Importing Libraries

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
from sklearn.metrics import classification_report
import re
import string
```

Importing **Dataset**

```
df_fake=pd.read_csv("/content/Fake.csv")
df_fake
```

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

23481 rows × 4 columns

Next steps: Generate code with df_fake | View recommended plots | New interactive sheet

```
df_fake.head()
```

	title	text	subject	date
0	Donald Trump Sends Out Embarrassing New Year'...	Donald Trump just couldn t wish all Americans ...	News	December 31, 2017
1	Drunk Bragging Trump Staffer Started Russian ...	House Intelligence Committee Chairman Devin Nu...	News	December 31, 2017
2	Sheriff David Clarke Becomes An Internet Joke...	On Friday, it was revealed that former Milwauk...	News	December 30, 2017
3	Trump Is So Obsessed He Even Has Obama's Name...	On Christmas day, Donald Trump announced that ...	News	December 29, 2017
4	Pope Francis Just Called Out Donald Trump Dur...	Pope Francis used his annual Christmas Day mes...	News	December 25, 2017

Next steps: Generate code with df_fake | View recommended plots | New interactive sheet

```
df_true = pd.read_csv("/content/True.csv")
```

```
df_true.head()
```

	title	text	subject	date
0	As U.S. budget fight looms, Republicans flip t...	WASHINGTON (Reuters) - The head of a conservat...	politicsNews	December 31, 2017
1	U.S. military to accept transgender recruits o...	WASHINGTON (Reuters) - Transgender people will...	politicsNews	December 29, 2017
2	Senior U.S. Republican senator: 'Let Mr. Muell...	WASHINGTON (Reuters) - The special counsel inv...	politicsNews	December 31, 2017
3	FBI Russia probe helped by Australian diplomat...	WASHINGTON (Reuters) - Trump campaign adviser ...	politicsNews	December 30, 2017
4	Trump wants Postal Service to charge 'much mor...	SEATTLE/WASHINGTON (Reuters) - President Donal...	politicsNews	December 29, 2017

Next steps: Generate code with df_true | View recommended plots | New interactive sheet

```
df_fake["class"] = 0
df_true["class"] = 1
```

```
df_fake.shape, df_true.shape
```

```
((23481, 5), (21417, 5))
```

```
# Removing last 10 rows for manual testing
df_fake_manual_testing = df_fake.tail(10)
for i in range(23480,23470,-1):
    df_fake.drop([i], axis = 0, inplace = True)
```

```
df_true_manual_testing = df_true.tail(10)
for i in range(21416,21406,-1):
    df_true.drop([i], axis = 0, inplace = True)
```

```
df_fake.shape, df_true.shape
```

```
((23471, 5), (21407, 5))
```

Inserting a column "class" as target feature

```
df_fake_manual_testing["class"] = 0
df_true_manual_testing["class"] = 1
```

```
<ipython-input-156-3aaf8ec2aad1>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus
  df_fake_manual_testing["class"] = 0
<ipython-input-156-3aaf8ec2aad1>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus
  df_true_manual_testing["class"] = 1
```

```
df_fake_manual_testing.head(10)
```

	title	text	subject	date	class
23471	Seven Iranians freed in the prisoner swap have...	21st Century Wire says This week, the historic...	Middle-east	January 20, 2016	0
23472	#Hashtag Hell & The Fake Left	By Dady Chery and Gilbert MercierAll writers ...	Middle-east	January 19, 2016	0
23473	Astroturfing: Journalist Reveals Brainwashing ...	Vic Bishop Waking TimesOur reality is carefull...	Middle-east	January 19, 2016	0
23474	The New American Century: An Era of Fraud	Paul Craig RobertsIn the last years of the 20t...	Middle-east	January 19, 2016	0
23475	Hillary Clinton: 'Israel First' (and no peace ...	Robert Fantina CounterpunchAlthough the United...	Middle-east	January 18, 2016	0
23476	McPain: John McCain Furious That Iran Treated ...	21st Century Wire says As 21WIRE reported earl...	Middle-east	January 16, 2016	0
23477	JUSTICE? Yahoo Settles E-mail Privacy Class-	21st Century Wire says It s a familiar theme. ...	Middle-	January 16,	0

```
df_true_manual_testing.head(10)
```

	title	text	subject	date	class
21407	Mata Pires, owner of embattled Brazil builder ...	SAO PAULO (Reuters) - Cesar Mata Pires, the ow...	worldnews	August 22, 2017	1
21408	U.S., North Korea clash at U.N. forum over nuc...	GENEVA (Reuters) - North Korea and the United ...	worldnews	August 22, 2017	1
21409	U.S., North Korea clash at U.N. arms forum on ...	GENEVA (Reuters) - North Korea and the United ...	worldnews	August 22, 2017	1
21410	Headless torso could belong to submarine journ...	COPENHAGEN (Reuters) - Danish police said on T...	worldnews	August 22, 2017	1
21411	North Korea shipments to Syria chemical arms a...	UNITED NATIONS (Reuters) - Two North Korean sh...	worldnews	August 21, 2017	1
21412	'Fully committed' NATO backs new U.S. approach...	BRUSSELS (Reuters) - NATO allies on Tuesday we...	worldnews	August 22, 2017	1
21413	LexisNexis withdrew two products from Chinese ...	LONDON (Reuters) - LexisNexis, a provider of l...	worldnews	August 22, 2017	1

Merging True and Fake Dataframes

```
df_manual_testing = pd.concat([df_fake_manual_testing,df_true_manual_testing], axis = 0)
df_manual_testing.to_csv("manual_testing.csv")
```

```
df_merge = pd.concat([df_fake, df_true], axis =0 )
df_merge.head(10)
```

	title	text	subject	date	class
0	Donald Trump Sends Out Embarrassing New Year'...	Donald Trump just couldn t wish all Americans ...	News	December 31, 2017	0
1	Drunk Bragging Trump Staffer Started Russian ...	House Intelligence Committee Chairman Devin Nu...	News	December 31, 2017	0
2	Sheriff David Clarke Becomes An Internet Joke...	On Friday, it was revealed that former Milwauk...	News	December 30, 2017	0
3	Trump Is So Obsessed He Even Has Obama's Name...	On Christmas day, Donald Trump announced that ...	News	December 29, 2017	0
4	Pope Francis Just Called Out Donald Trump Dur...	Pope Francis used his annual Christmas Day mes...	News	December 25, 2017	0
5	Racist Alabama Cops Brutalize Black Boy While...	The number of cases of cops brutalizing and ki...	News	December 25, 2017	0
6	Fresh Off The Golf Course, Trump Lashes Out A...	Donald Trump spent a good portion of his day a...	News	December 23, 2017	0
7	Trump Said Some INSANELY Racist Stuff Inside ...	In the wake of yet another court decision that...	News	December 23, 2017	0
8	Former CIA Director Slams Trump Over UN Bully...	Many people have raised the alarm regarding th...	News	December 22, 2017	0
9	WATCH: Brand-New Pro-Trump Ad Features So Muc...	Just when you might have thought we d get a br...	News	December 21, 2017	0

Next steps: Generate code with df_merge | View recommended plots | New interactive sheet

```
df_merge.columns
```

```
Index(['title', 'text', 'subject', 'date', 'class'], dtype='object')
```

Removing columns which are not required

```
df = df_merge.drop(["title", "subject","date"], axis = 1)
```

```
df.isnull().sum()
```

	0
text	0
class	0

dtype: int64

Random Shuffling the dataframe

```
df = df.sample(frac = 1)
```

```
df.head()
```

	text	class
4608	BRASILIA (Reuters) - Brazilian and U.S. offici...	1
8732	NEW YORK (Reuters) - U.S. presidential hopeful...	1
6654	(Reuters) - The following people are mentioned...	1
5724	NEW YORK (Reuters) - Hundreds of New York City...	1
12938	I wish this was a joke!#BlackLivesMatter prote...	0

Next steps: Generate code with df | View recommended plots | New interactive sheet

```
df.reset_index(inplace = True)
df.drop(["index"], axis = 1, inplace = True)
```

```
df.columns
```

```
Index(['text', 'class'], dtype='object')
```

```
df.head()
```

	text	class
0	BRASILIA (Reuters) - Brazilian and U.S. offici...	1
1	NEW YORK (Reuters) - U.S. presidential hopeful...	1
2	(Reuters) - The following people are mentioned...	1
3	NEW YORK (Reuters) - Hundreds of New York City...	1
4	I wish this was a joke!#BlackLivesMatter prote...	0

Next steps: Generate code with df | View recommended plots | New interactive sheet

Creating a function to process the texts **bold text**

```
def wordopt(text):
    text = text.lower()
    text = re.sub('\[.*?\]', '', text)
    text = re.sub("\\W"," ",text)
    text = re.sub('https?://\S+|www\.\S+', '', text)
    text = re.sub('<.*?>+', '', text)
    text = re.sub('[%s]' % re.escape(string.punctuation), '', text)
    text = re.sub('\n', '', text)
    text = re.sub('\w*\d\w*', '', text)
    return text
```

```
df["text"] = df["text"].apply(wordopt)
```

Defining dependent and independent variables

```
x = df["text"]
y = df["class"]
```

Splitting Training and Testing

```
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.25)
```

Convert text to vectors

```
from sklearn.feature_extraction.text import TfidfVectorizer

vectorization = TfidfVectorizer()
xv_train = vectorization.fit_transform(x_train)
xv_test = vectorization.transform(x_test)
```

Logistic Regression

```
from sklearn.linear_model import LogisticRegression

LR = LogisticRegression()
LR.fit(xv_train,y_train)
```

```
LogisticRegression()
```

```
pred_lr=LR.predict(xv_test)
```

```
LR.score(xv_test, y_test)
```

```
0.9848484848484849
```

```
print(classification_report(y_test, pred_lr))
```

```
              precision    recall  f1-score   support

           0       0.99      0.98      0.99      5876
           1       0.98      0.99      0.98      5344

    accuracy                           0.98     11220
   macro avg       0.98      0.98      0.98     11220
weighted avg       0.98      0.98      0.98     11220
```

Decision Tree Classification

```
from sklearn.tree import DecisionTreeClassifier

DT = DecisionTreeClassifier()
DT.fit(xv_train, y_train)
```

```
DecisionTreeClassifier()
```

```
pred_dt = DT.predict(xv_test)
```

```
DT.score(xv_test, y_test)
```

```
0.9946524064171123
```

```
print(classification_report(y_test, pred_dt))
```

```
              precision    recall  f1-score   support

           0       0.99      1.00      0.99      5876
           1       1.00      0.99      0.99      5344

    accuracy                           0.99     11220
   macro avg       0.99      0.99      0.99     11220
weighted avg       0.99      0.99      0.99     11220
```

Gradient Boosting Classifier

```
from sklearn.ensemble import GradientBoostingClassifier

GBC = GradientBoostingClassifier(random_state=0)
GBC.fit(xv_train, y_train)
```

```
GradientBoostingClassifier(random_state=0)
```

```
pred_gbc = GBC.predict(xv_test)
```

```
GBC.score(xv_test, y_test)
```

```
0.9959893048128342
```

```
print(classification_report(y_test, pred_gbc))
```

```
              precision    recall  f1-score   support

           0       1.00      0.99      1.00      5876
           1       0.99      1.00      1.00      5344

    accuracy                           1.00     11220
   macro avg       1.00      1.00      1.00     11220
weighted avg       1.00      1.00      1.00     11220
```

Random Forest Classifier

```
from sklearn.ensemble import RandomForestClassifier

RFC = RandomForestClassifier(random_state=0)
RFC.fit(xv_train, y_train)
```

```
RandomForestClassifier(random_state=0)
```

```
pred_rfc = RFC.predict(xv_test)
```

```
RFC.score(xv_test, y_test)
```

```
0.988680926916221
```

```
print(classification_report(y_test, pred_rfc))
```

```
              precision    recall  f1-score   support

           0       0.99      0.99      0.99      5876
           1       0.99      0.99      0.99      5344

    accuracy                           0.99     11220
   macro avg       0.99      0.99      0.99     11220
weighted avg       0.99      0.99      0.99     11220
```

Model Testing

```
def output_lable(n):
    if n == 0:
        return "Fake News"
    elif n == 1:
        return "Not A Fake News"

def manual_testing(news):
    testing_news = {"text":[news]}
    new_def_test = pd.DataFrame(testing_news)
    new_def_test["text"] = new_def_test["text"].apply(wordopt)
    new_x_test = new_def_test["text"]
    new_xv_test = vectorization.transform(new_x_test)
    pred_LR = LR.predict(new_xv_test)
    pred_DT = DT.predict(new_xv_test)
    pred_GBC = GBC.predict(new_xv_test)
    pred_RFC = RFC.predict(new_xv_test)

    return print("\n\nLR Prediction: {} \nDT Prediction: {} \nGBC Prediction: {} \nRFC Prediction: {}".format(output_lable(pred_LR[0]),
                                                                                                              output_lable(pred_DT[0]),
                                                                                                              output_lable(pred_GBC[0]),
                                                                                                              output_lable(pred_RFC[0])))


news = str(input())
manual_testing(news)
```

```
"21st Century Wire says This week, the historic international Iranian Nuclear Deal was punctuated by a two-way prisoner swap betweer


    LR Prediction: Fake News
    DT Prediction: Fake News
    GBC Prediction: Fake News
```

```
RFC Prediction: Fake News
```

```
news = str(input())
manual_testing(news)
```

```
"JAKARTA (Reuters) - Indonesia will buy 11 Sukhoi fighter jets worth $1.14 billion from Russia in exchange for cash and Indonesian c
```

```
LR Prediction: Not A Fake News
DT Prediction: Not A Fake News
GBC Prediction: Not A Fake News
RFC Prediction: Not A Fake News
```

```
news = str(input())
manual_testing(news)
```

```
hi this a real news
```

```
LR Prediction: Fake News
DT Prediction: Fake News
GBC Prediction: Fake News
RFC Prediction: Fake News
```

NOW USING LSTM AND NLP

```
import nltk
from wordcloud import WordCloud
```

```
 from tensorflow.keras.preprocessing.text import Tokenizer
 from tensorflow.keras.preprocessing.sequence import pad_sequences
 from tensorflow.keras.models import Sequential
 from sklearn.preprocessing import LabelEncoder
from tensorflow.keras.layers import Embedding, LSTM, Dense, Dropout
from tensorflow.keras.optimizers import Adam
```

```
df_fake.columns
```

```
Index(['title', 'text', 'subject', 'date', 'class'], dtype='object')
```

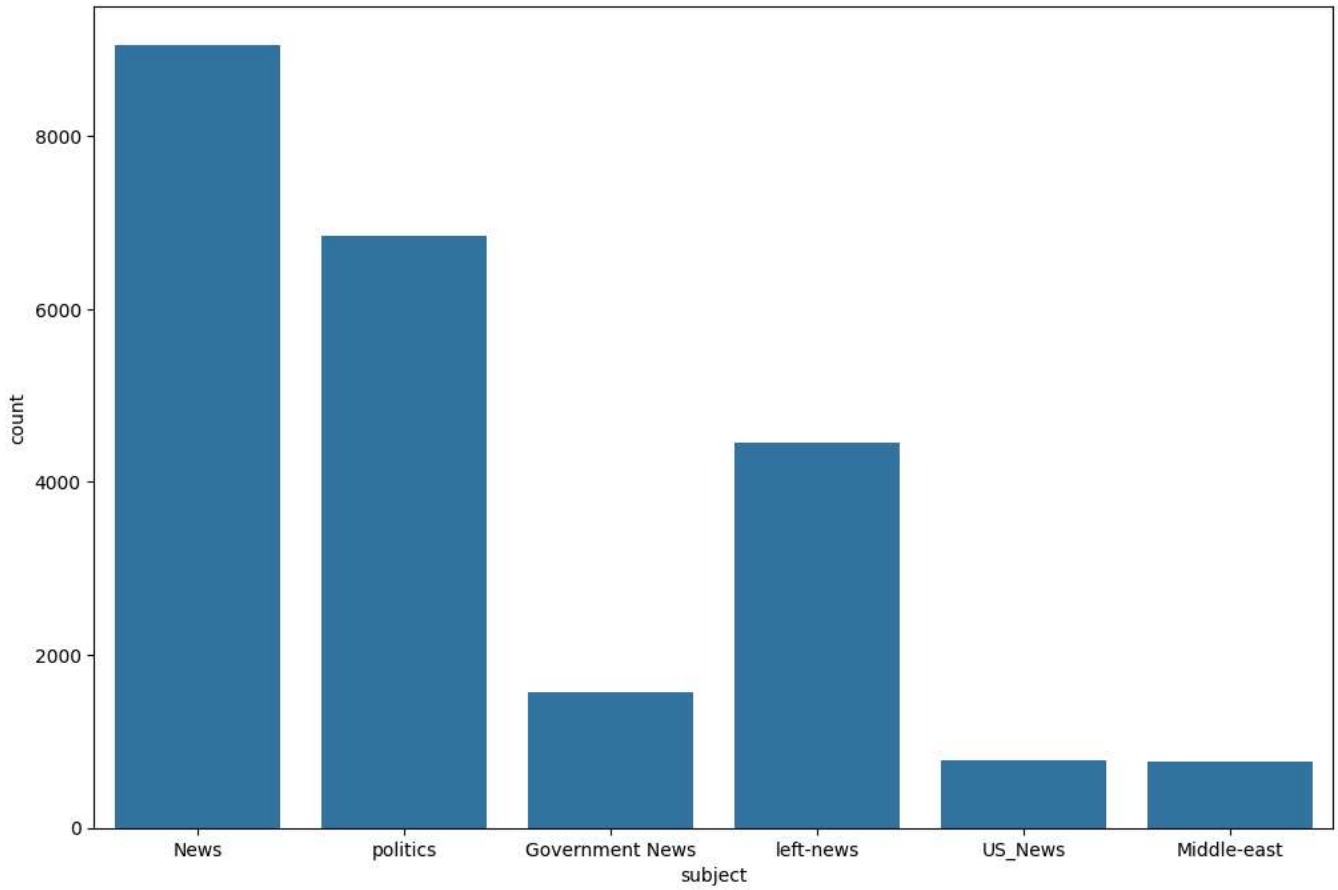
```
df_fake['subject'].value_counts()
```

subject	count
News	9050
politics	6841
left-news	4459
Government News	1570
US_News	783
Middle-east	768

dtype: int64

```
plt.figure(figsize=(12,8))
sns.countplot(x='subject', data=df_fake)
```

<Axes: xlabel='subject', ylabel='count'>

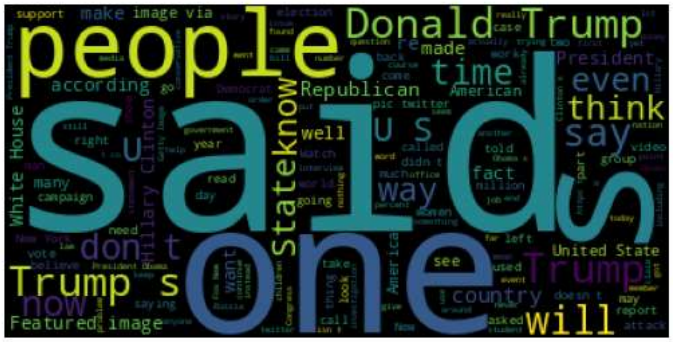


##wordcloud

```
text=" ".join(df_fake['text'].tolist())
```

```
wordcloud=WordCloud().generate(text)
plt.imshow(wordcloud)
plt.axis('off')
```

(-0.5, 399.5, 199.5, -0.5)



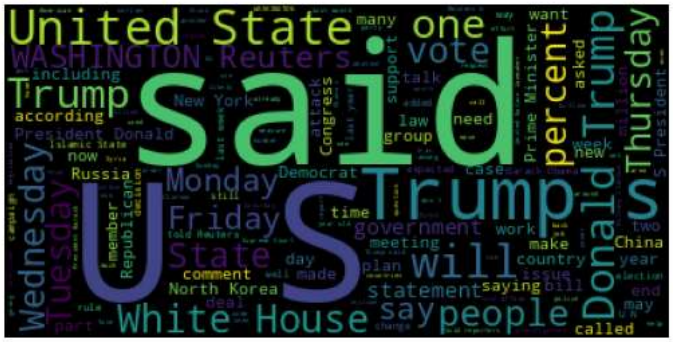

```
df_true.columns
```

Index(['title', 'text', 'subject', 'date', 'class'], dtype='object')

```
text=" ".join(df_true['text'].tolist())
```

```
wordcloud=WordCloud().generate(text)
plt.imshow(wordcloud)
plt.axis('off')
```

(-0.5, 399.5, 199.5, -0.5)




```
df_true.sample(5)
```

	title	text	subject	date	class
14654	Youth leader of Zimbabwe's ruling party apolog...	HARARE (Reuters) - The head of the youth wing ...	worldnews	November 15, 2017	1
8610	Trump draws ire after urging Russia to find 'm...	MIAMI/WASHINGTON (Reuters) - Republican Donald...	politicsNews	July 27, 2016	1
14821	More than 60 killed in air strike on Syrian ma...	BEIRUT (Reuters) - The death toll from air str...	worldnews	November 14, 2017	1
[illegible]	Turkey feels betrayed over EU accession but	[illegible]	[illegible]	September 14,	[illegible]

```
# Concatenate the two datasets
data = pd.concat([df_fake[['text', 'class']], df_true[['text', 'class']]], axis=0)

# Shuffle the data
data = data.sample(frac=1).reset_index(drop=True)


data = data.sample(frac=1).reset_index(drop=True)


# Preprocess the text data
def preprocess_text(text):
    # Remove any unwanted characters, lowercasing, etc. (basic preprocessing)
    text = text.lower()
    return text



data['text'] = data['text'].apply(preprocess_text)


# Split data into training and testing sets
X = data['text']
y = data['class']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=1)


# Tokenization and padding
tokenizer = Tokenizer(num_words=10000)
tokenizer.fit_on_texts(X_train)

X_train_seq = tokenizer.texts_to_sequences(X_train)
X_test_seq = tokenizer.texts_to_sequences(X_test)


# Pad sequences to ensure uniform input size
max_len = 100  # You can adjust this based on your dataset
X_train_pad = pad_sequences(X_train_seq, padding='post', maxlen=max_len)
X_test_pad = pad_sequences(X_test_seq, padding='post', maxlen=max_len)



# Build the LSTM model
model = Sequential()


# Add an embedding layer
model.add(Embedding(input_dim=10000, output_dim=128, input_length=max_len))
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/layers/core/embedding.py:90: UserWarning: Argument `input_length` is deprecated. J
  warnings.warn(
```

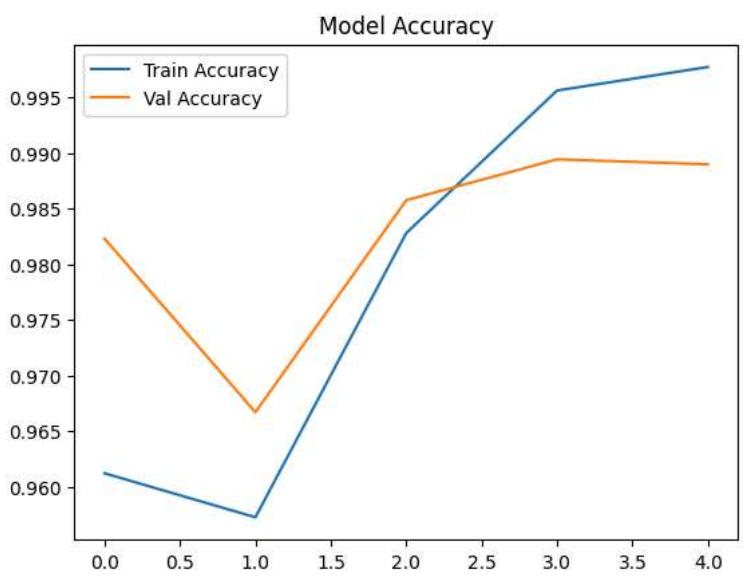
```
# Add an LSTM layer
model.add(LSTM(128, return_sequences=False))

# Add a dropout layer to reduce overfitting
model.add(Dropout(0.5))

# Add a dense layer for classification
model.add(Dense(1, activation='sigmoid'))


# Compile the model
model.compile(optimizer=Adam(), loss='binary_crossentropy', metrics=['accuracy'])


# Train the model
history = model.fit(X_train_pad, y_train, epochs=5, batch_size=64, validation_data=(X_test_pad, y_test))
```

```
Epoch 1/5
561/561 ━━━━━━━━━━━━━━━━━━━━ 206s 361ms/step - accuracy: 0.9206 - loss: 0.2259 - val_accuracy: 0.9823 - val_loss: 0.0596
Epoch 2/5
561/561 ━━━━━━━━━━━━━━━━━━━━ 264s 364ms/step - accuracy: 0.9780 - loss: 0.0720 - val_accuracy: 0.9667 - val_loss: 0.1302
Epoch 3/5
561/561 ━━━━━━━━━━━━━━━━━━━━ 253s 349ms/step - accuracy: 0.9742 - loss: 0.0728 - val_accuracy: 0.9857 - val_loss: 0.0461
Epoch 4/5
561/561 ━━━━━━━━━━━━━━━━━━━━ 165s 283ms/step - accuracy: 0.9951 - loss: 0.0172 - val_accuracy: 0.9894 - val_loss: 0.0376
Epoch 5/5
561/561 ━━━━━━━━━━━━━━━━━━━━ 203s 284ms/step - accuracy: 0.9983 - loss: 0.0068 - val_accuracy: 0.9890 - val_loss: 0.0406
```

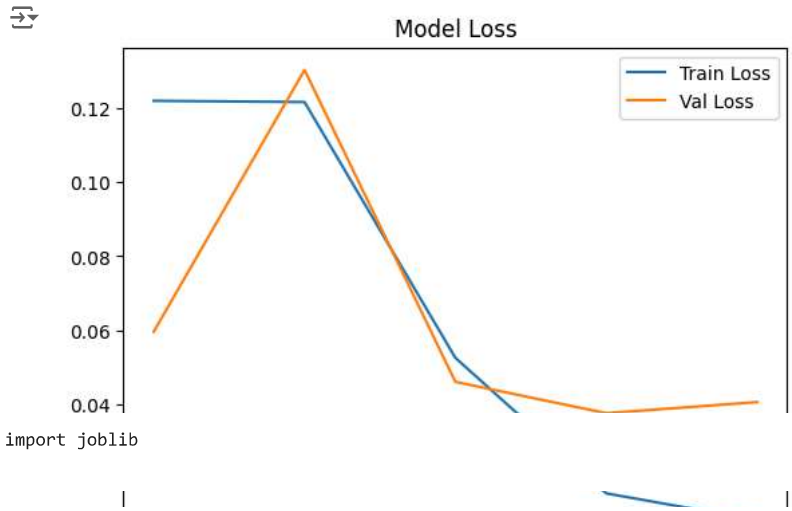
```
# Evaluate the model
test_loss, test_accuracy = model.evaluate(X_test_pad, y_test)
print(f"Test Accuracy: {test_accuracy * 100:.2f}%")
```

```
281/281 ━━━━━━━━━━━━━━━━━━━━ 18s 64ms/step - accuracy: 0.9891 - loss: 0.0391
Test Accuracy: 98.90%
```

```
# Plot training history (accuracy and loss)
plt.plot(history.history['accuracy'], label='Train Accuracy')
plt.plot(history.history['val_accuracy'], label='Val Accuracy')
plt.legend()
plt.title('Model Accuracy')
plt.show()
```




```
plt.plot(history.history['loss'], label='Train Loss')
plt.plot(history.history['val_loss'], label='Val Loss')
plt.legend()
plt.title('Model Loss')
plt.show()
```




```
import joblib
```

```
# Save the trained model and tokenizer
joblib.dump(model, 'fake_news_lstm_model.pkl')
joblib.dump(tokenizer, 'fake_news_tokenizer.pkl')
```

```
['fake_news_tokenizer.pkl']
```

```
# Preprocess the text
def preprocess_text(text):
  return text.lower()  # Convert text to lowercase

data['text'] = data['text'].apply(preprocess_text)
```

```
# Function to predict whether a news article is fake or real
def predict_news(news_text):
    # Preprocess the input text
  news_text = preprocess_text(news_text)
```