```
                                        Experiment-1
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the
decision tree and apply this knowledge to classify a new sample.
```

In [1]:

```
# Importing the necessary libraries
import pandas as pd
```

In [2]:

```
# Reading the Excel file and storing the data in a Pandas DataFrame
df_music = pd.read_excel('Music.xlsx')
```

In [3]:

```
# Displaying the first few rows of the DataFrame
df_music.head()
```

Out[3]:

	Age	Gender	Genre
0	20	1	HIP HOP
1	24	1	HIP HOP
2	26	1	HIP HOP
3	27	1	ROCK
4	29	1	ROCK

In [4]:

```
# Separating the input features and output label into separate variables
X = df_music.drop('Genre', axis=1)
y = df_music['Genre']
```

In [5]:

```
# Displaying the first few rows of the input feature DataFrame
X.head()
```

Out[5]:

	Age	Gender
0	20	1
1	24	1
2	26	1
3	27	1
4	29	1

In [6]:

```
# Displaying the first few rows of the output label DataFrame
y.head()
```

Out[6]:

```
0    HIP HOP
1    HIP HOP
2    HIP HOP
3       ROCK
4       ROCK
Name: Genre, dtype: object
```

In [7]:

```
# Creating a Decision Tree classifier object with the 'entropy' criterion
from sklearn.tree import DecisionTreeClassifier
model = DecisionTreeClassifier(criterion='entropy')
```

In [8]:

```
# Training the model on the input feature and output label data
model.fit(X, y)
```

Out[8]:

```
▾          DecisionTreeClassifier
DecisionTreeClassifier(criterion='entropy')
```

In [9]:

```
# Predicting the genre for two sets of input data and storing the predictions in the 'prediction' variable
prediction = model.predict([[23, 1], [31, 0]])
```

```
C:\Users\khana\miniconda3\envs\ML_Experiments\lib\site-packages\sklearn\base.py:450: UserWarning: X does not have valid fea
ture names, but DecisionTreeClassifier was fitted with feature names
  warnings.warn(
```

In [10]:

```
# Displaying the predictions
prediction
```

Out[10]:

```
array(['HIP HOP', 'CLASSICAL'], dtype=object)
```

In [11]:

```
# Splitting the data into training and testing sets using the 'train_test_split' function from the 'sklearn.model_selection' module
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2)
```

In [12]:

```
# Training the model on the training set
model.fit(X_train, y_train)
```

Out[12]:

```
▾          DecisionTreeClassifier
DecisionTreeClassifier(criterion='entropy')
```

In [13]:

```
# Predicting the output for the test set and storing the predictions in the 'prediction' variable
prediction = model.predict(X_test)
```

In [14]:

```
# Displaying the predictions
prediction
```

Out[14]:

```
array(['JAZZ', 'ROCK', 'POPULAR', 'DANCE', 'DANCE', 'POPULAR'],
      dtype=object)
```

In [15]:

```
# Displaying the actual output labels for the test set
y_test
```

Out[15]:

```
18       JAZZ
3        ROCK
21    POPULAR
16      DANCE
15      DANCE
22    POPULAR
Name: Genre, dtype: object
```

In [16]:

```
# Evaluating the accuracy of the model using the 'accuracy_score' function from the 'sklearn.metrics' module
from sklearn.metrics import accuracy_score
accuracy_score(y_test, prediction)
```

Out[16]:

```
1.0
```

In [17]:

```
#import the required libaries
import joblib
```

In [18]:

```
# Saving the trained model using joblib
joblib.dump(model, 'music-recommender')
```

Out[18]:

```
['music-recommender']
```

In [19]:

```
# Loading the saved model using joblib
model = joblib.load('music-recommender')
```

In [20]:

```
# Predicting the genre for two sets of input data and storing the predictions in the 'prediction' variable
prediction=model.predict([[23,1],[31,0]])
```

```
C:\Users\khana\miniconda3\envs\ML_Experiments\lib\site-packages\sklearn\base.py:450: UserWarning: X does not have valid fea
ture names, but DecisionTreeClassifier was fitted with feature names
  warnings.warn(
```

In [21]:

```
# Displaying the predictions
prediction
```

Out[21]:

```
array(['HIP HOP', 'CLASSICAL'], dtype=object)
```

In [22]:

```
from sklearn.tree import export_graphviz
```

```
export decision tree models in a format that can be visualized using Graphviz.

The function takes several parameters:

model: The decision tree model that you want to export.
out_file: The name of the file to which you want to write the exported graph.
feature_names: A list of feature names to use for labeling the nodes of the decision tree.
class_names: A list of class names to use for labeling the different classes in the decision tree.
label: Controls how the nodes are labeled. 'all' means that all nodes are labeled, 'root' means only the root node is labeled, and None
means no nodes are labeled.
rounded: Whether to round the corners of the boxes used to represent nodes in the decision tree.
filled: Whether to fill the boxes used to represent nodes with colors to indicate class probabilities.
```

In [23]:

```
# Creating a visualization of the decision tree using Graphviz and Pydotplus
export_graphviz(model,out_file='music-recommeder.dot',feature_names=['Age','Gender'],class_names=sorted(y.unique()),label='all',rounded=Tr
```

In [24]:

```
import pydotplus
```

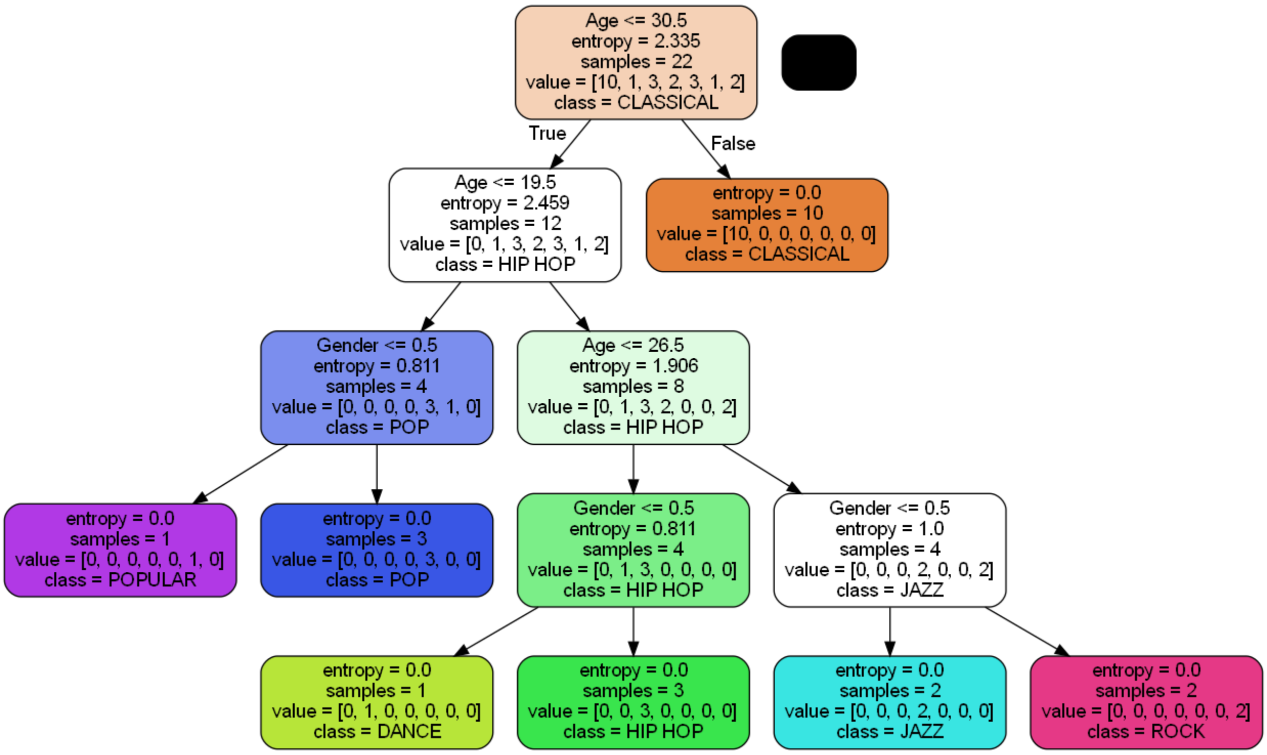
In [25]:

```
decision_tree=pydotplus.graph_from_dot_file('music-recommeder.dot')
```

In [26]:

```
from IPython.display import Image
Image(decision_tree.create_png())
```

Out[26]:


Age <= 30.5
entropy = 2.335
samples = 22
value = [10, 1, 3, 2, 3, 1, 2]
class = CLASSICAL
True
False
Age <= 19.5
entropy = 2.459
samples = 12
value = [0, 1, 3, 2, 3, 1, 2]
class = HIP HOP
entropy = 0.0
samples = 10
value = [10, 0, 0, 0, 0, 0, 0]
class = CLASSICAL
Gender <= 0.5
entropy = 0.811
samples = 4
value = [0, 0, 0, 0, 3, 1, 0]
class = POP
Age <= 26.5
entropy = 1.906
samples = 8
value = [0, 1, 3, 2, 0, 0, 2]
class = HIP HOP
entropy = 0.0
samples = 1
value = [0, 0, 0, 0, 0, 1, 0]
class = POPULAR
entropy = 0.0
samples = 3
value = [0, 0, 0, 0, 3, 0, 0]
class = POP
Gender <= 0.5
entropy = 0.811
samples = 4
value = [0, 1, 3, 0, 0, 0, 0]
class = HIP HOP
Gender <= 0.5
entropy = 1.0
samples = 4
value = [0, 0, 0, 2, 0, 0, 2]
class = JAZZ
entropy = 0.0
samples = 1
value = [0, 1, 0, 0, 0, 0, 0]
class = DANCE
entropy = 0.0
samples = 3
value = [0, 0, 3, 0, 0, 0, 0]
class = HIP HOP
entropy = 0.0
samples = 2
value = [0, 0, 0, 2, 0, 0, 0]
class = JAZZ
entropy = 0.0
samples = 2
value = [0, 0, 0, 0, 0, 0, 2]
class = ROCK