

INTERN:- Bhagyashri Sharad Pisal

Intern ID:- CT4MOTH

Domain:- Machine Learning

Duration:-January 25, 2025, to May 25, 2025

Company:- CODETECH IT SOLUTIONS

Mentor:- Neela Santhosh Kumar

✓ TASK ONE:DECISION TREE IMPLEMENTATION

BUILD AND VISUALIZE A DECISION TREE MODEL USING SCIKIT-LEARN TO CLASSIFY OR PREDICT OUTCOMES ON A CHOSEN DATASET.

DELIVERABLE: A NOTEBOOK WITH MODEL VISUALIZATION AND ANALYSIS.

```
import numpy as np
import pandas as pd
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier, export_text, plot_tree
import matplotlib.pyplot as plt
import seaborn as sns
```

```
# Loading the Iris dataset
iris = load_iris()
data = pd.DataFrame(iris.data, columns=iris.feature_names)
data['target'] = iris.target
```

```
# Displaying the first few rows of the dataset
print("Dataset preview:")
print(data.head())
```






Dataset preview:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	\
0	5.1	3.5	1.4	0.2	
1	4.9	3.0	1.4	0.2	
2	4.7	3.2	1.3	0.2	
3	4.6	3.1	1.5	0.2	
4	5.0	3.6	1.4	0.2	

	target
0	0
1	0
2	0
3	0
4	0

```
#getting the top 10 values
data.head(10)
```



	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	
0	5.1	3.5	1.4	0.2	0	
1	4.9	3.0	1.4	0.2	0	
2	4.7	3.2	1.3	0.2	0	
3	4.6	3.1	1.5	0.2	0	
4	5.0	3.6	1.4	0.2	0	
5	5.4	3.9	1.7	0.4	0	
6	4.6	3.4	1.4	0.3	0	
7	5.0	3.4	1.5	0.2	0	
8	4.4	2.9	1.4	0.2	0	
9	4.9	3.1	1.5	0.1	0	

Next steps:

[Generate code with data](#)

[View recommended plots](#)

[New interactive sheet](#)

```
# getting the 10 bottom values
data.tail(10)
```



	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target	
140	6.7	3.1	5.6	2.4	2	
141	6.9	3.1	5.1	2.3	2	
142	5.8	2.7	5.1	1.9	2	
143	6.8	3.2	5.9	2.3	2	
144	6.7	3.3	5.7	2.5	2	
145	6.7	3.0	5.2	2.3	2	
146	6.3	2.5	5.0	1.9	2	
147	6.5	3.0	5.2	2.0	2	
148	6.2	3.4	5.4	2.3	2	
149	5.9	3.0	5.1	1.8	2	

```
# Splitting the dataset into training and testing sets
X = data[iris.feature_names]
y = data['target']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
# Initialize the Decision Tree model
dt_model = DecisionTreeClassifier(random_state=42)
```

```
# Train the model on the training data
dt_model.fit(X_train, y_train)
```




DecisionTreeClassifier



DecisionTreeClassifier(random_state=42)

```
# Evaluate the model on the test data
accuracy = dt_model.score(X_test, y_test)
print(f"Model accuracy: {accuracy:.2f}")
```

 Model accuracy: 1.00

```
# Visualize feature importance
feature_importances = dt_model.feature_importances_
plt.figure(figsize=(10, 6))
sns.barplot(x=feature_importances, y=iris.feature_names, palette="viridis")
```

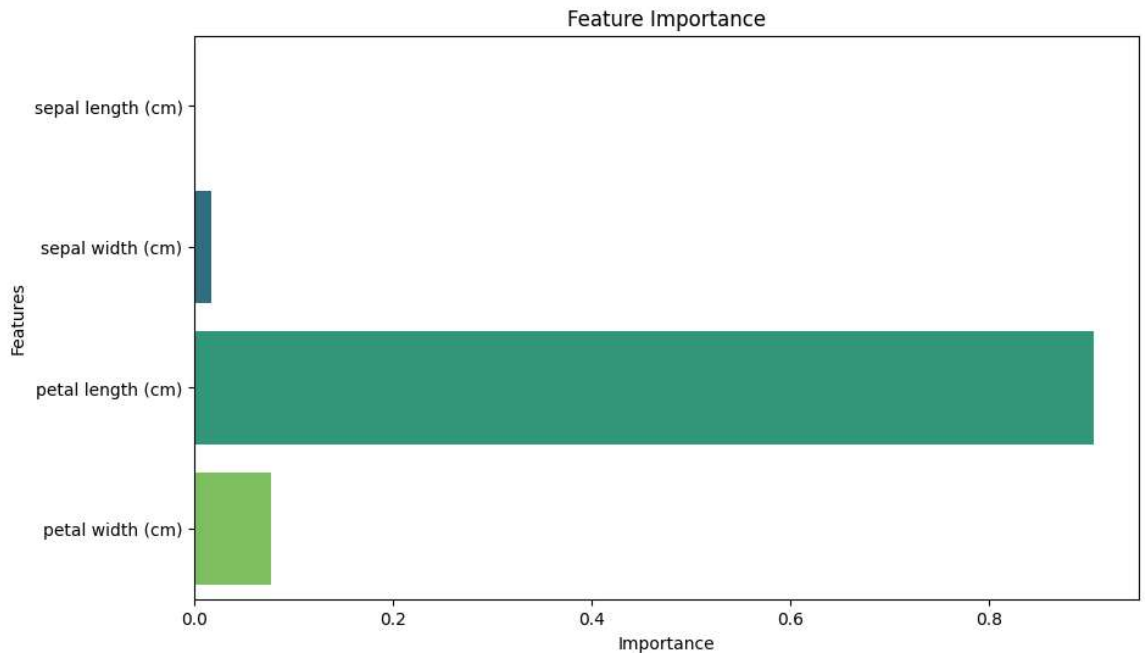
```
plt.title("Feature Importance")
plt.xlabel("Importance")
plt.ylabel("Features")
plt.show()
```



<ipython-input-9-327d3bdf328>:4: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `y` variable

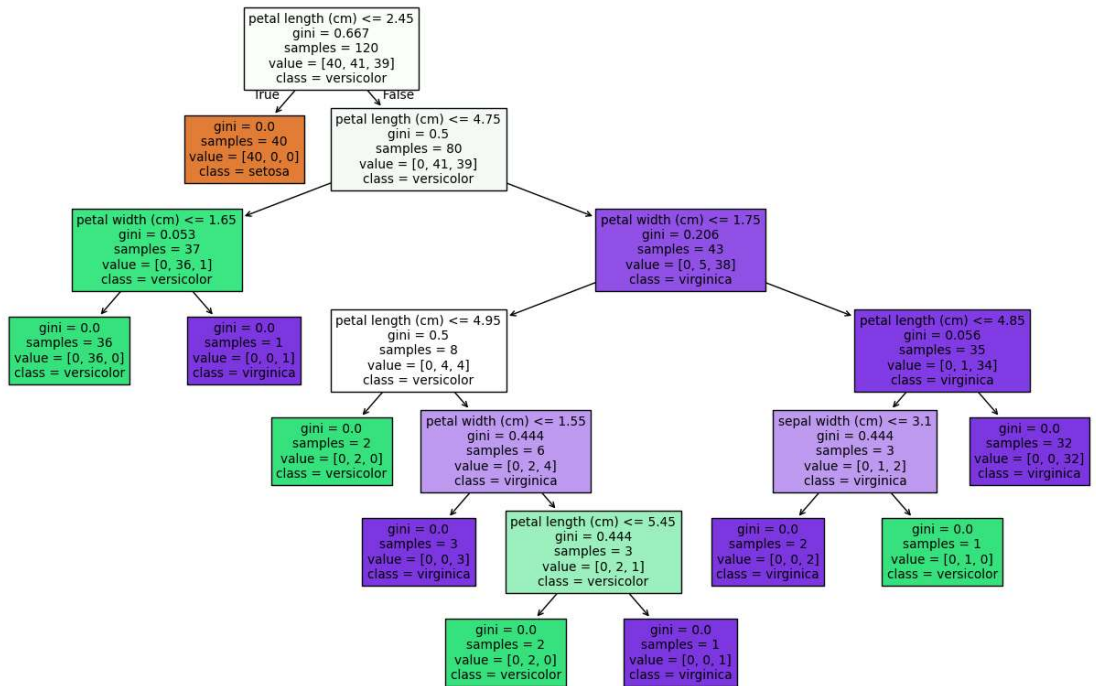
```
sns.barplot(x=feature_importances, y=iris.feature_names, palette="viridis")
```



```
# Visualize the Decision Tree
plt.figure(figsize=(16, 10))
plot_tree(dt_model, feature_names=iris.feature_names, class_names=iris.target_names.tolist(), filled=True)
plt.title("Decision Tree Visualization ")
plt.show()
```



Decision Tree Visualization



```

# Export the tree in textual format
tree_rules = export_text(dt_model, feature_names=iris.feature_names)
print("Decision Tree Rules:")
print(tree_rules)

```

```

# Pairplot of the dataset to show relationships between features
sns.pairplot(data, hue="target", palette="deep", diag_kind="kde", markers=["o", "s", "D"],
              plot_kws={'alpha': 0.7})
plt.suptitle("Pairplot of Iris Dataset", y=1.02)
plt.show()

```



Decision Tree Rules:

```
|--- petal length (cm) <= 2.45
|   |--- class: 0
|--- petal length (cm) > 2.45
|   |--- petal length (cm) <= 4.75
|   |   |--- petal width (cm) <= 1.65
|   |   |--- class: 1
|   |   |--- petal width (cm) > 1.65
|   |   |--- class: 2
|   |--- petal length (cm) > 4.75
|   |   |--- petal width (cm) <= 1.75
|   |   |   |--- petal length (cm) <= 4.95
|   |   |   |--- class: 1
|   |   |   |--- petal length (cm) > 4.95
|   |   |   |   |--- petal width (cm) <= 1.55
|   |   |   |   |--- class: 2
|   |   |   |   |--- petal width (cm) > 1.55
|   |   |   |   |   |--- petal length (cm) <= 5.45
|   |   |   |   |   |--- class: 1
|   |   |   |   |   |--- petal length (cm) > 5.45
|   |   |   |   |   |--- class: 2
|   |   |--- petal width (cm) > 1.75
|   |   |   |--- petal length (cm) <= 4.85
|   |   |   |   |--- sepal width (cm) <= 3.10
|   |   |   |   |--- class: 2
|   |   |   |   |--- sepal width (cm) > 3.10
|   |   |   |   |--- class: 1
|   |   |   |--- petal length (cm) > 4.85
|   |   |   |--- class: 2
```

Pairplot of Iris Dataset

