

# The Effect of Fake Reviews on e-Commerce and fake review detection

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## ABSTRACT

The spread of Covid-19, as well as the implementation of lockdown, social distancing, and other precautionary measures, causes a global increase in online shopping. The growing importance of online shopping and the widespread use of e-commerce has increased competition among businesses for online sales. The importance of online reviews in promoting or slandering a business is highlighted. Product reviews are an important factor in customer decision-making, which has sparked a heated debate about detecting fraudulent or fake reviews. Given the power of these reviews over a business, the treacherous act of giving false reviews for personal gain has grown in popularity over time. In our study, we proposed a model for detecting fake reviews using Text Classification and Machine Learning techniques. We used classifiers like Support Vector Machine, K-Nearest Neighbor, and a bigram model to detect fraudulent reviews based on the number of pronouns, verbs, and sentiments.

**Keywords**—*K nearest neighbor, Support vector machine, Logistic regression.*

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## INTRODUCTION

E-commerce is now one of the most growing industries. Almost everyone now purchases products online, whenever we buy a product, we first search about it on internet. After pandemic, now even grocery items are bought online. From the current scenario of online transaction's, the reviews of the customer play an important role, the reviews of the customer decides whether the product is good or not. So, people post fake reviews for false purpose. This also leads to some online scam and frauds, people commented fake reviews on the product for false purpose. The matter has become more sophisticated and organized due to the profit achieved by such pursuit. This phenomenon is called "Opinion Spamming". For this reason, it is essential to detect their genuineness.

Large financial gains result from positive evaluations, whilst negative reviews frequently have the opposite impact. As a result, there is a growing tendency toward depending on customer opinions to alter organizations by improving products, services, and marketing. This is because customers are becoming more important in the marketplace. For example, when several customers who purchased a specific model of Acer laptop posted reviews complaining about the low display quality, the manufacturer was inspired to produce a higher-resolution version of the laptop.

How customers genuinely share and act upon their feedback has exacerbated problems with websites that contain customer reviews. Anyone can post reviews or criticisms of any business at any time using social media (such as Twitter, Facebook, etc.). Without constraints or obligations, at any time. Because there are no restrictions, some businesses use social media to unfairly market their products, brands, or stores, or to criticize their competitors. For example, suppose a few consumers who bought a specific smartphone posted negative reviews on display quality. These reviews portray the smartphone is unfavourable to the public. Thus, the competitors might employ an individual or team to post fake positive reviews about the smartphone. Similarly, in order to promote the company, the producer might ask the hired persons to post negative comments about competitors' products. Reviews published by people who have not personally encountered the items being reviewed are considered fake reviews. As a result, someone who posts fake reviews is referred to as a spammer. When a spammer collaborates with other spammers to achieve a specific goal, the spammers are referred to as a group of spammers.

Fake reviews are the most pressing issue in the present era. The gain and loss of businesses partially depend on the feedback, especially in the e-commerce domain. Therefore, it is important to determine their authenticity by using

Artificial intelligence & Machine learning techniques such as K- Nearest Neighbor, Support Vector Machine, and Logistic regression (SKL).

Many studies have investigated the fake review detection problem and its challenges. The main task associated with fake review detection is classifying the review as fake or genuine. The majority of the time, businesses hire professionals to write fraudulent comments. These experts are compensated for posting both positive and negative reviews of goods or brands, which greatly aids in promoting or demonizing a particular company. However, a user's actions could also turn out to be just a coincidence. According to American research, 80 percent of purchasing behaviour depends on product feedback. The problem is to determine if the feedback given is genuine or fraudulent.

Scikit-learn (SKL) is a free software machine learning library for the Python programming language. It features various classification, regression and clustering algorithms including support-vector machines. Using SKL and regression algorithms we can predict fake reviews. First, a multi-level feature extraction system is used to select features. In addition to the standard Natural Language Processing (NLP) on the corpus to extract and feed features to classifiers. In addition, behavioral features were extracted for feature engineering. The statistical significance of a user's review is represented by behavioral features. All of these factors contributed to the overall classification accuracy and authenticity of the results.

### **RELATED WORK**

W Liu [2] has proposed un-supervised method of learning. They have used isolation forest algorithm for outlier detection for trends analysis & fake review detection. They first analyzed the characteristics of online review; then proposed an isolation forest-based method for fake review detection. Semi-supervised and supervised learning have both been the subject of research by Rakibul et al. [7]. For semi-supervised learning, they used the EM (Expectation Maximization) algorithm, and for supervised learning, they used SVM and Naive Byers. The length of each review is measured and added to the feature vector after it has been tokenized, the candidate feature has been generated, and the count feature. J Yao et al [3] proposed an optimization method for the classifier for fake review detection. First, the original data is pre-proposed based on review centric and reviewer centric features. The data is then used to train classifiers, and after data resampling, feature pruning, and optimization, the classifier's optimized data is used to train the model or classifier. J Yao et al [3] proposed a method of optimizing the classifier for fake review detection. First, the original data is pre-processed according to review centric feature & reviewer centric features. Then this data is used to train classifiers & then data resampling feature pruning & optimization is done, the optimized data of the classifier is used to train the model or classifier. n, this they have used RF, Xghoost, Lightglom, Catboost, and GBPT. Data optimization is carried out precisely, which increases the accuracy of the model. Jindong et al [4] have used unsupervised learning. Unsupervised learning methods also give slightly less accuracy than supervised learning. First sentimental intensity is calculated by,

$$POS = |adj(r)| + |adv(r)| \setminus tw(r)$$

-where  $tw(r)$  = total no of words

Based on this the feature extraction is done. Then the cross-validation classification is done by 2 classification models SVM & RF, in which SVM shows better results. SVM gives 84% accuracy while RF gives 78% accuracy.

Sanjay et al [5] have used the Decision Tree classifier technique. They have used the following features for the detection of fake review

1. Response
2. Useful profile
3. Template
4. Stars
5. Reply
6. Thickness of review

The review is read & then according to the above features it is decided review is fake or not. The accuracy of this model is 96%

### **PROPOSED WORK**

We have proposed SVM and Logistic regression classifier-based model. In order to achieve our goal, we studied a dataset of hotel reviews and used text classification and machine learning techniques to identify evaluations that were not truthful.

### Data Pre-processing

Pre-processing data phase includes the filtering process. It represents the part where we get rid of the text's less valuable parts, such as punctuation symbols. Punctuation marks such as, ",!?:;. etc. are eliminated because it lowers the overall accuracy of the classification process. Their removal results in better output by the algorithm used.

The objective of this process is to achieve a higher level of accuracy. In our proposed method, feature selection is based on the following parameters:

1. Length count
2. Bigram Type
3. Relationship words
4. Sentiment word count
5. Noun, Verb count

The total length of the review is calculated first, and then the probability of the next coming word is calculated using the bigram probability model. This is also known as the Markov model, and it allows you to define the probability of the next word without having to look at the entire document. Some words, such as husband, wife, sister, niece, and so on, describe the relationship. We called these words relationship words in our text classification analysis. SKL chooses features based on relationship words. A list of relationship words is generated and used for the proposed SKL-based solution. The sentiment of the word count, whether it is a positive or negative word in a review, also influences feature selection.

### Classification algorithm

Classifying data into two or more than 2 classes/Labels is called classification. Machine Learning comes with many classification algorithms. The classification algorithms we utilized are Support Vector Machine (SVM) with linear SVC (Support Vector Classifier) kernel to predict that either given product review is fake or genuine. SVM is a pattern detection model in supervised learning, also associated with learning algorithms used for classification and prediction. It draws a decision boundary, also known as a hyperplane, near the extreme points of the dataset after identifying those extreme points inside the dataset. SVM is a supervised learning pattern detection model that is also associated with learning algorithms used for classification and prediction. After identifying the extreme points within the dataset, it draws a decision boundary, also known as a hyperplane, near those extreme points. The K-Nearest Neighbors (K = 5) is also used for pattern recognition and classification. It is an easy algorithm to understand. Many factors influence its performance, including the k parameter, an acceptable measure distance, and a majority voting scheme.

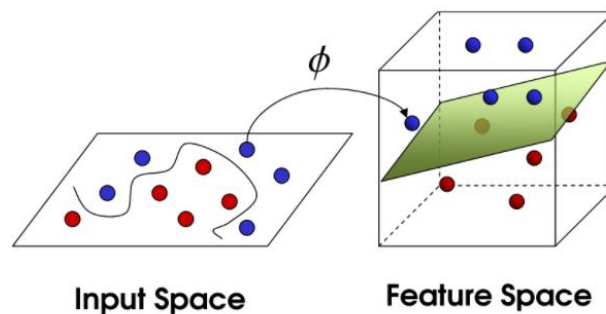


Fig [1] SVM hyperplane

### Training model

Model is being trained by SVM and KNN. The dataset is divided into two parts.i.e., train and test for model performance evaluation. We divided the dataset in an 80-20 ratio, with 80% being the training set and 20% being the test set. We then split our data into 75-25 and 85-15 ratio splits to evaluate the performance of the best suitable model for the proposed problem.

The availability of labelled datasets is one of the most difficult issues in fake review detection. It has been discovered that the majority of the available datasets are built using a crowdsourcing framework.

Results are calculated using the following classification evaluation metrics: precision, recall, accuracy. The fig [2] and fig [3] gives the result of the model

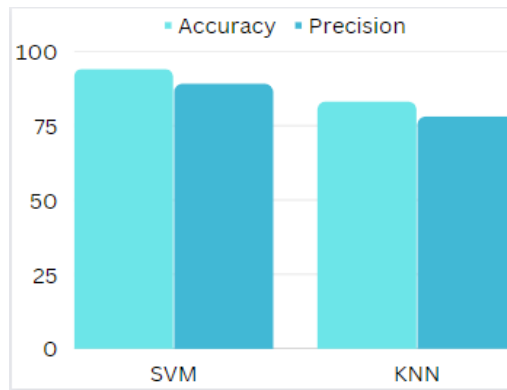


Fig [2] 75-25 data split result

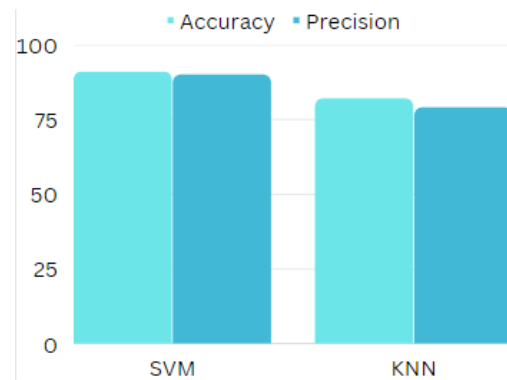


Fig [3] 85-15 data split result

Table [1] 75-25 data split result

Classification algorithm	Accuracy	Precision
SVM	94	89
KNN	83	78

Table [2] 85-15 data split result

Classification algorithm	Accuracy	Precision
SVM	91	90
KNN	82	79

Thus, SVM outperformed in this case, providing the highest accuracy and precision. The 85-15 split produces better results than the 75-25 split. From this we can determine fake and genuine reviews.

### CONCLUSION

Thus, fake reviews detection is a vivid and ongoing research area. We proposed a machine learning-based text classification methodology that aided determine whether the given comments on a specific product/service are genuine or fabricated. Traditional statistical machine learning improves the performance of text classification models by improving feature extraction and classifier design. Deep learning, on the other hand, improves performance by improving the presentation learning method, algorithm structure, and additional knowledge. We can conclude that most of the existing works focused on supervised machine learning to detect fake reviews. However, supervised machine learning needs a labelled dataset to predict whether the review is fake or not, which can be hard to obtain in a fake review detection area.

### FUTURE WORK

1. Group of spammer’s detection. They discovered high accuracy in fake review detection by considering studies that focus on burst patterns to detect fake reviews. Future research should look into the study of burst patterns using new techniques to detect spammers.

2. Detection of cross-domain fake reviews. The cross domain problem needs to be effectively addressed. For example, the model was trained in one domain and tested in another. The experimental results show that performance has decreased significantly when compared to performance in the same domain.

3. Detecting fake reviews in multiple languages. The detection of fake reviews has been transformed into a multilingual analysis. Users can post reviews in multiple languages. As a result, there is still a need to address this issue in order to detect multilingual fake reviews.

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