# Fake News Detection – Report

### Introduction

In today’s digital age, false information spreads quickly through social media and online platforms. Distinguishing real news from fake has become essential. This project uses machine learning and natural language processing (NLP) to automatically classify news articles as real or fake, based on the “Fake and Real News Dataset” from Kaggle.

### Approach

The dataset combined two sources: True.csv for real news and Fake.csv for misleading articles. Labels were assigned (1 for real, 0 for fake) and the data was shuffled. Text was cleaned by converting to lowercase, removing punctuation and stopwords, and applying lemmatization. TF-IDF vectorization with 5000 features was then used to represent the articles numerically. The data was split into training (80%) and testing (20%).

Three models were trained: Logistic Regression, Naïve Bayes, and Random Forest. Their performance was measured using accuracy, precision, recall, F1-score, and confusion matrices. Logistic Regression gave the most balanced and accurate results.

### Challenges

Some challenges included handling very short articles with limited context, ensuring the dataset remained balanced during training, and improving interpretability when articles were borderline. Another issue was generalization—while models performed well on this dataset, new forms of fake news could reduce accuracy.

### Outcomes

Logistic Regression achieved the best accuracy (above 90%) and provided reliable predictions. Naïve Bayes was strong in detecting fake articles, while Random Forest worked well but was more resource-intensive. An additional function was built for manual testing, allowing users to input text and receive predictions with confidence scores.

### Conclusion

This project shows that combining NLP techniques with machine learning is an effective way to detect fake news. With proper preprocessing and feature extraction, traditional models can achieve strong results. Future improvements could include deep learning methods, adding metadata such as source credibility, and updating with newer datasets to keep pace with changing misinformation trends.