

# Study on Fake Review Detection by Classification Algorithm using Machine Learning Technique

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*Abstract*— Internet got boosted in few last years, people use web services more than expected. As the Internet got expanded people started their business online like E-Commerce websites. In today's modern era e-commerce has expanded broadly. Online Review has become an important factor for customers to buy products and judge how good the product is. However there are some users tend to give false reviews for the product, manufacturers and retailers are highly concerned with this customer feedback and review. This arise a serious concern that false reviewers devalue/value the products and the services. This is called Fake Review, where the users generate false review about the product for revenue gain/loss, hence fake review exist it is important to develop a technique to detect fake reviews. We have use active learning detection technique to detect the fake reviews.

**Key words:** Amazon E-Commerce Dataset, Dataset Acquisition, Data Pre-Processing, Active Learning, Support Vector Machine, Perceptron Algorithm, Random Forest Algorithm

## I. INTRODUCTION

The Internet has changed our lives since it was introduced. With rapidly expansion and usage of Internet people are now totally dependent on the web services, which also changed people's behaviour of communicating and expressing their views. People post their views in their respective discussion groups, forums, social media, and blogs and in e-commerce website for a product/service. These contents are user generated which are written in natural language. Opinion sharing on a product/service is based on their personal experience which is called as reviews.

In order to solve this malignant problem, we propose an interactive semi-supervised model to identify fake reviews which is evaluated later on using real life data and compared with some sophisticated prior research work. Active learning will be use to pre-process data set. Original dataset of Amazon reviews will be use to analyse and compare the results of different algorithm that are Support Vector Machine, Perceptron Algorithm, Random Forest Algorithm. In the literature, review spam has been categorized into three groups: Untruthful Reviews: The main concern of this paper. Reviews on Brands: Where the comments are only concerned with the brand or the seller of the product and fail to review the product. Non-Reviews: Those reviews that contain either unrelated text or advertisements. The first category, untruthful reviews, is of most concern as they undermine the integrity of the online review system.

## II. MOTIVATION

Online review is an important element in the era of E-commerce industry, where personal opinion on product is a

convenient way to make decision whether to buy the product or not. That's why some people post poison reviews to harm the reputation of the respective product even though the product is good.

Writing fake review has become a serious issue, because of which user get false information about the product/service.

It's very serious review manipulation has been a problem for some time, and has only been growing.

It affects both sellers and buyers alike, negatively. It creates false depictions of inferior products; prevents better products from gaining traction and getting into the hands of people that need them; and of course limits your potential for sales as a result.

Companies that post fake reviews on websites to increase their ratings could face fines of thousands as part of a new government crackdown on misleading business practice.

## III. LITERATURE REVIEW

M.N. Istiaq Ahsan, Tamzid Nahian, et.al have introduced an active learning approach to detect review spam using the TF-IDF features of the review content [16]. They have proposed an interactive semi-supervised model to identify fake reviews which is evaluated later on using real life data. They have not used the large-scale datasets from different domains in order to increase the size and diversity of the data to evaluate the heftiness of different classifiers. Diverse sets of tuning and smoothness techniques could be introduced. The feature set might be improved by using n-gram models (unigram, bigram, and trigram) with additional pre-processing techniques.

M.N. Istiaq Ahsan, Tamzid Nahian et .al, have introduced an ensemble learning approach which combines two different types of learning methods (active and supervised) by creating a hybrid dataset of both real-life and pseudo reviews [15]. This model holds 3 different filtering phases that is based on KL and JS distance, TF-IDF features and n-gram features of the review content. Large-scale datasets from different domains of different languages have not used in this system.

Elskrif Elmurugi, Abdelouahed Gherbi have analyse online movie reviews using SA methods in order to detect fake reviews [10]. Sentiment Analysis (SA) and text classification methods are applied to a dataset of movie reviews. The comparison of five supervised machine learning algorithms i.e Naive Bayes (NB), Support Vector Machine (SVM), K-Nearest Neighbours (KNN-IBK), KStar (K\*) and Decision Tree (DT-J48) for sentiment classification of reviews using two different datasets, including movie review dataset V2.0 and movie reviews dataset V1.0 has been given in this paper. The experiment shows that SVM

algorithm outperforms other algorithms, and that it reaches the highest accuracy not only in text classification, but also in detecting fake reviews.

Lu zhang, Zhiangwu, Jiecao have proposed a partially supervised learning model (PSGD) to detect spammer groups. PSGD applies Positive Unlabelled Learning (PU-Learning) to study a classified as spammer group detector from positive instances (labelled spammer groups) and unlabelled instances (unlabelled groups). They have extracted reliable negative set in terms of the positive instances and the distinctive features. By combining the positive instances, extracted negative instances and unlabelled instances, we convert the PU-Learning problem into the well-known semi-supervised learning problem, and then use Naive Bayesian model and EM algorithm to train a classifier for spammer group detection. They have implemented this system using Amazon.cn dataset [9].

Chirag Visani, Navjyotsinh Jadeja, Manali Modi have constructed a feeling classifier, which can decide positive, negative and nonpartisan assumptions for a record. They have given the study about the algorithmic techniques for review spam discovery like Naive Bayes Classifier, Support Vector Machine (SVM), K-Nearest-Neighbour (Knn), Logistic Regression Classifier and detecting parameters like Group Time Stamp, Group Rating Fluctuation, Group Plagiarism, Cosine Similarity, Group Member Plagiarism, Early Time Stamp, Group Impact, Group Member Impact, Support Count, Review Length, Reviewer Investigation, and Stupidity. From the study we can say that support vector machine (SVM) outflank than the various administered strategies for survey spam identification [8].

Anna V. Sandifer, Casey Wilson, Aspen Olmsted have introduced a model for detecting fake online hotel reviews. They have extracted part-of-speech features from the data set and applied three classification techniques to identify fake online reviews. The three classification techniques are Multinomial Naive Bayes classifier, Bernoulli Naive Bayes classifier, logistic regression classifier [7].

#### IV. PROPOSED WORK

In this proposed system, there are five methods among this first four methods are about data sets and data pre-processing. Active Learning is a machine learning technique which is used to train datasets and used some classifier algorithms like Support Vector Machine (SVM), Random forest and Perceptron.

##### A. Data Acquisition

Data acquisition is products and/or processes used to collect or analyse some phenomenon. We have used the original dataset of the Amazon reviews to test our methods of reviews classification and the dataset is used as unlabelled data. The Amazon dataset is used for both training and testing purpose in this method

##### B. Data Preprocessing

Data pre-processing task is extremely crucial as it helps to generate organized information that is easy to understand and improves accuracy as well.

We apply a number of pre-processing techniques to deal with noisy, missing, and inconsistent data which might disturb decision-making process. Low-quality data will produce poor quality mining results and classification results. We ensure that the quality of the data we use in this experiment is up to the mark. Unstructured data in MS Excel format acquired from the source is converted into structured data i.e. in My SQL Database format.

Pre-processing procedures includes- tokenization & lowercasing letters, removing stop words, removing punctuations, stemming etc.

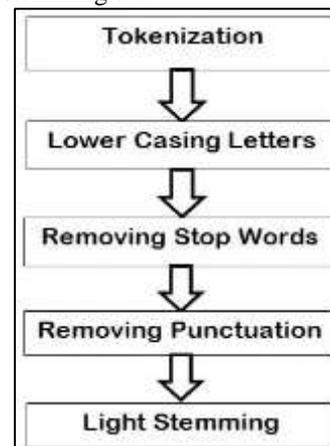


Fig. 1: Data Pre-processing Steps

##### 1) Processing Unlabeled Data

Processing unlabeled data means tagging a label to the unprocessed data. In this step we make cluster head from the structured data.

##### 2) Active Learning

Active learning is a special case of semi supervised machine learning which can interactively request the user or some sort of supervisor to determine the class of some unknown data points to achieve the desired results. We adopt this technique to train our model. This is a kind of a situation when unlabelled data is ample but labelling the whole dataset manually is extremely time consuming and labour intensive. So, the algorithm actively queries the user for labelling the new, confusing data points. In this type of learning, learner itself chooses the data point examples that's why it needs a much lower number of examples to learn a concept than it is required in typical supervised learning.

The algorithm trains the model based on a training dataset and evaluates using a test dataset. After each evaluation, the algorithm selects certain.

##### C. Classifiers

###### 1) Support Vector Machine (SVM)

SVM in machine learning is a supervised learning models with the related learning algorithm, which examines data and identifies patterns, which is used for regression and classification analysis.

Recently, many text-classification algorithms have been proposed, but SVM is still one of the most widely and most popular used classifiers. By applying the kernel equations arranges the data instances in such a way within the multi-dimensional space, that there is a hyper-plane that separates data instances of one kind into classes. The mostly used type of kernel equation is RBF. The function of kernel

is to take data instance as input and transform it into the required output form. Once we manage to divide the data instances into two distinct categories, our aim is to get the best hyper-plane to separate the two types of instances.

The data points that were not linearly separable in the original domain have become linearly separable in the new domain, due to the application of a function (kernel) that transforms the position of the data instances from one domain to another. This is the basic idea for analyse large amount of data and patterns using Support Vector Machines and their kernel techniques. Whenever a new data instance is encountered in the original domain, the same kernel function is applied to this new instance too, and its position in the new domain is found out.

### 2) Perceptron Algorithm

Perceptron is a machine learning linear classifier that helps to classified outcomes for computing.

Although it is suitable for large-scale learning we use this classifier to train our model. Some advantages that Perceptron classifier provides are learning rate is not required in this type of model, it is not regularized or penalized and this updates the model only when it commits a mistake that's why Perceptron is slightly faster to train with the hinge loss and that the resulting models are sparser.

### 3) Random Forest

Random forest algorithm is a supervised classification algorithm. This algorithm generates the forest with a number of trees. In short, the more trees in the forest the more robust the forest looks like. Similarly, in the random forest classifier, the higher the number of trees in the forest gives the high accuracy results. Random forest algorithm can be state into two stages. (1) Random forest creation pseudo code. (2) Pseudo code to perform prediction from the created random forest classifier.

First, let's begin with random forest creation pseudo code

#### a) Random Forest Pseudo Code

- 1) Randomly choose "a" features from total "n" features. Where  $n \gg a$ .
- 2) From the "a" features, calculate the node "b" using the best split point.
- 3) Divide the node into daughter nodes using the best split.
- 4) Repeat steps 1<sup>st</sup> to 3<sup>rd</sup> until "l" number of nodes has been reached.
- 5) Build forest by repeating steps 1<sup>st</sup> to 4<sup>th</sup> for "n" number times to create "n" number of trees.

The random forest algorithm starts with randomly selecting "a" features out of total "n" features. In the above image, you are observing that we can randomly taking features and observations. In the next stage, we are using the randomly selected "a" features to find the root node by using the best split point approach.

- In the next stage, we will be calculating the daughter nodes using best split approach.
- Repeated 1 to 3 stages until we form the tree with a root node and having the target as the leaf node.
- Finally, we repeat stages from 1 to 4 to create "n" randomly created trees. This randomly created trees forms the random forest.

#### b) Random forest prediction pseudo code

- To perform prediction using the trained random forest algorithm uses the below pseudo code.
- Takes the test features and apply the rules of each randomly created decision tree to predict the outcome and stores the predicted outcome (target) Calculate the votes for each predicted target.
- Consider the maximum voted predicted target as the final prediction from the random forest algorithm.

To perform the prediction using the random forest algorithm we need to pass the test features through the rules of each randomly created trees. Suppose, we formed 200 random decision trees to from the random forest.

Each random forest will predict different decision tree (outcome) for the same test feature. Then by considering each predicted target outcome votes will be calculated. Suppose the 200 random decision trees are prediction some 3 unique outcomes such as a, b, c then the votes of a target is nothing but out of 200 decision tree how many trees prediction is a.

Likewise for other 2 targets (b, c). If a is get high votes. After out of 200 random decision tree 60 trees are predicting the target will be a. Then the final random forest returns the a as the predicted target. This concept of voting is popular as majority voting.

## V. OBJECTIVES

The primary objectives of this study can be summarized as follows:

- 1) To develop a System to accept Reviews from Authenticate Users.
- 2) To accept reviews from trustworthy clients (Genuine Users), Active Learning Technique will be use with some classification Algorithm.
- 3) To classify, predict (Positive, negative, neutral) reviews.
- 4) To identify any occurrence of unrelated (non-referrals) words will leads to fake review.
- 5) Fake Reviews - Unauthorized, Non trustworthy, Contents of Unrelated words.

## VI. CONCLUSION

As Internet continues to grow, online reviews are becoming more relevant source of information. People can post their views or opinions on tons of thousands of discussion groups, internet community, and forums, product/service reviews, and blogs etc. Fake/false reviews affects businesses and customers too. So it's very important to detect false review. In this paper, studied different classifier algorithm and machine learning to detect false review based on product description. Still it needs to beex posed yet in this regard.

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