ibimbing

PORTOFOLIO
DATA SCIENCE

Iris Classification Machine Learning

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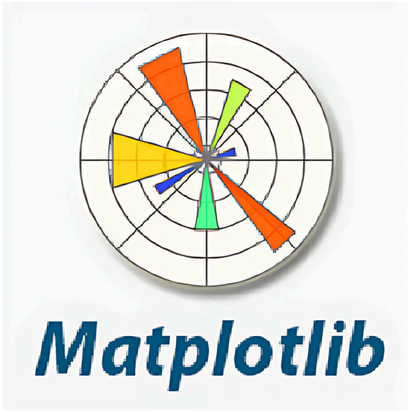
Exercise

- Create a simple machine learning (classification) program using a dataset that has already been provided by scikit-learn. You can access it at the following link: https://scikit-learn.org/1.5/datasets/toy_dataset.html
- You are free to use any algorithm. You can learn about classification algorithms at the following link: https://www.geeksforgeeks.org/top-6-machine-learning-algorithms-for-classification/

TOOLS



```
[ ] import pandas as pd
    import numpy as np
    import matplotlib.pyplot as plt
    %matplotlib inline
    import seaborn as sns
    from sklearn.preprocessing import LabelEncoder
    from sklearn.model_selection import train_test_split
    from sklearn.tree import DecisionTreeClassifier
    from sklearn.metrics import classification_report, confusion_matrix
    from sklearn.tree import plot_tree
```

```
[ ] iris = sns.load_dataset('iris')
    iris.head()
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

IMPORT LIBRARY

- Imports several libraries like pandas, numpy, matplotlib.pyplot, seaborn, and various modules from sklearn for preprocessing, splitting data, training a decision tree classifier, and generating reports.
- Loads the Iris dataset using sns.load_dataset('iris') and displays the first five rows of the dataset using iris.head()

EXPLANATORY DATA ANALYSIS

```
[ ] #Dataframe Information
    iris.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   sepal_length  150 non-null    float64
 1   sepal_width   150 non-null    float64
 2   petal_length  150 non-null    float64
 3   petal_width   150 non-null    float64
 4   species       150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

```
[ ] #Describing Data
    iris.describe()
```

	sepal_length	sepal_width	petal_length	petal_width
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.057333	3.758000	1.199333
std	0.828066	0.435866	1.765298	0.762238
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

```
[ ] #Dataframe Shape
    iris.shape
```

```
(150, 5)
```

```
[ ] #Checking Missing Value
    print("Checking Missing Value: ")
    iris.isnull().sum()
```

```
Checking Missing Value:
```

	0
sepal_length	0
sepal_width	0
petal_length	0
petal_width	0
species	0

```
dtype: int64
```

PREDICTING TARGET VARIABLE

```
[ ]  #Separating target variable(y) & feature variables (x)
     target = iris['species']
     data = iris.copy()
     data = data.drop('species', axis=1)

     x = data  # dependent variable
     target  # independent variable
```

	species
0	setosa
1	setosa
2	setosa
3	setosa
4	setosa
...	...
145	virginica
146	virginica
147	virginica
148	virginica
149	virginica

150 rows × 1 columns

```
[ ]  #Label encoding as target variable
     le = LabelEncoder()
     target = le.fit_transform(target)
     target
```

```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2])
```

```
[ ]  y = target
```

TRAINING DATASET

```
[ ]  #Splitting the data - 80:20 ratio
     x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2, random_state = 40)
```

DECISION TREE CLASSIFIER

```
[ ] #Defining the decision tree algorithm
    model = DecisionTreeClassifier()
    model.fit(x_train, y_train)
```

```
DecisionTreeClassifier()
```

```
[ ] #Predicting values from test data using confusion matrix and classification report.
    y_predt = model.predict(x_test)
    from sklearn.metrics import confusion_matrix
    print(confusion_matrix(y_test, y_predt))
```

```
[[ 8  0  0]
 [ 0 12  0]
 [ 0  0 10]]
```

```
[ ] print('Classification report: \n', classification_report(y_test, y_predt))
```

```
Classification report:
               precision    recall  f1-score   support

           0       1.00      1.00      1.00         8
           1       1.00      1.00      1.00        12
           2       1.00      1.00      1.00        10

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30
```

```
[ ] #Checking feature importance
    model.feature_importances_
```

```
array([0.01668057, 0.01251043, 0.06433933, 0.90646968])
```

```
[ ] features = pd.DataFrame(model.feature_importances_, index=x.columns)
    features.head()
```

	0
sepal_length	0.016681
sepal_width	0.012510
petal_length	0.064339
petal_width	0.906470

Langkah berikutnya: Buat kode dengan features | Lihat plot yang direkomendasikan | New interactive sheet

```
[ ] #Training a second decision tree with entropy criterion and pruning
    model2 = DecisionTreeClassifier(criterion="entropy", ccp_alpha=0.4)
```

```
[ ] model2.fit(x_train, y_train)
```

```
DecisionTreeClassifier(ccp_alpha=0.4, criterion='entropy')
```

```
[ ] y_predt2 = model2.predict(x_test)
    print(confusion_matrix(y_test, y_predt2))
```

```
[[ 8  0  0]
 [ 0 12  0]
 [ 0  0 10]]
```

```
[ ] print('Classification report: \n', classification_report(y_test, y_predt2))
```

```
Classification report:
               precision    recall  f1-score   support

           0       1.00      1.00      1.00         8
           1       1.00      1.00      1.00        12
           2       1.00      1.00      1.00        10

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30
```

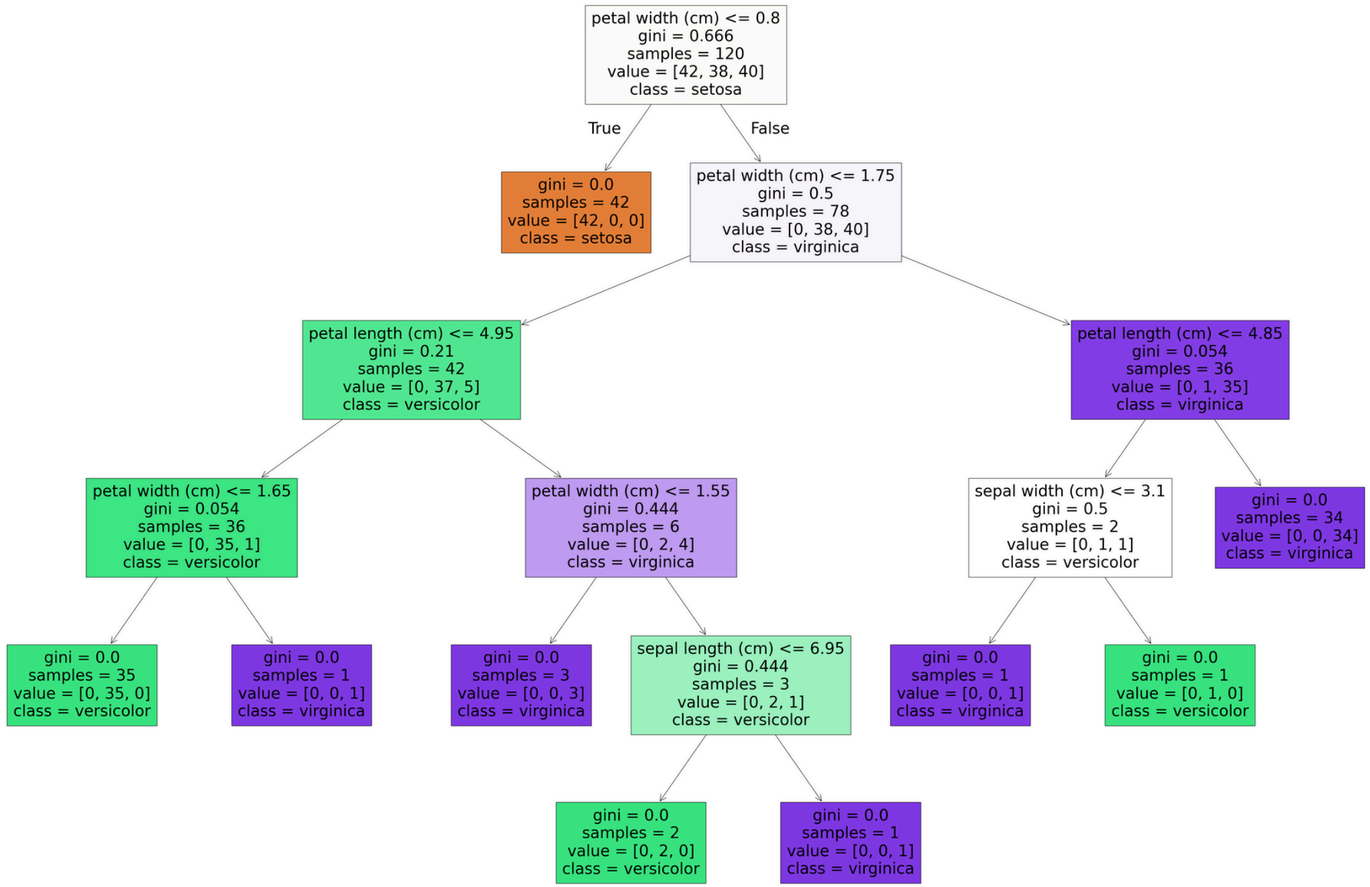
```
[ ] features2 = pd.DataFrame(model2.feature_importances_, index=x.columns)
    features2.head()
```

	0
sepal_length	0.0
sepal_width	0.0
petal_length	0.0
petal_width	1.0

VISUALIZING

```
]  from sklearn import tree
   fn = ['sepal length (cm)','sepal width (cm)','petal length (cm)','petal width (cm)']
   cn = ['setosa','versicolor','virginica']
   fig = plt.figure(figsize=(60,40))
   tree.plot_tree(model, feature_names = fn,
                  class_names = cn ,
                  filled = True);
```

Visualizes a decision tree model using sklearn. It defines feature names (fn) and class names (cn) for the dataset, creates a large figure (60x40 inches), and uses tree.plot_tree() to display the tree. The visualization includes feature splits, class labels, and filled nodes, showing how the model classifies data into flower species (setosa, versicolor, virginica).



CHECKING ACCURACY

```
[ ]  #Model Accuracy
     import sklearn.metrics as sm
     print("Accuracy:", f"{sm.accuracy_score(y_test, y_predt) * 100:.2f}%")
```

```
Accuracy: 100.00%
```

The code calculates and displays the accuracy of a machine learning model using the accuracy_score function from sklearn.metrics. It compares the true labels (y_test) with the predicted labels (y_predt), multiplies the result by 100 to convert it into a percentage, formats it to two decimal places, and prints it in a readable format. Accuracy represents the proportion of correct predictions made by the model.

Thank You For Attention

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