



# Capstone Project

## Fake Review Classification

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# Problem Statement

Of Consumers say online reviews impact their purchasing decisions.

**93%**

**70%**

Hotel industry sales gets affected by negative online reviews.

Of consumers have read fake review in the last year.

**82%**

**\$25 T  
USD**

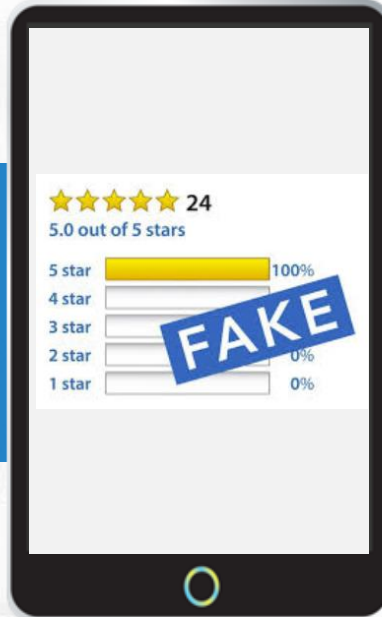
World wide eCommerce annual sales in 2019.

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

**54%**

**\$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 Bayes Model
- Gradient Boosting
- Etc.

2

## Neural Network

- Word2Vec
  - Word embeddings using shallow neural network
  - Words with similar context occupy close spatial positions

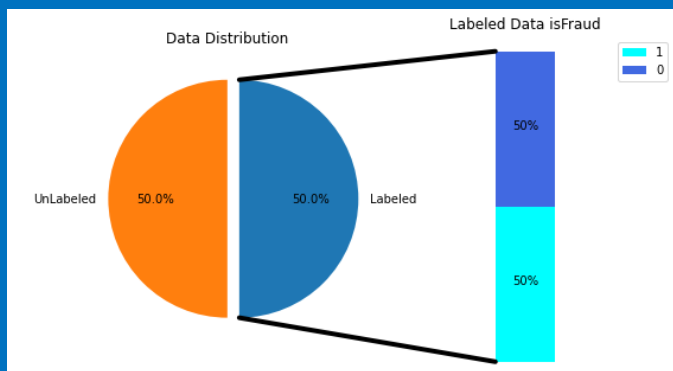
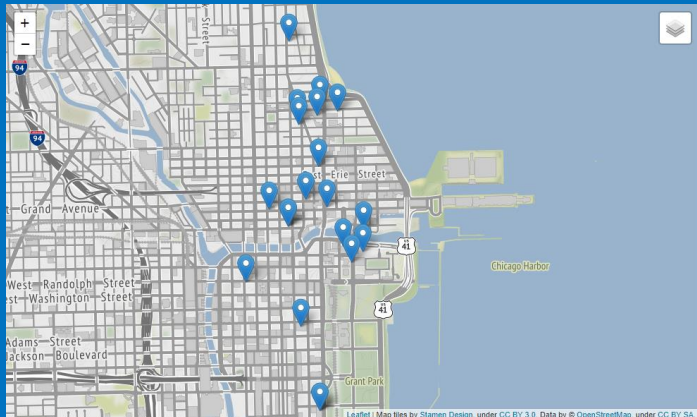
3

## Semi Supervised Learning

- Label Propagation
  - Iterative algorithm where it assign labels to unlabeled points by propagating labels through data set



# Methodology cont.



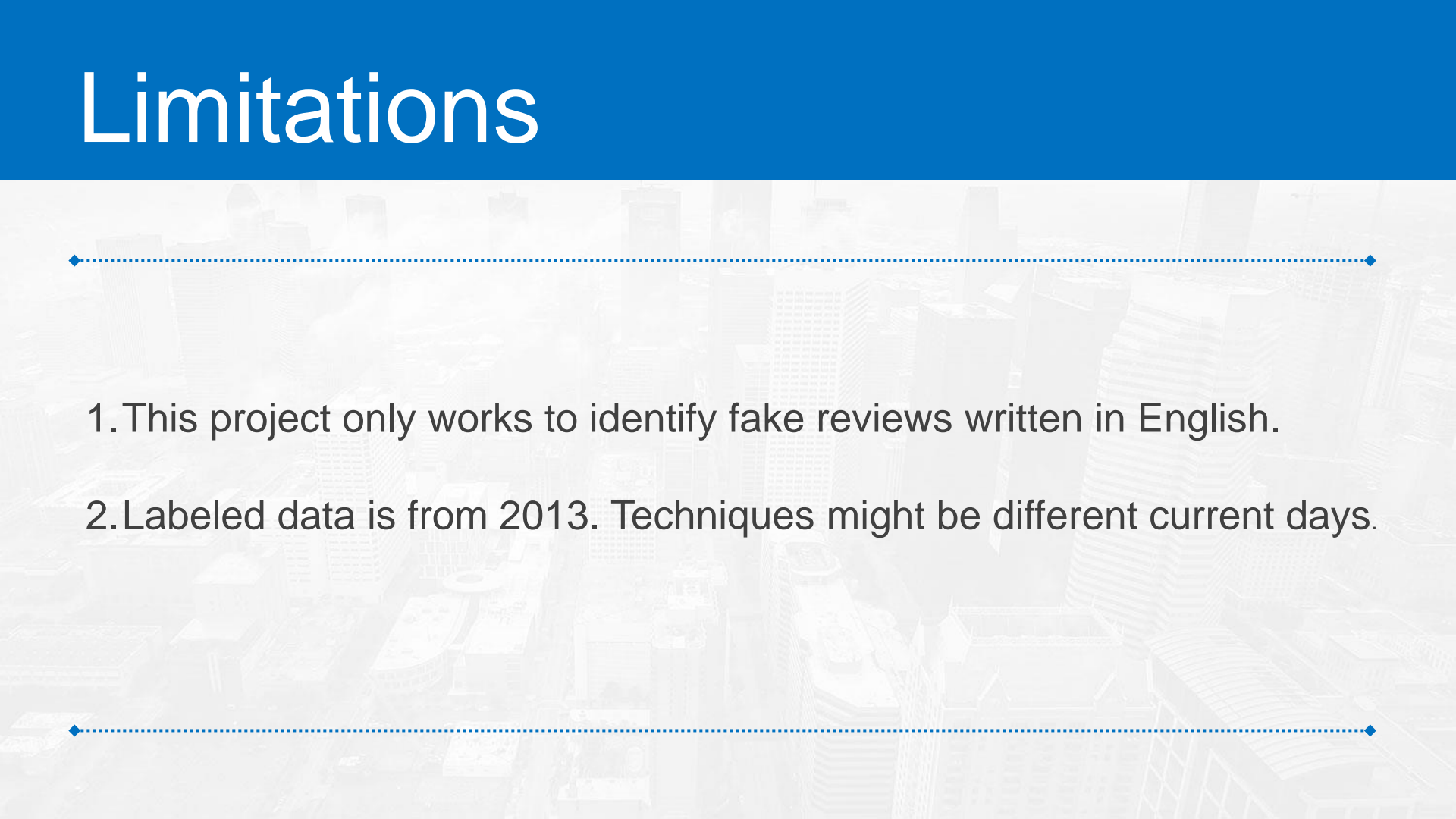
## - About the Data

**1600** labeled data was sourced from Myle Ott's research

**1600** Unlabeled data was web-scraped from TripAdvisor

Accumulated data was sourced from 20 different Chicago area hotels

# Limitations

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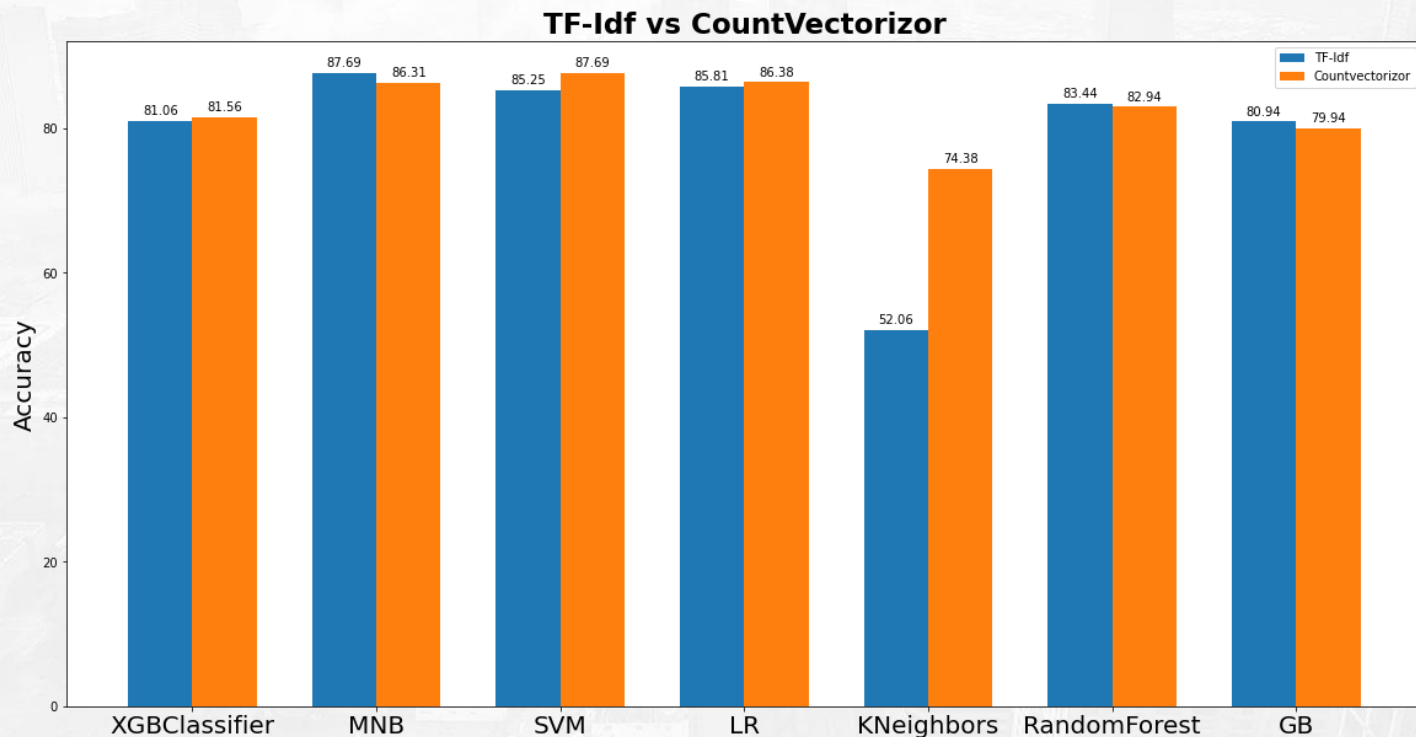
# Conclusion

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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.
-

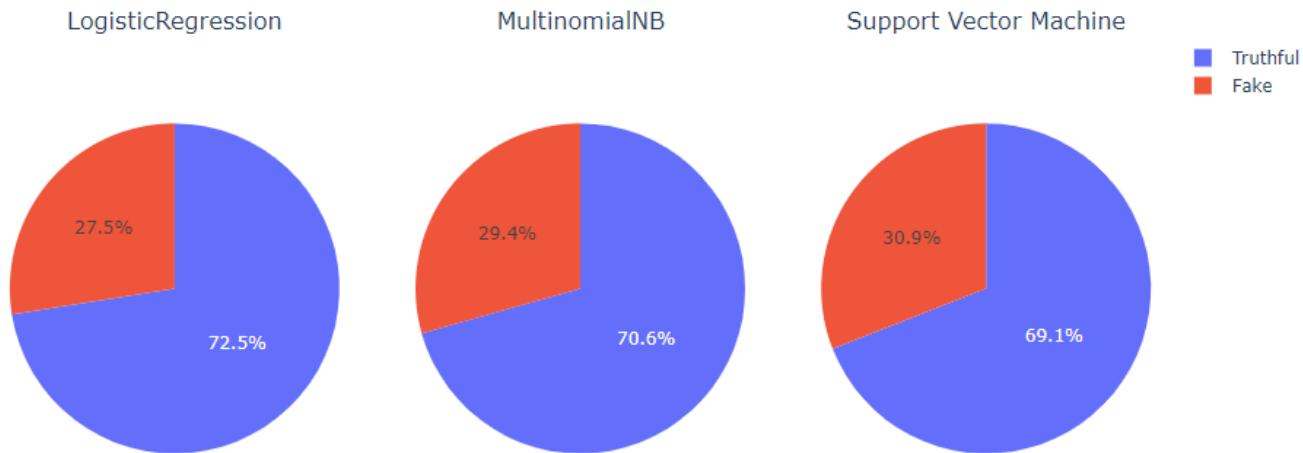


# Conclusion

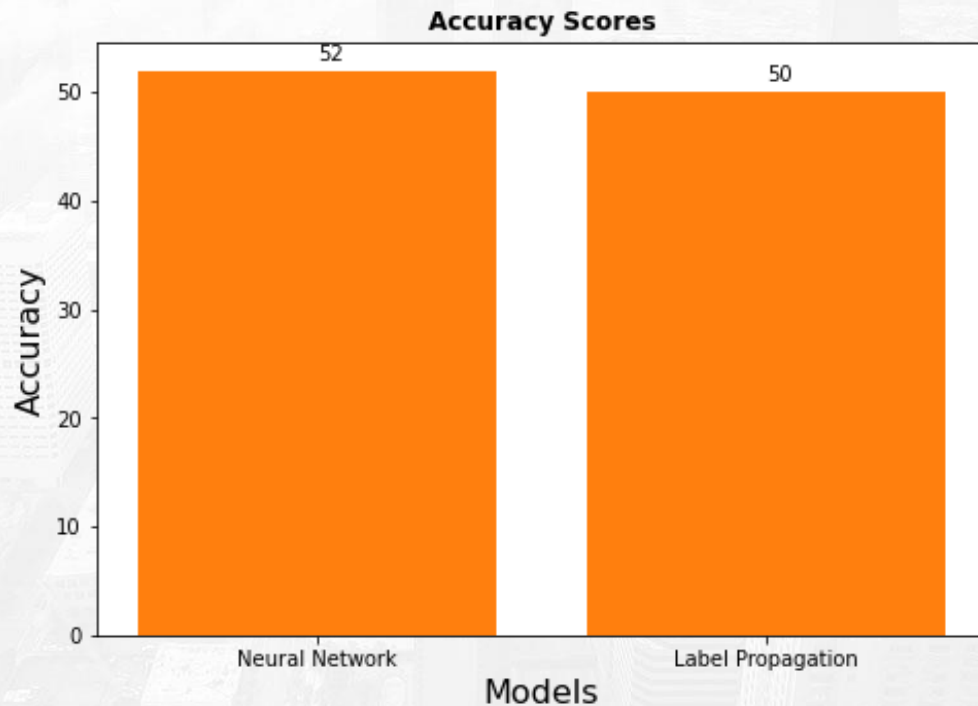


# Conclusion

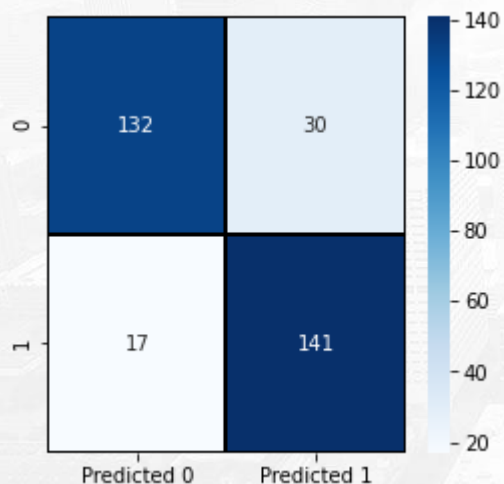
Predicted Numbers of Truthful vs Fake Reviews by Pre-Trained Machine Learning Methods



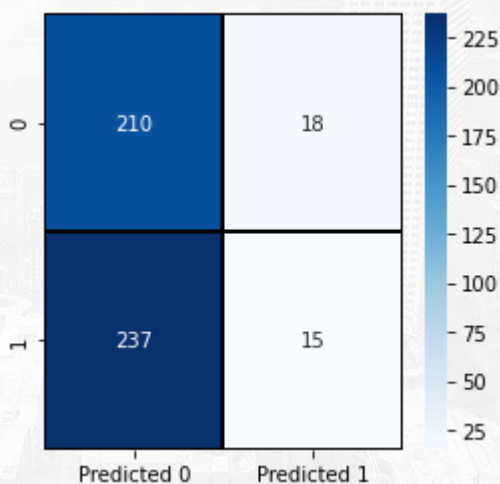
# Conclusion



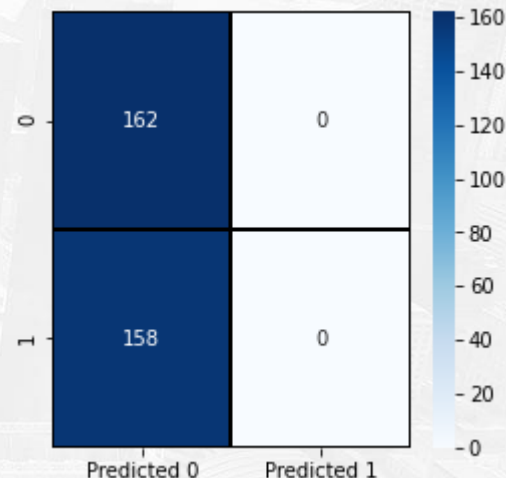
# Conclusion



Support Vector Machine  
Confusion Matrix



Neural Network  
Confusion Matrix



Semi Supervised Model  
Confusion Matrix







# 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

The background of the slide features a grayscale, high-angle photograph of a dense urban skyline, likely New York City, with numerous skyscrapers and buildings. A solid blue horizontal bar at the top contains the title 'Future Works' in white. Another solid blue horizontal bar at the bottom is also present. Two horizontal dotted lines, each starting and ending with a small blue diamond, separate the title from the list and the list from the bottom bar.

1. Finding better model for semi supervised model.
2. Applying deep learning method.
3. Developing unsupervised model.

# Q&A



# References

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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
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# Thank you

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