# A SUPERVISED MACHINE LEARNING APPROACH USING K-NEAREST NEIGHBOR ALGORITHM TO DETECT FAKE REVIEWS ON AMAZON

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**Abstract** - *In the enterprise marketing process, online data plays a very crucial role. As a type of data , fake reviews of the products have been seriously affecting the reliability of both decision making and data analysis of the enterprise. Some of the users tend to spread fake news through the online platforms and they are also unverified. Both the customers as well as the vendors get seriously affected due to fake reviews as the customer is not able to buy genuine product based on review and the vendor results in less sales of product due to the negative impact of review. To detect fake reviews has become a necessity of this era.The use of supervised machine learning is described in this system for detecting fake reviews.We offer a method to distinguish between real and false product reviews by letting users know whether or not they are trustworthy. This strategy for spotting fake reviews explains the application of supervised machine learning. This methodology was developed in response to shortcomings in how traditional fake review detection methods categorised reviews as true or false based on categorical datasets or sentiment polarity ratings. Our approach helps close this gap by taking into account both polarity ratings and classifiers for false review identification. As part of our endeavour, a survey of previously published articles was completed. Our system's accuracy was 88% thanks to the machine learning technique called Support Vector Machine[2]*

*Key Words*: *Enterprise Marketing, KNN, Fake Reviews, Decision Making, Data Analysis, Unverified, Supervised Machine Learning .*

## 1. INTRODUCTION

TIn today's world, online shopping is one of the most important aspects of daily living. Many everyday consumers use online reviews to choose which product to buy. On e-commerce platforms, customer reviews play a significant role in determining a company's revenue. Nowadays, it is simple to trick and control a customer by publishing a fictitious review on a specific product. The Competition and Markets Authority (CMA) of the UK claims that fabricated or inaccurate reviews may yearly have an impact on £23 billion in consumer spending in the nation. On Amazon, 61% of the reviews on devices are fake. One in seven reviews on Tripadvisor can be false. Numerous false reviews on online review sites like Tripadvisor, Yelp, etc. either increase or decrease the popularity of a hotel or product. Many websitevisitors are unable to quickly recognise fake reviews. As a result, the buyer is duped and their perception of real items is manipulated. We thus decided to develop a user-friendly fake review detection system to stop people from being duped by fake reviews in order to overcome this discrepancy between fake and factual reviews.

## 2. LITERATURE REVIEW

The [1] fake feature framework, which is made up of 2 types of reviews, is used to characterise and organise the features of false reviews. Using Logistic Regression, techniques used to analyse user-centric features in Amazon electronic product reviews produced an F-score of 86% accuracy.

The system was built on Opinion-Mining, which makes use of Sentiment Analysis to identify false reviews. They had created a working model that collected annotations for individual reviews in the dataset. Also, it was discovered that Sentiment Analysis is a method of implementation in which Vader determined whether a passage of text is positive, negative, or neutral. The majority of sentiment analysis methods fall into one of two categories: valence-based (where texts are classified as positive or negative) or polarity-based (where the strength of the sentiment is taken into account). For instance, in a polarity-based approach, the terms "good" and "great" would be viewed equally, while in a valence-based approach, "excellent" would be viewed as more positive than "good."

According to another study[3], there are two main types of phoney reviews: textual (dependent on the reviews' substance) and behavioural (completely dependent on the reviewer's writing style, emotional expressions, and frequency of writing). The difference between bogus and authentic reviews was determined using a variety of machine learning algorithms.

Identification was carried out by considering both "important elements of review" and "reviewer behaviour." Without behavioural characteristics, Logistic Regression provided an accuracy of 86% in the bi-gram, KNN provided an accuracy of 73% in the tri-gram, and SVM provided an accuracy of 88.1% in the bi-gram.

The system created to identify fake hotel reviews on yelp[4], tripadvisor, and other websites. The system's architecture

includes a web crawler that compiles all the review data and stores it in a MySQL database. Four separate techniques were used to find the fake reviews: text mining-based categorization, spell checking, reviewer behaviour analysis, and hotel environment analysis. After all factors have been evaluated, the overall probability of fraudulent reviews for a certain hotel is computed using a grading algorithm employing the individual probabilities. When putting the text mining-based false detection method into practise, the standard pre-processing recommendations were followed. The percentage of fake reviews was about 14%. Prior study has used and confirmed this data source for determining the veracity of the hotels.

One of the studies focused on Sentiment analysis[5] and Machine Learning approach in finding the Fake reviews. This system used ML Algorithms Naïve Bayes ,KNN, SVM, Decision Tree (j48). SVM (81.75%)[5] outperforms other algorithms in both w/ and w/o stop word approaches.

The assumption was made that classification of Fake reviews is either True or False [6]. When recognising fake reviews, it is important to consider the reviewer's credibility, the dependability of the product, and the reviewer's honesty. As a result, Naive Bayes delivered 98% accuracy whereas Random Forest produced 99% accuracy.

Another research [7] centred on the methods used for classifying fake reviews which are Content based method which considers POS tag frequency count as a feature and Behaviour Feature based method which considers unfair rating as a feature. The unsupervised machine learning algorithm used for this purpose is Expectation Maximisation which gave accuracy of 81.34% and supervised machine learning algorithm used is SVM and Naive Bayes which gave accuracy of 86.32%.

One of the studies [8] suggested Combination of classification algorithms with LDA which yielded higher accuracy results. The traditional SVM, Logistic regression and Multi-layer perceptron model gave accuracy of 65.7%, 80.5% and 80.3% respectively. When combined with LDA the SVM, Logistic Regression and Multi-layer perceptron model gave accuracy of 67.9% and 81.3% respectively.

Three techniques are used in the system [9] to classify false reviews. The first one is Review Centric Approach which considers content of review, use of capital letters, and numericals.

The second approach is Reviewer Centric approach which considers profile image, URL length, IP address, etc and the third approach is Product Centric Approach which considers rank of product, price of product as feature. The algorithms used to detect the fake reviews were supervised, unsupervised and semi-supervised.

One of the systems we studied focuses on annotating the sentiments of a review [10] using VADER. The gathered reviews are cleaned and opinion mined, after which the sentiment analysis step takes place. The results of the sentiment analysis are then appended to the dataset and classified using vector calculation.

Research [11] primarily focused on reviews that were produced with the intention of seeming authentically misleading. The dataset underwent sentiment analysis in the system[12]. Two classification models, a two-way classification that categorises reviews as positive or negative, and a three-way classification that categorises data as positive, negative, or neutral with sentiment analysis in between, were reported.

Using R, an open source statistical programming language and software environment, additional experimental work was conducted. It is especially helpful for data processing, data analysis, calculations, and the graphical display of results.

Another method for identifying phoney reviews is to use reviewer behaviour and history analysis, as explained in [13]. The focus of the study is on exploiting jaccard similarity to distinguish between human users and bots. If product reviews are overly favourable or unfavourable and are structured similarly, they may be deemed manipulated.

## 3. METHODOLOGY

Our recommended methodology is as follows, which is based on the study we did and observations of how earlier systems operated.

The reviews from the user-provided website link will be scraped as the first stage. Selenium is used to execute the web scraping. After the reviews are saved in json format, the necessary information will be retrieved, such whether the review is favourable or negative, only the necessary content from the review, etc. At this point, the ML model will be prepared, and the extracted data will be input into it. The training dataset will then be used by the algorithm to determine whether the reviews are fraudulent or legitimate. The user will be able to recognise this output because it will be visualised on the website.

The steps summarised are as follows-

1. Scraping of the reviews from Amazon

2. Extraction of necessary information

3. Transferring the data as input to models.

4. Adapting algorithms to training set

5. Predicting the test data results.

6. Visualising the test data set result.

## 4. PROPOSED SYSTEM ARCHITECTURE

In order to determine the optimum model to be utilised to obtain the highest accuracy and quickest speed, the approach is explained in detail and is carried out in five major parts.

Using **web scraping**, data will be collected from the online websites.

### 4.1 Data Collection

Consumer review data collection- Raw review data was collected from Kaggle's Amazon datasets reviews. Doing so was to increase the diversity of the review data. A dataset of 40000 thousand reviews was collected.

### 4.2 Data Preprocessing

Processing and refining the data by removal of irrelevant and redundant information as well as noisy and unreliable data from the review dataset. Step 1:Sentence tokenization The entire review is given as input and it is tokenized. Step 2: Removal of punctuation marks Punctuation marks used at the starting and ending of the reviews are removed along with additional white spaces. Step 3: Word Tokenization Each individual review is tokenized into words and stored in a list for easier retrieval. Step 4: Removal of stop words Affixes are removed from the stem.

### 4.3 Sentiment Analysis

Classifying the reviews according to their emotion factor or sentiments being positive, negative or neutral. It includes predicting the reviews being positive or negative according to the words used in the text, emojis used, ratings given to the review and so on. Related research shows that fake reviews has stronger positive or negative emotions than true reviews. The reasons are that, fake reviews are used to affect people opinion, and it is more significant to convey opinions than to plainly describe the facts. The Subjective vs Objective ratio matters: Advertisers post fake reviews with more objective information, giving more emotions such as how happy it made them than conveying how the product is or what it does. Positive sentiment vs negative sentiment: The sentiment of the review is analyzed which in turn help in making the decision of it being a fake or genuine review.

### 4.4 Feature extraction/Engineering

It mainly involves reduction of the number of resources so that a large dataset can be described. Selection of the appropriate features for predicting the results.

### 4.5 Fake Review Detection

Classification assigns items in a collection to target categories or classes. The goal of classification is to accurately predict the target class for each case in the data. Each data in the review file is assigned a weight and depending upon which it is classified into respective classes - Fake and Genuine.
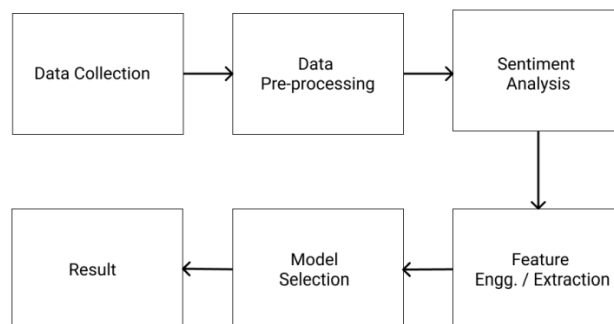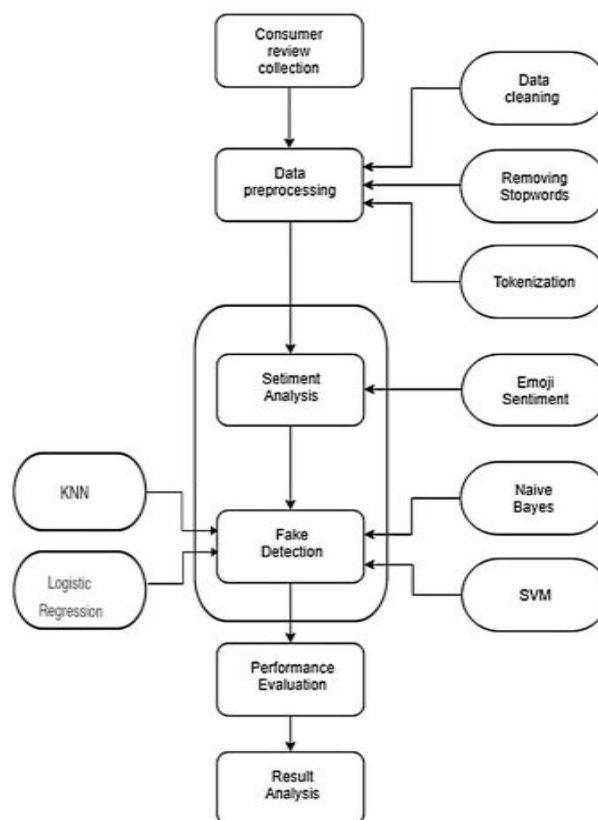


**Fig -1 :** Data Flow Diagram



**Fig -2** : Proposed System Architecture

## 5. EXPERIMENTAL RESULTS

The Trained model is used for prediction of the fake reviews and genuine reviews. Different libraries are available in Python that helps in machine learning, classification projects. Several of those libraries have improved the performance of this project. For user interface we have used Web technologies to build website.
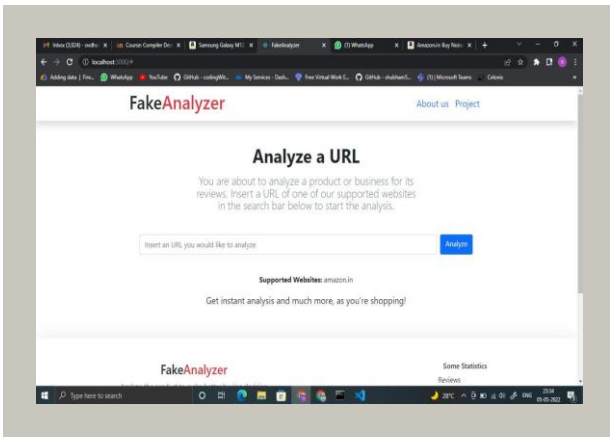
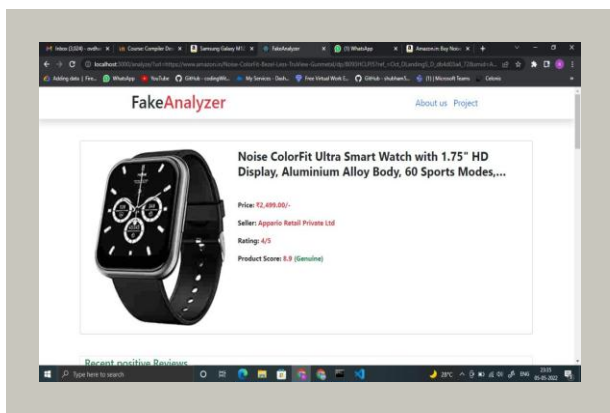**Fig -3**: Product Need to be given by user(prototype)



**Fig -4:** Web Scrapping of given product(prototype)

## 6. IMPORTANT LIBRARIES

First, "Numpy" that provides with high-level math function collection to support multi-dimensional matrices and arrays. This is used for faster computations over the weights (gradients) in neural networks. Second, "scikit-learn" is a machine learning library for Python which features different algorithms and Machine Learning function packages. NLTK, natural language toolkit is helpful in word processing and tokenization. The project makes use of Anaconda Environment which is an open source distribution for Python which simplifies package management and deployment. It is best for large scale data processing

## 7. CONCLUSION

Using Supervised Machine learning algorithm we can easily differentiate between fake or real reviews. The fake review detection is designed for filtering the fake reviews. In this research work SVM classification provided a better accuracy of classifying than the other algorithm for testing dataset. Also, the approach provides to find the most truthful reviews to enable the purchaser to make decisions about the product. It will benefit the customer as well as the company since they will get the genuine reviews by the customers about the product. Customers will be able to buy the best product based on the classification of fake reviews.

## REFERENCES

[1] Rodrigo Barbado, Oscar Araque, Carlos A. Iglesias, "A framework for fake review detection in online consumer electronics retailers",Volume 56, Issue 4,July 2020, Pages12341244,ISSN03064573,https://doi.org/10.1016/j.ipm.2020.03.002

[2] N. Kousika, D. S, D. C, D. B M and A. J, "A System for Fake News Detection by using Supervised Learning Model for Social Media Contents," 2021 5th International Conference on Intelligent Computing and Control Systems(ICICCS),2021,pp.1042-1047,doi:10.1109/ICICCS51141.2021.9432096.

[3] Ammar Mohammed, Atef Ibrahim ,Usman Tariq, Ahmed Mohamed Elmogy "Fake Reviews Detection using Supervised Machine Learning" ,January 2021 International Journal of Advanced Computer Science and Applications 12(1),DOI:10.14569/IJACSA.2021.0120169.

[4] Möhring M., Keller B., Schmidt R., Gutmann M., Dacko S. HOTFRED: "A Flexible Hotel Fake Review Detection System''. In: Wörndl W., Koo C., Steinmetz J.L. (eds) Information and Communication Technologies in Tourism. Springer,Cham.https://doi.org/10.1007/978-3-030-65785-7_29.

[5] E. Elmurngi and A. Gherbi, "An empirical study on detecting fake reviews using machine learning techniques," Seventh International Conference on Innovative Computing Technology(INTECH),pp.107-114,doi:10.1109/INTECH.2017.8102442.

[6] Neha S.,Anala A. ,"Fake Review Detection using Classification",une,International Journal of Computer Applications180(50):16-21,DOI:10.5120/ijca2018917316

[7] R. Hassan and M. R. Islam, "Detection of fake online reviews using semi-supervised and supervised learning,"International Conference on Electrical, Computer and Communication Engineering (ECCE), pp. 1-5, doi: 10.1109/ECACE.2019.8679186.

[8] S. Jia, X. Zhang, X. Wang and Y. Liu, "Fake reviews detection based on LDA," 4th International Conference on Information Management (ICIM), 2018, pp. 280-283, doi:10.1109/INFOMAN.2018.8392850.

[9] N. A. Patel and R. Patel, "A Survey on Fake Review Detection using Machine Learning Techniques," 4th International Conference on Computing Communication

and Automation (ICCCA), 2018, pp. 1-6, doi: 10.1109/CCAA.2018.8777594.

[10] Dhairya Patel1, Aishwerya Kapoor2, Sameet Sonawane3 ,"Fake Review Detection using Opinion Mining",https://www.irjet.net/archives/V5/i12/IRJET-V5I12154.pdf

[11] Ott, Myle & Choi, Yejin & Cardie, Claire & Hancock, Jeffrey. (2011) "Finding Deceptive Opinion Spam by Any Stretch of the Imagination".

[12] Dipak R. Kawade et al., "Sentiment Analysis Machine Learning Approach", / International Journal of Engineering and Technology(IJET),DOI: 10.21817/ijet/2017/v9i3/1709030151,Vol 9 No 3 Jun-Jul 2017

[13] Sadman, Nafiz & Gupta, Kishor Datta & Sen, Sajib & Poudyal, Subash & Haque, Mohd. (2020). Detect Review Manipulation by Leveraging Reviewer Historical Stylometrics in Amazon, Yelp, Facebook and Google Reviews. 10.1145/3387263.3387272.

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