In [1]:
```
import warnings
```

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

In [3]:
```
import pandas as pd
```

1.Display Top 5 Rows of The Dataset

In [4]:
```
data = pd.read_csv('car data.xls')
```

In [5]:
```
data.head()
```

Out[5]:

	Car_Name	Year	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Transı
0	ritz	2014	3.35	5.59	27000	Petrol	Dealer	
1	sx4	2013	4.75	9.54	43000	Diesel	Dealer	
2	ciaz	2017	7.25	9.85	6900	Petrol	Dealer	
3	wagon r	2011	2.85	4.15	5200	Petrol	Dealer	
4	swift	2014	4.60	6.87	42450	Diesel	Dealer	

In [6]:
```
data.tail()
```

Out[6]:

	Car_Name	Year	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Trar
296	city	2016	9.50	11.6	33988	Diesel	Dealer	
297	brio	2015	4.00	5.9	60000	Petrol	Dealer	
298	city	2009	3.35	11.0	87934	Petrol	Dealer	
299	city	2017	11.50	12.5	9000	Diesel	Dealer	
300	brio	2016	5.30	5.9	5464	Petrol	Dealer	

3.Find the shape of the Dataset(Number of Rows And Number of Columns)

In [7]:
```
data.shape
```

Out[7]:
```
(301, 9)
```

In [8]:
```
print("Number of Rows",data.shape[0])
print("Number of Columns",data.shape[1])
```

```
Number of Rows 301
Number of Columns 9
```

4. Getting Entire Information About Our Dataset

In [9]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 301 entries, 0 to 300
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Car_Name       301 non-null    object 
 1   Year           301 non-null    int64  
 2   Selling_Price  301 non-null    float64
 3   Present_Price  301 non-null    float64
 4   Kms_Driven     301 non-null    int64  
 5   Fuel_Type      301 non-null    object 
 6   Seller_Type    301 non-null    object 
 7   Transmission   301 non-null    object 
 8   Owner          301 non-null    int64  
dtypes: float64(2), int64(3), object(4)
memory usage: 21.3+ KB
```

5 Checking Any Null Values In The Dataset

In [10]:
```
data.isnull().sum()
```

Out[10]:
```
Car_Name         0
Year             0
Selling_Price    0
Present_Price    0
Kms_Driven       0
Fuel_Type        0
Seller_Type      0
Transmission     0
Owner            0
dtype: int64
```

6. Get Overall Statistics About The Dataset

In [11]:
```
data.describe()
```

Out[11]:

	Year	Selling_Price	Present_Price	Kms_Driven	Owner
count	301.000000	301.000000	301.000000	301.000000	301.000000
mean	2013.627907	4.661296	7.628472	36947.205980	0.043189
std	2.891554	5.082812	8.644115	38886.883882	0.247915
min	2003.000000	0.100000	0.320000	500.000000	0.000000
25%	2012.000000	0.900000	1.200000	15000.000000	0.000000
50%	2014.000000	3.600000	6.400000	32000.000000	0.000000
75%	2016.000000	6.000000	9.900000	48767.000000	0.000000
max	2018.000000	35.000000	92.600000	500000.000000	3.000000

In [12]:
```
data.head()
```

Out[12]:

	Car_Name	Year	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Transı
0	ritz	2014	3.35	5.59	27000	Petrol	Dealer	
1	sx4	2013	4.75	9.54	43000	Diesel	Dealer	
2	ciaz	2017	7.25	9.85	6900	Petrol	Dealer	
3	wagon r	2011	2.85	4.15	5200	Petrol	Dealer	
4	swift	2014	4.60	6.87	42450	Diesel	Dealer	

In [13]:
```
import datetime
```

In [14]:
```
date_time = datetime.datetime.now()
```

In [15]:
```
data['Age']=date_time.year - data['Year']
```

In [16]:
```
data.head()
```

Out[16]:

	Car_Name	Year	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Transı
0	ritz	2014	3.35	5.59	27000	Petrol	Dealer	
1	sx4	2013	4.75	9.54	43000	Diesel	Dealer	
2	ciaz	2017	7.25	9.85	6900	Petrol	Dealer	
3	wagon r	2011	2.85	4.15	5200	Petrol	Dealer	
4	swift	2014	4.60	6.87	42450	Diesel	Dealer	

In [17]:
```
data.drop('Year',axis=1,inplace=True)
```

In [18]:
```
data.head()
```

Out[18]:

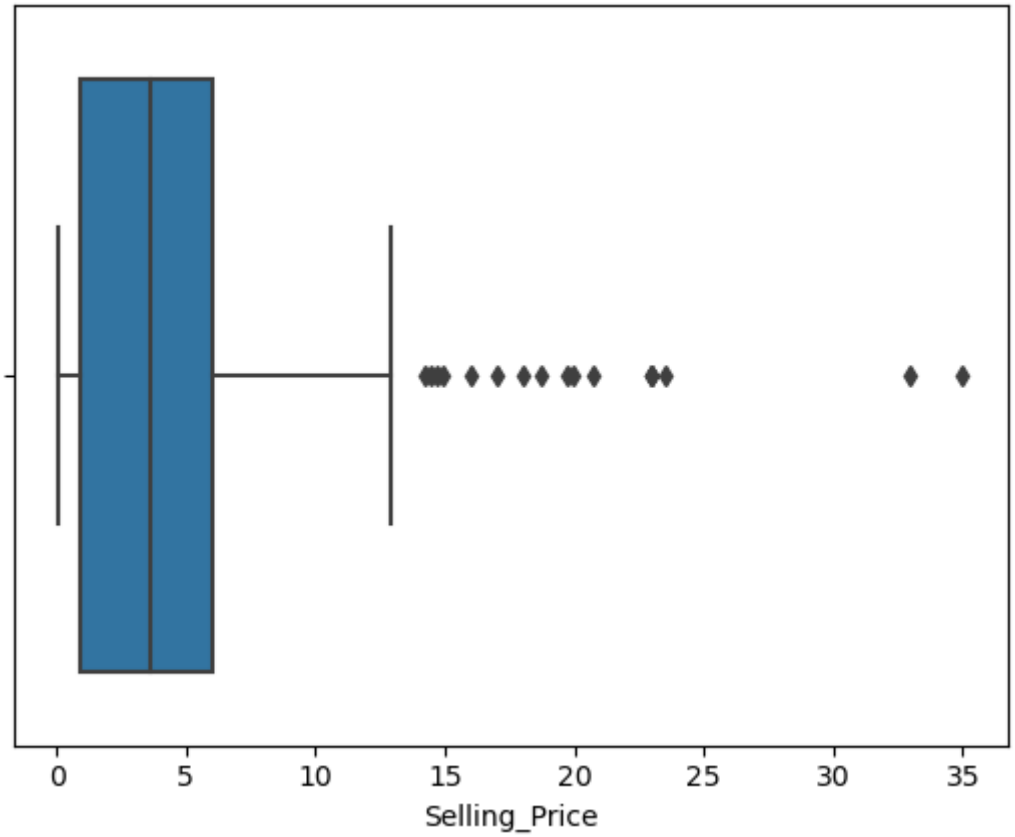
	Car_Name	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Transmissior
0	ritz	3.35	5.59	27000	Petrol	Dealer	Manua
1	sx4	4.75	9.54	43000	Diesel	Dealer	Manua
2	ciaz	7.25	9.85	6900	Petrol	Dealer	Manua
3	wagon r	2.85	4.15	5200	Petrol	Dealer	Manua
4	swift	4.60	6.87	42450	Diesel	Dealer	Manua

Outlier Removal

In [19]:
```
import seaborn as sns
```

In [20]:
```
sns.boxplot(data['Selling_Price'])
```

Out[20]:
```
<AxesSubplot:xlabel='Selling_Price'>
```



In [21]:
```
sorted(data['Selling_Price'],reverse=True)
```

Out[21]:
```
[35.0,
 33.0,
 23.5,
 23.0,
 23.0,
 23.0,
 20.75,
 19.99,
 19.75,
 18.75,
 18.0,
 17.0,
 16.0,
 14.9,
 14.73,
 14.5,
 14.25,
 12.9,
 12.5,
```

In [22]:
```
data = data[~(data['Selling_Price']>=33.0) & (data['Selling_Price']<=35.0)]
```

In [23]:
```
data.shape
```

Out[23]:
```
(299, 9)
```

Encoding the Categorical Columns

In [24]:
```
data.head()
```

Out[24]:

	Car_Name	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Transmissior
0	ritz	3.35	5.59	27000	Petrol	Dealer	Manua
1	sx4	4.75	9.54	43000	Diesel	Dealer	Manua
2	ciaz	7.25	9.85	6900	Petrol	Dealer	Manua
3	wagon r	2.85	4.15	5200	Petrol	Dealer	Manua
4	swift	4.60	6.87	42450	Diesel	Dealer	Manua

In [25]:
```
data['Fuel_Type'].unique()
```

Out[25]:
```
array(['Petrol', 'Diesel', 'CNG'], dtype=object)
```

In [26]:
```
data['Fuel_Type'] = data['Fuel_Type'].map({'Petrol':0,'Diesel':1,'CNG':2})
```

In [27]:
```
data['Fuel_Type'].unique()
```

Out[27]:
```
array([0, 1, 2], dtype=int64)
```

In [28]:
```
data['Seller_Type'].unique()
```

Out[28]:
```
array(['Dealer', 'Individual'], dtype=object)
```

In [29]:
```
data['Seller_Type'] = data['Seller_Type'].map({'Dealer':0,'Individual':1})
```

In [30]:
```
data['Seller_Type'].unique()
```

Out[30]:
```
array([0, 1], dtype=int64)
```

In [31]:
```
data['Transmission'].unique()
```

Out[31]:
```
array(['Manual', 'Automatic'], dtype=object)
```

In [32]:
```
data['Transmission'] =data['Transmission'].map({'Manual':0,'Automatic':1})
```

In [33]:
```
data['Transmission'].unique()
```

Out[33]:
```
array([0, 1], dtype=int64)
```

In [34]:
```
data.head()
```

Out[34]:

	Car_Name	Selling_Price	Present_Price	Kms_Driven	Fuel_Type	Seller_Type	Transmissior
0	ritz	3.35	5.59	27000	0	0	0
1	sx4	4.75	9.54	43000	1	0	0
2	ciaz	7.25	9.85	6900	0	0	0
3	wagon r	2.85	4.15	5200	0	0	0
4	swift	4.60	6.87	42450	1	0	0

8.Store Feature Matix In X and Response(Target) In Vector y

In [35]:
```
X = data.drop(['Car_Name','Selling_Price'],axis=1)
y = data['Selling_Price']
```

In [36]:
```
y
```

Out[36]:
```
0       3.35
1       4.75
2       7.25
3       2.85
4       4.60
       ...
296     9.50
297     4.00
298     3.35
299    11.50
300     5.30
Name: Selling_Price, Length: 299, dtype: float64
```

9. Splitting The Dataset Into The Training Set And Test Set

In [37]:
```
from sklearn.model_selection import train_test_split
```

In [38]:
```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.20,random_st
```

10. Import The models

In [39]:
```
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.ensemble import GradientBoostingRegressor
from xgboost import XGBRegressor
```

Model Training

In [40]:
```
lr = LinearRegression()
lr.fit(X_train,y_train)

rf = RandomForestRegressor()
rf.fit(X_train,y_train)

xgb = GradientBoostingRegressor()
xgb.fit(X_train,y_train)

xg = XGBRegressor()
xg.fit(X_train,y_train)
```

Out[40]:
```
XGBRegressor(base_score=None, booster=None, callbacks=None,
             colsample_bylevel=None, colsample_bynode=None,
             colsample_bytree=None, device=None, early_stopping_rounds=Non
e,
             enable_categorical=False, eval_metric=None, feature_types=Non
e,
             gamma=None, grow_policy=None, importance_type=None,
             interaction_constraints=None, learning_rate=None, max_bin=Non
e,
             max_cat_threshold=None, max_cat_to_onehot=None,
             max_delta_step=None, max_depth=None, max_leaves=None,
             min_child_weight=None, missing=nan, monotone_constraints=Non
e,
             multi_strategy=None, n_estimators=None, n_jobs=None,
             num_parallel_tree=None, random_state=None, ...)
```

Prediction on Test Data

In [41]:
```
y_pred1 = lr.predict(X_test)
y_pred2 = rf.predict(X_test)
y_pred3 = xgb.predict(X_test)
y_pred4 = xg.predict(X_test)
```

13.Evaluating the Algorithm

In [42]:
```
from sklearn import metrics
```

In [43]:
```
score1 = metrics.r2_score(y_test,y_pred1)
score2 = metrics.r2_score(y_test,y_pred2)
score3 = metrics.r2_score(y_test,y_pred3)
score4 = metrics.r2_score(y_test,y_pred4)
```

In [44]:
```
print(score1,score2,score3,score4)
```

```
0.6790884983129402 0.753978289874026 0.8808282518332534 0.8887471822279068
```

In [45]:
```
final_data = pd.DataFrame({'Models':['LR','RF','GBR','XG'],
             "R2_SCORE":[score1,score2,score3,score4]})
```

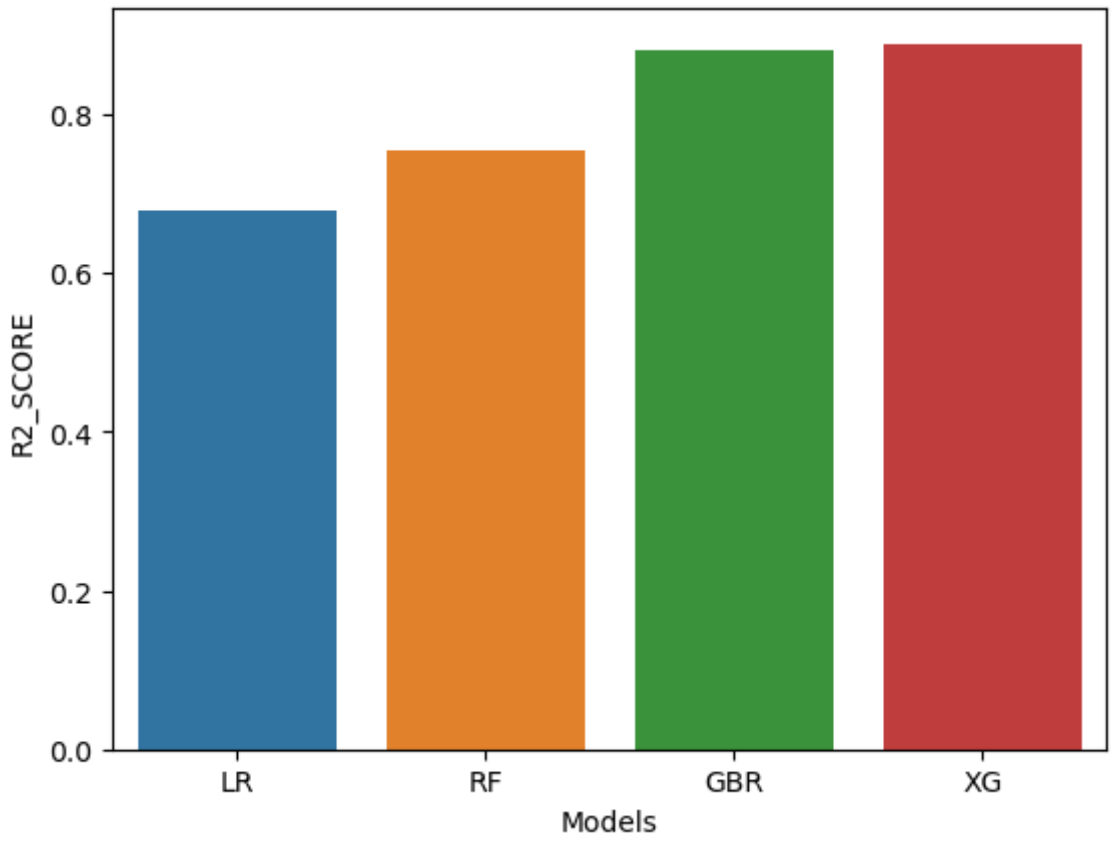
In [46]:
```
final_data
```

Out[46]:

	Models	R2_SCORE
0	LR	0.679088
1	RF	0.753978
2	GBR	0.880828
3	XG	0.888747

In [47]:
```
sns.barplot(final_data['Models'],final_data['R2_SCORE'])
```

Out[47]:
```
<AxesSubplot:xlabel='Models', ylabel='R2_SCORE'>
```



14. Save The Model

In [48]:
```
xg = XGBRegressor()
xg_final = xg.fit(X,y)
```

In [49]:
```
import joblib
```

In [50]:
```
joblib.dump(xg_final,'car_price_predictor')
```

Out[50]:
```
['car_price_predictor']
```

In [51]:
```
model = joblib.load('car_price_predictor')
```

15. Predicted on New Data

In [52]:
```
import pandas as pd
data_new = pd.DataFrame({
    'Present_Price':5.97,
    'Kms_Driven':25000,
    'Fuel_Type':0,
    'Seller_Type':0,
    'Transmission':0,
    'Owner':0,
    'Age':8
},index=[0])
```

In [53]:
```
model.predict(data_new)
```

Out[53]:
```
array([4.9346933], dtype=float32)
```

GUI

In [ ]:

```
from tkinter import *
import joblib

def show_entry_fields():
    p1=float(e1.get())
    p2=float(e2.get())
    p3=float(e3.get())
    p4=float(e4.get())
    p5=float(e5.get())
    p6=float(e6.get())
    p7=float(e7.get())

    model = joblib.load('car_price_predictor')
    data_new = pd.DataFrame({
    'Present_Price':p1,
    'Kms_Driven':p2,
    'Fuel_Type':p3,
    'Seller_Type':p4,
    'Transmission':p5,
    'Owner':p6,
    'Age':p7
},index=[0])
    result=model.predict(data_new)
    Label(master, text="Car Purchase amount").grid(row=8)
    Label(master, text=result).grid(row=10)
    print("Car Purchase amount", result[0])

master = Tk()
master.title("Car Price Prediction Using Machine Learning")
label = Label(master, text = "Car Price Prediction Using Machine Learning"
                          , bg = "black", fg = "white"). \
                               grid(row=0,columnspan=2)
Label(master, text="Present_Price").grid(row=1)
Label(master, text="Kms_Driven").grid(row=2)
Label(master, text="Fuel_Type").grid(row=3)
Label(master, text="Seller_Type").grid(row=4)
Label(master, text="Transmission").grid(row=5)
Label(master, text="Owner").grid(row=6)
Label(master, text="Age").grid(row=7)


e1 = Entry(master)
e2 = Entry(master)
e3 = Entry(master)
e4 = Entry(master)
e5 = Entry(master)
e6 = Entry(master)
e7 = Entry(master)


e1.grid(row=1, column=1)
e2.grid(row=2, column=1)
e3.grid(row=3, column=1)
e4.grid(row=4, column=1)
e5.grid(row=5, column=1)
e6.grid(row=6, column=1)
e7.grid(row=7, column=1)


Button(master, text='Predict', command=show_entry_fields).grid()
```

```
mainloop()

Label(master, text="Present_Price").grid(row=1)
Label(master, text="Kms_Driven").grid(row=2)
Label(master, text="Fuel_Type").grid(row=3)
Label(master, text="Seller_Type").grid(row=4)
Label(master, text="Transmission").grid(row=5)
Label(master, text="Owner").grid(row=6)
Label(master, text="Age").grid(row=7)


e1 = Entry(master)
e2 = Entry(master)
e3 = Entry(master)
e4 = Entry(master)
e5 = Entry(master)
e6 = Entry(master)
e7 = Entry(master)


e1.grid(row=1, column=1)
e2.grid(row=2, column=1)
e3.grid(row=3, column=1)
e4.grid(row=4, column=1)
e5.grid(row=5, column=1)
e6.grid(row=6, column=1)
e7.grid(row=7, column=1)


Button(master, text='Predict', command=show_entry_fields).grid()

mainloop()
```

In [ ]:

In [ ]: