Comparison of Individual, Bagging and Boosting Algorithms

In [1]:

```
# !pip install xgboost -q
```

In [2]:

```
# import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score
from sklearn.preprocessing import LabelEncoder
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from xgboost import XGBClassifier
```

In [3]:

```
# import the data
df = sns.load_dataset('diamonds')
```

In [4]:

```
df.head()
```

Out[4]:

	carat	cut	color	clarity	depth	table	price	x	y	z
0	0.23	Ideal	E	SI2	61.5	55.0	326	3.95	3.98	2.43
1	0.21	Premium	E	SI1	59.8	61.0	326	3.89	3.84	2.31
2	0.23	Good	E	VS1	56.9	65.0	327	4.05	4.07	2.31
3	0.29	Premium	I	VS2	62.4	58.0	334	4.20	4.23	2.63
4	0.31	Good	J	SI2	63.3	58.0	335	4.34	4.35	2.75

In [5]:

```
df.shape
```

Out[5]:

```
(53940, 10)
```

In [6]:

```
# split the data into X and y
X = df.drop('cut', axis=1)
y = df['cut']

# encode the input variables
le = LabelEncoder()
X['color'] = le.fit_transform(X['color'])
X['clarity'] = le.fit_transform(X['clarity'])

# encode the target variable
y = le.fit_transform(y)

# split the data into train and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2)
```

In [7]:

```
%%time
# train the decision tree model
dt = DecisionTreeClassifier()
dt.fit(X_train, y_train)

# predict the test data
y_pred = dt.predict(X_test)

print('Accuracy score: ', accuracy_score(y_test, y_pred))
print('Precision score: ', precision_score(y_test, y_pred, average='micro'))
print('Recall score: ', recall_score(y_test, y_pred, average='micro'))
print('F1 score: ', f1_score(y_test, y_pred, average='micro'))
```

```
Accuracy score:  0.7087504634779385
Precision score:  0.7087504634779385
Recall score:  0.7087504634779385
F1 score:  0.7087504634779384
CPU times: total: 750 ms
Wall time: 797 ms
```

In [8]:

```
%%time
# train the random forest model
rf = RandomForestClassifier()
rf.fit(X_train, y_train)

# predict the test data
```

```
y_pred = rf.predict(X_test)

print('Accuracy score: ', accuracy_score(y_test, y_pred))
print('Precision score: ', precision_score(y_test, y_pred, average='micro'))
print('Recall score: ', recall_score(y_test, y_pred, average='micro'))
print('F1 score: ', f1_score(y_test, y_pred, average='micro'))
```

```
Accuracy score:  0.7846681497960697
Precision score:  0.7846681497960697
Recall score:  0.7846681497960697
F1 score:  0.7846681497960697
CPU times: total: 17.6 s
Wall time: 18.8 s
```

In [9]:

```
%%time
# train the xgboost model
xgb = XGBClassifier()
xgb.fit(X_train, y_train)

# predict the test data
y_pred = xgb.predict(X_test)

print('Accuracy score: ', accuracy_score(y_test, y_pred))
print('Precision score: ', precision_score(y_test, y_pred, average='micro'))
print('Recall score: ', recall_score(y_test, y_pred, average='micro'))
print('F1 score: ', f1_score(y_test, y_pred, average='micro'))
```

```
Accuracy score:  0.7997775305895439
Precision score:  0.7997775305895439
Recall score:  0.7997775305895439
F1 score:  0.7997775305895439
CPU times: total: 20.1 s
Wall time: 2.98 s
```

In [10]:

```
# make a bar plot showing each of the matrix with respect to the model
plt.figure(figsize=(15, 4))
plt.subplot(1, 4, 1)
sns.barplot(x=['Accuracy', 'Precision', 'Recall', 'F1'], y=[accuracy_score(y_test, y_pred),
                                                            precision_score(y_test, y_pred, average='micro'),
                                                            recall_score(y_test, y_pred, average='micro'),
                                                            f1_score(y_test, y_pred, average='micro')])
plt.title('Decision Tree')
plt.subplot(1, 4, 2)
```

```
sns.barplot(x=['Accuracy', 'Precision', 'Recall', 'F1'], y=[accuracy_score(y_test, y_pred),
                                                          precision_score(y_test, y_pred, average='micro'),
                                                          recall_score(y_test, y_pred, average='micro'),
                                                          f1_score(y_test, y_pred, average='micro')])
plt.title('Random Forest')
plt.subplot(1, 4, 3)
sns.barplot(x=['Accuracy', 'Precision', 'Recall', 'F1'], y=[accuracy_score(y_test, y_pred),
                                                          precision_score(y_test, y_pred, average='micro'),
                                                          recall_score(y_test, y_pred, average='micro'),
                                                          f1_score(y_test, y_pred, average='micro')])
plt.title('XGBoost')
# plt.tight_layout()
plt.show()
```

```
C:\Users\ustb\.anaconda\anwaar\Lib\site-packages\seaborn\_oldcore.py:1765: FutureWarning: unique with argument that i
s not not a Series, Index, ExtensionArray, or np.ndarray is deprecated and will raise in a future version.
  order = pd.unique(vector)
C:\Users\ustb\.anaconda\anwaar\Lib\site-packages\seaborn\_oldcore.py:1765: FutureWarning: unique with argument that i
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s not not a Series, Index, ExtensionArray, or np.ndarray is deprecated and will raise in a future version.
  order = pd.unique(vector)
```

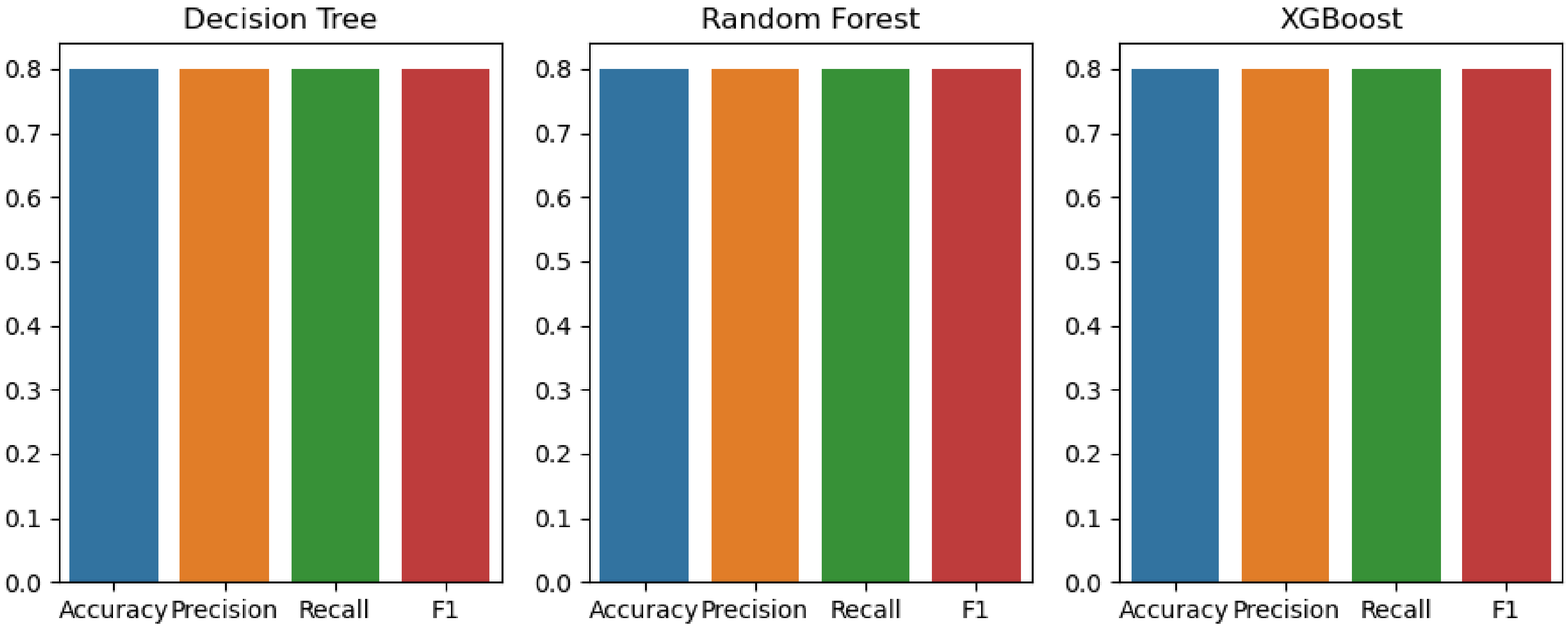
Decision Tree
Random Forest
XGBoost
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Accuracy
Precision
Recall
F1