In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
from IPython import get_ipython
import warnings
warnings.filterwarnings("ignore")
```

In [4]:

```
df=pd.read_csv("music_train.csv")
```

In [5]:

```
df.head(5)
```

Out[5]:

	lyric	class
0	Can't drink without thinkin' about you	1
1	Now Lil Pump flyin' private jet (Yuh)	0
2	No, matter fact, you ain't help me when I had ...	0
3	And you could find me, I ain't hidin'	0
4	From the way you talk to the way you move	1

In [6]:

```
df.columns
```

Out[6]:

```
Index(['lyric', 'class'], dtype='object')
```

In [7]:

```
df.info
```

Out[7]:

```
<bound method DataFrame.info of                                                    lyric  class
0                  Can't drink without thinkin' about you      1
1                   Now Lil Pump flyin' private jet (Yuh)      0
2      No, matter fact, you ain't help me when I had ...      0
3                   And you could find me, I ain't hidin'      0
4               From the way you talk to the way you move      1
...                                                  ...    ...
51049  I told her pour me some more, then she went ri...      0
51050              Hit the ground and crawl to the dresser      0
51051  Just keep breathin' and breathin' and breathin...      1
51052      Down go the system, long live the king (King)      0
51053  If your mother knew all the things we do (From...      1

[51054 rows x 2 columns]>
```

In [8]:

```
df.isnull().sum()
```

Out[8]:

```
lyric    0
class    0
dtype: int64
```

In [9]:

```
df.tail()
```

Out[9]:

	lyric	class
51049	I told her pour me some more, then she went ri...	0
51050	Hit the ground and crawl to the dresser	0
51051	Just keep breathin' and breathin' and breathin...	1
51052	Down go the system, long live the king (King)	0
51053	If your mother knew all the things we do (From...	1

In [10]:

```
df.describe()
```

Out[10]:

	class
count	51054.000000
mean	0.434227
std	0.495660
min	0.000000
25%	0.000000
50%	0.000000
75%	1.000000
max	1.000000

In [11]:

```
df.shape
```

Out[11]:

```
(51054, 2)
```

In [12]:

```
df['class'].unique()
```

Out[12]:

```
array([1, 0])
```

In [13]:

```
df['class'].value_counts()
```

Out[13]:

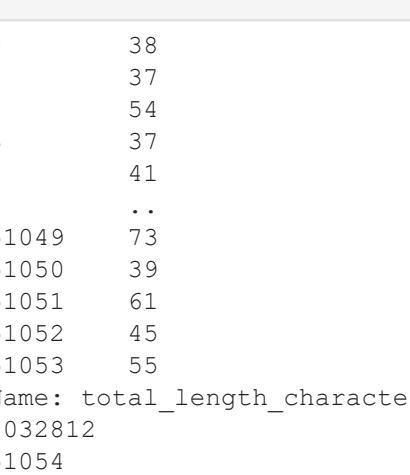
```
0    28885
1    22169
Name: class, dtype: int64
```

In [14]:

```
plt.figure(figsize=(15,6))
sns.countplot('class', data = df, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```

In [15]:

```
colors = sns.color_palette('bright')
plt.pie(df['class'].value_counts(),
colors = colors,
autopct = '%0.0f%%', shadow = 'True',
startangle = 90)
plt.show()
```



In [16]:

```
df2=df.copy()
```

In [17]:

```
df2['total_length_characters'] = df2['lyric'].str.len()
print(df2['total_length_characters'])
total_length_characters = df2['total_length_characters'].sum()
print(total_length_characters)
count = 0
for y in df2["lyric"]:
    count = count + 1
print(count)
average_length = total_length_characters / count
print (average_length)
```

```
0        38
1        37
2        54
3        37
4        41
         ..
51049    73
51050    39
51051    61
51052    45
51053    55
Name: total_length_characters, Length: 51054, dtype: int64
2032812
51054
39.81689975320249
```

In [18]:

```
df2['total_count_words'] = df2['lyric'].str.split().str.len()
print(df2['total_count_words'])
total_words = df2['total_count_words'].sum()
print(total_words)
count = 0
for y in df2["lyric"]:
    count = count + 1
print(count)
average_words = total_words / count
print (average_words)
```

```
0         6
1         7
2        12
3         8
4        10
         ..
51049    16
51050     8
51051     9
51052     9
51053    12
Name: total_count_words, Length: 51054, dtype: int64
418280
51054
8.19289379872292
```

In [19]:

```
import string
import re
import nltk
from nltk.util import pr
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from nltk.corpus import stopwords
stemmer = nltk.SnowballStemmer("english")
nltk.download('stopwords')
stopword=set(stopwords.words('english'))
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
```

In [20]:

```
def clean(text):
    text = str(text).lower()
    text = re.sub('\[.*?\]', '', text)
    text = re.sub('https?://\S+|www\.\S+', '', text)
    text = re.sub('<.*?>+', '', text)
    text = re.sub('[%s]' % re.escape(string.punctuation),
    '', text)
    text = re.sub('\n', '', text)
    text = re.sub('\w*\d\w*', '', text)
    text = [word for word in text.split(' ') if word not in stopword]
    text=" ".join(text)
    text = [stemmer.stem(word) for word in text.split(' ')]
    text=" ".join(text)
    return text
df2["lyric"] = df2["lyric"].apply(clean)
```

In [21]:

```
df2['total_length_characters'] = df2['lyric'].str.len()
print(df2['total_length_characters'])
total_length_characters = df2['total_length_characters'].sum()
print(total_length_characters)
count = 0
for y in df2["lyric"]:
    count = count + 1
print(count)
average_length = total_length_characters / count
print (average_length)
```

```
0        26
1        29
2        27
3        21
4        17
         ..
51049    30
51050    24
51051    40
51052    29
51053    20
Name: total_length_characters, Length: 51054, dtype: int64
1155941
51054
22.64153641242606
```

In [22]:

```
df2['total_count_words'] = df2['lyric'].str.split().str.len()
print(df2['total_count_words'])
total_words = df2['total_count_words'].sum()
print(total_words)
count = 0
for y in df2["lyric"]:
    count = count + 1
print(count)
average_words = total_words / count
print (average_words)
```

```
0        4
1        6
2        5
3        4
4        4
        ..
51049    6
51050    4
51051    5
51052    6
51053    4
Name: total_count_words, Length: 51054, dtype: int64
229901
51054
4.5030947624084305
```

In [23]:

```
x = np.array(df2["lyric"])
y = np.array(df2["class"])
```

In [24]:

```
from sklearn.feature_extraction.text import TfidfVectorizer
vectorizer = TfidfVectorizer()
X = vectorizer.fit_transform(x)
vectorizer.get_feature_names_out()
print(X.shape)
```

```
(51054, 11136)
```

In [25]:

```
first_vector = X[0]
dataframe = pd.DataFrame(first_vector.T.todense(),
index = vectorizer.get_feature_names(),
columns = ["tfidf"])
dataframe.sort_values(by = ["tfidf"],ascending=False)
```

Out[25]:

	tfidf
thinkin	0.549645
drink	0.539251
without	0.520521
cant	0.368994
aa	0.000000
...	...
fragil	0.000000
fragranc	0.000000
frame	0.000000
franc	0.000000
zzzzt	0.000000

11136 rows × 1 columns

In [26]:

```
from sklearn.cluster import KMeans
```

In [29]:

```
wcss = []
for i in range(1,11):
  km = KMeans(n_clusters=i)
  km.fit_predict(X)
  wcss.append(km.inertia_)
```

In [30]:

```
print(km.cluster_centers_)
```

```
[[8.32949851e-06 1.71349657e-05 2.23652022e-05 ... 1.15610999e-05
  1.10205424e-05 1.87244284e-05]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00
  0.00000000e+00 0.00000000e+00]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00
  0.00000000e+00 0.00000000e+00]
 ...
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00
  0.00000000e+00 0.00000000e+00]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00
  0.00000000e+00 0.00000000e+00]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00
  0.00000000e+00 0.00000000e+00]]
```

In [31]:

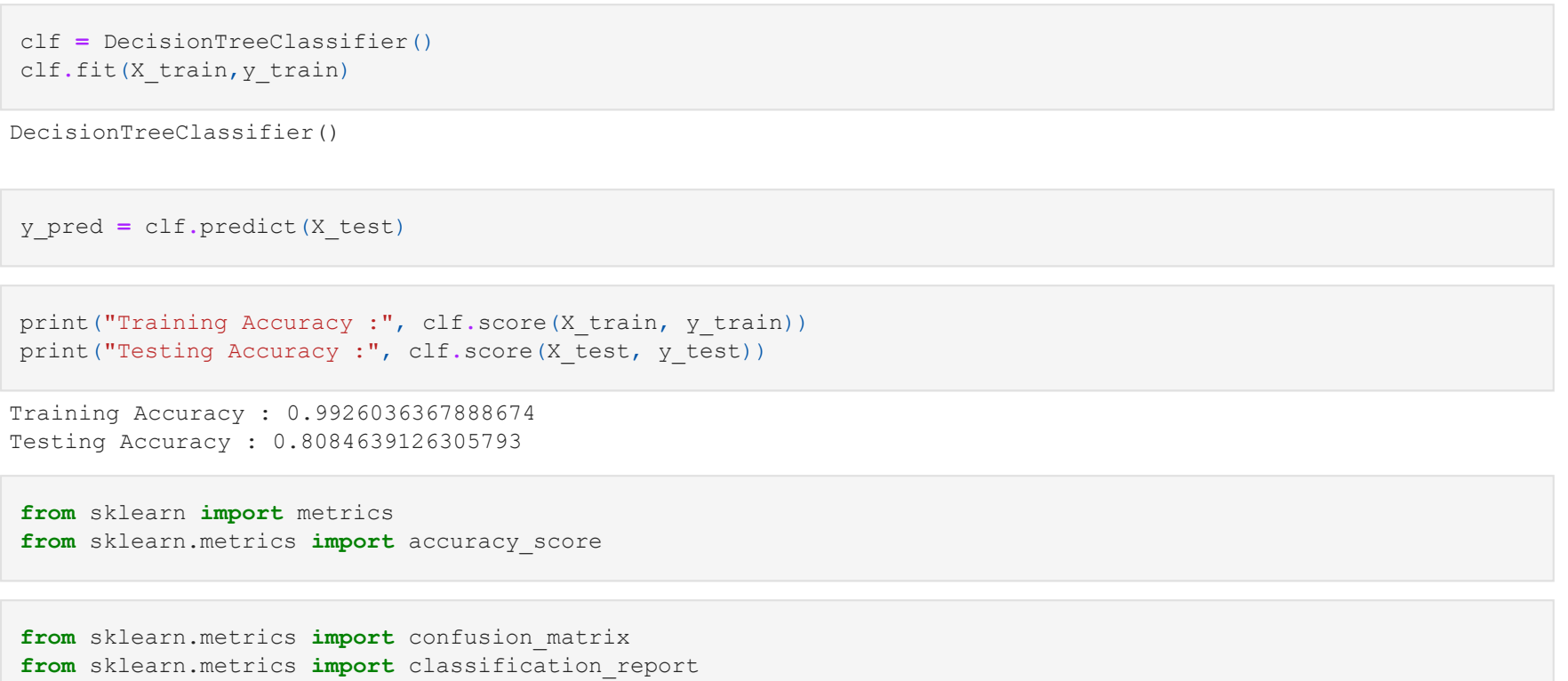
```
wcss
```

Out[31]:

```
[50509.854628753834,
 50130.61663373843,
 49722.67653543665,
 49356.99339948883,
 49248.13289522941,
 48916.11400301749,
 48874.232592511675,
 48680.16886288056,
 48451.740582835664,
 48254.15776224645]
```

In [32]:

```
plt.figure(figsize=(15,6))
plt.plot(range(1,11),wcss)
plt.grid()
plt.xticks(rotation = 0)
plt.show()
```



In [33]:

```
X_train, X_test, y_train, y_test = train_test_split(X,
y,
test_size=0.33,
random_state=42)
```

In [34]:

```
clf = DecisionTreeClassifier()
clf.fit(X_train,y_train)
```

Out[34]:

```
DecisionTreeClassifier()
```

In [35]:

```
y_pred = clf.predict(X_test)
```

In [43]:

```
print("Training Accuracy :", clf.score(X_train, y_train))
print("Testing Accuracy :", clf.score(X_test, y_test))
```

```
Training Accuracy : 0.9926036367888674
Testing Accuracy : 0.8084639126305793
```

In [36]:

```
from sklearn import metrics
from sklearn.metrics import accuracy_score
```

In [37]:

```
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
```

In [38]:

```
matrix = confusion_matrix(y_test,y_pred)
print('Confusion matrix : \n',matrix)
```

```
Confusion matrix :
 [[7902 1631]
 [1596 5719]]
```

In [39]:

```
from sklearn.linear_model import LogisticRegression
```

In [40]:

```
model = LogisticRegression()
model.fit(X_train, y_train)
```

Out[40]:

```
LogisticRegression()
```

In [41]:

```
y_pred = model.predict(X_test)
```

In [42]:

```
print("Training Accuracy :", model.score(X_train, y_train))
print("Testing Accuracy :", model.score(X_test, y_test))
```

```
Training Accuracy : 0.809477869379641
Testing Accuracy : 0.7647792022792023
```

In [44]:

```
matrix = confusion_matrix(y_test,y_pred)
print('Confusion matrix : \n',matrix)
```

```
Confusion matrix :
 [[7781 1752]
 [2211 5104]]
```

In [45]:

```
from sklearn.svm import LinearSVC
```

In [46]:

```
LSVCClf = LinearSVC(dual = False, random_state = 0,
penalty = 'l1',tol = 1e-5)
LSVCClf.fit(X_train, y_train)
```

Out[46]:

```
LinearSVC(dual=False, penalty='l1', random_state=0, tol=1e-05)
```

In [47]:

```
y_pred = LSVCClf.predict(X_test)
```

In [50]:

```
print("Training Accuracy :", LSVCClf.score(X_train, y_train))
print("Testing Accuracy :", LSVCClf.score(X_test, y_test))
```

```
Training Accuracy : 0.8418113781207975
Testing Accuracy : 0.7680436847103513
```

In [48]:

```
matrix = confusion_matrix(y_test,y_pred)
print('Confusion matrix : \n',matrix)
```

```
Confusion matrix :
 [[7330 2203]
 [1705 5610]]
```

In [49]:

```
from sklearn.ensemble import GradientBoostingClassifier
```

In [51]:

```
GB=GradientBoostingClassifier(n_estimators=2)
GB.fit(X_train, y_train)
```

Out[51]:

```
GradientBoostingClassifier(n_estimators=2)
```

In [53]:

```
y_pred = GB.predict(X_test)
```

In [54]:

```
print("Training Accuracy :", GB.score(X_train, y_train))
print("Testing Accuracy :", GB.score(X_test, y_test))
```

```
Training Accuracy : 0.5660995147050225
Testing Accuracy : 0.5661206077872745
```

In [55]:

```
matrix = confusion_matrix(y_test,y_pred)
print('Confusion matrix : \n',matrix)
```

```
Confusion matrix :
 [[9533    0]
 [7310    5]]
```

In [56]:

```
from sklearn.ensemble import RandomForestClassifier
```

In [57]:

```
rf_classifier= RandomForestClassifier(n_estimators= 10,
criterion="entropy")
rf_classifier.fit(X_train, y_train)
```

Out[57]:

```
RandomForestClassifier(criterion='entropy', n_estimators=10)
```

In [58]:

```
y_pred = rf_classifier.predict(X_test)
```

In [59]:

```
print("Training Accuracy :", rf_classifier.score(X_train, y_train))
print("Testing Accuracy :", rf_classifier.score(X_test, y_test))
```

```
Training Accuracy : 0.9817283517511548
Testing Accuracy : 0.8363603988603988
```

In [60]:

```
matrix = confusion_matrix(y_test,y_pred)
print('Confusion matrix : \n',matrix)
```

```
Confusion matrix :
 [[8496 1037]
 [1720 5595]]
```

In [ ]: