

Fake Product Review Monitoring System

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Abstract: *In the current scenario, the data on the web is growing to a larger extent. Social Media is generating a large amount of data such as reviews, comments and customer's opinions on a daily basis. This huge amount of user generated data is worthless unless some mining techniques are applied to it. Nowadays, there are several people using social media reviews to order anything through online. Online spam detection is one of the herculean problems since there are many faux or fake reviews that are created by organizations or by the people themselves for various purposes. Such organizations tend to write fake reviews to mislead readers or automated detection systems by promoting or demoting the targeted product services. Fake reviews detection has recently become a limelight that's capturing attention. Fake reviews are generated intentionally to mislead readers to believe false data that makes it tough and non-trivial to discover supported content. Hence, it is highly necessary to create a monitoring system which thoroughly checks for fake reviews among various product websites and removes them promptly.*

Keywords: *Fake reviews, spam detection, opinion mining.*

INTRODUCTION

In current trends, e-commerce has been one of the very happening fields. In General, it provides facility for customers to write reviews concerned with its service. The existence of these reviews can be used as a source of information. Before purchasing anything, it is a normal human tendency to surf reviews on that product. Based on reviews, customers can compare different brands and can finalize a product of their interest. These online reviews can change the opinion of a customer about the product. If these reviews are true, then this can help the users to select proper product that satisfies their requirements. On the other hand, if the reviews are manipulated or unreal, then there are chances that it can

mislead users. This resulted in the development of a system which detects fake reviews for a product by using the text and rating property from a review. The honesty value and measure of a fake review is often measured by utilizing the data mining techniques.

An algorithm could very well be used for tracking customer reviews. Fake reviews include dishonest or inaccurate information. They are used to misinform consumers, so they make wrong purchase decisions, thus affecting the revenues for products. Spam product reviews are three types: Deceitful reviews, Reviews of a specific brand and non-reviews. 1) Deceitful (fake) reviews of products that are written to mislead customers. They include undeserving positive reviews to promote the online trade of specific products and negative reviews to defame worthy products. This type of spam product review is called hyperactive spam products reviews. 2) Reviews of a brand only: these opinions target the manufacturer brands instead of the product itself. 3) Non- reviews, which have two sub-kinds: (a) announcements and (b) unrelated reviews that contain no opinions, such as interrogations, responses or undefined text

LITERATURE SURVEY

Review spam is strenuous to detect unless read manually. Here are some of the works proposed and implemented. Paper [1] proposes behavioral approach to detect review spammers who manipulate the ratings on some target products wherein an aggregated behavior scoring methods for rank reviewers is derived. Paper [2] proposes that spotting the individual fake reviews was quite grueling unlike spotting the groups which was comparatively easier. One frequent item set mining (FIM) method is used to analyze the dataset. In paper [3], the approach was to detect the fake review by identifying the IP address of the user ID that is recorded multiple times. Paper [4] used linguistic features like unigram presence, unigram frequency, bigram presence, bigram frequency and review length to build a model and find fake reviews. Although, the

main problem is data scarcity, and it requires both linguistic features and behavioral features. Paper proposes new features like review density, semantic, and emotion and gives the model and algorithm to construct each of these features. Although, it is not a good metric, and the reduction is not substantial. In paper [6], scraping processing is used to build the data set from yelp and then

Fake Feature Framework for organizing the extraction and characterization of features in fake detection. Their framework is composed of two main types of features: review centric and user centric. Review centric features are only related to the text of the review and User centric features show how the user behaves within the site.

PROPOSED SYSTEM

The system proposed will include methods like collection of datasets from Kaggle and preprocessing them.

A. Pre-Processing

The term Pre-processing the data is defined as the process of converting a data into an understandable format by cleaning it and preparing the text for classification. Texts from online contain usually lots of noise and uninformative parts such as scripts and advertisements. Processing includes certain steps such as online text cleaning, white space removal, expanding abbreviation, Stemming, stop words removal and feature selection. These might reduce the noise in the text which helps to speed up the performance of the classifier. Before carrying out the transformation and vectorization of the sentences of the reviews, preprocessing steps were used to clean the data and remove noise. The goal of text pre- processing is to convert the texts of the reviews to a form that deep learning algorithms can understand and analyze. The pre-processing steps are as follows: a) Removing punctuation: deleting punctuation marks from the reviews. b) Removing stop words: This process cleans articles from the text; for example, 'the', 'a', '' words are removed from text. c) Stripping useless words and characters from the dataset. d) Word stemming: converting each word of a sentence into its root; for instance, 'undesired' becomes 'desire' e) Tokenizing: splitting whole sentences in the text into separate words, keywords, phrases, and pieces of tokens. f) Padding sequences: using deep learning neural networks to ensure that the input data have equal sequence length. However, we implemented a pre-padding method to add zeros to the beginnings of the vector representation.

Understanding deviation of ratings: -

- The ratings or reviews which are showing a trend of continuous growth but suddenly shows negativity is simply displaying a deviation from the normal ratings.

Sentiment analysis of the product review: -

It is necessary for the system to understand whether the review is positive or negative, which further helps to understand the deviation from either the positivity or the negativity in the reviews. The analysis will help us to understand the overall aspect of the products so that few spam reviews doesn't affect the overall statistics of products.

- The posted reviews will undergo the process of sentiment analysis, IP address track, and its deviation from overall reviews. In case of miscalculations, reviews will be analyzed and detected.

Web Scripting is an automatic method to obtain large amounts of data from websites. Most of this data is unstructured data in an HTML format which is then converted into structured data in a spreadsheet or a database so that it can be used in various applications. This large amounts of data from a website are used to train an algorithm. Web scraping requires two parts namely the crawler and the scraper. The crawler is an artificial intelligence algorithm that browses the web to search the data required by following the links across the internet. The scraper, on the other hand, is a specific tool created to extract the data from the website. The design of the scraper can vary greatly according to the complexity and scope of the project so that it can quickly and accurately extract the data. When a web scraper needs to scrape a site, first it is provided the URLs of the required sites. Then it loads all the HTML code from those sites and a more advanced scraper might even extract all the CSS and JavaScript elements as well. Then the scraper obtains the required data from this HTML code and outputs this data in the format specified by the user. Initially, a website is created which contains featured products of famous brands. Users have to login to the website for entering reviews. Once the reviews have been entered, machine learning algorithms will be used for classifying them into fake or real. Fake or spam reviews will be removed thereafter from the website. Only the reviews which remain truthful get published in this process. Thus, the product review website is an efficient and effective way for users to know about the actual information of the product.

B. We Are Using Two Machine Learning Algorithms

- 1) TF-IDF Vectorizer: TF-IDF Vectorizer (Term Frequency-Inverse Document Frequency): TF-IDF which stands for Term Frequency– Inverse Document Frequency is a statistical method of evaluating the significance of word in given documents. This is very common algorithm to transform text into a meaningful representation of numbers which is used to fit machine algorithm for prediction. TF- IDF vectorizer is defined with parameter (stop words= 'English') which eliminates all the common English words.

2) **Naïve Bayes Classifier:** Naïve Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fast machine learning models that can make quick predictions. It is a probabilistic classifier, which means it predicts based on the probability of an object. It is called Bayes because it depends on the principle of Bayes theorem, which is used to determine the probability of a hypothesis with prior knowledge. It depends on the conditional probability. Naïve Bayes Classifier works on the following steps:

- Convert the given dataset into frequency tables. Generate Likelihood table by finding the probabilities of given features. Now, use Bayes theorem to calculate the posterior probability. Formula: $P(c|x) = \frac{P(x|c) P(c)}{P(x)}$ Referred from Bayes's theorem, in probability theory, a means for revising predictions considering relevant evidence, also known as conditional probability or inverse probability.
- **Passive Aggressive Classifier** Passive-Aggressive algorithms are called so because Passive- If the prediction is correct, keep the representation and do not make any interchanges. i.e., the data in the example is not enough to cause any changes in the representation. Aggressive- If the prediction is incorrect, make interchanges to the representation. i.e., some interchange to the representation may correct it. Understanding the mathematics supporting this algorithm is not very simple and is supporting the scope of a single article. This section provides just an overview of the algorithm and a simple implementation of it. To learn more about the mathematics supporting this algorithm.

SYSTEM OVERVIEW

In this system overview we will undergo various modules for implementing our project they are listed below:

1.Data Collection: Using this module we will upload AMAZON reviews dataset to the application.

2.Data Preprocessing: Using this module we will read all reviews and then remove stop words, special symbols, punctuation and numeric data from all reviews and after applying Preprocessing we will extract features from all reviews.

3.Features Extraction: Here we will apply the TF-IDF (term frequency Inverse Document Frequency) algorithm to convert string reviews into numeric vectors. Each word count will be put in a vector in place of words.

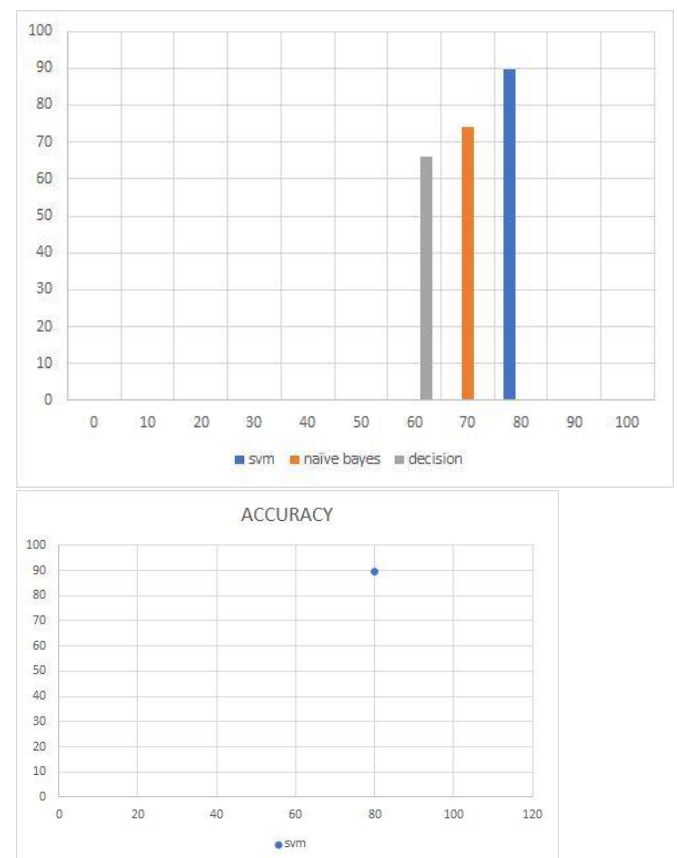
4.Run SVM Algorithm: We will apply SVM algorithm on TF-IDF vector to train SVM algorithm and then we apply test

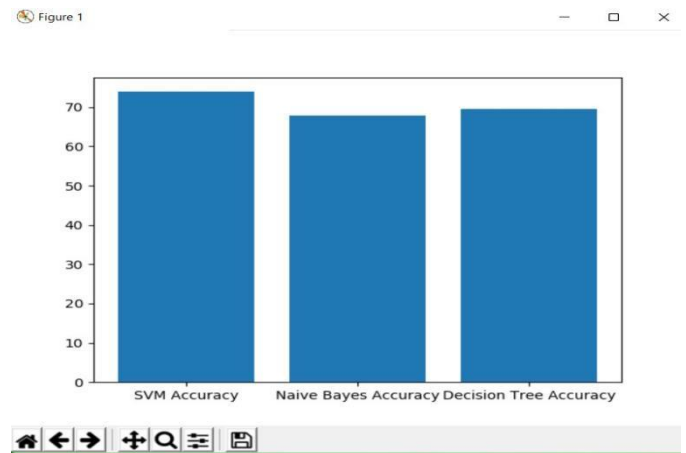
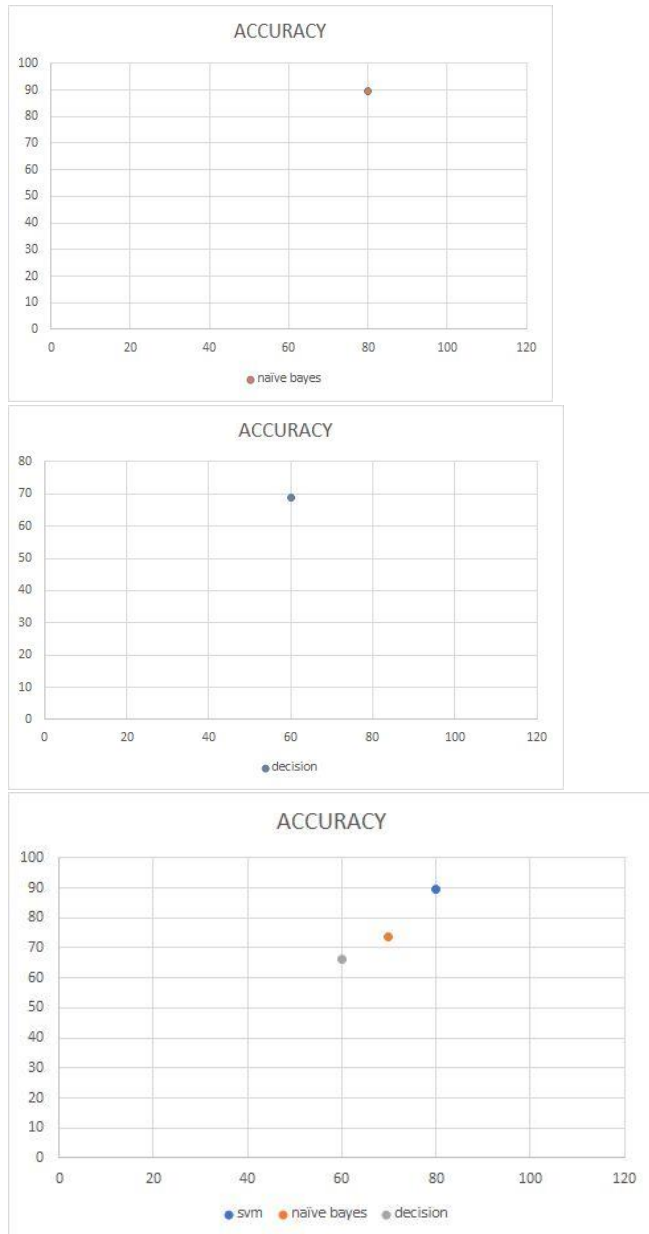
data on SVM trained model to calculate SVM prediction accuracy

5.Run Naive Bayes Algorithm: We will apply Naïve Bayes algorithm on TF-IDF vector to train Naïve Bayes algorithm and then we apply test data on Naïve Bayes trained model to calculate Naïve Bayes prediction accuracy

6.Run Decision Tree Algorithm: We will apply Decision Tree algorithm on TF-IDF vector to train Decision Tree algorithm and then we apply test data on Decision Tree trained model to calculate Decision Tree prediction accuracy

RESULTS





CONCLUSION

This project presented an extensive survey of the most notable works to date on machine learning-based fake review detection. Firstly, we have reviewed the feature extraction approaches used by many researchers. Then, we detailed the existing datasets with their construction methods. Then, we outlined some traditional machine learning models and neural network models applied for fake review detection with summary tables. Traditional statistical machine learning enhances text classification model performance by improving the feature extraction and classifier design. In contrast, deep learning improves performance by enhancing the presentation learning method, algorithm's structure and additional knowledge. We also provided a comparative analysis of some neural network model-based deep learning and transformers that have not been used in fake review detection. The outcomes showed that RoBERTa achieved the highest accuracy on both datasets. Further, recall, precision, and F1 score proved the efficacy of using RoBERTa in detecting fake reviews. Finally, we summarized the current gaps in this research area and the possible future direction to get robust outcomes in this domain.

We can conclude that most of the existing works focused on supervised machine learning to detect fake reviews. However, supervised machine learning needs a labeled

dataset to predict whether the review is fake or not, which can be hard to obtain in a fake review detection area. According to the difficulty of obtaining labeled dataset, we observed that the most commonly used datasets in the current works are constructed based on a crowdsourcing framework. Evaluating the machine learning techniques on these datasets is not preferred as these datasets do not present the fake review in a real-world application. Consequently, assessing the classifiers on the real-world application is preferred as this will help us develop algorithms that can work efficiently in the real world.

FUTURE DEVELOPMENTS

For future developments, a web application can be designed which makes the process of finding out fake reviews easier. Every user will be given an account through which they can write reviews for various products. The app would automatically filter out fake reviews based on the proposed Machine Learning algorithm. Eventually, customer will get rid of fake reviews present in online shopping websites.

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