A PYTHON PROGRAM TO IMPLEMENT DECISION TREE

Name: JAYASREE D
Roll no : 241801100
Exp no: 7

Code:

```
from sklearn.datasets import load_iris
import numpy as np
import matplotlib.pyplot as plt
from sklearn.tree import DecisionTreeClassifier, plot_tree

# Load dataset
iris = load_iris()

# Parameters
n_classes = 3
plot_colors = "ryb"
plot_step = 0.02

# Plot decision boundaries for all feature pairs plt.figure(figsize=(15, 10))
for pairidx, pair in enumerate([[0, 1], [0, 2], [0, 3],
                    [1, 2], [1, 3], [2, 3]]):
# Select the two features
X = iris.data[:, pair]
y = iris.target

# Train the decision tree
clf = DecisionTreeClassifier().fit(X, y)

# Plot decision boundary
plt.subplot(2, 3, pairidx + 1)
x_min, x_max = X[:, 0].min() - 1, X[:, 0].max() + 1
y_min, y_max = X[:, 1].min() - 1, X[:, 1].max() + 1
xx, yy = np.meshgrid(
    np.arange(x_min, x_max, plot_step),
    np.arange(y_min, y_max, plot_step)
)

plt.tight_layout(h_pad=0.5, w_pad=0.5, pad=2.5)
Z = clf.predict(np.c_[xx.ravel(), yy.ravel()])
Z = Z.reshape(xx.shape)
plt.contourf(xx, yy, Z, cmap=plt.cm.RdYlBu)
```

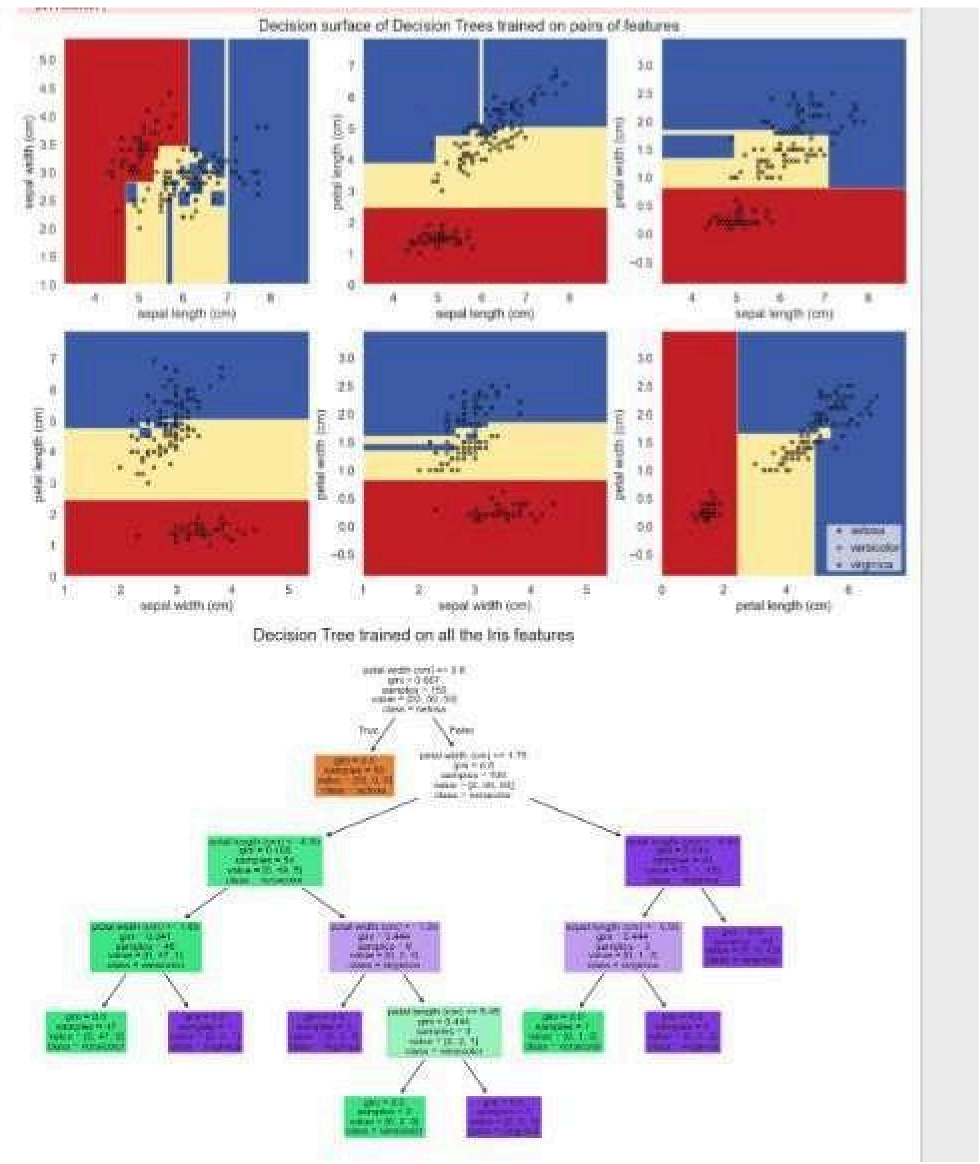
```
    # Label axes
    plt.xlabel(iris.feature_names[pair[0]])
    plt.ylabel(iris.feature_names[pair[1]])

    # Plot the training points
    for i, color in zip(range(n_classes), plot_colors):
        idx = np.where(y == i)
        plt.scatter(
            X[idx, 0],
            X[idx, 1],
            c=color,
            label=iris.target_names[i],
            cmap=plt.cm.RdYlBu,
            edgecolor="black",
            s=15
        )

plt.suptitle("Decision surface of Decision Trees trained on pairs of features")
plt.legend(loc="lower right", borderpad=0, handletextpad=0)
plt.axis("tight")
plt.show()
```

```
# Plot full decision tree using all features
plt.figure(figsize=(12, 8))
clf = DecisionTreeClassifier().fit(iris.data, iris.target)
plot_tree(clf, filled=True, feature_names=iris.feature_names, class_names=iris.target_names)
plt.title("Decision Tree trained on all the Iris features")
plt.show()
```

output:


Decision surface of Decision Trees trained on pairs of features
sepal width (cm)
sepal length (cm)
petal length (cm)
sepal length (cm)
petal width (cm)
sepal length (cm)
petal length (cm)
sepal width (cm)
petal width (cm)
sepal width (cm)
petal width (cm)
petal length (cm)
setosa
versicolor
virginica
Decision Tree trained on all the Iris features
petal width (cm) <= 0.8
gini = 0.667
samples = 150
value = [50, 50, 50]
class = setosa
True
False
petal width (cm) <= 1.75
gini = 0.5
samples = 100
value = [0, 50, 50]
class = versicolor
petal length (cm) <= 4.95
gini = 0.168
samples = 54
value = [0, 49, 5]
class = versicolor
petal width (cm) <= 1.65
gini = 0.041
samples = 48
value = [0, 47, 1]
class = versicolor
petal width (cm) <= 1.55
gini = 0.444
samples = 6
value = [0, 2, 4]
class = virginica
sepal length (cm) <= 5.95
gini = 0.444
samples = 3
value = [0, 1, 2]
class = virginica
gini = 0.0
samples = 47
value = [0, 47, 0]
class = versicolor
petal length (cm) <= 5.45
gini = 0.444
samples = 3
value = [0, 2, 1]
class = versicolor
gini = 0.0
samples = 1
value = [0, 1, 0]
class = versicolor
gini = 0.0
samples = 2
value = [0, 2, 0]
class = versicolor