In [61]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import LabelEncoder
from sklearn import metrics
import math
```

In [62]:

```
sales_data = pd.read_csv("train.csv")
sales_data.head()
```

Out[62]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Establishment
0	**FDA15**	**9.30**	**Low Fat**	**0.016047**	**Dairy**	**249.8092**	**OUT049**	
1	**DRC01**	**5.92**	**Regular**	**0.019278**	**Soft Drinks**	**48.2692**	**OUT018**	
2	**FDN15**	**17.50**	**Low Fat**	**0.016760**	**Meat**	**141.6180**	**OUT049**	
3	**FDX07**	**19.20**	**Regular**	**0.000000**	**Fruits and Vegetables**	**182.0950**	**OUT010**	
4	**NCD19**	**8.93**	**Low Fat**	**0.000000**	**Household**	**53.8614**	**OUT013**	

In [63]:

```
sales_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8523 entries, 0 to 8522
Data columns (total 12 columns):
 #   Column                     Non-Null Count  Dtype
---  ------                     --------------  -----
 0   Item_Identifier            8523 non-null   object
 1   Item_Weight                7060 non-null   float64
 2   Item_Fat_Content           8523 non-null   object
 3   Item_Visibility            8523 non-null   float64
 4   Item_Type                  8523 non-null   object
 5   Item_MRP                   8523 non-null   float64
 6   Outlet_Identifier          8523 non-null   object
 7   Outlet_Establishment_Year  8523 non-null   int64
 8   Outlet_Size                6113 non-null   object
 9   Outlet_Location_Type       8523 non-null   object
 10  Outlet_Type                8523 non-null   object
 11  Item_Outlet_Sales          8523 non-null   float64
dtypes: float64(4), int64(1), object(7)
memory usage: 799.2+ KB
```

In [64]:

```
sales_data.isnull().sum()
```

Out[64]:

```
Item_Identifier                 0
Item_Weight                  1463
Item_Fat_Content                0
Item_Visibility                 0
```

```
Item_Type                       0
Item_MRP                        0
Outlet_Identifier               0
Outlet_Establishment_Year       0
Outlet_Size                  2410
Outlet_Location_Type            0
Outlet_Type                     0
Item_Outlet_Sales               0
dtype: int64
```

In [65]:

```
# Imputation
sales_data['Item_Weight'] = sales_data['Item_Weight'].fillna(sales_data['Item_Weight'].mean())
sales_data['Outlet_Size'] = sales_data['Outlet_Size'].fillna(sales_data['Outlet_Size'].mode()[0])
sales_data.isnull().sum()
```

Out[65]:

```
Item_Identifier              0
Item_Weight                  0
Item_Fat_Content             0
Item_Visibility              0
Item_Type                    0
Item_MRP                     0
Outlet_Identifier            0
Outlet_Establishment_Year    0
Outlet_Size                  0
Outlet_Location_Type         0
Outlet_Type                  0
Item_Outlet_Sales            0
dtype: int64
```

In [66]:

```
sales_data.head()
```

Out[66]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Establishment
0	**FDA15**	**9.30**	**Low Fat**	**0.016047**	**Dairy**	**249.8092**	**OUT049**	
1	**DRC01**	**5.92**	**Regular**	**0.019278**	**Soft Drinks**	**48.2692**	**OUT018**	
2	**FDN15**	**17.50**	**Low Fat**	**0.016760**	**Meat**	**141.6180**	**OUT049**	
3	**FDX07**	**19.20**	**Regular**	**0.000000**	**Fruits and Vegetables**	**182.0950**	**OUT010**	
4	**NCD19**	**8.93**	**Low Fat**	**0.000000**	**Household**	**53.8614**	**OUT013**	

In [67]:

```
sales_data['Item_Fat_Content'].value_counts()
```

Out[67]:

```
Low Fat    5089
Regular    2889
LF          316
reg         117
low fat     112
Name: Item_Fat_Content, dtype: int64
```

In [68]:

```
sales_data.describe()
```

Out[68]:

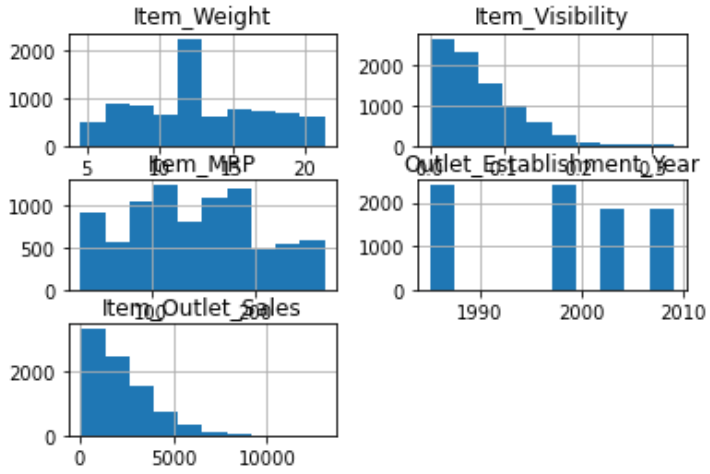
	Item_Weight	Item_Visibility	Item_MRP	Outlet_Establishment_Year	Item_Outlet_Sales
count	8523.000000	8523.000000	8523.000000	8523.000000	8523.000000
mean	12.857645	0.066132	140.992782	1997.831867	2181.288914
std	4.226124	0.051598	62.275067	8.371760	1706.499616
min	4.555000	0.000000	31.290000	1985.000000	33.290000
25%	9.310000	0.026989	93.826500	1987.000000	834.247400
50%	12.857645	0.053931	143.012800	1999.000000	1794.331000
75%	16.000000	0.094585	185.643700	2004.000000	3101.296400
max	21.350000	0.328391	266.888400	2009.000000	13086.964800

In [69]:

```
sales_data.hist()
```

Out[69]:

```
array([[<AxesSubplot:title={'center':'Item_Weight'}>,
        <AxesSubplot:title={'center':'Item_Visibility'}>],
       [<AxesSubplot:title={'center':'Item_MRP'}>,
        <AxesSubplot:title={'center':'Outlet_Establishment_Year'}>],
       [<AxesSubplot:title={'center':'Item_Outlet_Sales'}>,
        <AxesSubplot:>]], dtype=object)
```



In [70]:

```
# Low Fat, LF and low fat are all same and Regular and reg are same so we need to combine them.
sales_data.replace({'Item_Fat_Content':{'low fat':'Low Fat','LF':'Low Fat','reg':'Regular'}},inplace=True)
sales_data['Item_Fat_Content'].value_counts()
```

Out[70]:

```
Low Fat    5517
Regular    3006
Name: Item_Fat_Content, dtype: int64
```

In [71]:

```
encoder = LabelEncoder()
sales_data['Item_Identifier'] = encoder.fit_transform(sales_data['Item_Identifier'])
sales_data['Item_Fat_Content'] = encoder.fit_transform(sales_data['Item_Fat_Content'])
sales_data['Item_Type'] = encoder.fit_transform(sales_data['Item_Type'])
# le_name_mapping = dict(zip(encoder.classes_, encoder.transform(encoder.classes_)))
# print(le_name_mapping)
sales_data['Outlet_Identifier'] = encoder.fit_transform(sales_data['Outlet_Identifier'])
```

```
sales_data['Outlet_Size'] = encoder.fit_transform(sales_data['Outlet_Size'])
sales_data['Outlet_Location_Type'] = encoder.fit_transform(sales_data['Outlet_Location_Ty
pe'])
sales_data['Outlet_Type'] = encoder.fit_transform(sales_data['Outlet_Type'])


sales_data.head()
```

Out[71]:

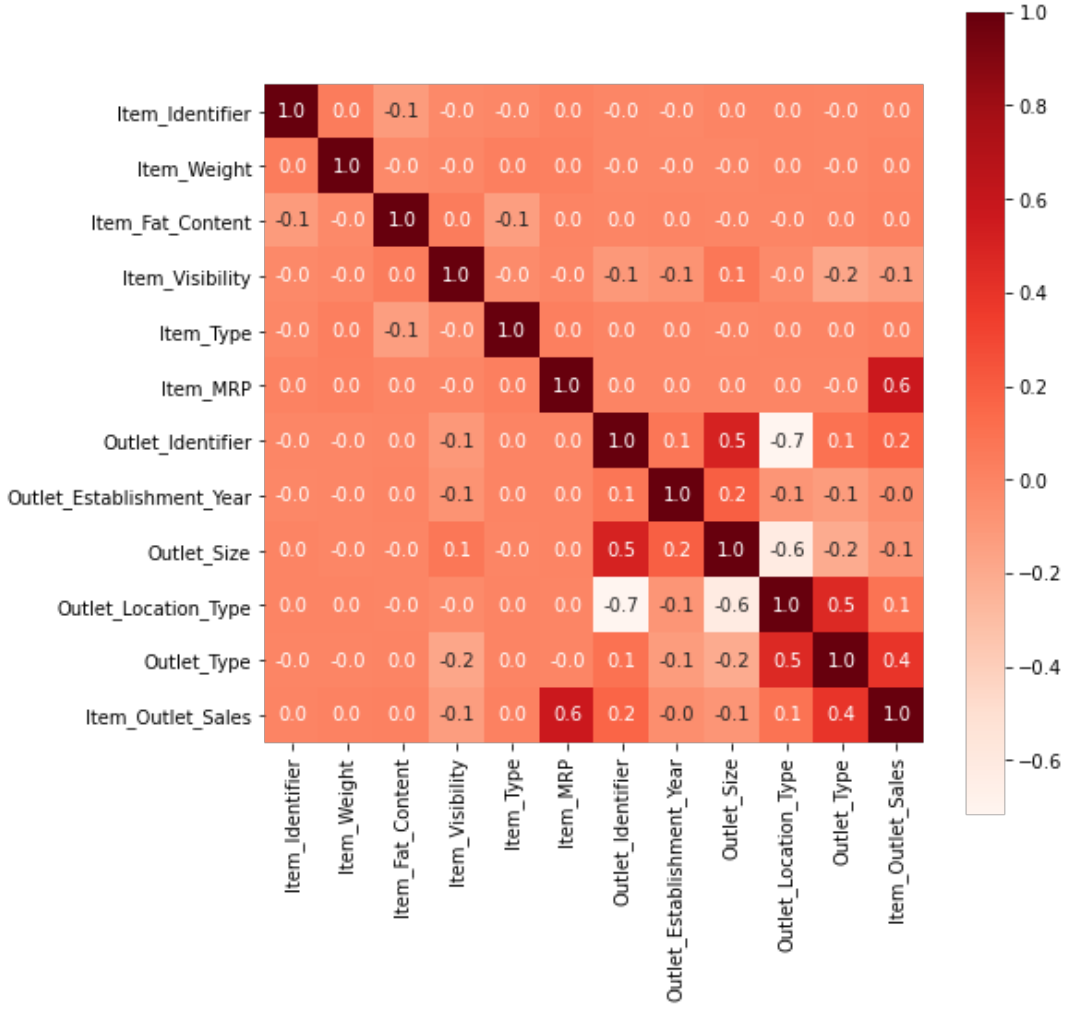
	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Establishment_
0	156	9.30	0	0.016047	4	249.8092	9	
1	8	5.92	1	0.019278	14	48.2692	3	
2	662	17.50	0	0.016760	10	141.6180	9	
3	1121	19.20	1	0.000000	6	182.0950	0	
4	1297	8.93	0	0.000000	9	53.8614	1	

In [72]:

```
corr = sales_data.corr()
plt.figure(figsize=(8,8))
sns.heatmap(corr,cbar=True,square=True,fmt='.1f',annot=True,cmap='Reds')
```

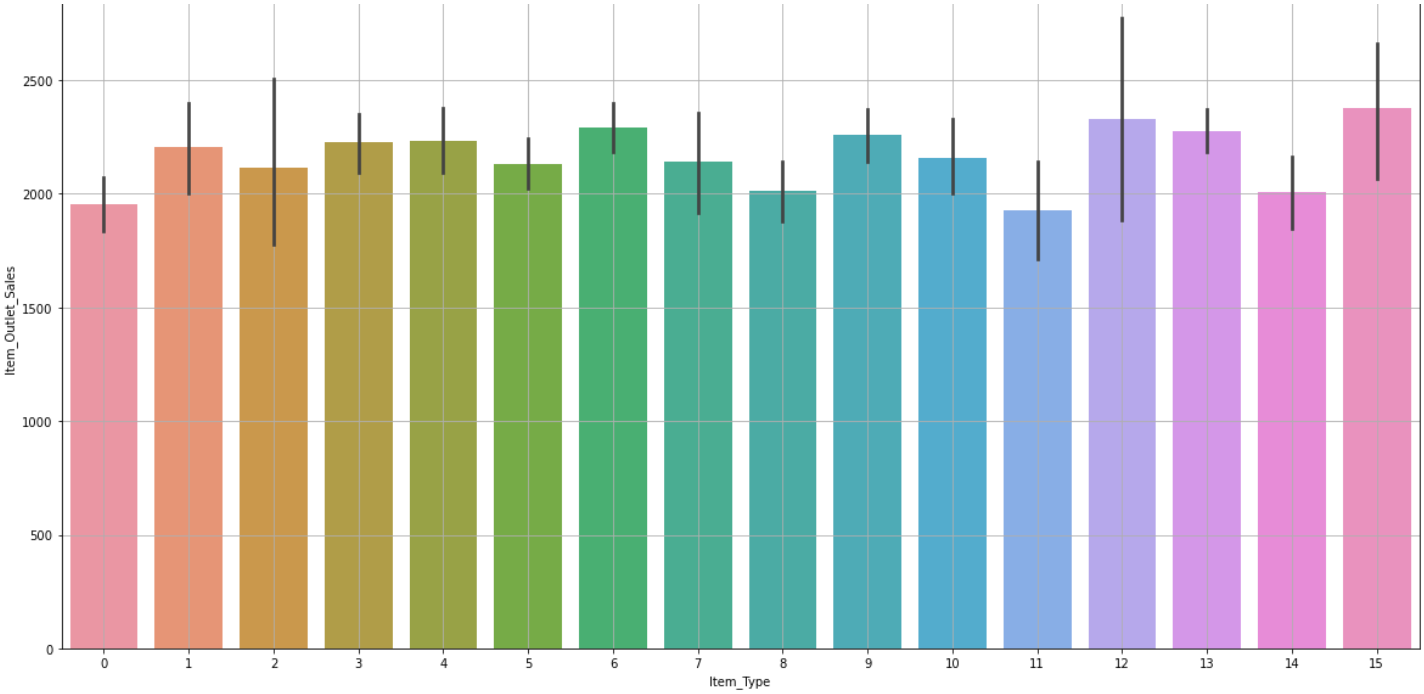
Out[72]:

<AxesSubplot:>



In [73]:

```
plt.figure(figsize=(20,10))
sns.barplot(x='Item_Type',y='Item_Outlet_Sales',data=sales_data)
plt.grid()
```

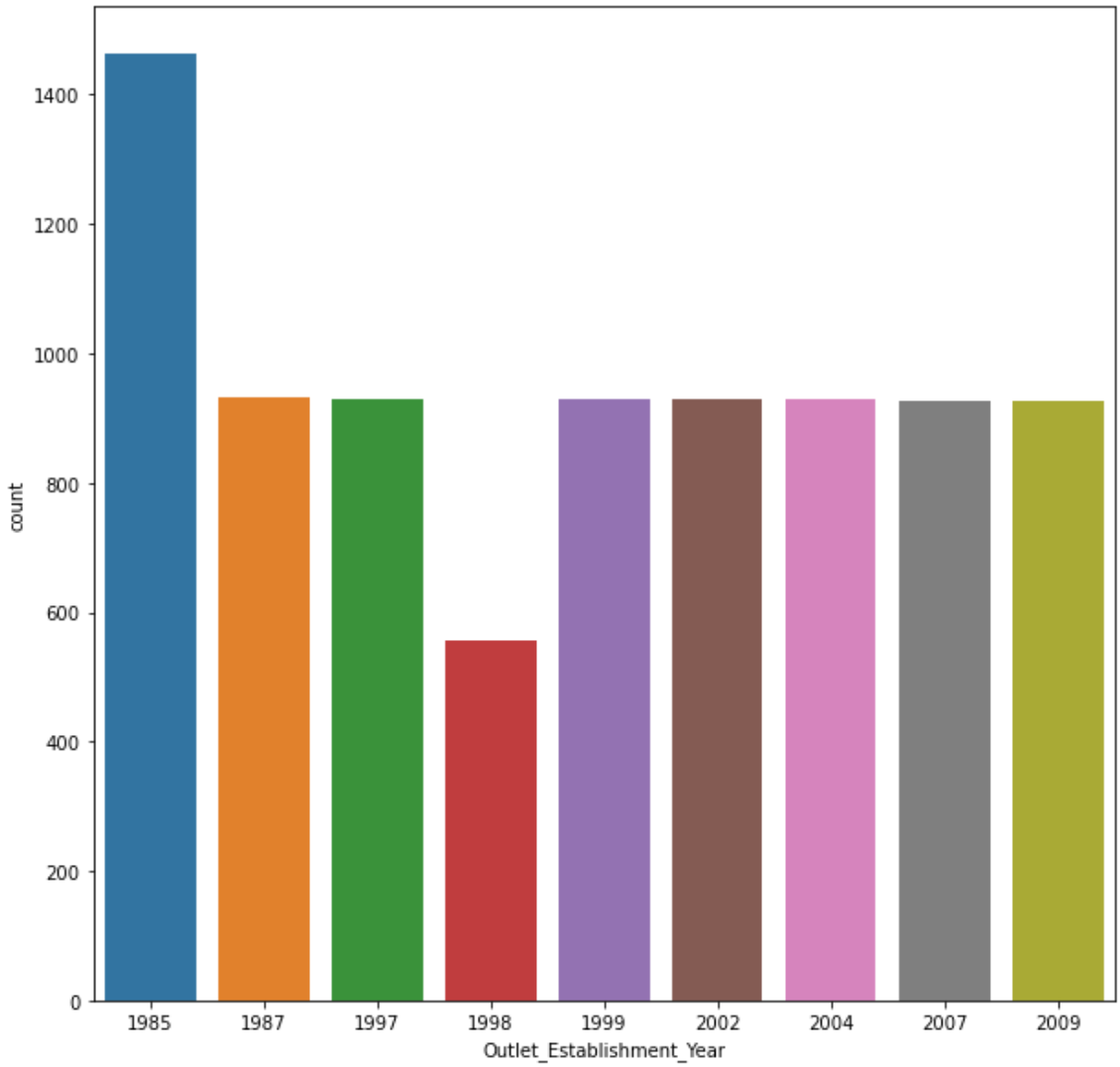


In [74]:

```
plt.figure(figsize=(10,10))
sns.countplot(x="Outlet_Establishment_Year", data=sales_data)
```

Out[74]:

```
<AxesSubplot:xlabel='Outlet_Establishment_Year', ylabel='count'>
```



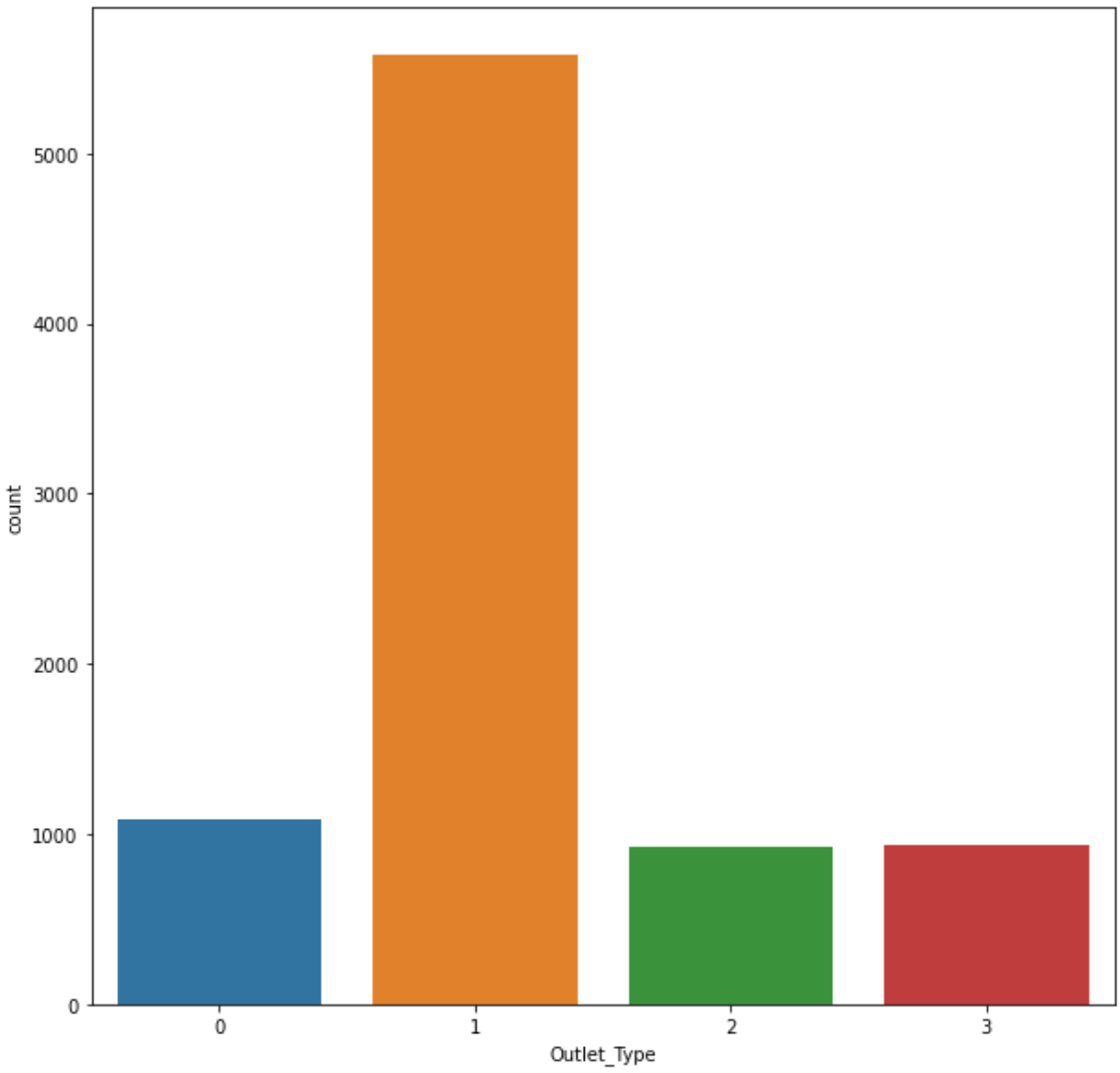
In [75]:

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

```
sns.countplot(x="Outlet_Type", data=sales_data)
```

Out[75]:

```
<AxesSubplot:xlabel='Outlet_Type', ylabel='count'>
```



In [76]:

```
# We need to split the data
X = sales_data.drop(columns='Item_Outlet_Sales',axis=1) # We need all the variables (colu
mns) as independent variables so we're just dropping the target column to make things eas
ier.
y = sales_data['Item_Outlet_Sales'] # Target

# Then we split the data into training and testing data
X_train, X_test, y_train, y_test = train_test_split(X,y,test_size = 0.2, random_state =
2) # 80% data will be used for training the model and rest 20% for testing.
```

In [77]:

```
print(X.shape,X_train.shape)
```

```
(8523, 11) (6818, 11)
```

In [78]:

```
def RegressionAlgorithm(func, **kwargs):
    def innerFunction():
        model = func(**kwargs)
        model.fit(X_train, y_train)
        y_pred = model.predict(X_test)
        rmse = math.sqrt(metrics.mean_squared_error(y_test, y_pred))
        print("Root Mean squared error: %.2f" % rmse)
        print('R2 score: %.2f' % metrics.r2_score(y_test, y_pred))
    return innerFunction
```

In [79]:

```
RegressionAlgorithm(LinearRegression)()
```

```
Root Mean squared error: 1248.61
R2 score: 0.49
```

In [80]:

```
from sklearn.ensemble import RandomForestRegressor
RegressionAlgorithm(RandomForestRegressor,n_estimators=100)()
```

```
Root Mean squared error: 1130.31
R2 score: 0.59
```

In [81]:

```
from sklearn.tree import DecisionTreeRegressor
RegressionAlgorithm(DecisionTreeRegressor,max_depth=15,min_samples_leaf=300)()
```

```
Root Mean squared error: 1155.71
R2 score: 0.57
```

In [ ]:

```

```