## A PYTHON PROGRAM TO IMPLEMENT DECISION TREE

**Ex.No.:** 7

Date: 04/10/24

#### AIM:-

To implement a decision tree using a python program for the given dataset and plot the trained decision tree.

#### **ALGORITHM:-**

Step1: Import the iris dataset from the "sklearn.datasets" library.

Step2: Import all the other necessary libraries(numpy as np, matplotlib.pyplot as plt and DecisionTreeClassifier from sklearn.tree).

Step3: Declare and initialize the parameters(n\_classes = 3,plot\_colors = "ryb" and plot\_step = 0.02)

Step4: Loop through the list of features and assign "X" with all the pairs in the list and "Y" with the target list.

Step5: Train the model and assign it to a variable name "clt".

Step6: Use the "pairidx" variable to plot the graph.

Step7: Assign "x\_min", "x\_max", "y\_min" and "y\_max" variables with the respective values from the list.

Step8: Assign the variables "X" and "Y" the values obtained by using the "meshgrid()" function on arranged x\_min,x\_max and y\_min,y\_max.

Step9: Plot the graph using the "tight\_layout" function and the following parameters(h\_pad=0.5, w pad=0.5, pad=2.5).

Step10: Assign the prediction using the variables "xx" and "yy" and then reshape Z to the shape of "xx".

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Step11: Plot the graphs using "xx", "yy" and "Z" as the parameters and with the "RdYlBu"(red,yellow and blue) color scheme.

Step12: Plot all the x label and y label feature pairs.

Step13: Plot all the training points with "RdYlBu" color scheme, black color to represent the points and with size equal to 15.

Step14: Plot the final decision tree with the title "Decision tree trained on all the iris

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features". IMPLEMENTATION:-
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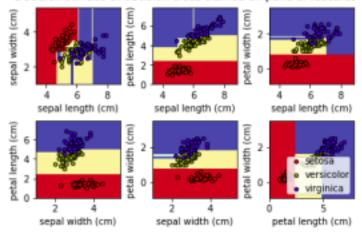
```
from sklearn.datasets import load iris
iris = load iris()
import numpy as np
import matplotlib.pyplot as plt
from sklearn.tree import DecisionTreeClassifier
# Parameters
n classes = 3
plot colors = "ryb"
plot step = 0.02
for pairidx, pair in enumerate([[0, 1], [0, 2], [0, 3], [1, 2], [1, 3], [2, 3]]):
  # We only take the two corresponding features
  X = iris.data[:, pair]
  y = iris.target
  # Train
  clf = DecisionTreeClassifier().fit(X, y)
  # Plot the decision boundary
  plt.subplot(2, 3, pairidx + 1)
  x \min_{x} \max = X[:, 0].\min() - 1, X[:, 0].\max() + 1
  y \min_{x \in X} y \max_{x \in X} = X[:, 1].\min() - 1, X[:, 1].\max() + 1
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xx, yy = np.meshgrid(
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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)
  cs = plt.contourf(xx, yy, Z, cmap=plt.cm.RdYlBu)
  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")
```

## Decision surface of decision trees trained on pairs of features

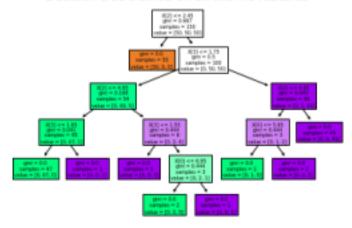


from sklearn.tree import plot tree

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plt.figure()
clf = DecisionTreeClassifier().fit(iris.data,iris.target)
plot\_tree(clf, filled=True)
plt.title("Decision tree trained on all the iris features")
plt.show()

## Decision tree trained on all the iris features



# **RESULT:-**

Thus the python program to implement Decision Tree for the given dataset has been successfully implemented and the results have been verified and analyzed.