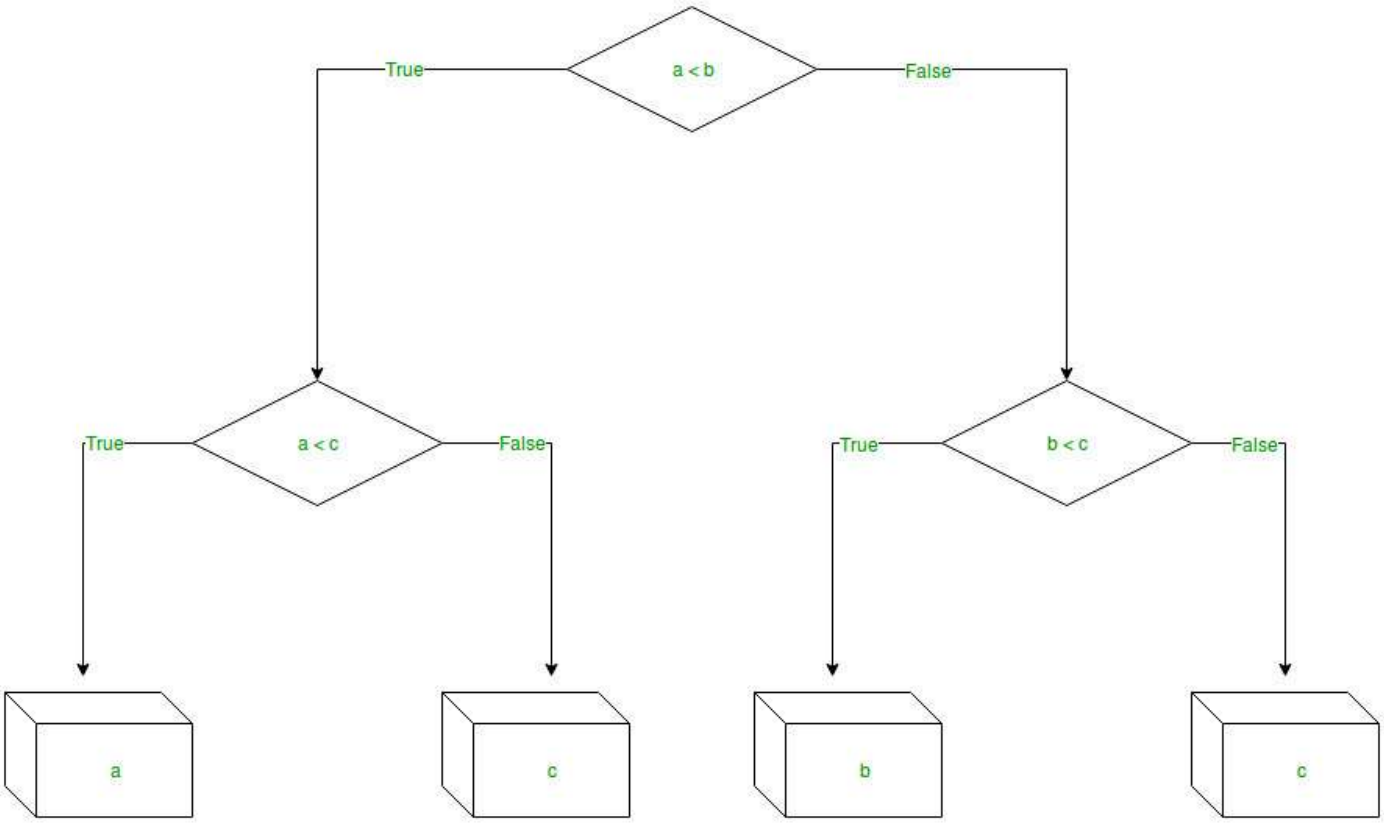
Python | Decision Tree Regression using sklearn

Decision Tree is a decision-making tool that uses a flowchart-like tree structure or is a model of decisions and all of their possible results, including outcomes, input costs, and utility.
Decision-tree algorithm falls under the category of supervised learning algorithms. It works for both continuous as well as categorical output variables.

The branches/edges represent the result of the node and the nodes have either:

1. Conditions [Decision Nodes]
2. Result [End Nodes]

The branches/edges represent the truth/falsity of the statement and take makes a decision based on that in the example below which shows a decision tree that evaluates the smallest of three numbers:



Decision Tree Regression:
Decision tree regression observes features of an object and trains a model in the structure of a tree to predict data in the future to produce meaningful continuous output. Continuous output means that the output/result is not discrete, i.e., it is not represented just by a discrete, known set of numbers or values.

Discrete output example: A weather prediction model that predicts whether or not there'll be rain on a particular day.
Continuous output example: A profit prediction model that states the probable profit that can be generated from the sale of a product.
Here, continuous values are predicted with the help of a decision tree regression model.

Let's see the Step-by-Step implementation –

- **Step 1:** Import the required libraries.

Python3

```
import  numpy as np

import  matplotlib.pyplot as plt

import  pandas as pd
```

- **Step 2:** Initialize and print the Dataset.

Python3

```
dataset  =  np.array(

[[``'Asset Flip'``,  100``,  1000``],

[``'Text Based'``,  500``,  3000``],

[``'Visual Novel'``,  1500``,  5000``],

[``'2D Pixel Art'``,  3500``,  8000``],

[``'2D Vector Art'``,  5000``,  6500``],

[``'Strategy'``,  6000``,  7000``],

[``'First Person Shooter'``,  8000``,  15000``],

[``'Simulator'``,  9500``,  20000``],

[``'Racing'``,  12000``,  21000``],

[``'RPG'``,  14000``,  25000``],

[``'Sandbox'``,  15500``,  27000``],
```

```
[``'Open-World'``,  16500``,  30000``],

[``'MMOFPS'``,  25000``,  52000``],

[``'MMORPG'``,  30000``,  80000``]

])

print``(dataset)
```

Output:

```
[['Asset Flip' '100' '1000']
 ['Text Based' '500' '3000']
 ['Visual Novel' '1500' '5000']
 ['2D Pixel Art' '3500' '8000']
 ['2D Vector Art' '5000' '6500']
 ['Strategy' '6000' '7000']
 ['First Person Shooter' '8000' '15000']
 ['Simulator' '9500' '20000']
 ['Racing' '12000' '21000']
 ['RPG' '14000' '25000']
 ['Sandbox' '15500' '27000']
 ['Open-World' '16500' '30000']
 ['MMOFPS' '25000' '52000']
 ['MMORPG' '30000' '80000']]
```

- **Step 3:** Select all the rows and column 1 from the dataset to “X”.

Python3

```
X  =  dataset[:,  1``:``2``].astype(``int``)

print``(X)
```

Output:

```
[[  100]
 [  500]
 [ 1500]
 [ 3500]
 [ 5000]
 [ 6000]
 [ 8000]
 [ 9500]
 [12000]
```

```
[14000]
[15500]
[16500]
[25000]
[30000]]
```

- **Step 4:** Select all of the rows and column 2 from the dataset to “y”.

Python3

```
y  =  dataset[:,  2``].astype(``int``)

print``(y)
```

Output:

```
[ 1000  3000  5000  8000  6500  7000 15000 20000 21000 25000 27000 30000 52000 80000]
```

- **Step 5:** Fit decision tree regressor to the dataset

Python3

```
from  sklearn.tree  import  DecisionTreeRegressor

regressor  =  DecisionTreeRegressor(random_state  =  0``)

regressor.fit(X, y)
```

Output:

```
DecisionTreeRegressor(ccp_alpha=0.0, criterion='mse', max_depth=None,
                      max_features=None, max_leaf_nodes=None,
                      min_impurity_decrease=0.0, min_impurity_split=None,
                      min_samples_leaf=1, min_samples_split=2,
                      min_weight_fraction_leaf=0.0, presort='deprecated',
                      random_state=0, splitter='best')
```

- **Step 6:** Predicting a new value

Python3

```
y_pred  =  regressor.predict([[``3750``]])

print``(``"Predicted price: % d\n"``%  y_pred)
```

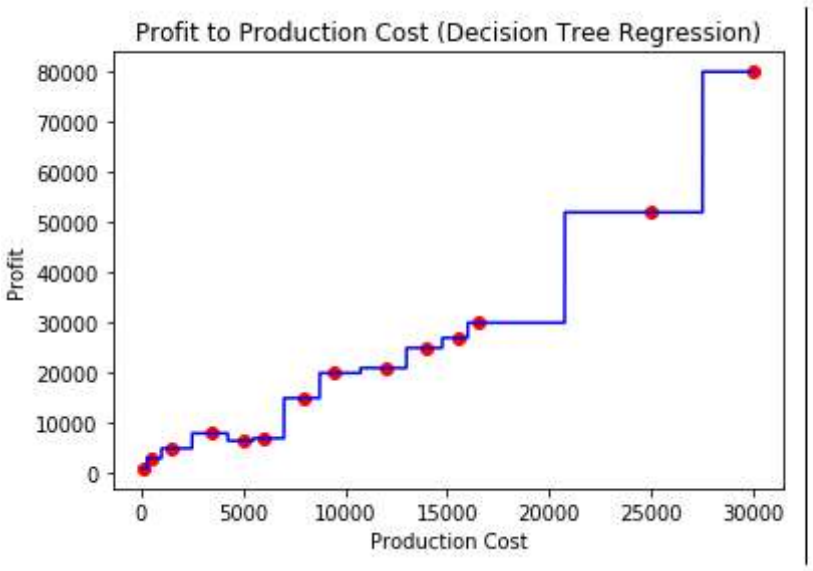
Output:

```
Predicted price:  8000
```

- **Step 7:** Visualising the result

Python3

```
X_grid  =  np.arange(``min``(X),  max``(X),  0.01``)

X_grid  =  X_grid.reshape((``len``(X_grid),  1``))

plt.scatter(X, y, color  =  'red'``)

plt.plot(X_grid, regressor.predict(X_grid), color  =  'blue'``)

plt.title(``'Profit to Production Cost (Decision Tree Regression)'``)

plt.xlabel(``'Production Cost'``)

plt.ylabel(``'Profit'``)

plt.show()
```



- **Step 8:** The tree is finally exported and shown in the TREE STRUCTURE below, visualized using http://www.webgraphviz.com/ by copying the data from the 'tree.dot' file.

Python3

```
from  sklearn.tree  import  export_graphviz

export_graphviz(regressor, out_file  =``'tree.dot'``,

        feature_names  =``[``'Production Cost'``])
```

Output (Decision Tree):