FAKE NEWS DETECTION

In [1]:
```
#Libraries to import!
import pandas as pd
import numpy as np
import regex as re
import string
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.ensemble import RandomForestClassifier
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import PassiveAggressiveClassifier
from sklearn import metrics
from sklearn.metrics import accuracy_score
from scipy import stats
```

In [2]:
```
#Reading the data from csv!
df_fnews=pd.read_csv("C:/Users/yuvak/OneDrive/Desktop/code clause/news/news.csv")
```

In [3]:
```
df_fnews.head()
```

Out[3]:

	Unnamed: 0	title	text	label
0	8476	You Can Smell Hillary’s Fear	Daniel Greenfield, a Shillman Journalism Fello...	FAKE
1	10294	Watch The Exact Moment Paul Ryan Committed Pol...	Google Pinterest Digg Linkedin Reddit Stumbleu...	FAKE
2	3608	Kerry to go to Paris in gesture of sympathy	U.S. Secretary of State John F. Kerry said Mon...	REAL
3	10142	Bernie supporters on Twitter erupt in anger ag...	— Kaydee King (@KaydeeKing) November 9, 2016 T...	FAKE
4	875	The Battle of New York: Why This Primary Matters	It's primary day in New York and front-runners...	REAL

In [4]:
```
df_fnews.rename(columns={'Unnamed: 0':'Id'}, inplace=True)
```

In [5]:
```
df_fnews.head()
```

Out[5]:

	Id	title	text	label
0	8476	You Can Smell Hillary’s Fear	Daniel Greenfield, a Shillman Journalism Fello...	FAKE
1	10294	Watch The Exact Moment Paul Ryan Committed Pol...	Google Pinterest Digg Linkedin Reddit Stumbleu...	FAKE
2	3608	Kerry to go to Paris in gesture of sympathy	U.S. Secretary of State John F. Kerry said Mon...	REAL
3	10142	Bernie supporters on Twitter erupt in anger ag...	— Kaydee King (@KaydeeKing) November 9, 2016 T...	FAKE
4	875	The Battle of New York: Why This Primary Matters	It's primary day in New York and front-runners...	REAL

In [6]:
```
df_fnews.describe()
```

Out[6]:

	Id
count	6335.000000
mean	5280.415627
std	3038.503953
min	2.000000
25%	2674.500000
50%	5271.000000
75%	7901.000000
max	10557.000000

In [7]:
```
df_fnews.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6335 entries, 0 to 6334
Data columns (total 4 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   Id      6335 non-null   int64 
 1   title   6335 non-null   object
 2   text    6335 non-null   object
 3   label   6335 non-null   object
dtypes: int64(1), object(3)
memory usage: 198.1+ KB
```

In [8]:
```
df_fnews.shape
```

Out[8]:
```
(6335, 4)
```

In [9]:
```
df_fnews.dtypes
```

Out[9]:
```
Id        int64
title    object
text     object
label    object
dtype: object
```

In [10]:
```
# Drop the unnecessary columns
df_fnews = df_fnews.drop(['Id', 'title'], axis=1)

# Drop the missing values
df_fnews = df_fnews.dropna()
```

In [11]:
```
df_fnews.head()
```

Out[11]:

	text	label
0	Daniel Greenfield, a Shillman Journalism Fello...	FAKE
1	Google Pinterest Digg Linkedin Reddit Stumbleu...	FAKE
2	U.S. Secretary of State John F. Kerry said Mon...	REAL
3	— Kaydee King (@KaydeeKing) November 9, 2016 T...	FAKE
4	It's primary day in New York and front-runners...	REAL

In [12]:
```
#Data cleaning!
df_fnews.isnull()
```

Out[12]:

	text	label
0	False	False
1	False	False
2	False	False
3	False	False
4	False	False
...	...	...
6330	False	False
6331	False	False
6332	False	False
6333	False	False
6334	False	False

6335 rows × 2 columns

In [13]:
```
df_fnews.isnull().sum()
```

Out[13]:
```
text     0
label    0
dtype: int64
```

In [14]:
```
df_fnews.notnull()
```

Out[14]:

	text	label
0	True	True
1	True	True
2	True	True
3	True	True
4	True	True
...	...	...
6330	True	True
6331	True	True
6332	True	True
6333	True	True
6334	True	True

6335 rows × 2 columns

In [15]:
```
# Remove urls!
# Define regular expression patterns
url_pattern = r"http\S+|www\S+"
mention_pattern = r"@\w+"
```

```
hashtag_pattern = r"#\w+"

# Apply regular expression substitutions to the Text column
df_fnews["text"] = df_fnews["text"].str.replace(url_pattern, "", regex=True)
df_fnews["text"] = df_fnews["text"].str.replace(mention_pattern, "", regex=True)
df_fnews["text"] = df_fnews["text"].str.replace(hashtag_pattern, "", regex=True)
```

In [16]:
```
df_fnews.head()
```

Out[16]:

	text	label
0	Daniel Greenfield, a Shillman Journalism Fello...	FAKE
1	Google Pinterest Digg Linkedin Reddit Stumbleu...	FAKE
2	U.S. Secretary of State John F. Kerry said Mon...	REAL
3	— Kaydee King () November 9, 2016 The lesson f...	FAKE
4	It's primary day in New York and front-runners...	REAL

In [17]:
```
# Define regular expression pattern to match all punctuation
punct_pattern = r"[{}]".format(string.punctuation)

# Apply regular expression substitution to the Text column
df_fnews["text"] = df_fnews["text"].str.replace(punct_pattern, "", regex=True)
```

In [18]:
```
# Split the dataset into train and test sets
X_train, X_test, y_train, y_test = train_test_split(df_fnews['text'], df_fnews['labe
```

In [19]:
```
# Initialize the TF-IDF vectorizer
tfidf_vectorizer = TfidfVectorizer(stop_words='english', max_df=0.7)
```

In [20]:
```
# Fit and transform the training set
tfidf_train = tfidf_vectorizer.fit_transform(X_train)
```

In [21]:
```
# Transform the test set
tfidf_test = tfidf_vectorizer.transform(X_test)
```

In [22]:
```
# Initialize the Passive Aggressive Classifier
pac = PassiveAggressiveClassifier(max_iter=50)
```

In [23]:
```
# Fit the model on the training set
pac.fit(tfidf_train, y_train)
```

Out[23]:
```
▾     PassiveAggressiveClassifier
PassiveAggressiveClassifier(max_iter=50)
```

In [24]:
```
# predict the labels of the test set
y_pred = pac.predict(tfidf_test)
```

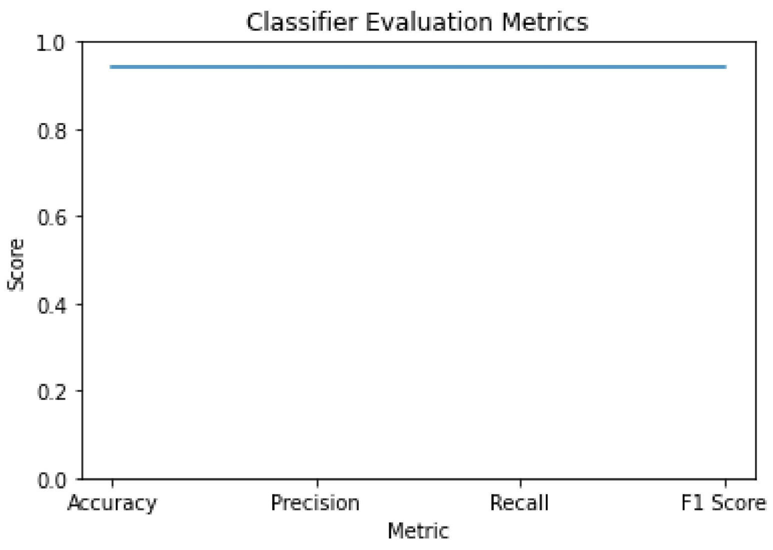
In [25]:
```
# calculate the accuracy score
accuracy = accuracy_score(y_test, y_pred)
```

In [26]:
```
# Calculate the accuracy, precision, recall, and f1 score of the classifier
accuracy = metrics.accuracy_score(y_test, y_pred)
precision = metrics.precision_score(y_test, y_pred, average='weighted')
recall = metrics.recall_score(y_test, y_pred, average='weighted')
f1_score = metrics.f1_score(y_test, y_pred, average='weighted')
```

```
# Print the evaluation metrics
print('Accuracy:', accuracy)
print('Precision:', precision)
print('Recall:', recall)
print('F1 Score:', f1_score)
```

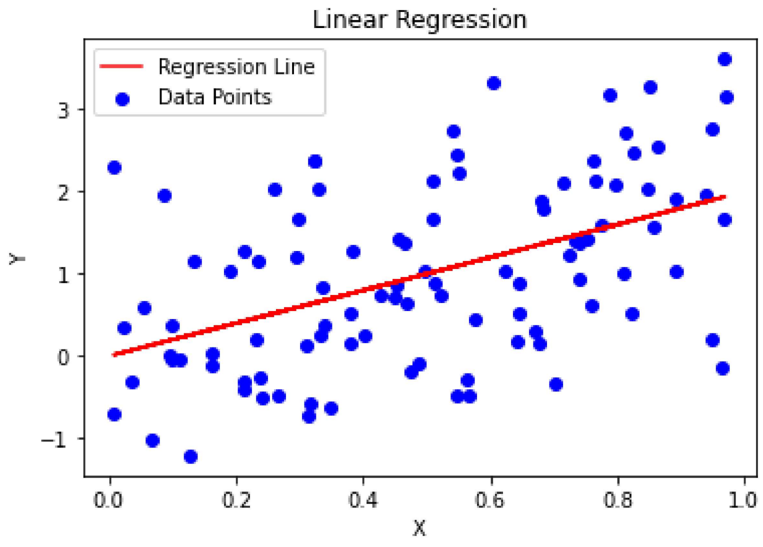
```
Accuracy: 0.9408050513022889
Precision: 0.9408053384654504
Recall: 0.9408050513022889
F1 Score: 0.9408046087632135
```

In [27]:
```
# Create a DataFrame to store the metrics
metrics_df = pd.DataFrame({
    'Metric': ['Accuracy', 'Precision', 'Recall', 'F1 Score'],
    'Score': [accuracy, precision, recall, f1_score]
})

# Plot the evaluation metrics
sns.lineplot(x='Metric', y='Score', data=metrics_df, palette='Blues')
plt.ylim([0, 1])  # Set the y-axis limits to ensure proper visualization of scores
plt.title('Classifier Evaluation Metrics')
plt.xlabel('Metric')
plt.ylabel('Score')
plt.show()
```

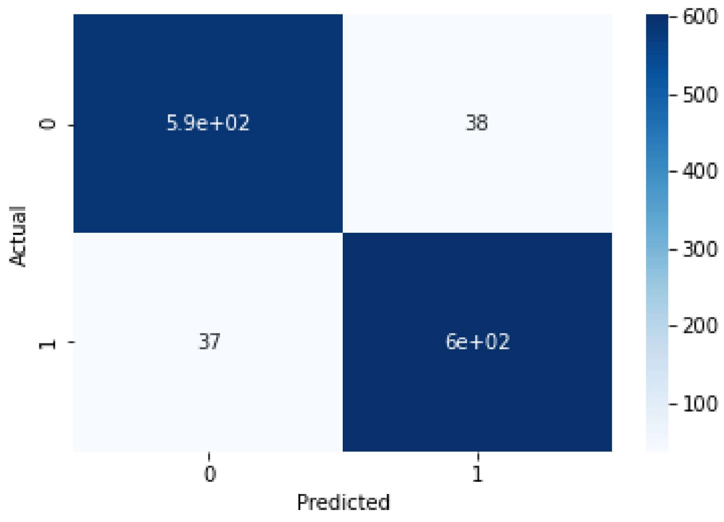


In [28]:
```
# Generate some random data
x = np.random.rand(100)
y = 2 * x + np.random.randn(100)  # Linear relationship with noise

# Perform linear regression
slope, intercept, r_value, p_value, std_err = stats.linregress(x, y)

# Print the results
print(f'Slope: {slope:.2f}')
print(f'Intercept: {intercept:.2f}')
print(f'R-squared: {r_value**2:.2f}')

# Plot the scatter points and regression line
plt.scatter(x, y, color='blue', label='Data Points')
plt.plot(x, intercept + slope * x, color='red', label='Regression Line')

plt.xlabel('X')
plt.ylabel('Y')
plt.title('Linear Regression')
plt.legend()
plt.show()
```

```
Slope: 2.00
Intercept: -0.00
R-squared: 0.24
```



In [29]:
```
# Create a confusion matrix
confusion_matrix = metrics.confusion_matrix(y_test, y_pred)

# Visualize the confusion matrix using a heatmap
sns.heatmap(confusion_matrix, annot=True, cmap='Blues')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.show()
```

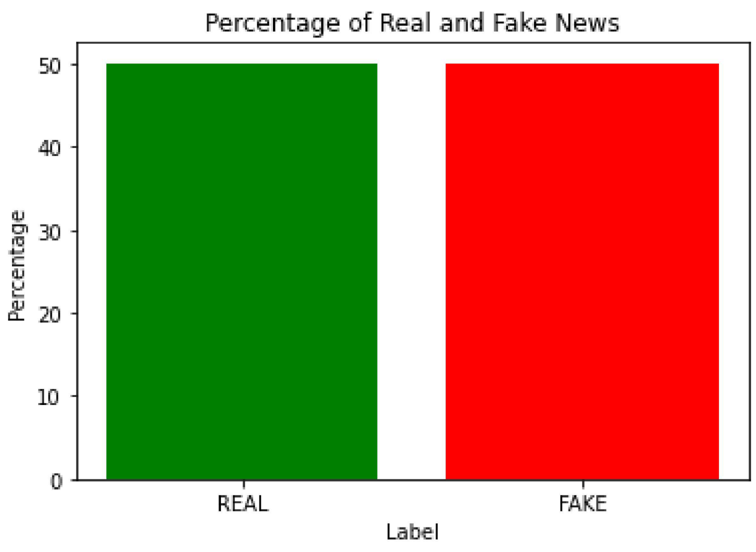


In [30]:
```
# Assume df_fnews is your DataFrame containing the news articles
total_count = len(df_fnews)
real_count = len(df_fnews[df_fnews['label'] == 'REAL'])
fake_count = len(df_fnews[df_fnews['label'] == 'FAKE'])

percent_real = (real_count / total_count) * 100
percent_fake = (fake_count / total_count) * 100

# Create a new DataFrame with the percentages
percentages = pd.DataFrame({
    'Label': ['REAL', 'FAKE'],
    'Percentage': [percent_real, percent_fake]
})
```

```
# Display the percentages
print(percentages)
```

```
  Label  Percentage
0  REAL   50.055249
1  FAKE   49.944751
```

In [31]:
```
# Assume df_fnews is your DataFrame containing the news articles
total_count = len(df_fnews)
real_count = len(df_fnews[df_fnews['label'] == 'REAL'])
fake_count = len(df_fnews[df_fnews['label'] == 'FAKE'])

percent_real = (real_count / total_count) * 100
percent_fake = (fake_count / total_count) * 100

# Create a new DataFrame with the percentages
percentages = pd.DataFrame({
    'Label': ['REAL', 'FAKE'],
    'Percentage': [percent_real, percent_fake]
})

# Define the colors for real and fake bars
colors = ['green', 'red']

# Plot the percentages with colors
plt.bar(percentages['Label'], percentages['Percentage'], color=colors)
plt.xlabel('Label')
plt.ylabel('Percentage')
plt.title('Percentage of Real and Fake News')
plt.show()
```



In [32]:
```
# Split data into input features and target variable
X = df_fnews['text']
y = df_fnews['label']

# Convert text data to numerical features using TF-IDF vectorization
tfidf = TfidfVectorizer(stop_words='english')
X_tfidf = tfidf.fit_transform(X)

# Split data into training and test sets
X_train, X_test, y_train, y_test = train_test_split(X_tfidf, y, test_size=0.2, rando

# Instantiate Random Forest classifier with 100 trees
rfc = RandomForestClassifier(n_estimators=100, random_state=42)

# Fit the model on the training data
```

```python
rfc.fit(X_train, y_train)

# Make predictions on the test data
y_pred = rfc.predict(X_test)

# Calculate accuracy
accuracy = accuracy_score(y_test, y_pred)
print('Accuracy:', accuracy)
```

```
Accuracy: 0.9194948697711128
```

In [33]:

```python
#Building the model using Support Vector Machine (SVM)

from sklearn.svm import SVC

svc_model = SVC()
svc_model.fit(X_train, y_train)

#Predict
svc_pred = svc_model.predict(X_test)

#Accuracy score for SVM
from sklearn import metrics

print("Accuracy Score =", format(metrics.accuracy_score(y_test, svc_pred)))
```

```
Accuracy Score = 0.9344909234411997
```

In [34]:

```python
from sklearn.linear_model import LogisticRegression
# Train the logistic regression model
model = LogisticRegression()
model.fit(X_train, y_train)

# Make predictions on the test set
predictions = model.predict(X_test)

# Evaluate the model
accuracy = accuracy_score(y_test, predictions)
print("Accuracy:", accuracy)
```

```
Accuracy: 0.9187056037884768
```

In [35]:

```python
from sklearn.ensemble import GradientBoostingClassifier
# Train the gradient boosting model
model = GradientBoostingClassifier()
model.fit(X_train, y_train)

# Make predictions on the test set
predictions = model.predict(X_test)

# Evaluate the model
accuracy = accuracy_score(y_test, predictions)
print("Accuracy:", accuracy)
```

```
Accuracy: 0.8973954222573007
```

In [36]:

```python
# Initialize the models
rfc = RandomForestClassifier(n_estimators=100, random_state=42)
svc = SVC()
lr = LogisticRegression()
gbc = GradientBoostingClassifier()

# Fit and evaluate the models
models = [rfc, svc, lr, gbc]
accuracies = []
```

```python
for model in models:
    model.fit(X_train, y_train)
    y_pred = model.predict(X_test)
    accuracy = accuracy_score(y_test, y_pred)
    accuracies.append(accuracy)

# Find the model with the highest accuracy
max_accuracy = max(accuracies)
best_model = models[accuracies.index(max_accuracy)]

# Print the results
print("Model accuracies:", accuracies)
print("Best model accuracy:", max_accuracy)
print("Best model:", best_model)
```

```
Model accuracies: [0.9194948697711128, 0.9344909234411997, 0.9187056037884768, 0.897
3954222573007]
Best model accuracy: 0.9344909234411997
Best model: SVC()
```

In [ ]: