

# FAKE NEWS DETECTION PROJECT

Automated Classification Using NLP

Marcela Caetano



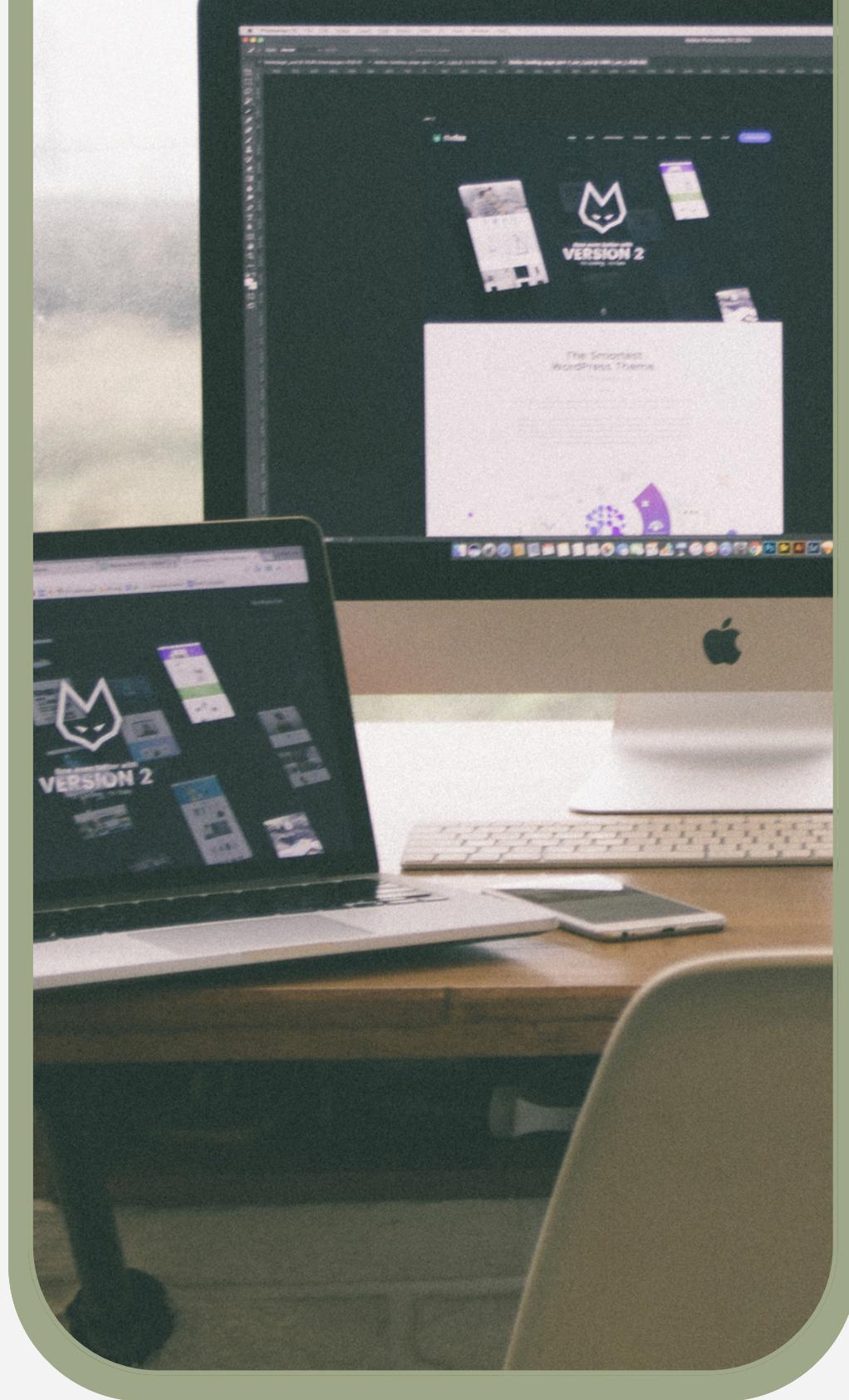
# GOAL OF PROJECT

The goal of this project is to build a machine learning-based model that classifies news articles as real or fake by analyzing textual features using Natural Language Processing (NLP) techniques.



# CHALLENGES & SOLUTIONS

- The main challenge in this project was deciding between Count Vectorizer and TF-IDF Vectorizer for text feature extraction.
- The solution was to use both approaches with different models and select the one with the best results.



# DATASET OVERVIEW

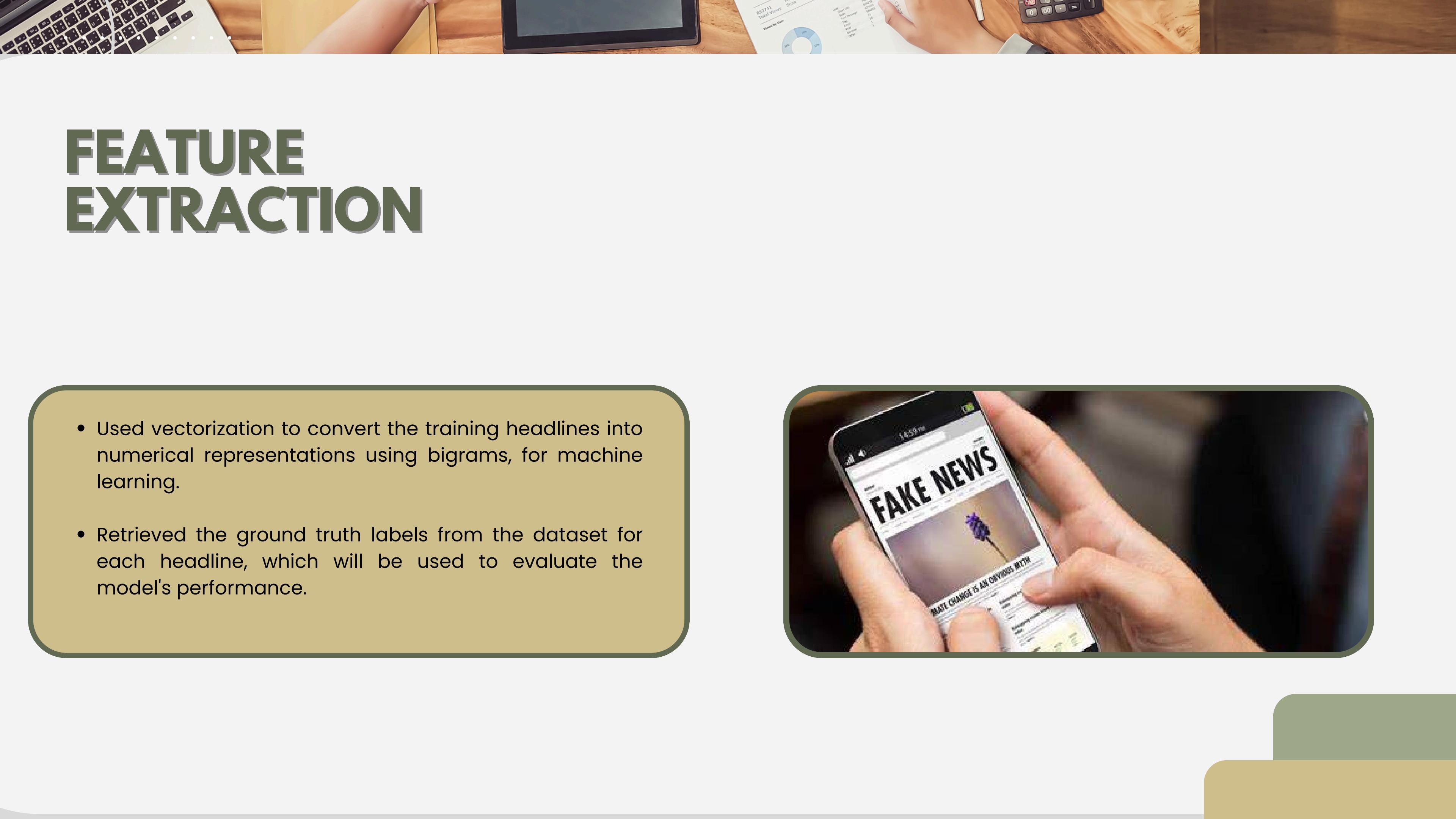
- The dataset consists of 34,151 rows and 2 columns, where each sentence is labeled as either fake or real news.
- It serves as the basis for training and evaluating the news classification model.



# ETL

- Create the function to load the data from the CSV file containing text and labeled data.
- Create the function to preprocess the data by standardizing it, removing non-alphabetic characters, and adjusting column names.
- Create the function to combine the words in each row into a single string, forming a list of headlines.





# FEATURE EXTRACTION

- Used vectorization to convert the training headlines into numerical representations using bigrams, for machine learning.
- Retrieved the ground truth labels from the dataset for each headline, which will be used to evaluate the model's performance.



# MODELS USED



SVM Classification Report				
	precision	recall	f1-score	support
0	0.92	0.88	0.90	5277
1	0.88	0.92	0.90	4969
accuracy			0.90	10246
macro avg	0.90	0.90	0.90	10246
weighted avg	0.90	0.90	0.90	10246

Naive Bayes Classification Report				
	precision	recall	f1-score	support
0	0.90	0.93	0.92	5277
1	0.93	0.89	0.91	4969
accuracy			0.91	10246
macro avg	0.92	0.91	0.91	10246
weighted avg	0.91	0.91	0.91	10246



# EVALUATION CONFUSION MATRIX

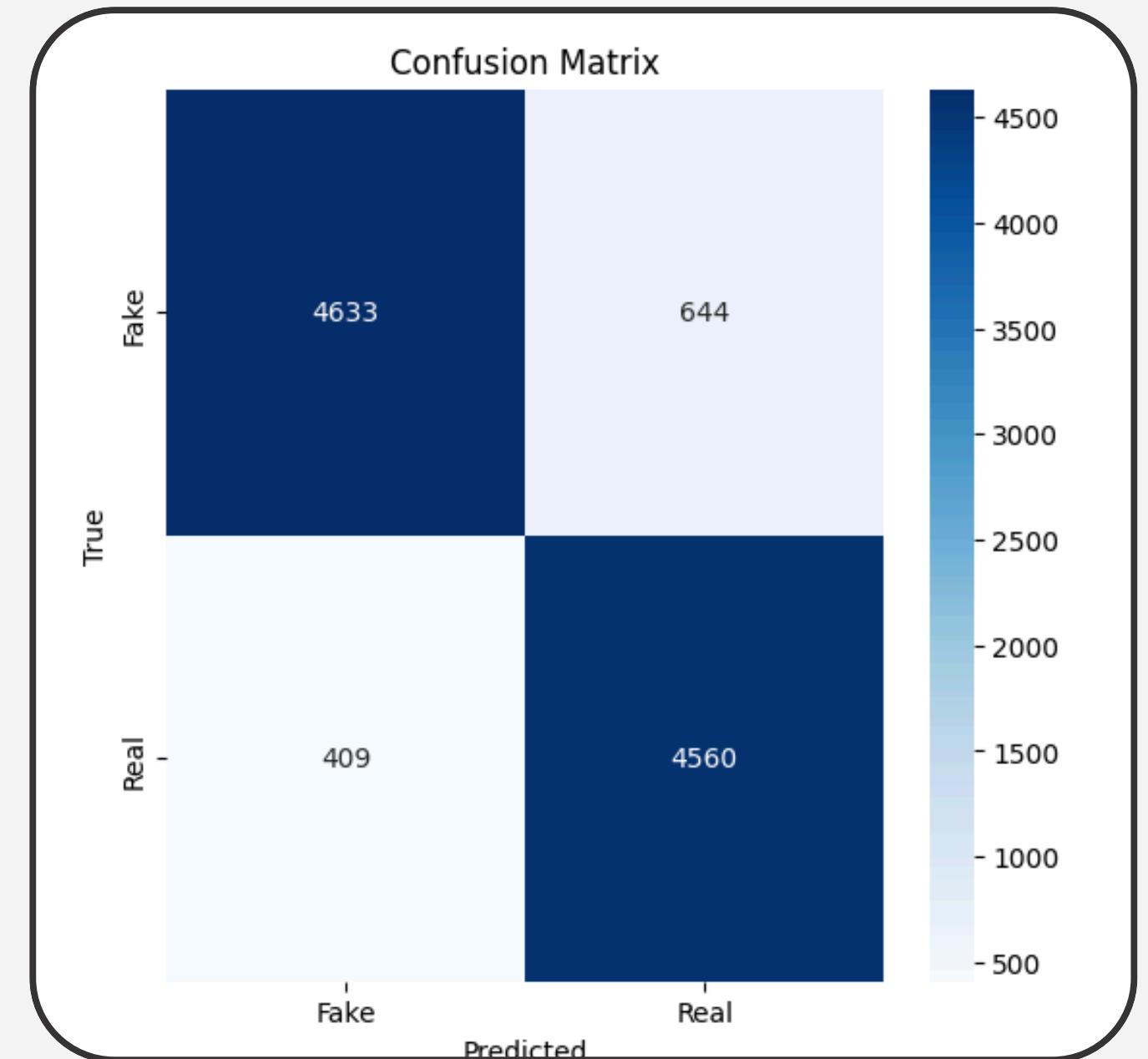
SVM

## Insights:

- The model performs well with 90% accuracy and a balanced F1-score, effectively distinguishing between real and fake news.

## Misclassification Analysis:

- The model misclassified 644 cases of fake news as real, and 409 cases of real news as fake.



# EVALUATION CONFUSION MATRIX

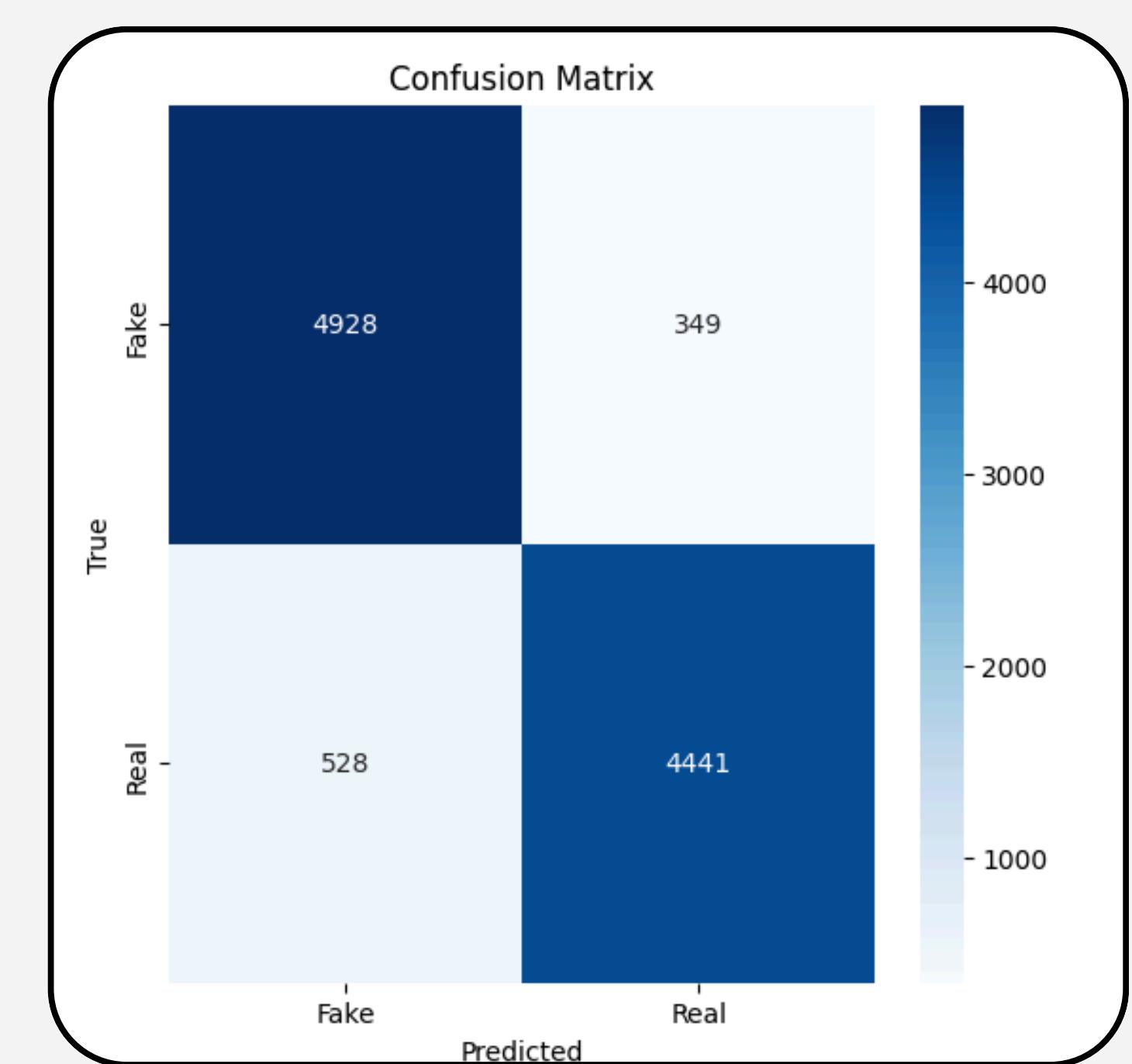
Naive  
Bayes

## Insights:

- The model performs better than SVM with 91% accuracy and a balanced F1-score, effectively distinguishing between real and fake news.

## Misclassification Analysis:

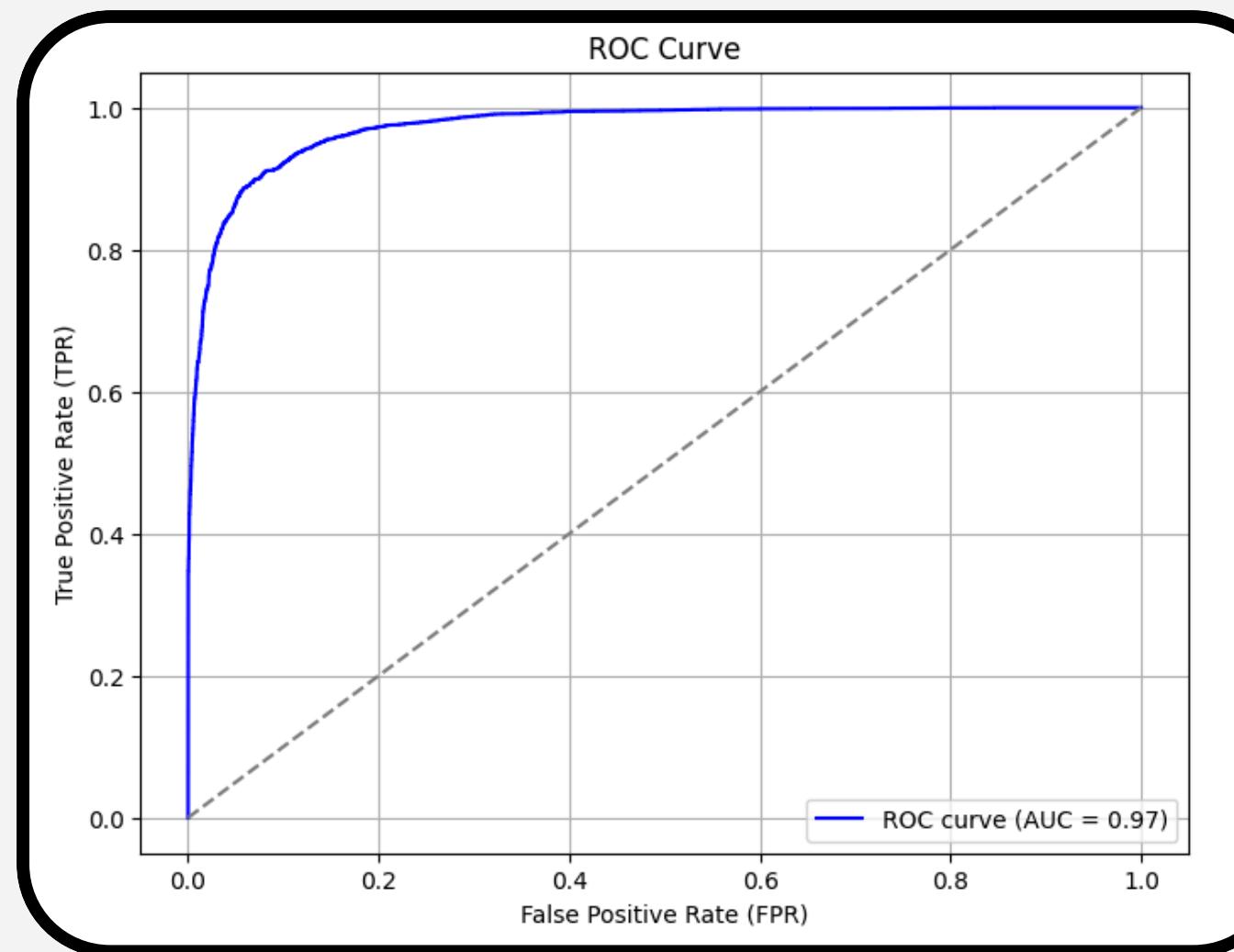
- The model misclassified 349 cases of fake news as real, and 528 cases of real news as fake.



# EVALUATION

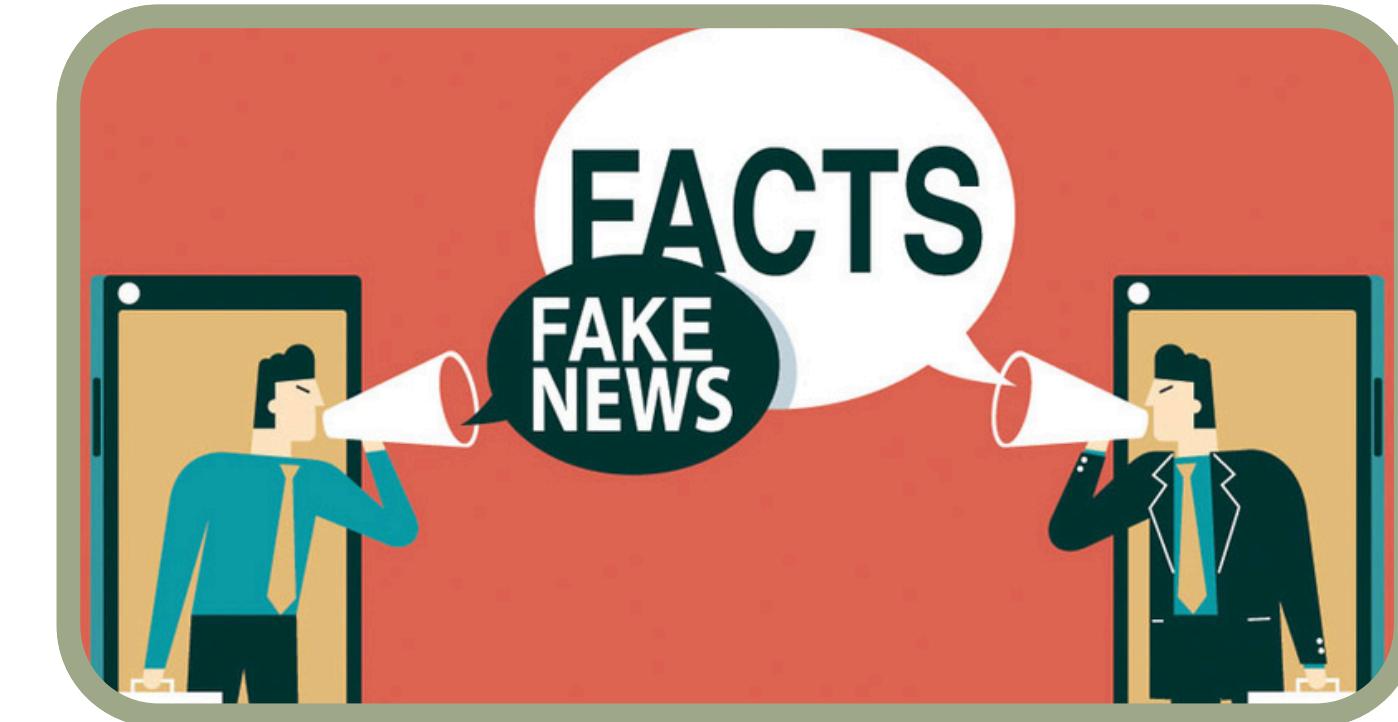
## ROC CURVE

- The model showed high performance with an AUC above 0.9, indicating that it effectively distinguishes between both classes, with a strong balance between precision and recall.



# CONCLUSION

- The Naive Bayes model outperformed the SVM model with 91% accuracy, demonstrating strong performance with accurate predictions.
- In this context, accuracy is the key metric, as our primary goal is to minimize false positives and false negatives to reduce their impact on the model's performance.



# DRIVEN QUESTIONS FOR BUSINESS TEAM

- Since our goal is to predict fake news, should we treat both false positives and false negatives with equal importance, or is it more critical, at first, to focus on reducing false negatives?
- Should we continue improving accuracy to capture both classes more effectively, or would it be more beneficial to explore new features to draw more robust conclusions and identify additional trends or patterns?
- Would it be useful to build a dashboard that displays the model's metrics/results, as well as the text features that are most influential in the predictions?



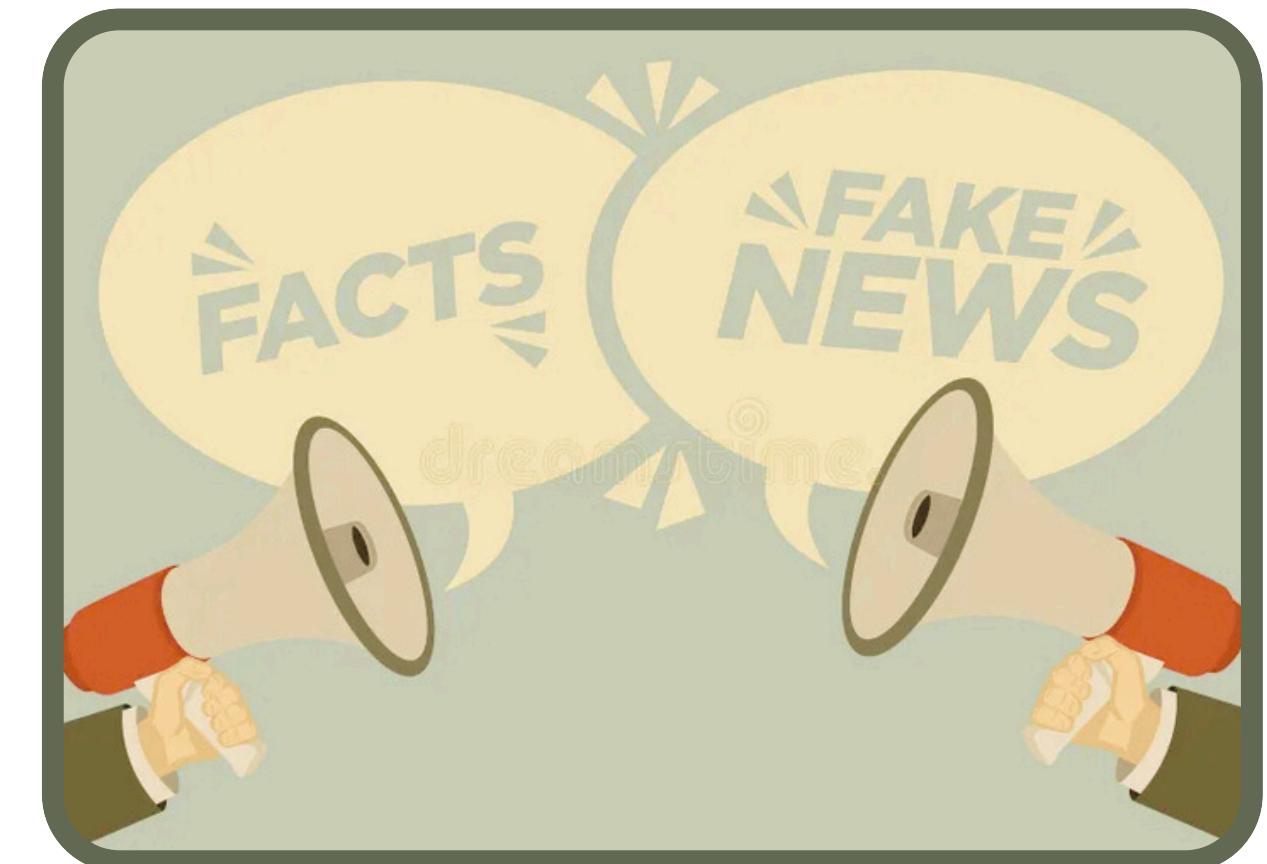
## NEXT STEPS



Fine Tuning the model with new parameters, suing for new NLP techniques such as lemmatization and removing stop words and punctuations



Performed sentiment analysis, feature importance analysis, and textual length analysis, and using K-means to detect another patters.



# THANK YOU

