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Detecting Fake Reviews in E-Commerce Platform

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Abstract: Online reviews in modern businesses and e-commerce platforms are influential and this is an important factor for customers. Potential buyers heavily rely on user's feedback when deciding whether or not to purchase products online. Unfortunately, there are some unscrupulous individuals and organizations that attempt to manipulate these reviews to suit their interests. As a result, fake reviews increase and mislead customers/buyers.

To address this issue, a proposed solution involves the implementation of an e-commerce platform that utilizes an NLP algorithm to analyze the features and sentiments of reviews and a data science algorithm to classify any fraudulent text. The proposed system contains a review detection model within an e-commerce application, where customers may register, view products, and make purchases. As customers buy products, they post reviews and ratings. Using these inputs, the model is able to classify given reviews as false or true using KNN classification algorithm.

Keywords: Machine Learning, NLP, Fake Reviews, Classification Algorithm, KNN, Lesk

I. INTRODUCTION

The rapid development of the Internet has led to the rising availability of review services on online platforms, such as shopping websites (e.g., amazon.com) and opinion-sharing websites. People typically do not now purchase products or services without first reading the reviews; consumer-generated reviews have become an indispensable part of the online shopping experience. However, certain studies revealed that around 30% of reviews and ratings delude customers into making bad and poor decisions.

They may even undermine the credibility and usefulness of reviews in general. Positive fake reviews can increase sales, by giving financial advantages to both the individual and the company status. Company's reputation and their business's sales may go through impairment because of these fake reviews posted online. Therefore, it is crucial to find and remove review spam if you want to safeguard the both buyers and sellers' interests. The seeking of fake reviews mainly depends on textual data and feature abstractions. Thus, particular data science algorithms help in detecting these fake reviews.

This research takes these features from the given reviews and the data of users and categorizes the reviews into fake or real. To train the machine learning model used the dataset which is referred from the Kaggle website, which provides huge number of datasets to work with data science algorithm. The results indicate that the extracted features from the user's information helps in categorization of reviews.

The next parts of this paper are briefed in the following manner: Section II summarizes the related works of fake review detection. Section III Provides the working of proposed model. Section IV contains the algorithms used. Section V contains results and discussion and at last Section VI concludes this research paper.

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II. RELATED WORK

Table 1 Summarization of the related works

Techniques	Methods	Benefit	Drawbacks	Reference No
KNN	▪ Data Processing (tokenization, stop words cleaning and lemmatization) ▪ Feature Extraction ▪ Feature Engineering.	It compares performance of several classifiers applied on a real Yelp dataset of restaurants reviews where KNN outperforms the rest of the classifiers in detection of fake reviews.	Not considered behavioral features such as ▪ Frequent times the reviewers do the reviews ▪ The time taken by reviewers to complete reviews ▪ How frequent they are submitting positive or negative reviews.	[1]
▪ Naïve Bayesian model ▪ EM algorithm ▪ Frequent Item set Mining (FIM).	▪ Reliable negative set (RN) extraction algorithm. ▪ Positive Unlabeled (PU).	▪ Measuring the discriminative power of group features using PSGD. ▪ Obtaining RN set consisting of only non-spammer groups.	This model involves unlabeled instances. But labelling by manual and large-scale labelling are difficult.	[2]
▪ SRD-BM ▪ SRD-LM	SRD-BM to create a labeled dataset. This labeled dataset, then, utilizes SRD-LM to train the classifiers.	Usage of N-gram approach to accurately analyze spam reviews.	Uses Amazon and yelp dataset but not implemented in real-time.	[3]
Combination of multiple feature fusion and rolling collaborative training.	▪N-gram based feature set. ▪ NB and SVM as classifiers.	Improved detection accuracy because of the rolling update sample data technique that can dynamically adjust the classifier parameters.	Manually compiled dataset cannot fully reflect the reviews in the real world	[4]
Ensemble model for fake review detection and for integrating the base classifiers.	▪ Data Resampling ▪ Feature Pruning ▪ Parameter Optimization ▪Term Frequency-Inverse Document Frequency (TF-IDF).	Combination of data resampling with the grid search method to address the data imbalance problem	Data ablation study is time consuming when there are too many features.	[5]
Supervised ML approach based on graphical method	▪ Data Collection ▪ Pre-processing ▪ Machine Learning	▪ Usage Review-centric features such as textual features, meta-data features. ▪ Usage Review-centric features such as rating features, temporal features.	Need only labeled dataset for training.	[6]
Minimal size of Amazon product review dataset has used	▪ TF-IDF ▪ Countvectorizer ▪ n-gram features ▪ Principal Component Analysis	Usage of PCA has made an excellent increase in accuracy and precision.	Minimal size of Amazon product review dataset has used	[7]

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▪ Time series outlier detection ▪ Outlier detection for stream data	▪ ARIMA (autoregressive integrated moving average) ▪ LOF (Local Outlier Factor) ▪ SVM (Support Vector Machine)	Using Isolation Forest algorithm that shows enhancement in detection of outlier reviews that focuses on different patterns of product reviews.	Proposed method shows no indication of products reviews with high probability of being false or true.	[8]

III. PROPOSED MODEL

The aim of this research is to design a system that can classify reviews on e-commerce websites. This model is able to do an analysis of the content of reviews, as well as other relevant data such as user details, to determine if a review is genuine or fake. The below high-level architecture is implemented and can be seen in Figure 1 and the problems are solved in the below mentioned six steps.

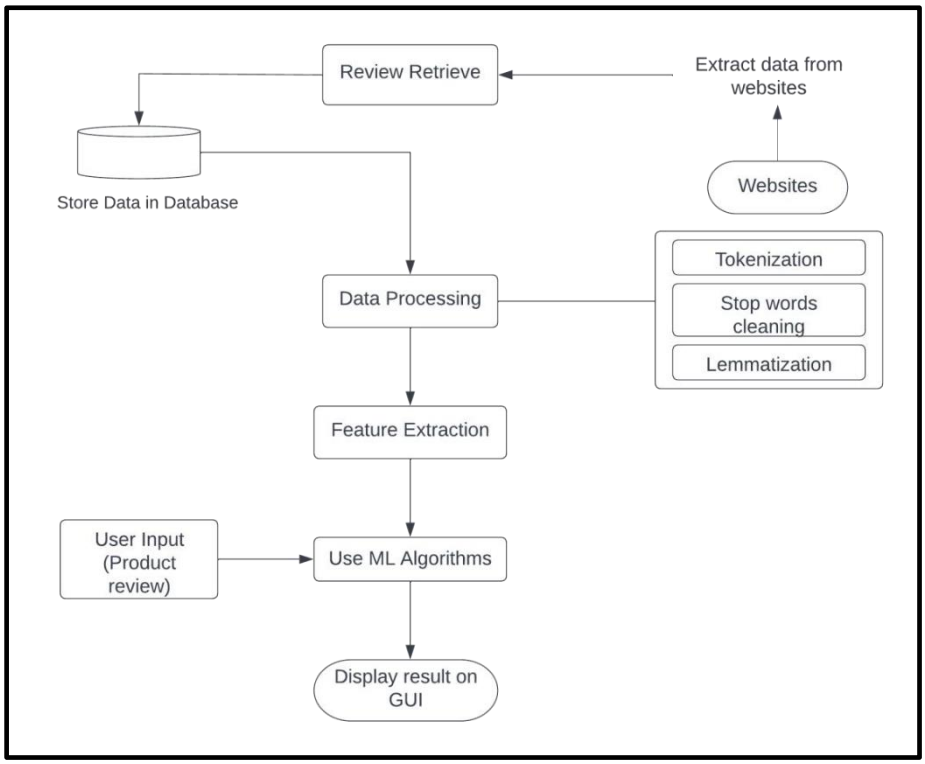

Fig. 1 Model Design

1. Collection of data from websites: This is the first stage of the proposed model where review datasets are extracted from websites such as Yelp, Kaggle, Amazon, etc. Usually these datasets can either be labeled and unlabeled consisting of reviews based on products that are posted by customers and reviewers.

2. Storing data in Database: Once the raw datasets are extracted, the review dataset is manually collected and then stored in the database.

3. Data Processing: The stored review dataset undergoes data processing methods which consist of tokenization, stop words cleaning and lastly lemmatization process. From this, the unwanted data is ignored and the relevant review data is collected for further processing.

4. Extraction of Features: With many features present, only a few selected features such as size of the review, positive and negative word count, etc. are considered for the implementation of machine learning algorithms.

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5. Use of ML Algorithms: Once the features are extracted, K Nearest Neighbor is implemented based on Euclidean distance.

6. Display Result on GUI: The final stage concludes by displaying/presenting the classified reviews onto the screen of the Graphical User Interface.
The K Nearest Neighbor algorithm classifies the reviews obtained from the available datasets from various sources and categories such as experience, age, total posts posted, posted time, location, product based, customer feedbacks. Using these, increased accuracy is obtained.

IV. ALGORITHMS

The algorithms used are:

1) Lesk Algorithm

Step-1: Texts of Posted Reviews are broken down into sentences and words.
Step-2: If some of the word are "stopping word", then those are removed.
Step-3: Remaining words are then compared with the dataset containing two categories; positive and negative, then the count of positive and negative words gets incremented.
Step-4: At last these counts are passed as input to KNN algorithm which helps to classify the reviews.

2) KNN Algorithm

Step-1: Load the data that you want to use for classification of reviews.
Step-2: Split the data into two sets, a training set and a testing set.
Step-3: Calculate the number K of the neighbors that you want to consider for making a prediction.
Step-4: Calculate the Euclidean distance of K number of neighbors.
Step-5: Take the K nearest neighbors as per the calculated Euclidean distance.
Step-6: Among these k neighbors, count the number of the data points in each category.
Step-7: Assign the new data points to that category for which the number of the neighbor is maximum.
Step-8: Finally, the model is ready.

V. RESULTS AND DISCUSSION

This model uses two algorithms i.e., Lesk and KNN. Lesk processes the review text and KNN classifies those text using Euclidean distance. For the dataset containing 600+ samples, model gives the accuracy of 93%. Our model classifies the reviews according to the user profiles.

Constraint	KNN Algorithm
Accuracy	93.75%
Time (milli secs)	713
Correctly Classified	93.75%
InCorrectly Classified	6.25%

Fig. 2 Results of proposed model

VI. CONCLUSION

The proposed fake review detection model uses KNN to classify the fake reviews in e-commerce platforms and businesses. Through the use of NLP and a dataset containing real and fake reviews, the model was able to learn patterns and certain features written by customers and reviewers which are distinguished between the two types of reviews. This model was able to show the achieved accuracy, prediction indicating its effectiveness in detecting fake reviews and ensures the authenticity and reliability of reviews in e-commerce platforms since product companies and customers rely on these reviews for their growing business and buying good products. In further studies, features in the dataset can be increased and parameters of KNN can be expanded for e.g. considering the upvotes or likes of particular review posts. In conclusion, fake review detection model classifies fake reviews, minimize false positives, automated, and continually improved over time.

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