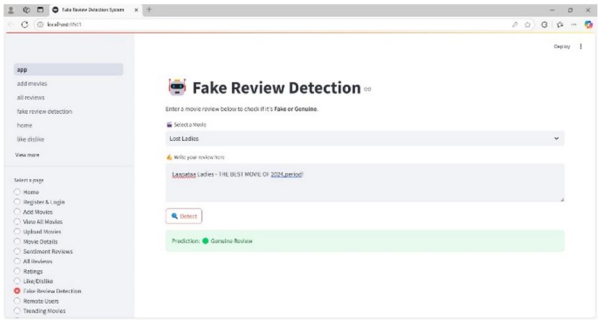


Fig. 5 Detection Result Page2

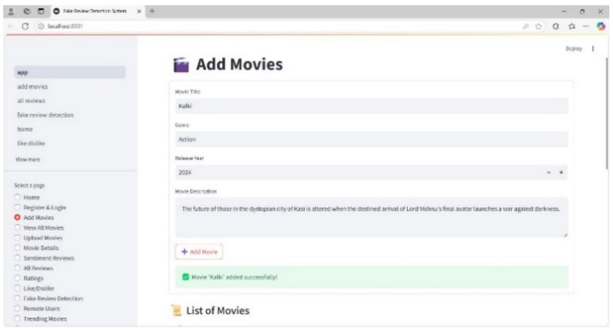


Fig. 6 Add Movie Page

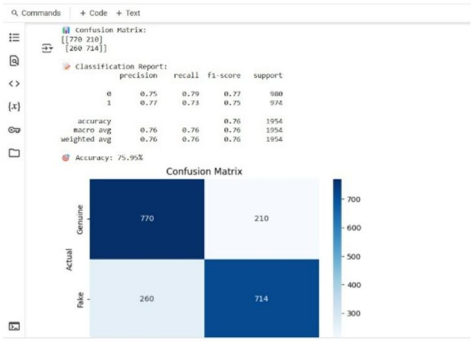


Fig : 7 Accuracy and classification report1

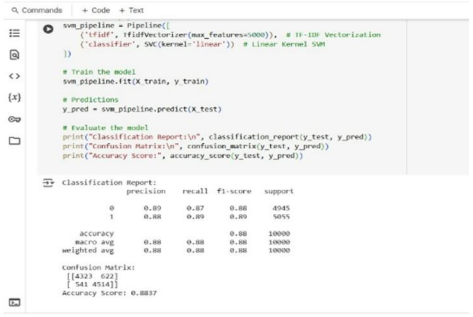


Fig : 8 Accuracy and classification report2

We explored different SVM variations. The backend uses Linearsvc, which is optimized for speed and simpler deployment. However, during model evaluation, we found SVC(kernel='linear') gave higher accuracy (~88%), and this is what we report in the performance section. Both are linear SVMs, just different implementations.

V. CONCLUSION

In this paper, we propose a model for detecting fake reviews using machine learning algorithms, specifically Support Vector Machines (SVM). Our model demonstrates a high level of accuracy in identifying fraudulent reviews. Fake review detection is an emerging area of research, particularly due to the limited availability of open datasets. Through this project, our goal is to not only achieve high accuracy but also minimize the time required to identify fake reviews. Additionally, the model is designed to detect multiple fake reviews, making it a practical solution for real-world applications.

VI. ACKNOWLEDGMENTS

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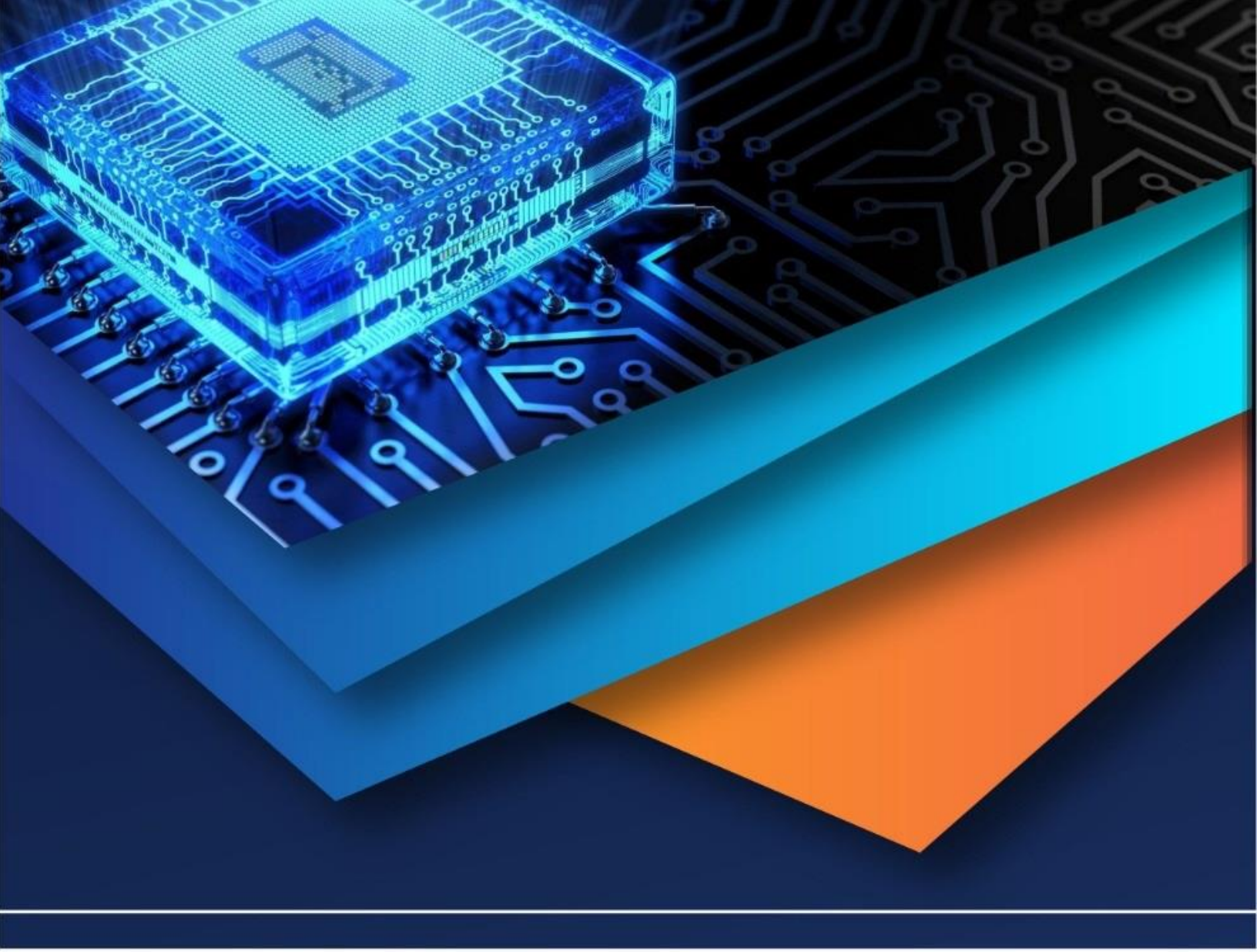

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