Computer Engineering Department National University of Technology Islamabad, Pakistan

Introduction to Data Mining

Practice Exercise 10

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Practice Exercise 10

Supervised Machine Learning | Decision Tree

Objective:

- Implement Decision Tree using Fisher iris Data.

Equipment/Software Required:

- Python (Spyder 4.0 Anaconda Distribution)

Background:

Decision Tree:

A decision tree is a structure that contains nodes (rectangular boxes) and edges(arrows) and is built from a dataset (table of columns representing features/attributes and rows corresponds to records). Each node is either used to make a decision (known as decision node) or represent an outcome (known as leaf node).

Main Steps of ID3 Algorithm:

1. Compute the entropy of Dataset ENTROPY(S)
2. For every attribute/feature: -
   a. Calculate entropy for all other values ENTROPY(A)
   b. Take AVERAGE INFORMATION ENTROPY for current attribute
   c. Calculate Gain for current attribute
3. Pick the Highest Gain attribute
4. Repeat until we get the tree we desire

Code:

 # importing Libraries

```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
from sklearn import tree
```

 # Loading iris dataset

```
fisher_iris=pd.read_csv(r"C:\Users\User\Downloads\iris.data")
```

 # Before implementing Decision Tree on fisher_iris Data frame lets do some data quality assessment

 # Converting fisher_iris as a Data Frame

```
fisher_iris=pd.DataFrame(fisher_iris)
```

 # Printing the head of fisher_iris Data Frame

```
print("Head of fisher_iris: \n", fisher_iris.head())
print("\n")
# Spcifying the columns name

attributes = ["sepal_length", "sepal_width", "petal_length", "petal_width", "class"]
fisher_iris.columns = attributes

# Printing shape/ Dimentions fisher_iris  of Data Frame

print("Head of fisher_iris: \n",fisher_iris.shape)
print("\n")
# Printing statistics of fisher_iris  Data Frame

print("Head of fisher_iris: \n", fisher_iris.describe())
print("\n")
#plotting the decision tree for iris dataset

plt.figure(1)

# Slicing Train and Target Data

X, y = load_iris(return_X_y=True)

# Using Decision Tree Classifier

clf = tree.DecisionTreeClassifier()

# Fitting target and Train Data

clf = clf.fit(X, y)

# plotting Decision Tree

tree.plot_tree(clf)

anypoint=[[3., 2., 3, 4]]

# predicting

prediction=clf.predict(anypoint)
print("\n")
print("Prediction of any point: \n",prediction)
```

Output:

Head of fisher_iris:

```
   5.1  3.5  1.4  0.2  Iris-setosa
0  4.9  3.0  1.4  0.2  Iris-setosa
1  4.7  3.2  1.3  0.2  Iris-setosa
2  4.6  3.1  1.5  0.2  Iris-setosa
3  5.0  3.6  1.4  0.2  Iris-setosa
4  5.4  3.9  1.7  0.4  Iris-setosa
```

Head of fisher_iris:

(149, 5)

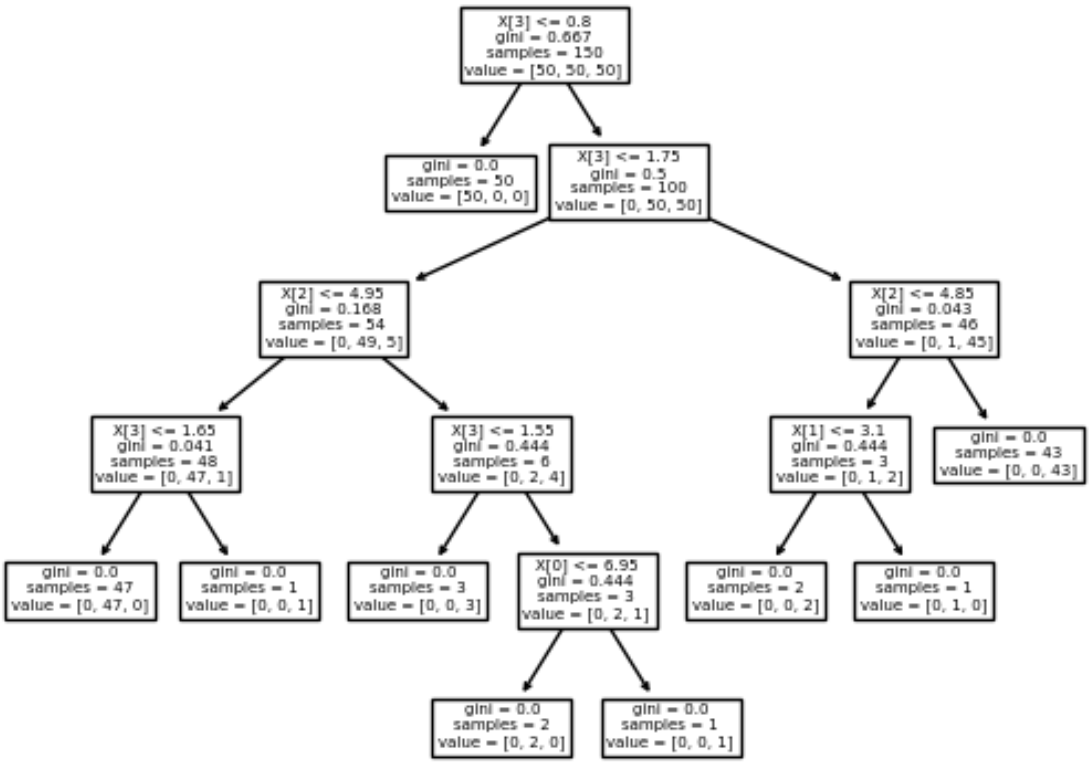
Head of fisher_iris:

	sepal_length	sepal_width	petal_length	petal_width
count	149.000000	149.000000	149.000000	149.000000
mean	5.848322	3.051007	3.774497	1.205369
std	0.828594	0.433499	1.759651	0.761292
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.400000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

Prediction of any point:

[2]

Graphs:



Results and Discussions:

Decision Trees (DTs) are a non-parametric supervised learning method used for classification and regression. The goal is to create a model that predicts the value of a target variable by learning simple decision rules inferred from the data features. A tree can be seen as a piecewise constant approximation.

Conclusion:

Decision Tree is one of the most powerful and popular algorithms. Decision-tree algorithm falls under the category of supervised learning algorithms. It works for both continuous as well as categorical output variables.