Empirical Study of Fake Reviews Detection of Online Reviews from E-Commerce Website

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Abstract: In this paper we present an empirical study of fake reviews detection algorithm. With the increase in internet usage, the demand for online servicing is growing rapidly, this leads to some threats like fake review. The users who used a product or service may give a genuine review, which makes it useful when other customers search for product/services. Whereas the online fake review may damage the customer sentiments and leads to negative impact on the product or services. Users’ opinions are the main source of reviews for selected products or services. To get profit or popularity for a services or brands fake reviews are generally written to advance or downgrade the targeted items. Existing systems studied fake reviews but a strong detection technique is needed in this problem. The service sectors like restaurants, e-commerce product selling websites have significant impact on their business through reviews, their customers increase when the reviews are good and vice versa. This proposed system examines detecting fake reviews that have been evaluated in the Yelp restaurant domain.

Keywords: Support Vector Machine, Term Frequency, Logistic Regression, Natural language processing, K-Nearest Neighbor, Decision Trees

1. Introduction

Word of mouth information is playing a major role in product sales, promoting services, which in turn customer reviews listed online in this computerized world. 52 percent of internet users use the internet for searching products online and 24 percent of users browse products for purchasing. Online reviews play a major role in e-commerce websites for product purchasing like electronic items, books, clothes, and other branded products. Similarly online movie review plays a major role in the entertainment industry. Hotels and restaurant reviews on online make tourism easier for customers these days.

These days consumers are checking the online reviews for making their purchase decision, thus reviews are important but the amount of data is high and sorting relevant information is too difficult. A real review should be written by the legitimate users who used the product or services and the content describing the review is also considered as an important factor. Promoting a product or services or demoting a product or services are based on fake reviews sometimes. Some of the business owners ask the employees to write the fake reviews to promote the services, in such cases, the reviews are fake and malicious, which may demote the legitimate services provided by the other service providers.

Yelp.com is one of the major restaurant chain information websites. This website uses a algorithm to find the illegitimate reviews. The algorithm is highly privatized and secured. In this proposed work, yelp.com reviews are used for studying purposes. The dataset is downloaded from yelp.com with labled as real and fake. We used vectorizer to extract features and trained and tested and analyzed our work.

2. Literature Survey

2.1 Existing Technology

Fake review detection is done the taken dataset by applying feature extraction techniques
- CountVectorizer
- Ngram model
- TfidfVectorizer

Machine learning algorithm applied on the above extracted features
- Naive Bayes
- Random Forest
- Logistic Regression
- SVM

2.2 Steps

The proposed application should be able to identify fake or real reviews. Feature extraction models used are n-gram, n-count and TF/IDF. We used classification models Naïve Bayes, Random forest, Logistic regression and SVM to predict the review type.
- Extract the feature using n-gram, n-count and TF/IDF
- Apply machine learning models Naïve Bayes, Random forest, Logistic regression and SVM
- Split train and test set
- On test set, apply machine learning algorithm Naïve Bayes, Random forest, Logistic regression and SVM
- Predict the review types
- Compare the machine learning algorithm’s accuracy on each feature extraction model
3. Proposed Architecture

![Diagram of Proposed Architecture]

Figure 1.1: System Architecture of Fake Reviews Detection

4. Testing

Table 1.1: Test Cases of Proposed System

<table>
<thead>
<tr>
<th>S. NO</th>
<th>Test Case ID</th>
<th>Test Description</th>
<th>Test Procedure</th>
<th>Test Input</th>
<th>Expected Result</th>
<th>Actual Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T101</td>
<td>To check dataset loading</td>
<td>Load collected dataset</td>
<td>Execute fake review.py</td>
<td>Dataset should be loaded to execute</td>
<td>Test should start and output files generated</td>
</tr>
<tr>
<td>2</td>
<td>T102</td>
<td>To check correct dataset format</td>
<td>Load collected dataset</td>
<td>Execute fake review.py</td>
<td>Dataset should be loaded to execute</td>
<td>Alert to user &quot;Dataset is trained&quot;</td>
</tr>
<tr>
<td>3</td>
<td>T103</td>
<td>To check training</td>
<td>Start training dataset</td>
<td>Execute fake review.py</td>
<td>Training should start and system learns data</td>
<td>Alert to user &quot;prediction completed&quot;</td>
</tr>
<tr>
<td>4</td>
<td>T104</td>
<td>To check prediction</td>
<td>Start prediction by test input</td>
<td>Execute fake review.py</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Results

We have implemented Fake review detection from yelp dataset by applying three vectorization techniques namely CountVectorizer, Ngram model, TfIdfVectorizer. The extracted features are trained and predicted using four machine learning algorithms namely Naïve Bayes, Random Forest, Logistic Regression, SVM. The proposed work is implemented in Python 3.6.4 with libraries scikit-learn, pandas, matplotlib and other mandatory libraries.

The following table shows the results arrive from our implementation model for N-gram feature extraction and prediction models. The following table shows the results arrive from our implementation model for TF-IDF feature extraction and prediction models.

Table 1.2: Experimental Analysis of N-gram Model

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naïve Bayes</td>
<td>66.67</td>
</tr>
<tr>
<td>Random Forest</td>
<td>70.37</td>
</tr>
<tr>
<td>Logistic Regression</td>
<td>69.13</td>
</tr>
<tr>
<td>SVM</td>
<td>74.07</td>
</tr>
</tbody>
</table>

The following table shows the results arrive from our implementation model for TF-IDF feature extraction and prediction models.

Table 1.3: Experimental Analysis of TF-IDF model

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naïve Bayes</td>
<td>69.13</td>
</tr>
<tr>
<td>Random Forest</td>
<td>76.54</td>
</tr>
<tr>
<td>Logistic Regression</td>
<td>70.37</td>
</tr>
<tr>
<td>SVM</td>
<td>80.24</td>
</tr>
</tbody>
</table>

From the above results we can understand that Naïve Bayes model is giving good accuracy on prediction.

References

