Fake News Detection using Machine Learning

Fake news has become a significant problem in today's digital world. The spread of misinformation through social media and online platforms can influence public opinion and create confusion. Machine Learning provides automated techniques to classify news articles as either 'fake' or 'true' based on their content. This report explores the process of building a fake news detection model using Python, Pandas, and Scikit-learn.

Dataset Description

We use the *Fake and True News Dataset*, which contains two files: **Fake.csv** – News articles identified as fake. **True.csv** – News articles identified as true. Each file has the following columns: **title** – Headline of the news article. **text** – The full content of the article. **subject** – Category of the article (politics, world, etc.). **date** – Date of publication. The dataset is balanced between fake and true news, allowing for effective training and evaluation of classification models.

Data Preprocessing

Before training the model, the following preprocessing steps are applied: Loading and combining Fake and True news datasets. Labeling fake news as **0** and true news as **1**. Cleaning the text by removing punctuation, numbers, and stopwords. Tokenizing and normalizing the text (lowercasing, stemming/lemmatization). Converting text into numerical features using **TF-IDF Vectorization**.

Model Building

We implemented several machine learning models for fake news classification: **Logistic Regression** – A simple baseline classifier that performs well on text classification tasks. **Naive Bayes** – Suitable for word-frequency-based models, efficient for text classification. **Random Forest** – An ensemble method that improves performance by combining multiple decision trees. **Support Vector Machine (SVM)** – Effective for high-dimensional spaces like TF-IDF vectors. The models are trained on 70% of the dataset and evaluated on 30% for testing.

Model Evaluation

The models are evaluated using the following metrics: **Accuracy** – Percentage of correctly classified news articles. **Precision** – Ability of the model to correctly identify true positives. **Recall** – Ability of the model to capture all relevant cases. **F1 Score** – Harmonic mean of precision and recall. **Confusion Matrix** – Distribution of true/false positives and negatives. Typically, Logistic Regression and SVM achieve accuracies above **95%** on this dataset, making them effective solutions for fake news detection.

Conclusion

Fake news detection using machine learning is an essential application in the fight against misinformation. This project demonstrates how preprocessing, feature engineering, and machine learning models can be combined to build an automated fake news classifier. While traditional models achieve high accuracy, future work can explore deep learning approaches (e.g., LSTMs, Transformers) for improved generalization on diverse datasets.