In [130]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [131]:

```
df = pd.read_csv('/kaggle/input/gender-classification/Transformed Data Set - Sheet 1.csv')
```

In [132]:

```
df
```

Out[132]:

	Favorite Color	Favorite Music Genre	Favorite Beverage	Favorite Soft Drink	Gender
0	Cool	Rock	Vodka	7UP/Sprite	F
1	Neutral	Hip hop	Vodka	Coca Cola/Pepsi	F
2	Warm	Rock	Wine	Coca Cola/Pepsi	F
3	Warm	Folk/Traditional	Whiskey	Fanta	F
4	Cool	Rock	Vodka	Coca Cola/Pepsi	F
...	...	...	...	...	...
61	Cool	Rock	Vodka	Coca Cola/Pepsi	M
62	Cool	Hip hop	Beer	Coca Cola/Pepsi	M
63	Neutral	Hip hop	Doesn't drink	Fanta	M
64	Cool	Rock	Wine	Coca Cola/Pepsi	M
65	Cool	Electronic	Beer	Coca Cola/Pepsi	M

66 rows × 5 columns

In [133]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 66 entries, 0 to 65
Data columns (total 5 columns):
 #   Column                Non-Null Count  Dtype 
---  ------                --------------  ----- 
 0   Favorite Color        66 non-null     object
 1   Favorite Music Genre  66 non-null     object
 2   Favorite Beverage     66 non-null     object
 3   Favorite Soft Drink   66 non-null     object
 4   Gender                66 non-null     object
dtypes: object(5)
memory usage: 2.7+ KB
```

In [134]:

```
df.isna().sum()
```

Out[134]:

```
Favorite Color          0
Favorite Music Genre    0
Favorite Beverage       0
Favorite Soft Drink     0
Gender                  0
dtype: int64
```

In [135]:

```
# Check for Duplicates
df.duplicated().sum()
```

Out[135]:

4

In [136]:

```
# Drop the Duplicates
df.drop_duplicates(inplace=True)
```

In [137]:

```
df.shape
```

Out[137]:

(62, 5)

Encoding the Categorical Data :

In [138]:

```
from sklearn.preprocessing import LabelEncoder

encoder = LabelEncoder()
```

In [139]:

```
df['Favorite Color'].unique()
```

Out[139]:

```
array(['Cool', 'Neutral', 'Warm'], dtype=object)
```

In [140]:

```
df['Favorite Color'] = encoder.fit_transform(df['Favorite Color'])
```

In [141]:

```
df['Favorite Music Genre'].unique()
```

Out[141]:

```
array(['Rock', 'Hip hop', 'Folk/Traditional', 'Jazz/Blues', 'Pop',
       'Electronic', 'R&B and soul'], dtype=object)
```

In [142]:

```
df['Favorite Music Genre'] = encoder.fit_transform(df['Favorite Music Genre'])
```

In [143]:

```
df['Favorite Beverage'].unique()
```

Out[143]:

```
array(['Vodka', 'Wine', 'Whiskey', "Doesn't drink", 'Beer', 'Other'],
      dtype=object)
```

In [144]:

```
df['Favorite Beverage'] = encoder.fit_transform(df['Favorite Beverage'])
```

In [145]:

```
df['Favorite Soft Drink'].unique()
```

Out[145]:

```
array(['7UP/Sprite', 'Coca Cola/Pepsi', 'Fanta', 'Other'], dtype=objec
t)
```

In [146]:

```
df['Favorite Soft Drink'] = encoder.fit_transform(df['Favorite Soft Drink'])
```

In [147]:

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

Out[147]:

```
array(['F', 'M'], dtype=object)
```

In [148]:

```
df['Gender'] = encoder.fit_transform(df['Gender'])
```

In [149]:

```
df.info()
```

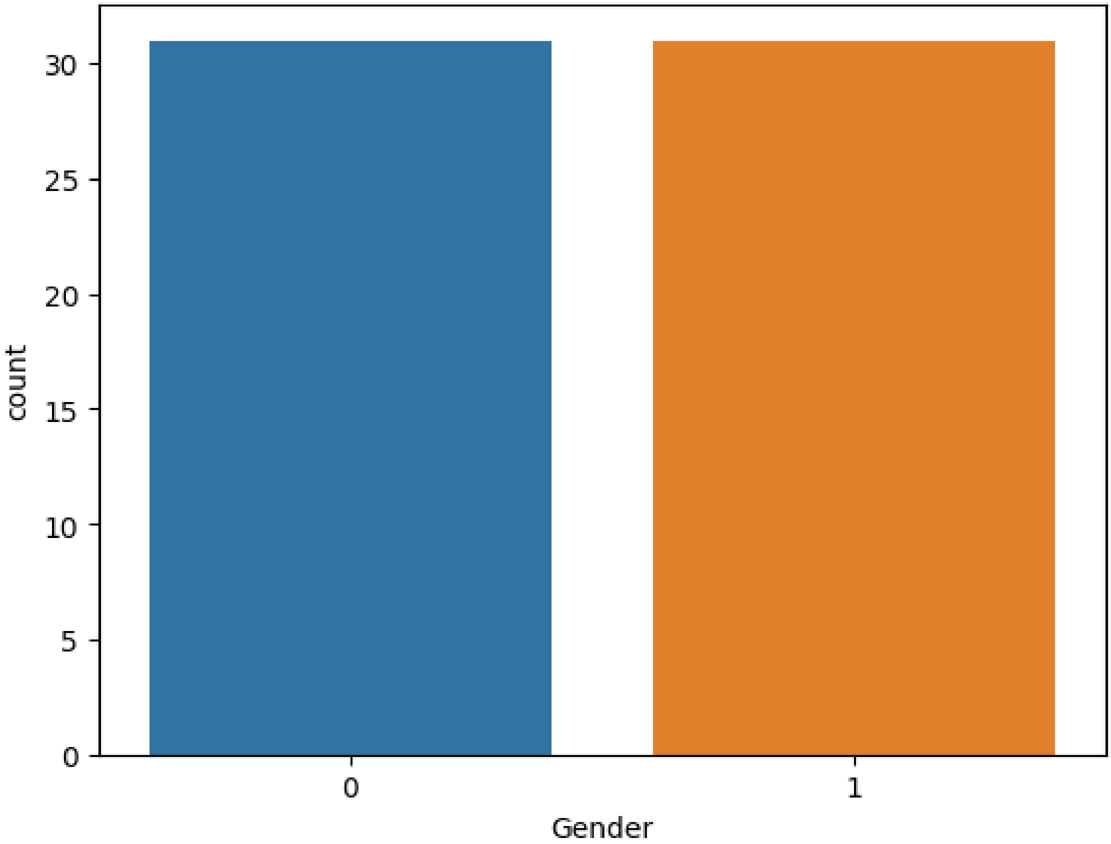
```
<class 'pandas.core.frame.DataFrame'>
Index: 62 entries, 0 to 65
Data columns (total 5 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Favorite Color        62 non-null     int64
 1   Favorite Music Genre  62 non-null     int64
 2   Favorite Beverage     62 non-null     int64
 3   Favorite Soft Drink   62 non-null     int64
 4   Gender                62 non-null     int64
dtypes: int64(5)
memory usage: 2.9 KB
```

Visualize the Data :

In [150]:

```
sns.countplot(x=df['Gender'])

plt.show()
```



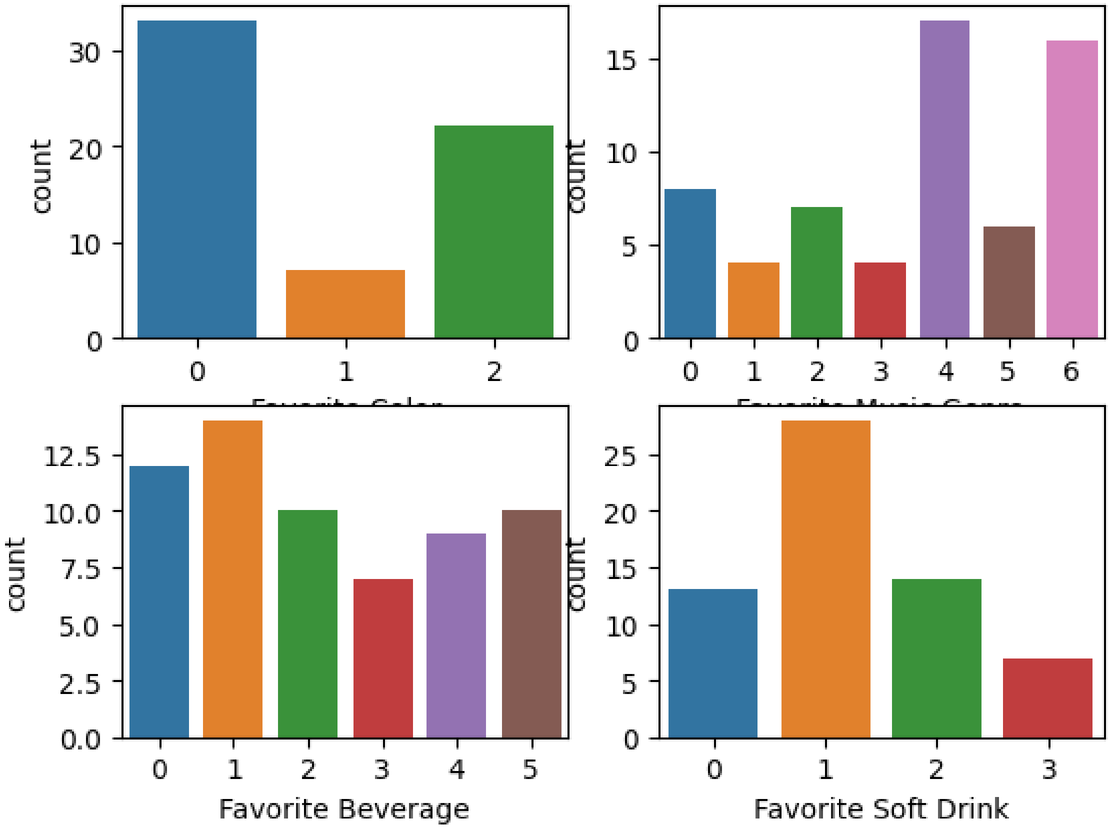
In [151]:

```
fig, ax =plt.subplots(2,2)

plt.figure(figsize=(10,12))

sns.countplot(x=df['Favorite Color'], ax=ax[0,0])
sns.countplot(x=df['Favorite Music Genre'], ax=ax[0,1])
sns.countplot(x=df['Favorite Beverage'], ax=ax[1,0])
sns.countplot(x=df['Favorite Soft Drink'], ax=ax[1,1])

plt.show()
```



<Figure size 1000x1200 with 0 Axes>

In [152]:

```
X = df.drop('Gender', axis=1)
Y = df['Gender']
```

In [153]:

```
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_state
=42)
```

Logistic Regression Model

Create and Train the Model :

In [154]:

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

In [155]:

```
log_regressor = LogisticRegression()
log_regressor.fit(x_train, y_train)
```

Out[155]:

```
▾ LogisticRegression
LogisticRegression()
```

Predict Test Set Results :

In [156]:

```
log_regr_y_pred = log_regressor.predict(x_test)
```

In [157]:

```
pd.DataFrame({'Actual':y_test, 'Predicted':log_regr_y_pred})
```

Out[157]:

	Actual	Predicted
52	1	1
58	1	0
0	0	0
59	1	1
5	0	0
50	1	1
16	0	1
12	0	0
27	0	1
63	1	1
32	0	1
9	0	0
49	1	0

Evaluate Performance of the Model :

In [158]:

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

In [159]:

```
log_regr_score = accuracy_score(y_test, log_regr_y_pred)
log_regr_score
```

Out[159]:

```
0.6153846153846154
```

In [160]:

```
log_regr_mat = confusion_matrix(y_test, log_regr_y_pred)
log_regr_mat
```

Out[160]:

```
array([[4, 3],
       [2, 4]])
```

In [161]:

```
log_regr_report = classification_report(y_test, log_regr_y_pred)
print(log_regr_report)
```

```
              precision    recall  f1-score   support

           0       0.67      0.57      0.62         7
           1       0.57      0.67      0.62         6

    accuracy                           0.62        13
   macro avg       0.62      0.62      0.62        13
weighted avg       0.62      0.62      0.62        13
```

Decision Tree

Create and Train Model :

In [162]:

```
from sklearn.tree import DecisionTreeClassifier
```

In [163]:

```
dt_clf = DecisionTreeClassifier(criterion='entropy')
dt_model = dt_clf.fit(x_train, y_train)
```

Predict Test Set Results :

In [164]:

```
dt_y_pred = dt_clf.predict(x_test)
```

In [165]:

```
pd.DataFrame({'Actual':y_test, 'Predicted':dt_y_pred})
```

Out[165]:

	Actual	Predicted
52	1	1
58	1	0
0	0	1
59	1	1
5	0	0
50	1	1
16	0	0
12	0	0
27	0	1
63	1	1
32	0	0
9	0	1
49	1	1

Evaluate Performance of the Model :

In [166]:

```
dt_score = accuracy_score(y_test, dt_y_pred)
dt_score
```

Out[166]:

```
0.6923076923076923
```

In [167]:

```
dt_mat = confusion_matrix(y_test, dt_y_pred)
dt_mat
```

Out[167]:

```
array([[4, 3],
       [1, 5]])
```

In [168]:

```
dt_report = classification_report(y_test, dt_y_pred)
print(dt_report)
```

```
              precision    recall  f1-score   support

           0       0.80      0.57      0.67         7
           1       0.62      0.83      0.71         6

    accuracy                           0.69        13
   macro avg       0.71      0.70      0.69        13
weighted avg       0.72      0.69      0.69        13
```

Plot the Tree :

In [169]:

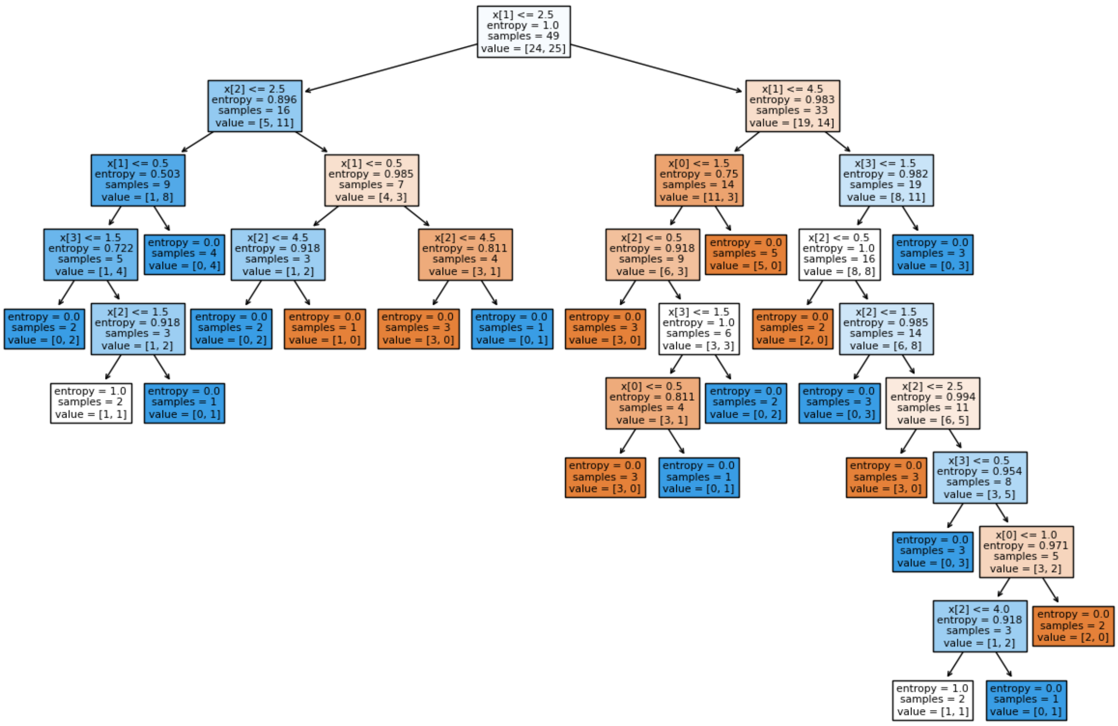
```
from sklearn import tree

plt.figure(figsize=(15,10))
tree.plot_tree(dt_model, filled=True)
```

Out[169]:

```
[Text(0.46875, 0.95, 'x[1] <= 2.5\nentropy = 1.0\nsamples = 49\nvalue
= [24, 25]'),
 Text(0.22916666666666666, 0.85, 'x[2] <= 2.5\nentropy = 0.896\nsample
s = 16\nvalue = [5, 11]'),
 Text(0.125, 0.75, 'x[1] <= 0.5\nentropy = 0.503\nsamples = 9\nvalue =
[1, 8]'),
 Text(0.08333333333333333, 0.65, 'x[3] <= 1.5\nentropy = 0.722\nsample
s = 5\nvalue = [1, 4]'),
 Text(0.041666666666666664, 0.55, 'entropy = 0.0\nsamples = 2\nvalue =
[0, 2]'),
 Text(0.125, 0.55, 'x[2] <= 1.5\nentropy = 0.918\nsamples = 3\nvalue =
[1, 2]'),
 Text(0.08333333333333333, 0.45, 'entropy = 1.0\nsamples = 2\nvalue =
[1, 1]'),
 Text(0.16666666666666666, 0.45, 'entropy = 0.0\nsamples = 1\nvalue =
[0, 1]'),
 Text(0.16666666666666666, 0.65, 'entropy = 0.0\nsamples = 4\nvalue =
[0, 4]'),
 Text(0.3333333333333333, 0.75, 'x[1] <= 0.5\nentropy = 0.985\nsamples
= 7\nvalue = [4, 3]'),
 Text(0.25, 0.65, 'x[2] <= 4.5\nentropy = 0.918\nsamples = 3\nvalue =
[1, 2]'),
 Text(0.20833333333333334, 0.55, 'entropy = 0.0\nsamples = 2\nvalue =
[0, 2]'),
 Text(0.2916666666666667, 0.55, 'entropy = 0.0\nsamples = 1\nvalue =
[1, 0]'),
 Text(0.4166666666666667, 0.65, 'x[2] <= 4.5\nentropy = 0.811\nsamples
= 4\nvalue = [3, 1]'),
 Text(0.375, 0.55, 'entropy = 0.0\nsamples = 3\nvalue = [3, 0]'),
 Text(0.4583333333333333, 0.55, 'entropy = 0.0\nsamples = 1\nvalue =
[0, 1]'),
 Text(0.7083333333333334, 0.85, 'x[1] <= 4.5\nentropy = 0.983\nsamples
= 33\nvalue = [19, 14]'),
 Text(0.625, 0.75, 'x[0] <= 1.5\nentropy = 0.75\nsamples = 14\nvalue =
[11, 3]'),
 Text(0.5833333333333334, 0.65, 'x[2] <= 0.5\nentropy = 0.918\nsamples
= 9\nvalue = [6, 3]'),
 Text(0.5416666666666666, 0.55, 'entropy = 0.0\nsamples = 3\nvalue =
[3, 0]'),
 Text(0.625, 0.55, 'x[3] <= 1.5\nentropy = 1.0\nsamples = 6\nvalue =
[3, 3]'),
 Text(0.5833333333333334, 0.45, 'x[0] <= 0.5\nentropy = 0.811\nsamples
= 4\nvalue = [3, 1]'),
 Text(0.5416666666666666, 0.35, 'entropy = 0.0\nsamples = 3\nvalue =
[3, 0]'),
 Text(0.625, 0.35, 'entropy = 0.0\nsamples = 1\nvalue = [0, 1]'),
 Text(0.6666666666666666, 0.45, 'entropy = 0.0\nsamples = 2\nvalue =
[0, 2]'),
 Text(0.6666666666666666, 0.65, 'entropy = 0.0\nsamples = 5\nvalue =
[5, 0]'),
 Text(0.7916666666666666, 0.75, 'x[3] <= 1.5\nentropy = 0.982\nsamples
= 19\nvalue = [8, 11]'),
 Text(0.75, 0.65, 'x[2] <= 0.5\nentropy = 1.0\nsamples = 16\nvalue =
[8, 8]'),
 Text(0.7083333333333334, 0.55, 'entropy = 0.0\nsamples = 2\nvalue =
[2, 0]'),
 Text(0.7916666666666666, 0.55, 'x[2] <= 1.5\nentropy = 0.985\nsamples
= 14\nvalue = [6, 8]'),
```

```
 Text(0.75, 0.45, 'entropy = 0.0\nsamples = 3\nvalue = [0, 3]'),
 Text(0.8333333333333334, 0.45, 'x[2] <= 2.5\nentropy = 0.994\nsamples
= 11\nvalue = [6, 5]'),
 Text(0.7916666666666666, 0.35, 'entropy = 0.0\nsamples = 3\nvalue =
[3, 0]'),
 Text(0.875, 0.35, 'x[3] <= 0.5\nentropy = 0.954\nsamples = 8\nvalue =
[3, 5]'),
 Text(0.8333333333333334, 0.25, 'entropy = 0.0\nsamples = 3\nvalue =
[0, 3]'),
 Text(0.9166666666666666, 0.25, 'x[0] <= 1.0\nentropy = 0.971\nsamples
= 5\nvalue = [3, 2]'),
 Text(0.875, 0.15, 'x[2] <= 4.0\nentropy = 0.918\nsamples = 3\nvalue =
[1, 2]'),
 Text(0.8333333333333334, 0.05, 'entropy = 1.0\nsamples = 2\nvalue =
[1, 1]'),
 Text(0.9166666666666666, 0.05, 'entropy = 0.0\nsamples = 1\nvalue =
[0, 1]'),
 Text(0.9583333333333334, 0.15, 'entropy = 0.0\nsamples = 2\nvalue =
[2, 0]'),
 Text(0.8333333333333334, 0.65, 'entropy = 0.0\nsamples = 3\nvalue =
[0, 3]')]
```



Random Forest Model

Create and Train the Model :

In [170]:

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

In [171]:

```
rf_clf = RandomForestClassifier(n_estimators=10, criterion='entropy')
rf_clf.fit(x_train, y_train)
```

Out[171]:

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

Predict Test Set Results :

In [172]:

```
rf_y_pred = rf_clf.predict(x_test)
```

In [173]:

```
pd.DataFrame({'Actual':y_test, 'Predicted':rf_y_pred})
```

Out[173]:

	Actual	Predicted
52	1	1
58	1	0
0	0	1
59	1	1
5	0	1
50	1	1
16	0	0
12	0	0
27	0	1
63	1	1
32	0	0
9	0	0
49	1	1

Evaluate Performance of the Model :

In [174]:

```
rf_clf_score = accuracy_score(y_test, rf_y_pred)
rf_clf_score
```

Out[174]:

```
0.6923076923076923
```

In [175]:

```
rf_clf_mat = confusion_matrix(y_test, rf_y_pred)
rf_clf_mat
```

Out[175]:

```
array([[4, 3],
       [1, 5]])
```

In [176]:

```
rf_clf_report = classification_report(y_test, rf_y_pred)
print(rf_clf_report)
```

```
              precision    recall  f1-score   support

           0       0.80      0.57      0.67         7
           1       0.62      0.83      0.71         6

    accuracy                           0.69        13
   macro avg       0.71      0.70      0.69        13
weighted avg       0.72      0.69      0.69        13
```

SVM Classifier

> **Create and Train the Model :**

In [177]:

```
from sklearn.svm import SVC
```

In [180]:

```
svm_clf = SVC(kernel='poly', degree=5, random_state=42)
svm_clf.fit(x_train, y_train)
```

Out[180]:

```
▾ SVC
SVC(degree=5, kernel='poly', random_state=42)
```

Predict Test Set Results :

In [198]:

```
svm_clf_y_pred = svm_clf.predict(x_test)
```

In [182]:

```
pd.DataFrame({'Actual':y_test, 'Predicted':svm_clf_y_pred})
```

Out[182]:

	Actual	Predicted
52	1	1
58	1	0
0	0	0
59	1	1
5	0	1
50	1	1
16	0	1
12	0	0
27	0	1
63	1	1
32	0	0
9	0	1
49	1	1

Evaluate Performance of the Model :

In [199]:

```
svm_clf_score = accuracy_score(y_test, svm_clf_y_pred)
svm_clf_score
```

Out[199]:

```
0.6153846153846154
```

In [200]:

```
svm_clf_mat = confusion_matrix(y_test, svm_clf_y_pred)
svm_clf_mat
```

Out[200]:

```
array([[3, 4],
       [1, 5]])
```

In [201]:

```
svm_clf_report = classification_report(y_test, svm_clf_y_pred)
print(svm_clf_report)
```

```
              precision    recall  f1-score   support

           0       0.75      0.43      0.55         7
           1       0.56      0.83      0.67         6

    accuracy                           0.62        13
   macro avg       0.65      0.63      0.61        13
weighted avg       0.66      0.62      0.60        13
```

KNN Classification Model

Create and Train the Model :

In [187]:

```
from sklearn.neighbors import KNeighborsClassifier
```

In [188]:

```
knn_clf = KNeighborsClassifier(n_neighbors=5, p=2, metric='minkowski')
knn_clf.fit(x_train,y_train)
```

Out[188]:

```
▾ KNeighborsClassifier
KNeighborsClassifier()
```

Predict Test Set Results :

In [190]:

```
knn_clf_y_pred = knn_clf.predict(x_test)
```

In [191]:

```
pd.DataFrame({'Actual':y_test, 'Predicted':knn_clf_y_pred})
```

Out[191]:

	Actual	Predicted
52	1	1
58	1	0
0	0	1
59	1	1
5	0	0
50	1	0
16	0	1
12	0	0
27	0	0
63	1	1
32	0	0
9	0	0
49	1	1

Evaluate Performance of the Model :

In [195]:

```
knn_clf_score = accuracy_score(y_test, knn_clf_y_pred)
knn_clf_score
```

Out[195]:

```
0.6923076923076923
```

In [196]:

```
knn_clf_mat = confusion_matrix(y_test, knn_clf_y_pred)
knn_clf_mat
```

Out[196]:

```
array([[5, 2],
       [2, 4]])
```

In [197]:

```
knn_clf_report = classification_report(y_test, knn_clf_y_pred)
print(knn_clf_report)
```

```
              precision    recall  f1-score   support

           0       0.71      0.71      0.71         7
           1       0.67      0.67      0.67         6

    accuracy                           0.69        13
   macro avg       0.69      0.69      0.69        13
weighted avg       0.69      0.69      0.69        13
```

Compare Performances of all the Models

In [211]:

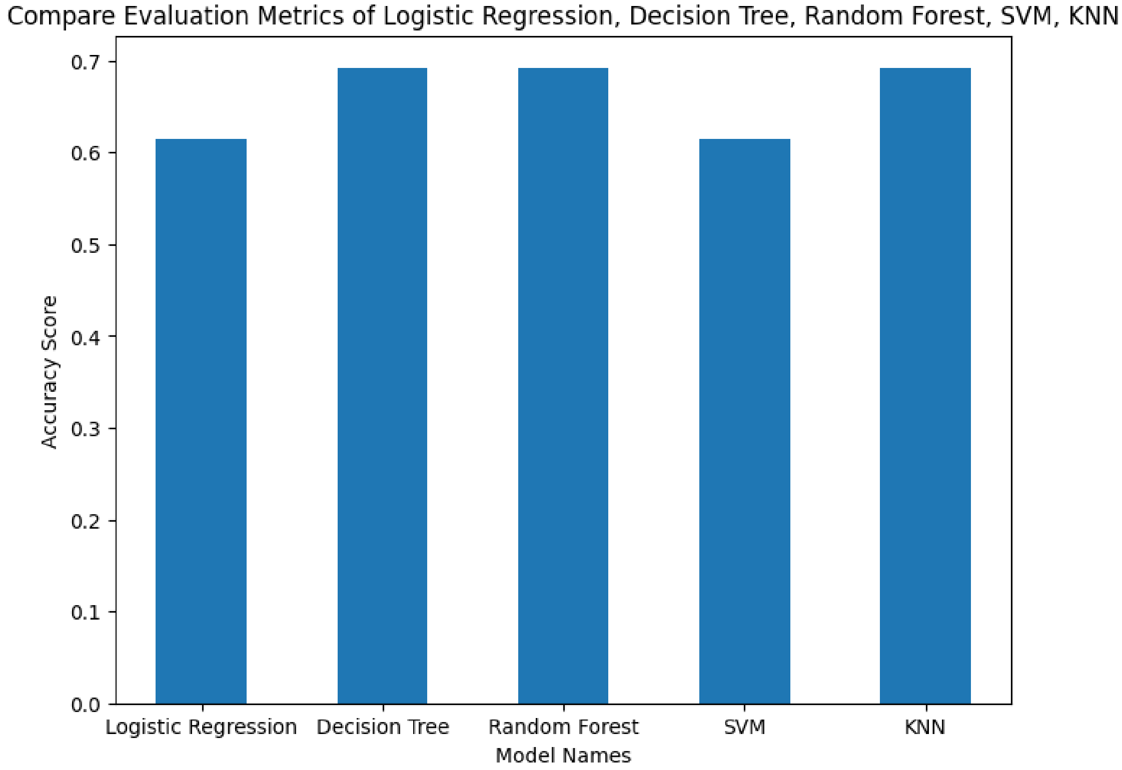
```
data = [log_regr_score, dt_score, rf_clf_score, svm_clf_score, knn_clf_score]
categories = ['Logistic Regression', 'Decision Tree', 'Random Forest', 'SVM', 'KN
N']

plt.figure(figsize=(8,6))

plt.bar(categories, data, width=0.50)

plt.xlabel('Model Names')
plt.ylabel('Accuracy Score')
plt.title('Compare Evaluation Metrics of Logistic Regression, Decision Tree, Random
Forest, SVM, KNN')

# Show the plot
plt.show()
```



(Decision_Tree == Random_Forest == KNN) > (Logistic_Regression == SVM)

In [ ]:

```
```