1. Impoting Dependencies :

In [ ]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from xgboost import XGBRegressor
from sklearn import metrics
from sklearn.preprocessing import StandardScaler
```

2. Data Collcetion and Analysis:

A- Loading dataset :

In [ ]:
```
data_mart = data_car = pd.read_csv("C:/Machine_learning Python/projets/bigMart/T
```

B- View the data (head)

In [ ]:
```
data_mart.head()
```

Out[ ]:

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

C- type of the data

In [ ]:
```
type(data_mart)
```

Out[ ]:
```
pandas.core.frame.DataFrame
```

D-Number of row & columns:

In [ ]:
```
data_mart.shape
```

Out[ ]:
```
(8523, 12)
```

E- Information about the data:

In [ ]:
```
data_mart.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
```

2. Statisctical measures :

A- General Statistic:

In [ ]:
```
data_mart.describe()
```

Out[ ]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Establishment_Year	Item_Outlet
count	7060.000000	8523.000000	8523.000000	8523.000000	8523.0
mean	12.857645	0.066132	140.992782	1997.831867	2181.2
std	4.643456	0.051598	62.275067	8.371760	1706.4
min	4.555000	0.000000	31.290000	1985.000000	33.2
25%	8.773750	0.026989	93.826500	1987.000000	834.2
50%	12.600000	0.053931	143.012800	1999.000000	1794.3
75%	16.850000	0.094585	185.643700	2004.000000	3101.2
max	21.350000	0.328391	266.888400	2009.000000	13086.9

B- Missing values:

In [ ]:
```
data_mart.isnull().sum()
```

Out[ ]:
```
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
```

C- Handling missing values:

In [ ]:
```
#Mean value of Item_Xeight column
m = data_mart["Item_Weight"].mean()
#Filling the missing value of Item_Xeight with m
data_mart["Item_Weight"].fillna(m,inplace=True)
data_mart.isnull().sum()
```

Out[ ]:
```
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                 2410
Outlet_Location_Type           0
Outlet_Type                    0
Item_Outlet_Sales              0
dtype: int64
```

In [ ]:
```
#Filling the missing value of Item_Xeight with mode
modee = data_mart.pivot_table(values='Outlet_Size' ,columns= 'Outlet_Type' , agg
print(modee)
```

```
Outlet_Type Grocery Store Supermarket Type1 Supermarket Type2  \
Outlet_Size         Small             Small            Medium

Outlet_Type Supermarket Type3
Outlet_Size            Medium
```

In [ ]:
```
missing_value  = data_mart['Outlet_Size'].isnull()
print(missing_value)
```

```
0       False
1       False
2       False
3        True
4       False
        ...
8518    False
8519     True
8520    False
8521    False
8522    False
Name: Outlet_Size, Length: 8523, dtype: bool
```

In [ ]:
```
data_mart.loc[missing_value , 'Outlet_Size'] = data_mart.loc[missing_value , 'Ou
```

In [ ]:
```
data_mart.isnull().sum()
```

Out[ ]:
```
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
```

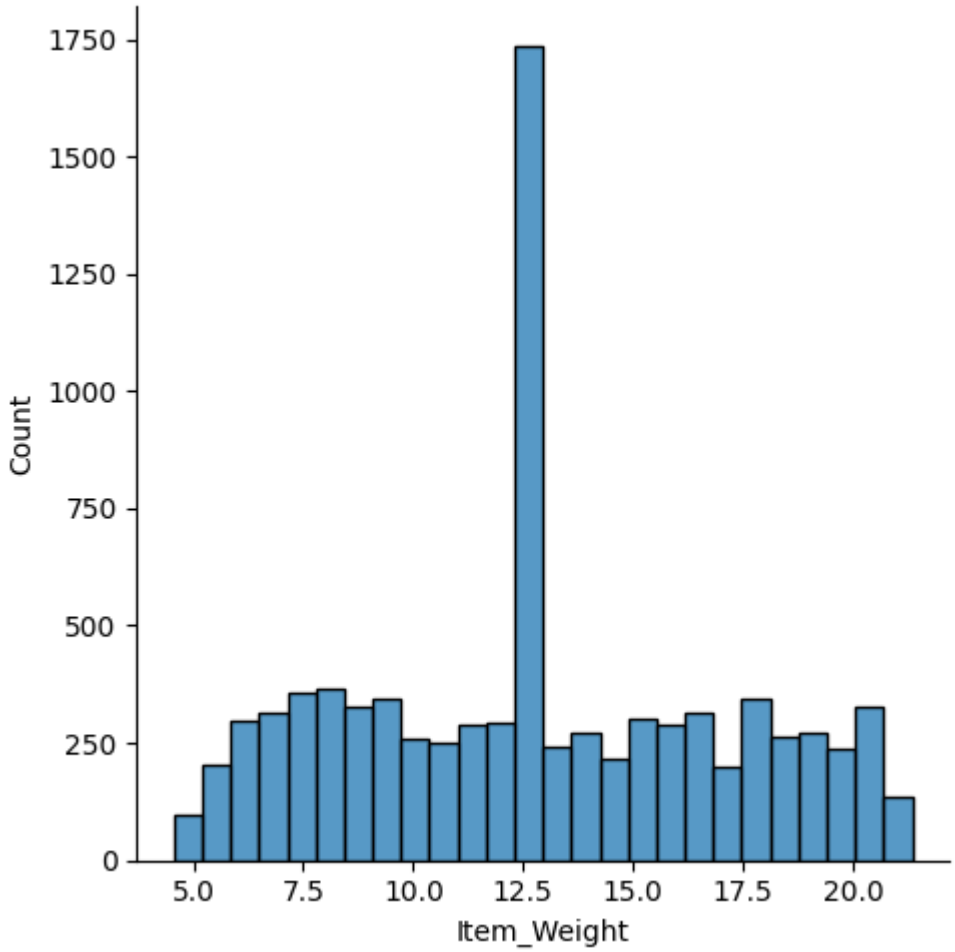
3. Data Analysis:

A- Numerical Features:

A-1. Distribution of Item_Weight :

In [ ]:
```
plt.figure(figsize=(6,6))
sns.displot(data_mart["Item_Weight"])
plt.show()
#Normal distribution
```

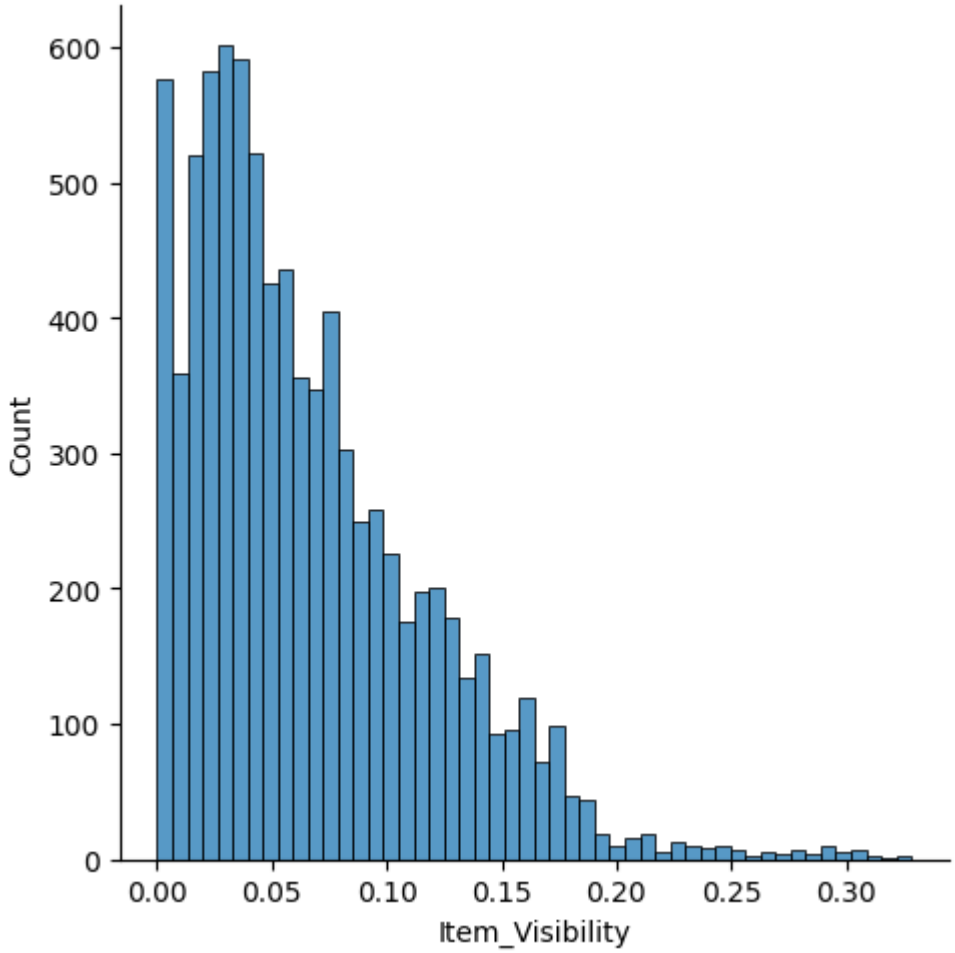
```
<Figure size 600x600 with 0 Axes>
```



A-2. Distribution of Item_Visibility :

In [ ]:
```
plt.figure(figsize=(6,6))
sns.displot(data_mart["Item_Visibility"])
plt.show()
#Not Normal distribution
```

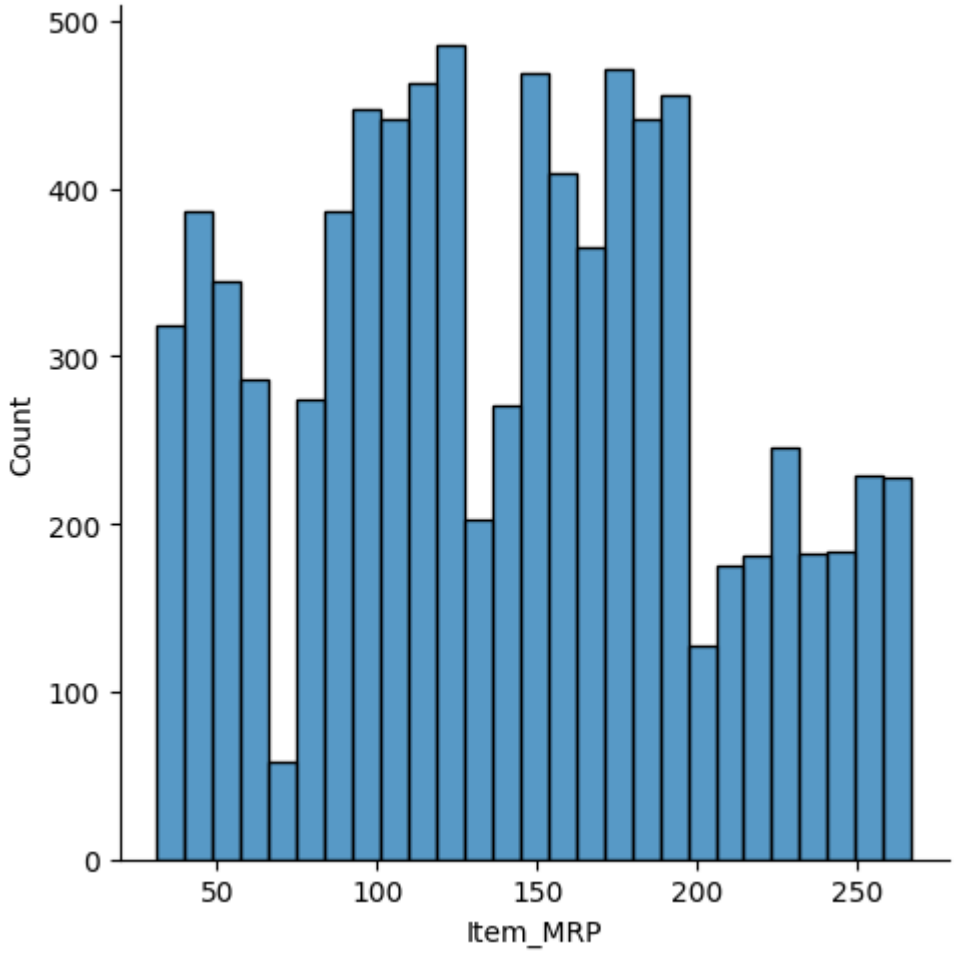
```
<Figure size 600x600 with 0 Axes>
```



A-3. Distribution of Item_MRP :

In [ ]:
```
plt.figure(figsize=(6,6))
sns.displot(data_mart["Item_MRP"])
plt.show()
#Not Normal distribution
```

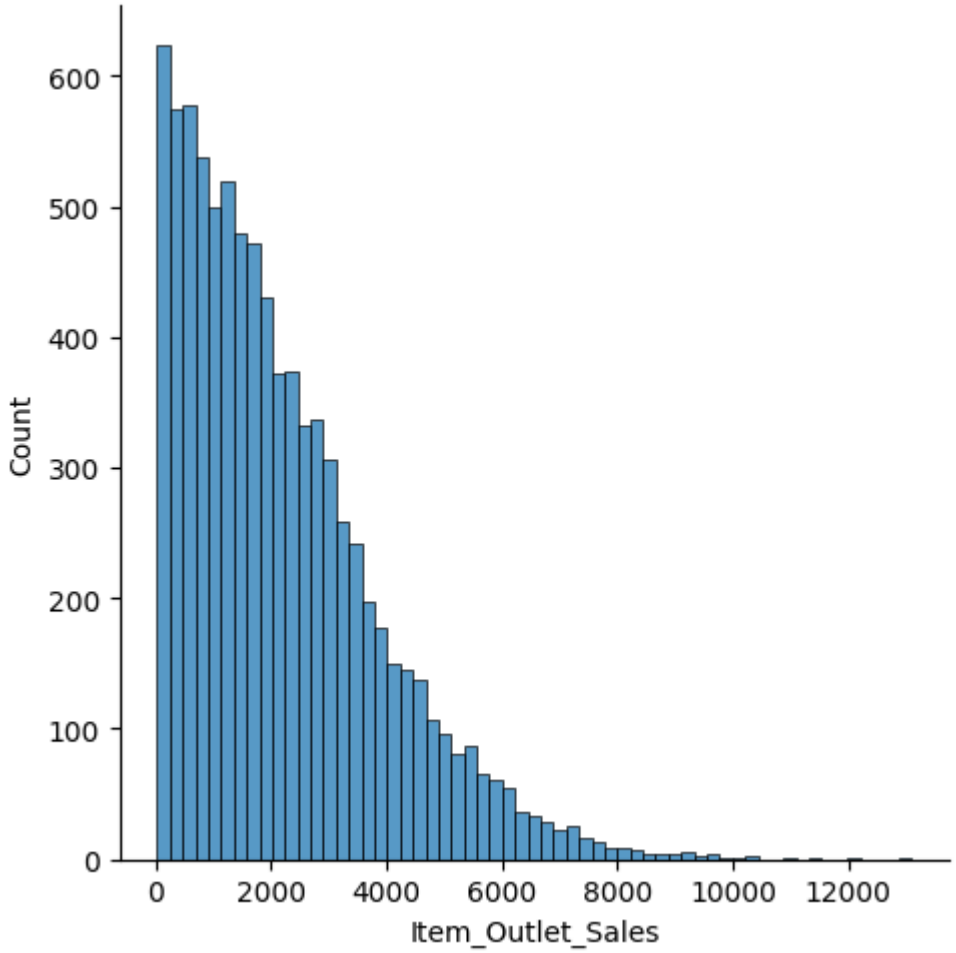
```
<Figure size 600x600 with 0 Axes>
```



A-4. Distribution of Item_Outlet_Sales :

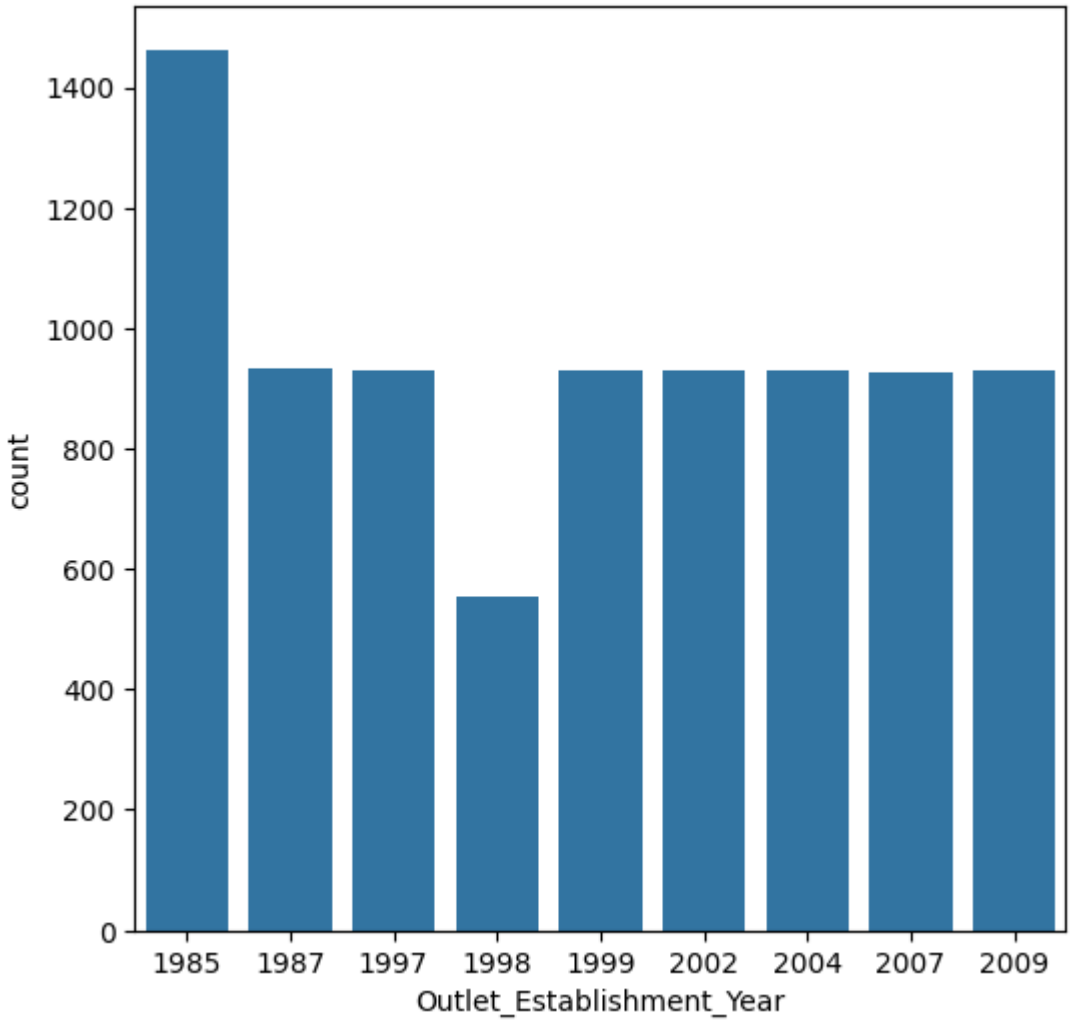
In [ ]:
```
plt.figure(figsize=(6,6))
sns.displot(data_mart["Item_Outlet_Sales"])
plt.show()
#Not Normal distribution
```

```
<Figure size 600x600 with 0 Axes>
```



A-5. Distribution of Outlet_Establishment_Year

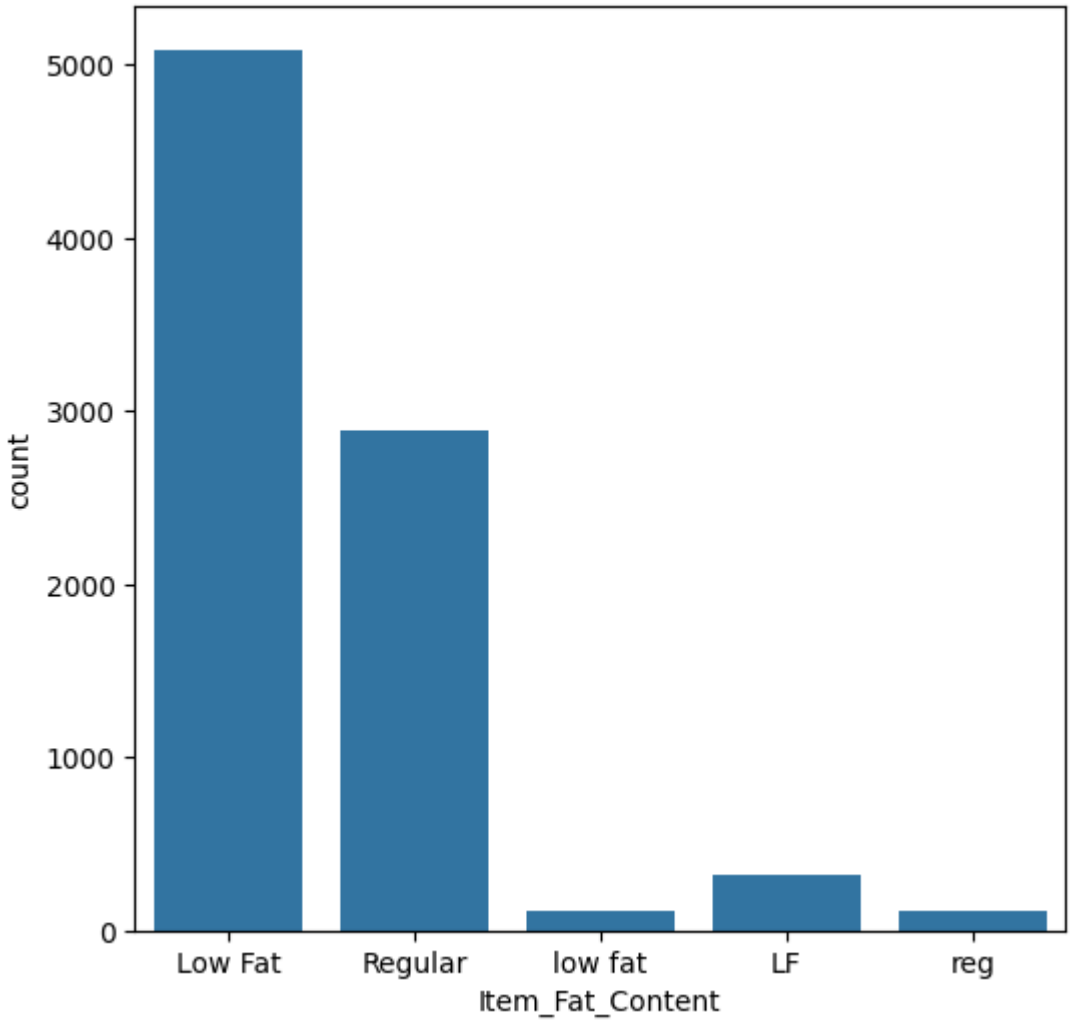
In [ ]:
```
plt.figure(figsize=(6,6))
sns.countplot(x = "Outlet_Establishment_Year", data= data_mart )
plt.show()
```



B- Categorical Features:

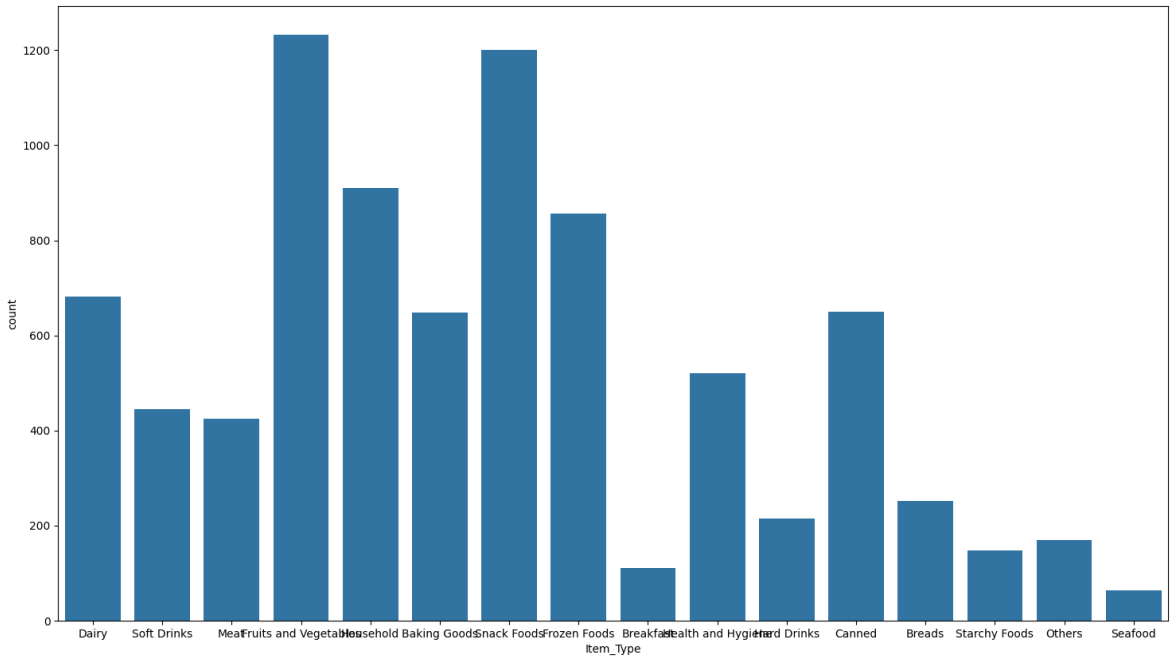
B-1. Count of the Item_Fat_Content

In [ ]:
```
plt.figure(figsize=(6,6))
sns.countplot(x = "Item_Fat_Content", data= data_mart )
plt.show()
```



B-2. Count of the Item_Type

In [ ]:
```
plt.figure(figsize=(18,10))
sns.countplot(x = "Item_Type", data= data_mart )
plt.show()
```



4. Label Encoding:

A- Replace the LF and reg to ow Fat and regular:

In [ ]:
```
data_mart["Item_Fat_Content"].value_counts()
```

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

In [ ]:
```
data_mart.head()
```

Out[ ]:

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

In [ ]:
```
data_mart.replace( {'Item_Fat_Content' : {'low fat' : 'Low Fat' , 'LF' : 'Low Fa
data_mart["Item_Fat_Content"].value_counts()
```

Out[ ]:
```
Item_Fat_Content
Low Fat    5517
Regular    3006
Name: count, dtype: int64
```

B- Transform the categorical value into yhe numerical value:

In [ ]:
```
encoder = LabelEncoder()
```

In [ ]:
```
data_mart = data_mart.drop('Outlet_Size', axis=1)
```

In [ ]:
```
data_mart['Item_Identifier'] = encoder.fit_transform(data_mart['Item_Identifier'
data_mart['Item_Fat_Content'] = encoder.fit_transform(data_mart['Item_Fat_Conten
data_mart['Item_Type'] = encoder.fit_transform(data_mart['Item_Type'])
data_mart['Outlet_Identifier'] = encoder.fit_transform(data_mart['Outlet_Identif
data_mart['Outlet_Location_Type'] = encoder.fit_transform(data_mart['Outlet_Loca
data_mart['Outlet_Type'] = encoder.fit_transform(data_mart['Outlet_Type'])
```

In [ ]:
```
data_mart.head()
```

Out[ ]:

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

5. Spliting feature & target:

A- Separating a data & label

In [ ]:
```
X = data_mart.drop(columns='Item_Outlet_Sales', axis=1)
Y = data_mart['Item_Outlet_Sales']
print(X)
print(Y)
```

```
      Item_Identifier  Item_Weight  Item_Fat_Content  Item_Visibility  \
0                 156        9.300                 0         0.016047
1                   8        5.920                 1         0.019278
2                 662       17.500                 0         0.016760
3                1121       19.200                 1         0.000000
4                1297        8.930                 0         0.000000
...               ...          ...               ...              ...
8518              370        6.865                 0         0.056783
8519              897        8.380                 1         0.046982
8520             1357       10.600                 0         0.035186
8521              681        7.210                 1         0.145221
8522               50       14.800                 0         0.044878

      Item_Type  Item_MRP  Outlet_Identifier  Outlet_Establishment_Year  \
0             4  249.8092                  9                       1999
1            14   48.2692                  3                       2009
2            10  141.6180                  9                       1999
3             6  182.0950                  0                       1998
4             9   53.8614                  1                       1987
...         ...       ...                ...                        ...
8518         13  214.5218                  1                       1987
8519          0  108.1570                  7                       2002
8520          8   85.1224                  6                       2004
8521         13  103.1332                  3                       2009
8522         14   75.4670                  8                       1997

      Outlet_Location_Type  Outlet_Type
0                        0            1
1                        2            2
2                        0            1
3                        2            0
4                        2            1
...                    ...          ...
8518                     2            1
8519                     1            1
8520                     1            1
8521                     2            2
8522                     0            1

[8523 rows x 10 columns]
0       3735.1380
1        443.4228
2       2097.2700
3        732.3800
4        994.7052
          ...
8518    2778.3834
8519     549.2850
8520    1193.1136
8521    1845.5976
8522     765.6700
Name: Item_Outlet_Sales, Length: 8523, dtype: float64
```

B- Test Split

In [ ]:
```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.2, randc
```

In [ ]:
```
print(X.shape,X_train.shape, X_test.shape)
```

```
(8523, 10) (6818, 10) (1705, 10)
```

6. Training the model (SGBRegressor):

A- Loading the model

In [ ]:
```
model = XGBRegressor()
```

B- Training the model:

In [ ]:
```
model.fit(X_train,Y_train)
```

Out[ ]:
```
XGBRegressor(base_score=None, booster=None, callbacks=None,
             colsample_bylevel=None, colsample_bynode=None,
             colsample_bytree=None, device=None, early_stopping_roun
ds=None,
             enable_categorical=False, eval_metric=None, feature_typ
es=None,
             gamma=None, grow_policy=None, importance_type=None,
             interaction_constraints=None, learning_rate=None, max_b
in=None,
```

7. Model Evaluation:

A- Prediction of training data:

In [ ]:
```
training_data = model.predict(X_train)
Rscore = metrics.r2_score(Y_train, training_data)
print("R squared Error of training data : ", Rscore)
```

```
R squared Error of training data :  0.874185623422072
```

B- Prediction of testing data:

In [ ]:
```
training_datatest = model.predict(X_test)
Rscore = metrics.r2_score(Y_test, training_datatest)
print("R squared Error of testing data: ", Rscore)
```

```
R squared Error of testing data:  0.4934005358588578
```

8- Example:

In [ ]:
```
def  predictionF(Item_Identifier,Item_Weight,Item_Fat_Content,Item_Visibility,It
    input_data = (Item_Identifier,Item_Weight,Item_Fat_Content,Item_Visibility,I
    #Input the data into the numpy array:
    input_dataNumpuy = np.asarray(input_data)
    #Reshape the data:
    input_dataReshaped = input_dataNumpuy.reshape(1,-1)
    #Predict the model:
    prediction = model.predict(input_dataReshaped)
    print("The predcition Item_Outlet_Sales is:", prediction[0])
```

```
predictionF(156,9.30,0,0.016047,4,249.8092,9,1999,0,1)
```

```
The predcition Item_Outlet_Sales is: 4284.2456
```