Capstone Project
Fake Review Classification

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Problem Statement

Of Consumers say online reviews impact their purchasing decisions.

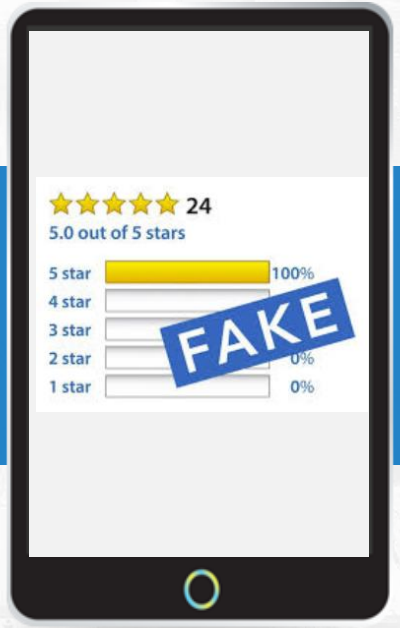
93%

Of consumers have read fake review in the last year.

82%

Of consumers would not buy a product if they suspected it to have fake reviews.

54%



70%

Hotel industry sales gets affected by negative online reviews.

$25 T USD

World wide eCommerce annual sales in 2019.

$61 B USD

US eCommerce annual Sales in 2019.

Objective

Developing Predictive Model

Utilizing various machine learning methods, predictive classification model will be developed.

Testing Developed Model with Unseen Data

Developed Machine Learning model will be tested with unseen Data

Developing Semi-Supervised Model

With combined labeled and unlabeled data, semi-supervised model will be developed.

Methodology

1

Supervised Learning

- Supportive Vector Machine
- Multinomial Naïve Bayse Model
- Gradient Boosting
- Etc.

2

Neural Network

- Word2Vec

- Word embeddings using shallow neural network

- Words with similar context occupy close spatial positions

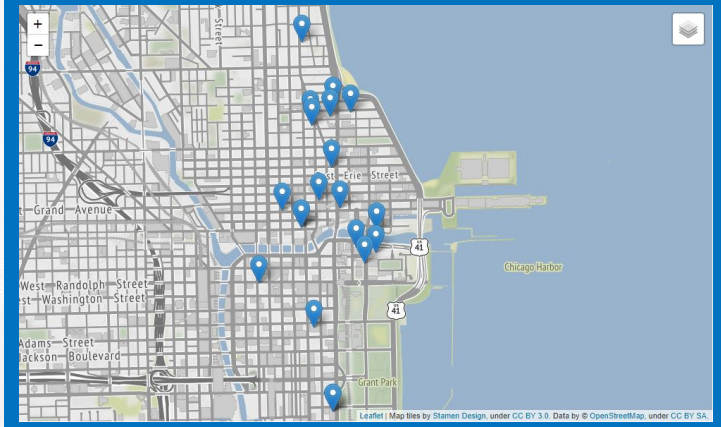
3

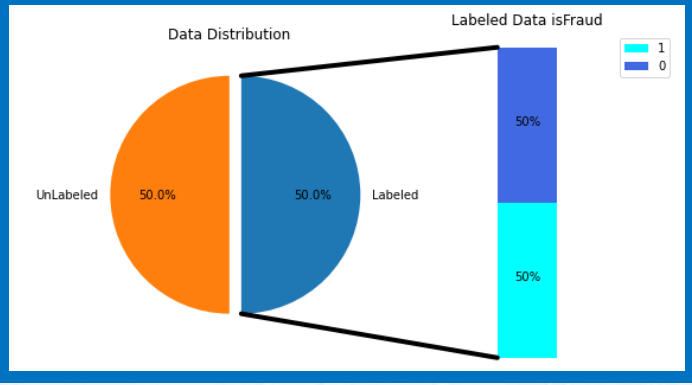
Semi Supervised Learning

- Label Propagation

- Iterative algorithm where it assign labels to unlabeled points by propag ating labels through data set

Methodology cont.





- About the Data

1600 labeled data was sourced from Myle Ott's research

1600 Unlabeled data was web-scrapped from TripAdvisor

Accumulated data was sourced from 20 different Chicago area hotels

Limitations

1. This project only works to identify fake reviews written in English.
2. Labeled data is from 2013. Techniques might be different current days.

Conclusion

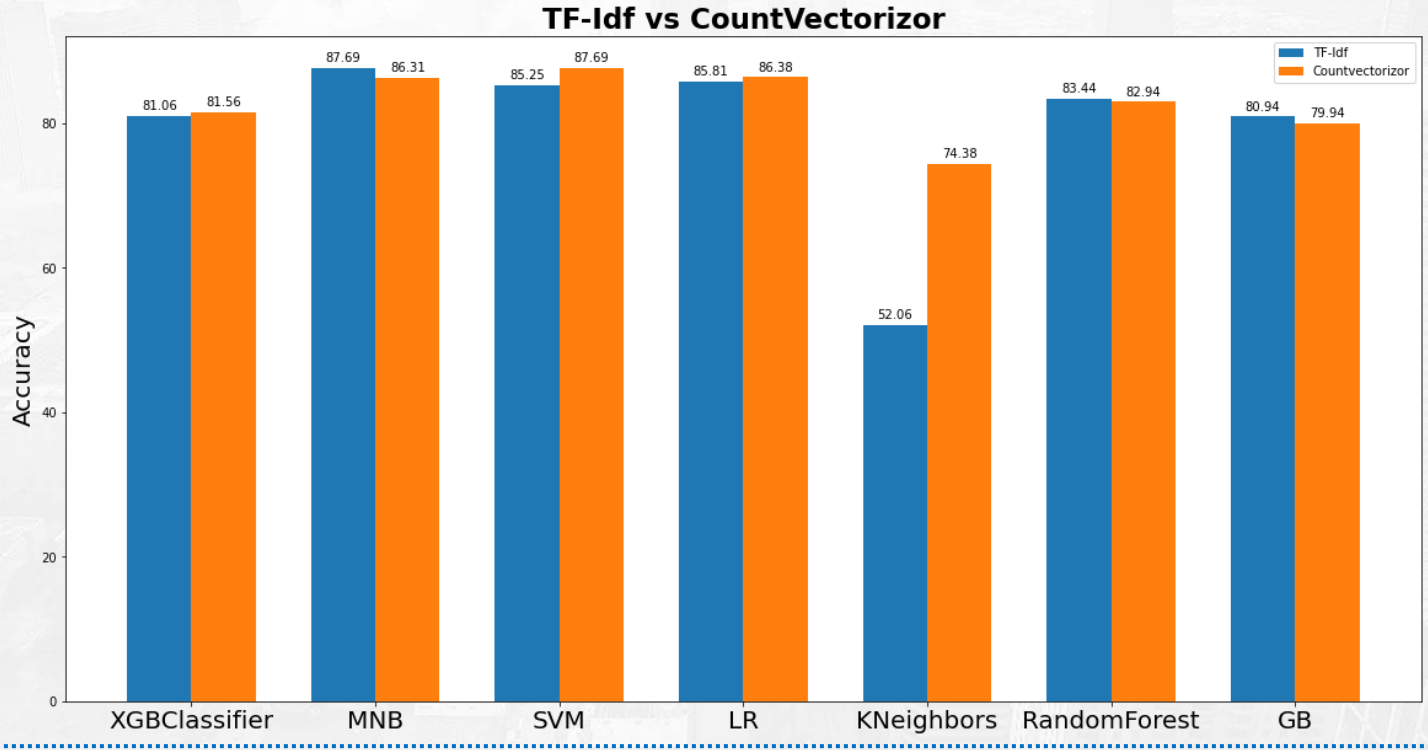
1. Supportive Vector Machine model had 87.7% of accuracy.

2. Word2Vec model had 53% accuracy.

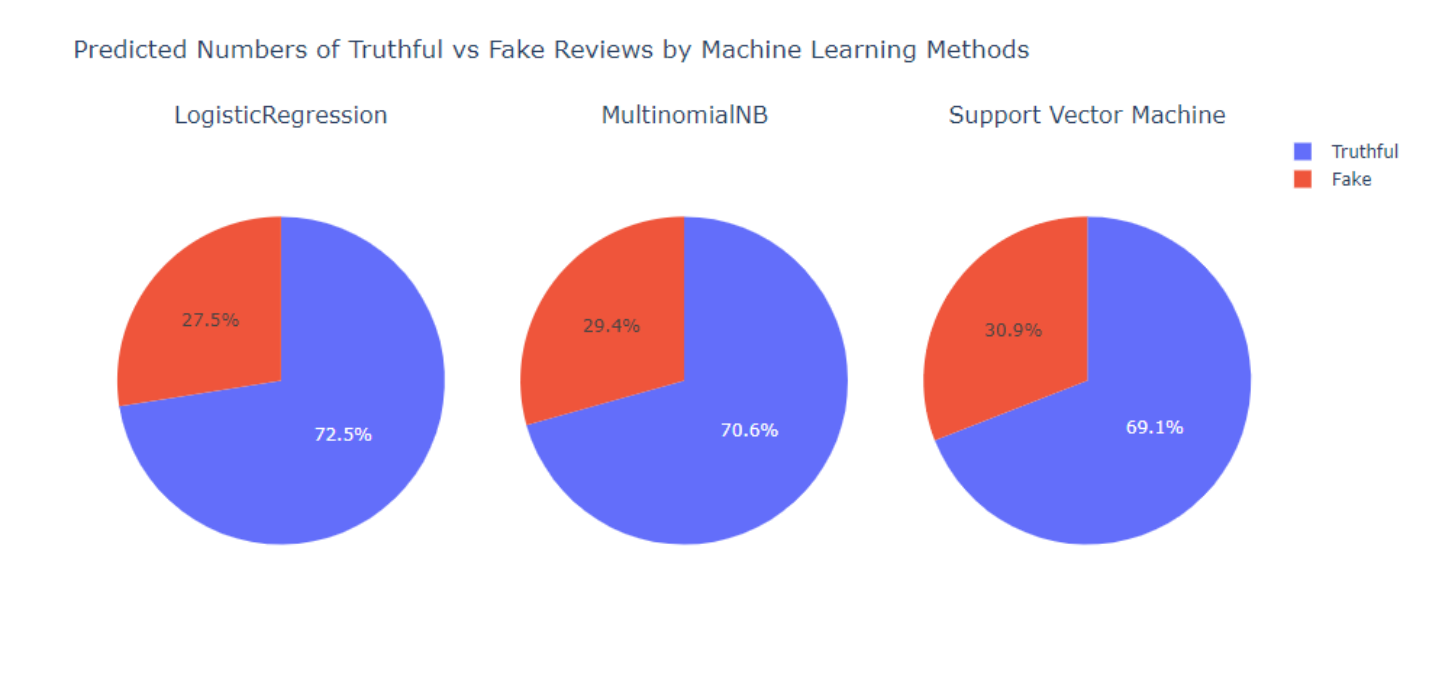
3. Pre-trained Multinomial Naïve Bayse model with unlabeled test data had accuracy of 51.2%.

4. Label propagation model had 50% accuracy.

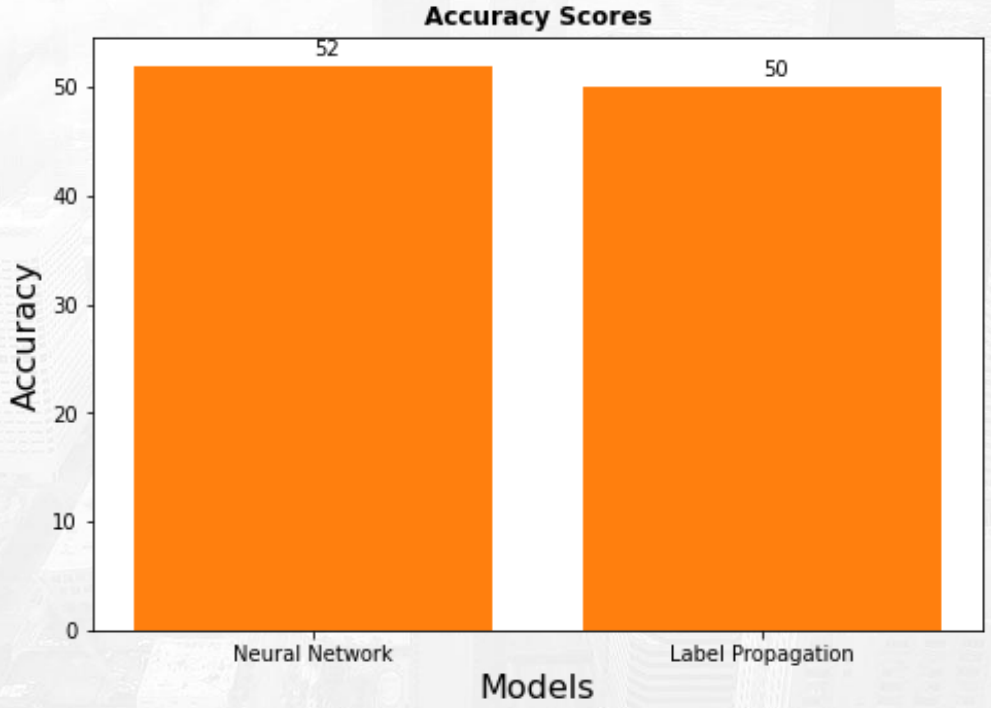
Conclusion


TF-Idf vs CountVectorizor
TF-Idf
Countvectorizor
Accuracy
0
20
40
60
80
81.06
81.56
87.69
86.31
85.25
87.69
85.81
86.38
52.06
74.38
83.44
82.94
80.94
79.94
XGBClassifier
MNB
SVM
LR
KNeighbors
RandomForest
GB

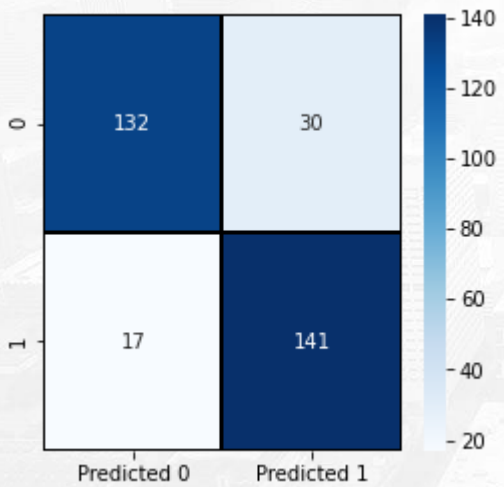
Conclusion


Predicted Numbers of Truthful vs Fake Reviews by Machine Learning Methods
LogisticRegression
MultinomialNB
Support Vector Machine
Truthful
Fake
27.5%
72.5%
29.4%
70.6%
30.9%
69.1%

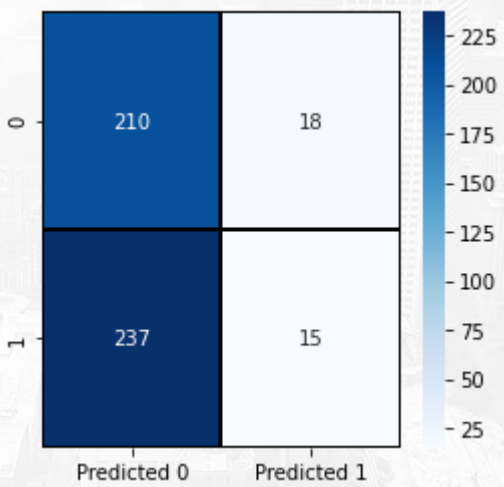
Conclusion


Accuracy Scores
52
50
0
10
20
30
40
50
Accuracy
Neural Network
Label Propagation
Models

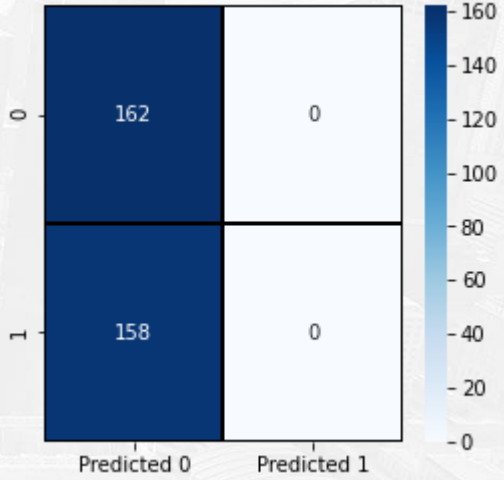
Conclusion



Support Vector Machine Confusion Matrix



Neural Network Confusion Matrix



Semi Supervised Model Confusion Matrix

Conclusion

Truthful Reviews
Word Cloud Model

Fake Reviews
Word Cloud Model

Conclusion

Unlabeled
Word Cloud Model

Business Recommendations

1.Keep the data up to date.

2. Periodically feed new data to the predictive learning model .

3.Filtering reviews using machine learning method is more accurate.

Future Works

1.Finding better model for semi supervised model.

2.Applying deep learning method.

3.Developing unsupervised model.

Q&A

References

1. https://websitebuilder.org/blog/online-review-statistics/
2. https://www.business2community.com/infographics/how-harmful-are-fake-online-reviews-infographic-02316083
3. https://myleott.com/
4. TripAdvisor.com

Thank you

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