Tutorial No. 4

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Code

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_diabetes
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix, roc_curve, auc
```

[2]:
```
diabetes = load_diabetes()
X, y = diabetes.data, diabetes.target
y_binary = (y > np.median(y)).astype(int)
```

[3]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y_binary, test_size=0.2, random_state=42)
```

[4]:
```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

[5]:
```
model = LogisticRegression()
model.fit(X_train, y_train)
```

[5]:
```
▾ LogisticRegression
LogisticRegression()
```

[6]:
```
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy: {:.2f}%".format(accuracy * 100))
```

```
Accuracy: 73.03%
```

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Code

[6]:
```
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy: {:.2f}%".format(accuracy * 100))
```

```
Accuracy: 73.03%
```

[7]:
```
print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("\nClassification Report:\n", classification_report(y_test, y_pred))
```

```
Confusion Matrix:
 [[36 13]
 [11 29]]

Classification Report:
              precision    recall  f1-score   support

           0       0.77      0.73      0.75        49
           1       0.69      0.72      0.71        40

    accuracy                           0.73        89
   macro avg       0.73      0.73      0.73        89
weighted avg       0.73      0.73      0.73        89
```

[8]:
```
plt.figure(figsize=(8, 6))
sns.scatterplot(x=X_test[:, 2], y=X_test[:, 8], hue=y_test, palette={0:'blue', 1:'red'}, marker='o')
plt.xlabel("BMI")
plt.ylabel("Age")
plt.title("Logistic Regression Decision Boundary\nAccuracy: {:.2f}%".format(accuracy * 100))
plt.legend(title="Diabetes", loc="upper right")
plt.show()
```

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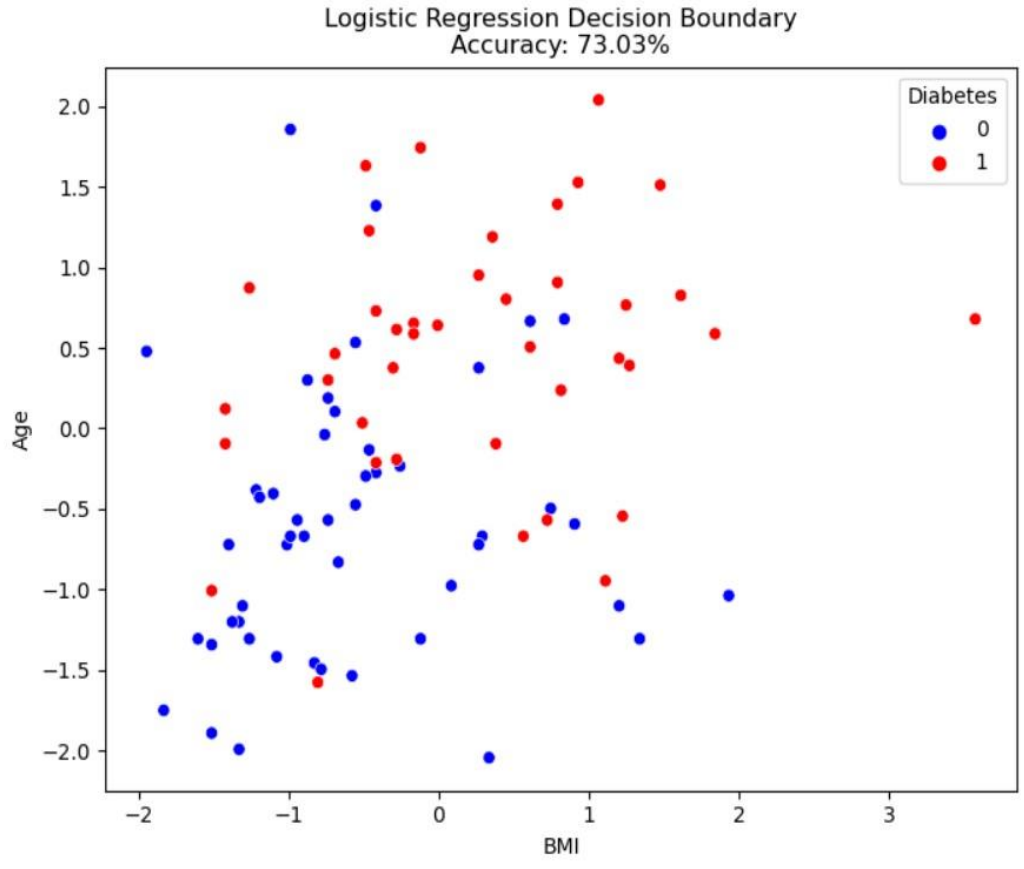
Code

```
plt.ylabel("Age")
plt.title("Logistic Regression Decision Boundary\nAccuracy: {:.2f}%".format(accuracy * 100))
plt.legend(title="Diabetes", loc="upper right")
plt.show()
```



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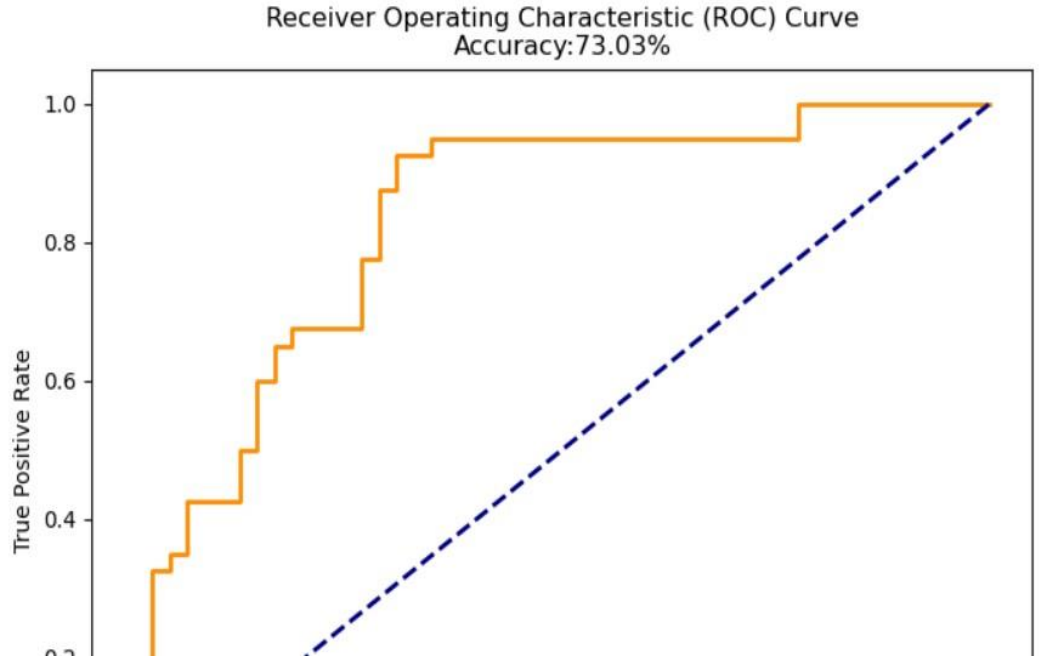
Code

[9]:
```
y_prob = model.predict_proba(X_test)[:, 1]
fpr, tpr, thresholds = roc_curve(y_test, y_prob)
roc_auc = auc(fpr, tpr)
plt.figure(figsize=(8, 6))
plt.plot(fpr, tpr, color='darkorange', lw=2,label='ROC Curve (AUC = {roc_auc:.2f})')
plt.plot([0, 1], [0, 1], color='navy', lw=2, linestyle='--', label='Random')
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver Operating Characteristic (ROC) Curve\nAccuracy:{:.2f}%'.format(accuracy * 100))
```

[9]:
```
Text(0.5, 1.0, 'Receiver Operating Characteristic (ROC) Curve\nAccuracy:73.03%')
```



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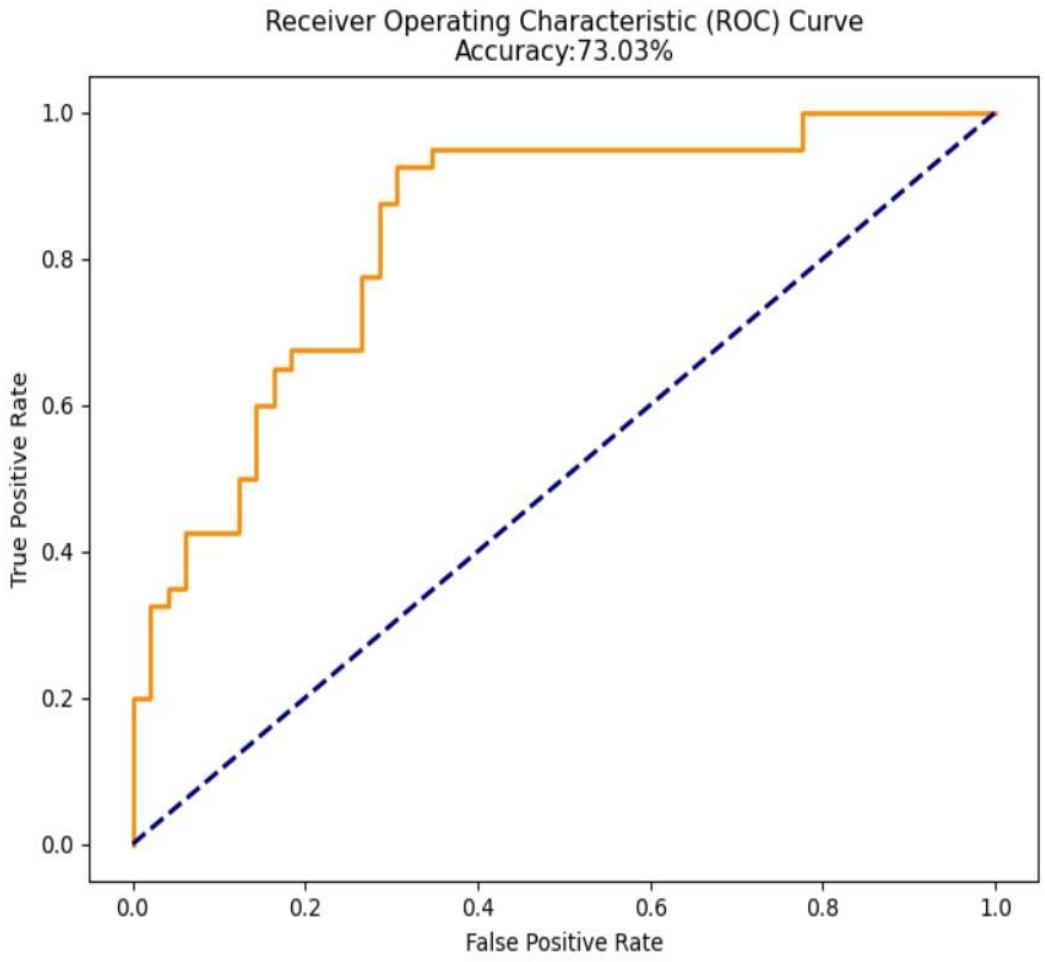
Code

[9]: `Text(0.5, 1.0, 'Receiver Operating Characteristic (ROC) Curve\nAccuracy:73.03%')`



[ ]: