**FAKE NEWS DETECTION USING NLP IN ARTIFICIAL INTELLIGENCE**

**TEAM MEMBER**

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**Phase-1 : Problem Definition and Design Thinking**

**Project: Fake News Detection Using NLP**



**PROBLEM STATEMENT:**

Detecting fake news using Natural Language Processing (NLP) involves developing a machine learning model or system that can differentiate between genuine news articles and fake or misleading information using a kaggle dataset.

**OBJECTIVES:**

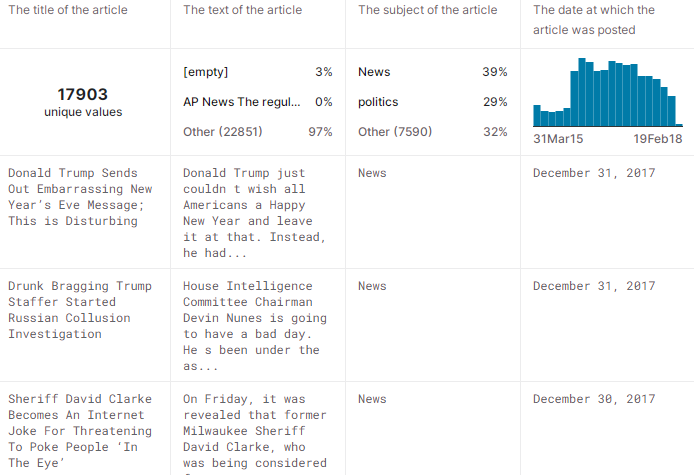
* To minimize false positives and false negatives.
* Enabling timely responses to misleading information.
* Allows users to easily access and verify the authenticity of news articles.
* Focus on building public trust in the system's ability to combat fake news and provide accurate information.

**PHASE 1: Problem Definition And Design Thinking**

1. **Data Source**

A best data source for fake news detection should be accurate ,complete and with their labels(genuine , fake).

**Dataset Link:**[**https://www.kaggle.com/datasets/clmentbisaillon/fake-and-real-news-dataset**](https://www.kaggle.com/datasets/clmentbisaillon/fake-and-real-news-dataset)

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1. **Data Preprocessing**

Data preprocessing is a crucial step in building a fake news detection model using NLP in AI and ML. Proper preprocessing ensures that the data is clean, structured, and ready for analysis and model training. Let’s elaborate on the specific steps:

1. **Data Collection:**

* Collect a reliable and diverse dataset of news articles.
* Ensure that the dataset contains both fake and real news articles for training and evaluation.

1. **Data Cleaning:**

* Remove any HTML tags, special characters, and non-alphanumeric characters from the text.
* Convert text to lowercase to ensure consistency.
* Remove duplicates, if any, from the dataset.

1. **Handling Missing Data:**

* Check for missing values in the dataset and decide on an appropriate strategy to handle them, such as imputation or removal.

**d) Handling Imbalanced Data:**

* In fake news detection, the dataset may be imbalanced, with a majority of real news articles.
* Consider techniques like oversampling, undersampling, or using synthetic data generation methods to balance the dataset.

1. **Feature Extraction:**

Feature extraction refers to the process of transforming raw data into numerical features that can be processed while preserving the information in the original data set. It yields better results than applying machine learning directly to the raw data. Feature extraction refers to the process of transforming raw data into numerical features that can be processed while preserving the information in the original data set. It yields better results than applying machine learning directly to the raw data.

* **Term Frequency-Inverse Document Frequency (TF-IDF):**
* TF-IDF is similar to BoW but takes into account the importance of words by considering their frequency in a specific document and across the entire dataset. It assigns a weight to each word based on its rarity in the corpus.
* Example: "This is a sample sentence" -> [0.6931, 0.6931, 0.6931, 0.6931, 0.2876]
* **Word Embeddings:**
* Word embeddings like Word2Vec, GloVe, or FastText represent words as dense, continuous-valued vectors in a lower-dimensional space. These embeddings capture semantic relationships between words.
* Example: "king" - "man" + "woman" ≈ "queen"

1. **Model Selection:**

Model Selection is the process of choosing the best model among all the potential candidate models for a given problem. The aim of the model selection process is to select a machine learning algorithm that evaluates to perform well against all the different parameters.

* **Logistic Regression:** A simple and interpretable model suitable for binary classification tasks. It can serve as a baseline model.
* **Naive Bayes:** Particularly useful for text classification tasks. It's fast, works well with high-dimensional data (like text), and can handle sparse features.
* **Random Forest:** An ensemble method that can handle a mixture of feature types (e.g., text and numerical features) and can capture complex relationships in the data.
* **Neural Networks:** While deep learning models are commonly used for fake news detection, traditional machine learning models can also be effective, especially for smaller datasets.

1. **MODEL TRAINING:**

Model training is the phase in the data science development lifecycle where practitioners try to fit the best combination of weights and bias to a machine learning algorithm to minimize a loss function over the prediction range.

import warnings

warnings.filterwarnings('ignore')

import numpy as np # linear algebra

import pandas as pd # data processing, CSV file I/O (e.g. pd.read\_csv)

import nltk

from nltk.sentiment import SentimentIntensityAnalyzer

import warnings

warnings.filterwarnings("ignore")

from sklearn.model\_selection import train\_test\_split

from sklearn.feature\_extraction.text import TfidfVectorizer

from sklearn.svm import SVC

from sklearn.metrics import accuracy\_score, classification\_report

import os

for dirname, \_, filenames in os.walk('/kaggle/input'):

for filename in filenames:

print(os.path.join(dirname, filename))

/kaggle/input/fake-and-real-news-dataset/True.csv

/kaggle/input/fake-and-real-news-dataset/Fake.csv

**Loading Data**

true = pd.read\_csv('/kaggle/input/fake-and-real-news-dataset/True.csv')

fake = pd.read\_csv('/kaggle/input/fake-and-real-news-dataset/Fake.csv')

fake['Category'] = 'fake'

fake

**OUTPUT:**

| title | text | subject | date | Category |
| --- | --- | --- | --- | --- |
| 0 | Donald Trump Sends Out Embarrassing New Year’... | Donald Trump just couldn t wish all Americans ... | News | December 31, 2017 | fake |
| 1 | Drunk Bragging Trump Staffer Started Russian ... | House Intelligence Committee Chairman Devin Nu... | News | December 31, 2017 | fake |
| 2 | Sheriff David Clarke Becomes An Internet Joke... | On Friday, it was revealed that former Milwauk... | News | December 30, 2017 | fake |
| 3 | Trump Is So Obsessed He Even Has Obama’s Name... | On Christmas day, Donald Trump announced that ... | News | December 29, 2017 | fake |
| 4 | Pope Francis Just Called Out Donald Trump Dur... | Pope Francis used his annual Christmas Day mes... | News | December 25, 2017 | fake |
| ... | ... | ... | ... | ... | ... |
| 23476 | McPain: John McCain Furious That Iran Treated ... | 21st Century Wire says As 21WIRE reported earl... | Middle-east | January 16, 2016 | fake |
| 23477 | JUSTICE? Yahoo Settles E-mail Privacy Class-ac... | 21st Century Wire says It s a familiar theme. ... | Middle-east | January 16, 2016 | fake |
| 23478 | Sunnistan: US and Allied ‘Safe Zone’ Plan to T... | Patrick Henningsen 21st Century WireRemember ... | Middle-east | January 15, 2016 | fake |
| 23479 | How to Blow $700 Million: Al Jazeera America F... | 21st Century Wire says Al Jazeera America will... | Middle-east | January 14, 2016 | fake |
| 23480 | 10 U.S. Navy Sailors Held by Iranian Military ... | 21st Century Wire says As 21WIRE predicted in ... | Middle-east | January 12, 2016 | fake |

23481 rows × 5 columns

true['Category'] = 'true'

true

**OUTPUT:**

| title | text | subject | date | Category |
| --- | --- | --- | --- | --- |
| 0 | As U.S. budget fight looms, Republicans flip t... | WASHINGTON (Reuters) - The head of a conservat... | politicsNews | December 31, 2017 | true |
| 1 | U.S. military to accept transgender recruits o... | WASHINGTON (Reuters) - Transgender people will... | politicsNews | December 29, 2017 | true |
| 2 | Senior U.S. Republican senator: 'Let Mr. Muell... | WASHINGTON (Reuters) - The special counsel inv... | politicsNews | December 31, 2017 | true |
| 3 | FBI Russia probe helped by Australian diplomat... | WASHINGTON (Reuters) - Trump campaign adviser ... | politicsNews | December 30, 2017 | true |
| 4 | Trump wants Postal Service to charge 'much mor... | SEATTLE/WASHINGTON (Reuters) - President Donal... | politicsNews | December 29, 2017 | true |
| ... | ... | ... | ... | ... | ... |
| 21412 | 'Fully committed' NATO backs new U.S. approach... | BRUSSELS (Reuters) - NATO allies on Tuesday we... | worldnews | August 22, 2017 | true |
| 21413 | LexisNexis withdrew two products from Chinese ... | LONDON (Reuters) - LexisNexis, a provider of l... | worldnews | August 22, 2017 | true |
| 21414 | Minsk cultural hub becomes haven from authorities | MINSK (Reuters) - In the shadow of disused Sov... | worldnews | August 22, 2017 | true |
| 21415 | Vatican upbeat on possibility of Pope Francis ... | MOSCOW (Reuters) - Vatican Secretary of State ... | worldnews | August 22, 2017 | true |
| 21416 | Indonesia to buy $1.14 billion worth of Russia... | JAKARTA (Reuters) - Indonesia will buy 11 Sukh... | worldnews | August 22, 2017 | true |

21417 rows × 5 columns

data = pd.concat([fake, true], ignore\_index = True)

data

**OUTPUT:**

| title | text | subject | date | Category |
| --- | --- | --- | --- | --- |
| 0 | Donald Trump Sends Out Embarrassing New Year’... | Donald Trump just couldn t wish all Americans ... | News | December 31, 2017 | fake |
| 1 | Drunk Bragging Trump Staffer Started Russian ... | House Intelligence Committee Chairman Devin Nu... | News | December 31, 2017 | fake |
| 2 | Sheriff David Clarke Becomes An Internet Joke... | On Friday, it was revealed that former Milwauk... | News | December 30, 2017 | fake |
| 3 | Trump Is So Obsessed He Even Has Obama’s Name... | On Christmas day, Donald Trump announced that ... | News | December 29, 2017 | fake |
| 4 | Pope Francis Just Called Out Donald Trump Dur... | Pope Francis used his annual Christmas Day mes... | News | December 25, 2017 | fake |
| ... | ... | ... | ... | ... | ... |
| 44893 | 'Fully committed' NATO backs new U.S. approach... | BRUSSELS (Reuters) - NATO allies on Tuesday we... | worldnews | August 22, 2017 | true |
| 44894 | LexisNexis withdrew two products from Chinese ... | LONDON (Reuters) - LexisNexis, a provider of l... | worldnews | August 22, 2017 | true |
| 44895 | Minsk cultural hub becomes haven from authorities | MINSK (Reuters) - In the shadow of disused Sov... | worldnews | August 22, 2017 | true |
| 44896 | Vatican upbeat on possibility of Pope Francis ... | MOSCOW (Reuters) - Vatican Secretary of State ... | worldnews | August 22, 2017 | true |
| 44897 | Indonesia to buy $1.14 billion worth of Russia... | JAKARTA (Reuters) - Indonesia will buy 11 Sukh... | worldnews | August 22, 2017 | true |

44898 rows × 5 columns

**data.shape**

**OUTPUT:**

(44898, 5)

**Preprocessing**

data['Category'].value\_counts()

**OUTPUT:**

Category

fake 23481

true 21417

Name: count, dtype: int64

#Transforming category values to numerical

from sklearn.preprocessing import LabelEncoder

encoder = LabelEncoder()

data['Category'] = encoder.fit\_transform(data['Category'])

data['Category']

**OUTPUT:**

0 0

1 0

2 0

3 0

4 0

..

44893 1

44894 1

44895 1

44896 1

44897 1

Name: Category, Length: 44898, dtype: int64

vectorizer = TfidfVectorizer()

title = vectorizer.fit\_transform(data['title'])

title

**OUTPUT:**

<44898x20896 sparse matrix of type '<class 'numpy.float64'>'

with 546512 stored elements in Compressed Sparse Row format>

**Modeling:**

from sklearn.model\_selection import train\_test\_split

X = title

y = data['Category']

X\_train, X\_test, y\_train, y\_test = train\_test\_split(X, y, test\_size = 0.2, random\_state = 42)

model = SVC()

model.fit(X\_train, y\_train)

y\_pred = model.predict(X\_test)

print('Classification Report: ')

print(classification\_report(y\_test, y\_pred))

**OUTPUT:**

Classification Report:

precision recall f1-score support

0 0.97 0.96 0.96 4733

1 0.95 0.97 0.96 4247

accuracy 0.96 8980

macro avg 0.96 0.96 0.96 8980

weighted avg 0.96 0.96 0.96 8980

1. **Evaluation:**

Model evaluation is important to assess the efficacy of a model during initial research phases, and it also plays a role in model monitoring.

**CONCLUSION:**

Fake news detection using NLP is a pivotal application of technology in safeguarding the reliability of information in the digital era. By leveraging natural language processing and machine learning, we can develop effective tools to distinguish between genuine and deceptive content.