Breast Cancer Classification Model

INTRODUCTION¶

Using the Breast Cancer Wisconsin Diagnostic Dataset, we assess the efficacy of several classification algorithms for breast cancer prediction in this article. The best model for classifying breast cancer will be determined by comparing the accuracy and other assessment criteria of several classifiers.

DATASET

Breast mass photos and the related diagnosis (Malignant or Benign) are used to construct features in the Breast Cancer Wisconsin Diagnostic Dataset. 80% of the data were utilised for training and 20% for testing after dividing the dataset into training and testing sets.

In [ ]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

Loading the Dataset

In [2]:

```
da=pd.read_csv("brca.csv")
```

In [3]:

```
da
```

Out[3]:

	Unnamed: 0	x.radius_mean	x.texture_mean	x.perimeter_mean	x.area_mean	x.smoothness_mean	x.compactness_mean	x.concavity_mean	x.con
0	1	13.540	14.36	87.46	566.3	0.09779	0.08129	0.06664	
1	2	13.080	15.71	85.63	520.0	0.10750	0.12700	0.04568	
2	3	9.504	12.44	60.34	273.9	0.10240	0.06492	0.02956	
3	4	13.030	18.42	82.61	523.8	0.08983	0.03766	0.02562	
4	5	8.196	16.84	51.71	201.9	0.08600	0.05943	0.01588	
...	...	...	...	...	...	...	...	...	
564	565	20.920	25.09	143.00	1347.0	0.10990	0.22360	0.31740	
565	566	21.560	22.39	142.00	1479.0	0.11100	0.11590	0.24390	
566	567	20.130	28.25	131.20	1261.0	0.09780	0.10340	0.14400	
567	568	16.600	28.08	108.30	858.1	0.08455	0.10230	0.09251	
568	569	20.600	29.33	140.10	1265.0	0.11780	0.27700	0.35140	

569 rows × 32 columns

Data Preprocessing

In [4]:

```
# Check for missing values
da.isnull().sum()
```

Out[4]:

```
Unnamed: 0             0
x.radius_mean          0
x.texture_mean         0
x.perimeter_mean       0
x.area_mean            0
x.smoothness_mean      0
x.compactness_mean     0
x.concavity_mean       0
x.concave_pts_mean     0
x.symmetry_mean        0
x.fractal_dim_mean     0
x.radius_se            0
x.texture_se           0
x.perimeter_se         0
x.area_se              0
x.smoothness_se        0
x.compactness_se       0
x.concavity_se         0
x.concave_pts_se       0
x.symmetry_se          0
x.fractal_dim_se       0
x.radius_worst         0
x.texture_worst        0
x.perimeter_worst      0
x.area_worst           0
x.smoothness_worst     0
x.compactness_worst    0
x.concavity_worst      0
x.concave_pts_worst    0
x.symmetry_worst       0
x.fractal_dim_worst    0
y                      0
dtype: int64
```

In [6]:

```
da = da.dropna()

```

In [7]:

```
X = da.drop('y', axis=1)
y = da['y']
```

In [9]:

```
from sklearn.preprocessing import LabelEncoder, StandardScaler
label_encoder = LabelEncoder()
y = label_encoder.fit_transform(y)
```

Splitting the Data

In [10]:

```
from sklearn.model_selection import train_test_split
```

In [12]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=50)
```

Feature Scaling

In [20]:

```
# Scale the features using StandardScaler
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)
```

Model Selection and Evaluation

In [ ]:

```

```

In [15]:

```python
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier, GradientBoostingClassifier, AdaBoostClassifier, ExtraTreesClassifier
from sklearn.svm import SVC
from sklearn.neighbors import KNeighborsClassifier

```

In [21]:

```python
classifiers = [
    LogisticRegression(),
    RandomForestClassifier(),
    GradientBoostingClassifier(),
    SVC(),
    KNeighborsClassifier()]
```

In [23]:

```python
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, roc_auc_score

```

In [24]:

```python
# List to store model performance
model_names = []
performance = []

# Train and evaluate each classifier
for classifier in classifiers:
    # Train the model
    classifier.fit(X_train_scaled, y_train)

    # Make predictions on the testing set
    predictions = classifier.predict(X_test_scaled)

    # Calculate evaluation metrics
    accuracy = accuracy_score(y_test, predictions)
    precision = precision_score(y_test, predictions)
    recall = recall_score(y_test, predictions)
    f1 = f1_score(y_test, predictions)
    roc_auc = roc_auc_score(y_test, predictions)

    # Store model performance
    model_names.append(classifier.__class__.__name__)
    performance.append([accuracy, precision, recall, f1, roc_auc])
```

```
C:\Users\Harshith\anaconda03\lib\site-packages\sklearn\neighbors\_classification.py:228: FutureWarning: Unlike other r
eduction functions (e.g. `skew`, `kurtosis`), the default behavior of `mode` typically preserves the axis it acts alon
g. In SciPy 1.11.0, this behavior will change: the default value of `keepdims` will become False, the `axis` over whic
h the statistic is taken will be eliminated, and the value None will no longer be accepted. Set `keepdims` to True or
False to avoid this warning.
  mode, _ = stats.mode(_y[neigh_ind, k], axis=1)
```

Model Performance Comparison

In [27]:

```python
performance_df = pd.DataFrame(performance, columns=['Accuracy', 'Precision', 'Recall', 'F1-Score', 'ROC AUC'], index=model_names
```

In [36]:

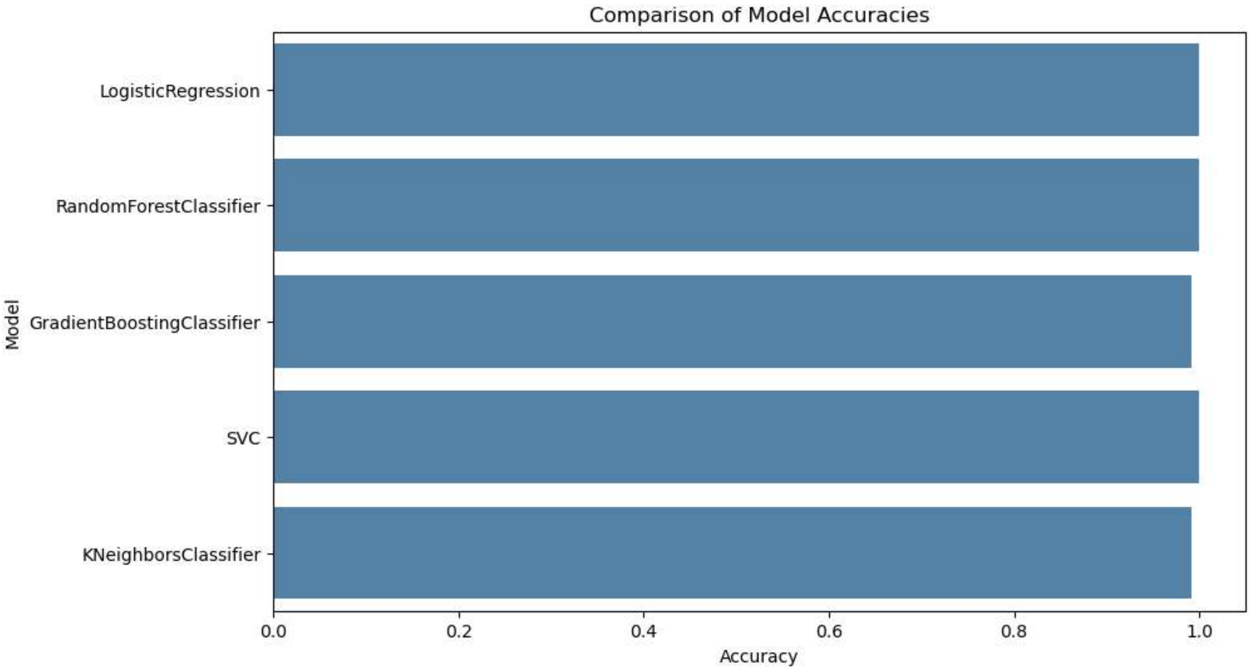
```python
from tabulate import tabulate

print(f'\nResult\n')
print(tabulate(performance_df, headers='keys', tablefmt='psql'))
print()

```

Result

	Accuracy	Precision	Recall	F1-Score	ROC AUC
LogisticRegression	1	1	1	1	1
RandomForestClassifier	1	1	1	1	1
GradientBoostingClassifier	0.991228	0.979167	1	0.989474	0.992537
SVC	1	1	1	1	1
KNeighborsClassifier	0.991228	1	0.978723	0.989247	0.989362
KNeighborsClassifier	0.991228	1	0.978723	0.989247	0.989362

In [39]:

```python
plt.figure(figsize=(10, 6))
sns.barplot(x=performance_df['Accuracy'], y=performance_df.index, color='steelblue')
plt.xlabel('Accuracy')
plt.ylabel('Model')
plt.title('Comparison of Model Accuracies')
plt.show()
```



In [ ]:

```python

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