In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [3]:
```
dataset = pd.read_csv(r"C:\Users\soham\OneDrive\Desktop\(OCT-18)th- DECISSION TREE\
```

In [4]:
```
dataset
```

Out[4]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

400 rows × 5 columns

In [5]:
```
x = dataset.iloc[:,[2,3]]
y = dataset.iloc[:,:-1]
```

In [6]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size = 0.20, random_st
```

In [7]:
```
(x_train, x_test, y_train, y_test)
```

Out[7]: (Age EstimatedSalary
336   58   144000
64   59   83000
55   24   55000
106   26   35000
300   58   38000
..   ..
323   48   30000
192   29   43000
117   36   52000
47   27   54000
172   26   118000

[320 rows x 2 columns],
     Age EstimatedSalary
132   30   87000
309   38   50000
341   35   75000
196   30   79000
246   35   50000
..   ..
14   18   82000
363   42   79000
304   40   60000
361   53   34000
329   47   107000

[80 rows x 2 columns],
      User ID Gender Age EstimatedSalary
336 15664907   Male   58   144000
64   15605000 Female   59   83000
55   15649136 Female   24   55000
106 15706185 Female   26   35000
300 15736397 Female   58   38000
..   ..
323 15619465 Female   48   30000
192 15779581   Male   29   43000
117 15591433   Male   36   52000
47   15776348 Female   27   54000
172 15794661 Female   26   118000

[320 rows x 4 columns],
      User ID Gender Age EstimatedSalary
132 15725660   Male   30   87000
309 15652400 Female   38   50000
341 15776844   Male   35   75000
196 15738448 Female   30   79000
246 15638003 Female   35   50000
..   ..
14   15628972   Male   18   82000
363 15768293 Female   42   79000
304 15598070 Female   40   60000
361 15778830 Female   53   34000
329 15639576 Female   47   107000

[80 rows x 4 columns])

In [8]:
```
x_train, x_test
```

Out[8]:
```
(     Age  EstimatedSalary
 336   58           144000
 64    59            83000
 55    24            55000
 106   26            35000
 300   58            38000
 ..   ...              ...
 323   48            30000
 192   29            43000
 117   36            52000
 47    27            54000
 172   26           118000

 [320 rows x 2 columns],
      Age  EstimatedSalary
 132   30            87000
 309   38            50000
 341   35            75000
 196   30            79000
 246   35            50000
 ..   ...              ...
 14    18            82000
 363   42            79000
 304   40            60000
 361   53            34000
 329   47           107000

 [80 rows x 2 columns])
```

In [9]:
```
y_train, y_test
```

Out[9]:
```
(      User ID  Gender  Age  EstimatedSalary
 336  15664907    Male   58           144000
 64   15605000  Female   59            83000
 55   15649136  Female   24            55000
 106  15706185  Female   26            35000
 300  15736397  Female   58            38000
 ..        ...     ...  ...              ...
 323  15619465  Female   48            30000
 192  15779581    Male   29            43000
 117  15591433    Male   36            52000
 47   15776348  Female   27            54000
 172  15794661  Female   26           118000

 [320 rows x 4 columns],
       User ID  Gender  Age  EstimatedSalary
 132  15725660    Male   30            87000
 309  15652400  Female   38            50000
 341  15776844    Male   35            75000
 196  15738448  Female   30            79000
 246  15638003  Female   35            50000
 ..        ...     ...  ...              ...
 14   15628972    Male   18            82000
 363  15768293  Female   42            79000
 304  15598070  Female   40            60000
 361  15778830  Female   53            34000
 329  15639576  Female   47           107000

 [80 rows x 4 columns])
```

In [10]:
```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
```

In [11]:
```
x_train, x_test
```

Out[11]:
```
(array([[ 1.92295008e+00,  2.14601566e+00],
        [ 2.02016082e+00,  3.78719297e-01],
        [-1.38221530e+00, -4.32498705e-01],
        [-1.18779381e+00, -1.01194013e+00],
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```

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```
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       [-2.15686344e-01, -4.61470776e-01],
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       [ 1.73156642e-01, -3.74554562e-01],
       [ 3.67578135e-01,  1.10302108e+00],
       [-1.77105829e+00, -1.35960499e+00],
       [ 1.73156642e-01, -1.42777990e-01],
       [ 8.53631867e-01, -1.44652121e+00],
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       [-3.12897090e-01,  2.62831011e-01],
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       [ 1.33968560e+00,  2.31984809e+00],
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       [ 3.67578135e-01, -4.61470776e-01],
       [-4.10107836e-01, -7.80163563e-01],
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       [ 9.50842613e-01, -1.15680049e+00],
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       [-1.96547978e+00, -5.58617754e-02],
       [ 8.53631867e-01, -7.80163563e-01],
       [-7.98950822e-01, -6.06331134e-01],
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       [-1.18475597e-01, -4.32498705e-01],
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```

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[-8.96161568e-01,  2.91803083e-01],
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[-1.96547978e+00, -5.19414919e-01],
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[ 1.04805336e+00, -9.82968063e-01],
[-1.09058306e+00,  5.23579655e-01],
[ 2.70367388e-01, -5.19414919e-01],
[-1.09058306e+00,  4.07691369e-01],
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[-1.09058306e+00, -3.45582490e-01],
[-1.18475597e-01,  2.91803083e-01],
[ 1.33968560e+00,  5.81523798e-01],
[-1.18779381e+00, -1.15680049e+00],
[ 1.04805336e+00,  4.65635512e-01],
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[-1.18779381e+00,  2.91803083e-01],
[ 1.04805336e+00, -1.21474464e+00],
[-1.47942605e+00, -1.44652121e+00],
[-6.04529329e-01, -1.50446535e+00],
[ 2.11737157e+00, -8.09135634e-01],
[-1.86826903e+00,  1.75914797e-01],
[-2.15686344e-01,  8.42272441e-01],
[-1.86826903e+00, -1.27268878e+00],
[ 2.11737157e+00,  3.78719297e-01],
[-1.38221530e+00,  5.52551726e-01],
[-1.09058306e+00, -3.45582490e-01],
[ 1.73156642e-01, -6.64275277e-01],
[ 3.67578135e-01,  2.08236764e-03],
[-6.04529329e-01,  2.31984809e+00],
[-3.12897090e-01,  2.04886868e-01],
```

```
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       [-1.09058306e+00,  5.52551726e-01],
       [-1.96547978e+00,  3.49747226e-01],
       [ 3.67578135e-01,  2.62831011e-01],
       [ 1.73156642e-01, -2.87638347e-01],
       [ 1.43689635e+00, -1.04091221e+00],
       [ 8.53631867e-01,  1.07404901e+00]]))
```

In [12]:
```
pip install tree
```

```
Requirement already satisfied: tree in c:\users\soham\anaconda3\lib\site-packages
(0.2.4)
Requirement already satisfied: Pillow in c:\users\soham\anaconda3\lib\site-packages
(from tree) (10.3.0)
Requirement already satisfied: svgwrite in c:\users\soham\anaconda3\lib\site-package
s (from tree) (1.4.3)
Requirement already satisfied: setuptools in c:\users\soham\anaconda3\lib\site-packa
ges (from tree) (69.5.1)
Requirement already satisfied: click in c:\users\soham\anaconda3\lib\site-packages
(from tree) (8.1.7)
Requirement already satisfied: colorama in c:\users\soham\anaconda3\lib\site-package
s (from click->tree) (0.4.6)
Note: you may need to restart the kernel to use updated packages.
```

In [27]:
```
pip install scikit-Tree
```

```
Requirement already satisfied: scikit-Tree in c:\users\soham\anaconda3\lib\site-pack
ages (0.8.0)
Requirement already satisfied: numpy>=1.25.0 in c:\users\soham\anaconda3\lib\site-pa
ckages (from scikit-Tree) (1.26.4)
Requirement already satisfied: scipy>=1.5.0 in c:\users\soham\anaconda3\lib\site-pac
kages (from scikit-Tree) (1.13.1)
Requirement already satisfied: scikit-learn>=1.4.1 in c:\users\soham\anaconda3\lib\s
ite-packages (from scikit-Tree) (1.4.2)
Requirement already satisfied: joblib>=1.2.0 in c:\users\soham\anaconda3\lib\site-pa
ckages (from scikit-learn>=1.4.1->scikit-Tree) (1.4.2)
Requirement already satisfied: threadpoolctl>=2.0.0 in c:\users\soham\anaconda3\lib
\site-packages (from scikit-learn>=1.4.1->scikit-Tree) (2.2.0)
Note: you may need to restart the kernel to use updated packages.
```

In [43]:
```
from sklearn.tree import DecisionTreeClassifier
classifier = DecisionTreeClassifier()
classifier.fit(X_train, y_train)
```

Out[43]:
```
DecisionTreeClassifier()
```

In [ ]:
```
from sklearn.tree import DecisionTreeClassifier
classifier = DecisionTreeClassifier()
classifier.fit(x_train, y_train)
```

In [53]:
```
y_predict = classifier.predict(x_test)
```

In [57]:
```
from sklearn.metrics import accuracy_score
ac = accuracy_score(y_test,y_pred)
print(ac)
```

```
0.9125
```

In [63]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test,y_predict)
print(cm)
```

```
[[54  4]
 [ 3 19]]
```

In [67]:
```
bias = classifier.score(x_train,y_train)
bias
```

Out[67]: 0.996875

In [71]:
```
varience = classifier.score(x_test,y_test)
varience
```

Out[71]: 0.9125

In [73]:
```
classifier.score(x_test,y_test)
```

Out[73]: 0.9125

In [77]:
```
from sklearn.ensemble import RandomForestClassifier
classifier = RandomForestClassifier(max_depth=4,n_estimators=30, criterion="entropy
classifier.fit(x_train, y_train)
```

Out[77]:

RandomForestClassifier

```
RandomForestClassifier(criterion='entropy', max_depth=4, n_estimators=30,
                       random_state=0)
```

In [41]:
```
# Decision Tree Classification

# Importing the libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd

# Importing the dataset
dataset = pd.read_csv(r"C:\Users\soham\OneDrive\Desktop\(OCT-18)th- DECISSION TREE\
X = dataset.iloc[:, [2, 3]].values
y = dataset.iloc[:, -1].values

# Splitting the dataset into the Training set and Test set
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.20, random_


# Feature Scaling
```

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)


# Training the Decision Tree Classification model on the Training set
from sklearn.tree import DecisionTreeClassifier
classifier = DecisionTreeClassifier()
classifier.fit(X_train, y_train)
'''
from sklearn.ensemble import RandomForestClassifier
classifier = RandomForestClassifier(max_depth=4,n_estimators=30, criterion="entropy
classifier.fit(X_train, y_train)
'''
# Predicting the Test set results
y_pred = classifier.predict(X_test)

# Making the Confusion Matrix
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
print(cm)

from sklearn.metrics import accuracy_score
ac = accuracy_score(y_test, y_pred)
print(ac)


bias = classifier.score(X_train, y_train)
bias

variance = classifier.score(X_test, y_test)
variance
```

```
[[54  4]
 [ 3 19]]
0.9125
```

Out[41]: 0.9125

In [ ]: