```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
from sklearn.tree import DecisionTreeClassifier, plot_tree
from itertools import combinations
from sklearn.preprocessing import LabelEncoder
```

```
file_path='/content/drive/MyDrive/MACHINE LEARNING/IRIS.csv'
```

```
df = pd.read_csv(file_path)
```

```
print("First five rows of the dataset:")
print(df.head())
```

```
First five rows of the dataset:
   sepal_length  sepal_width  petal_length  petal_width      species
0           5.1          3.5           1.4          0.2  Iris-setosa
1           4.9          3.0           1.4          0.2  Iris-setosa
2           4.7          3.2           1.3          0.2  Iris-setosa
3           4.6          3.1           1.5          0.2  Iris-setosa
4           5.0          3.6           1.4          0.2  Iris-setosa
```

```
X = df.iloc[:, :-1].values
y = df.iloc[:, -1].values
```

```
label_encoder = LabelEncoder()
y = label_encoder.fit_transform(y)
feature_names = df.columns[:-1]
target_names = label_encoder.classes_
```

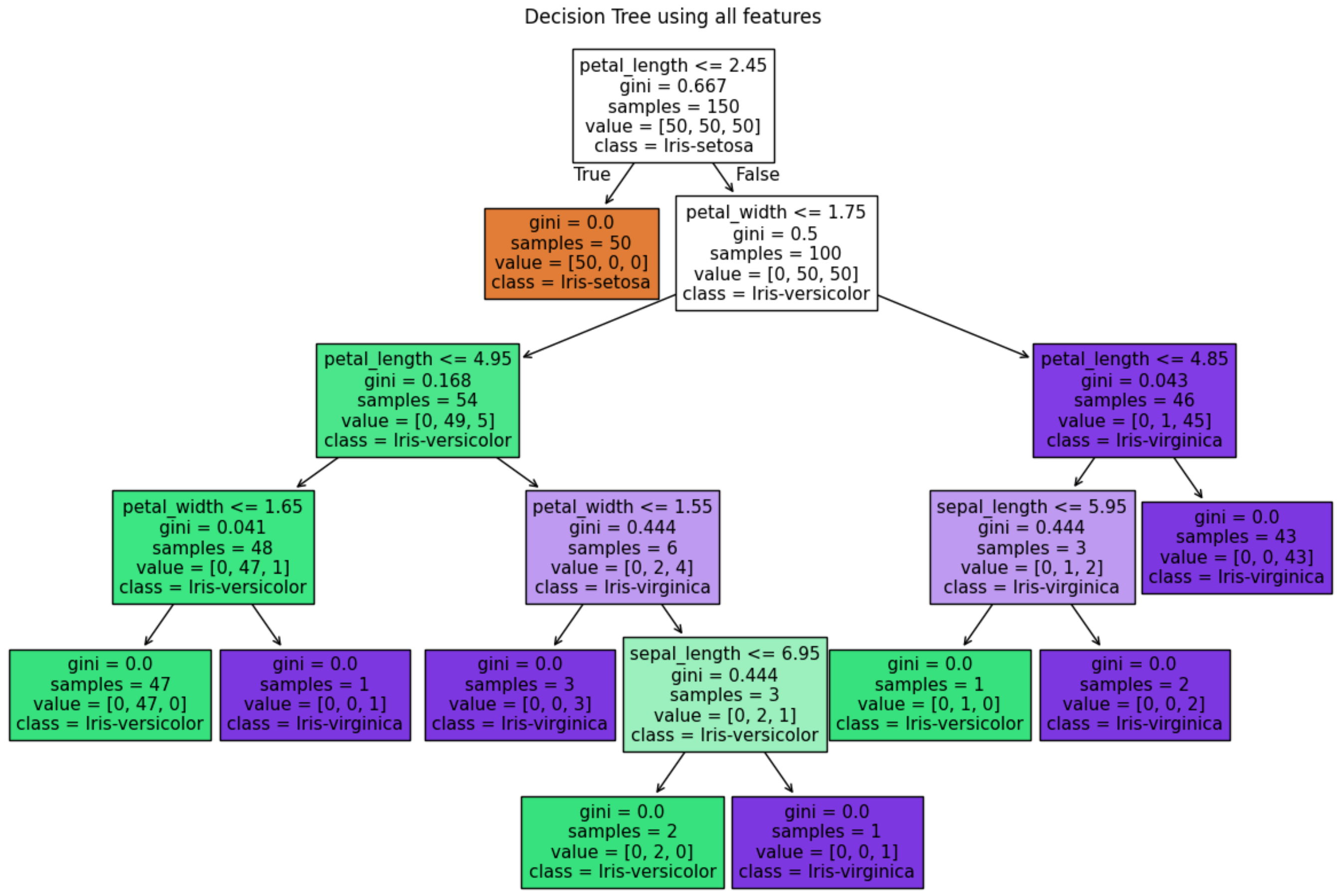
```
plot_colors = "ryb"
plot_step = 0.02
pairs = list(combinations(range(X.shape[1]), 2))
```

```
for i, (x_idx, y_idx) in enumerate(pairs):
      X_pair = X[:, [x_idx, y_idx]]
      clf = DecisionTreeClassifier().fit(X_pair, y)
      x_min, x_max = X_pair[:, 0].min() - 1, X_pair[:, 0].max() + 1
      y_min, y_max = X_pair[:, 1].min() - 1, X_pair[:, 1].max() + 1
      xx, yy = np.meshgrid(np.arange(x_min, x_max, plot_step),np.arange(y_min, y_max, plot_step))
      Z = clf.predict(np.c_[xx.ravel(), yy.ravel()])
      Z = Z.reshape(xx.shape)
      plt.figure(figsize=(6, 5))
      plt.contourf(xx, yy, Z, alpha=0.3, cmap=plt.cm.RdYlBu)
      for idx, color in zip(range(len(target_names)), plot_colors):
                plt.scatter(X_pair[y == idx, 0], X_pair[y == idx, 1],
                                    c=color, label=target_names[idx], edgecolor='k')
      plt.xlabel(feature_names[x_idx])
      plt.ylabel(feature_names[y_idx])
      plt.title(f"Decision Surface: {feature_names[x_idx]} vs {feature_names[y_idx]}")
      plt.legend()
```

Show hidden output

```
clf_all = DecisionTreeClassifier().fit(X, y)
```

```
plt.figure(figsize=(15, 10))
plot_tree(clf_all, filled=True, feature_names=feature_names, class_names=target_names)
plt.title("Decision Tree using all features")
plt.show()
```


Decision Tree using all features
petal_length <= 2.45
gini = 0.667
samples = 150
value = [50, 50, 50]
class = Iris-setosa
True
False
gini = 0.0
samples = 50
value = [50, 0, 0]
class = Iris-setosa
petal_width <= 1.75
gini = 0.5
samples = 100
value = [0, 50, 50]
class = Iris-versicolor
petal_length <= 4.95
gini = 0.168
samples = 54
value = [0, 49, 5]
class = Iris-versicolor
petal_length <= 4.85
gini = 0.043
samples = 46
value = [0, 1, 45]
class = Iris-virginica
petal_width <= 1.65
gini = 0.041
samples = 48
value = [0, 47, 1]
class = Iris-versicolor
petal_width <= 1.55
gini = 0.444
samples = 6
value = [0, 2, 4]
class = Iris-virginica
sepal_length <= 5.95
gini = 0.444
samples = 3
value = [0, 1, 2]
class = Iris-virginica
gini = 0.0
samples = 43
value = [0, 0, 43]
class = Iris-virginica
gini = 0.0
samples = 47
value = [0, 47, 0]
class = Iris-versicolor
gini = 0.0
samples = 1
value = [0, 0, 1]
class = Iris-virginica
gini = 0.0
samples = 3
value = [0, 0, 3]
class = Iris-virginica
sepal_length <= 6.95
gini = 0.444
samples = 3
value = [0, 2, 1]
class = Iris-versicolor
gini = 0.0
samples = 1
value = [0, 1, 0]
class = Iris-versicolor
gini = 0.0
samples = 2
value = [0, 0, 2]
class = Iris-virginica
gini = 0.0
samples = 2
value = [0, 2, 0]
class = Iris-versicolor
gini = 0.0
samples = 1
value = [0, 0, 1]
class = Iris-virginica