ML7

May 23, 2022

[2]:
```
# Apply Decision Tree Classification technique to solve given problem:
# A dataset collected in a cosmetics shop showing details of customers and whether or not they responded to a special offer to buy a new lip-stick is shown in table below.
# Use this dataset to build a decision tree, with Buys as the target variable, to help in buying lip-sticks in the future. Find the root node of decision tree.
# According to the decision tree you have made from previous training data set, what is the decision for the test data:
# [Age < 21, Income = Low, Gender = Female, Marital Status = Married]?
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[35]:
```
import numpy as np
import pandas as pd
from sklearn.preprocessing import LabelEncoder
from sklearn.tree import DecisionTreeClassifier
from sklearn.tree import plot_tree
```

[36]:
```
data = pd.read_csv("ML7.csv")
data
```

[36]:

	Age	Income	Gender	MaritialStatus	Buys
0	<21	High	Male	Single	No
1	<21	High	Male	Married	No
2	21-35	High	Male	Single	Yes
3	>35	Medium	Male	Single	Yes
4	>35	Low	Female	Single	Yes
5	>35	Low	Female	Married	No
6	21-35	Low	Female	Married	Yes
7	<21	Medium	Male	Single	No
8	<21	Low	Female	Married	Yes
9	>35	Medium	Female	Single	Yes
10	<21	Medium	Female	Married	Yes
11	21-35	Medium	Male	Married	Yes
12	21-35	High	Female	Single	Yes

[37]:
```
le = LabelEncoder()
x = data.iloc[:,:-1]
x = x.apply(le.fit_transform)
```

[38]:
```
print("Age: ",list(zip(data.iloc[:,0],x.iloc[:,0])))
print("Income: ",list(zip(data.iloc[:,1],x.iloc[:,1])))
print("Gender: ",list(zip(data.iloc[:,2],x.iloc[:,2])))
print("MaritialStatus: ",list(zip(data.iloc[:,3],x.iloc[:,3])))
```

```
Age:  [('<21', 1), ('<21', 1), ('21-35', 0), ('>35', 2), ('>35', 2), ('>35', 2),
('21-35', 0), ('<21', 1), ('<21', 1), ('>35', 2), ('<21', 1), ('21-35', 0),
('21-35', 0)]
Income:  [('High', 0), ('High', 0), ('High', 0), ('Medium', 2), ('Low', 1),
('Low', 1), ('Low', 1), ('Medium', 2), ('Low', 1), ('Medium', 2), ('Medium', 2),
('Medium', 2), ('High', 0)]
Gender:  [('Male', 1), ('Male', 1), ('Male', 1), ('Male', 1), ('Female', 0),
('Female', 0), ('Female', 0), ('Male', 1), ('Female', 0), ('Female', 0),
('Female', 0), ('Male', 1), ('Female', 0)]
MaritialStatus:  [('Single', 1), ('Married', 0), ('Single', 1), ('Single', 1),
('Single', 1), ('Married', 0), ('Married', 0), ('Single', 1), ('Married', 0),
('Single', 1), ('Married', 0), ('Married', 0), ('Single', 1)]
```

[39]:
```
x
```

[39]:

	Age	Income	Gender	MaritialStatus
0	1	0	1	1
1	1	0	1	0
2	0	0	1	1
3	2	2	1	1
4	2	1	0	1
5	2	1	0	0
6	0	1	0	0
7	1	2	1	1
8	1	1	0	0
9	2	2	0	1
10	1	2	0	0
11	0	2	1	0
12	0	0	0	1

[40]:
```
y = data.iloc[:,-1]
y
```

[40]:
```
0      No
1      No
2     Yes
3     Yes
4     Yes
5      No
6     Yes
7      No
8     Yes
9     Yes
```

```
10    Yes
11    Yes
12    Yes
Name: Buys, dtype: object
```

[41]:
```
dt = DecisionTreeClassifier()
dt.fit(x,y)
```

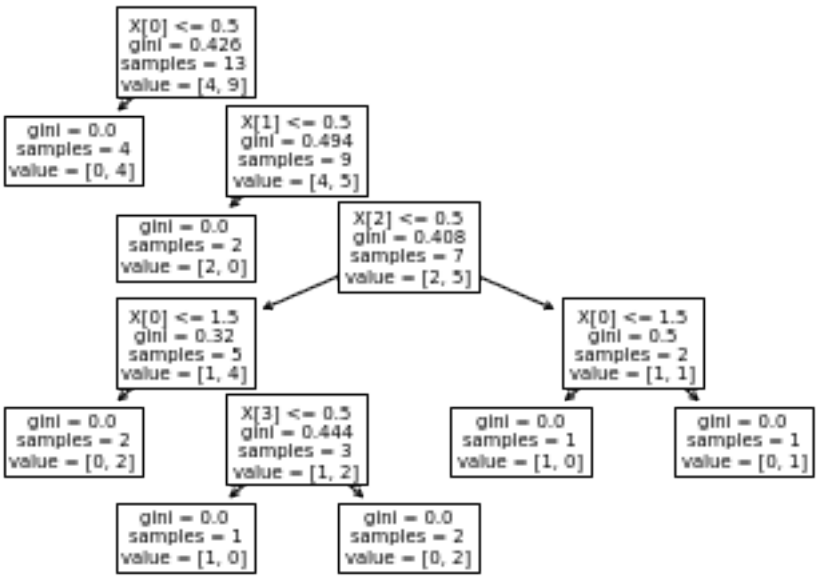
[41]:
```
DecisionTreeClassifier()
```

[42]:
```
#[Age < 21, Income = Low,Gender = Female, Marital Status = Married]
query = np.array([1,1,0,0])
pred = dt.predict([query])
pred
```

[42]:
```
array(['Yes'], dtype=object)
```

[43]:
```
plot_tree(dt)
```

[43]:
```
[Text(83.7, 199.32, 'X[0] <= 0.5\ngini = 0.426\nsamples = 13\nvalue = [4, 9]'),
 Text(41.85, 163.07999999999998, 'gini = 0.0\nsamples = 4\nvalue = [0, 4]'),
 Text(125.55000000000001, 163.07999999999998, 'X[1] <= 0.5\ngini =
0.494\nsamples = 9\nvalue = [4, 5]'),
 Text(83.7, 126.83999999999999, 'gini = 0.0\nsamples = 2\nvalue = [2, 0]'),
 Text(167.4, 126.83999999999999, 'X[2] <= 0.5\ngini = 0.408\nsamples = 7\nvalue
= [2, 5]'),
 Text(83.7, 90.6, 'X[0] <= 1.5\ngini = 0.32\nsamples = 5\nvalue = [1, 4]'),
 Text(41.85, 54.359999999999985, 'gini = 0.0\nsamples = 2\nvalue = [0, 2]'),
 Text(125.55000000000001, 54.359999999999985, 'X[3] <= 0.5\ngini =
0.444\nsamples = 3\nvalue = [1, 2]'),
 Text(83.7, 18.119999999999976, 'gini = 0.0\nsamples = 1\nvalue = [1, 0]'),
 Text(167.4, 18.119999999999976, 'gini = 0.0\nsamples = 2\nvalue = [0, 2]'),
 Text(251.10000000000002, 90.6, 'X[0] <= 1.5\ngini = 0.5\nsamples = 2\nvalue =
[1, 1]'),
 Text(209.25, 54.359999999999985, 'gini = 0.0\nsamples = 1\nvalue = [1, 0]'),
 Text(292.95, 54.359999999999985, 'gini = 0.0\nsamples = 1\nvalue = [0, 1]')]
```


X[0] <= 0.5
gini = 0.426
samples = 13
value = [4, 9]
gini = 0.0
samples = 4
value = [0, 4]
X[1] <= 0.5
gini = 0.494
samples = 9
value = [4, 5]
gini = 0.0
samples = 2
value = [2, 0]
X[2] <= 0.5
gini = 0.408
samples = 7
value = [2, 5]
X[0] <= 1.5
gini = 0.32
samples = 5
value = [1, 4]
X[0] <= 1.5
gini = 0.5
samples = 2
value = [1, 1]
gini = 0.0
samples = 2
value = [0, 2]
X[3] <= 0.5
gini = 0.444
samples = 3
value = [1, 2]
gini = 0.0
samples = 1
value = [1, 0]
gini = 0.0
samples = 1
value = [0, 1]
gini = 0.0
samples = 1
value = [1, 0]
gini = 0.0
samples = 2
value = [0, 2]

[ ]: