SAUDI DIGITAL ACADEMY
AI Bootcamp

Artificial Intelligence

Natural Language Processing (NLP)

2025

Represent By

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Group Number: 2

Project Number: 2

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Introduction

Natural Language Processing (NLP) is a branch of AI that helps computers understand and analyze human language. It is used in applications like chatbots, sentiment analysis, and text classification.

Main Objective of the Project

This project involves detecting fake news articles by classifying them into "real" or "fake" categories using machine learning.

Understand Dataset

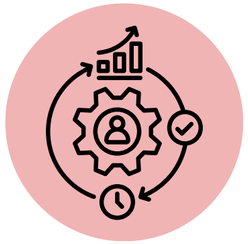
Data

data

validation data

validation_data

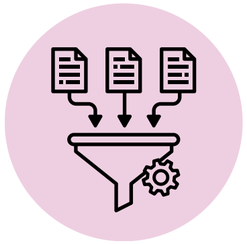
Data Preparation & Pre-processing



1

Drop unnecessary columns

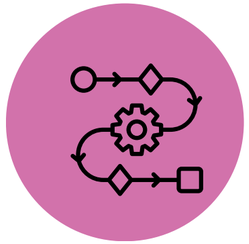
```
# Drop unnecessary columns
data = data[['title', 'text', 'label']]
data.dropna(inplace=True)
```



2

Text cleaning function

```
# Text cleaning function
def preprocess_text(text):
    #Function to clean and preprocess text
    text = text.lower()  # Convert to lowercase
    text = re.sub(r'\d+', '', text)  # Remove numbers
    # Remove punctuation
    text = text.translate
    (str.maketrans('', '', string.punctuation))
    # Remove extra spaces
    text = re.sub(r'\s+', ' ', text).strip()
    return text
```



3

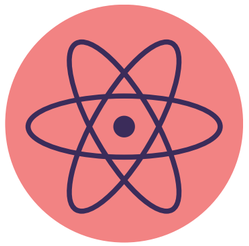
Features and target variable

```
# Features and target variable
X = data['title'] + " " + data['text']
y = data['label']
```

Vectorization Using TF-IDF

Convert text to numerical features

```
vectorizer = TfidfVectorizer(max_features=5000)
X_train_tfidf = vectorizer.fit_transform(X_train)
X_test_tfidf = vectorizer.transform(X_test)
```



Model Training

Split The Dataset Into Train & Test Sets

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
print(f"Training Data: {len(X_train)} samples")
print(f"Test Data: {len(X_test)} samples")
```

F or

A nd

N or

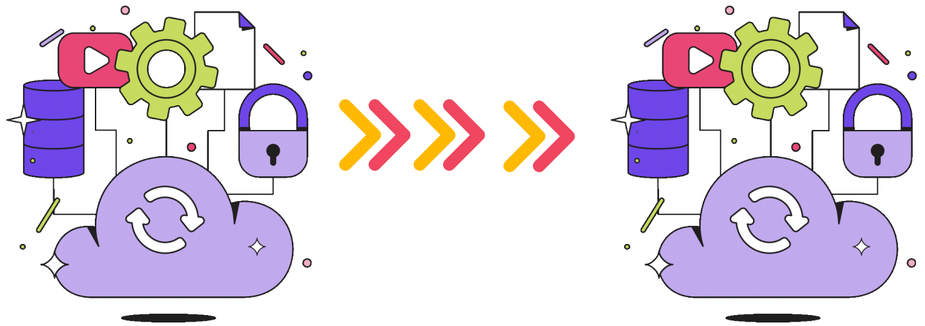
B ut

O r

Y et

S o

Models Training



1. KNN
2. Naive Bayes
3. Logistic Regression
4. XGBoost
5. Random Forest

```
KNeighborsClassifi
eighborsClassifier(
```

```
MultinomialNB
MultinomialNB()
```

```
LogisticRegressi
gisticRegression()
```

```
XGBClassifier
booster=None, call
=None, colsample_b
```

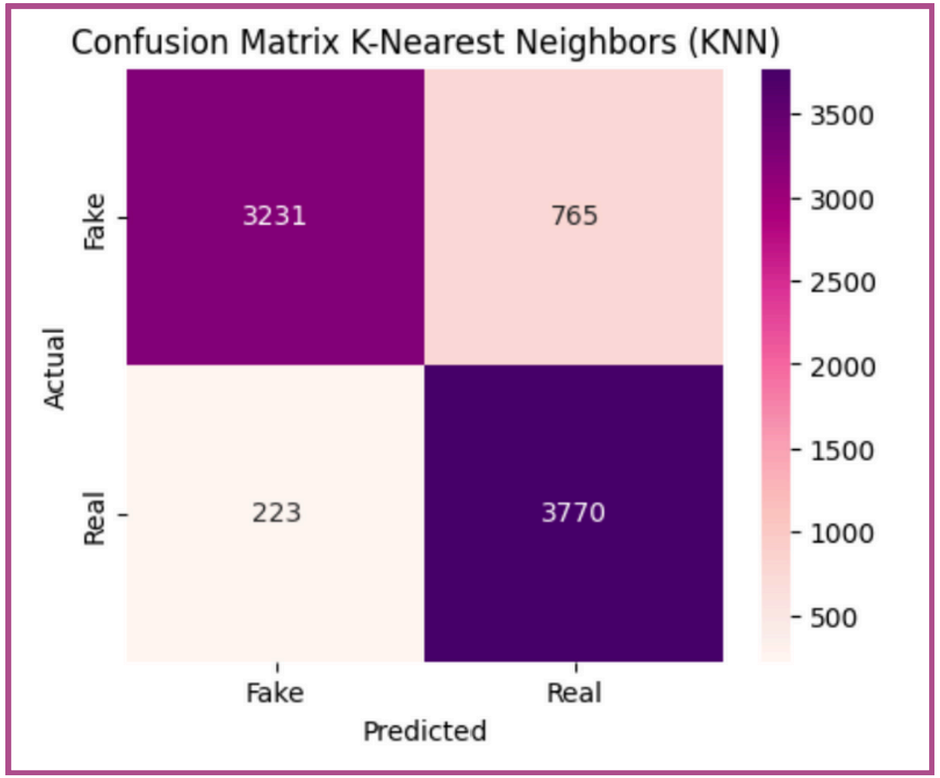
```
RandomForestClassifi
domForestClassifier
```

Models Evaluation

1

KNN

Confusion matrix



Accuracy Calculation

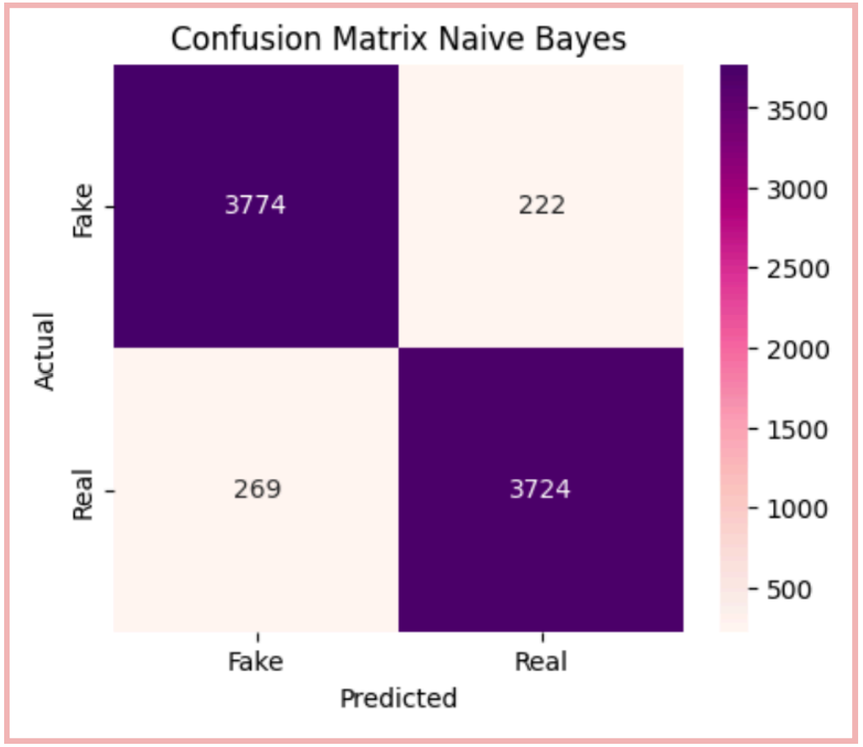
Accuracy K-Nearest Neighbors (KNN): 87.63%

Models Evaluation

2

Naive Bayes

Confusion matrix



Confusion matrix

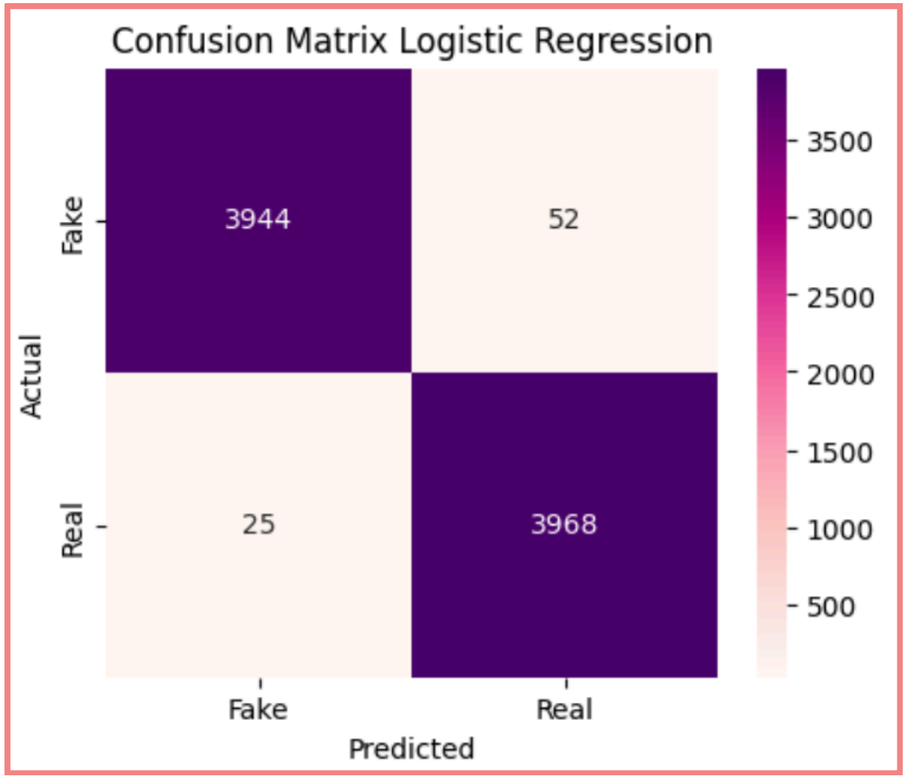
Accuracy Naive Bayes: 93.85%

Models Evaluation

3

Logistic Regression

Confusion matrix



Accuracy Calculation

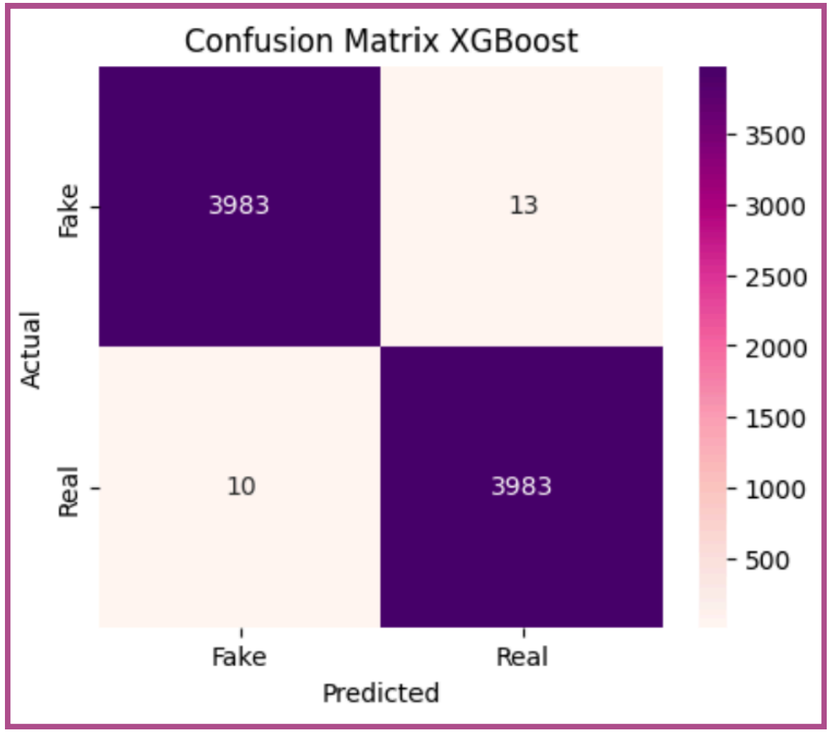
Accuracy Logistic Regression: 99.0362%

Models Evaluation

4

XGBoost

Confusion matrix



Accuracy Calculation

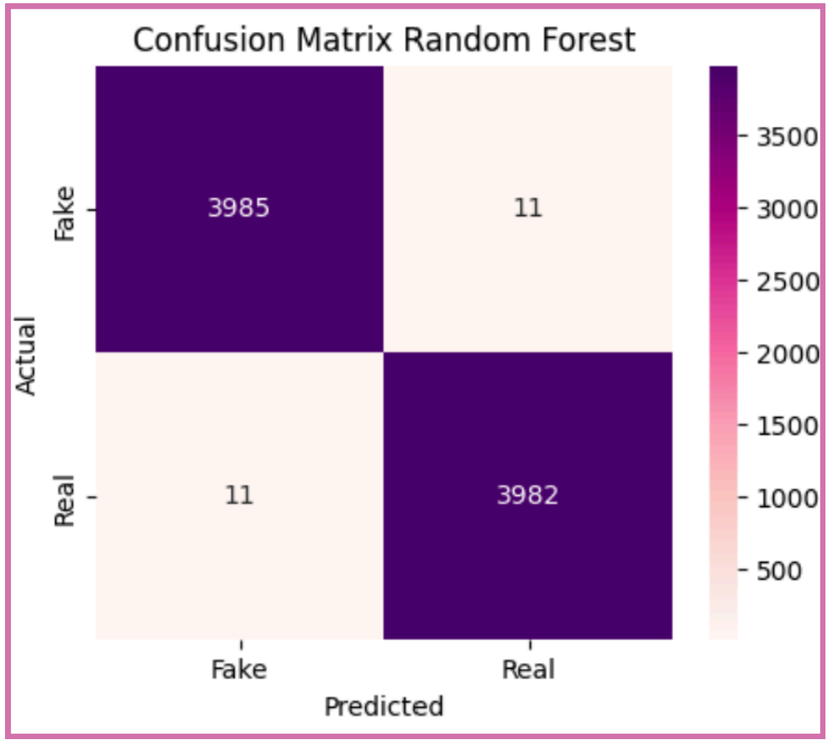
Accuracy XGBoost: 99.71%

Models Evaluation

5

Random Forest

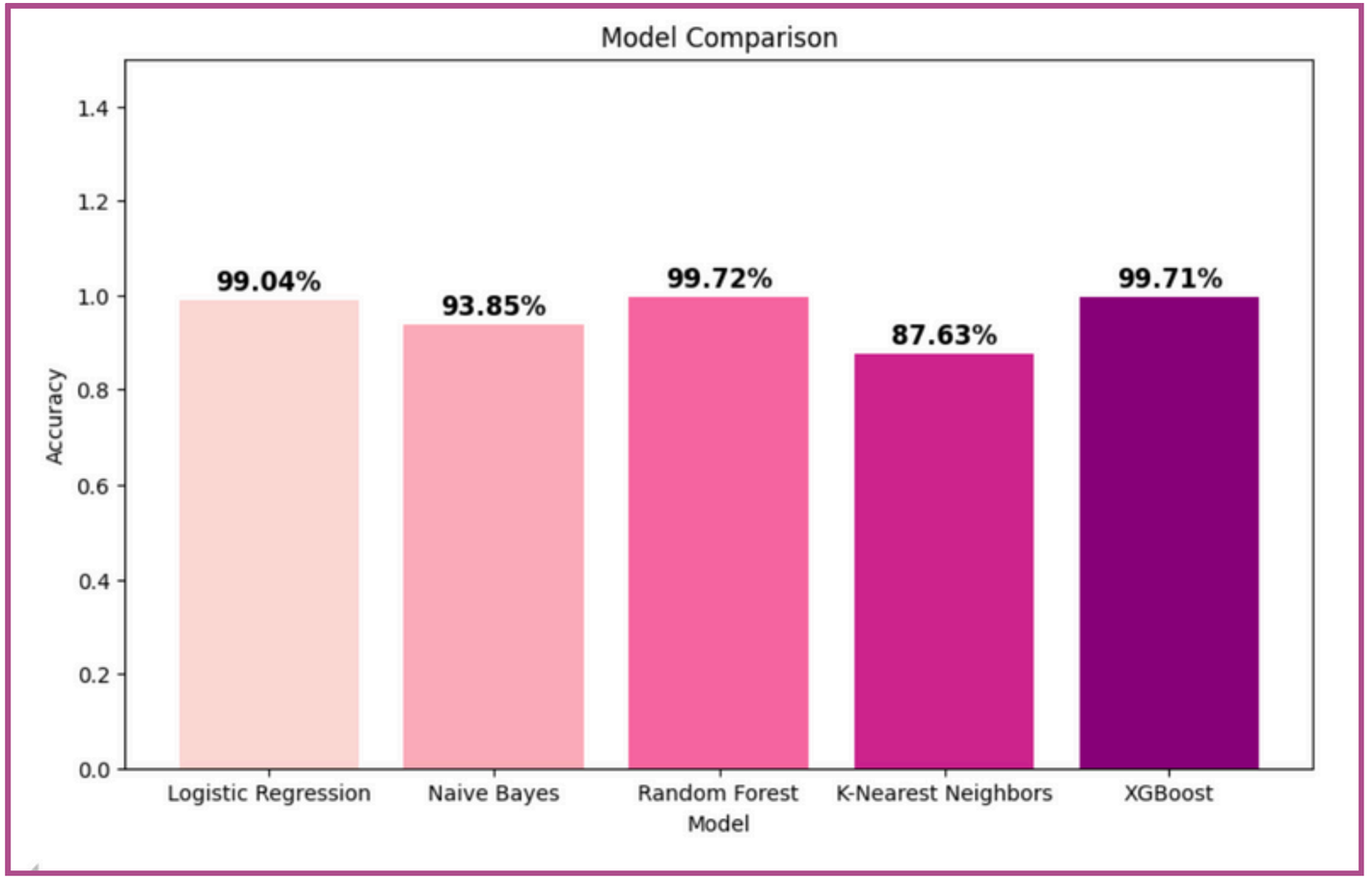
Confusion matrix



Accuracy Calculation

Accuracy Random Forest: 99.72%

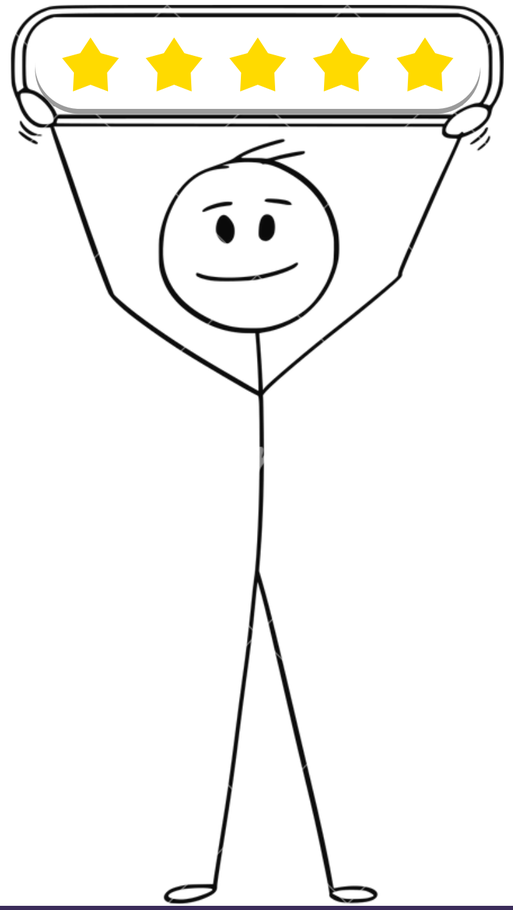
Models Comparison



Models Evaluation

Accuracy Calculation

1	2	3	4	5
KNN	Naive Bayes	Logistic Regression	XGBoost	Random Forest
87.63%	93.85%	99.0362%	99.71%	99.72%



Best Model Selection

Random Forest

99.72%

The best-performing model is: “Random Forest”

predictions on validation data

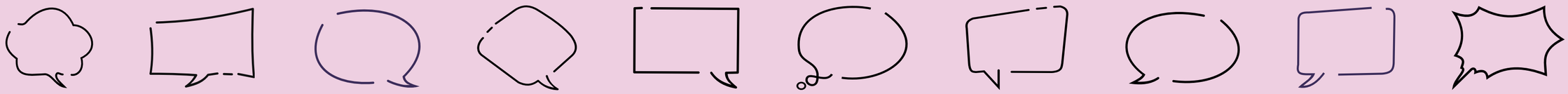
```
# Make predictions using the best model
predictions = model.predict(X_validation_tfidf)
# Add the predictions to the validation dataframe
validation_data['label'] = predictions
```

Save the result to a new CSV file

```
# Save predictions to CSV
validation_data.to_csv('validation_predictions.csv', index=False)
print("Predictions saved to 'validation_predictions.csv'")
# Display the first few rows of the validation data with predictions
validation_data.head()
```

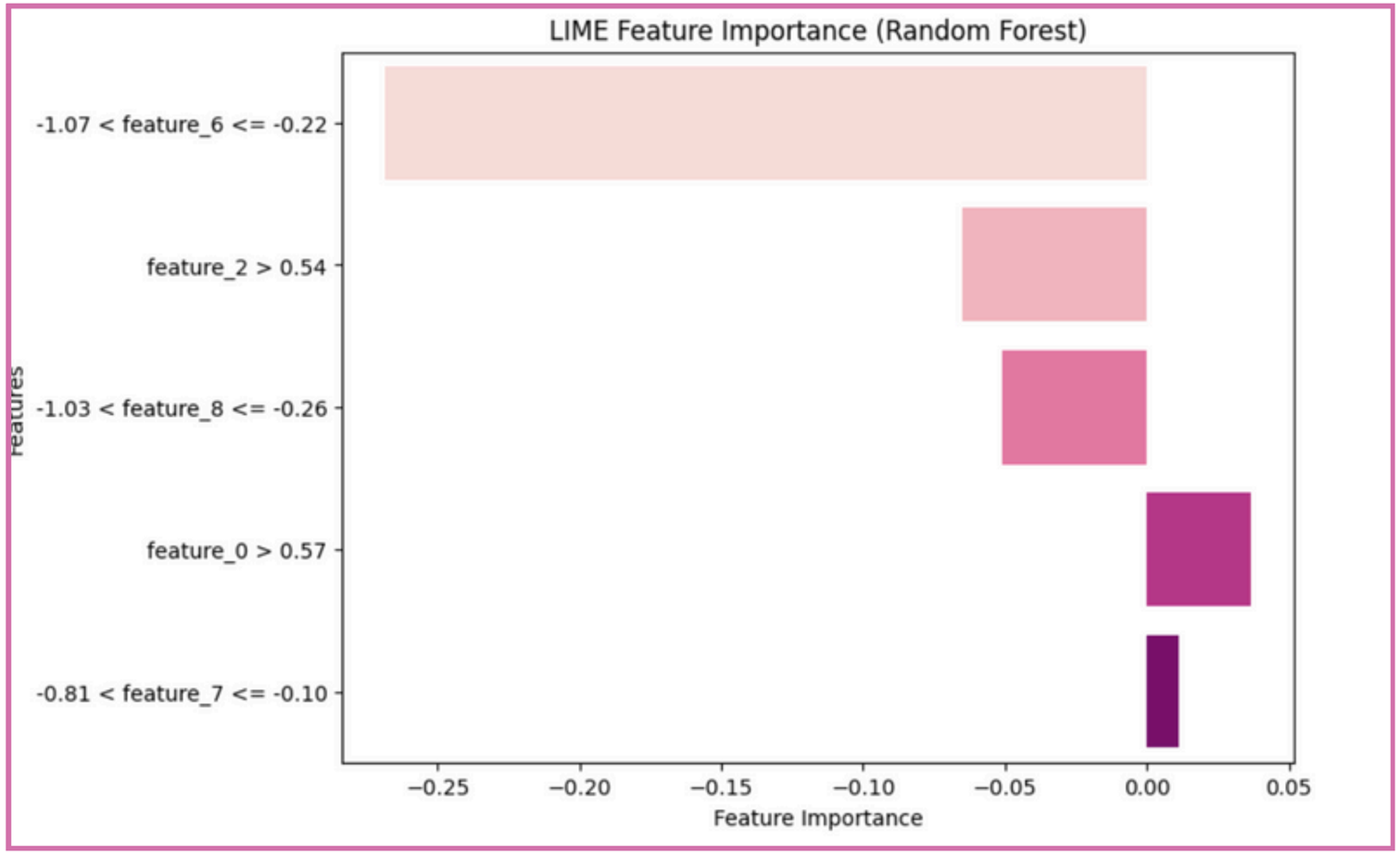
```
Predictions saved to 'validation_predictions.csv'
```

	label	title	text
0	1	UK's May 'receiving regular updates' on London...	LONDON (Reuters) - British Prime Minister Ther...
1	1	UK transport police leading investigation of L...	LONDON (Reuters) - British counter-terrorism p...
2	1	Pacific nations crack down on North Korean shi...	WELLINGTON (Reuters) - South Pacific island na...
3	1	Three suspected al Qaeda militants killed in Y...	ADEN, Yemen (Reuters) - Three suspected al Qae...
4	1	Chinese academics prod Beijing to consider Nor...	BEIJING (Reuters) - Chinese academics are publ...



Explain Predictions with LIME

Local Interpretable Model-agnostic Explanations



why Using LIME?

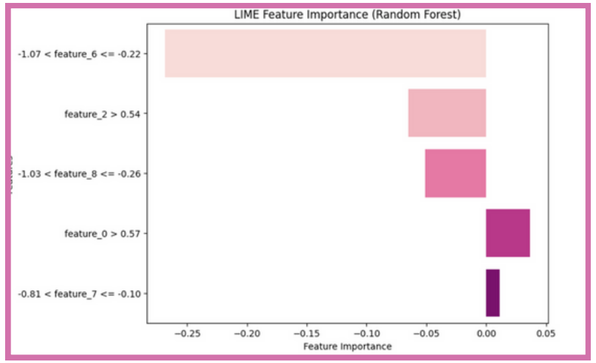
We use LIME for several reasons:

1 Understanding Complex Model Decisions 🧠

Helps explain how models like Random Forest or Deep Learning make predictions.

2 Improving Transparency & Trust 🔍

Makes AI decisions clearer.



why Using LIME?

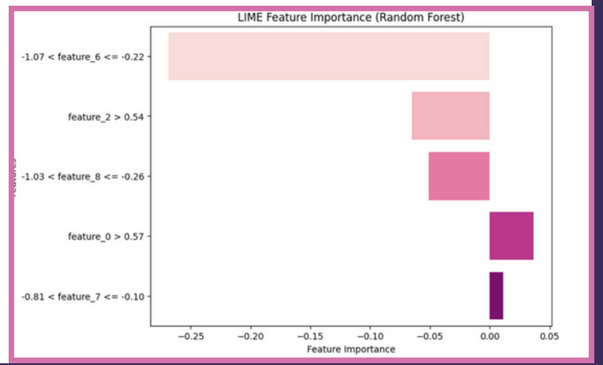
We use LIME for several reasons:

3 Detecting & Fixing Errors ⚠

Identifies unexpected feature influences, improving model performance.

4 Supporting Decision-Making ✅

Useful in healthcare, finance, and marketing to understand why a decision was made.



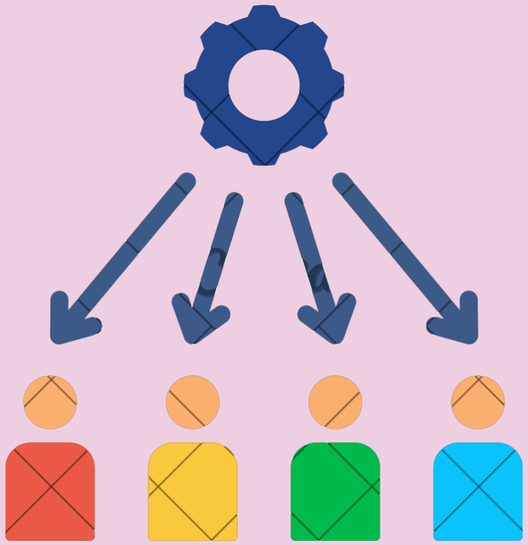
Challenges & Solutions

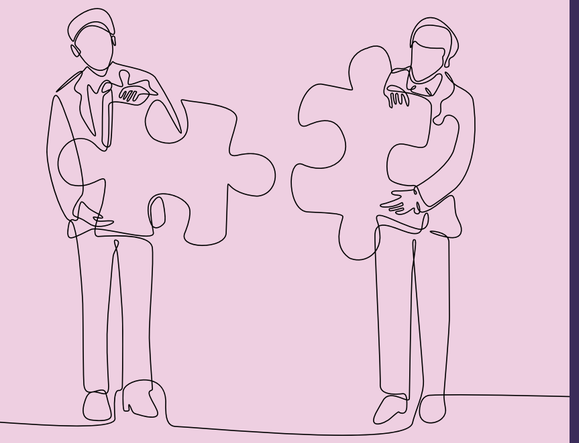
Challenges	Solutions
1. Difficulty in selecting the best model	We tested multiple models and compared their accuracy to find the best-performing one.
2. Understanding model predictions	We used LIME (Local Interpretable Model-agnostic Explanations) to interpret model decisions.
3. Balancing workload among team members	We assigned tasks based on each member's expertise and skill set.
4. Time management and meeting deadlines	We utilized Slack to track progress and ensure efficient collaboration.

Conclusion

In this project, we built a model to classify news as "real" or "fake" using NLP and machine learning. We cleaned the data, used TF-IDF for text processing, and trained models like KNN, Naive Bayes, Logistic Regression, XGBoost, and Random Forest.

In the end, we achieved our goal of classifying news accurately and learned a lot about NLP and machine learning.



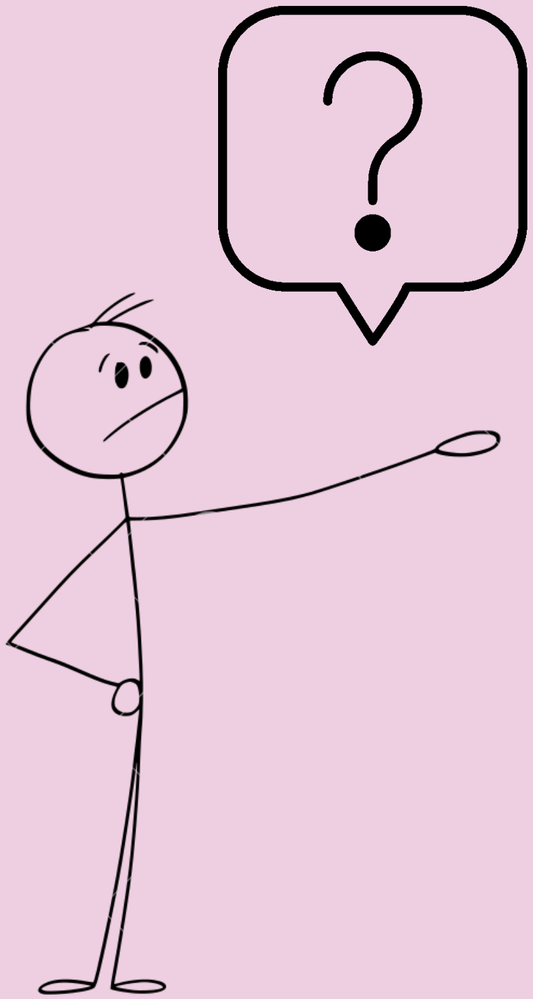


Organizing Labour Division in Our Team Strategies & Implementation

Ghala AlOtaibi	KNN - Logistic Regression - XGBoost
Hanan Alnbhani	Presentation -LIME
Sarah Alqahtani	Random Forest
SHATHA KAMAL	Naive Bayes - Read Me

Thank you

For your kind listening



ANY Questions?